5. R-8

Product information
Ball valves with rotary actuators
Important notes

Using Belimo actuators
The actuators described in this publication are intended for use in the open and closed water circuits of heating, ventilating and air-conditioning systems. Use of the actuators with other liquid or gaseous fluids on request.

Flow rates
The recognized rules should be applied when determining the flow characteristic of final controlling elements.

Safety notes

TR.. (pages 14, 15, 22 and 23):
The housing may only be opened at the manufacturer’s site. It does not contain any parts that can be replaced or repaired by the user.
If the cable has to be replaced, it is essential to ensure that the insulation is only stripped over a maximum length of 50 mm.

LR.. (pages 16, 26 and 27):
The housing may only be opened at the manufacturer’s site. It does not contain any parts that can be replaced or repaired by the user.

NR.. (pages 17, 18, 24, 25 and 28):
The motor cable cannot be replaced. If the lead is damaged, the new connection should be made using the cable gland. Maximum stripped length of insulation: 50 mm.

NR24-3-S, NR230-3-S (pages 24 and 25):
If the auxiliary switch cable has to be replaced, it is essential to ensure that the insulation is only stripped over a maximum length of 50 mm.

Rotary-action actuators for applications involving water

Characterized control valves, open-close ball valves and rotary actuators

5.R-..
Characterized control valves
DN 10...DN 80
• With equal-percentage characteristic
• For modulating control functions

Open-close ball valves DN 10...DN 80
• For shut-off or change-over functions

Rotary actuators
• For controls: open-close, 3-point or modulating

Rotary actuators for mixing valves

5.NR-..

• For mixing valves up to DN 80
• For controls: 3-point, modulating

Suitable mixing valves:
ESBE, Termonix, Pommerening, Dumserwerk, Lovato, Landis&Staefer, Oventrop, Meibes, Wita, Holter, Satchwell, Centra and other makes
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<tr>
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<td>18</td>
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</tr>
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</tr>
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<td>22</td>
</tr>
<tr>
<td>TR24-3</td>
<td>23</td>
</tr>
<tr>
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<td>24</td>
</tr>
<tr>
<td>NR230-3, NR230-3-S</td>
<td>25</td>
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<tr>
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</tr>
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<td>26</td>
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<td>LF230, LF230-S</td>
<td>30</td>
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<tr>
<td>AFR24, AFR24-S</td>
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<tr>
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<td>41</td>
</tr>
</tbody>
</table>
## Characterized control valves and rotary actuators for modulating control

### Technical characteristics of characterized control valves for modulating control of cold and hot water

<table>
<thead>
<tr>
<th>kvY</th>
<th>Characteristic: equal percentage</th>
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<tr>
<td></td>
<td>Rated pressure: 4140 kPa (DN10...DN32) 2760 kPa (DN32...DN50)</td>
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For more technical data: refer to pages 8 and 9

### Connection Internal thread

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<thead>
<tr>
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<th>[m³/h]</th>
<th>0.25</th>
<th>0.4</th>
<th>0.63</th>
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<th>1.6</th>
<th>2.5</th>
<th>4</th>
<th>6.3</th>
<th>4</th>
<th>6.3</th>
<th>8.6</th>
<th>6.3</th>
<th>10</th>
<th>16</th>
<th>10</th>
<th>16</th>
<th>25</th>
<th>25</th>
<th>40</th>
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</thead>
<tbody>
<tr>
<td>DN</td>
<td>[mm]</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>15</td>
<td>15</td>
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### Connection External thread

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<thead>
<tr>
<th>kvY</th>
<th>[m³/h]</th>
<th>0.25</th>
<th>0.4</th>
<th>0.63</th>
<th>1</th>
<th>1.6</th>
<th>2.5</th>
<th>4</th>
<th>6.3</th>
<th>4</th>
<th>6.3</th>
<th>8.6</th>
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<th>16</th>
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<th>16</th>
<th>25</th>
<th>25</th>
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<tbody>
<tr>
<td>DN</td>
<td>[mm]</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
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<td>20</td>
<td>25</td>
<td>25</td>
<td>32</td>
<td>32</td>
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</tbody>
</table>

### Suitable rotary actuators, modulating, DC 0...10 V

- TR24-SR, AC/DC 24 V
- TR24-3, AC 24 V
- NR24-SR, AC/DC 24 V
- NRY24-SR, AC/DC 24 V

### Suitable rotary actuators, 3-point

- TR24-3, AC 24 V
- NR24-3, AC 230 V
- NR230-3, AC 230 V

### Suitable rotary actuators, emergency control function

- LF24-SR, AC/DC 24 V
- AFR24-SR, AC/DC 24 V

### Connection Flange PN 6

| kvY | [m³/h] | 0.63 | 1 | 1.6 | 2.5 | 4 | 6.3 | 10 | 16 | 16 | 25 | 25 | 40 | 58 | 90 |
|-----|--------|------|---|-----|-----|---|-----|----|---|---|---|---|---|---|---|---|
| DN  | [mm]   | 15   | 15 | 15  | 15 | 15 | 20 | 25 | 32 | 40 | 40 | 50 | 50 | 65 | 80 |
| 2-way | R609R R610R R611R R612R R613R R618R R623R R631R – R639R – R649R R664R R679R |
| 3-way | R709R – R711R – R713R R718R R723R R731R R738R – R748R – – – |

### Suitable rotary actuators, modulating, DC 0...10 V

- TR24-SR, AC/DC 24 V
- LR24-SR, AC/DC 24 V
- NR24-SR, AC/DC 24 V
- NRY24-SR, AC/DC 24 V

### Suitable rotary actuators, 3-point

- TR24-3, AC/DC 24 V
- NR24-3, AC 24 V
- NR230-3, AC 230 V

### Suitable rotary actuators, emergency control function

- LF24-SR, AC/DC 24 V
- AFR24-SR, AC/DC 24 V
Open-close ball valves and rotary actuators for shut-off or change-over functions

Technical characteristics of open-close ball valves for cold and hot water

- Rated pressure: 4140 kPa (DN15…DN32)
  2760 kPa (DN32…DN50)

For more technical data: refer to pages 10 and 11

<table>
<thead>
<tr>
<th>Connection</th>
<th>Internal thread</th>
</tr>
</thead>
<tbody>
<tr>
<td>$k_v$ [m³/h]</td>
<td>8.6 21 26 16 32 32 49</td>
</tr>
<tr>
<td>DN [mm]</td>
<td>15 20 25 32 32 40 50</td>
</tr>
<tr>
<td>2-way</td>
<td>R215 R220 R225 R230 R232 R240 R250</td>
</tr>
<tr>
<td>3-way</td>
<td>R315 R320 R325 R330 R332 R340 R350</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Connection</th>
<th>External thread</th>
</tr>
</thead>
<tbody>
<tr>
<td>$k_v$ [m³/h]</td>
<td>8.6 21 26 16 32 32 49</td>
</tr>
<tr>
<td>DN [mm]</td>
<td>15 20 25 32 32 40 50</td>
</tr>
<tr>
<td>2-way</td>
<td>R415 R420 R425 R430 R432 R440 R450</td>
</tr>
<tr>
<td>3-way</td>
<td>R515 R520 R525 R530 R532 R540 R550</td>
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</table>

Suitable rotary actuators, 1-wire

- LR24(-S), AC/DC 24 V
- LR230(-S), AC 230 V
- NR230-1-T, AC 230 V

Suitable rotary actuators, 2-wire

- TR24-3, AC 24 V
- NR24-3(-S), AC 24 V
- NR230-3(-S), AC 230 V

Suitable rotary actuators, emergency control function

- LF24(-S), AC/DC 24 V
- LF230(-S), AC 230 V
- AFR24(-S), AC 24 V
- AFR230(-S), AC 230 V

<table>
<thead>
<tr>
<th>Connection</th>
<th>Flange PN 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>$k_v$ [m³/h]</td>
<td>8.6 21 26 32 32 49 230 230</td>
</tr>
<tr>
<td>DN [mm]</td>
<td>15 20 25 32 40 50 65 80</td>
</tr>
<tr>
<td>2-way</td>
<td>R615R R620R R625R R632R R640R R650R R665R R680R</td>
</tr>
<tr>
<td>3-way</td>
<td>R715R R720R R725R R732R R740R R750R – –</td>
</tr>
</tbody>
</table>

Suitable rotary actuators, 1-wire

- LR24(-S), AC/DC 24 V
- LR230(-S), AC 230 V

Suitable rotary actuators, 2-wire

- TR24-3, AC 24 V
- NR24-3(-S), AC 24 V
- NR230-3(-S), AC 230 V

Suitable rotary actuators, emergency control function

- LF24(-S), AC/DC 24 V
- LF230(-S), AC 230 V
- AFR24(-S), AC 24 V
- AFR230(-S), AC 24 V
The Belimo characterized control valve

Ordinary ball valves are unsuitable as control devices
In order to ensure good stability of control, a hydraulic final controlling element must possess a flow characteristic that supplements the non-linear characteristic of the heat exchanger in the HVAC system.

Belimo adds "characterized control" to ball valves
Belimo has succeeded in solving the problem of the distorted flow characteristic of ordinary ball valves. A so-called "characterizing disc" in the inlet of the characterized control valve converts the valve’s characteristic to the equal-percentage kind. The side of the characterizing disc facing the ball is concave and in contact with the surface of the ball. Thus, the actual flow is regulated by the hole in the ball and by the V-shaped aperture in the characterizing disc.

Elements of the characterized control valve
1. Simple direct mounting using a central screw. The rotary actuator can be mounted in four different positions
2. Square stem head for form-fit attachment of the rotary actuator
3. Identical mounting flange for all sizes
4. Stem with two O-ring seals for a long service life
5. Ball and stem made of stainless steel

Ordinary ball valves are unsuitable as control devices

Ordinary ball valves are unsuitable as control devices because they lack the necessary flow characteristic to complement the non-linear characteristic of the heat exchanger in the HVAC system. In order to ensure good stability of control, a hydraulic final controlling element must possess a flow characteristic that supplements the non-linear characteristic of the heat exchanger.

Belimo adds "characterized control" to ball valves

Belimo has succeeded in solving the problem of the distorted flow characteristic of ordinary ball valves by introducing a so-called "characterizing disc" in the inlet of the characterized control valve. This disc converts the valve’s characteristic to the equal-percentage kind. The side of the characterizing disc facing the ball is concave and in contact with the surface of the ball, allowing actual flow to be regulated by the hole in the ball and the V-shaped aperture in the characterizing disc.

Advantages of the Belimo characterized control valve

Advantages of the Belimo characterized control valve include:
- Equal-percentage characteristic
- No initial jump in flow on opening
- Excellent stability of control thanks to the characterizing disk
- kvs values similar to those of globe valves of comparable size
- Fewer pipe reducers needed
- Less prone to vibration, greater stability of control
- Tight-sealing (2-way)

Optimum choice of kvs valves of identical size

The Belimo range of characterized control valves includes 2-way and 3-way types. These are available in a variety of sizes and with a choice of kvs values. A characterized control valve is supplied as a unit complete with a suitable Belimo rotary actuator.
The sizing of ball valves

**Formula**

\[
k_{VS} = \sqrt{\frac{V_{100}}{\Delta P_{100}}}\]

**Definition of \(\Delta P\)**

Closing pressure at which the actuator can still seal the valve tightly allowing for the appropriate leakage rate.

**Legend**

- \(\Delta P_{\text{max}}\)
  - Maximum permitted pressure difference for a long service life across control path A-AB referred to the whole range of opening.
  - \(\Delta P\)
  - For low-noise operation.

**Formula for \(\Delta P_{100}\)**

\[
\Delta P_{100} = \frac{k_{VS} \cdot V_{100}}{100}\]

**Sizing table**

<table>
<thead>
<tr>
<th>Differential pressure (\Delta P_{100}) [kPa]</th>
<th>0.1</th>
<th>1</th>
<th>3</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>k_{VS} [m³/h]</td>
<td>0.27</td>
<td>0.86</td>
<td>1.49</td>
<td>2.72</td>
</tr>
<tr>
<td></td>
<td>0.66</td>
<td>2.1</td>
<td>3.6</td>
<td>6.6</td>
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<tr>
<td></td>
<td>0.82</td>
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<td>4.5</td>
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<td>5.06</td>
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<td></td>
<td>7.26</td>
<td>23</td>
<td>39.86</td>
<td>72.78</td>
</tr>
</tbody>
</table>

Connection

R2.. Internal thread
R4.. External thread
R6.. Flange

Flow rate \(V_{100}\) [m³/h]
Characterized control valves, 2-way

**Applications**
- Water-side control of air handling apparatus in ventilation and air-conditioning systems
- Water-side control in heating systems

**Mode of operation**
The characterized control valve is operated by a rotary actuator. The actuators are controlled by a standard modulating or 3-point control system and move the ball of the valve – the throttling device – to the opening position dictated by the control signal.

**Ordering**
An order for an R2.. characterized control valve includes a suitable rotary actuator.

**Ordering examples:** (with NR24-SR)

- **a)** R231 characterized control valve with NR24-SR
  - Rotary actuator fitted
  - Order code: R231+NR24-SR
- **b)** R231 characterized control valve and NR24-SR
  - Rotary actuator supplied separately
  - Order code: R231/NR24-SR

**Technical data**

- **Flow media**
  - Cold and hot water
  - Water with max. 50% volume of glycol

- **Temperature of medium**
  - +5 °C...+110 °C (lower or higher temperatures on request)

- **Rated pressure $p_{\text{r}}$**
  - See table below

- **Flow characteristic**
  - Control path A–AB: equal percentage (to VDI/VDE 2173)
  - DN10…15*: $n(gl) = 3.2$, optimized in opening range
  - DN20…50**: $n(gl) = 3.9$, optimized in opening range

- **Rangeability**
  - DN 10…15*: $S_V > 50$
  - DN 20…50**: $S_V > 100$

- **Leakage rate**
  - Air bubble-tight (BO 1, DIN 3230 Part 3)

- **Pipe connector**
  - R2.. internal thread to ISO 7/1
  - R4.. external thread to ISO 228/1
  - R6.. flange PN 6 to EN 1092/1

- **Differential pressure**
  - $\Delta p_{\text{max}}$: 350 kPa (200 kPa for low-noise operation)
  - $\Delta p_{\text{c}}$: 1400 kPa

- **Angle of rotation**
  - 90° (operating range 15°...90°)

- **Installation position**
  - Upright to horizontal (in relation to the stem)

- **Maintenance**
  - Maintenance-free

**Materials**

- **Fitting**
  - Forged, nickel-plated brass body

- **Valve cone**
  - Stainless steel / R6.. chrome-plated brass

- **Seal**
  - PTFE

- **Stem**
  - Stainless steel / R6.. chrome-plated brass

- **Stem seal**
  - EPDM

- **Flange ring**
  - DN 15/20 Zinc-plated steel
  - DN 25…80 Aluminum

- **Flange joint surface**
  - Nickel-plated brass

**Characterizing disk**
- TEFZEL

**Selection**

<table>
<thead>
<tr>
<th>$k_{V_S}$</th>
<th>DN</th>
<th>Type</th>
<th>Suitable rotary actuators</th>
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<tbody>
<tr>
<td>[m³/h]</td>
<td>mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.25</td>
<td>10</td>
<td>3/8“</td>
<td>R205K R405K</td>
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<tr>
<td>0.4</td>
<td>10</td>
<td>3/8“</td>
<td>R206K R406K</td>
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<tr>
<td>0.63</td>
<td>10</td>
<td>3/8“</td>
<td>R207K R407K</td>
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<tr>
<td>1</td>
<td>10</td>
<td>3/8“</td>
<td>R208K R408K</td>
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<tr>
<td>1.6</td>
<td>10</td>
<td>3/8“</td>
<td>R209K R409K</td>
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<td>0.63</td>
<td>15</td>
<td>1/2“</td>
<td>R210 R410 R610R</td>
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<td>15</td>
<td>1/2“</td>
<td>R211 R411 R611R</td>
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<td>R212 R412 R612R</td>
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<td>R213 R413 R613R</td>
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<td>6.3</td>
<td>15</td>
<td>1/2“</td>
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<td>4</td>
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<td>R217 R417 R617R</td>
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<td>R218 R418 R618R</td>
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<td>3/8“</td>
<td>R219 R419 R619R</td>
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<td>1”</td>
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<td>1”</td>
<td>R223 R423 R623R</td>
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<td>16</td>
<td>25</td>
<td>1”</td>
<td>R224 R424 R624R</td>
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<td>32</td>
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<td>R229 R429 R629R</td>
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<td>32</td>
<td>1/2“</td>
<td>R231 R431 R631R</td>
</tr>
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<td>16</td>
<td>40</td>
<td>1/2“</td>
<td>R238 R438 R638R</td>
</tr>
<tr>
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<td>R248 R448 R648R</td>
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<td>2”</td>
<td>R249 R449 R649R</td>
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<td>90</td>
<td>80</td>
<td>3”</td>
<td>– – R679R</td>
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**Ordering**

An order for an R2.. characterized control valve includes a suitable rotary actuator.

**Ordering examples:**

- **a)** R231 characterized control valve with NR24-SR
  - Rotary actuator fitted
  - Order code: R231+NR24-SR
- **b)** R231 characterized control valve and NR24-SR
  - Rotary actuator supplied separately
  - Order code: R231/NR24-SR

**Important**

- **Sizing diagram for characterized control valves:** page 7
- **Dimensions:** pages 12, 33, 34 and 36
- **Installation instructions:** pages 33, 34, 36
- **Please note the information provided on pages 2 and 38 to 40 regarding use, installation, project design, commissioning and maintenance**
- **Pipe connectors can be supplied as an accessory:** page 13
Applications
Water-side control of air handling apparatus in ventilation and air-conditioning systems
Water-side control in heating systems

Mode of operation
The characterized control valve is operated by a rotary actuator. The actuators are controlled by a standard modulating or 3-point control system and move the ball of the valve – the mixing device – to the opening position dictated by the control signal.

Product features
Equal-percentage characteristic of the flow rate ensured by the integral characterizing disc.

Manual operation by lever after disengaging the gearing latch on the Type TR.., LR.. or NR.. rotary actuator (manual operation not possible with LF ../AFR..).

Ordering
An order for an R3.. characterized control valve includes a suitable rotary actuator.

Ordering examples: (with NR24-SR)
a) R318 characterized control valve with NR24-SR
- Rotary actuator fitted
- Order code: R318+NR24-SR

b) R318 characterized control valve and NR24-SR
- Rotary actuator supplied separately
- Order code: R318/NR24-SR

3-way characterized control valves
DN 10...50
For modulating control of cold and hot water

Equal-percentage characteristic

Technical data
Flow media Cold and hot water, Water with max. 50% volume of glycol
Temperature of medium +5 °C...+110 °C (lower or higher temperatures on request)
Rated pressure $p_r$ See table below
Flow characteristic Control path A–AB: equal percentage (to VDI/VDE 2173)
$\Delta p_{\text{max}}$ 350 kPa (200 kPa for low-noise operation)
Closing pressure $\Delta p_s$ 1400 kPa
Angle of rotation 90° (operating range of control path A–AB 15º...90° bypass B–AB 15°...70°)
Installation position Upright to horizontal (in relation to the stem)
Maintenance Maintenance-free

Materials
Fitting Forged, nickel-plated brass body
Valve cone Stainless steel / R7.. chrome-plated brass
Seal PTFE
Stem Stainless steel / R7.. chrome-plated brass
Stem seal EPDM
Flange ring DN 15/20 Zinc-plated steel
DN 25...80 Aluminum
Flange joint surface Nickel-plated brass
Characterizing disk TEFZEL

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<td>R505.. – R529</td>
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<td>R351 – R548</td>
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<td>R709R – R748R</td>
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Important
- Sizing diagram for characterized control valves: page 7
- Dimensions: pages 12, 33, 34 and 36
- Installation instructions: pages 33, 34, 36
- Please note the information provided on pages 2 and 36 to 40 regarding use, installation, project design, commissioning and maintenance
- Pipe connectors can be supplied as an accessory: page 13
Applications
For shutting off cold and hot water circuits in heating and ventilation systems on the water side or for 2-point control of these circuits.

Mode of operation
The open-close ball valve is operated by a rotary actuator. The rotary actuators are controlled by an open-close signal.

Product features
Manual operation by lever after disengaging the gearing latch on the Type TR.., LR.. or NR.. rotary actuator (manual operation not possible with LF ../AFR..).

Ordering
An order for an R2.. open-close ball valve includes a suitable rotary actuator.

Ordering examples:
(a) R240 open-close ball valve with NR230-3
   - Rotary actuator fitted
   - Order code: R240+NR 230-3
(b) R240 open-close ball valve and NR24-SR
   - Rotary actuator supplied separately
   - Order code: R240/NR230-3

Technical data
Flow media Cold and hot water,
Water with max. 50% volume of glycol
Temperature of medium +5 °C...+110 °C (lower or higher temperatures on request)
Rated pressure $p_{\text{R}}$ See table below
Leakage rate Air bubble-tight (BO 1, DIN 3230 Part 3)
Pipe connector R2.., Internal thread to ISO 7/1
R4.., External thread to ISO 228/1
R6.., Flange PN 6 to EN 1092/1
Differential pressure $\Delta p_{\text{max}}$ 1000 kPa (200 kPa for low-noise operation)
Closing pressure $\Delta p_{\text{s}}$ 1400 kPa
Angle of rotation 90°
Installation position Upright to horizontal (in relation to the stem)
Maintenance Maintenance-free

Materials
Fitting Forged, nickel-plated brass body
Valve cone Stainless steel / R6.. chrome-plated brass
Seal PTFE
Stem Stainless steel / R6.. chrome-plated brass
Stem seal EPDM
Flange ring DN 15/20 Zinc-plated steel
DN 25...80 Aluminum
Flange joint surface Nickel-plated brass

Selection

<table>
<thead>
<tr>
<th>$k_{\text{VS}}$</th>
<th>DN</th>
<th>Type</th>
<th>Suitable rotary actuators</th>
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<td>[m³/h]</td>
<td>mm</td>
<td></td>
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<td>15</td>
<td>1/2&quot;</td>
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<td>3/4&quot;</td>
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<td>1&quot;</td>
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<td>32</td>
<td>1 1/4&quot;</td>
<td>R230 R430 –</td>
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<td>R250 R450 R650R</td>
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<td>2 1/2&quot;</td>
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<tr>
<td>230</td>
<td>80</td>
<td>3&quot;</td>
<td>– – R680R</td>
</tr>
</tbody>
</table>


2-way open-close ball valves DN 15...80

Shut-off function and 2-point controls in cold and hot water circuits

Important
- Sizing diagram for characterized control valves: page 7
- Dimensions: pages 12, 33, 34 and 36
- Installation instructions: pages 33, 36
- Please note the information provided on pages 2 and 38 to 40 regarding use, installation, project design, commissioning and maintenance
- Pipe connectors can be supplied as an accessory: page 13
R3.., R5.., R7.. Open-close ball valves, 3-way

Change-over function and 2-point controls in cold and hot water circuits

Applications
For changing over cold and hot water circuits in heating and ventilation systems on the water side or for 2-point control of these circuits.

Mode of operation
The open-close ball valve is operated by a rotary actuator. The rotary actuators are controlled by an open-close signal.

Product features
Manual operation by lever after disengaging the gearing latch on the Type TR.., LR.. or NR.. rotary actuator (manual operation not possible with LF../AFR..).

Ordering
An order for an R2.. open-close ball valve includes a suitable rotary actuator.

Ordering examples:
(a) R315 open-close ball valve with LR230
   – Rotary actuator fitted
   – Order code: R315+LR230

(b) R315 open-close ball valve and LR230
   – Rotary actuator supplied separately
   – Order code: R315/LR230

Technical data
Flow media Cold and hot water, Water with max. 50% volume of glycol
Temperature of medium +5 °C...+110 °C (lower or higher temperatures on request)
Rated pressure $p_s$ See table below
Flow rate Bypass B-AB: approx. 50% of $k_{VS}$
Leakage rate Control path A-AB: air bubble-tight (BO 1, DIN 3230 Part 3) Bypass B-AB: 1% of $k_{VS}$
Pipe connector R3.., Internal thread to ISO 7/1 R5.., External thread to ISO 228/1 R7.., Flange PN 6 to EN 1092/1
Differential pressure $\Delta p_{\text{max}}$ 1000 kPa (200 kPa for low-noise operation)
Closing pressure $\Delta p_s$ 1400 kPa
Angle of rotation 90°
Installation position Upright to horizontal (in relation to the stem)
Maintenance Maintenance-free
Materials
Fitting Forged, nickel-plated brass body
Valve cone Stainless steel / R7.. chrome-plated brass
Seal PTFE
Stem Stainless steel / R7.. chrome-plated brass
Stem seal EPDM
Flange ring DN 15/20 Zinc-plated steel DN 25...80 Aluminum
Flange joint surface Nickel-plated brass

<table>
<thead>
<tr>
<th>$k_{VS}$ [m³/h]</th>
<th>DN [mm]</th>
<th>Type</th>
<th>Suitable rotary actuators</th>
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Number of wires
1-wire
2-wire
Emergency control function

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<tr>
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<td>R352 – R550</td>
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<td>R715R – R750R</td>
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Important
- Sizing diagram for characterized control valves: page 7
- Dimensions: pages 12, 33, 34 and 36
- Installation instructions: pages 33, 34, 36
- Please note the information provided on pages 2 and 36 to 40 regarding use, installation, project design, commissioning and maintenance
- Pipe connectors can be supplied as an accessory: page 13


2-way ball valves with internal thread

```
Dimensions Thread Weight
L H BSP Max. screwing depth [mm] [mm] [mm] [Inches] [mm] [kg]
10 52 36 3/8" 10 0.3
15 67 45 1/2" 13 0.4
25 87 47.5 1" 17 0.7
32 105 47.5 1½" 19 0.9
40 111 52 1½" 19 1.05
50 125 58 2" 22 1.8
```

2-way ball valves with external thread

```
Dimensions Thread Weight
L H G [mm] [mm] [mm] [Inches] [kg]
10 59 31.5 3/8" 0.4
15 74 44 1" 0.6
20 85.5 46 1½" 0.8
25 84.5 46 1½" 0.9
32 97.5 46 2" 1.1
32 102 50.5 2" 1.3
40 103 50.5 2½" 1.4
50 115.5 56 2½" 2.3
```

2-way ball valves with flanges

```
Dimensions Flange Weight
L H D C K d [mm] [mm] [mm] [mm] [mm] [mm] [kg]
15 101.5 45 80 15 55 4 x 11.5 1.3
20 112 47.5 90 15 65 4 x 11 1.7
25 132 47.5 100 20 75 4 x 11.5 1.7
32 143.5 52 120 17 90 4 x 14 2.3
40 149.5 52 130 18 100 4 x 14 2.7
50 165 58 140 18 110 4 x 14 3.7
65 180.5 69 160 18 130 4 x 14 6.0
80 191.5 69 190 20.5 150 4 x 18 7.6
```
Dimensions of R3.., R5.. and R7.. ball valves

3-way ball valves with internal thread

3-way ball valves with external thread

3-way ball valves with flanges

Pipe connectors (accessory)

Included in scope of delivery of ZR23..:
1 male part (R thread),
1 union nut (G thread),
1 female part (BSP thread),
1 flat gasket (IT)

Pipe connectors for ball valve

Included in scope of delivery of ZR45..:
Female part, union nut, flat gasket

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<th>Thread Weight</th>
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<td>G 2 3/4&quot;</td>
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</tbody>
</table>
TRD24-SR rotary actuator for characterized control valves

Wiring diagram

Technical data

- Nominal voltage: AC 24 V, 50/60 Hz, DC 24 V
- Power supply range: AC 19.2...28.8 V
- For wire sizing: 1 VA
- Power consumption: 0.5 W
- Connection: Cable 1 m, 3 x 0.75 mm²
- Manual operation: Temporary disengagement of gearing latch
- Torque: min. 1.6 Nm (at nominal voltage)
- Angle of rotation: 90°
- Running time: 90 s
- Sound power level: max. 35 dB (A)
- Protection class: III Safety extra-low voltage
- Degree of protection: IP 40
- Ambient temperature range: -7...+50°C (together with ball valve)
- Temperature of medium: +5...+100°C (ball valve)
- Non-operating temperature: -40...+80°C
- Humidity test: To EN 60730-1
- EMC: CE according to 89/336/EEC
- LV Directive: CE according to 73/23/EEC
- Mode of operation: Type 1 EN 60730-1
- Maintenance: Maintenance-free
- Weight: 0.3 kg (without ball valve)

Wiring diagram

Override control (frost protection circuit)

Connection via safety isolating transformer

Y DC 0...10 V

TRD24-SR

Y TRD24-SR

AC 24 V

DC 24 V

Direction of rotation R (standard) when switch set to right position

R M

Y = 0

Modulating operation

Important

- Suitable characterized control valves: pages 8 and 9
- Use and safety: page 2
- Installation instructions: page 33
- Installation dimensions: page 33

Rotary actuator for 2 and 3-way characterized control valves DN 10

Modulating actuator (AC/DC 24 V)

Control DC 0...10 V

Application

Operation of characterized control valves.

Mode of operation

Modulating control is effected by means of a standard 0…10 V DC control signal.

Product features

Simple direct mounting on the characterized control valve using only one screw. The mounting position in relation to the characterized control valve can be selected in 90° steps.

Functional reliability: The actuator is overload-proof and automatically stops when the end stops are reached.

Manual operation possible by lever (the gearing latch remains disengaged as long as the self-resetting lever is pressed).

Ordering examples:

a) TRD24-SR rotary actuator with R.., characterized control valve fitted
   - Order code: R..+TRD24-SR
b) TRD24-SR rotary actuator and R.., characterized control valve supplied separately
   - Order code: R../TRD24-SR
c) TRD24-SR rotary actuator packed loose
   - Order code: TRD24-SR

Dimensions [mm]

78
55
69
22
67
84

Important
TR24-SR rotary actuator for characterized control valves

Wiring diagram

<table>
<thead>
<tr>
<th>Standard connection</th>
<th>Override control (frost protection circuit)</th>
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<tbody>
<tr>
<td><img src="image.png" alt="Diagram" /></td>
<td><img src="image.png" alt="Diagram" /></td>
</tr>
</tbody>
</table>

### Technical data

- **Nominal voltage**: AC 24 V, 50/60 Hz, DC 24 V
- **Power supply range**: AC 19.2...28.8 V
- **For wire sizing**: 1 VA
- **Power consumption**: 0.5 W
- **Connection**: Cable 1 m, 3 x 0.75 mm²
- **Manual operation**: Temporary disengagement of gearing latch
- **Torque**: min. 2 Nm (at nominal voltage)
- **Angle of rotation**: 90°
- **Running time**: 90 s
- **Sound power level**: max. 35 dB (A)
- **Protection class**: III Safety extra-low voltage
- **Degree of protection**: IP 40
- **Ambient temperature range**: -7...+50°C (together with ball valve)
- **Temperature of medium**: +5...+100°C (ball valve)
- **Non-operating temperature**: -40...+80°C
- **Humidity test**: To EN 60730-1
- **EMC**: CE according to 89/336/EEC
- **LV Directive**: CE according to 73/23/EEC
- **Mode of operation**: Type 1 EN 60730-1
- **Maintenance**: Maintenance-free
- **Weight**: 0.3 kg (without ball valve)

### Important

- Suitable characterized control valves: pages 8 and 9
- Use and safety: page 2
- Installation instructions: page 33
- Installation dimensions: page 33
LR24-SR rotary actuator for characterized control valves

Wiring diagram

### Mode of operation

Modulating control is effected by means of a standard 0…10 V DC control signal.

### Product features

- **Simple direct mounting** on the characterized control valve using only one screw. The mounting position in relation to the characterized control valve can be selected in 90° steps.
- **Functional reliability**: The actuator is overload-proof and automatically stops when the end stops are reached.
- **Manual operation** possible by lever (the gearing latch remains disengaged as long as the self-resetting lever is pressed).

### Ordering examples:

- a) LR24-SR rotary actuator with R.. characterized control valve fitted
  - Order code: R..+LR24-SR
- b) LR24-SR rotary actuator and R.. characterized control valve supplied separately
  - Order code: R../LR24-SR
- c) LR24-SR rotary actuator packed loose
  - Order code: LR24-SR

### Dimensions [mm]

![Dimensions diagram]

### Important

- Suitable characterized control valves: pages 8 and 9
- Use and safety: page 2
- Installation instructions: page 34
- Installation dimensions: page 34
NR24-SR rotary actuator for characterized control valves

Application
Operation of characterized control valves.

Mode of operation
Modulating control is effected by means of a standard 0...10 V DC control signal. A synchronization process starts when the power supply is switched on. The actuator moves at high speed to the closed position ("closed" limit switch), where it is synchronized.

Product features
Simple direct mounting on the characterized control valve using only one screw. The mounting position in relation to the characterized control valve can be selected in 90° steps.

Functional reliability: The actuator is overload-proof and automatically stops when the end stops are reached.

Manual operation possible by lever (temporary disengagement of the gearing latch by pressing, permanent disengagement by means of the rotary knob on the housing).

Ordering examples:
- NR24-SR rotary actuator with R.. characterized control valve fitted
  - Order code: R..+NR24-SR
- NR24-SR rotary actuator and R.. characterized control valve supplied separately
  - Order code: R../NR24-SR
- NR24-SR rotary actuator packed loose
  - Order code: NR24-SR+WNR (WNR mounting kit for characterized control valve)

Technical data
- Nominal voltage: AC 24 V, 50/60 Hz, DC 24 V
- Power supply range: AC 19.2...28.8 V, DC 21.6...28.8 V
- For wire sizing: 2.5 VA
- Power consumption: 1.5 W
- Connection: Cable 1 m, 4 x 0.75 mm²
- Control: DC 0...10 V @ 100 kΩ input impedance
- Operating range: DC 2...10 V for 0...100% (0...90°)
- Position feedback: DC 2...10 V (max. 1 mA) for 0...100% (0...90°)
- Uni-rotation: ±5%
- Manual operation: Temporary and permanent disengagement of the gearing latch by means of the rotary knob on the housing
- Torque: min. 10 Nm (at nominal voltage)
- Running time: 140 s
- Sound power level: max. 35 dB (A)
- Position indication: Scale plate 0..1
- Protection class: III Safety extra-low voltage
- Degree of protection: IP 40
- Ambient temperature range: 0...+50°C
- Temperature of medium: +5...+120°C (ball valve)
- Non-operating temperature: -30...+80°C
- Humidity test: To EN 60730-1
- EMC: CE according to 89/336/EEC
- Mode of operation: Type 1 / Softwareklasse A
- Maintenance: Maintenance-free
- Weight: 0.5 kg (without ball valve)

Dimensions [mm]

Important
- Suitable characterized control valves: pages 8 and 9
- Use and safety: page 2
- Installation instructions: page 34
- Installation dimensions: page 34
NRY24-SR rotary actuator for characterized control valves

Application

Operation of characterized control valves.

Modulating actuator (AC/DC 24 V)

Control DC 0...10 V

Running time 35 s

Adjustable operating range

Locked-rotor protection

No override synchronization in case of power failure

Product features

Simple direct mounting on the characterized control valve using only one screw. The mounting position in relation to the characterized control valve can be selected in 90° steps.

Functional reliability: The actuator is overload-proof and automatically stops when the end stops are reached.

Manual operation possible by lever (temporary disengagement of the gearing latch by pressing, permanent disengagement by means of the rotary knob on the housing).

Ordering examples:

a) NRY24-SR rotary actuator with R.. characterized control valve fitted – Order code: R..+NRY24-SR
b) NRY24-SR rotary actuator packed loose – Order code: NRY24-SR+WNR (WNR mounting kit for characterized control valve)

Technical data

Nominal voltage AC 24 V 50/60 Hz, DC 24 V

Power supply range AC 19.2...28.8 V, DC 21.6...28.8 V

For wire sizing 4 VA

Power consumption 2.5 W

Control DC 0...10 V @ 100 kΩ input impedance

Operating range DC 2...10 V for 0...100% \(\leq (15...90^\circ)\)

Position feedback DC 2...10 V (max. 1 mA) for 0...100% \(\leq (15...90^\circ)\)

Uni-rotation \(\pm 5\%\)

Manual operation Temporary and permanent disengagement of the gearing latch by means of the rotary knob on the housing

Torque min. 10 Nm (at nominal voltage)

Running time 35 s

Sound power level max. 50 dB (A)

Position indication Scale plate 0...1

Protection class III Safety extra-low voltage

Degree of protection IP 40

Ambient temperature range 0...+50°C

Temperature of medium +5...+120°C (ball valve)

Non-operating temperature –30...+80°C

Humidity test To EN 60730-1

EMC CE according to 89/336/EEC

Mode of operation Type 1 / software class A

Maintenance Maintenance-free

Weight 0.5 kg (without ball valve)

Important

- Suitable characterized control valves:
  - pages 8 and 9
- Use and safety: page 2
- Installation instructions: page 34
- Installation dimensions: page 34
NRY24-SR rotary actuator for characterized control valves

Adjustable operating range

The actuator positions to 15° when Y control = approx. 1.9 V (operating range 2..10 V). The actuator opens the valve linearly from 15 to 90° between 2 and 10 V.
- (Y control = position feedback U = 2...10 V)

Locked-rotor protection

The actuator features a locked-rotor protection function. If the Y control value remains both unchanged and 20% below the start of the operating range (2 V) for 23 hours, the actuator opens the valve from 0 to 13° and then returns it to 0° again.
- (Characterized control valve A-AB = 0...15° = air bubble-tight)

No override synchronization

- The current position of the actuator is stored in case of a power failure. There is therefore no need to resynchronize when the power is restored.
- If the angle of rotation deviates > 10°, for instance due to a preceding manual override, the actuator is synchronized when the “closed” or “open” limit switch is reached.
- If the angle of rotation deviates <10°, the necessary correction is effected without synchronizing the actuator when the “closed” or “open” limit switch is reached.
LF24-SR rotary actuator for characterized control valves

Rotary actuator for 2 and 3-way characterized control valves
DN 15...32
with emergency control function

Modulating actuator (AC/DC 24 V)
Control DC 0...10 V

Application
Operation of characterized control valves.

Mode of operation
Modulating control is effected by means of a standard 0...10 V DC control signal. The LF.. actuator moves the characterized control valve into the operating position while simultaneously charging the return spring. The characterized control valve is turned back into the safety position by the application of spring energy when the supply voltage is interrupted.

Product features
Simple direct mounting on the characterized control valve using only one screw. The mounting position in relation to the characterized control valve can be selected in 90° steps.

Functional reliability: The actuator is overload-proof and automatically stops when the end stops are reached.

Signalization: 0...100%, with adjustable auxiliary switch.

Ordering examples:

a) LF24-SR rotary actuator with R.. open-close ball valve fitted
– Order code: R..+LF24-SR

b) LF24-SR rotary actuator and R.. open-close ball valve supplied separately
– Order code: R../LF24-SR

c) LF24-SR rotary actuator packed loose
– Order code: LF24-SR+WLF
(WLF mounting kit for characterized control valve)

Dimensions [mm]

Important

- Suitable characterized control valves: pages 8 and 9
- Use and safety: page 2
- Installation instructions: page 36
- Installation dimensions: page 36
AFR24-SR rotary actuator for characterized control valves

Technical data
- Nominal voltage: AC 24 V, DC 24 V
- Power supply range: AC 19.2...28.8 V, DC 24 V
- For wire sizing: 10 VA (max. 5.8 A @ 5 ms)
- Power consumption: When charging spring 6 W, holding position 2.5 W
- Connection: Cable 1 m, 4 x 0.75 mm²
- Control signal: Y DC 0...10 V @ 100 kΩ input impedance
- Operating range: DC 2...10 V for 0...100%
- Measuring voltage: U DC 2...10 V (max. 0.7 mA) for 0...100%
- Direction of rotation: Motor reversible with L / R switch, spring return reversible by mounting L / R
- Torque: Motor min. 15 Nm, spring return min. 15 Nm
- Angle of rotation: max. 95° (37...100% adjustable with integral, mechanical angle of rotation limiting)
- Running time: Motor 150 s, spring return ~16 s @ –20...50°C / max. 60 s @ –30°C
- Sound power level: Motor max. 30 dB (A), spring return ~62 dB (A)
- Service life: min. 60 000 safety positions
- Protection class: III Safety extra-low voltage
- Degree of protection: IP 54
- Ambient temperature range: –30...+50°C
- Non-operating temperature: –40...+80°C
- Humidity test: To EN 60730-1
- EMC: CE according to 89/336/EEC
- Maintenance: Maintenance-free
- Weight: 1.4 kg (without ball valve)

Product features
- Simple direct mounting on the characterized control valve using only one screw. The mounting position in relation to the characterized control valve can be selected in 90° steps.
- Functional reliability: The actuator is overload-proof and automatically stops when the end stops are reached.
- Signalization: 0...100%, with adjustable auxiliary switch.

Ordering examples:
- a) AFR24-SR rotary actuator with R.. open-close ball valve fitted – Order code: R..+AFR24-SR
- b) AFR24-SR rotary actuator and R.. open-close ball valve supplied separately – Order code: R../AFR24-SR
- c) AFR24-SR rotary actuator packed loose – Order code: AFR24-SR+WAFR (WAFR mounting kit for characterized control valve)

Dimensions [mm]

Important
- Suitable characterized control valves: pages 8 and 9
- Use and safety: page 2
- Installation instructions: page 36
- Installation dimensions: page 36
TRD24-3 rotary actuator for characterized control valves and open-close ball valves

**Application**
Operation of characterized control valves or open-close ball valves.

**Mode of operation**
3-point control for characterized control valves. Open-close control for open-close ball valves.

**Product features**
Simple direct mounting on the ball valve using only one screw. The mounting position in relation to the ball valve can be selected in 90° steps.
Functional reliability: The actuator automatically stops when the end stops are reached.
Manual operation possible by lever (the gearing latch remains disengaged as long as the self-resetting lever is pressed).

**Ordering examples:**
a) TRD24-3 rotary actuator with R.. characterized control valve fitted
   - Order code: R..+TRD24-3
b) TRD24-3 rotary actuator and R.. characterized control valve supplied separately
   - Order code: R../TRD24-3
c) TRD24-3 rotary actuator packed loose
   - Order code: TRD24-3

**Technical data**
- Nominal voltage: AC 24 V 50/60 Hz
- Power supply range: AC 19.2...28.8 V
- For wire sizing 1 VA
- Power consumption: 1 W
- Connection: Cable 1 m, 3 x 0.75 mm²
- Manual operation: Temporary disengagement of gearing latch
- Torque: min. 1.6 Nm (at nominal voltage)
- Angle of rotation: 90°
- Running time: 105/90 s
- Sound power level: max. 35 dB (A)
- Protection class: III Safety extra-low voltage
- Degree of protection: IP 40
- Ambient temperature range: -7...+50°C (together with ball valve)
- Temperature of medium: +5...+100°C (ball valve)
- Non-operating temperature: -40...+80°C
- Humidity test: To EN 60730-1
- EMC: CE according to 89/336/EEC
- LV Directive: CE according to 73/23/EEC
- Mode of operation: Type 1 EN 60730-1
- Maintenance: Maintenance-free
- Weight: 0.3 kg (without ball valve)

**Dimensions [mm]**

**Important**
- Suitable characterized control valves and open-close ball valves: pages 8 to 11
- Use and safety: page 2
- Installation instructions: page 33
- Installation dimensions: page 33
TR24-3 rotary actuator for characterized control valves and open-close ball valves

Rotary actuator for 2 and 3-way characterized control valves DN 15 and 2 and 3-way open-close ball valves DN 15

3-point actuator (AC 24 V)
3-point or open-close control

Application
Operation of characterized control valves or open-close ball valves.

Mode of operation
3-point control for characterized control valves. Open-close control for open-close ball valves.

Product features
Simple direct mounting on the ball valve using only one screw. The mounting position in relation to the ball valve can be selected in 90° steps.

Functional reliability: The actuator automatically stops when the end stops are reached.

Manual operation possible by lever (the gearing latch remains disengaged as long as the self-resetting lever is pressed).

Ordering examples:
a) TR24-3 rotary actuator with R.. characterized control valve fitted
   – Order code: R..+TR24-3
b) TR24-3 rotary actuator and R.. characterized control valve supplied separately
   – Order code: R../TR24-3
c) TR24-3 rotary actuator packed loose
   – Order code: TR24-3

Technical data
Nominal voltage AC 24 V 50/60 Hz
Power supply range AC 19.2..28.8 V
For wire sizing 1 VA
Power consumption 1 W
Connection Cable 1 m, 3 x 0.75 mm²
Manual operation Temporary disengagement of gearing latch
Torque min. 2 Nm (at nominal voltage)
Angle of rotation 90°
Running time 105/90 s
Sound power level max. 35 dB (A)
Protection class III Safety extra-low voltage
Degree of protection IP 40
Ambient temperature range -7...+50°C (together with ball valve)
Temperature of medium +5...+100°C (ball valve)
Non-operating temperature -40...+80°C
Humidity test To EN 60730-1
EMC CE according to 89/336/EEC
LV Directive CE according to 73/23/EEC
Mode of operation Type 1 EN 60730-1
Maintenance Maintenance-free
Weight 0.3 kg (without ball valve)

Important
- Suitable characterized control valves and open-close ball valves: pages 8 to 11
- Use and safety: page 2
- Installation instructions: page 33
- Installation dimensions: page 33
NR24-3(-S) rotary actuator for characterized control valves and open-close ball valves

Technical data

Nominal voltage AC 24 V 50/60 Hz
Power supply range AC 19.2...28.8 V
For wire sizing 1.5 VA
Power consumption 1.5 W
Connection Motor Cable 1 m, 3 x 0.75 mm²
Auxiliary switch (NR24-3-S) Cable 1 m, 3 x 0.75 mm²
Auxiliary switch (NR24-3-S) 1 x EPU 5 (1) A, AC 250 V
Adjustable switching point, 0...100%
Manual operation Temporary and permanent disengagement of the gearing latch by means of the rotary knob on the housing
Torque min. 10 Nm (at nominal voltage)
Angle of rotation 90°
Running time 140 s
Sound power level max. 35 dB (A)
Position indication Scale plate 0...1
Protection class III Safety extra-low voltage
Degree of protection IP 40
Ambient temperature range 0...+50°C (together with ball valve)
Temperature of medium +5...+120°C (ball valve)
Non-operating temperature –30...+80°C
Humidity test To EN 60730-1
EMC CE according to 89/336/EEC
LV Directive CE according to 73/23/EEC
Mode of operation Type 1.C
Maintenance Maintenance-free
Weight 0.5 kg (without ball valve)

Application
Operation of characterized control valves or open-close ball valves.

Mode of operation
3-point control for characterized control valves. Open-close control for open-close ball valves.

Product features
Simple direct mounting on the ball valve using only one screw. The mounting position in relation to the ball valve can be selected in 90° steps.
Functional reliability: The actuator automatically stops when the end stops are reached.
Manual operation possible by lever (temporary disengagement of the gearing latch by pressing, permanent disengagement by means of the rotary knob on the housing).

Ordering examples:
- a) NR24-3 rotary actuator with R.. characterized control valve fitted
  – Order code: R..+NR24-3
- b) NR24-3 rotary actuator and R.. characterized control valve supplied separately
  – Order code: R../NR24-3
- c) NR24-3 rotary actuator packed loose
  – Order code: NR24-3

Dimensions [mm]

Important
- Suitable characterized control valves and open-close ball valves: pages 8 to 11
- Use and safety: page 2
- Installation instructions: page 34
- Installation dimensions: page 34
NR230-3(-S) rotary actuator for characterized control valves and open-close ball valves

Technical data

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<td>3.5 W</td>
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<td>Connection Motor</td>
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<td>Auxiliary switch (NR230-3-S)</td>
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<td>Auxiliary switch (NR230-3-S)</td>
<td>1 x EPU 5 (1) A, AC 250 V</td>
</tr>
</tbody>
</table>

Adjustable switching point, 0...100%

Manual operation Temporary and permanent disengagement of the gearing latch by means of the rotary knob on the housing

Torque min. 10 Nm (at nominal voltage)

Angle of rotation 90°

Running time 140 s

Sound power level max. 35 dB (A)

Position indication Scale plate 0...1

Protection class II Totally insulated

Degree of protection IP 40

Ambient temperature range 0...+50°C (duty cycle 140/35 s)

Temperature of medium +5...+120°C (ball valve)

Non-operating temperature –30...+80°C

Humidity test To EN 60730-1

EMC CE according to 89/336/EEC

LV Directive CE according to 73/23/EEC

Mode of operation Type 1.C

Maintenance Maintenance-free

Weight 0.5 kg (without ball valve)

Application

Operation of characterized control valves or open-close ball valves.

Mode of operation

3-point control for characterized control valves. Open-close control for open-close ball valves.

Product features

Simple direct mounting on the ball valve using only one screw. The mounting position in relation to the ball valve can be selected in 90° steps.

Functional reliability: The actuator automatically stops when the end stops are reached.

Manual operation possible by lever (temporary disengagement of the gearing latch by pressing, permanent disengagement by means of the rotary knob on the housing).

Signaling: 0...100%, with adjustable auxiliary switch (NR230-3-S only).

Ordering examples:

a) NR230-3 rotary actuator with R.. characterized control valve fitted
   – Order code: R..+NR230-3
b) NR230-3 rotary actuator and R.. characterized control valve supplied separately
   – Order code: R../NR230-3
c) NR230-SR rotary actuator packed loose
   – Order code: NR230-3+WNR
   (WNR mounting kit for characterized control valve)

Dimensions [mm]

Important

- Suitable characterized control valves and open-close ball valves: pages 8 to 11
- Use and safety: page 2
- Installation instructions: page 34
- Installation dimensions: page 34
LR24(-S) rotary actuator for open-close ball valves

Technical data
Nominal voltage AC 24 V 50/60 Hz, DC 24 V
Power supply range AC/DC 19.2...28.8 V
For wire sizing 2 VA
Power consumption 1.5 W
Connection Motor                                  Cable 1 m, 3 x 0.75 mm²
Auxiliary switch (LR24-S)                          Cable 1 m, 3 x 0.75 mm²
Auxiliary switch (LR24-S) 1 x EPU 5 (1.5) A, AC 250 V II
Adjustable switching point, 0...100%
Manual operation Pushbutton, self-resetting
Torque min. 4 Nm (at nominal voltage)
Angle of rotation max. 90°
Running time 80...110 s (0...4 Nm)
Sound power level max. 35 dB (A)
Position indication Scale plate 0..1
Protection class III Safety extra-low voltage
Degree of protection IP 40
Ambient temperature range 0...+50°C (together with ball valve)
Temperature of medium +5...+100°C (ball valve)
Non-operating temperature -40...+80°C
Humidity test To EN 60730-1
EMC CE according to 89/336/EEC
LV Directive CE according to 73/23/EEC
Mode of operation Type 1.C
Maintenance Maintenance-free
Weight 0.55 kg (without ball valve)

Wiring diagram

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<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>S1</td>
<td>S2</td>
<td>S3</td>
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</tbody>
</table>
| 0  | 0 | 0 | 0%
| 100%| 100%| 100%|

Connection via safety isolating transformer

Important
- Suitable open-close ball valves: pages 8 to 11
- Use and safety: page 2
- Installation instructions: page 34
- Installation dimensions: page 34

Rotary actuator for 2 and 3-way open-close ball valves DN 15...32
Modulating actuator (AC/DC 24 V)
Open-close control

Application
Operation of open-close ball valves.

Mode of operation
Open-close control is effected with 1-wire control.

Product features
Simple direct mounting on the open-close ball valve using only one screw. The mounting position in relation to the open-close ball valve can be selected in 90° steps.

Functional reliability: The actuator is overload-proof and automatically stops when the end stops are reached.

Manual operation possible by lever (the gearing latch remains disengaged as long as the self-resetting pushbutton on the housing is pressed).

Signalization: 0...10%, with adjustable auxiliary switch (LR24-S only).

Ordering examples:
a) LR24 rotary actuator with R.. open-close ball valve fitted
   – Order code: R..+LR24
b) LR24 rotary actuator and R.. open-close ball valve supplied separately
   – Order code: R../LR24
c) LR24 rotary actuator packed loose
   – Order code: LR24

Dimensions [mm]
LR230(-S) rotary actuator for open-close ball valves

**Wiring diagram**

- **Nominal voltage**: AC 230 V
- **Power supply range**: AC 198...264 V
- **Power consumption**: 1 W
- **Connection**: Motor Cable 1 m, 3 x 0.75 mm²
- **Auxiliary switch (LR230-S)** Cable 1 m, 3 x 0.75 mm²
- **Auxiliary switch (LR230-S)** 1 x EPU 5 (1.5) A, AC 250 V

**Technical data**

- **Torque min.**: 4 Nm (at nominal voltage)
- **Angle of rotation max.**: 90°
- **Running time**: 80...110 s (0...4 Nm)
- **Sound power level max.**: 35 dB (A)
- **Angle of rotation max.**: 95°
- **Position indication**: Scale plate 0...1
- **Protection class**: II Totally insulated
- **Degree of protection**: IP 40
- **Ambient temperature range**: 0...+50°C (together with ball valve)
- **Temperature of medium**: +5...+100°C (ball valve)
- **Non-operating temperature**: -40...+80°C
- **Humidity test**: To EN 60730-1
- **EMC**: CE according to 89/336/EEC
- **LV Directive**: CE according to 73/23/EEC
- **Mode of operation**: Type 1.C
- **Maintenance**: Maintenance-free
- **Weight**: 0.55 kg (without ball valve)

**Application**

Operation of open-close ball valves.

**Mode of operation**

Open-close control is effected with 1-wire control.

**Product features**

- **Simple direct mounting**: on the open-close ball valve using only one screw. The mounting position in relation to the open-close ball valve can be selected in 90° steps.
- **Functional reliability**: The actuator is overload-proof and automatically stops when the end stops are reached.
- **Manual operation**: possible by lever (the gearing latch remains disengaged as long as the self-resetting pushbutton on the housing is pressed).
- **Signalization**: 0...10%, with adjustable auxiliary switch (LR230-S only).

**Ordering examples**

- **a)** LR230 rotary actuator with R.. open-close ball valve fitted
  - Order code: R..+LR230
- **b)** LR230 rotary actuator and R.. open-close ball valve supplied separately
  - Order code: R../LR230
- **c)** LR230 rotary actuator packed loose
  - Order code: LR230

**Important**

- **Suitable open-close ball valves**: pages 8 to 11
- **Use and safety**: page 2
- **Installation instructions**: page 34
- **Installation dimensions**: page 34
NR230-1-T rotary actuator for open-close ball valves

Wiring diagram

Technical data

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<tr>
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<td>Running time</td>
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<td>Protection class</td>
<td>II Totally insulated</td>
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<td>Humidity test</td>
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<td>Maintenance</td>
<td>Maintenance-free</td>
</tr>
<tr>
<td>Weight</td>
<td>0.5 kg (without ball valve)</td>
</tr>
</tbody>
</table>

Rotary actuator for 2 and 3-way open-close ball valves DN 15...80
Modulating actuator (AC 230 V)
Open-close control

Application
Operation of open-close ball valves.

Mode of operation
Open-close control is effected with 1-wire control.

Product features
Simple direct mounting on the ball valve using only one screw. The mounting position in relation to the ball valve can be selected in 90° steps.

Functional reliability: The actuator automatically stops when the end stops are reached.

Manual operation possible by lever (temporary disengagement of the gearing latch by pressing, permanent disengagement by means of the rotary knob on the housing).

Ordering examples:

a) NR230-1-T rotary actuator with R.. characterized control valve fitted – Order code: R..+NR230-1-T
b) NR230-3 rotary actuator and R.. characterized control valve supplied separately – Order code: R../NR230-1-T
c) NR230-1-T rotary actuator packed loose – Order code: NR230-1-T+WNR (WNR mounting kit for characterized control valve)

Dimensions [mm]

Important

- Suitable characterized control valves and open-close ball valves: pages 8 to 11
- Use and safety: page 2
- Installation instructions: page 34
- Installation dimensions: page 34
LF24(-S) rotary actuator for open-close ball valves

Wiring diagram

<table>
<thead>
<tr>
<th>1</th>
<th>~</th>
<th>AC 24 V</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>+</td>
<td>DC 24 V</td>
</tr>
</tbody>
</table>

Connection via safety isolating transformer

Technical data

Nominal voltage AC 24 V, 50/60 Hz, DC 24 V
Power supply range AC 19.2...28.8 V, DC 21.6...28.8 V
For wire sizing 7 VA (max 5.8 A @ 5 ms)
Power consumption When charging spring 5 W
In holding position 2.5 W
Connection Motor Cable 1 m, 2 x 0.75 mm²
Auxiliary switch (LF24-S) Cable 1 m, 3 x 0.75 mm²
Auxiliary switch (LF24-S) 1 x EPU 6 (1.5) A, AC 250 V
Adjustable switching point, 0...100%
Direction of rotation Reversible with L / R switch
Torque Motor min. 4 Nm (at nominal voltage)
Spring return min. 4 Nm
Angle of rotation max. 95° (37...100% adjustable < with integral, mechanical angle of rotation limiting)
Running time Motor 40...75 s (0...4 Nm)
Spring return ~20 s @ –20...50°C / max. 60 s @ –30°C
Sound power level Motor max. 50 dB (A)
Spring return ~62 dB (A)
Service life min. 60 000 safety positions
Protection class III Safety extra-low voltage
Degree of protection IP 54
Ambient temperature range –30...+50°C
Non-operating temperature –40...+80°C
Humidity test To EN 60730-1
EMC CE according to 89/336/EEC
LV Directive CE according to 73/23/EEC
Maintenance Maintenance-free
Weight 1.4 kg (without ball valve)

Application
Operation of open-close ball valves.

Mode of operation
Open-close control is effected with 1-wire control.
The LF.. actuator moves the ball valve into the operating position while simultaneously charging the return spring. The ball valve is turned back into the safety position by the application of spring energy when the power supply is interrupted.

Product features
Simple direct mounting on the open-close ball valve using only one screw. The mounting position in relation to the open-close ball valve can be selected in 90° steps.
Functional reliability: The actuator is overload-proof and automatically stops when the end stops are reached.

Signaling: 0...100%, with adjustable auxiliary switch (LF24-S only).

Ordering examples:
a) LF24 rotary actuator with R.. open-close ball valve fitted
   – Order code: R..+LF24
b) LF24 rotary actuator and R.. open-close ball valve supplied separately
   – Order code: R../LF24
c) LF24 rotary actuator packed loose
   – Order code: LF24+WLF
   (WLF mounting kit for characterized control valve)

Dimensions [mm]

Important
- Suitable open-close ball valves: pages 8 to 11
- Use and safety: page 2
- Installation instructions: page 36
- Installation dimensions: page 36
**LF230(-S) rotary actuator for open-close ball valves**

**Technical data**

- **Nominal voltage:** AC 230 V 50/60 Hz
- **Power supply range:** AC 198...264 V
- **For wire sizing:** 7 VA (Imax 150 mA @ 10 ms)
- **Power consumption:**
  - When charging spring: 5 W
  - In holding position: 3 W
- **Connection:**
  - Motor: Cable 1 m, 2 x 0.75 mm²
  - Auxiliary switch (LF230-S): Cable 1 m, 3 x 0.75 mm²
- **Auxiliary switch (LR24-S):** 1 x EPU 6 (1.5) A, AC 250 V
- **Adjustable switching point:** 0...100%
- **Direction of rotation:** Reversible with L / R switch
- **Torque:**
  - Motor: min. 4 Nm (at nominal voltage)
  - Spring return: min. 4 Nm
- **Angle of rotation:**
  - Max. 95° (37...100% <x, adjustable with integral, mechanical angle of rotation limiting)
- **Running time:**
  - Motor: ~40...75 s (0...4 Nm)
  - Spring return: ~20 s @ ~20...50°C / max. 60 s @ ~30°C
- **Sound power level:**
  - Motor: max. 50 dB (A)
  - Spring return: ~62 dB (A)
- **Service life:** min. 60 000 safety positions
- **Position indication:** Mechanical
- **Protection class:** II Totally insulated
- **Degree of protection:** IP 54
- **Ambient temperature range:** –30...+50°C
- **Non-operating temperature:** –40...+80°C
- **Humidity test:** To EN 60730-1
- **EMC:**
  - CE according to 89/336/EEC
- **LV Directive:**
  - CE according to 73/23/EEC
- **Maintenance:** Maintenance-free
- **Weight:** 1.55 kg (without ball valve)

**Rotary actuator for 2 and 3-way open-close ball valves DN 15...32 with emergency control function**

**Modulating actuator (AC 230 V)**

**Open-close control**

**Application**

Operation of open-close ball valves.

**Mode of operation**

Open-close control is effected with 1-wire control. The LF.. actuator moves the characterized control valve into the operating position while simultaneously charging the return spring. The characterized control valve is turned back into the safety position by the application of spring energy when the supply voltage is interrupted.

**Product features**

- **Simple direct mounting** on the open-close ball valve using only one screw. The mounting position in relation to the open-close ball valve can be selected in 90° steps.
- **Functional reliability:** The actuator is overload-proof and automatically stops when the end stops are reached.
- **Signalization:** 0...100%, with adjustable auxiliary switch (LF230-S only).

**Ordering examples:**

a) LF230 rotary actuator with R.. open-close ball valve fitted
   - Order code: R..+LF230
b) LF230 rotary actuator and R.. open-close ball valve supplied separately
   - Order code: R../LF230
c) LF230 rotary actuator packed loose
   - Order code: LF230+WLF
   - (WLF mounting kit for characterized control valve)

**Wiring diagram**

A device that disconnects the pole conductors (minimum contact gap 3 mm) is required for isolation from the power supply.

**Dimensions [mm]**

- **Length:** 181 mm
- **Width:** 87.5 mm
- **Height:** 57 mm

**Important**

- Suitable open-close ball valves: pages 8 to 11
- Use and safety: page 2
- Installation instructions: page 36
- Installation dimensions: page 36
AFR24(-S) rotary actuator for open-close ball valves

Technical data
- Nominal voltage: AC 24 V, 50/60 Hz, DC 24 V
- Power supply range: AC 19.2...28.8 V, DC 21.6...28.8 V
- For wire sizing: 10 VA
- Power consumption:
  - When charging spring: 5 W
  - In holding position: 1.5 W
- Connection:
  - Motor
  - Auxiliary switch (LF24-S): Cable 1 m, 2 x 0.75 mm²
  - Auxiliary switch (LR24-S): 1 x EPU 6 (3) A, AC 250 V
- Adjustable switching point: 0...89%
- Direction of rotation: Reversible by mounting L / R
- Torque:
  - Motor: min. 15 Nm (at nominal voltage)
  - Spring return: min. 15 Nm
- Angle of rotation: max. 95° (adjustable from 33% in 5.5% steps with ZDB-AF angle of rotation limiting)
- Running time:
  - Motor: ~150 s
  - Spring return: ~16 s
- Sound power level:
  - Motor: max. 45 dB (A)
  - Spring return: ~62 dB (A)
- Service life: min. 60 000 safety positions
- Position indication: Mechanical
- Protection class: III Safety extra-low voltage
- Degree of protection: IP 54
- Ambient temperature range: -30...+50°C
- Non-operating temperature: -40...+80°C
- Humidity test: To EN 60730-1
- EMC: CE according to 89/336/EEC
- LV Directive: CE according to 73/23/EEC
- Maintenance: Maintenance-free
- Weight: 3 kg (without ball valve)

Application
Operation of open-close ball valves.

Mode of operation
Open-close control is effected with 1-wire control. The AFR.. actuator moves the characterized control valve into the operating position while simultaneously charging the return spring. The characterized control valve is turned back into the safety position by the application of spring energy when the power supply is interrupted.

Functional reliability: The actuator is overload-proof and automatically stops when the end stops are reached.

Signalization: 0...89%, with adjustable auxiliary switch (AFR24-S only).

Ordering examples:
- a) AFR24 rotary actuator with R.. open-close ball valve fitted
  - Order code: R..+AFR24
- b) AFR24 rotary actuator and R.. open-close ball valve supplied separately
  - Order code: R../AFR24
- c) AFR24 rotary actuator packed loose
  - Order code: AFR24+WAFR
    (WAFR mounting kit for characterized control valve)

Dimensions [mm]

Important
- Suitable open-close ball valves: pages 8 to 11
- Use and safety: page 2
- Installation instructions: page 36
- Installation dimensions: page 36
AFR230(-S) rotary actuator for open-close ball valves

Rotary actuator for 2 and 3-way open-close ball valves DN 15...80 with emergency control function

Modulating actuator (AC 230 V)

Open-close control

Application

Operation of open-close ball valves.

Mode of operation

Open-close control is effected with 1-wire control. The AFR.. actuator moves the characterized control valve into the operating position while simultaneously charging the return spring. The characterized control valve is turned back into the safety position by the application of spring energy when the power supply is interrupted.

Product features

Simple direct mounting on the open-close ball valve using only one screw. The mounting position in relation to the open-close ball valve can be selected in 90° steps.

Functional reliability: The actuator is overload-proof and automatically stops when the end stops are reached.

Signalization: 0...89%, with adjustable auxiliary switch (AFR230-S only).

Ordering examples:

a) AFR230 rotary actuator with R.. open-close ball valve fitted

   – Order code: R..+AFR230

b) AFR230 rotary actuator and R.. open-close ball valve supplied separately

   – Order code: R../AFR230

c) AFR230 rotary actuator packed loose

   – Order code: AFR230+WAFR

   (WAFR mounting kit for characterized control valve)

Important

- Suitable open-close ball valves: pages 8 to 11
- Use and safety: page 2
- Installation instructions: page 36
- Installation dimensions: page 36

Technical data

Nominal voltage AC 230 V  50/60 Hz
Power supply range AC 198...264 V
For wire sizing 11 VA
Power consumption When charging spring 6.5 W
In holding position 2.5 W
Connection Motor Cable 1 m, 2 x 0.75 mm²
Auxiliary switch (LF230-S) Cable 1 m, 3 x 0.75 mm²
Auxiliary switch (LR24-S) 1 x EPU 6 (3) A, AC 250 V
Adjustable switching point, 0...89%
Direction of rotation Reversible by mounting L / R
Torque Motor min. 15 Nm (at nominal voltage)
Spring return min. 15 Nm
Angle of rotation max. 95° (adjustable from 33% in 5.5% steps with ZDB-AF angle of rotation limiting)
Running time Motor ~150 s
Spring return ~16 s
Sound power level Motor max. 45 dB (A)
Spring return ~62 dB (A)
Service life min. 60 000 safety positions
Position indication Mechanical
Protection class II Totally insulated
Degree of protection IP 54
Ambient temperature range –30...+50°C
Non-operating temperature –40...+80°C
Humidity test To EN 60730-1
EMC CE according to 89/336/EEC
LV Directive CE according to 73/23/EEC
Maintenance Maintenance-free
Weight 3 kg (without ball valve)
Installation of TR.. rotary actuator with R.. ball valve

Delivery condition of R..+TR.. :
- Ball valve open
- Lever of the rotary actuator in the counterclockwise end position (ccw)
- Cable connected to port A
- Ball valve dimensions: page 12/13

Installation dimensions, TR.. + R..
Installation of LR.. rotary actuator with R.. ball valve

Installation dimensions, LR.. + R..

Delivery condition of R..+LR.. :
- Ball valve open
- Lever of the rotary actuator in the counterclockwise end position (ccw)
- Cable connected to port A
- Ball valve dimensions: page 12/13

Installation of NR.. rotary actuator with R.. ball valve

Installation dimensions, NR.. + R..

Delivery condition of R..+NR.. :
- Ball valve open
- Lever of the rotary actuator in the counterclockwise end position (ccw)
- Cable connected to port A
- Ball valve dimensions: page 12/13
Procedure:

1. Press the manual pushbutton and move the actuator by hand into the position in which it must be switched (e.g. 60% angle of rotation).
2. Turn the scale knob of the auxiliary switch clockwise (cw) and slightly overtravel the 0 on the switch scale with the arrowhead (connection S1–S3 is switched and a 60% angle of rotation is programmed as the switching point).

Procedure:

1. Remove the cover of the housing.
2. Press down the manual disengagement A on the actuator and turn the actuator into the required switching position of the auxiliary switch by means of the lever.
3. Insert the cam ring B as shown in Fig. 1, so that the switching point C just about operates the switch. Connection S1–S2 is switched (the arrow D is now at the top).
4. Assemble the cover of the housing.
LF.., AFR.. with R.. installation instructions and dimensions

Installation of LF.. rotary actuator with R.. ball valve

NC

NO

Installation dimensions, LF.. + R..

Delivery condition of R..+LF.. :
- Type of installation for NC: ball valve A–AB closed (safety position)
- Type of installation for NO: ball valve A–AB open (safety position)
- Cable connected to port A
- Ball valve dimensions: page 12/13

Installation of AFR.. rotary actuator with R.. ball valve

NC

NO

Installation dimensions, AFR.. + R..

Delivery condition of R..+AFR.. :
- Type of installation for NC: ball valve A–AB closed (safety position)
- Type of installation for NO: ball valve A–AB open (safety position)
- Cable connected to port A
- Ball valve dimensions: page 12/13
Adjusting LF..-S and AFR..-S auxiliary switches

Initial situation:
Actuator in safety position

Procedure:
1. Turn the knob of the auxiliary switch so that the arrow indicates the required switching point (see diagram opposite).
   Example: Switching point setting = .4 corresponds to 40% angle of rotation.
2. If the actuator is now turned into the operating position (ccw), the knob also turns ccw.
The auxiliary switch is switched as soon as the arrowhead overtravels 0 on the scale (connection S1–S3 is switched).

Adjusting LF24-S and LF230-S auxiliary switches

Installation side R

Initial situation:
Actuator in safety position

Procedure:
1. Turn the knob of the auxiliary switch so that the arrow indicates the required switching point (see diagram opposite).
   Example: Switching point setting = .4 corresponds to 40% angle of rotation.
2. If the actuator is now turned into the operating position (ccw), the knob also turns ccw.
The auxiliary switch is switched as soon as the arrowhead overtravels 0 on the scale (connection S1–S3 is switched).

Adjusting AFR24-S and AFR230-S auxiliary switches

Installation side L

Initial situation:
Actuator in safety position

Procedure:
1. Turn the knob of the auxiliary switch so that the arrow indicates the required switching point (see diagram opposite).
   Example: Switching point setting = .4 corresponds to 40% angle of rotation.
2. If the actuator is now turned into the operating position (cw), the knob also turns cw.
The auxiliary switch is switched as soon as the arrowhead overtravels 0 on the scale (connection S1–S3 is switched).

* 3 mm (1/8") hexagonal key not included with the actuator, see Fig. 2
### Specified directions of flow

<table>
<thead>
<tr>
<th>Characterized control valves</th>
<th>A-AB open</th>
<th>A-AB closed</th>
<th>2-way R2..</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><img src="image1" alt="Diagram" /></td>
<td><img src="image2" alt="Diagram" /></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Open-close ball valves</th>
<th>A-AB open</th>
<th>A-AB closed</th>
<th>3-way R3..</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><img src="image3" alt="Diagram" /></td>
<td><img src="image4" alt="Diagram" /></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stem position corresponding to ball valve flow direction</th>
<th>A-AB closed</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image5" alt="Diagram" /></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Actuator position corresponding to ball valve flow direction</th>
<th>Actuator 100%</th>
<th>Actuator 0% A-AB closed</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image6" alt="Diagram" /></td>
<td><img src="image7" alt="Diagram" /></td>
<td></td>
</tr>
</tbody>
</table>

### Flow characteristics of characterized control valves

**2-way**

The flow characteristic is equal-percentage, with a characteristic factor of n(ep) 3.2 or 3.9. This ensures stable control behavior in the elevated part-load range. In the lower part of the opening range between 0 and 30% working range the characteristic is linear. This ensures excellent control behavior in the lower part-load range too. The working range between 0 and 100% corresponds to an angle of rotation between 15 and 85°.

### 3-way

The characteristic of control path A–AB is the same as that for 2-way characterized control valves. The bypass flow rate (B–AB) is 70% of the kvs value of the control path (A–AB). The bypass has a linear characteristic.

**Note:**

Owing to its ball design, the 3-way characterized control valve is only partially suitable for conventional supply temperature control systems. It is therefore advisable to design this kind of temperature control system as a double mixing circuit (see diagram below). There are no restrictions on mixing circuits for air heaters or injection circuits.
Mounting positions, installation, commissioning

Separate delivery
If the ball valve is delivered separately from the rotary actuator, they can be assembled directly on site.

No special tools are needed for installation. Full instructions are supplied with the valves and actuators.

Commissioning
Commissioning must not be carried out until the ball valve and the rotary actuator have been properly assembled in accordance with the instructions.

Recommended mounting positions
The ball valves may be mounted either vertically (Fig. 1) or horizontally (Fig. 2). However, mounting the valves with the stem pointing downwards, i.e. upside down, is not recommended (Fig. 3).

Maintenance
- The ball valves and rotary actuators are maintenance-free.
- Before any kind of service work is carried out on actuator sets of this type, it is essential to isolate the rotary actuator from the power supply (by unplugging the power lead). Any pumps in the part of the piping system concerned must also be switched off and the appropriate isolating fittings closed (allow everything to cool down first if necessary and reduce the pressure in the system to atmospheric).
- 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 pipework has been refilled in the proper manner.

Subsequent removal
If the application requires the ball valve to be removed subsequently, it is advisable to take appropriate precautions. Example: Provide additional, detachable ZR23.. pipe connectors (page 3).

Disposal
When a complete actuator set (ball valve and rotary actuator) has come to the end of its service life, the two parts must be dismantled, segregated and disposed of in a suitable manner.

Project design
Installation of R2.. characterized control valves, 2-way
R2.. characterized control valves are throttling devices and must therefore be installed in the return line of the system in order to ensure minimum thermal stress on the seals in the fitting. The specified direction of flow must be adhered to.

Installation of R3.. characterized control valves, 3-way
R3.. characterized control valves (3-way) are mixing devices. The specified direction of flow for each application must be adhered to. Whether they are installed in the supply or the return of a system depends on the type of hydraulic circuit that is employed.

In the case of diverter circuits, a balancing valve is not required in the bypass line owing to the reduced flow rate in the bypass.

Water quality requirements
The water quality requirements specified in VDI 2035 must be adhered to.

Strainers recommended
Characterized control valves are relatively sensitive control devices. In order to ensure a long service life, it is advisable to fit strainers.

Sufficient shut-off devices
It is essential to ensure that sufficient shut-off devices are provided.

Correct valve selection and sizing
In order to ensure that the actuator set (characterized control valve and rotary actuator) achieves a long service life, it is essential for the valve to be rated for the correct differential pressure $\Delta p_{100}$, i.e. with adequate valve authority (Pv > 0.5). The differential pressure $\Delta p_{100}$ depends on the type of hydraulic circuit in which the valve is employed.
Pressure differences $\Delta p_{v100}$ with characterized control valves fully open

<table>
<thead>
<tr>
<th>$\Delta p_{v100}$ R2.. characterized control valve, 2-way</th>
<th>$\Delta p_{v100}$ R3.. characterized control valve, 3-way</th>
</tr>
</thead>
<tbody>
<tr>
<td>Throttling circuit $\Delta p_{v100} &gt; \Delta p_{VR} / 2$</td>
<td>Injection circuit with throttling device $\Delta p_{v100} &gt; \Delta p_{VR} / 2$</td>
</tr>
<tr>
<td>Typical values: 15 kPa $&lt; \Delta p_{v100} &lt; 150$ kPa</td>
<td>Typical values: 10 kPa $&lt; \Delta p_{v100} &lt; 100$ kPa</td>
</tr>
<tr>
<td>Injection circuit with throttling device $\Delta p_{v100} &gt; \Delta p_{VR} / 2$</td>
<td>Diverter circuit $\Delta p_{v100} &gt; \Delta p_{MV}$</td>
</tr>
<tr>
<td>Typical values: 15 kPa $&lt; \Delta p_{v100} &lt; 150$ kPa</td>
<td>Typical values: 5 kPa $&lt; \Delta p_{v100} &lt; 50$ kPa</td>
</tr>
<tr>
<td>Mixing circuit $\Delta p_{v100} &gt; \Delta p_{MV}$</td>
<td>Injection circuit with 3-way characterized control valve $\Delta p_{MV1} + \Delta p_{MV2} = 0$</td>
</tr>
<tr>
<td>Typical values: $\Delta p_{v100} &gt; 3$ kPa</td>
<td>Typical values: $\Delta p_{v100} &gt; 3$ kPa</td>
</tr>
</tbody>
</table>

Legend:

- $\text{Characterized control valve, 2-way, with rotary actuator}$
- $\text{Characterized control valve, 3-way, with rotary actuator}$
- $\text{Differential pressure across specified section at rated load}$
- $\text{Differential pressure across variable-flow section at rated load (e.g. heat exchanger)}$
- $\text{Supply}$
- $\text{Return}$
- $\text{Pump}$
- $\text{Non-return valve}$
- $\text{Balancing valve}$

Note: Strainers and shut-off devices are not shown.
Characterized control valve with rotary actuator

Throttling or mixing valve with internal or external threads or flanges. Equal-percentage characteristic for controlling low to medium flow rates. Also available for open-close applications. Pipe connectors can be supplied as an option.

Pressure-independent control valve with rotary actuator

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 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 valves.

Globe valve with linear actuator

Classic globe valve with equal-percentage characteristic for controlling low to medium flow rates. Available as a straight-through or mixing valve with flanges or external threads. Also suitable for open-close duty. Actuators with an emergency control function can be supplied.

SuperCompact control valve with linear actuator, flange

With equal-percentage (standard) or linear (optional) characteristic for controlling low to medium flow rates. Designed as a straight-through valve with an intermediate flange. Also available for open-close applications.

Control valves with bus-capable actuators. For new installations Belimo offers a selected range of control valves in all the usual nominal widths. The actuators that are used with them can satisfy all application requirements.

Converting and retro-fitting globe valves. Belimo offers a wide range of intelligent linear actuators for motorizing and/or converting and retro-fitting all leading makes of valve. This also means, of course, that existing equipment can be upgraded to the latest state of the art at minimum cost. Suitable brackets make mounting the actuators a very simple task requiring no special tools.
Innovation, Quality, and Reliability: A partnership for motorizing HVAC actuators

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Air applications

Standard actuators and spring-return actuators for air control dampers in HVAC systems

Safety actuators for motorizing fire and smoke extraction dampers

VAV systems for individual room air control

Water applications

Mixing actuators and motorized ball valves for HVAC water circuits

Globe valves and intelligent linear actuators – also for leading makes of valve