

# Control valves

## Ball valves

2-Way

3-Way

with high close-off pressure



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GRUNER – The Friendly Alternative

● = Standard

○ = Optional

| Type                         | 225-230T | 225-230T-P5 | 225-230T-S2 | 225-024T | 225-024T-P5 | 225-024T-S2 | 225C-024T | 225C-024T-S2 |
|------------------------------|----------|-------------|-------------|----------|-------------|-------------|-----------|--------------|
| Torque                       | 5 Nm     | 5 Nm        | 5 Nm        | 5 Nm     | 5 Nm        | 5 Nm        | 5 Nm      | 5 Nm         |
| Control                      |          |             |             |          |             |             |           |              |
| Tri-State                    | ●        | ●           | ●           | ●        | ●           | ●           |           |              |
| On/Off                       | ●        | ●           | ●           | ●        | ●           | ●           |           |              |
| Continuous Control           |          |             |             |          |             |             |           |              |
| (0) 2-10 VDC or              |          |             |             |          |             |             | ●         | ●            |
| (0) 4-20 mA                  |          |             |             |          |             |             |           |              |
| Connecting Voltage           |          |             |             |          |             |             |           |              |
| 24 VAC/DC                    |          |             |             | ●        | ●           | ●           | ●         | ●            |
| 230 VAC                      | ●        | ●           | ●           |          |             |             |           |              |
| Options                      |          |             |             |          |             |             |           |              |
| Potentiometer                |          | ●           |             |          | ●           |             |           |              |
| Feedback signal (continuous) |          |             |             |          |             |             | ●         | ●            |
| Auxiliary Switch             |          |             | ●           |          |             | ●           |           | ●            |
| Page                         | 9 - 10   | 9 - 10      | 9 - 10      | 11 - 12  | 11 - 12     | 11 - 12     | 13 - 14   | 13 - 14      |

Please note:

All ball valve / actuator combinations are possible!

ATTENTION:

2" (DN50) Ball Valves for 225 5Nm actuators needs clean fluids (no limestone, salt, etc.) in order to guarantee life-time operation. If that cannot be achieved it is necessary to use 227 8Nm actuators.

### Order information

The actuators and ball valves have to be listed separately in an order in consideration to the particular order number.

### Applications

The motorized ball valve is used according to the version for many-sided applications of media like industrial water and other process media, e. g. in useful plants of rain water, as area valves in feeders etc.

All actuators correspond to the DIN-VDE-Standards and CE-Principles.



### Technical characteristics

|                              |                                                                                                      |
|------------------------------|------------------------------------------------------------------------------------------------------|
| <b>Media</b>                 | heating circuit, process and waste water, cooling water with max. 50% vol. glycol, condensate or air |
| <b>Temperature of medium</b> | -45°C...+180°C (insulation)                                                                          |
| <b>Leakage rate</b>          | bubble-tight (DIN 3230-3)                                                                            |
| <b>Differential pressure</b> | 2,500 kPa (25 bar) @ 120°C                                                                           |
| <b>Close-off pressure</b>    | 1,100 kPa (11 bar) @ 5Nm up to DN 20<br>860 kPa (8,6 bar) @ 5Nm up to DN 50                          |
| <b>Rated pressure</b>        | 4,000 kPa (40 bar) @+20°C                                                                            |
| <b>Mounting position</b>     | vertical to horizontal (relating to stem)                                                            |
| <b>Materials</b>             |                                                                                                      |
| <b>Body</b>                  | brass ASTM B283                                                                                      |
| <b>Ball</b>                  | brass, nickel-plated                                                                                 |
| <b>Characterising disc</b>   | NORYL®                                                                                               |
| <b>Stem</b>                  | brass                                                                                                |
| <b>Seal of stem</b>          | EPDM o-rings                                                                                         |
| <b>Seal</b>                  | teflon seal with EPDM o-rings                                                                        |
| <b>Lubrication</b>           | none or according to permission                                                                      |
| <b>Direction of flow</b>     | one                                                                                                  |

### Dimensions

| k <sub>VS</sub> | Full Port | Thread Rp | DN mm | A mm | B mm | C mm | D mm | E mm | F mm | Type     |
|-----------------|-----------|-----------|-------|------|------|------|------|------|------|----------|
| 0,32            |           | 1/2"      | 15    | 145  | 61   | 14   | 26   | 60   | 143  | BOFB156D |
| 0,58            |           | 1/2"      | 15    | 145  | 61   | 14   | 26   | 60   | 143  | BOFB155D |
| 1,11            |           | 1/2"      | 15    | 145  | 61   | 14   | 26   | 60   | 143  | BOFB154D |
| 2,22            |           | 1/2"      | 15    | 145  | 61   | 14   | 26   | 60   | 143  | BOFB153D |
| 4,01            |           | 1/2"      | 15    | 145  | 61   | 14   | 26   | 67   | 146  | BOFB152D |
| 9,98            | ●         | 1/2"      | 15    | 145  | 61   | 14   | 31   | 60   | 143  | BOFB150D |
| 2,13            |           | 3/4"      | 20    | 145  | 61   | 14   | 26   | 67   | 146  | BOFB204D |
| 3,67            |           | 3/4"      | 20    | 145  | 61   | 14   | 26   | 67   | 146  | BOFB203D |
| 8,60            |           | 3/4"      | 20    | 145  | 61   | 14   | 26   | 67   | 146  | BOFB202D |
| 12,5            | ●         | 3/4"      | 20    | 145  | 61   | 14   | 31   | 67   | 146  | BOFB201D |
| 7,70            |           | 1"        | 25    | 145  | 61   | 14   | 34   | 70   | 148  | BOFB255D |
| 13,1            |           | 1"        | 25    | 145  | 61   | 14   | 39   | 77   | 151  | BOFB254D |
| 24,2            | ●         | 1"        | 25    | 145  | 61   | 14   | 39   | 70   | 148  | BOFB252D |
| 12,7            |           | 1 1/4"    | 32    | 145  | 61   | 14   | 44   | 76   | 151  | BOFB323D |
| 31,1            |           | 1 1/4"    | 32    | 145  | 61   | 14   | 44   | 92   | 159  | BOFB322D |
| 35,1            | ●         | 1 1/4"    | 32    | 145  | 61   | 14   | 49   | 76   | 151  | BOFB321D |
| 19,4            |           | 1 1/2"    | 40    | 145  | 61   | 14   | 54   | 87   | 156  | BOFB403D |
| 35,2            |           | 1 1/2"    | 40    | 145  | 61   | 14   | 54   | 103  | 164  | BOFB402D |
| 63,0            | ●         | 1 1/2"    | 40    | 145  | 61   | 14   | 74   | 87   | 156  | BOFB401D |
| 35,6            |           | 2"        | 50    | 145  | 61   | 14   | 72   | 101  | 163  | BOFB506D |
| 60,6            |           | 2"        | 50    | 145  | 61   | 14   | 87   | 125  | 175  | BOFB504D |
| 92,1            | ●         | 2"        | 50    | 145  | 61   | 14   | 87   | 101  | 163  | BOFB502D |

### Equations

Flow Factor  $K_{VS}$  is defined as  $\Delta P = 1$  [bar] pressure drop over a 100% open ball valve at flow rate of  $Q = 1$  [m<sup>3</sup>/h] water of 20°C (density  $\rho = 1$  [kg/l] ).

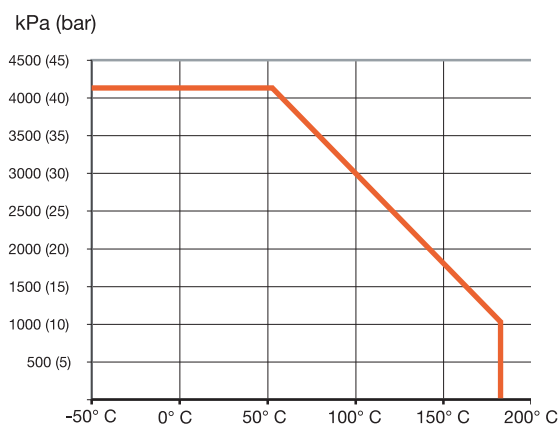
For the flow factor  $K_V$  the general term applies:

$$K_V = Q \cdot \sqrt{\frac{\rho}{\Delta P}}$$

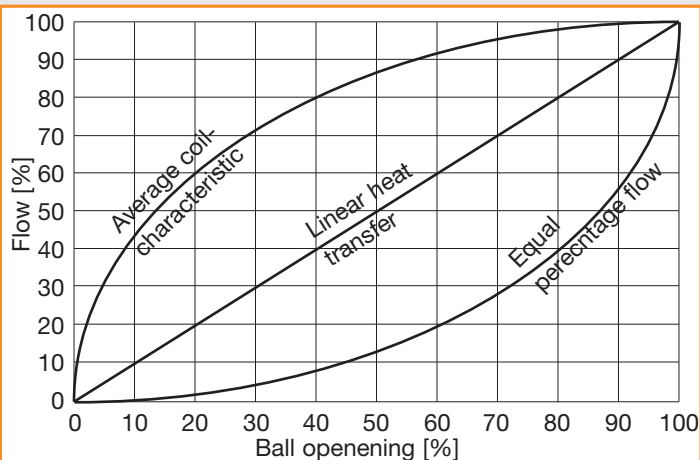
For different ball openings % there follows according to the equal percentage flow curve the different  $K_V/K_{VS}$  ratios:

$$\frac{K_V(\%) }{K_{VS}} = \frac{e^{3 \cdot (\% - 1)} - e^{-3}}{1 - e^{-3}}$$

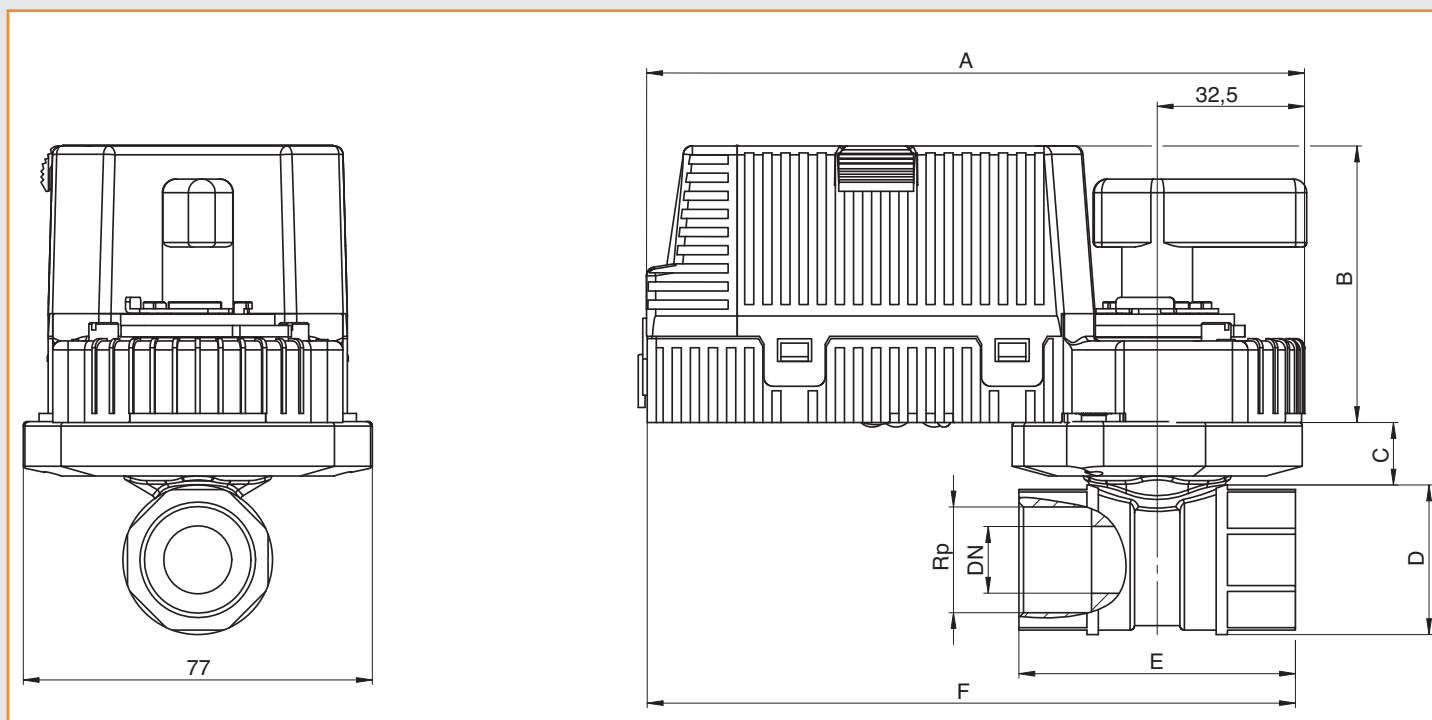
### Temperature-pressure-diagram



### Linear flow



Technical drawing





### Technical characteristics

|                              |                                                                                                      |
|------------------------------|------------------------------------------------------------------------------------------------------|
| <b>Media</b>                 | heating circuit, process and waste water, cooling water with max. 50% vol. glycol, condensate or air |
| <b>Temperature of medium</b> | -45°C...+180°C (insulation)                                                                          |
| <b>Leakage rate</b>          | bubble-tight (DIN 3230-3)                                                                            |
| <b>Differential pressure</b> | 2,500 kPa (25 bar) @ 120°C                                                                           |
| <b>Close-off pressure</b>    | 430 kPa (4,3 bar) @ 5Nm up to DN 25<br>340 kPa (3,4 bar) @ 5Nm up to DN 50                           |
| <b>Rated pressure</b>        | 4,000 kPa (40 bar) @+20°C                                                                            |
| <b>Mounting position</b>     | vertical to horizontal (relating to stem)                                                            |
| <b>Materials</b>             |                                                                                                      |
| <b>Body</b>                  | brass ASTM B283                                                                                      |
| <b>Ball</b>                  | brass, nickel-plated                                                                                 |
| <b>Characterising disc</b>   | NORYL®                                                                                               |
| <b>Stem</b>                  | brass                                                                                                |
| <b>Seal of stem</b>          | EPDM o-rings                                                                                         |
| <b>Seal</b>                  | teflon seal with EPDM o-rings                                                                        |
| <b>Lubrication</b>           | none or according to permission                                                                      |
| <b>Direction of flow</b>     | one                                                                                                  |

### Dimensions

| k <sub>VS</sub> | Full Port | Thread Rp | DN mm | A mm | B mm | C mm | D mm | E mm | F mm | Type     |
|-----------------|-----------|-----------|-------|------|------|------|------|------|------|----------|
| 0,51            |           | 1/2"      | 15    | 145  | 61   | 14   | 39   | 67   | 146  | BOLB154D |
| 0,85            |           | 1/2"      | 15    | 145  | 61   | 14   | 39   | 67   | 146  | BOLB153D |
| 2,05            |           | 1/2"      | 15    | 145  | 61   | 14   | 39   | 67   | 146  | BOLB152D |
| 3,67            |           | 1/2"      | 15    | 145  | 61   | 14   | 39   | 67   | 146  | BOLB151D |
| 6,82            | ●         | 1/2"      | 15    | 145  | 61   | 14   | 39   | 67   | 146  | BOLB150D |
| 2,05            |           | 3/4"      | 20    | 145  | 61   | 14   | 31   | 67   | 146  | BOLB202D |
| 3,24            |           | 3/4"      | 20    | 145  | 61   | 14   | 31   | 67   | 146  | BOLB201D |
| 9,50            | ●         | 3/4"      | 20    | 145  | 61   | 14   | 31   | 67   | 148  | BOLB200D |
| 7,34            |           | 1"        | 25    | 145  | 61   | 14   | 44   | 78   | 152  | BOLB254D |
| 19,0            | ●         | 1"        | 25    | 145  | 61   | 14   | 67   | 78   | 152  | BOLB251D |
| 10,8            |           | 1 1/4"    | 32    | 145  | 61   | 14   | 59   | 92   | 159  | BOLB322D |
| 29,1            | ●         | 1 1/4"    | 32    | 145  | 61   | 14   | 59   | 92   | 159  | BOLB320D |
| 20,0            |           | 1 1/2"    | 40    | 145  | 61   | 14   | 56   | 103  | 164  | BOLB402D |
| 52,0            | ●         | 1 1/2"    | 40    | 145  | 61   | 14   | 82   | 103  | 164  | BOLB400D |
| 33,0            |           | 2"        | 50    | 145  | 61   | 14   | 82   | 124  | 175  | BOLB502D |
| 93,0            | ●         | 2"        | 50    | 145  | 61   | 14   | 107  | 124  | 175  | BOLB500D |

## Equations

Flow Factor  $K_{VS}$  is defined as  $\Delta P = 1$  [bar] pressure drop over a 100% open ball valve at flow rate of  $Q = 1$  [m<sup>3</sup>/h] water of 20°C (density  $\rho = 1$  [kg/l] ).

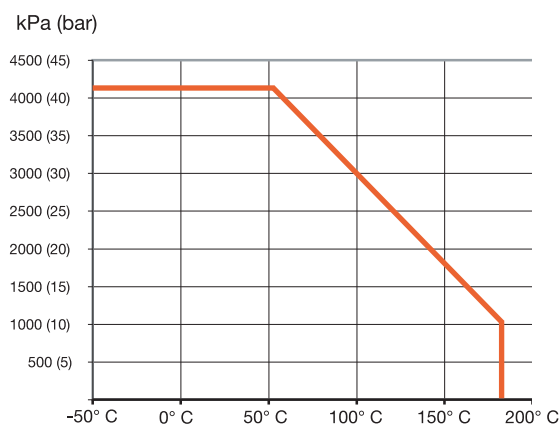
For the flow factor  $K_V$  the general term applies:

$$K_V = Q \cdot \sqrt{\frac{\rho}{\Delta P}}$$

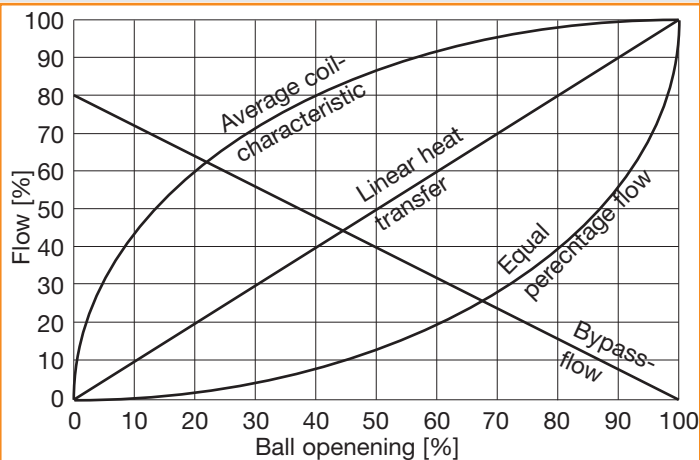
For different ball openings % there follows according to the equal percentage flow curve the different  $K_V/K_{VS}$  ratios:

$$\frac{K_V(\%) }{K_{VS}} = \frac{e^{3 \cdot (\% - 1)} - e^{-3}}{1 - e^{-3}}$$

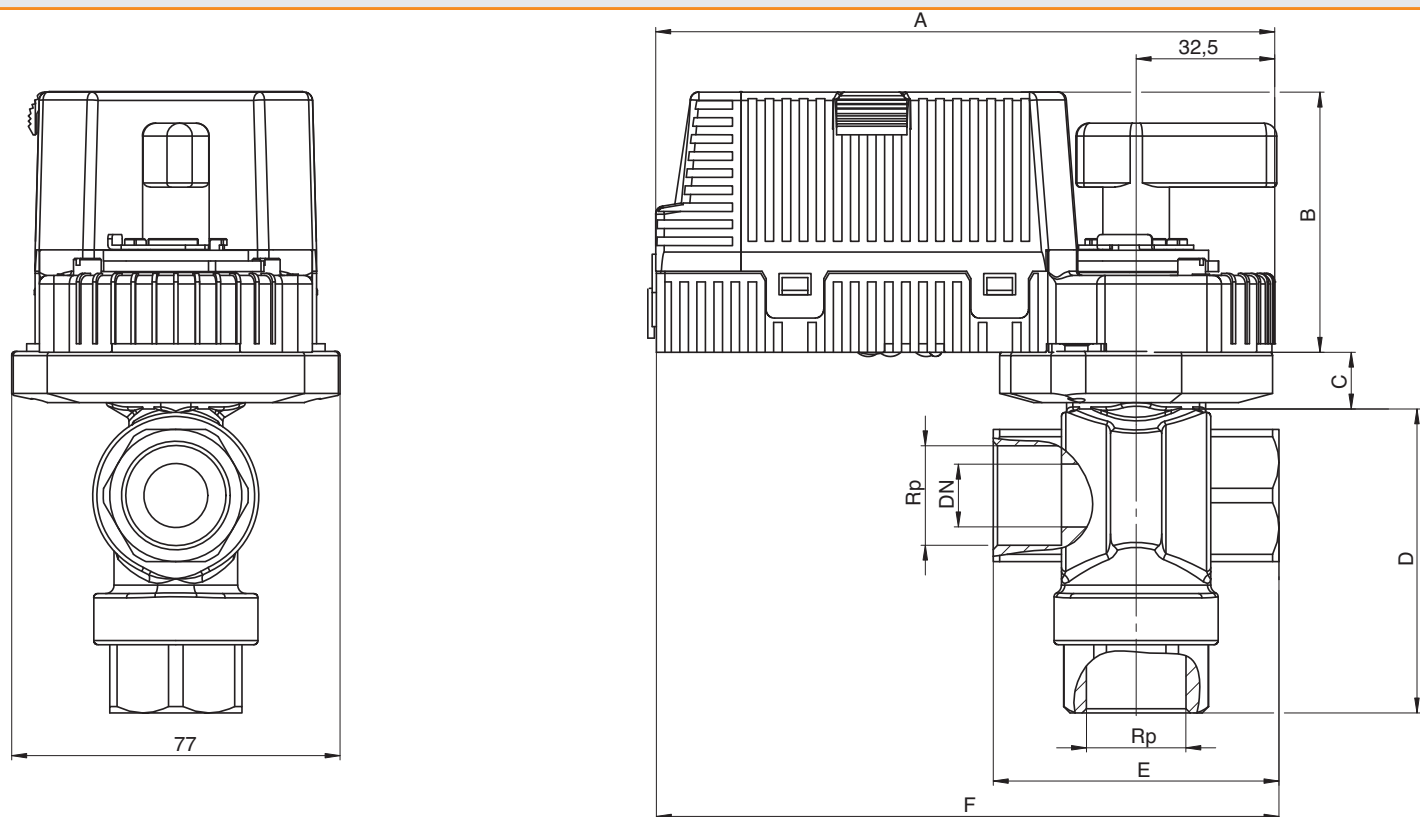
## Temperature-pressure-diagram



## Linear flow



## Technical drawing



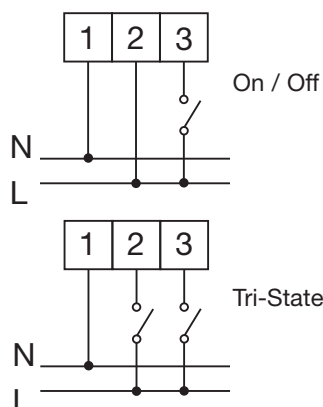


### Technical characteristics

|                                         |                                              |
|-----------------------------------------|----------------------------------------------|
| <b>Control</b>                          | On/Off + Tri-state                           |
| <b>Connecting voltage</b>               | 80...265 VAC (50/60 Hz) / DC                 |
| <b>Power consumption</b>                | 1.5 W / 2.0 VA                               |
| <b>Angle of rotation</b>                | max. 95° (changeable from outside)           |
| <b>Direction of rotation</b>            | changeable from inside                       |
| <b>Running time</b>                     | 60...120 s @ 90°                             |
| <b>Torque</b>                           | 5 Nm                                         |
| <b>Auxiliary switch</b>                 | max. 2, adjustable from outside              |
| <b>Switching power auxiliary switch</b> | 250 VAC / 5 (2.5) A                          |
| <b>Potentiometer</b>                    | 4.7 kΩ (0.2 W)                               |
| <b>Connection</b>                       | terminal for cable 0,5...1,5 mm <sup>2</sup> |
| <b>Safety class</b>                     | II                                           |
| <b>Protection</b>                       | IP42                                         |
| <b>Dimensions</b>                       | 145 x 65 x 61 mm                             |
| <b>Ambient temperature</b>              | -30...+50°C                                  |
| <b>Maintenance</b>                      | maintenance-free                             |
| <b>CE</b>                               | 73/23/EWG, 89/336/EWG                        |
| <b>Weight</b>                           | ca. 500 g                                    |

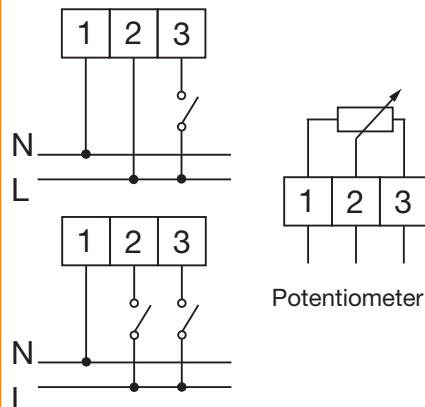
### 225-230T

#### Connection scheme



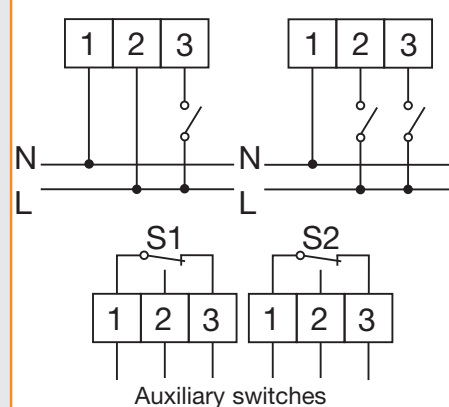
### 225-230T-P5

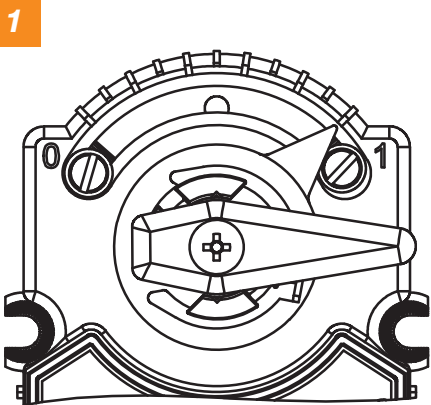
#### Connection scheme



### 225-230T-S2

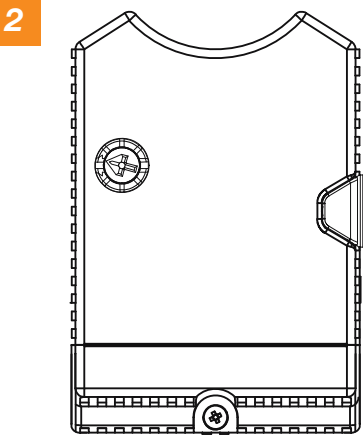
#### Connection scheme





Adjustment of the angle of rotation (fig. 1)

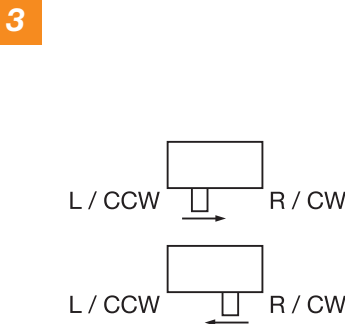
Both end stops are adjusted to 0 (0°) and 1 (90°). For smaller rotation angles, loosen the screws at the metal end stop, adjust the end stops as requested, and fasten the screws again.



Adjustment of the auxiliary switch (fig. 2)

The scale at the adjusting knob corresponds to a percentage graduation, related to 0° - 90°.

- 1) End stop is set to "0": Switch off the motor and choose the requested switching position by turning the knob to the right, i.e. "2" = 20%.
- 2) End stop is set to "1": Switch off the motor and choose the requested switching position by turning the knob to the left, i.e. "8" = 20%.



Adjustment of the rotating direction (On/Off) (fig. 3)

| Direction of rotation | Clockwise (0...90°) | Counter clockwise (90...0°) |
|-----------------------|---------------------|-----------------------------|
| Switch position       |                     |                             |
| L / CCW               | 2+3 Supply          | 2 Supply                    |
| R / CW                | 2 Supply            | 2+3 Supply                  |

Adjustment of the rotating direction (Tri-state) (fig. 3)

| Direction of rotation | Clockwise (0...90°) | Counter clockwise (90...0°) |
|-----------------------|---------------------|-----------------------------|
| Switch position       |                     |                             |
| L / CCW               | 3 Supply            | 2 Supply                    |
| R / CW                | 2 Supply            | 3 Supply                    |

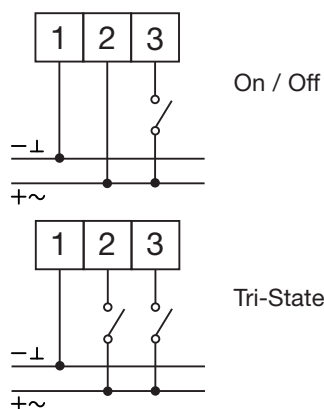


### Technical characteristics

|                                         |                                              |
|-----------------------------------------|----------------------------------------------|
| <b>Control</b>                          | On/Off + Tri-state                           |
| <b>Connecting voltage</b>               | 24 VAC (50/60 Hz) / DC $\pm 20\%$            |
| <b>Power consumption</b>                | 1.0 W / 2.0 VA                               |
| <b>Angle of rotation</b>                | max. 95° (changeable from outside)           |
| <b>Direction of rotation</b>            | changeable from inside                       |
| <b>Running time</b>                     | 60...120 s @ 90°                             |
| <b>Torque</b>                           | 5 Nm                                         |
| <b>Auxiliary switch</b>                 | max. 2, adjustable from outside              |
| <b>Switching power auxiliary switch</b> | 250 VAC / 5 (2.5) A                          |
| <b>Potentiometer</b>                    | 4.7 k $\Omega$ (0.2 W)                       |
| <b>Connection</b>                       | terminal for cable 0,5...1,5 mm <sup>2</sup> |
| <b>Safety class</b>                     | III                                          |
| <b>Protection</b>                       | IP42                                         |
| <b>Dimensions</b>                       | 145 x 65 x 61 mm                             |
| <b>Ambient temperature</b>              | -30...+50°C                                  |
| <b>Maintenance</b>                      | maintenance-free                             |
| <b>CE</b>                               | 73/23/EWG, 89/336/EWG                        |
| <b>Weight</b>                           | ca. 500 g                                    |

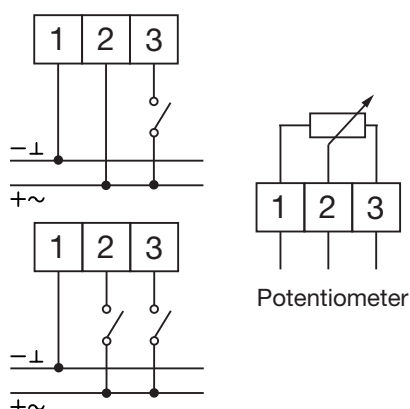
#### 225-024T

##### Connection scheme



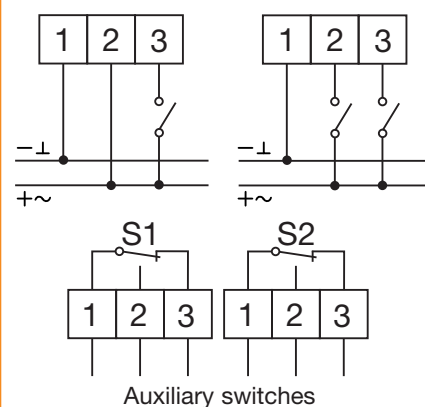
#### 225-024T-P5

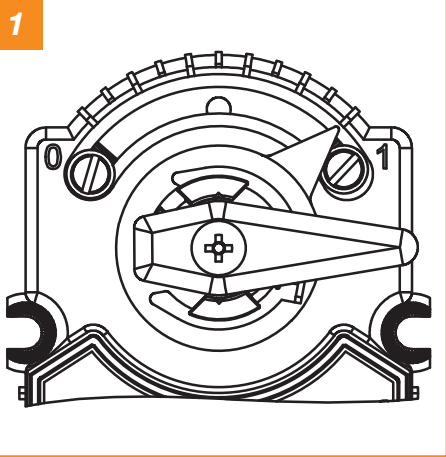
##### Connection scheme



#### 225-024T-S2

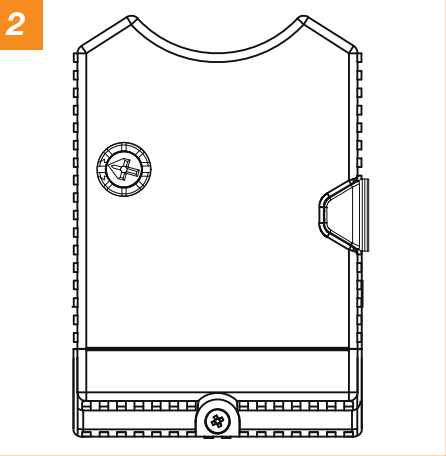
##### Connection scheme





Adjustment of the angle of rotation (fig. 1)

Both end stops are adjusted to 0 (0°) and 1 (90°). For smaller rotation angles, loosen the screws at the metal end stop, adjust the end stops as requested, and fasten the screws again.

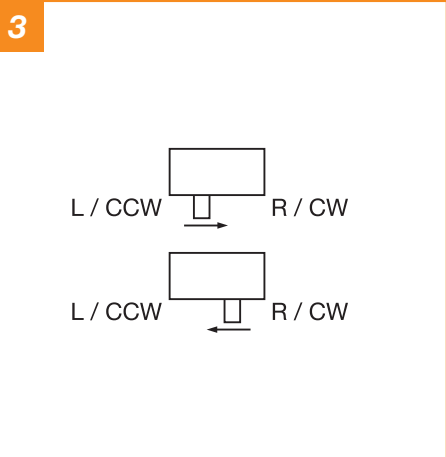


Adjustment of the auxiliary switch (fig. 2)

The scale at the adjusting knob corresponds to a percentage graduation, related to 0° - 90°.

1) End stop is set to "0": Switch off the motor and choose the requested switching position by turning the knob to the right, i.e. "2" = 20%.

2) End stop is set to "1": Switch off the motor and choose the requested switching position by turning the knob to the left, i.e. "8" = 20%.



Adjustment of the rotating direction (On/Off) (fig. 3)

| Direction of rotation | Clockwise (0...90°) | Counter clockwise (90...0°) |
|-----------------------|---------------------|-----------------------------|
| Switch position       |                     |                             |
| L / CCW               | 2+3 Supply          | 2 Supply                    |
| R / CW                | 2 Supply            | 2+3 Supply                  |

Adjustment of the rotating direction (Tri-state) (fig. 3)

| Direction of rotation | Clockwise (0...90°) | Counter clockwise (90...0°) |
|-----------------------|---------------------|-----------------------------|
| Switch position       |                     |                             |
| L / CCW               | 3 Supply            | 2 Supply                    |
| R / CW                | 2 Supply            | 3 Supply                    |

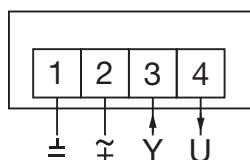


### Technical characteristics

|                                         |                                                                        |
|-----------------------------------------|------------------------------------------------------------------------|
| <b>Control</b>                          | Continuous control                                                     |
| <b>Control signal Y</b>                 | 0...10 VDC or<br>2...10 VDC (Standard) or<br>0...20 mA or<br>4...20 mA |
| <b>Feedback signal U</b>                | 0...10 VDC or<br>2...10 VDC (Standard)                                 |
| <b>Connecting voltage</b>               | 24 VAC (50/60 Hz) / DC $\pm 20\%$                                      |
| <b>Power consumption</b>                | 1.5 W / 2.5 VA                                                         |
| <b>Angle of rotation</b>                | max. 95° (changeable from outside)                                     |
| <b>Direction of rotation</b>            | changeable from inside                                                 |
| <b>Running time</b>                     | 60...120 s @ 90°                                                       |
| <b>Torque</b>                           | 5 Nm                                                                   |
| <b>Auxiliary switch</b>                 | max. 2, adjustable from outside                                        |
| <b>Switching power auxiliary switch</b> | 250 VAC / 5 (2.5) A, change-over switch                                |
| <b>Connection</b>                       | terminal for cable 0,5...1,5 mm <sup>2</sup>                           |
| <b>Safety class</b>                     | III                                                                    |
| <b>Protection</b>                       | IP42                                                                   |
| <b>Dimensions</b>                       | 145 x 65 x 61 mm                                                       |
| <b>Ambient temperature</b>              | -30...+50°C                                                            |
| <b>Maintenance</b>                      | maintenance-free                                                       |
| <b>CE</b>                               | 73/23/EWG, 89/336/EWG                                                  |
| <b>Weight</b>                           | ca. 500 g                                                              |

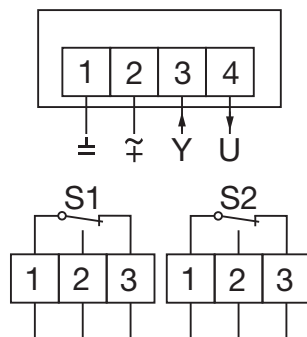
### 225C-024T

**Connection scheme**  
(Continuous control)

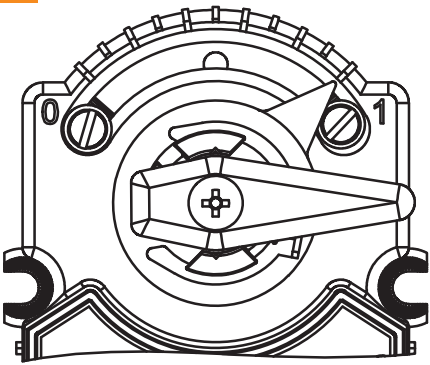


### 225C-024T-S2

**Connection scheme**  
(Continuous control)



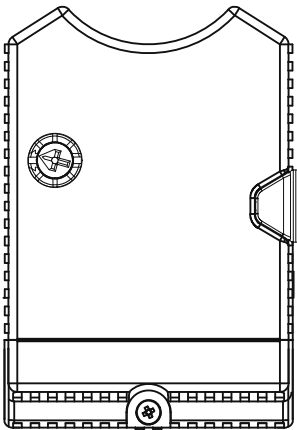
1



Adjustment of the angle of rotation (fig. 1)

Both end stops are adjusted to 0 (0°) and 1 (90°). For smaller rotation angles, loosen the screws at the metal end stop, adjust the end stops as requested, and fasten the screws again.

2



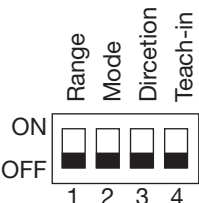
Adjustment of the auxiliary switch (fig. 2)

The scale at the adjusting knob corresponds to a percentage graduation, related to 0° - 90°.

1) End stop is set to "0": Switch off the motor and choose the requested switching position by turning the knob to the right, i.e. "2" = 20%.

2) End stop is set to "1": Switch off the motor and choose the requested switching position by turning the knob to the left, i.e. "8" = 20%.

3

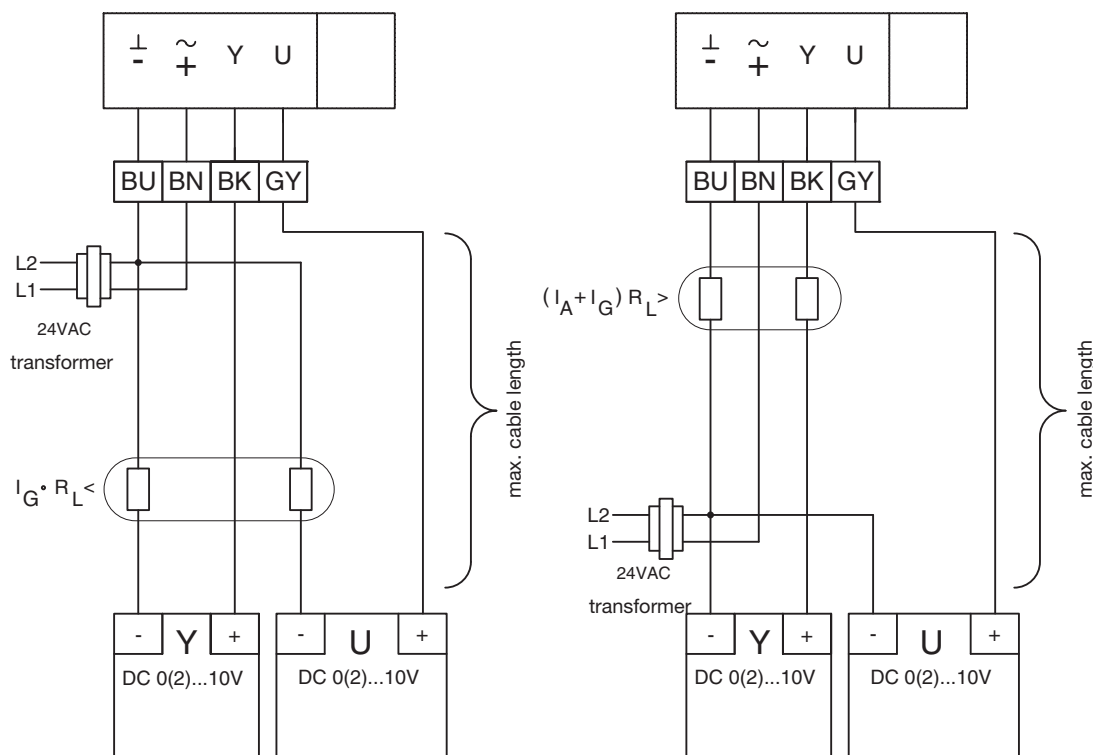


Adjustment of the functional switches (fig. 3)

|                                   | OFF  | ON   |
|-----------------------------------|------|------|
| <b>Direction of rotation</b>      |      |      |
| clockwise (0...90°)               | 3    | -    |
| counter clockwise (90...0°)       | -    | 3    |
| <b>Control signal Y</b>           |      |      |
| 2...10 VDC (Standard)             | 1, 2 | -    |
| 0...10 VDC                        | 2    | 1    |
| 4...20 mA                         | 1    | 2    |
| 0...20 mA                         | -    | 1, 2 |
| <b>Teach-in of range of angle</b> |      |      |
| Active                            | -    | 4    |
| Inactive                          | 4    | -    |

All switches are set to OFF by factory default.  
See page 15 for further instructions concerning teach-in.

### Wiring configuration and recommended cable length



$I_G$  ... current of set valve selector

$I_A$  ... actuator current

$I_G \ll I_A$

$R_L$  ... cable resistance

$$R_L = \frac{1}{\sigma} \times \frac{L}{A}$$

$L$  ... cable length

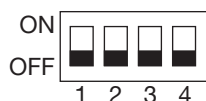
$A$  ... cable cross section

$\sigma$  ...  $56,2 \times 10^6 \text{ S/m}$

| cable cross section   | max. cable length |
|-----------------------|-------------------|
| 0,75 mm <sup>2</sup>  | 23 m              |
| 1 mm <sup>2</sup>     | 31 m              |
| 1,5 mm <sup>2</sup>   | 46 m              |
| 2,5 mm <sup>2</sup> * | 76 m              |

For several actuators switched in parallel the max. cable length must be divided by the number of actuators.

\* Cable cross section for terminal up to 1,5 mm<sup>2</sup>



### Teach-in of range of angle > 30°

1. Actuator stand by
2. Adjusting mechanical endstops
3. Switch ON DIP 4
4. Actuator starts teach-in process of range of angle (60...120 s)
5. Turn OFF DIP 4
6. Y now corresponds to the taught-in angle

## ► ► ► YOUR WAY TO GRUNER

