

**Modulating rotary actuators for butterfly valves**

- Torque 90 ... 500 Nm
- Nominal voltage 24 V
- Control: modulating DC 0 ... 10 V
- Position feedback DC 0 ... 10 V
- 2 Auxiliary switches
- State at loss of signal: closed


**Overview of types**

| Type               | Torque<br>(Nominal torque)  | Running time | Power consumption   |         |                 | Current consumption | Connection flange | Weight        |
|--------------------|-----------------------------|--------------|---------------------|---------|-----------------|---------------------|-------------------|---------------|
|                    |                             |              | In operation        | At rest | For wire sizing |                     |                   |               |
| <b>SY2-24-SR-T</b> | <b>90 Nm</b> <sup>1)</sup>  | 15 s         | 70 W <sup>2)</sup>  | 5.4 W   | 72 VA           | 3.0 A               | ISO 5211 / F07    | Approx. 11 kg |
| <b>SY3-24-SR-T</b> | <b>150 Nm</b> <sup>1)</sup> | 22 s         | 70 W <sup>2)</sup>  | 5.4 W   | 72 VA           | 3.0 A               | ISO 5211 / F07    | Approx. 11 kg |
| <b>SY4-24-SR-T</b> | <b>400 Nm</b> <sup>1)</sup> | 16 s         | 180 W <sup>2)</sup> | 5.4 W   | 144 VA          | 6.0 A               | ISO 5211 / F10    | Approx. 22 kg |
| <b>SY5-24-SR-T</b> | <b>500 Nm</b> <sup>1)</sup> | 22 s         | 180 W <sup>2)</sup> | 5.4 W   | 156 VA          | 6.5 A               | ISO 5211 / F10    | Approx. 22 kg |

<sup>1)</sup> @ Nominal voltage

<sup>2)</sup> @ Nominal torque

**Technical data**

|                        |                                                       |                                                                                       |
|------------------------|-------------------------------------------------------|---------------------------------------------------------------------------------------|
| <b>Electrical data</b> | Nominal voltage                                       | AC 24 V, 50/60 Hz for 3-lead connection<br>AC/DC 24 V, 50/60 Hz for 4-lead connection |
|                        | Nominal voltage range                                 | AC/DC 21.6 ... 26.4 V                                                                 |
|                        | Power consumption                                     | See «Overview of types»                                                               |
|                        | Current consumption                                   | See «Overview of types»                                                               |
|                        | Auxiliary switches                                    | 2 x SPDT, 5 A, AC 230 V I $\frac{1}{2}$<br>Switching points: 90° $\nabla$             |
|                        | Connection                                            | Terminals, 2 x 1.5 mm <sup>2</sup> or 1 x 2.5 mm <sup>2</sup>                         |
|                        | Parallel operation                                    | Not possible                                                                          |
|                        | Supply voltage<br>Controller signals                  | Possible only with 4-lead connection                                                  |
| <b>Functional data</b> | Torque (nominal torque)                               | See «Overview of types»                                                               |
|                        | Control Control signal Y                              | DC 0 ... 10 V, input impedance 100 k $\Omega$                                         |
|                        | Operating range                                       | DC 0.5 ... 10 V                                                                       |
|                        | Position feedback (measuring voltage U <sub>S</sub> ) | DC 0 ... 10 V, max. 0.5 mA                                                            |
|                        | Position accuracy                                     | ±5% absolute                                                                          |
|                        | Manual override                                       | Temporary with handwheel (not revolving)                                              |
|                        | Angle of rotation                                     | 90° $\nabla$ (internal limit switch)                                                  |
|                        | Running time                                          | See «Overview of types»                                                               |
|                        | Duty cycle                                            | 75% (e.g. 15 s / 5 s)                                                                 |
|                        | Sound power level                                     | Max. 70 dB (A)                                                                        |
|                        | Position indication                                   | Mechanical (integrated)                                                               |
| <b>Safety</b>          | Protection class                                      | III Safety extra-low voltage                                                          |
|                        | Degree of protection                                  | IP67                                                                                  |
|                        | EMC                                                   | CE according to 2004/108/EC                                                           |
|                        | Low-voltage directive                                 | CE according to 2006/95/EC                                                            |
|                        | Certification                                         | Tested in accordance with EN 61000-6-2 : 2005<br>EN 61000-6-4 : 2007                  |
|                        | Mode of operation                                     | Type 1                                                                                |
|                        | Control pollution degree                              | 4                                                                                     |

## Technical data

(continued)

|                            |                           |                                                                |
|----------------------------|---------------------------|----------------------------------------------------------------|
|                            | Ambient temperature       | -20 ... +65 °C                                                 |
|                            | Medium temperature        | -20° ... +120 °C (in the butterfly valve)<br>Max. 130 °C / 1 h |
|                            | Non-operating temperature | -30 ... +80 °C                                                 |
|                            | Ambient humidity          | 95% r.h., non-condensating                                     |
|                            | Maintenance               | Maintenance-free                                               |
| <b>Mechanical data</b>     | Housing material          | Cast aluminium                                                 |
| <b>Dimensions / Weight</b> | Dimensions                | See «Dimensions» on page 6                                     |
|                            | Weight                    | See «Overview of types»                                        |

## Safety notes



- The actuator has been designed for use in stationary heating, ventilation and air conditioning systems and is not allowed to be used outside the specified field of application, especially in aircraft or in any other airborne means of transport.
- It may only be installed by suitably trained personnel. Any legal regulations or regulations issued by authorities must be observed during assembly.
- The device does not contain any parts that can be replaced or repaired by the user.
- The device contains electrical and electronic components and is not allowed to be disposed of as household refuse. All locally valid regulations and requirements must be observed.

## Product features

|                                              |                                                                                                                                                                                                                                                                    |
|----------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Mode of operation</b>                     | The actuator is controlled with a standard modulating signal and travels to the position defined by the control signal. Measuring voltage U serves for the electrical display of the actuator position 0 ... 100% and as slave control signal for other actuators. |
| <b>Simple direct mounting</b>                | Simple direct mounting on the butterfly valve. The mounting position in relation to the butterfly valve can be selected in 90°-steps.                                                                                                                              |
| <b>Manual override</b>                       | The butterfly valve can be closed (turn clockwise) and opened (turn anticlockwise) with the handwheel. The handwheel does not move while the motor is running.                                                                                                     |
| <b>Internal heating</b>                      | An internal heater prevents condensation buildup.                                                                                                                                                                                                                  |
| <b>High functional reliability</b>           | Mechanical stops limit the actuator to -2° and 92°-steps. The internal limit switches interrupt the voltage supply to the motor. In addition, a motor thermostat provides overload protection because at 135 °C it interrupts the voltage supply.                  |
| <b>Combination butterfly valve actuators</b> | Refer to the butterfly valve documentation for suitable butterfly valves, their permitted media temperatures and closing pressures.                                                                                                                                |

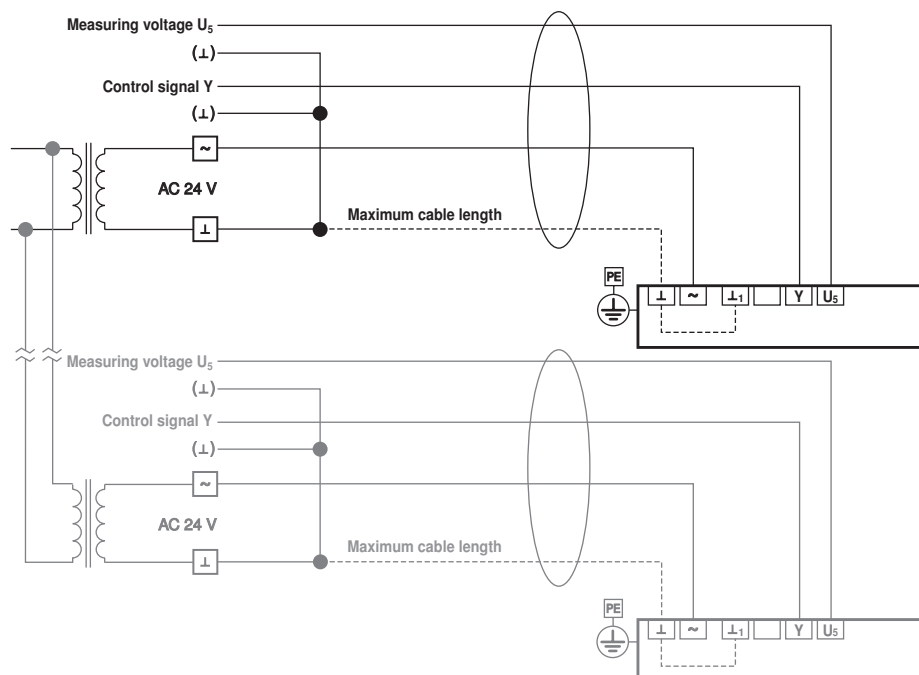
### Restrictions for 3-lead (and 4-lead) connector techniques

The following overview shows the differences between the 24 V actuator wiring options. The same PCB (Print) can be used for both wirings.

|                                        | 3-lead connection                                                              | 4-lead connection                                                                  |
|----------------------------------------|--------------------------------------------------------------------------------|------------------------------------------------------------------------------------|
| <b>Description</b>                     | Signal and connection to power supply have the same ground connection          | Signal and connection to power supply have different ground connections            |
| <b>Supply voltage</b>                  | AC only                                                                        | AC / DC                                                                            |
| <b>Maximum cable length *</b>          | The maximum cable length is defined in the following connection diagram:       |                                                                                    |
| <b>Wire cross-section</b>              | 0.75 mm <sup>2</sup> 1 mm <sup>2</sup> 1.5 mm <sup>2</sup> 2.5 mm <sup>2</sup> | No limitation                                                                      |
| SY2                                    | 12 m    17 m    24 m    43 m                                                   | No limitation                                                                      |
| SY3                                    | 12 m    17 m    24 m    43 m                                                   | No limitation                                                                      |
| SY4                                    | 5 m    7 m    10 m    17 m                                                     | No limitation                                                                      |
| SY5                                    | 5 m    7 m    10 m    17 m                                                     | No limitation                                                                      |
| <b>Measuring voltage U<sub>5</sub></b> | U <sub>5</sub> is stable as soon as the actuator stops                         | No limitation                                                                      |
| <b>Control signal mA</b>               | Not possible                                                                   | The ground connection $\perp$ must be wired to the actuator with mA control signal |

\* The limitation regarding cable length is because of the large amounts of current required by the SY actuator. A high level of current will in turn have an influence on the signals.

### 3-lead system connection

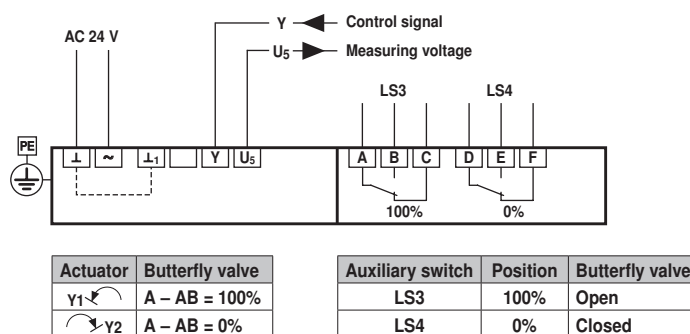


#### Note

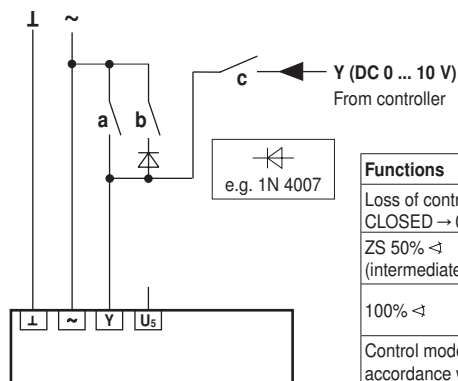
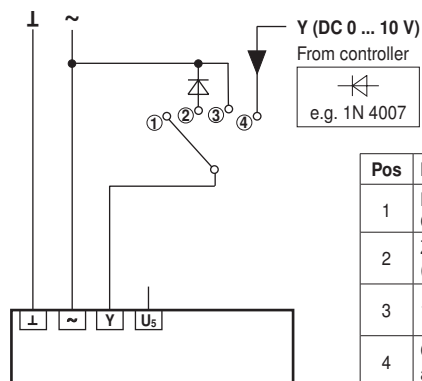
( $\perp$ ) of the control signal Y and ( $\perp$ ) of the measuring voltage U<sub>5</sub> can be connected together.

### Electrical installation for 3-lead connection

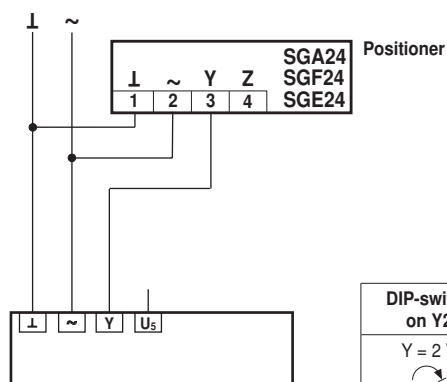
#### Wiring diagram



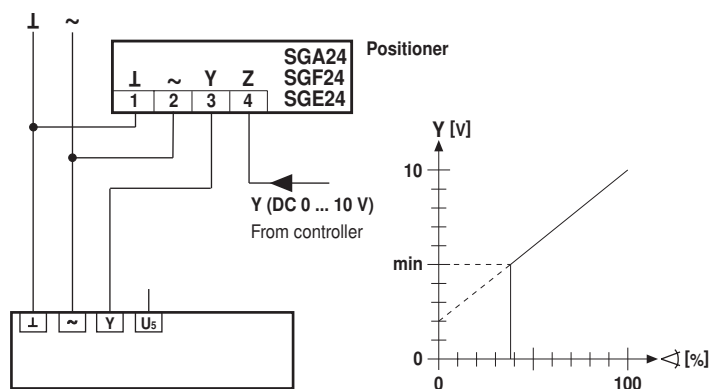
## Functions with basic values – 3-lead connection technology

Override control with AC 24 V  
with relay contactsOverride control with AC 24 V  
with rotary control switch

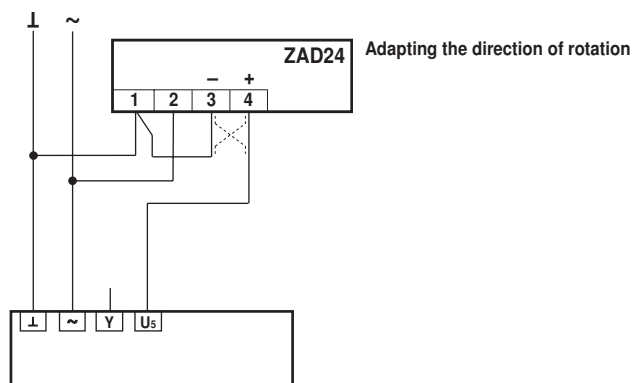
## Remote control 0 ... 100 %



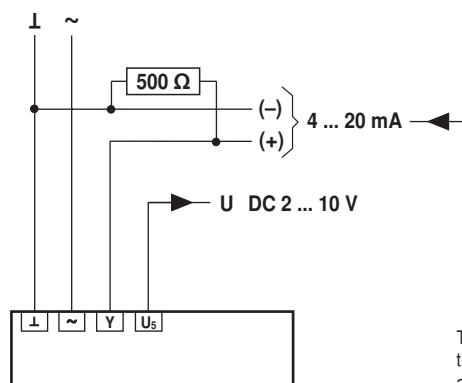
## Minimum limit



## Position indication



## Control with 4 ... 20 mA via external resistance



The 500 Ω-resistor converts  
the 4 ... 20 mA current signal to  
a voltage signal DC 2 ... 10 V

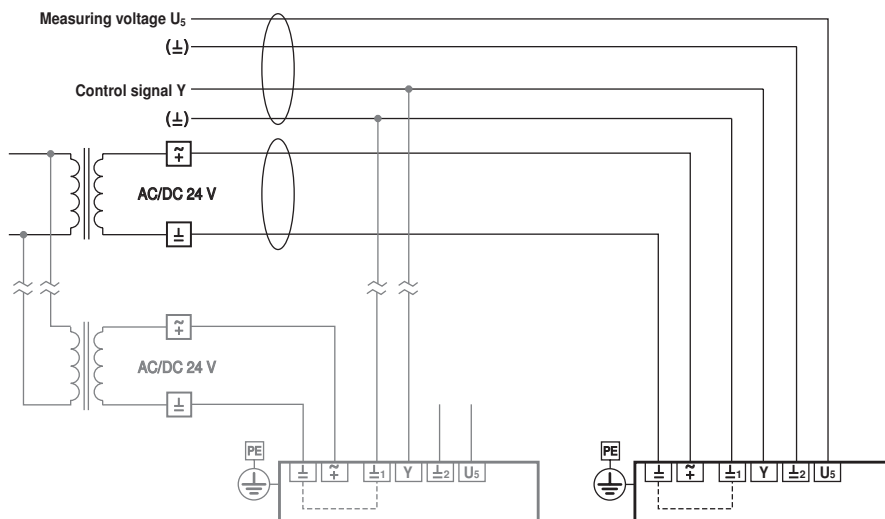
### Restrictions for (3-lead and) 4-lead connector techniques

The following overview shows the differences between the 24 V actuator wiring options. The same PCB (Print) can be used for both wirings.

|                                        | 3-lead connection                                                              | 4-lead connection                                                                  |
|----------------------------------------|--------------------------------------------------------------------------------|------------------------------------------------------------------------------------|
| <b>Description</b>                     | Signal and connection to power supply have the same ground connection          | Signal and connection to power supply have different ground connections            |
| <b>Supply voltage</b>                  | AC only                                                                        | AC / DC                                                                            |
| <b>Maximum cable length *</b>          | The maximum cable length is defined in the following connection diagram:       |                                                                                    |
| <b>Wire cross-section</b>              | 0.75 mm <sup>2</sup> 1 mm <sup>2</sup> 1.5 mm <sup>2</sup> 2.5 mm <sup>2</sup> | No limitation                                                                      |
| SY2                                    | 12 m   17 m   24 m   43 m                                                      | No limitation                                                                      |
| SY3                                    | 12 m   17 m   24 m   43 m                                                      | No limitation                                                                      |
| SY4                                    | 5 m   7 m   10 m   17 m                                                        | No limitation                                                                      |
| SY5                                    | 5 m   7 m   10 m   17 m                                                        | No limitation                                                                      |
| <b>Measuring voltage U<sub>5</sub></b> | U <sub>5</sub> is stable as soon as the actuator stops                         | No limitation                                                                      |
| <b>Control signal mA</b>               | Not possible                                                                   | The ground connection $\perp$ must be wired to the actuator with mA control signal |

\* The limitation regarding cable length is because of the large amounts of current required by the SY actuator. A high level of current will in turn have an influence on the signals.

### 4-lead system connection

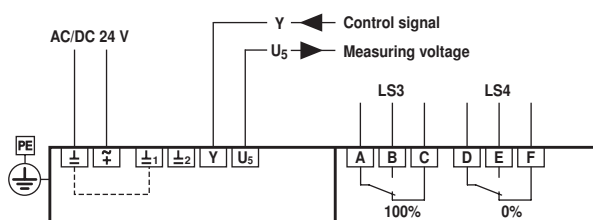


#### Note

( $\perp$ ) of the control signal Y and ( $\perp$ ) of the measuring voltage U<sub>5</sub> can be connected together.

### Electrical installation for 4-lead connection

#### Wiring diagram

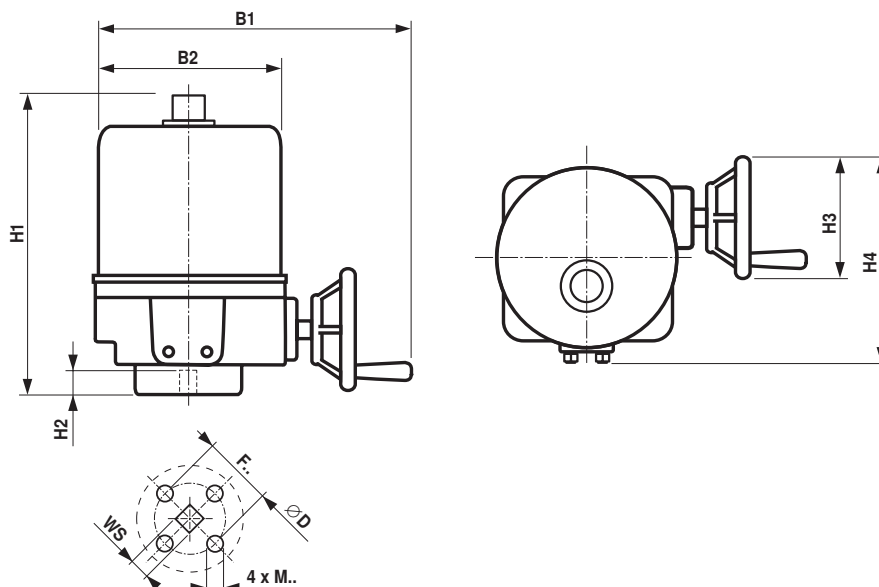


| Actuator                                                                               | Butterfly valve |
|----------------------------------------------------------------------------------------|-----------------|
| Y1  | A - AB = 100%   |
| Y2  | A - AB = 0%     |

| Auxiliary switch | Position | Butterfly valve |
|------------------|----------|-----------------|
| LS3              | 100%     | Open            |
| LS4              | 0%       | Closed          |

## Dimensions [mm]

Dimensional drawings



| Type        | H1<br>[mm] | H2<br>[mm] | H3<br>[mm] | H4<br>[mm] | B1<br>[mm] | B2<br>[mm] | F.<br>ISO 5211 | D<br>[mm] | WS<br>[mm] | M.. |
|-------------|------------|------------|------------|------------|------------|------------|----------------|-----------|------------|-----|
| SY2-24-SR-T | 289        | 30         | 123        | 203        | 326        | 180        | F07            | 70        | 22         | M8  |
| SY3-24-SR-T | 289        | 30         | 123        | 203        | 326        | 180        | F07            | 70        | 22         | M8  |
| SY4-24-SR-T | 317        | 40         | 194        | 290        | 394        | 217        | F10            | 102       | 35         | M10 |
| SY5-24-SR-T | 317        | 40         | 194        | 290        | 394        | 217        | F10            | 102       | 35         | M10 |

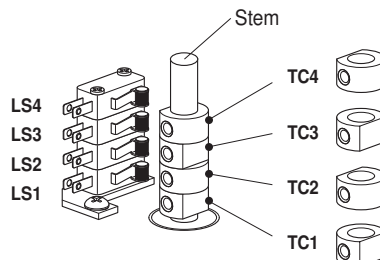
## Settings

### Setting cam

#### Important!

Settings are only allowed to be made by authorised specialist personnel.

The setting cams for limit and auxiliary switches can be accessed by removing the housing cover. Optionally, auxiliary switches LS4 / LS3 can be connected for signalling. Limit switches LS2 / LS1 interrupt the voltage to the motor and are controlled by setting cams TC.. . The setting cams turn with the stem. The butterfly valve closes when the stem is turning clockwise (cw) and opens when the stem is turning counterclockwise (ccw).

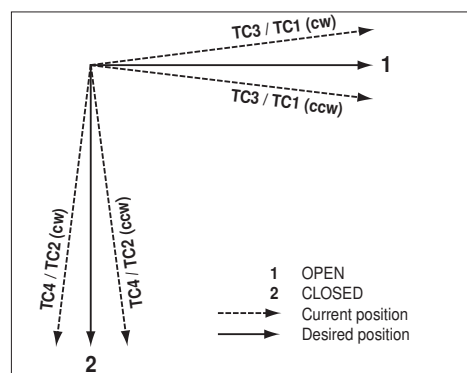


#### Settings of setting cams TC..

- TC4 for auxiliary switch position closed (factory setting  $3^\circ \triangleleft$ ).
- TC3 for auxiliary switch position open (factory setting  $87^\circ \triangleleft$ ).
- TC2 for limit switch closed (factory setting  $0^\circ \triangleleft$ ).
- TC1 for limit switch open (factory setting  $90^\circ \triangleleft$ ).

#### Adjusting setting cams

- 1 Use a 2.5 mm Allen key to unscrew the corresponding setting cams TC..
- 2 Turn the setting cam using the Allen key
- 3 Set as shown in the illustration below
- 4 Use the Allen key to tighten the corresponding setting cams



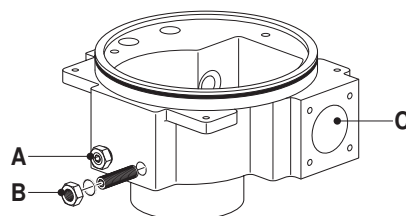
#### Adaption

An adaptation must take place after the TC1 and TC2 have been adjusted.

#### Mechanical angle of rotation limitation

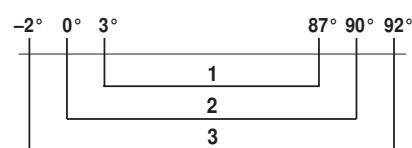
The mechanical angle of rotation is set at the factory to  $94^\circ \triangleleft$  and cannot be changed. The handwheel is rotated by means of a worm gear in a planetary gear unit. The gearing is stopped mechanically by means of two setscrews **A** and **B** ( $1\frac{1}{2}$  rotations of the setscrews correspond to  $2^\circ \triangleleft$ ).

Both limit switches LS 2 / LS 1 are set to  $90^\circ \triangleleft$  and must always switch off the motor before the mechanical angle of rotation limitation.



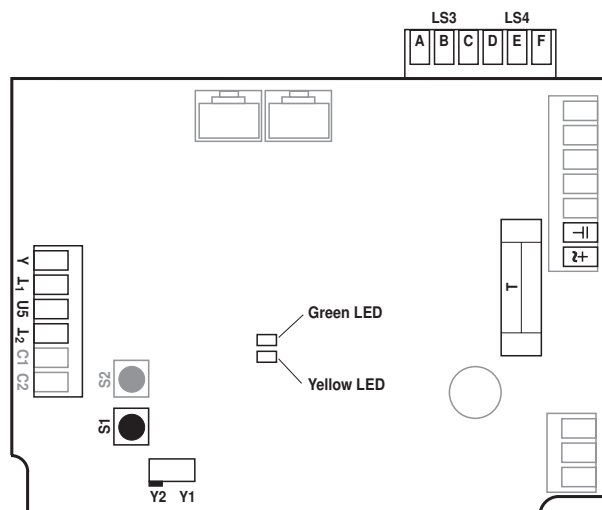
- A** Angle of rotation limiting OPEN ( $90^\circ \triangleleft$ )
- B** Angle of rotation limiting CLOSED ( $0^\circ \triangleleft$ )
- C** Connection of handwheel for angle of rotation limiting

#### Relationship between mechanical angle of rotation limiting, limit and auxiliary switches



- 1 Auxiliary switch TC3 / TC4
- 2 Limit switch TC1 / TC2
- 3 Mechanical angle of rotation limitation (A + B)

## Connection and function elements

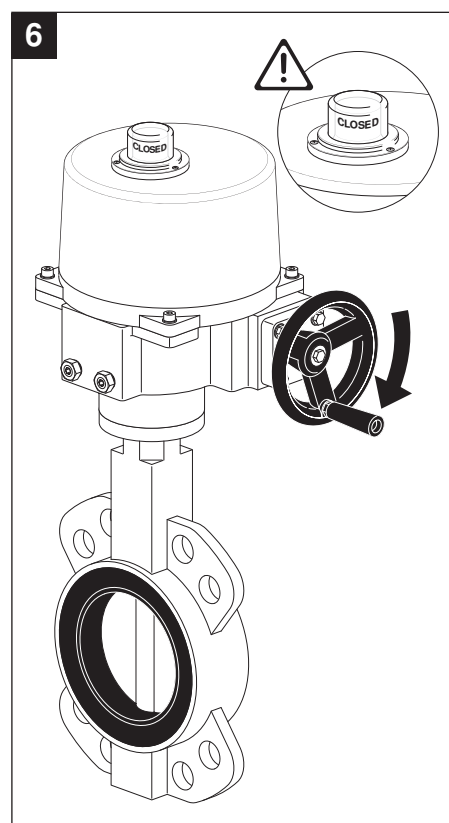
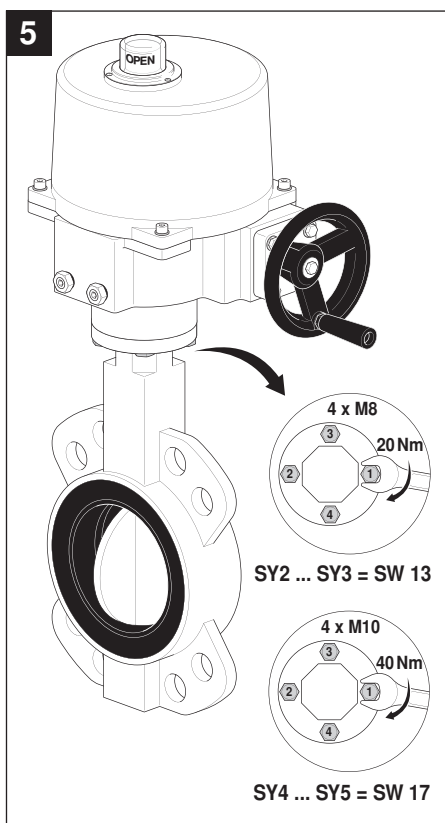
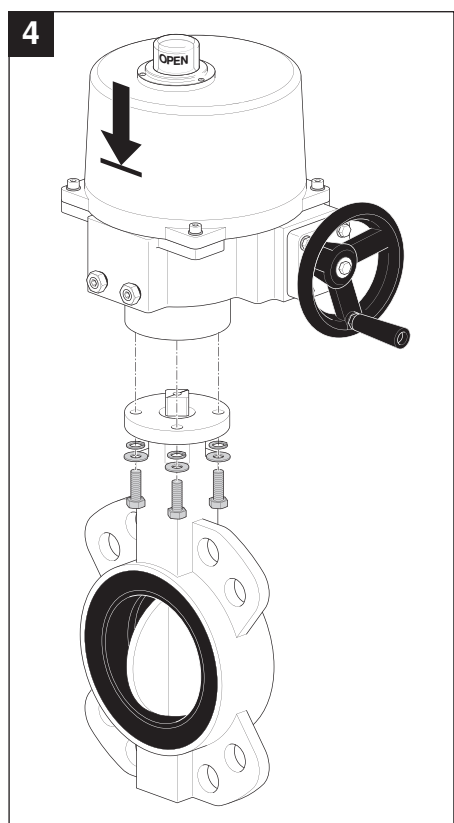
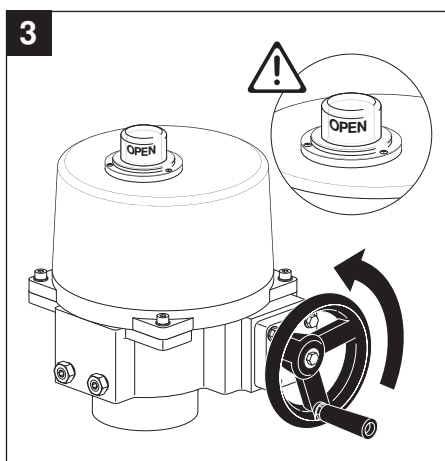
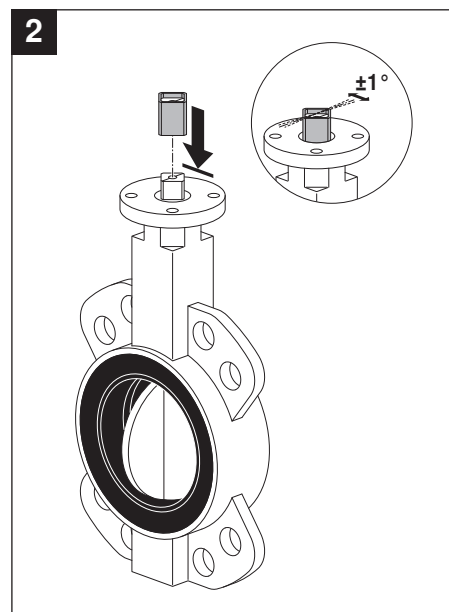
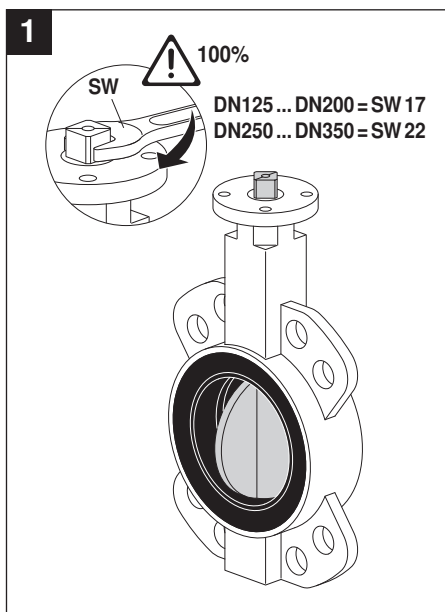
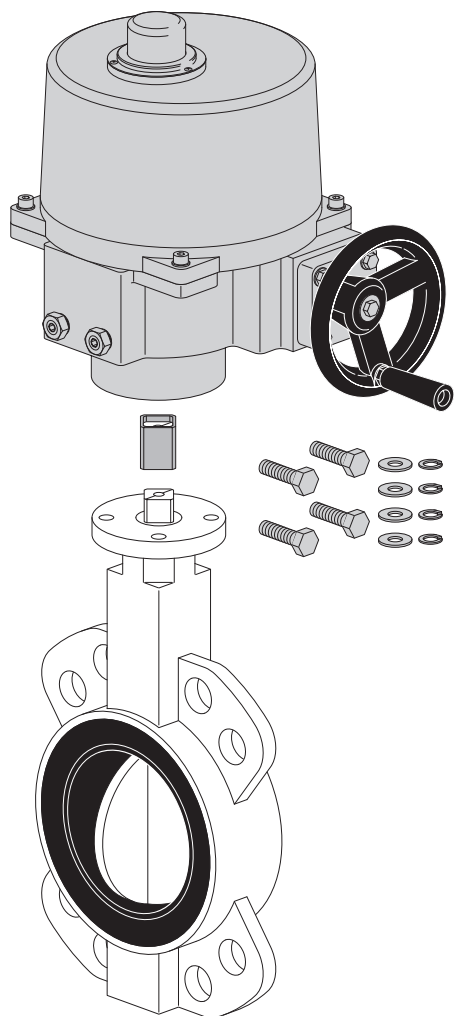


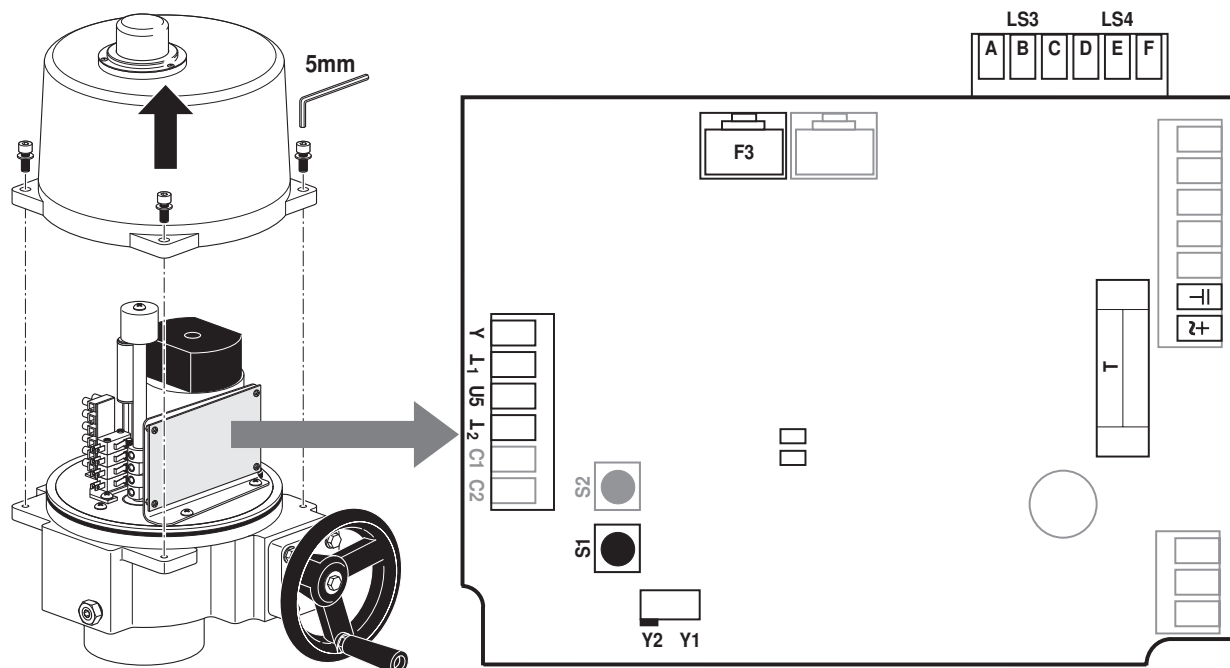
| Symbol          | Function                     | Description                                                                                                                 |
|-----------------|------------------------------|-----------------------------------------------------------------------------------------------------------------------------|
| $\perp / \nmid$ | Power supply voltage         |                                                                                                                             |
| Y1              | Direction of rotation switch | Actuator rotates anticlockwise (ccw), valve opens                                                                           |
| Y2              | Direction of rotation switch | Actuator rotates clockwise (cw) valve closes                                                                                |
| Y               | Control signal               |                                                                                                                             |
| U5              | Position feedback            |                                                                                                                             |
| L1 / L2         | 0-lead (ground)              |                                                                                                                             |
| S1              | Adaptation button            | Adaptation procedures is started (press S1 for 3 s)<br>Adaptation must take place after the TC1 and TC2 have been adjusted. |
| Yellow LED      | On                           | Adaptation procedure activated                                                                                              |
|                 | Off                          | Standard operation                                                                                                          |
| Green LED       | On                           | In operation                                                                                                                |
|                 | Off                          | No voltage supply or fault                                                                                                  |
| T               | Plug-in fuse                 | Type T10A250V                                                                                                               |
| LS3             | Auxiliary switch             | Factory setting 87° <math>\triangleleft</math>                                                                              |
| LS4             | Auxiliary switch             | Factory setting 3° <math>\triangleleft</math>                                                                               |
| C1 / C2         | Not used                     |                                                                                                                             |
| S2              | Not used                     |                                                                                                                             |

## Further documentations

- Complete overview «The complete range of water solutions»
- Data sheets, butterfly valves
- Installation instructions for actuators and/or butterfly valves, respectively
- Notes for project planning (hydraulic characteristic curves and circuits, installation regulations, commissioning, maintenance, etc.)

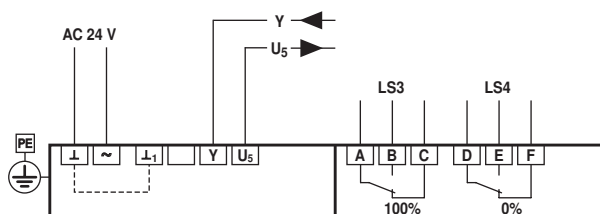
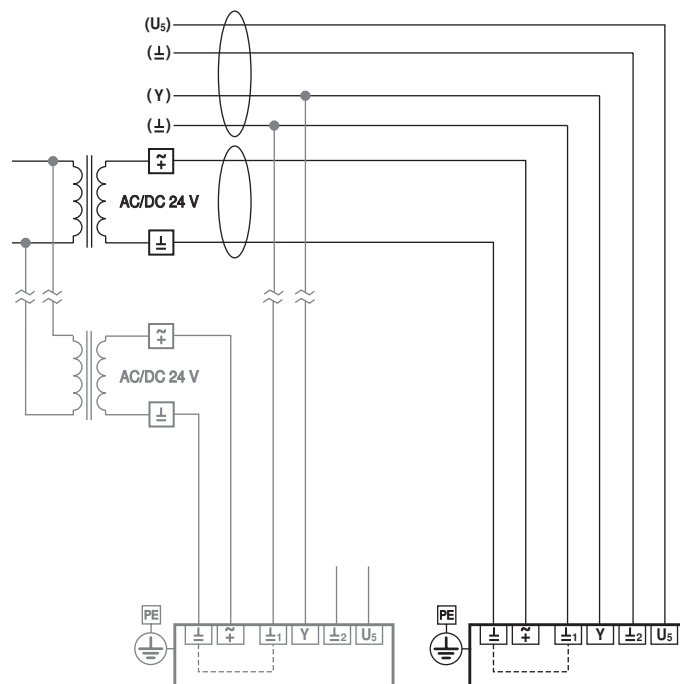
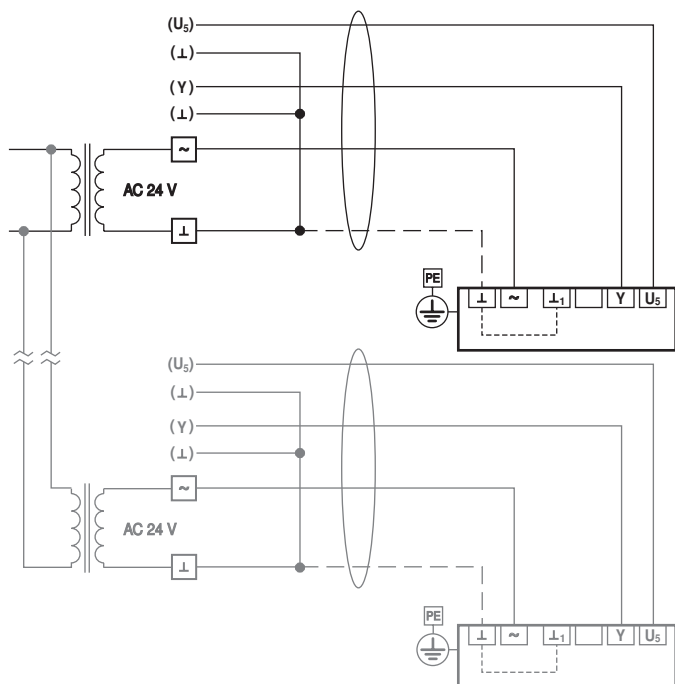




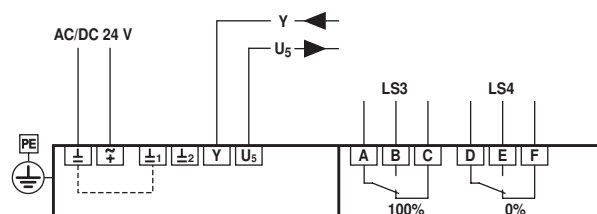


## SY..-24-SR-T / SY..-24-MF-T

## SY..-24-SR-T / SY..-24-MF-T



|    |               |
|----|---------------|
| Y1 | A - AB = 100% |
| Y2 | A - AB = 0%   |



|    |               |
|----|---------------|
| Y1 | A - AB = 100% |
| Y2 | A - AB = 0%   |

## SY..-24-MP-T

