

# SIEMENS



## **Acvatix™** **Actuators SAX.., SAL.. for valves** **Basic Documentation**

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# 1 About this documentation

## 1.1 Navigation / Quick access

Information about a specific actuator is provided throughout the document. The structure of chapters 2 to 4 is as follows:

|                                 |                          |
|---------------------------------|--------------------------|
| 2 Engineering                   | <b>device oriented</b>   |
| 2.1 Product description         |                          |
| 2.2 Use                         |                          |
| 3 Handling                      | <b>handling oriented</b> |
| 3.1 Mounting and installation   |                          |
| 3.2 Commissioning and operation |                          |
| 4 Functions and Control         | <b>assembly oriented</b> |
| 4.1 3-position control          |                          |
| 4.2 Modulating control          |                          |

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Quick access to important information including reference to pages:

| Product no.               | 2 Engineering          |             | 3 Handling  |                        | 4 Function and control |             |             |
|---------------------------|------------------------|-------------|-------------|------------------------|------------------------|-------------|-------------|
|                           | Equipment combinations | Accessories | Calibration | Accessories (mounting) | Control                | Calibration | Accessories |
| SAX31.00                  | Page 10                | Page 13     | -           | Page 26-31             | Page 37-38             | -           | Page 53     |
| SAX31.03                  |                        |             |             |                        |                        |             |             |
| SAX61.03 <sup>1)</sup>    |                        |             | Page 33     |                        | Page 40                | Page 44     |             |
| SAX81.00 <sup>1)</sup>    |                        |             |             |                        |                        |             |             |
| SAX81.03 <sup>1)</sup>    |                        |             |             |                        |                        |             |             |
| SAL31.00T10               | Page 10                | Page 13     | -           | Page 26-31             | Page 37-38             | -           | Page 53     |
| SAL31.00T20               |                        |             |             |                        |                        |             |             |
| SAL31.00T40               |                        |             |             |                        |                        |             |             |
| SAL31.03T10               |                        |             |             |                        |                        |             |             |
| SAL61.00T10 <sup>1)</sup> |                        |             | Page 33     |                        | Page 40                | Page 44     |             |
| SAL61.00T20 <sup>1)</sup> |                        |             |             |                        |                        |             |             |
| SAL61.00T40 <sup>1)</sup> |                        |             |             |                        |                        |             |             |
| SAL61.03T10 <sup>1)</sup> |                        |             |             |                        |                        |             |             |
| SAL81.00T10 <sup>1)</sup> |                        |             |             |                        |                        |             |             |
| SAL81.00T20 <sup>1)</sup> |                        |             |             |                        |                        |             |             |
| SAL81.00T40 <sup>1)</sup> |                        |             |             |                        |                        |             |             |
| SAL81.03T10 <sup>1)</sup> |                        |             |             |                        |                        |             |             |

<sup>1)</sup>These types of actuator are UL-listed versions

Note

Glossary and Index are arranged at the end of the document.

## 1.2 Revision history

| Revision      | Date       | Changes   | Chapter  |
|---------------|------------|---|--|
| First edition | 16.07.2010 | -   | -  |
| 2.0           | 2010-12-12 | Rotary actuator SAL..T10 integrated   |  |
|               |            | Mounting and installation of butterfly valves and slipper valves corrected and expanded | 3.1  |
|               |            | New chapter „Position feedback U“   | 4.6  |
|               |            | Technical data corrected  | 5  |
| 2.1           | 2011-09-14 | V..F53.. valves added   | 2.5  |
|               |            | SAL.T20 rotary actuators added  | 1.1, 1.2, 2.3, 2.4, 2.5, 2.6, 3, 3.1, 4.12, 5, 7 |
| 3             | 2013-09-12 | Corrections regarding SAX..Series „G“ “   | 2.4, 4.1, 4.7,                                   |
|               |            | VVF53.50-40K valve added  | 4.13, 5, 6.4                                     |
| 3.1           | 2013-12-17 | SAL..T40 is added   | ...  |

## 1.3 Reference documents

| Type of document             | SAX..   | SAL..   |         |
|------------------------------|---|---|---------|
| Data Sheet                   | N4501, N4509, Q4501   | N4502   |         |
| Mounting Instructions        | -   | ASK31N: M4502.1<br>ASK33N: M4502.2<br>ASK35N: M4502.3 |         |
|                              | ASC.: M4040.1<br>ASZ7.5/..: M4040.2<br>AZX61..: M4040.3<br>ASK39..: M4040.3 |   |         |
|                              | ASZ6.6: M4501.1   | -   |         |
|                              |   |   |         |
| CE Declaration of Conformity | AC 230 V  | T4501X1   | T4502X1 |
|                              | AC/DC 24 V  | T4501X2   | T4502X2 |
| Environmental Declaration    | E4501   | E4502   |         |

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### 1.4.1 Trademarks

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|------------|-------------------------|
| Acvatix™   | Siemens Switzerland Ltd |

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- All necessary corrections are included in subsequent versions
- Anpassungen bzw. Documents are automatically amended as a consequence of modifications and corrections to the products described

Please make sure that you are aware of the latest document revision date.

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## 1.5 Scope of this documentation

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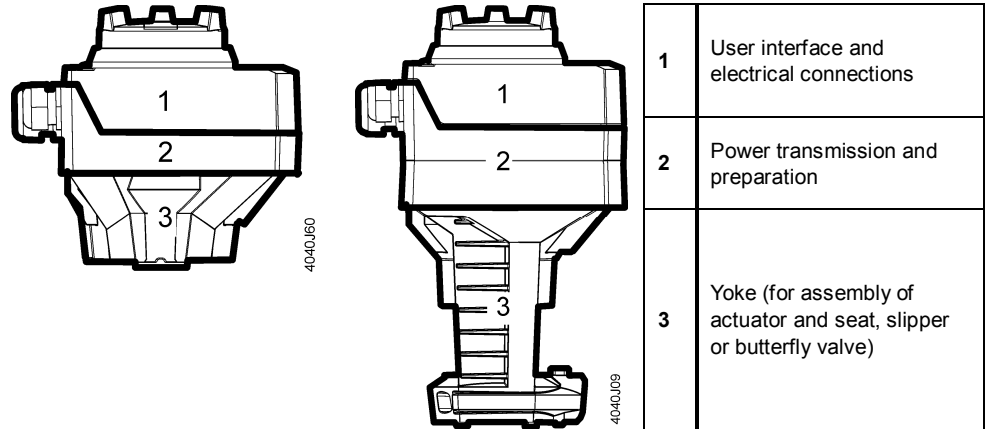
This document shall serve as a source of knowledge. In addition to basic information, it provides general technical information about the actuators used in HVAC plants. It is also targeted at engineering staff, HVAC electrical planners, system integrators and service engineers and provides all information required for planning work, correct installation, commissioning and service.

## 2 Engineering

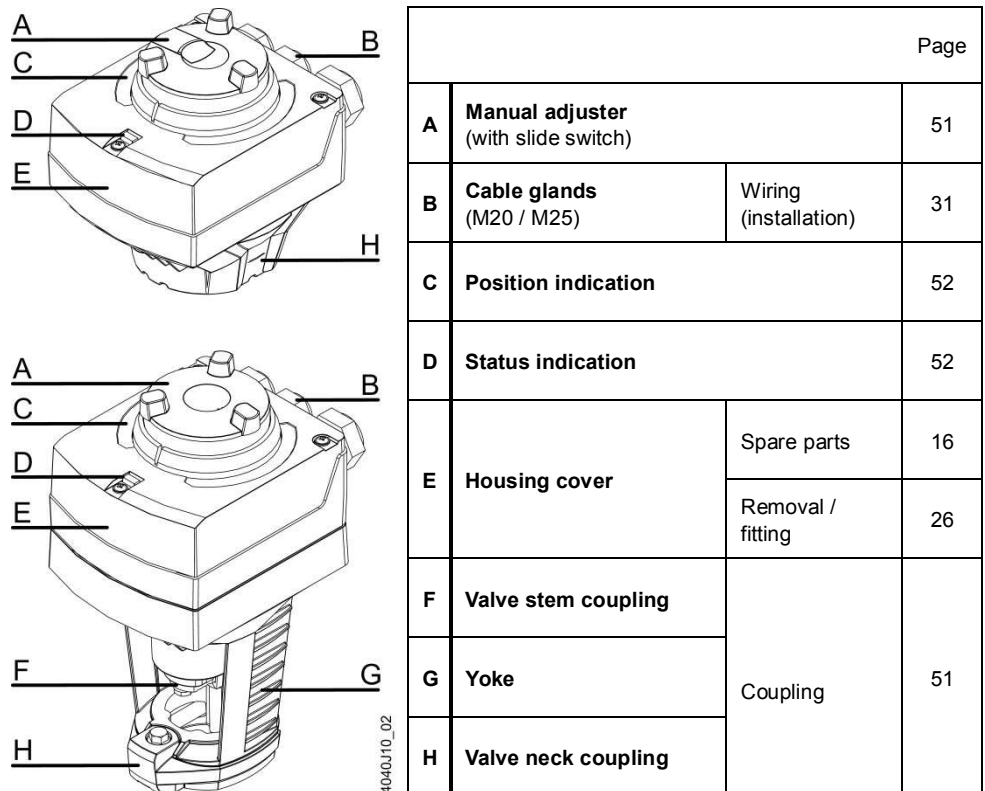
### 2.1 Product description

The line of large actuators is comprised of stroke actuators SAX.. and rotary actuators SAL...

#### Mechanical design



#### Components



### 2.2 Use

#### SAX..

For use in connection with Siemens 2-port or 3-port valves with 20 mm stroke, as control or shutoff valves for HVAC plants.

#### SAL..

For use in connection with Siemens butterfly or slipper valves, as control or shutoff valves for HVAC plants.

#### Note

When using the actuators outdoors, weather shield ASK39.1 must be fitted.



## 2.3 Type summary

### 2.3.1 Stroke actuators

| Product no.                         | Stock no.                       | Stroke | Pos. force | Operating voltage | Positioning signal                        | Spr. ret. time | Pos. time  | LED   | Manual adjuster | Extra functions |   |
|-------------------------------------|---------------------------------|--------|------------|-------------------|---|----------------|------------|-------|-----------------|-----------------|---|
| <b>SAX31.00</b>                     | S55150-A105                     | 20 mm  | 800 N      | AC 230 V          | 3-position                                | -              | 120 s      | -     | Push and fix    | -               |   |
| <b>SAX31.03</b>                     | S55150-A106                     |        |            | AC/DC 24 V        | DC 0...10 V<br>DC 4...20 mA<br>0...1000 Ω |                | 3-position | 30 s  |                 | ✓               | Position feedback, forced control, change of characteristic |
| <b>SAX61.03</b><br><b>SAX61.03U</b> | S55150-A100<br>S55150-A100-A100 |        |            |                   |   |                |            | 120 s |                 | -               | -   |
| <b>SAX81.00</b><br><b>SAX81.00U</b> | S55150-A102<br>S55150-A102-A100 |        |            |                   |   |                |            | 30 s  |                 | -               | -   |
| <b>SAX81.03</b><br><b>SAX81.03U</b> | S55150-A103<br>S55150-A103-A100 |        |            |                   |   |                |            | -     |                 | -               | -   |

### 2.3.2 Stroke actuators – combi valves

| Product no.     | Stock no.   | Stroke | Pos. force | Operating voltage | Positioning signal                        | Spr. ret. time | Pos. time | LED        | Manual adjuster | Extra functions |   |
|-----------------|-------------|--------|------------|-------------------|---|----------------|-----------|------------|-----------------|-----------------|---|
| <b>SAX31P03</b> | S55150-A118 | 20 mm  | 500 N      | AC 230 V          | 3-position                                | -              | 30 s      | -          | -               | -               |   |
| <b>SAX61P03</b> | S55150-A114 |        |            | AC/DC 24 V        | DC 0...10 V<br>DC 4...20 mA<br>0...1000 Ω |                |           | 3-position |                 | ✓               | Position feedback, forced control, change of characteristic |
| <b>SAX81P03</b> | S55150-A116 |        |            |                   |   |                |           |            |                 | -               | -   |

### 2.3.3 Rotary actuators

| Product no.        | Stock no.   | Angular rotation | Torque     | Operating voltage | Positioning signal                        | Positioning time | LED  | Manual adjuster | Extra functions |                                   |
|--------------------|-------------|------------------|------------|-------------------|---|------------------|------|-----------------|-----------------|-----------------------------------|
| <b>SAL31.00T10</b> | S55162-A108 | 90°              | 10 Nm      | AC 230 V          | 3-position                                | 120 s            | -    | Push and fix    | -               |                                   |
| <b>SAL31.00T20</b> | S55162-A110 |                  | 20 Nm      |                   |   |                  |      |                 |                 |                                   |
| <b>SAL31.00T40</b> | S55162-A111 |                  | 40 Nm      |                   |   |                  |      |                 |                 |                                   |
| <b>SAL31.03T10</b> | S55162-A109 |                  | AC/DC 24 V | 10 Nm             | DC 0...10 V<br>DC 4...20 mA<br>0...1000 Ω | 3-position       | 30 s | ✓               | Push and fix    | Position feedback, forced control |
| <b>SAL61.00T10</b> | S55162-A100 |                  |            | 20 Nm             |   |                  |      |                 |                 |                                   |
| <b>SAL61.00T20</b> | S55162-A102 |                  |            | 40 Nm             |   |                  |      |                 |                 |                                   |
| <b>SAL61.00T40</b> | S55162-A103 |                  |            | 10 Nm             |   |                  |      |                 |                 |                                   |
| <b>SAL61.03T10</b> | S55162-A101 |                  |            | 20 Nm             |   |                  |      |                 |                 |                                   |
| <b>SAL61.03T20</b> | S55162-A104 |                  |            | 40 Nm             |   |                  |      |                 |                 |                                   |
| <b>SAL81.00T10</b> | S55162-A104 |                  | 3-position | 10 Nm             | 3-position                                | 120 s            | -    | Push and fix    | -               |                                   |
| <b>SAL81.00T20</b> | S55162-A106 |                  |            | 20 Nm             |   |                  |      |                 |                 |                                   |
| <b>SAL81.00T40</b> | S55162-A107 |                  |            | 40 Nm             |   |                  |      |                 |                 |                                   |
| <b>SAL81.03T10</b> | S55162-A105 |                  |            | 10 Nm             |   |                  |      |                 |                 | 30 s                              |

## 2.4 Ordering

Example

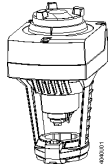






| Product no. | Stock no.   | Description   | Quantity |
|-------------|-------------|---------------|----------|
| SAX81.03    | S55150-A103 | Actuator      | 1        |
| ASZ7.5/1000 | S55845-Z106 | Potentiometer | 1        |

Delivery

Actuators, valves and accessories are supplied in individual packs.

## 2.5 Equipment combinations

### 2.5.1 Stroke actuators – 3-port valves

| Typical applications   | Stroke actuators          | Data Sheet                  | Stroke                   |  | 20 mm   |                                   |                   |
|--|---------------------------|-----------------------------|--------------------------|--|---|-----------------------------------|-------------------|
|  |                           |                             | Positioning force        |  | 800 N   |                                   |                   |
| <ul style="list-style-type: none"> <li>• Heating plants</li> <li>• Ventilation and air conditioning plants</li> <li>• Heat generation</li> <li>• Heat distribution</li> <li>• District heating plants</li> </ul> | SAX..                     | N4501                       |                          |  |  |                                   |                   |
| <b>Valves</b>  | <b>Basic Doc. (P4030)</b> |                             |                          |  |   | $\Delta p_{\max V}$ <sup>5)</sup> | $\Delta p_{\max}$ |
| <b>Valves</b>  | <b>Data Sheet</b>         | <b>Valve type</b>           | <b>DN</b>                | <b><math>k_{vs}</math> [m<sup>3</sup>/h]</b> |   |                                   |                   |
| <b>PN6</b><br><br>-10... 130 °C <sup>4)</sup>   | N4410                     | VXF21.22...25 <sup>1)</sup> | 25                       | 1,9 / 3 / 5 / 7,5                            | -   | 300                               |                   |
|  |                           | VXF21.25... <sup>2)</sup>   | 25                       | 2,5 / 4 / 6,3 / 10                           |   |                                   |                   |
|  |                           | VXF21.39-40                 | 40                       | 12 / 19                                      |   |                                   |                   |
|  |                           | VXF21.40-... <sup>2)</sup>  | 40                       | 16 / 25                                      |   |                                   |                   |
|  |                           | VXF21.50                    | 50                       | 31   |   |                                   |                   |
|  |                           | VXF21.50-40                 | 50                       | 40   |   |                                   |                   |
|  |                           | VXF21.65                    | 65                       | 49   |   |                                   |                   |
|  |                           | VXF21.65-63                 | 65                       | 63   |   |                                   |                   |
|  |                           | VXF21.80-78                 | 80                       | 78   |   |                                   |                   |
|  |                           | VXF21.80-100                | 80                       | 100  |   |                                   |                   |
| <b>PN10</b><br><br>-10... 130 °C <sup>4)</sup>  | N4420                     | VXF31.15-... <sup>2)</sup>  | 15                       | 2,5 / 4                                      | -   | 300                               |                   |
|  |                           | VXF31.24...25 <sup>1)</sup> | 25                       | 5 / 7,5                                      |   |                                   |                   |
|  |                           | VXF31.25-... <sup>2)</sup>  | 25                       | 6,3 / 10                                     |   |                                   |                   |
|  |                           | VXF31.39...40 <sup>1)</sup> | 40                       | 12 / 19                                      |   |                                   |                   |
|  |                           | VXF31.40-... <sup>2)</sup>  | 40                       | 16 / 25                                      |   |                                   |                   |
|  |                           | VXF31.50                    | 50                       | 31   |   |                                   |                   |
|  |                           | VXF31.50-40                 | 50                       | 40   |   |                                   |                   |
|  |                           | VXF31.65                    | 65                       | 49   |   |                                   |                   |
|  |                           | VXF31.65-63                 | 65                       | 63   |   |                                   |                   |
|  |                           | VXF31.80                    | 80                       | 78   |   |                                   |                   |
| VXF31.80-100   | 80                        | 100                         |                          |  |   |                                   |                   |
| <b>PN16</b><br><br>-10... 130 °C <sup>4)</sup>  | N4430                     | VXF40.15-... <sup>2)</sup>  | 15                       | 1,9 / 2,5 / 3 / 4                            | -   | 300                               |                   |
|  |                           | VXF40.25-... <sup>2)</sup>  | 20                       | 5 / 6,3 / 7,5 / 10                           |   |                                   |                   |
|  |                           | VXF40.40-... <sup>2)</sup>  | 40                       | 12 / 16 / 19 / 25                            |   |                                   |                   |
|  |                           | VXF40.50-... <sup>2)</sup>  | 50                       | 31 / 40                                      |   |                                   |                   |
|  |                           | VXF40.65-... <sup>2)</sup>  | 65                       | 49 / 63                                      |   |                                   |                   |
| VXF40.80-... <sup>2)</sup>   | 80                        | 78 / 100                    |                          |  |   |                                   |                   |
| <b>PN16</b><br><br>-10... 130 °C <sup>4)</sup>  | N4440                     | VXF41.14...15 <sup>1)</sup> | 15                       | 1,9 / 3                                      | -   | 800                               |                   |
|  |                           | VXF41.24...25 <sup>1)</sup> | 25                       | 5 / 7,5                                      |   | 500                               |                   |
|  |                           | VXF41.39...40 <sup>1)</sup> | 40                       | 12 / 19                                      |   | 350                               |                   |
|  |                           | VXF41.49...50 <sup>1)</sup> | 50                       | 19 / 31                                      |   |                                   |                   |
| <b>PN25/16</b><br><br>-20... 130 °C <sup>4)</sup>   | N4405                     | VXF53.15-... <sup>2)</sup>  | 15                       | 1,6 / 2,5 / 4                                | 200   | 1'200                             |                   |
|  |                           | VXF53.20-6,3                | 20                       | 6,3  |   |                                   |                   |
|  |                           | VXF53.25-... <sup>2)</sup>  | 25                       | 6,3 / 10                                     |   |                                   |                   |
|  |                           | VXF53.32-16                 | 32                       | 16   |   |                                   |                   |
|  |                           | VXF53.40-... <sup>2)</sup>  | 40                       | 16 / 25                                      |   |                                   |                   |
| VXF53.50-40  | 50                        | 40                          | 100                      | 300  |   |                                   |                   |
| <b>PN16</b><br><br>-25... 130 °C <sup>4)</sup>  | N4463                     | -                           | VXG41.1301 <sup>3)</sup> | 15   | 1,6   | -                                 | 800               |
|  |                           | -                           | VXG41.1401 <sup>3)</sup> | 15   | 2,5   |                                   |                   |
|  |                           | VXG41.15                    | VXG41.1501 <sup>3)</sup> | 15   | 4   |                                   |                   |
|  |                           | VXG41.20                    | VXG41.2001 <sup>3)</sup> | 20   | 6,3   |                                   |                   |
|  |                           | VXG41.25                    | VXG41.2501 <sup>3)</sup> | 25   | 10  |                                   |                   |
|  |                           | VXG41.32                    | VXG41.3201 <sup>3)</sup> | 32   | 16  |                                   |                   |
|  |                           | VXG41.40                    | VXG41.4001 <sup>3)</sup> | 40   | 25  |                                   |                   |
|  |                           | VXG41.50                    | VXG41.5001 <sup>3)</sup> | 50   | 40  |                                   |                   |

1) Insert running number instead of  $k_{vs}$  value

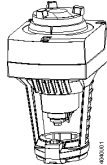







2) .. = insert  $k_{vs}$  value

3) With tight bypass; VXG41.1301 and VXG41.1401: use only SAX61..., SKD32.50 or SKD82.50.

4) For media temperatures > 130 °C use electrohydraulic actuators SKD.. (N4561), SKB.. (N4564).

5)  $\Delta p_{\max V}$  = max. permissible differential pressure in diverting mode

## 2.5.2 Stroke actuators – 2-port valves

| Typical applications   | Stroke actuators   | Data Sheet                  | Stroke            |  | 20 mm   |                        |       |
|--|--------------------|-----------------------------|-------------------|--|---|------------------------|-------|
|  |                    |                             | Positioning force |  | 800 N   |                        |       |
| <ul style="list-style-type: none"> <li>• Heating plants</li> <li>• Ventilation and air conditioning plants</li> <li>• Heat generation</li> <li>• Heat distribution</li> <li>• District heating plants</li> </ul> | SAX..              | N4501                       |                   |  |  |                        |       |
| Valves   | Basic Doc. (P4030) |                             |                   |  |   |                        |       |
| Valves   | Data Sheet         | Valve type                  | DN                | $k_{vs}$ [m <sup>3</sup> /h]   | $\Delta p_s$ [kPa]  | $\Delta p_{max}$ [kPa] |       |
| <b>PN6</b><br><br>-10...130 °C <sup>3)</sup>  | N4310              | VVF21.22...25 <sup>1)</sup> | 25                | 1,9 / 3 / 5 / 7,5  | 600   | 300                    |       |
|  |                    | VVF21.25... <sup>2)</sup>   | 25                | 2,5 / 4 / 6,3 / 10   |   |                        |       |
|  |                    | VVF21.39-40                 | 40                | 12 / 19  |   |                        |       |
|  |                    | VVF21.40... <sup>2)</sup>   | 40                | 16 / 25  | 500   |                        |       |
|  |                    | VVF21.50                    | 50                | 31   |   |                        |       |
|  |                    | VVF21.50-40                 | 50                | 40   | 300   |                        |       |
|  |                    | VVF21.65                    | 65                | 49   |   |                        |       |
|  |                    | VVF21.65-63                 | 65                | 63   | 175   |                        | 175   |
|  |                    | VVF21.80-78                 | 80                | 78   | 100   |                        | 100   |
| VVF21.80-100   | 80                 | 100                         |                   |  |   |                        |       |
| <b>PN10</b><br><br>-10...130 °C <sup>3)</sup>   | N4320              | VVF31.15... <sup>2)</sup>   | 15                | 2,5 / 4  | 1'000   | 300                    |       |
|  |                    | VVF31.24...25 <sup>1)</sup> | 25                | 5 / 7,5  |   |                        |       |
|  |                    | VVF31.25... <sup>2)</sup>   | 25                | 6,3 / 10   |   |                        |       |
|  |                    | VVF31.39...40 <sup>1)</sup> | 40                | 12 / 19  | 525   |                        |       |
|  |                    | VVF31.40... <sup>2)</sup>   | 40                | 16 / 25  |   |                        |       |
|  |                    | VVF31.50                    | 50                | 31   | 325   |                        |       |
|  |                    | VVF31.50-40                 | 50                | 40   |   |                        |       |
|  |                    | VVF31.65                    | 65                | 49   | 175   |                        | 175   |
|  |                    | VVF31.65-63                 | 65                | 63   |   |                        |       |
| VVF31.80   | 80                 | 78                          | 100               | 100  |   |                        |       |
| VVF31.80-100   | 80                 | 100                         |                   |  |   |                        |       |
| <b>PN16</b><br><br>-10...130 °C <sup>3)</sup>   | N4330              | VVF40.15... <sup>2)</sup>   | 15                | 1,9 / 2,5 / 3 / 4  | 1'600   | 300                    |       |
|  |                    | VVF40.25... <sup>2)</sup>   | 20                | 5 / 6,3 / 7,5 / 10   | 1'550   |                        |       |
|  |                    | VVF40.40... <sup>2)</sup>   | 40                | 12 / 16 / 19 / 25  | 525   |                        |       |
|  |                    | VVF40.50... <sup>2)</sup>   | 50                | 31 / 40  | 325   |                        |       |
|  |                    | VVF40.65... <sup>2)</sup>   | 65                | 49 / 63  | 175   |                        | 175   |
|  |                    | VVF40.80... <sup>2)</sup>   | 80                | 78 / 100   | 100   |                        | 100   |
| <b>PN16</b><br><br>-10...130 °C <sup>3)</sup>   | N4340              | VVF41.49                    | 50                | 19   | 350   | 300                    |       |
|  |                    | VVF41.50                    | 50                | 31   |   |                        |       |
| <b>PN25</b><br><br>-20...130 °C <sup>3)</sup>   | N4373              | VVF52.15... <sup>2)</sup>   | 15                | 0,16 / 0,2 / 0,25 / 0,32 / 0,4 / 0,5   | 2'500   | 1'600                  |       |
|  |                    | VVF52.15... <sup>2)</sup>   | 15                | 0,63 / 0,8 / 1 / 1,25 / 1,6 / 2  |   |                        |       |
|  |                    | VVF52.15... <sup>2)</sup>   | 15                | 2,5 / 3,2 / 4  |   |                        |       |
|  |                    | VVF52.25... <sup>2)</sup>   | 25                | 5 / 6,3 / 8 / 10   | 1'500   |                        | 1'200 |
|  |                    | VVF52.40... <sup>2)</sup>   | 40                | 12,5 / 16 / 20 / 25  | 500   |                        | 400   |
| <b>PN25/16</b><br><br>-20...130 °C <sup>3)</sup>  | N4405              | VVF53.15... <sup>2)</sup>   | 15                | 0,16 / 0,2 / 0,25 / 0,32 / 0,4 / 0,5 / 0,63 / 0,8 / 1 / 1,25 / 1,6 / 2 / 2,5 / 3,2 / 4 | 2'500   | 1'200                  |       |
|  |                    | VVF53.20-6.3                | 20                | 6,3  |   |                        |       |
|  |                    | VVF53.25... <sup>2)</sup>   | 25                | 5 / 6,3 / 8 / 10   | 1'600   |                        |       |
|  |                    | VVF53.32-16                 | 32                | 16   | 900   |                        | 750   |
|  |                    | VVF53.40... <sup>2)</sup>   | 40                | 12,5 / 16 / 20 / 25  | 550   |                        | 500   |
|  |                    | VVF53.50... <sup>2)</sup>   | 50                | 31,5 / 40  | 350   |                        | 300   |
|  |                    | VVF53.50-40K <sup>2)</sup>  | 50                | 40   | 2500  |                        | 1250  |
| <b>PN16</b><br><br>-25...130 °C <sup>3)</sup>   | N4363              | VVG41.11...12 <sup>1)</sup> | 15                | 0,63 / 1   | 1'600   | 800                    |       |
|  |                    | VVG41.13                    | 15                | 1,6  |   |                        |       |
|  |                    | VVG41.14                    | 15                | 2,5  |   |                        |       |
|  |                    | VVG41.15                    | 15                | 4  |   |                        |       |
|  |                    | VVG41.20                    | 20                | 6,3  |   |                        |       |
|  |                    | VVG41.25                    | 25                | 10   |   |                        | 1'550 |
|  |                    | VVG41.32                    | 32                | 16   |   |                        | 875   |
|  |                    | VVG41.40                    | 40                | 25   | 525   |                        | 525   |
| VVG41.50   | 50                 | 40                          | 300               | 300  |   |                        |       |

<sup>1)</sup> insert running number instead of  $k_{vs}$  value



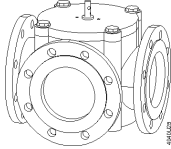

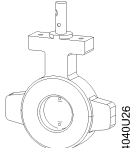

<sup>2)</sup> .. = insert  $k_{vs}$  value

<sup>3)</sup> For media temperatures > 130 °C use electrohydraulic actuators SKD.. (N4561), SKB.. (N4564).

## 2.5.3 Stroke Actuators – combi valves

| Valves             |             |    |                          | Actuators<br>SAX..P..      |                          |
|--------------------|-------------|----|--------------------------|----------------------------|--------------------------|
|                    |             | DN | H <sub>100</sub><br>[mm] | Δp <sub>max</sub><br>[kPa] | Δp <sub>s</sub><br>[kPa] |
| Standard flow rate | VPF43.50F16 | 50 | 20                       | 600                        | 600                      |
|                    | VPF43.65F24 | 65 |                          |                            |                          |
|                    | VPF43.80F35 | 80 |                          |                            |                          |
|                    | VPF53.50F16 | 50 |                          |                            |                          |
|                    | VPF53.65F24 | 65 |                          |                            |                          |
| High flow rate     | VPF43.50F25 | 50 | 20                       | 600                        | 600                      |
|                    | VPF43.65F35 | 65 |                          |                            |                          |
|                    | VPF43.80F45 | 80 | 20                       | 600                        | 600                      |
|                    | VPF53.50F25 | 50 |                          |                            |                          |
|                    | VPF53.65F35 | 65 |                          |                            |                          |
|                    | VPF53.80F45 | 80 |                          |                            |                          |

## 2.5.4 Rotary actuators – slipper and butterfly valves

| Typical applications   | Rotary actuators  | Data Sheet              | Angular rotation |   | 90 °  |                               |       |          |
|--|---|-------------------------|------------------|---|---|-------------------------------|-------|----------|
|  |   |                         | Torque           |   | 10 Nm   | 20 Nm                         | 40 Nm |          |
| <ul style="list-style-type: none"> <li>• Heating plants</li> <li>• Ventilation and air conditioning plants</li> <li>• Heat generation</li> <li>• Heat distribution</li> <li>• District heating plants</li> </ul> | SAL..   | N4502                   |                  |   |  |                               |       |          |
|  |   |                         | SAL..T10         | SAL..T20                                |   |                               |       | SAL..T40 |
| <b>Slipper valves</b>  | <b>Data Sheet</b>   | <b>Valve type</b>       | <b>DN</b>        | <b>k<sub>vs</sub> [m<sup>3</sup>/h]</b> | <b>Mounting set</b>   | <b>Δp<sub>max</sub> [kPa]</b> |       |          |
| PN6  | N4241   | VBF21.40                | 40               | 25                                      | -   | - <sup>1)</sup>               | 30    |          |
|   |  | VBF21.50                | 50               | 40                                      | -   | - <sup>1)</sup>               |       |          |
|  |   | VBF21.65                | 65               | 63                                      | ASK31N  |                               |       |          |
|  |   | VBF21.80                | 80               | 100                                     | ASK31N  |                               |       |          |
|  |   | VBF21.100               | 100              | 160                                     | ASK31N  |                               |       |          |
|  |   | VBF21.125               | 125              | 550                                     | ASK31N  |                               |       |          |
|  |   | VBF21.150               | 150              | 820                                     | ASK31N  |                               |       |          |
| 1 °C...120 °C  |   |                         |                  |   |   |                               |       |          |
| <b>Butterfly valves</b>  |   |                         |                  |   |   | <b>Δp<sub>s</sub> [kPa]</b>   |       |          |
| PN16   | N4131   | VKF41.40 <sup>2)</sup>  | 40               | 50                                      | ASK33N  | 500                           |       |          |
|   |  | VKF41.50 <sup>2)</sup>  | 50               | 80                                      | ASK33N  |                               |       |          |
|  |   | VKF41.65 <sup>2)</sup>  | 65               | 200                                     | ASK33N  |                               |       |          |
|  |   | VKF41.80 <sup>2)</sup>  | 80               | 400                                     | ASK33N  |                               |       |          |
|  |   | VKF41.100 <sup>2)</sup> | 100              | 760                                     | ASK33N  |                               |       |          |
|  |   | VKF41.125 <sup>2)</sup> | 125              | 1'000                                   | ASK33N  |                               |       |          |
|  |   | VKF41.150 <sup>3)</sup> | 150              | 2'100                                   | ASK33N  |                               |       |          |
|  |   | VKF41.200 <sup>3)</sup> | 200              | 4'000                                   | ASK33N  |                               |       |          |
| -10 °C...120 °C  |   |                         |                  |   |   |                               |       |          |
| PN16   | N4136   | VKF46.40 <sup>4)</sup>  | 40               | 50                                      | -   | -                             | 1'600 |          |
|   |   | VKF46.50 <sup>4)</sup>  | 50               | 85                                      | -   |                               |       |          |
|  |   | VKF46.65 <sup>4)</sup>  | 65               | 215                                     | -   |                               |       |          |
|  |   | VKF46.80 <sup>4)</sup>  | 80               | 420                                     | -   |                               |       |          |
|  |   | VKF46.100 <sup>4)</sup> | 100              | 800                                     | -   |                               |       |          |
|  |   | VKF46.125 <sup>4)</sup> | 125              | 1'010                                   | -   |                               |       |          |
| -10 °C...120 °C  |   |                         |                  |   |   |                               |       |          |

<sup>1)</sup> SAL..T10 rotary actuators only fit on VBF21..., DN65...150. For VBF21..., DN40/50 use SQK34..., SQK84.. or SQK33.00 rotary actuators.

<sup>2)</sup> VKF41.. maximum flow speed with SAL.T10 actuator with water DN40.. DN125 = 4 m/s

<sup>3)</sup> VKF41.. maximum flow speed with SAL.T0 actuator with water DN150/200 = 2.5 m/s, with SAL.T40 actuator with water DN150/200 = 4 m/s

<sup>4)</sup> VKF46.. maximum flow speed water = 4.5 m/s, air 40 m/s

## 2.6 Accessories

### 2.6.1 Electrical accessories

| Product no. | Auxiliary switch<br>ASC10.51 | Potentiometer<br>ASZ7.5/.. <sup>1)</sup>  | Function module<br>AZX61.1 | Stem heating<br>element<br>ASZ6.6 |
|-------------|------------------------------|---|----------------------------|-----------------------------------|
| Stock no.   | S55845-Z103                  | S55845-Z104 (ASZ7.5/135)<br>S55845-Z105 (ASZ7.5/200)<br>S55845-Z106 (ASZ7.5/1000) | S55845-Z107                | S55845-Z108                       |
|             |                              | Max. 2  |                            | Max. 1                            |
| SAX31..     | Max. 2                       | Max. 1  | -                          | Max. 1                            |
| SAX61..     |                              | -   | Max. 1 AZX61.1             |                                   |
| SAX81..     |                              | Max. 1  | -                          |                                   |
| SAX31P..    | Max. 2                       | Max. 1  | -                          | -                                 |
| SAX61P..    |                              | -   |                            |                                   |
| SAX81P..    |                              | Max. 1  |                            |                                   |
| SAL31..     | Max. 2                       | Max. 1  | -                          | -                                 |
| SAL61..     |                              | -   | Max. 1 AZX61.1             |                                   |
| SAL81..     |                              | Max. 1  | -                          |                                   |

<sup>1)</sup> Available with 135 Ω, 200 Ω or 1000 Ω

### 2.6.2 Mechanical accessories

| Product no. | Weather shield<br>ASK39.1 | Mounting set       |                    |                                  |
|-------------|---------------------------|--------------------|--------------------|----------------------------------|
|             |                           | ASK31N for VBF21.. | ASK33N for VKF41.. | ASK35N für VKF45.. <sup>1)</sup> |
| Stock no.   | S55845-Z109               | S55845-Z100        | S55845-Z101        | S55845-Z102                      |
| SAX..       | Max. 1                    | -                  | -                  | -                                |
| SAL..T10    | Max. 1                    | ✓                  | ✓                  | -                                |
| SAL..T20    |                           | -                  | -                  | DN40...DN65                      |
| SAL..T40    |                           | -                  | DN150 / 200        | DN80...DN200                     |

<sup>1)</sup> In 2000 VKF45.. line was replaced by VKF46.. line.

## 2.7 Product replacements

Replacement of SQX.. / SQL.. actuators by SAX.. / SAL.. actuators.

Note

- When replacing actuators consider positioning force, torque and positioning times.
- Adjust in the controller the parameter "Running time" respectively "Positioning time", to ensure stable control.
- The replacement of accessory items needs to be taken into consideration also. In that case, compatibility is not necessarily ensured.

### 2.7.1 Stroke actuators SQX.. to SAX..

| SQX..                 |           | Pos. time [s] | Pos. force [N] | SAX.. <sup>1)</sup> |                | VVF21../VXF21..<br>VVF31../VXF31..<br>VVF40../VXF40.. | VVF41../VXF41..<br>VVG41../VXG41.. | VVF51..<br>VVF52.. |
|-----------------------|-----------|---------------|----------------|---------------------|----------------|---|------------------------------------|--------------------|
|                       |           |               |                | Pos. time [s]       | Pos. force [N] |   |                                    |                    |
|                       |           |               |                |                     |                | DN15...80   | DN15...50                          | DN15...40          |
| SQX31.. <sup>2)</sup> | SQX31.00  | 150           | 500            | SAX31.00            | 120            | 800   | ✓                                  | ✓                  |
|                       | SQX31.03  | 35            | 500            | SAX31.03            | 30             | 800   | ✓                                  | ✓                  |
| SQX61..               | SQX61     | 35            | 500            | SAX61.03            | 30             | 800   | ✓                                  | ✓                  |
|                       | SQX61U    | 35            | 500            | SAX61.03U           | 30             | 800   | ✓                                  | ✓                  |
| SQX81..               | SQX81.00  | 150           | 500            | SAX81.00            | 120            | 800   | ✓                                  | ✓                  |
|                       | SQX81.00U | 150           | 500            | SAX81.00U           | 120            | 800   | ✓                                  | ✓                  |
|                       | SQX81.03  | 35            | 500            | SAX81.03            | 30             | 800   | ✓                                  | ✓                  |
|                       | SQX81.03U | 35            | 500            | SAX81.03U           | 30             | 800   | ✓                                  | ✓                  |
| SQX32..               | SQX32.00  | 150           | 700            | SAX31.00            | 120            | 800   | ✓                                  | ✓                  |
|                       | SQX32.03  | 35            | 700            | SAX31.03            | 30             | 800   | ✓                                  | ✓                  |
| SQX62..               | SQX62     | 35            | 700            | SAX61.03            | 30             | 800   | ✓                                  | ✓                  |
|                       | SQX62U    | 35            | 700            | SAX61.03U           | 30             | 800   | ✓                                  | ✓                  |
| SQX82..               | SQX82.00  | 150           | 700            | SAX81.00            | 120            | 800   | ✓                                  | ✓                  |
|                       | SQX82.00U | 150           | 700            | SAX81.00U           | 120            | 800   | ✓                                  | ✓                  |
|                       | SQX82.03  | 35            | 700            | SAX81.03            | 30             | 800   | ✓                                  | ✓                  |
|                       | SQX82.03U | 35            | 700            | SAX81.03U           | 30             | 800   | ✓                                  | ✓                  |

<sup>1)</sup> SAX81.., SAX61.. are available as UL-listed versions.

<sup>2)</sup> SQX31.06: Actuator for gas valves. Either replace complete valve-actuator combination or clarify required positioning time and replace only actuator. Consider if mounting set is required.

### 2.7.2 Rotary actuators SQL.. to SAL..

| SQL..   |          | Pos. time [s] | Torque [Nm] | SAL..                                       |             |          |
|---------|----------|---------------|-------------|---|-------------|----------|
|         |          |               |             | Pos. time [s]                               | Torque [Nm] |          |
| SQL31.. | SQL31.10 | 120           | 12,5        | SAL31.00T10                                 | 120         | 10       |
| SQL32.. | SQL32.10 | 125           | 12,5        | SAL31.00T10                                 | 120         | 10       |
|         | SQL32.12 | 70            | 12,5        | SAL31.00T10 or<br>SAL31.03T10 <sup>1)</sup> | 120<br>30   | 10<br>10 |
|         | SQL32.13 | 30            | 5           | SAL31.03T10                                 | 30          | 10       |
| SQL33.. | SQL33.00 | 125           | 12,5        | SAL31.00T10                                 | 120         | 10       |
|         | SQL33.03 | 30            | 10          | SAL31.03T10                                 | 30          | 10       |
| SQL83.. | SQL83.00 | 125           | 12,5        | SAL81.00T10                                 | 120         | 10       |
|         | SQL83.04 | 30            | 10          | SAL81.03T10                                 | 30          | 10       |
| SQL35.. | SQL35.00 | 125           | 20          | SAL31.00T20 <sup>2)</sup>                   | 120         | 20       |
|         | SQL35.00 | 125           | 20          | SAL31.00T40 <sup>2)</sup>                   | 120         | 40       |
| SQL85.. | SQL85.00 | 125           | 20          | SAL81.00T20 <sup>2)</sup>                   | 120         | 20       |
|         | SQL85.00 | 125           | 20          | SAL81.00T40 <sup>2)</sup>                   | 120         | 40       |

<sup>1)</sup> SAL.. positioning time differs from that of SQL32.12 and SQL32.13 rotary actuators. Consider positioning time when replacing.

<sup>2)</sup> use SAL.T20 on VKF46.40, VKF46.50 and VKF46.65  
use SAL.T40 on VKF46.80, VKF46.100 and VKF46.125

| Rotary actuators |                             | SQL..   |         |                    |                    | SAL..  |                            |                            |
|------------------|-----------------------------|---------|---------|--------------------|--------------------|--|----------------------------|----------------------------|
|                  |                             | SQL31.. | SQL32.. | SQL33..<br>SQL83.. | SQL35..<br>SQL85.. | SAL31.00T10<br>SAL31.03T10<br>SAL81.00T10<br>SAL81.03T10 | SAL31.00T20<br>SAL81.00T20 | SAL31.00T40<br>SAL81.00T40 |
| VBF21..          | DN 40 / DN 50 <sup>1)</sup> | -       | -       | ASK32              | -                  | <sup>1)</sup>  | <sup>1)</sup>              | <sup>1)</sup>              |
|                  | DN 65...150                 | -       | -       | ASK31              | -                  | <b>ASK31N</b>  | -                          | -                          |
| VBF31..          | DN 40 / DN 50 <sup>1)</sup> | -       | -       | ASK32              | -                  | <sup>1)</sup>  | <sup>1)</sup>              | <sup>1)</sup>              |
|                  | DN 65...100                 | -       | -       | ASK31              | -                  | <b>ASK31N</b>  | -                          | -                          |
| B3f..            | DN 40 / DN 50 <sup>1)</sup> | Direct  | ASK25   | ASK31              | -                  | <sup>1)</sup>  | <sup>1)</sup>              | <sup>1)</sup>              |
|                  | DN 65...150                 | Direct  | ASK25   | ASK31              | -                  | <b>ASK31N</b>  | -                          | -                          |
| C1f..            | DN 40 / DN 50 <sup>1)</sup> | Direct  | -       | ASK31              | -                  | <sup>1)</sup>  | <sup>1)</sup>              | <sup>1)</sup>              |
|                  | DN 65...100                 | Direct  | -       | ASK31              | -                  | <b>ASK31N</b>  | -                          | -                          |
| K1i..            | DN 20...32                  | Direct  | ASK24   | ASK33              | -                  | <b>ASK33N</b>  | -                          | -                          |
| K1f..            | DN 40...200                 | Direct  | ASK24   | ASK33              | -                  | <b>ASK33N</b>  | -                          | -                          |
| VKF41..          | DN 40...125                 | -       | -       | ASK33              | -                  | <b>ASK33N</b>  | -                          | -                          |
|                  | DN 150 / DN 200             | -       | -       | ASK33              | ASK35              | <b>ASK33N</b>  | -                          | <b>ASK33N</b>              |
| VKF45..          | DN40...65                   | -       | -       | -                  | ASK35              | -  | <b>ASK35N</b>              | <b>ASK35N</b>              |
|                  | DN80...200                  | -       | -       | -                  | -                  | -  | -                          | <b>ASK35N</b>              |

<sup>1)</sup> Replace with rotary actuators SQK34..., SQK84.. (data sheet N4508) or SQK33.00 (data sheet N4506).

#### Note

Rotary actuators SAL.. are not suited for mounting sets ASK24, ASK25, ASK31, ASK32, ASK33, ASK35, ASK40 and ASK41.

### 2.7.3 Electrical accessories

#### Notes

- If an auxiliary switch is required, its switching point should be indicated on the plant schematic.
- For media below 0 °C the stem heating element ASZ6.6 keeps the valve free from freezing.
- For this case, do not insulate the actuator bracket and the valve stem, as air circulation must be ensured!
- **Non-observance of the above may result in accidents and fires!**
- **Do not touch the hot parts without prior protective measures to avoid burns.**



| Stroke actuators |   | SQX..   |         |         |         | SAX..                             |               |
|------------------|---|---------|---------|---------|---------|-----------------------------------|---------------|
|                  |   | SQX31.. | SQX61.. | SQX32.. | SQX62.. | SAX31..                           | SAX61..       |
|                  |   | SQX81.. | -       | SQX82.. | -       | SAX81..                           | -             |
| ASZ6.5           | Stem heater                                     | ASZ6.5  | ASZ6.5  | ASZ6.5  | ASZ6.5  | <b>ASZ6.6</b>                     | <b>ASZ6.6</b> |
| ASZ7.4           | 1 auxiliary switch,<br>1 potentiometer (1000 Ω) | ASZ7.4  | -       | ASZ7.4  | -       | <b>ASC10.51 +<br/>ASZ7.5/1000</b> | -             |
| ASC9.4           | Double auxiliary switch                         | ASC9.4  | -       | ASC9.4  | -       | <b>2x ASC10.51</b>                | -             |
| ASC9.5           | Auxiliary switch                                | ASC9.5  | -       | ASC9.5  | -       | <b>ASC10.51</b>                   | -             |

| Rotary actuators |   | SQL..   |          |         |                   | SAL..                             |                                   |
|------------------|---|---------|----------|---------|-------------------|-----------------------------------|-----------------------------------|
|                  |   | SQL31.. | SQL32..  | SQL33.. | -                 | SAL31..T10                        | -                                 |
|                  |   | -       | -        | SQL83.. | -                 | SAL81..T10                        | -                                 |
|                  |   | -       | -        | -       | SQL35.00          | -                                 | SAL31.00T20 / T40                 |
| -                | -   | -       | SQL85.00 | -       | SAL81.00T20 / T40 |                                   |                                   |
| ASZ7.4           | 1 auxiliary switch,<br>1 potentiometer (1000 Ω) | -       | -        | ASZ7.4  | ASZ7.4            | <b>ASC10.51 +<br/>ASZ7.5/1000</b> | <b>ASC10.51 +<br/>ASZ7.5/1000</b> |
| ASC9.4           | Double auxiliary switch                         | -       | -        | ASC9.4  | ASC9.4            | <b>2x ASC10.51</b>                | <b>2x ASC10.51</b>                |
| ASC9.5           | Auxiliary switch                                | -       | -        | ASC9.5  | ASC9.5            | <b>ASC10.51</b>                   | <b>ASC10.51</b>                   |
| ASZ8.4           | Potentiometer (220 Ω)                           | ASZ8.4  | ASZ8.4   | -       | -                 | <sup>1)</sup>                     | -                                 |
| ASZ9.4           | Potentiometer (2800 Ω)                          | ASZ9.4  | ASZ9.4   | -       | -                 | <sup>1)</sup>                     | -                                 |
| ASC1.4           | Auxiliary switch                                | ASC1.4  | ASC1.4   | -       | -                 | <b>ASC10.51</b>                   | -                                 |


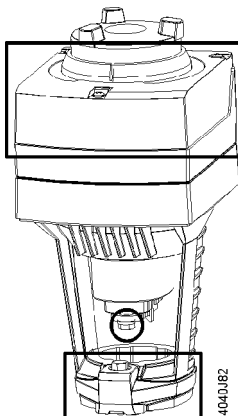

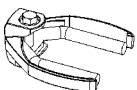
<sup>1)</sup> Used auxiliary switches or potentiometer (order accessories additionally were applicable):

- Check used functionality
- Check compatibility with controller

## 2.8 Spare parts

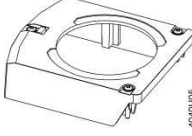
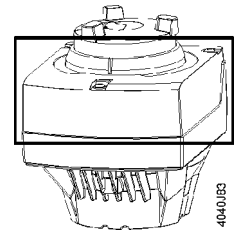


The following spare part sets are available:

**SAX..**

|                                   |   |   |
|-----------------------------------|---|---|
| <b>Stock number</b><br>8000060843 | Housing cover<br>                 |  |
|                                   | Screw<br>(valve stem coupling)<br> |   |
|                                   | U-bracket<br>                      |   |

Single components from the spare part sets are not available.

**SAL..**

|                                   |  |  |
|-----------------------------------|--|--|
| <b>Stock number</b><br>8000060844 | Housing cover<br>                                    |  |
|                                   | 2 adapters<br> 1 pc. 14 mm<br>1 pc. 11 mm           |  |
|                                   | 4 screws<br> 2 pcs. M5 x 20 mm<br>2 pcs. M6 x 20 mm |  |

Single components from the spare part sets are not available.



## 2.9 Sizing

### 2.9.1 Parallel operation of actuators

SA..31.. and SA..81..

3-position actuators must have one specific controller each, refer to "Connection diagrams" (page 59).

SA..61..

Up to 10 actuators can drive in parallel on a controller output with a rating of 1 mA. Modulating actuators have an input impedance of 100 kΩ.

### 2.9.2 Permissible cable lengths and wire cross-sectional areas

Cable lengths and wire cross-sectional areas depend on the following criteria of the actuators:

- Current draw
- Permissible voltage drop across the power supply lines

The control accuracy of the modulating actuators can be improved by using 4-wire connections, thus ensuring that voltage drops on G0 will not distort the positioning signal.

Note

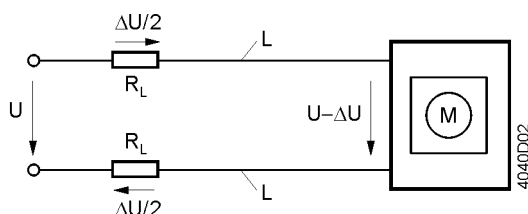
When determining the cable length and the wire cross-sectional area, adherence to the permissible operating voltage tolerance at the actuator is of importance, in addition to the permissible voltage drop across the operating voltage and signal lines (see table below).

| Product no. | Operating voltage | Terminal  | Max. permissible voltage drop |
|-------------|-------------------|-----------|-------------------------------|
| SA..31..    | AC 230 V          | N, Y1, Y2 | 2% each (total of 4%)         |
| SA..61..    | AC/DC 24 V        | G0, G     | 4% each (total of 8%)         |
| SA..81..    |                   | G0, Y, U  | 1% each (at DC 0...10 V)      |
|             |                   | G, Y1, Y2 | 4% each (total of 8%)         |

The following criteria must be considered:

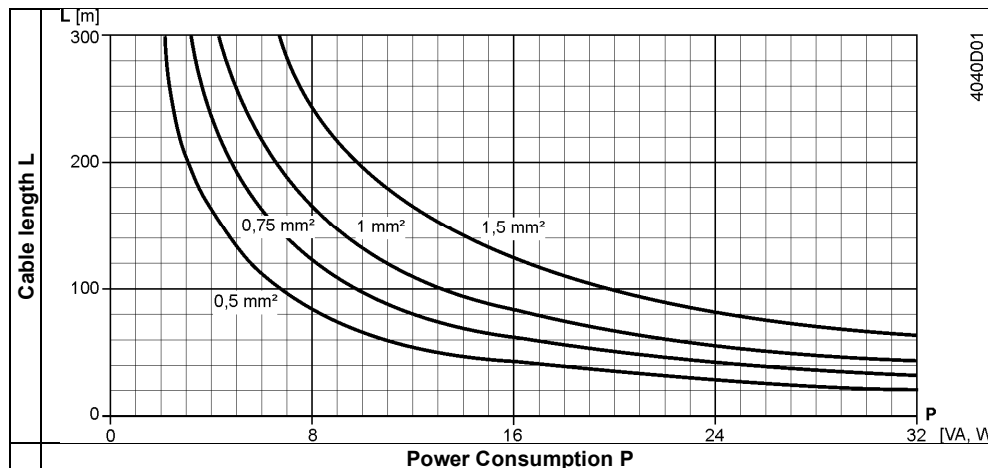
- With modulating control, the permissible positioning signal error must not exceed 1%, the reason being the voltage drop on the G0 wire.
- The voltage drop, caused by charging current peaks in the actuator's DC circuit, must not exceed 2 Vpp.
- If the G0 line is not correctly sized, load changes of the actuator due to changes of the DC voltage drop might lead to self-oscillations.
- The operating voltage drop at AC/DC 24 V may be a maximum of 8% (4% above the G0 wire).

Basic diagram – voltage drop across the power supply cables



The following diagram can be used to determine the cable lengths and wire cross-sectional areas.

**L/P-diagram for AC/DC 24 V**



Permissible cable length **L** as a function of power **P** and cross-sectional area of wire as a parameter

**Note**

**P** is the decisive power consumption of all actuators connected in parallel. When operating on AC 24 V, power consumption is in VA; when operating on DC 24 V, in W.

**Formulas for wire lengths**

| Operating voltage | Permissible voltage drop / wire | Formula for wire length                     |
|-------------------|---------------------------------|---|
| AC 230 V          | 2% of AC 230 V                  | $L = 46 \cdot \frac{1313 \cdot A}{P}$ [m]   |
| AC/DC 24 V        | 4% of AC 24 V                   | $L = \frac{1313 \cdot A}{P}$ [m]            |
|                   | 1% of DC 10 V                   | $L = \frac{5.47 \cdot A}{I(\text{DC})}$ [m] |

- A Cross-sectional area of wire in mm<sup>2</sup>
- L Permissible wire length in m
- P Power consumption in VA (AC) or W (DC) (see actuator's rating plate)
- I(DC) DC current part (in A) on G0 wire

## 2.10 Warranty

The engineering data specified in chapter "Equipment combinations" (page 10) are only guaranteed in connection with the Siemens valves listed.

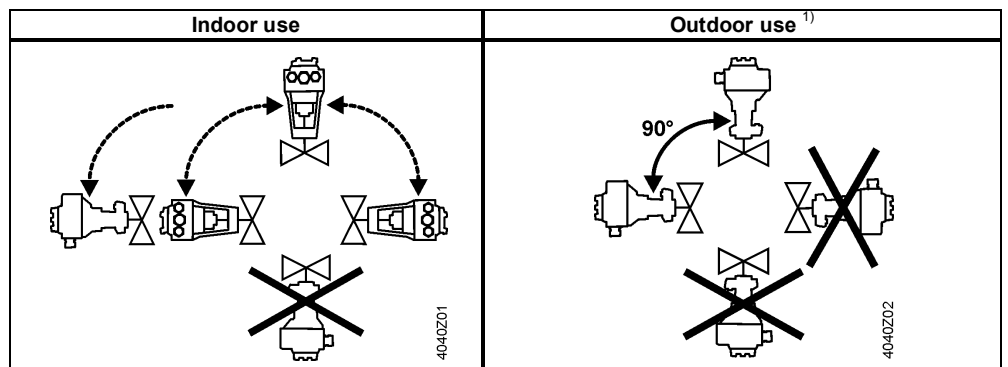
**Note**

When using the actuators in connection with valves of other manufacture, correct functioning must be ensured by the user, and Siemens will assume no responsibility.

### 3 Handling

#### 3.1 Mounting and installation

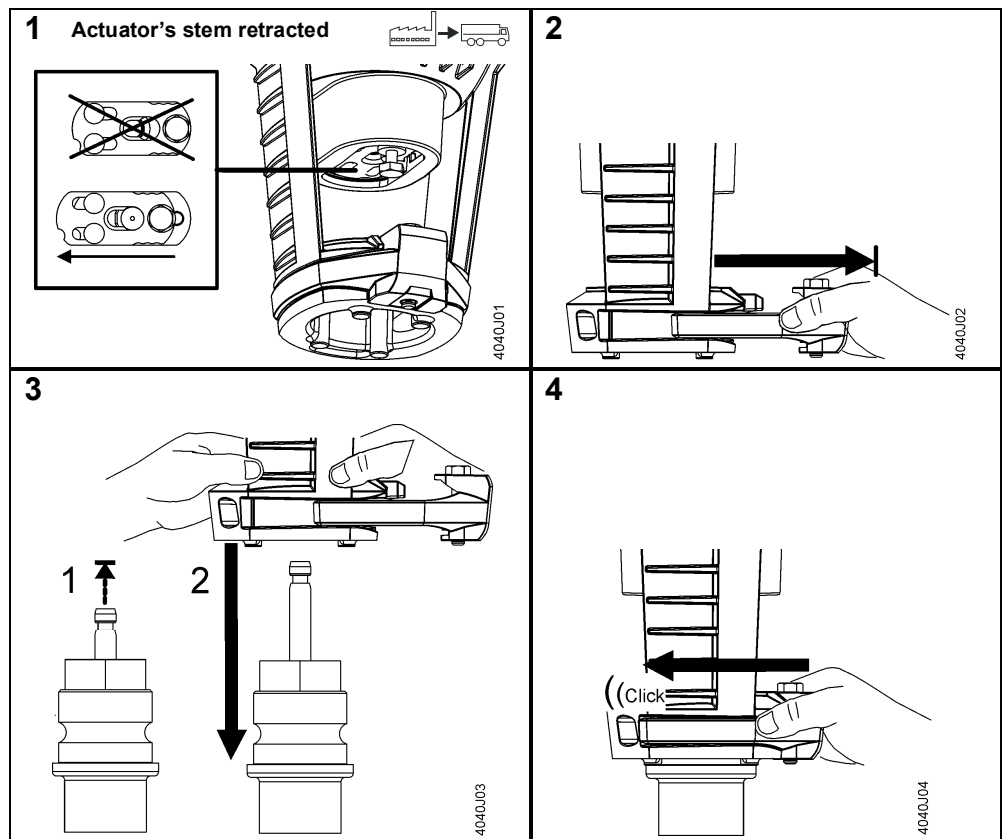
##### 3.1.1 Mounting positions

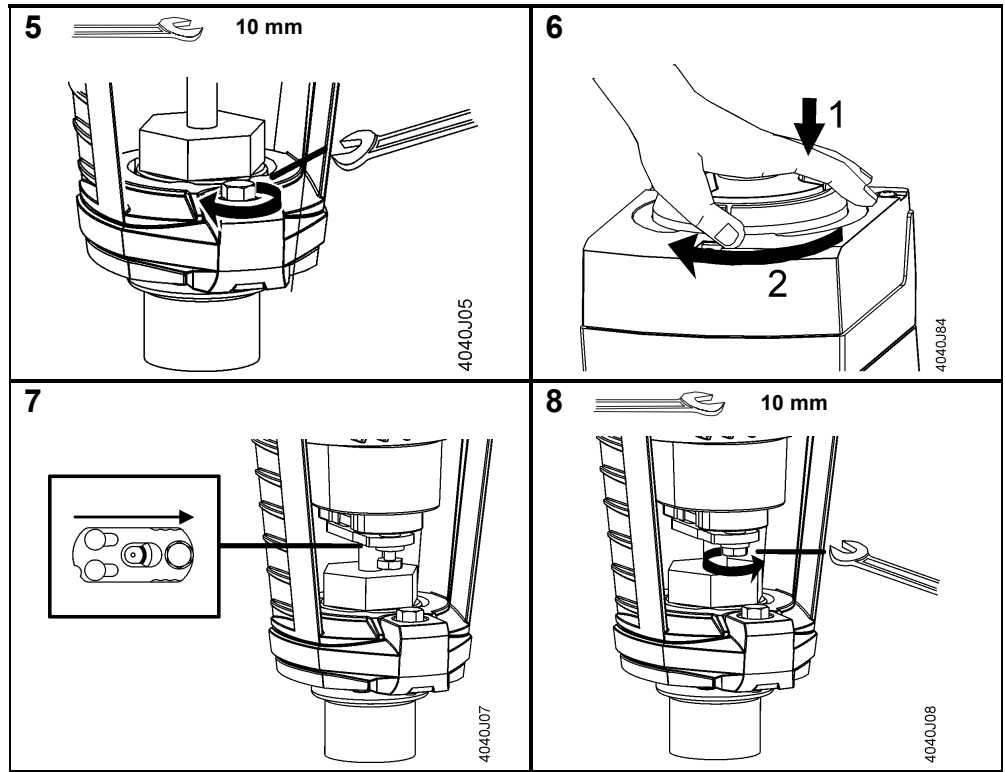


<sup>1)</sup> Only in connection with weather shield ASK39.1

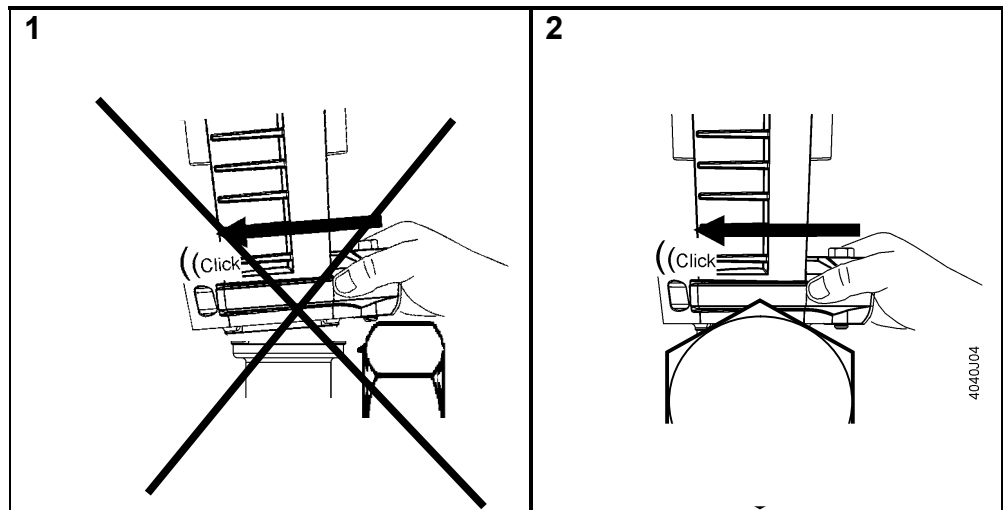
##### 3.1.2 Fitting stroke actuators to seat valves VVF.. / VXF.. or VVG.. / VXG..

First, observe "Mounting positions" (page 19).





### 3.1.3 Avoid missalignment on V\_G41 valves with fittings

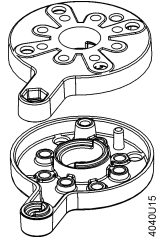
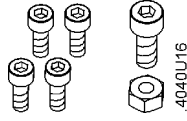
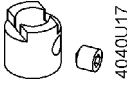
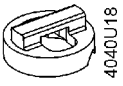


On threaded valves it's possible that the actuator is missaligned on the valve due to a collision with the fitting. If so, please take care for correct mounting, either by turning the actuator or by adjusting the fitting (e.g. use a second sealing to change fitting position).

### 3.1.4 Fitting rotary actuators to butterfly valves VKF41..

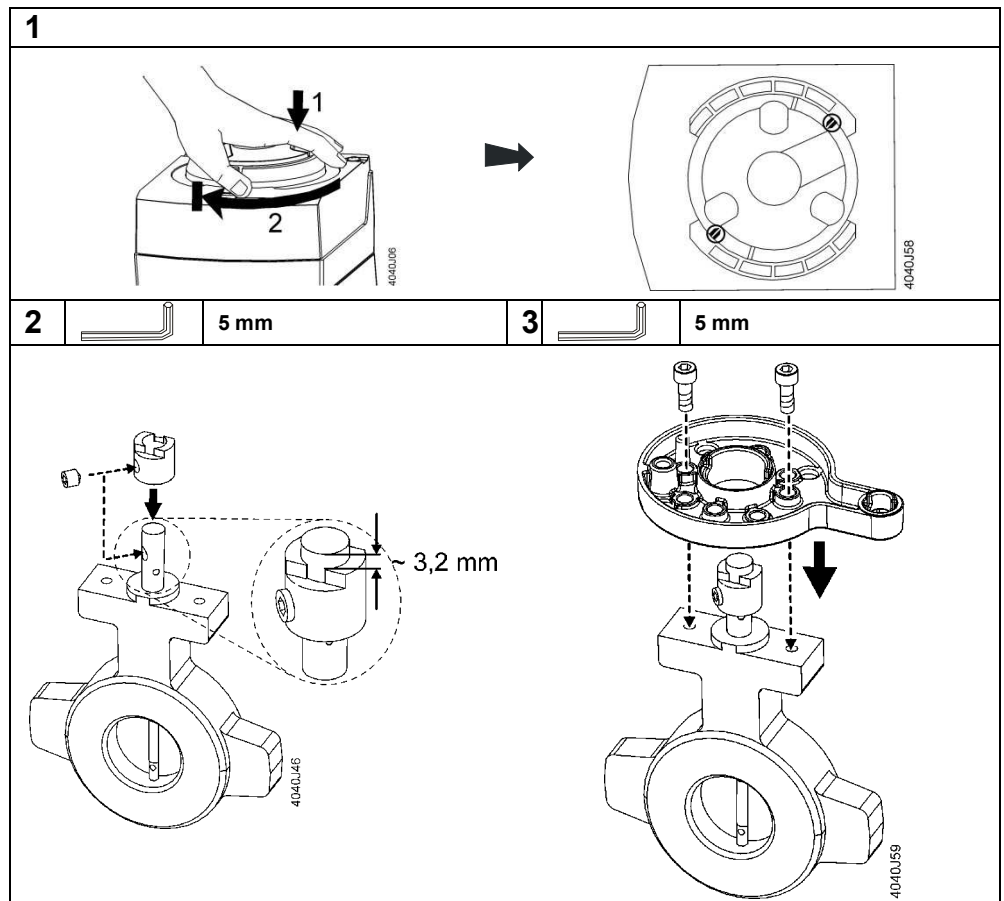
First, observe "Mounting positions" (page 19).

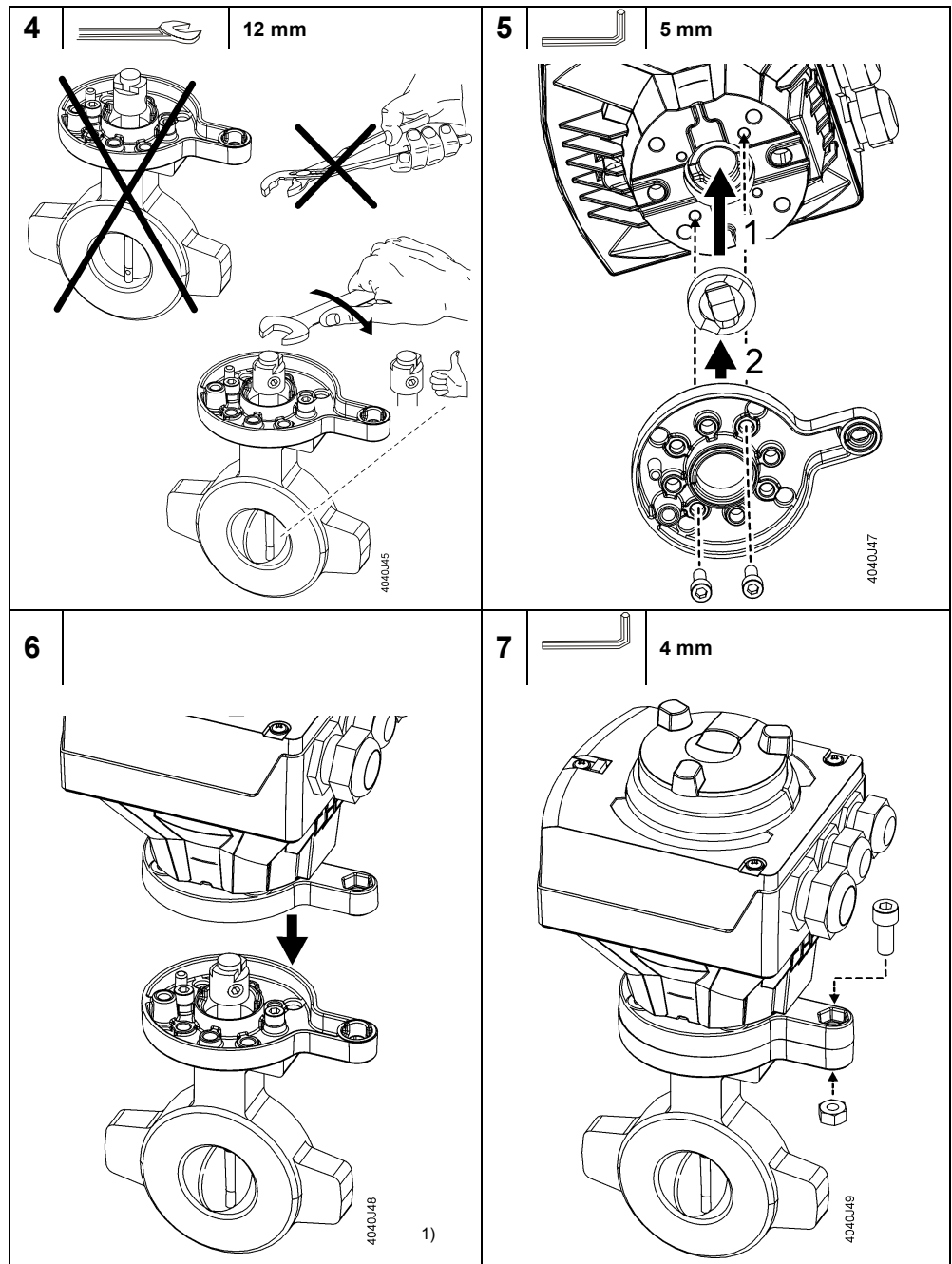
#### Mounting set ASK33N

| Scope of delivery   |  |   |   |
|---|--|---|---|
| Mounting set (2 parts)  | 5 screws   | 1 adapter inc. fixing screw   | 1 adapter   |
|  | 4 pcs. M6 x 16 mm<br>1 pc. M5 x 20 incl. nut<br> |  |  |

#### Note

Actuators SAL.. are not compatible with mounting sets ASK31, ASK32, ASK33, ASK35, ASK40, and ASK41.



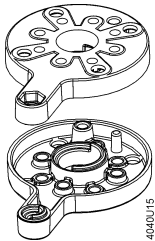
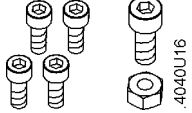
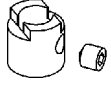
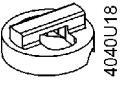


<sup>1)</sup> Angle position errors between actuator shaft and valve stem must be corrected via manual control (refer to "Manual adjuster" page 51).

### 3.1.5 Fitting rotary actuators to slipper valves VBF21..

First, observe "Mounting positions" (page 19).

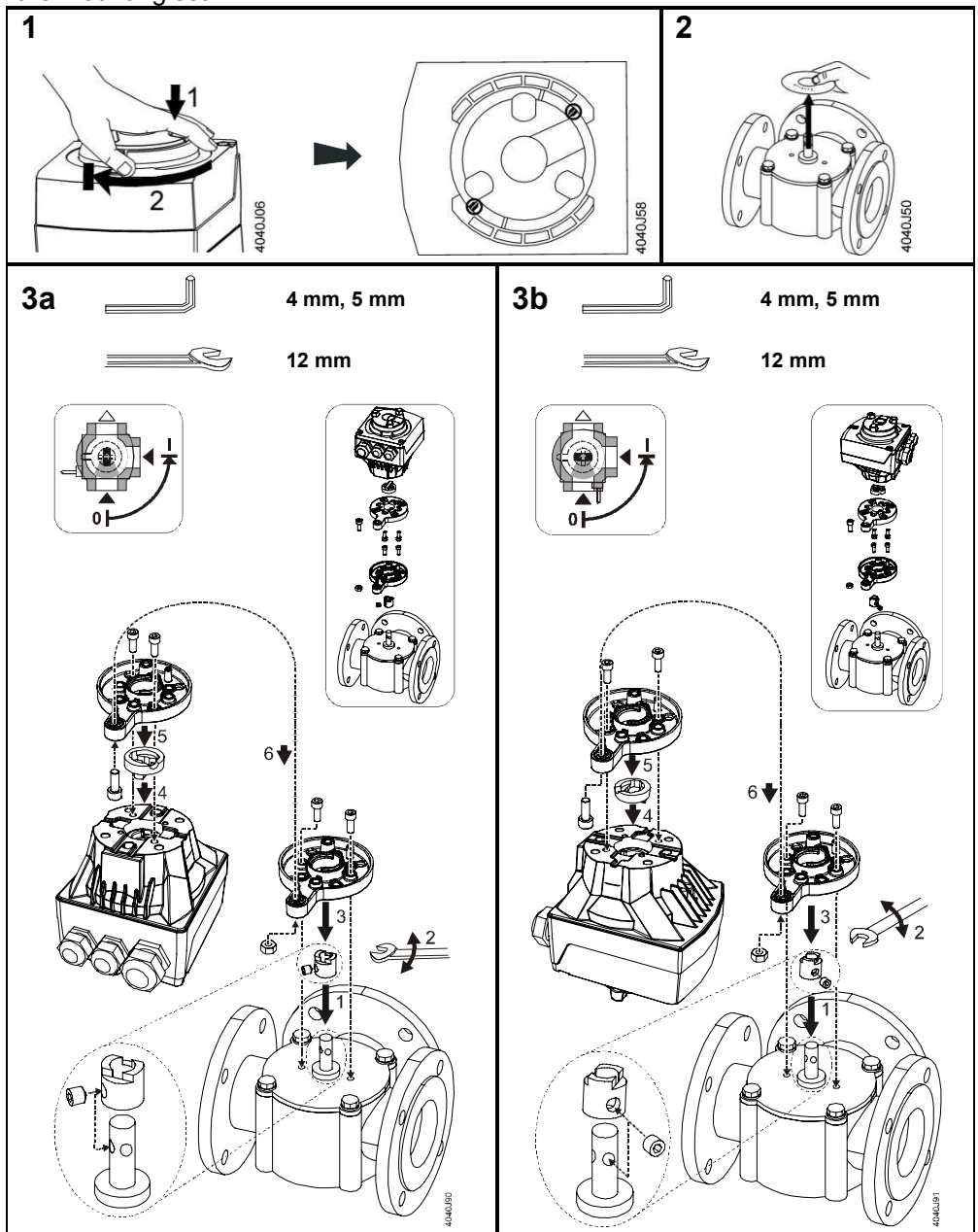
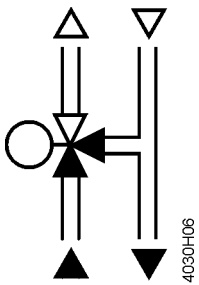
#### Mounting set ASK31N

| Scope of delivery   |  |   |   |
|---|--|---|---|
| Mounting set (2 parts)  | 5 screws   | 1 adapter inc. fixing screw   | 1 adapter   |
|  | 4 pcs. M6 x 16 mm<br>1 pc. M5 x 20 mm incl. nut<br> |  |  |

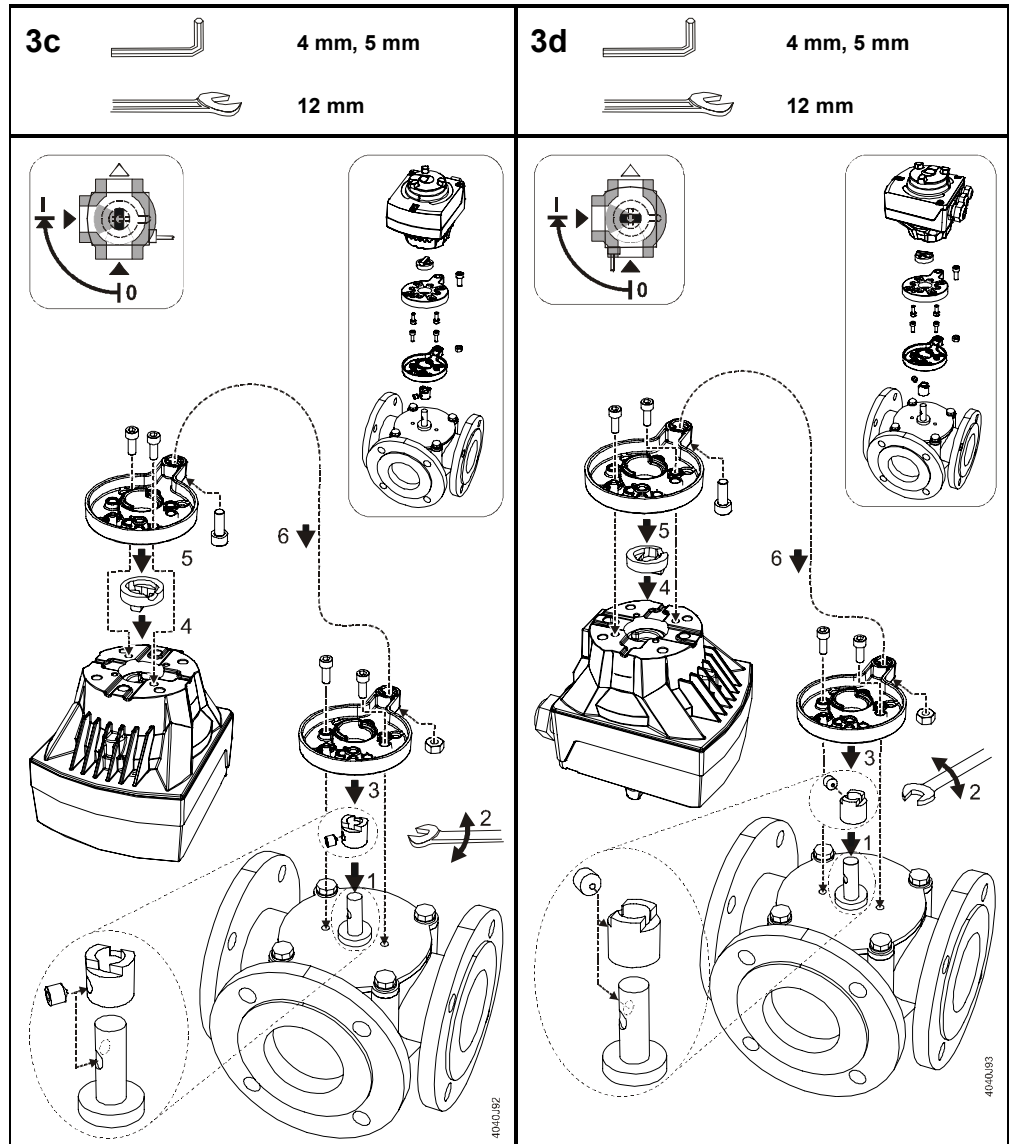
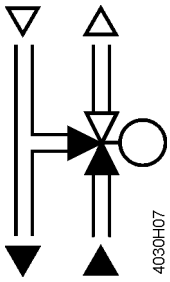
SAL..T10 rotary actuators only fit on VBF21.., DN65...150. For VBF21.., DN40/50 use SQK34.., SQK84.. or SQK33.00 rotary actuators.

With VBF21.. (e.g. DN 125), the following steps must be performed prior to fitting the mounting set.

Opening counterclockwise



Opening clockwise



For further mounting positions of VBF 21.. and routing of the connection cables the rotary actuators and adapters must be mounted according to the sketches above.

### 3.1.6 Fitting rotary actuators to butterfly valves VKF45..

First, observe "Mounting positions" (page 19).

#### Mounting set ASK35N

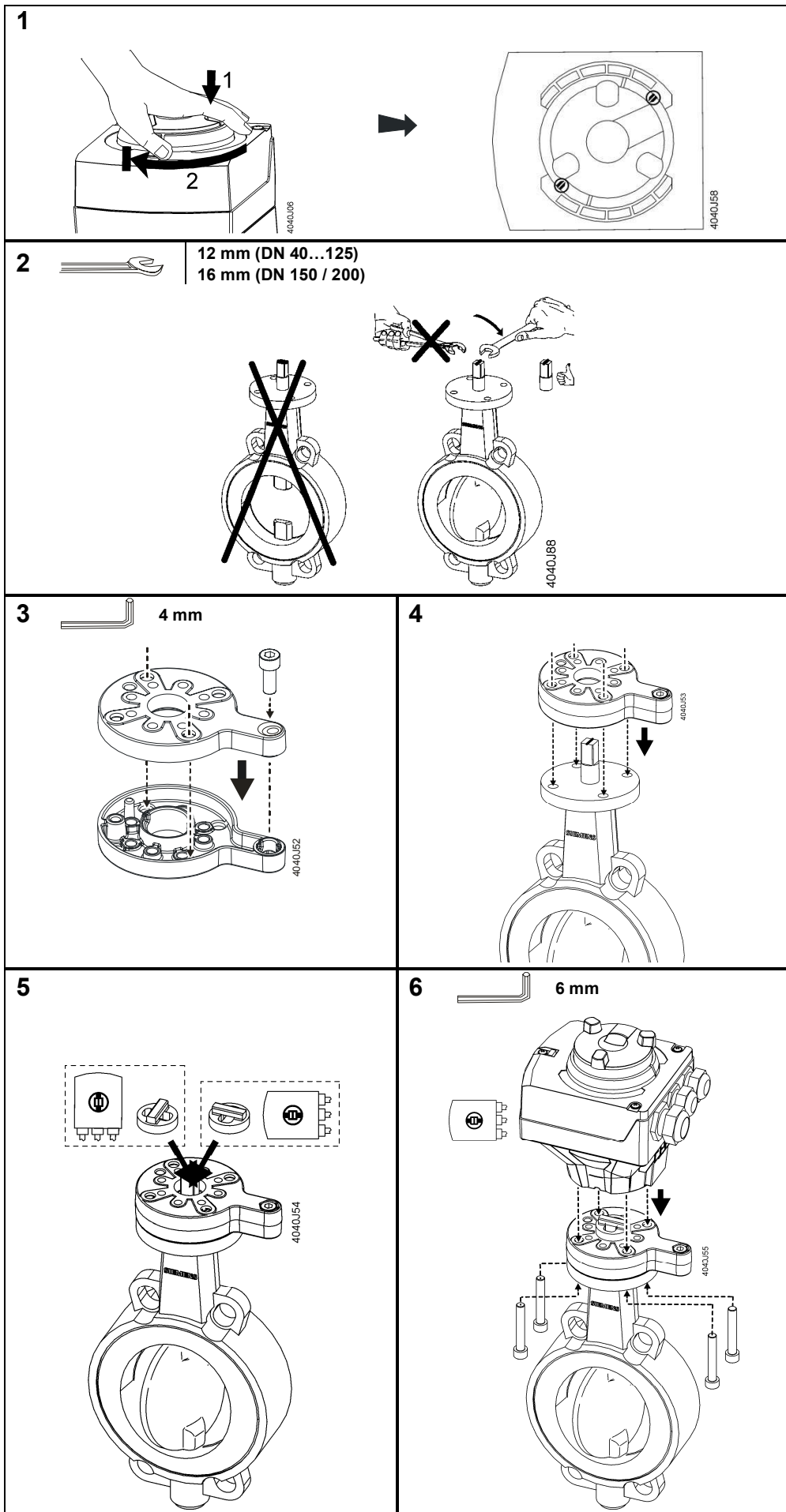
For VKF45..

| Scope of delivery      |   |                                |
|------------------------|---|--------------------------------|
| Mounting set (2 parts) | 5 screws  | 2 adapters                     |
|                        | 2 pcs. M8 x 50 mm<br>1 pc. M5 x 20 mm incl. nut<br> | 1 pc. 12 mm<br>1 pc. 16 mm<br> |

#### Note

Actuators SAL.. are not suited for use with mounting sets ASK31, ASK32, ASK33, ASK35, ASK40, and ASK41.





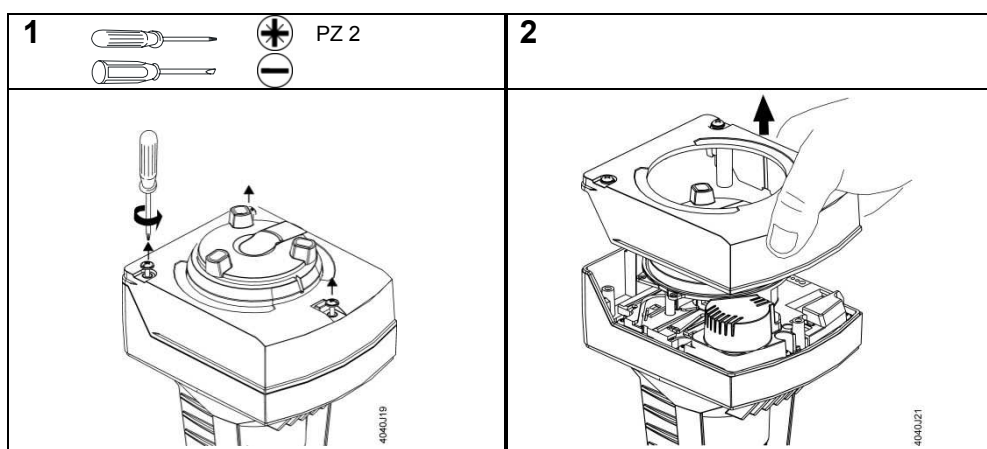
### 3.1.7 Accessories

#### Special notes on mounting

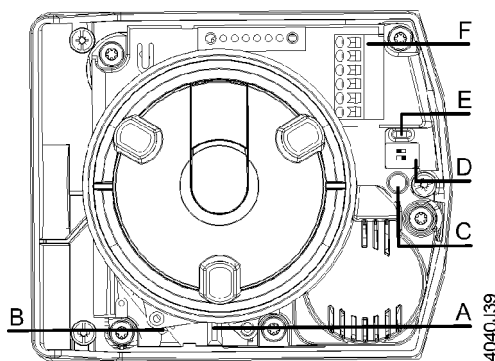


Before fitting the accessory items shown below, the following steps must be performed:

1. Actuator is mechanically connected to a Siemens valve.
2. Observe compatibility and choice of combinations. Refer to "Accessories" (page 13).
3. Disconnect actuator from power. **Attention if AC 230 V connected danger of life!**
4. Only required with actuators without fail safe function: Using the manual adjuster, drive the actuator's stem to the fully retracted position and fix the coupling. See "Manual operation" and "Fixing coupling" (page 45).
5. When mounting two different accessories watch out for correct plug-in space A or B (see below).
6. To fit an auxiliary switch, potentiometer or function module, the housing cover must be removed.

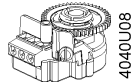


Interior view of setting elements and plug-in spaces



|          |   |
|----------|---|
|          | Plug-in space for...  |
| <b>A</b> | <ul style="list-style-type: none"> <li>• Potentiometer ASZ7.5/.., or</li> <li>• Auxiliary switch ASC10.51</li> </ul>                      |
| <b>B</b> | Plug-in space for... <ul style="list-style-type: none"> <li>• Function module AZX61.1, or</li> <li>• Auxiliary switch ASC10.51</li> </ul> |
| <b>C</b> | LED   |
| <b>D</b> | DIL switches  |
| <b>E</b> | Calibration slot  |
| <b>F</b> | Connection terminals  |

#### Potentiometer ASZ7.5/..

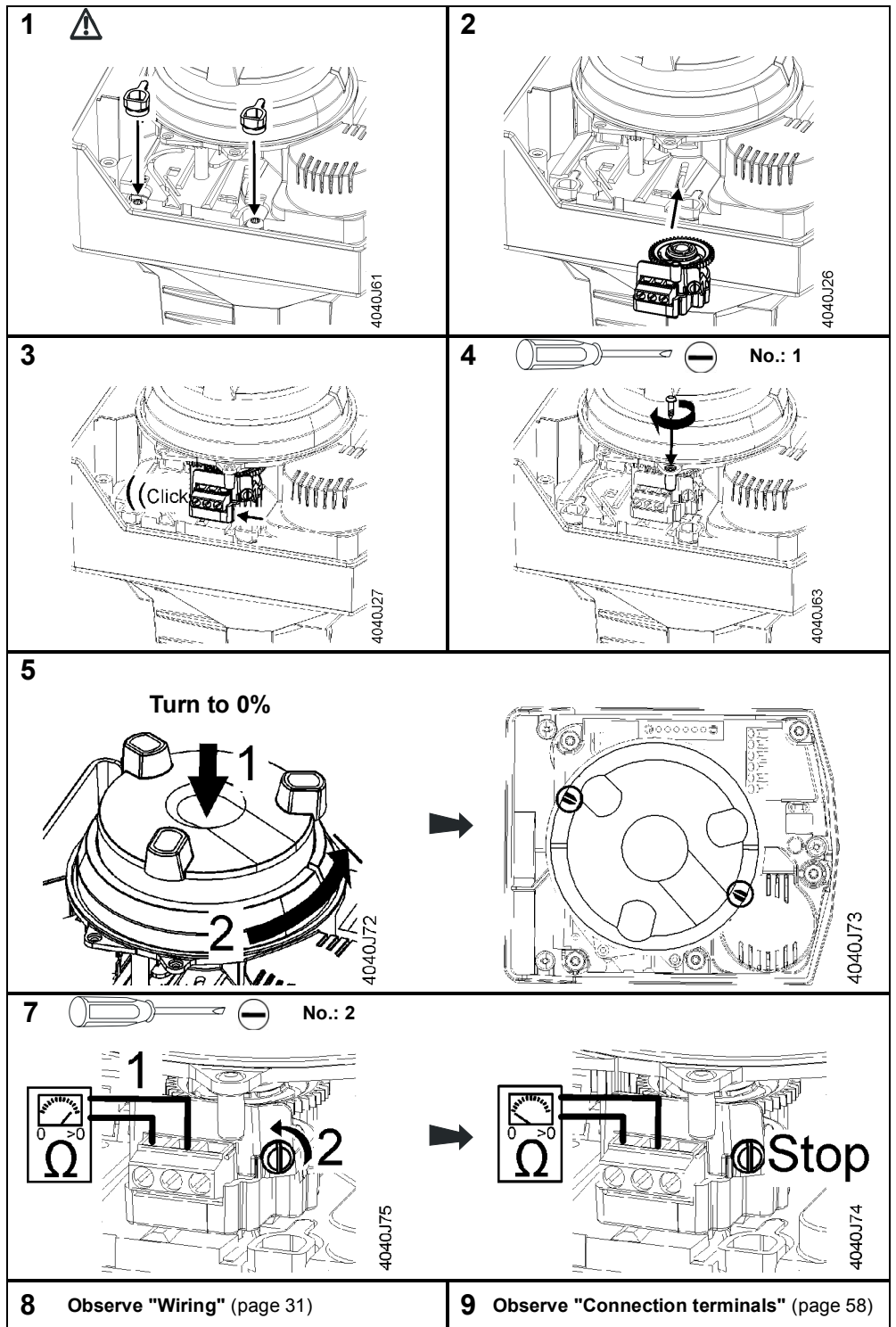


| Scope of delivery         |           |                |
|---------------------------|-----------|----------------|
| 1 potentiometer ASZ7.5/.. | 1 screw   | 2 screw covers |
| 4040U08                   | 1 pc.<br> | 4040U29        |



- First, observe "Special notes on mounting" (page 26).
- **Fit the screw covers first – otherwise danger of life!**

Plug-in space A



## Function module

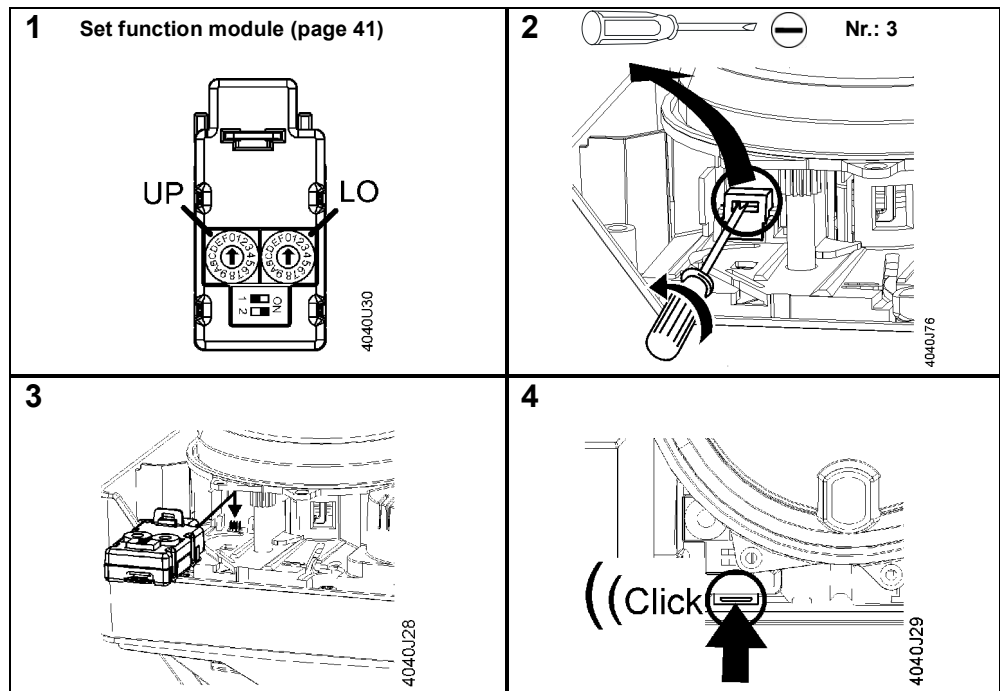
### AZX61.1



4040U09

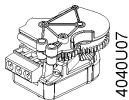
Plug-in space B

First, observe "Special notes on mounting" (page 26).



## Auxiliary switch

### ASC10.51



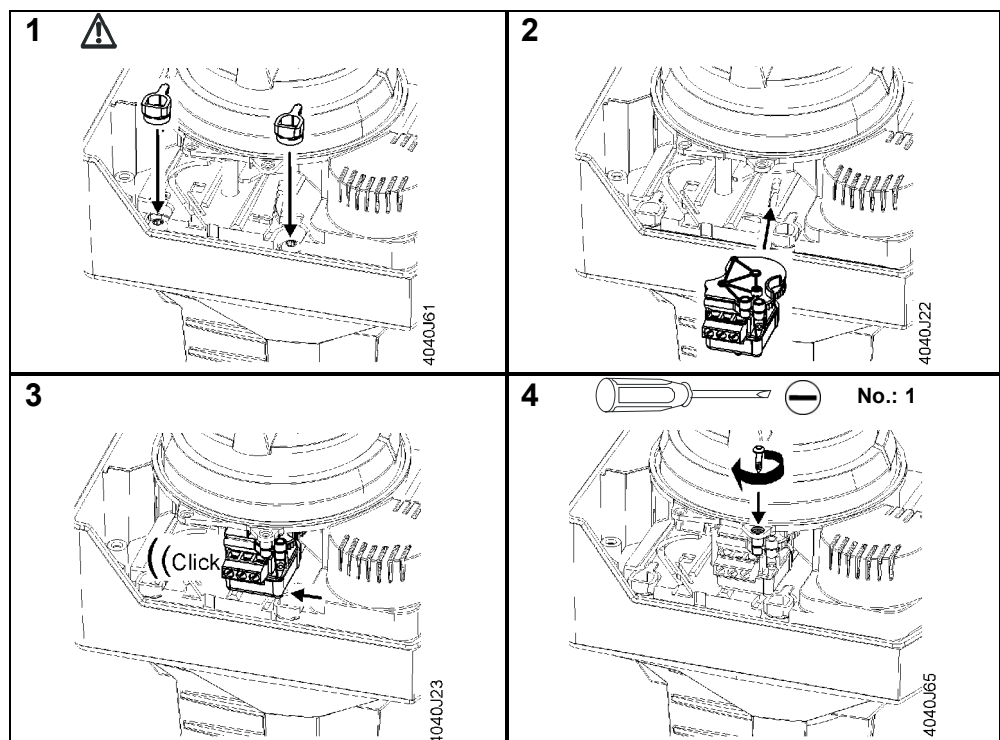
4040U07

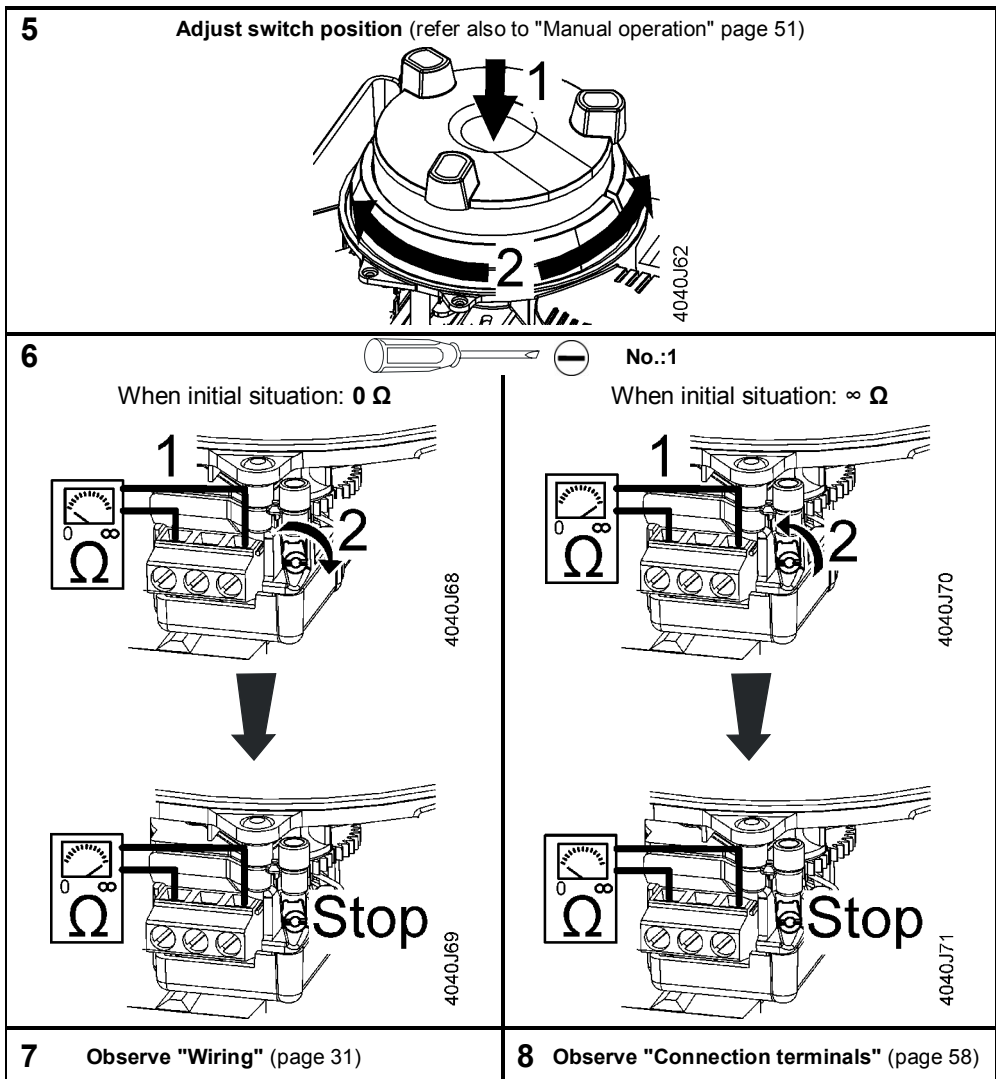
Plug-in space A



| Scope of delivery           |                  |                |
|-----------------------------|------------------|----------------|
| 1 auxiliary switch ASC10.51 | 1 screw          | 2 screw covers |
| 4040U07                     | 1 pc.<br>4040U28 | 4040U29        |

- First, observe "Special notes on mounting" (page 26).
- **Fit the screw covers first– otherwise danger of life!**

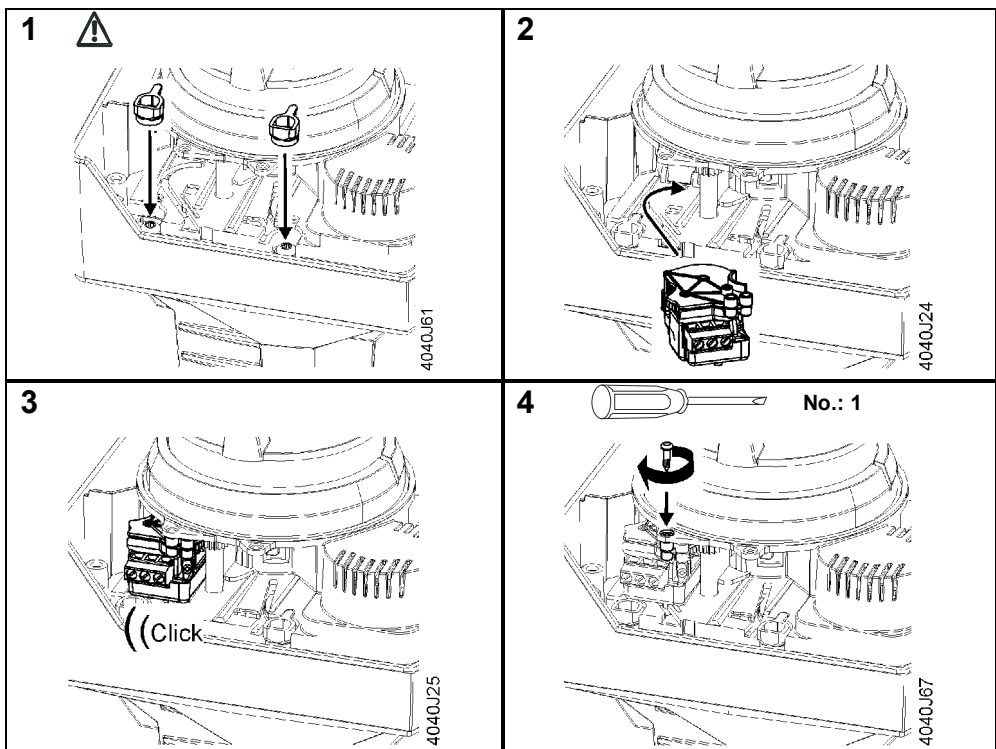


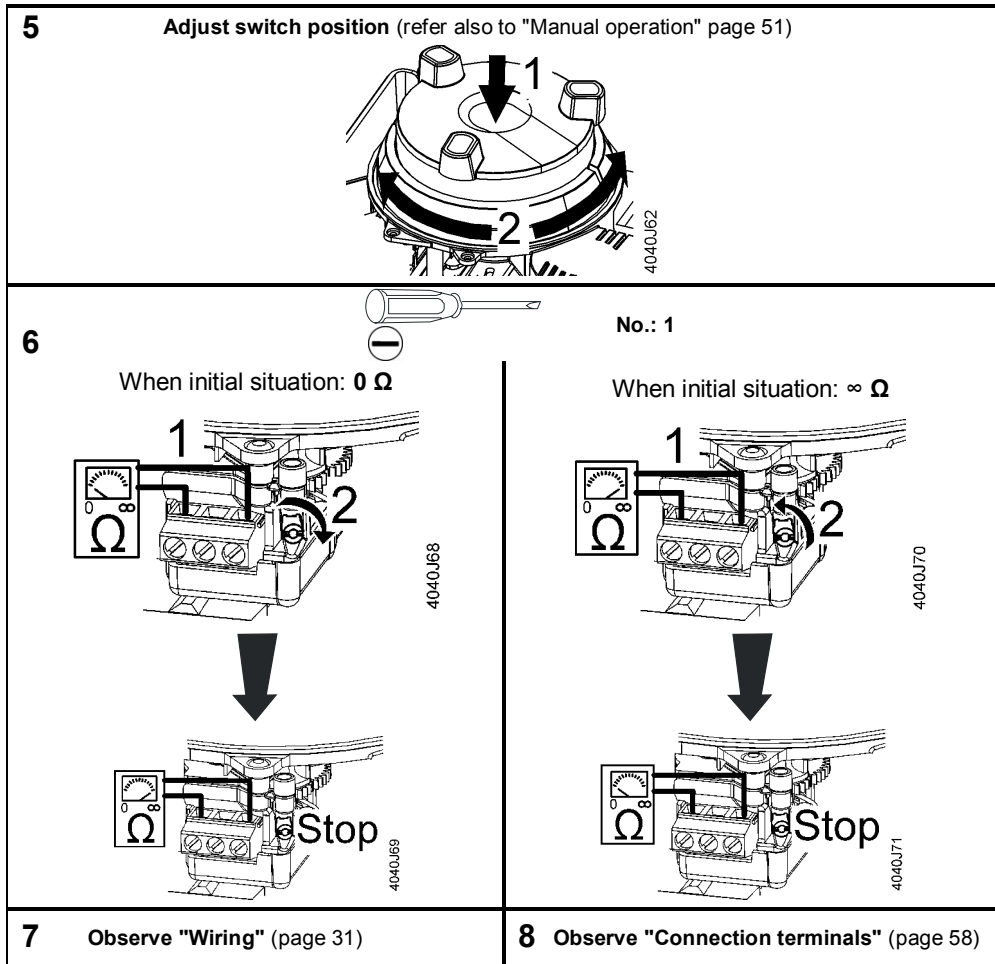


Plug-in space B

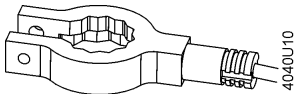


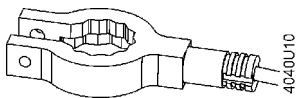

- First, observe "Special notes on mounting" (page 26).
- **First, fit the screw covers – otherwise danger of life!**





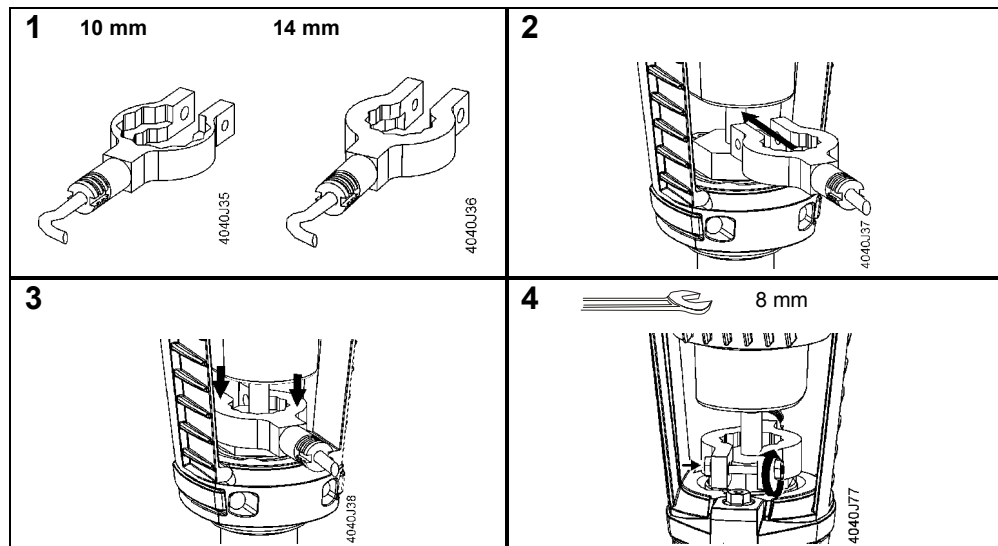
**Stem heating element ASZ6.6**



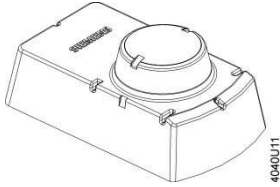
| Scope of delivery   |  |
|---|--|
| 1 stem heating element ASZ6.6   | 1 screw  |
|  | 1 pc. M4 x 30 incl. nut<br> |

When fitting the stem heating element, stroke actuator and valve must be assembled. The stem heating element is powered separately.

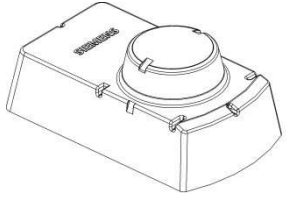
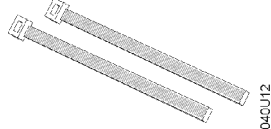
First, observe "Special notes on mounting" (page 26).



**Weather shield  
ASK39.1**

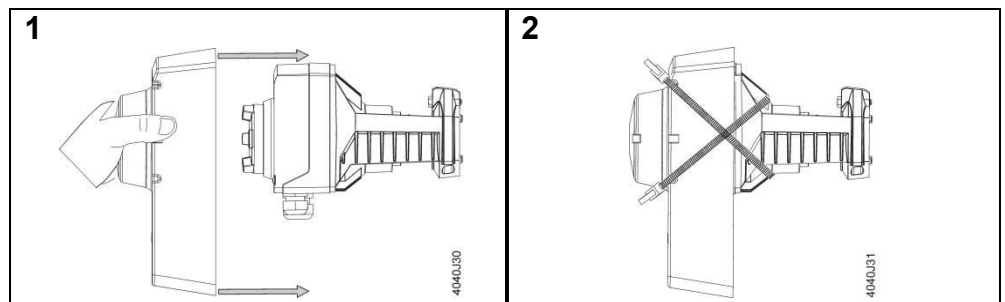


First, observe "Special notes on mounting" (page 26).

| Scope of delivery   |   |
|---|---|
| Weather shield ASK39.1  | 2 UV-proof cable ties   |
|  |  |

**Notes**

- To protect the actuator when used outdoors, the weather shield must always be fitted.
- If fitted several times, 2 UV-proof cable ties (800 x 4 mm) must be used.
- The manual adjuster can not be used when the weather shield is mounted.

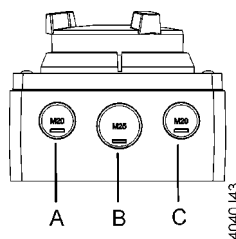
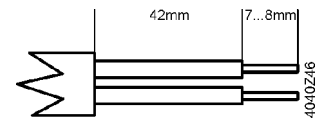


**3.1.8 Wiring (installation)**

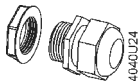
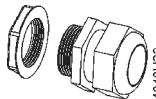

Conduct the electrical connections in accordance with local regulations on electrical installations as well as the "Connection diagrams" on page 58.

**Preparation of wire endings**

The cable endings must be prepared before as follows.





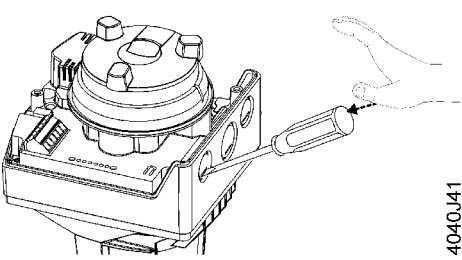
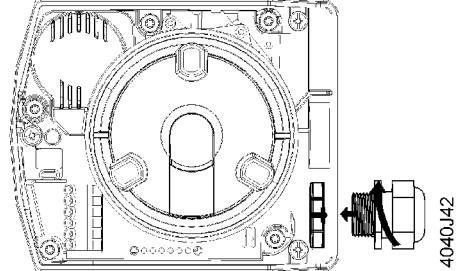
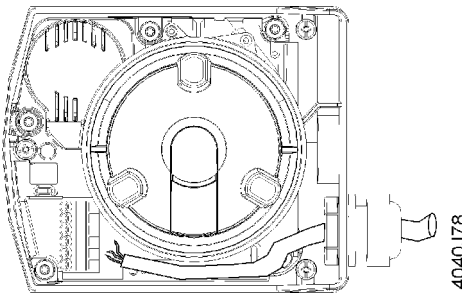
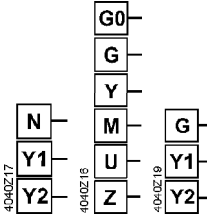
|          |                     |                                       |                        |
|----------|---------------------|---------------------------------------|------------------------|
| <b>A</b> | EU: M20<br>US: 1/2" | Standard                              | Connection actuator    |
| <b>B</b> | EU: M25<br>US: 1/2" | Ground cable for outdoor installation |                        |
| <b>C</b> | EU: M20<br>US: 1/2" |                                       | Connection accessories |

| Cable glands (not contained in scope of delivery)                                   |  |   |
|---|--|---|
| Metric  | Metric   | Inch thread   |
| M20   | M25  | 1/2"  |
|  |  |  |
| 4040U24   | 4040U23  | 4040U33   |

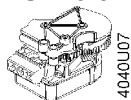
Prior to installation, the following preconditions must be satisfied:

- Actuator is mechanically connected to a Siemens valve.
- Housing cover is removed (step 6 "Special notes on mounting", page 26).

### Actuator

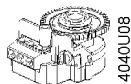
|  |  |
|--|--|
| <p><b>1</b>   No.: 4</p>  <p style="text-align: right;">4040J41</p> | <p><b>2</b></p>  <p style="text-align: right;">4040J42</p> |
| <p><b>3</b></p>  <p style="text-align: right;">4040J78</p>  | <p><b>4</b> Observe "Connection terminals" (page58)</p>   |



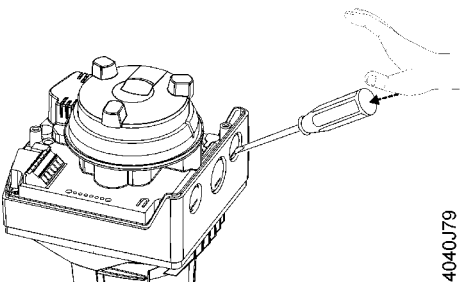
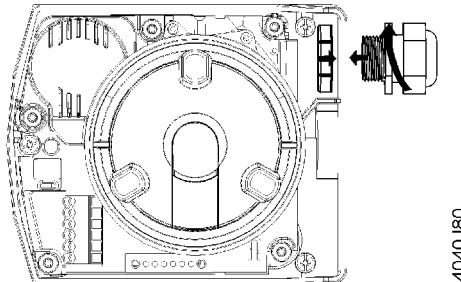
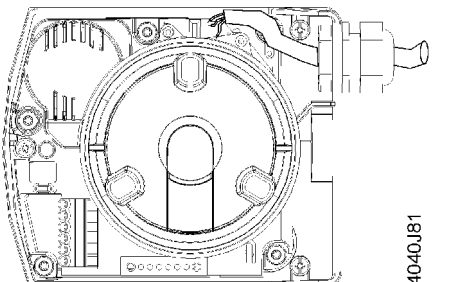
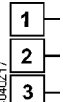
### Auxiliary switch ASC10.51



and

### Potentiometer ASZ7.5/..



|  |  |
|--|--|
| <p><b>1</b>   No.: 4</p>  <p style="text-align: right;">4040J79</p> | <p><b>2</b></p>  <p style="text-align: right;">4040J80</p> |
| <p><b>3</b></p>  <p style="text-align: right;">4040J81</p>  | <p><b>4</b> Observe "Connection terminals" (page58)</p>   |



## 3.2 Commissioning and operation

### 3.2.1 Function check and Calibration

#### Mechanically

Before making the function check, the following preconditions must be satisfied:

- Environmental conditions specified in chapter "Technical data" (page 55)
- Actuator is mechanically connected to a Siemens valve
- **Actuator is in "Manual operation" mode** (page 51).

The actuator can be operated with the help of the "Manual adjuster" (see page 51).

| Manual adjuster                        | Stroke actuator          | Rotary actuator  | Control path valve A→AB | Bypass valve B → AB |
|--|--------------------------|--|-------------------------|---------------------|
| Turning in clockwise direction         | Actuator's stem extends  | Actuator's spindle turns in clockwise direction        | Opening                 | Closing             |
| Turning in counter-clockwise direction | Actuator's stem retracts | Actuator's spindle turns in counterclockwise direction | Closing                 | Opening             |

#### Notes

- Ensure that the actuator's and valve's stem, or actuator's and valve's spindle are securely connected in all positions.
- If the actuator is forced to travel beyond its end positions, overload protection responds.
- Observe information given in chapter "Acting direction and flow characteristic" on page 44.

#### Electrically

Before making the function check, the following preconditions must be satisfied:

- Environmental conditions specified in chapter "Technical data" (page 55).
- Actuator is mechanically connected to a Siemens valve.
- **Actuator is in "Automatic" mode** (page 51).
- Actuator and, if required, accessories are correctly fitted and connected. Also refer to "Connection terminals" (page 58).
- Power is applied.

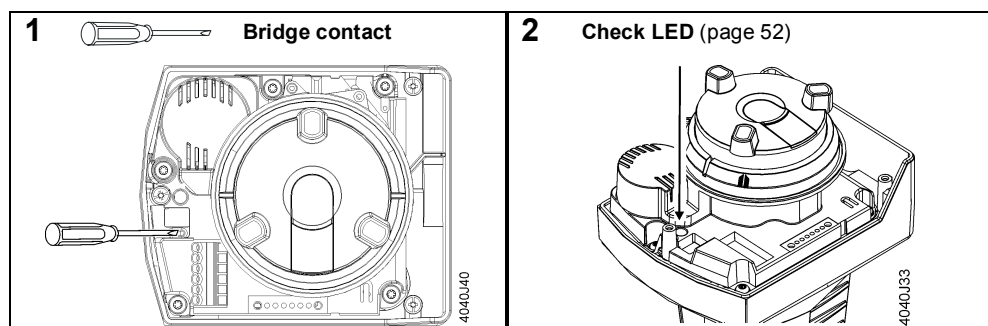
#### SA..61..

Calibration is required with modulating actuators and SA..61.. before the function check.

#### General notes on calibration

Before making the calibration, the following preconditions must be satisfied:

- A description of the calibration function is given in chapter "Calibration" (page 44).
- Housing cover is removed (step 6 "Special notes on mounting", page 26).



If required, calibration can be repeated any number of times.

Make the function check for modulating actuators after the calibration with a point test according to the following table:

| Connection terminals  | Stroke actuator                | Rotary actuator   | Control path valve A→AB | Bypass valve B → AB | Position feedback U |
|-----------------------|--------------------------------|---|-------------------------|---------------------|---------------------|
| Y 6 V<br>13.6 mA      | Actuator's stem extends (60%)  | Actuator's spindle turns in clockwise direction (60 %)        | Opening                 | Closing             | 6 V                 |
| Y 5 V<br>12 mA        | Actuator's stem retracts (50%) | Actuator's spindle turns in counterclockwise direction (50 %) | Closing                 | Opening             | 5 V                 |
| "Z" connected to "G"  | Actuator's stem extends        | Actuator's spindle turns in clockwise direction               | Opening                 | Closing             | 10 V                |
| "Z" connected to "G0" | Actuator's stem retracts       | Actuator's spindle turns in counterclockwise direction        | Closing                 | Opening             | 0 V                 |

SA..31.. and SA..81..

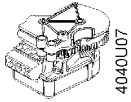
Make the function check for 3-position actuators according to the following table:

| Connection terminals    | Stroke actuator                        | Rotary actuator  | Control path valve A→AB | Bypass valve B → AB |
|-------------------------|--|--|-------------------------|---------------------|
| Voltage at Y1           | Actuator's stem extends                | Actuator's spindle turns in clockwise direction        | Opening                 | Closing             |
| Voltage at Y2           | Actuator's stem retracts               | Actuator's spindle turns in counterclockwise direction | Closing                 | Opening             |
| No voltage at Y1 and Y2 | Actuator's stem maintains the position | Actuator's spindle maintains the position              | Maintains the position  |                     |

Notes

- If function module AZX61.1 is used, observe information given in chapter "Changeover of acting direction" (page 42).
- Observe information given in chapter "Acting direction and flow characteristic" on page 44.

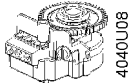
Auxiliary switch  
ASC10.51



Make the function check for mounted auxiliary switches according to the following table – example switching point at 25% position:

| Connection terminals   |                                    | Stroke actuator  | Rotary actuator   | Terminal S1 – S3 | Terminal S1 – S2 |
|--|------------------------------------|--|---|------------------|------------------|
| Voltage at Y2  | Y = 0 V                            | Actuator's stem retracts (until end position is reached) | Actuator's spindle turns in counter-clockwise direction (until end position is reached) | -                | -                |
| No voltage at Y1 und Y2  | Y = 0 V                            | Actuator's stem maintains the position                   | Actuator's spindle maintains the position   |                  |                  |
| Voltage at Y1 for desired valve position % + 2% x positioning time<br><b>Example:</b><br>SAX31.00 = 27% x 120 sec = 32.5 sec | Valve position % + 2%<br>Y = 2.7 V | Actuator's stem extends to desired position (27%)        | Actuator's spindle turns in clockwise direction to desired position (27%)               |                  |                  |
| Check switching point with voltmeter   |                                    | Actuator's stem maintains the position                   | Actuator's spindle maintains the position   | -                | -                |

Potentiometer ASZ7.5



Make the function check for mounted potentiometer according to the following table (Example values for ASZ7.5/1000):

| Connection terminals  |  | Stroke actuator  | Rotary actuator   | Terminal P1 – P2 | Terminal P2 – P3 |
|---|--|--|---|------------------|------------------|
| Voltage at Y2   |  | Actuator's stem retracts (until end position is reached) | Actuator's spindle turns in counter-clockwise direction (until end position is reached) | -                | -                |
| No voltage at Y1 und Y2   |  | Actuator's stem maintains the position                   | Actuator's spindle maintains the position   | < 1 Ω            | > 996 Ω          |
| Voltage at Y1 for desired valve position % positioning time<br><b>Example:</b><br>SAX31.00 = 75% x 120 sec = 90 sec             |  | Actuator's stem extends to desired position (75%)        | Actuator's spindle turns in clockwise direction to desired position (75%)               | -                | -                |
| Check position value with ohmmeter  |  | Actuator's stem maintains the position                   | Actuator's spindle maintains the position   | ~ 560 Ω          | ~ 436 Ω          |
| Voltage at Y2 for desired change of valve position % x positioning time<br><b>Example:</b><br>SAX31.00 = 10% x 120 sec = 12 sec |  | Actuator's stem retracts to desired position (65%)       | Actuator's spindle turns in counter-clockwise to desired position (65%)                 | -                | -                |
| Check position value with ohmmeter  |  | Actuator's stem maintains the position                   | Actuator's spindle maintains the position   | ~ 485 Ω          | ~ 511 Ω          |

## Maintenance

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The actuators are maintenance-free.

### 3.2.2 Disposal

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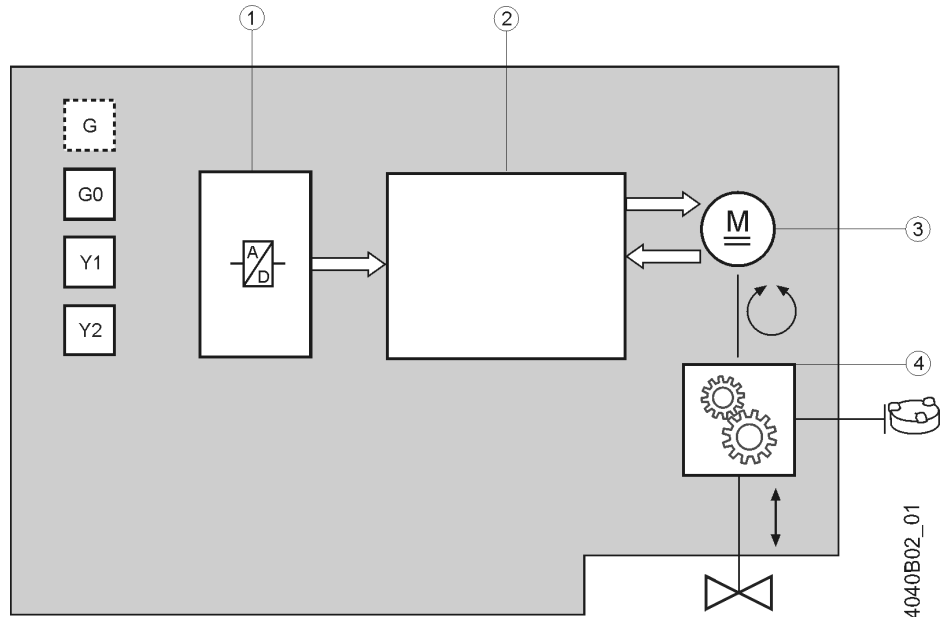
The products contain electrical and electronic components and must not be disposed of together with domestic waste. This applies in particular to the printed circuit board.

Legislation may demand special handling of certain components, or it may be sensible from an ecological point of view.

**Observe all local and currently valid legislation.**

# 4 Functions and control

## 4.1 3-position control



A 3-position signal drives the actuator via connection terminals Y1 or Y2. The required position is transferred to the valve.

|   |                    |                        |
|---|--------------------|------------------------|
| 1 | A/D conversion     |                        |
| 2 | Control functions  | Identification of seat |
|   |                    | Control of direction   |
|   |                    | Motor control          |
|   |                    | Manual adjustment      |
| 3 | Brushless DC motor |                        |
| 4 | Gear train         |                        |
|   | Manual adjuster    |                        |

| Positioning signal      | Stroke actuator                        | Rotary actuator   | Control path valve A→AB | Bypass valve B → AB |
|-------------------------|--|---|-------------------------|---------------------|
| Voltage at Y1           | Actuator's stem extends                | Actuator's spindle turns in clockwise direction         | Opening                 | Closing             |
| Voltage at Y2           | Actuator's stem retracts               | Actuator's spindle turns in counter-clockwise direction | Closing                 | Opening             |
| No voltage at Y1 and Y2 | Actuator's stem maintains the position | Actuator's spindle maintains the position               | Maintains the position  |                     |

### Note

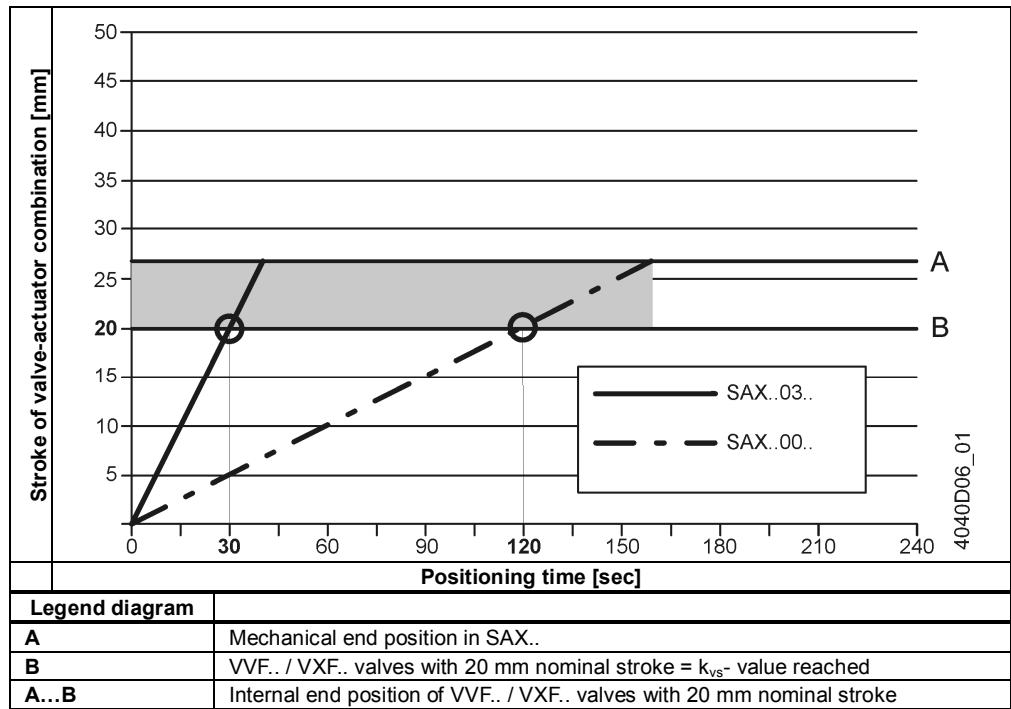
Observe information given in chapter "Acting direction and flow characteristic" on page 44.

Internal control ensures very constant positioning times and determination of the actuator's position.

### Positioning times stroke model

The specified positioning times refer to the respective nominal stroke / nominal angular rotation. Since the end positions of rotary actuators are inside the actuator, the following remarks refer to stroke actuators.

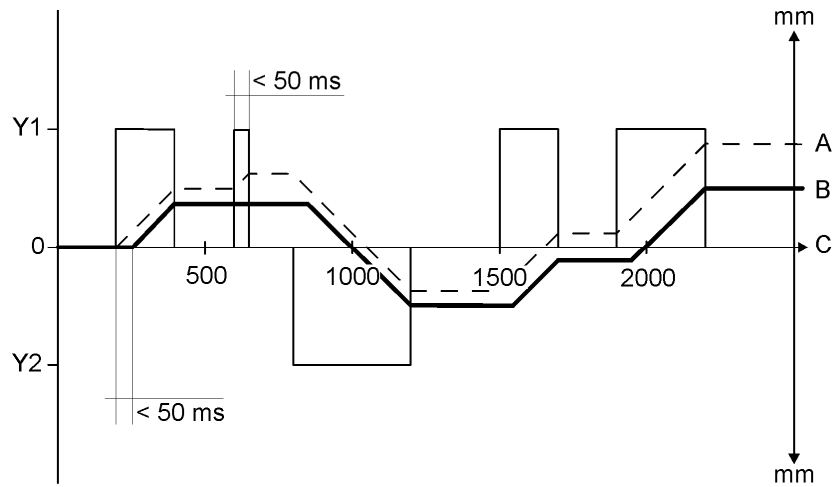
The resulting effective strokes vary, depending on the type of valve, resulting in shorter or longer actuator positioning times.



Notes

Deviations occur...

- after several positioning signals Y1 and Y2 in the same direction since the stroke movement starts with a delay of 200 ms.
- when positioning signals Y1 and Y2 are active for less than 200 ms since the stroke movement cannot be made in that case.



Accurate position feedback is made possible with the help of a potentiometer (page 53).

Notes

**4.1.1 Combination with RVD.. controller for direct domestic hot water distribution by heat exchanger**

The design based slow reaction on control signals of SAX31.. and SAX81.. actuators doesn't allow the actuator to react on very short control pulses. Only control pulses with a length greater than 400 ms allow a sufficient reaction.

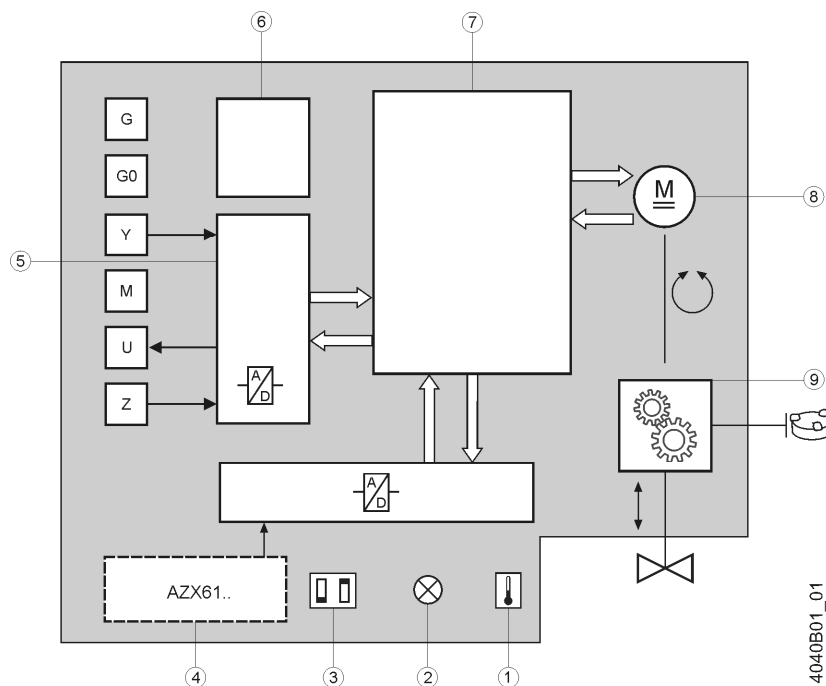
Especially the direct domestic hot water control does not allow such long control pulses. The specific optimized control loops – equipped with an SIGMAGYR RVD.. controller and Acvatix SQS359.05 actuator– work with pulses down to 40 ms.

SAX31.. and SAX81.. are not able to work with these short pulses.

The following table gives alternatives which actuators can be used within these control loops.

| Controller | Plant type | Prefered actuator | Valve line | DN        | kvs         |
|------------|------------|-------------------|------------|-----------|-------------|
| RVD130     | 4 und 5    | SQS35.03          | VVG55..    | DN15 ..25 | 0.25 .. 6.3 |
| RVD135/109 |            | SQS359.05         | VVG549..   | DN15 ..25 | 0.25 .. 6.3 |
| RVD135/309 |            | SQS359.54         | VVG549..   | DN15 ..25 | 0.25 .. 6.3 |
| RVD140     |            | SKD32.21          | VVG41..    | DN15 ..50 | 0.63 .. 40  |
| RVD144/109 |            |                   | VVF53..    |           | 0.16 .. 40  |
| RVD145/109 |            | SKD32.21E         |            | DN15 ..50 | 0.63 .. 40  |
| RVD139     |            |                   |            |           | 0.16 .. 40  |
| RVD230     | x- 4       | SQS35.03          | VVG55..    | DN15 ..25 | 0.25 .. 6.3 |
| RVD235/109 |            | SQS359.05         | VVG549..   | DN15 ..25 | 0.25 .. 6.3 |
| RVD250     |            | SQS359.54         | VVG549..   | DN15 ..25 | 0.25 .. 6.3 |
| RVD255/109 |            | SKD32.21          | VVG41..    | DN15 ..50 | 0.63 .. 40  |
| RVD240     |            |                   | VVF53..    |           | 0.16 .. 40  |
| RVD245/109 |            | SKD32.21E         | VVG41..    | DN15 ..50 | 0.63 .. 40  |
| RVD260     |            |                   | VVF53..    |           | 0.16 .. 40  |
| RVD265/109 |            |                   |            |           |             |

## 4.2 Modulating control



The modulating positioning signal drives the actuator steplessly. The positioning signal range (DC 0...10 V / DC 4...20 mA, 0...1000  $\Omega$ ) corresponds in a linear manner to the positioning range (fully closed...fully open, or 0...100 % stroke).

The actuator is driven via connection terminal Y or forced control Z (page 49). The required stroke / rotation is transferred to the valve's stem / spindle.

|   |                    |                              |
|---|--------------------|------------------------------|
| 1 | Calibration slot   |                              |
| 2 | LED (2 colors)     |                              |
| 3 | DIL switches       | Changeover of characteristic |
|   |                    | Positioning signal           |
| 4 | Function module    |                              |
| 5 | A/D conversion     |                              |
| 6 | Power supply       |                              |
| 7 | Control functions  | Identification of seat       |
|   |                    | Position control             |
|   |                    | Motor control                |
|   |                    | Detection of foreign bodies  |
|   |                    | Calibration                  |
|   |                    | Forced control               |
|   |                    | Characteristics function     |
| 8 | Brushless DC motor |                              |
| 9 | Gear train         |                              |
|   | Manual adjuster    |                              |

| Positioning signal     | Stroke actuator                        | Rotary actuator  | Control path valve A $\rightarrow$ AB | Bypass valve B $\rightarrow$ AB |
|------------------------|--|--|---------------------------------------|---------------------------------|
| Signal Y, Z increasing | Actuator's stem extends                | Actuator's spindle turns in clockwise direction        | Opening                               | Closing                         |
| Signal Y, Z decreasing | Actuator's stem retracts               | Actuator's spindle turns in counterclockwise direction | Closing                               | Opening                         |
| Signal Y, Z constant   | Actuator's stem maintains the position | Actuator's spindle maintains the position              | Maintains the position                |                                 |

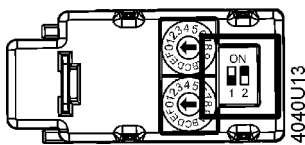
### Notes





- If function module AZX61.1 is used, observe the information given in chapter "Changeover of acting direction" (page 42).
- Observe the information given in chapter "Acting direction and flow characteristic" on page 44.



### 4.3 Function module AZX61.1

#### DIL switches




|                   | Acting direction   | Sequence control   |
|-------------------|--|--|
| OFF <sup>1)</sup> |  Direct acting positioning signal Y or Z  |  Sequence control <b>not</b> active   |
| ON <sup>1)</sup>  |  Reverse acting positioning signal Y or Z |  Sequence control (signal adaptation) |

<sup>1)</sup> Factory setting: All switches set to OFF

#### 4.3.1 Sequence control (signal adaptation)

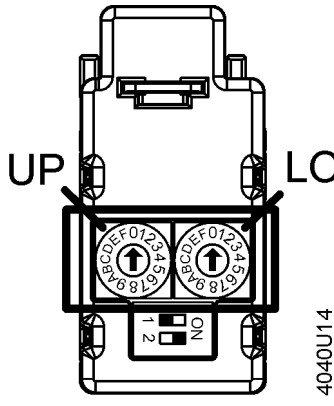
#### DIL switches

|                  | Sequence control   |
|------------------|--|
| ON <sup>1)</sup> |  Sequence control (signal adaptation) |

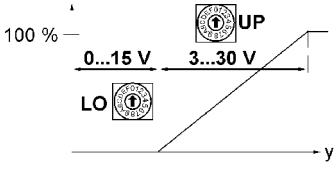
<sup>1)</sup> Factory setting: All switches set to OFF

#### HEX switches

Nr.: 1



4040U14



**Setting sequence control**

Rotary switches LO and UP are used to set the starting point or working range of a sequence.

| Position "LO" | Starting point | Position "UP" | Working range |
|---------------|----------------|---------------|---------------|
| 0             | 0,3 V          | 0             | 9,4 V         |
| 1             | 1 V            | 1             | 3 V           |
| 2             | 2 V            | 2             | 4 V           |
| 3             | 3 V            | 3             | 5 V           |
| 4             | 4 V            | 4             | 6 V           |
| 5             | 5 V            | 5             | 7 V           |
| 6             | 6 V            | 6             | 8 V           |
| 7             | 7 V            | 7             | 9 V           |
| 8             | 8 V            | 8             | 10 V          |
| 9             | 9 V            | 9             | 12 V          |
| A             | 10 V           | A             | 14 V          |
| B             | 11 V           | B             | 16 V          |
| C             | 12 V           | C             | 18 V          |
| D             | 13 V           | D             | 20 V          |
| E             | 14 V           | E             | 25 V          |
| F             | 15 V           | F             | 30 V          |

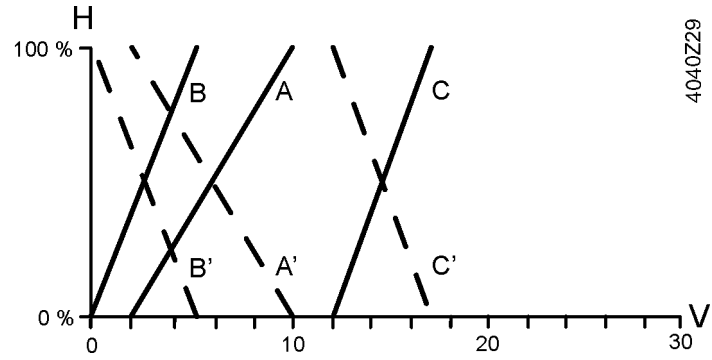
**Invalid HEX switches combinations**

|    |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
|----|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LO | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | A | B | C | D | E | F |
| UP |   | F | F | F | F | F | F | F | F | F | F | D | D | C | C | B |
| UP |   |   |   |   |   | E | E | E | E | E | E | E | E | D | D | C |
| UP |   |   |   |   |   |   |   |   |   |   |   | F | F | E | E | D |
| UP |   |   |   |   |   |   |   |   |   |   |   |   |   | F | F | E |
| UP |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   | F |

#### Notes

- Can only be used with voltage input.
- Maximum input voltage is DC 30 V. If the configuration is invalid, the actuator operates on DC 0...10 V.

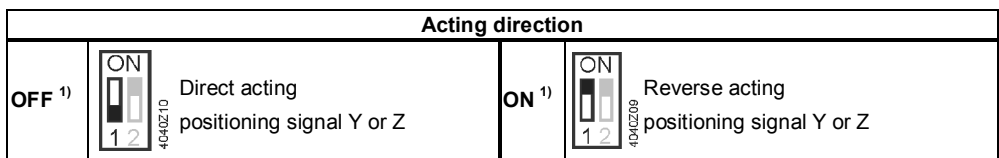
Examples



| Legend diagram | Positioning signal range               | Position LO | Position UP | Position feedback U |
|----------------|--|-------------|-------------|---------------------|
| A              | DC 2...10 V                            | 2           | 6           | DC 0...10 V         |
| B              | DC 0...5 V                             | 0           | 3           | DC 0...10 V         |
| C              | DC 12...17 V                           | C           | 3           | DC 0...10 V         |
| H              | Stroke or rotary angle                 |             |             |                     |
|                | Acting direction: Direct (A, B, C)     |             |             |                     |
|                | Acting direction: Reverse (A', B', C') |             |             |                     |

4.3.2 Changeover of acting direction

DIL switches



1) Factory setting: All switches set to OFF

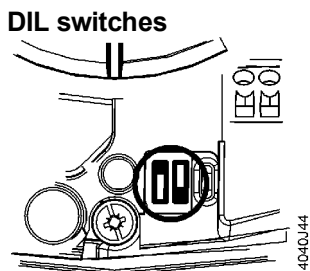
Selecting the acting direction



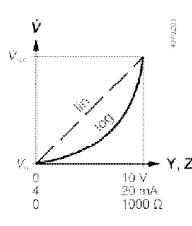


- With valves whose stem is extended in the fully closed position, "direct acting" means that the valve is fully closed (0 %) when positioning signal Y = 0 V resp. Z = 0 Ω. This applies to all Siemens valves according to "Equipment combinations" (page 10).
- With valves whose stem is retracted in the fully closed position, "direct acting" means that the valve is fully open (100 %) when positioning signal Y = 0 V resp. Z = 0 Ω.

The diagram includes a graph on the left showing V vs Y, Z with a solid line for direct acting and a dashed line for reverse acting. Below the graph are two valve cross-sections: 4040Z14 (Direct acting) and 4040Z15 (Reverse acting). The direct acting valve shows a downward stem movement from 0% to 100% as the signal Y or Z increases. The reverse acting valve shows an upward stem movement from 100% to 0% as the signal Y or Z increases.

|      |                           |
|------|---------------------------|
| Y, Z | Positioning signal        |
| V    | Volumetric flow           |
|      | Acting direction: Direct  |
|      | Acting direction: Reverse |

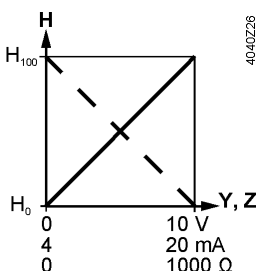
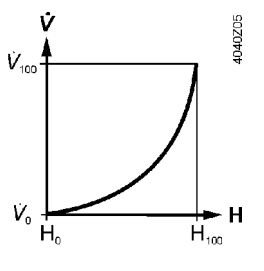
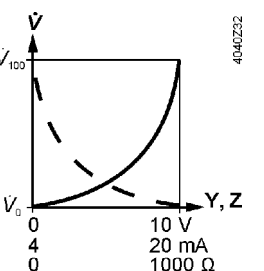
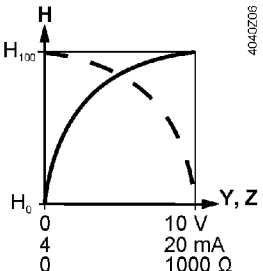
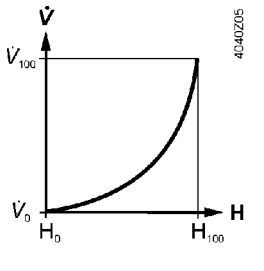
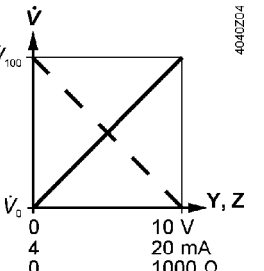
## 4.4 Positioning signal and flow characteristic selection



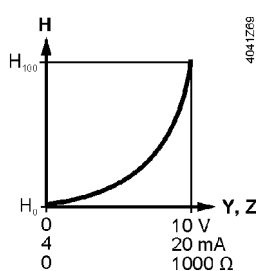
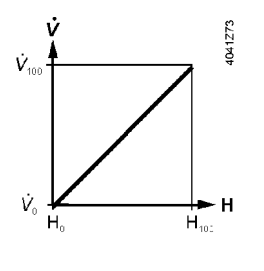
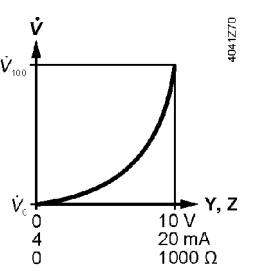
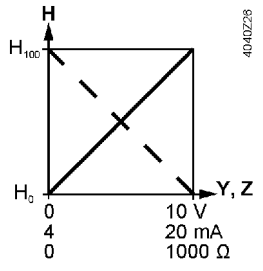
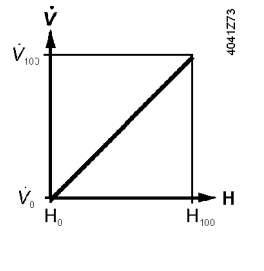
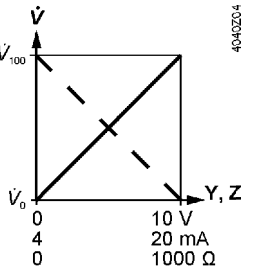
|                   | Positioning signal "Y"  | Position feedback "U" | Flow characteristic   |   |
|-------------------|---|-----------------------|---|---|
| OFF <sup>1)</sup> | <br>DC 0...10 V  | DC 0...10 V           | <br>log = equal-percentage |  |
| ON                | <br>DC 4...20 mA | DC 0...10 V           | <br>lin = linear           |   |

<sup>1)</sup> Factory setting: All DIL switches set to OFF  $\Omega$

### Flow characteristic SAX61.03 + VVF..

|     | Actuator   | Valve VVF.. / VVG41..   | Totally  |
|-----|--|---|--|
| log |   |   |   |
| lin |  |  |  |

### Flow characteristic SAX61P03 + VPF..

|           | Actuator  | Combi-Valve VPF43/VPF53  | Totally   |
|-----------|---|--|---|
| log       |  |  |  |
| lin       |  |  |  |
| Y, Z      | Positioning signal  |  |   |
| H         | Stroke  |  |   |
| V         | Volumetric flow   |  |   |
| —————     | Acting direction: Direct  |  |   |
| - - - - - | Acting direction: Reverse   |  |   |

## 4.5 Acting direction and flow characteristic

The selection of changeover of acting direction and characteristic with the DIL switches depends on the type of actuator (with or without fail safe function) and the associated type of valve (valve characteristic, push to open, pull to open).

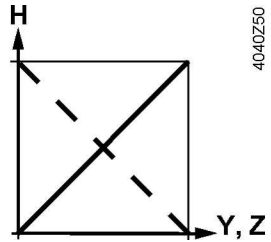
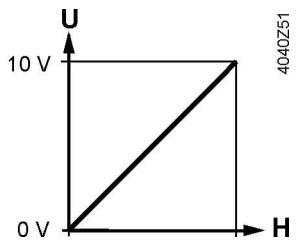
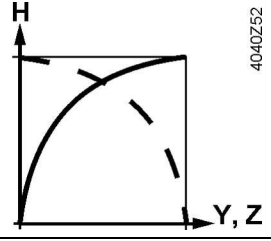
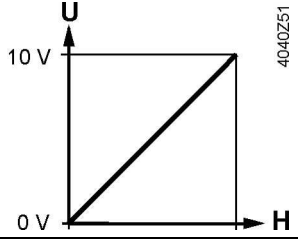
When the positioning signal increases (DC 0...10 V, DC 4...20 mA, 0...1000  $\Omega$ ), the objective is to have the valve's volumetric flow  $V$  rising, but to fully open the valve,  $V = 100\%$  (NO = normally open), or to fully close it,  $V = 0\%$  (NC = normally closed) in the event of a power failure.

|  |                                   |                            |                        |                  |         |                  |
|--|-----------------------------------|----------------------------|------------------------|------------------|---------|------------------|
|  |                                   |                            |                        |                  |         |                  |
|  |                                   |                            |                        |                  |         |                  |
|  | <b>DIL switches</b>               | <b>Acting direction</b>    | Direct                 |                  | Reverse |                  |
|  |                                   | <b>Flow characteristic</b> | Linear                 | Equal-percentage | Linear  | Equal-percentage |
|  | <b>Without fail safe function</b> | <b>No power applied</b>    | Maintains the position |                  |         |                  |

## 4.6 Position Feedback U

The position feedback  $U$  (DC 0...10 V) is always proportional to stroke  $H$  of the actuator's stem.

|  |                        | Actuator Positioning signal Y, Z | Actuator Position feedback U |
|--|------------------------|----------------------------------|------------------------------|
|  | log = equal-percentage |                                  |                              |
|  | lin = linear           |                                  |                              |

|                | Actuator<br>Positioning signal Y, Z  | Actuator<br>Position feedback U   |
|----------------|--|---|
| Direct acting  |  4040Z50 |  4040Z51 |
| Reverse acting |  4040Z52 |  4040Z51 |
| Y, Z           | Positioning signal   |   |
| H              | Stroke   |   |
| U              | Position feedback  |   |
| —              | Acting direction: direct   |   |
| - - -          | Acting direction: reverse  |   |

## 4.7 Position control with ClosedPosition Synchronisation

Within SAX/SAL61.. actuators the position control works based on the HALL-sensor pulses from the brushless DC-motor calculating with an internal stroke model calculating the actual position. This kind of control is more accurate and wearless compared with a physical element for position measurement and grants a precise position control with high resolution.

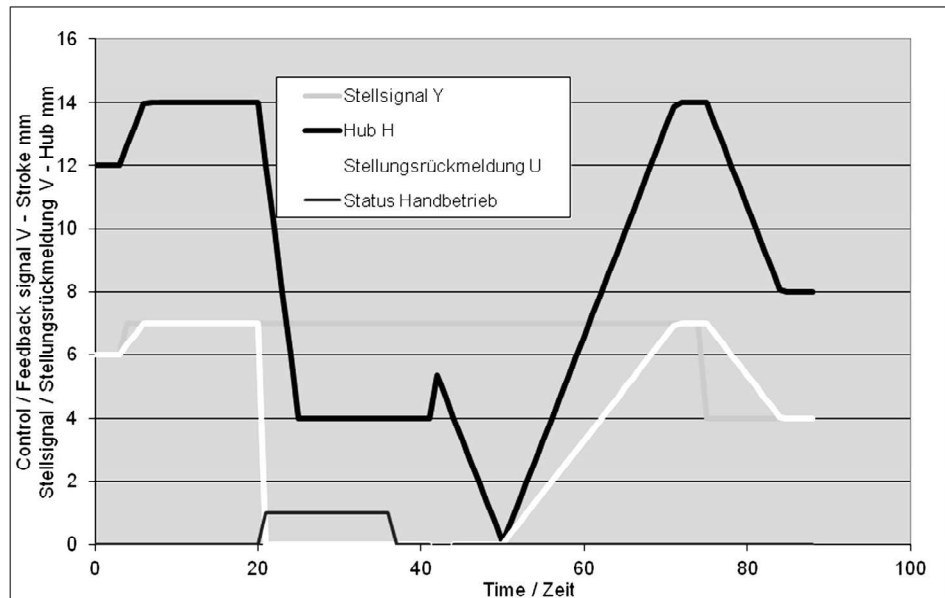
During manual operation the motor is declutched from the geartrain and the internal position control get's not sensor pulses. So real position will deviate from the internally calculated position. As a consequence the position feedback on terminal U is set to "0V" during manual operation.

To grant – after manual operation – that real mechanical position and internal position control are matching the SAX61.. does after manual operation an automatic ClosedPosition-Synchronisation.

### 4.7.1 ClosedPosition-Synchronisation

Returned into automatic operation the actuator runs for 0.5.. 2 s into opening direction to grant secure closed-position detection. Then the actuator runs into closed position (seat A-AB in the valve). Reaching the closed position the internal stroke model is synchronized. Positioning signal, position feedback and meachanical position now match perfectly again. With this function it's granted that the position feedback U – which was zero during manual operation and synchronization - always represents the real mechanical position of the actuator.

After synchronization the actuator follows the control signal again.



#### 4.7.1.1 Active forced position input on Z

If after return to automatic mode a signal on Z is active (GND, AC/DC 24 V or 0...1000 Ohm) the ClosedPosition-Synchronisation is deactivated as long as the signal on Z remains. After Z is deactivated the ClosedPosition-Synchronisation will be performed.

Note

ClosedPosition-Synchronisation is only automatically activated after manual operation. A power failure does not activate this function automatically, to avoid that all actuators in a section close in parallel.

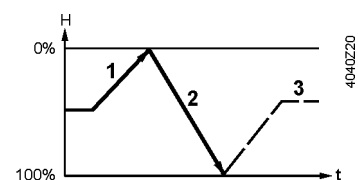
If the customer likes synchronization also after a power failure he should take care that the plant restarting routine drives the actuator automatically into an end position. This will also synchronises the internal position control and the real position.

## 4.8 Calibration

To match the actuator to production-related mechanical tolerances of the individual valves, accurate positioning and position feedback must be ensured, if calibration is performed when the plant is commissioned (page 33). During commissioning, the actuator detects the valve's end positions and files the exact stroke in its internal memory.

Calibration takes place in the following phases:

- Actuator drives to  $H_0$  (1), valve closes. Detection of upper end position.
- Actuator drives to  $H_{100}$  (2), valve opens. Detection of lower end position.
- The detected values are stored (3). Then the actuator follows the positioning signal.




Note

- Observe status indication (LED) during and after calibration (page 52).
- If the actuator does not detect the second end position within an appropriate stroke range (max. 25 mm), the first end stop will be adopted and the actuator operates with a working range of 20 mm.

## 4.9 Signal priorities

The actuators are controlled via different interlinked positioning signal paths (positioning signal "Y", forced control input "Z", manual adjuster). The signal paths are assigned the following priorities:

| Priority              | Description   |   |
|-----------------------|---|---|
| <b>1</b><br>(highest) | The manual adjuster always has priority 1, thus overriding all signals active at "Z" or "Y", independent of whether or not power is applied.  |  |
| <b>2</b>              | Only SA..61..: As soon as a valid positioning signal is active at input "Z", the position is determined via positioning signal "Z" (forced control). Prerequisite: The manual adjuster is not used. | <b>Z</b>  |
| <b>3</b><br>(lowest)  | The position is determined via positioning signal "Y". The manual adjuster is not used and on Z there is no active signal.  | <b>Y</b>  |

Examples

| Manual adjuster                   | Forced control (Z) | Positioning signal (Y) | Stroke actuator                           | Rotary actuator   |
|-----------------------------------|--------------------|------------------------|---|---|
| Automatic mode                    | Not connected      | <b>5 V</b>             | Actuator's stem travels to position (50%) | Actuator's spindle travels to position (50%)                            |
| Automatic mode                    | <b>G</b>           | 3 V                    | Actuator's stem extends                   | Actuator's spindle turns in clockwise direction                         |
| Automatic mode                    | <b>G0</b>          | 3 V                    | Actuator's stem retracts                  | Actuator's spindle turns in counter-clockwise direction                 |
| <b>Operated (30%) and engaged</b> | G                  | 8 V                    | Actuator's stem retracts manual (to 30%)  | Actuator's spindle turns manual in counterclock-wise direction (to 30%) |

Bold printing = positioning signal currently active

## 4.10 Detection of valve seat

The actuators feature force-dependent valve seat detection. After calibration, the exact valve stroke is filed in the actuator's memory. When the actuator reaches the respective end of stroke, it does not hit the valve's seat at full speed, but stops for 5 seconds at about 1% before the stored position is reached. If the positioning signal stays at 0% or 100%, the actuator travels to the calculated end position at reduced positioning speed and builds up the required nominal force.

This function extends the actuator's service life since the dynamic forces are reduced when approaching the valve seat and there will be less strain on the gear train.

In addition, the actuator's oscillations in the case of instable control are suppressed.

If no force is built up in the calculated end position (e.g. in the event of temperature effects for instance), the actuator continues to operate at a reduced positioning speed until the nominal positioning force is restored. This ensures that the valve always fully closes.

After a power failure, valve seat identification is not active – the actuators define their stroke position on power resoration to be at 50%. From now on, the actuator follows the positioning signal.

When the valve plug reaches its seat for the first time, the actuator readjusts its stroke model.

Example

The supposed position is 50%, Y = 2 V, the actuator travels 30% of the stored valve stroke in the direction of "Actuator's stem retracted".

If the actuator reaches the seat within this 30% travel, it interprets the position as "Valve fully closed" and shifts the position of the valve's stroke accordingly without changing the extent of travel.

From now on, the actuator follows the changed valve stroke position.

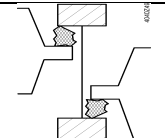
This means: New position 0%, Y = 2 V, actuator travels 20% of the stored valve stroke in the direction "Actuator's stem extended".

## 4.11 Detection of foreign bodies

---

The actuator detects when the valve is clogged and adjusts its operational behavior accordingly to prevent damage to itself or the valve.

If the actuator hits an obstacle within the calibrated stroke and is not able to overcome it with its nominal positioning force, it stores the position at which the obstacle was hit. Depending on the direction of travel, as ...

- |  |   |
|--|---|
| <ul style="list-style-type: none"><li>• "Lower limit of valve clogging", if the clogging was detected when traveling in the direction of "Actuator's stem retracting".</li></ul> |  |
| <ul style="list-style-type: none"><li>• "Upper limit of valve clogging", if the clogging was detected when traveling in the direction of "Actuator's stem extending".</li></ul>  |   |

Now, the status LED blinks green and the actuator only follows the positioning signal between the positions "Actuator's stem retracted" and "Upper limit of valve clogging" or "Actuator's stem extended" and "Lower limit of valve clogging".

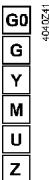
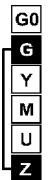
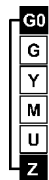
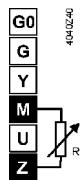
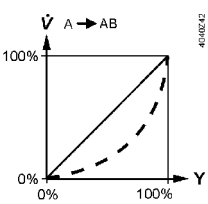
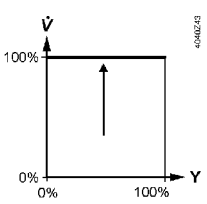
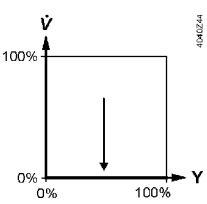
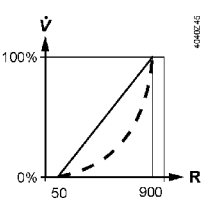
After detection of clogging, 3 attempts are made to overcome clogging by traveling about 15% in the opposite direction and then trying again to overcome the position of clogging. If the attempts made are unsuccessful, the actuator continues to follow the positioning signal within the restricted range only and the LED continues to blink green (refer to "Indicators" on page 52).



## 4.12 Forced control Z

SA..61.. only

Forced control is affected by changeover of acting direction. It uses the following operating modes:

|             |   | Z-mode  |   |  |   |
|-------------|---|---|---|--|---|
|             |   | No function   | Fully open  | Fully closed   | Overriding positioning signal "Y" by 0...1000 Ω                                     |
| Connections |  |  |  |   |   |
|             | Transmission  |  |    |   |  |
|             | Equal-percentage or linear characteristic   |   |   |  | Equal-percentage or linear characteristic   |
|             | Contact "Z" not connected, valve follows positioning signal "Y"                   | Contact "Z" is connected directly to "G", positioning signal "Y" has no impact    | Contact "Z" is connected directly to "G0", positioning signal "Y" has no impact     | Contact "Z" is connected to "M" via resistor "R", starting point at 50 Ω, end point at 900 Ω, positioning signal "Y" has no impact |   |

Note

The operating modes "Z" shown are based on factory setting "direct acting" and a "push to open" valve.

## 4.13 Technical and mechanical design

### 4.13.1 Transmission of power

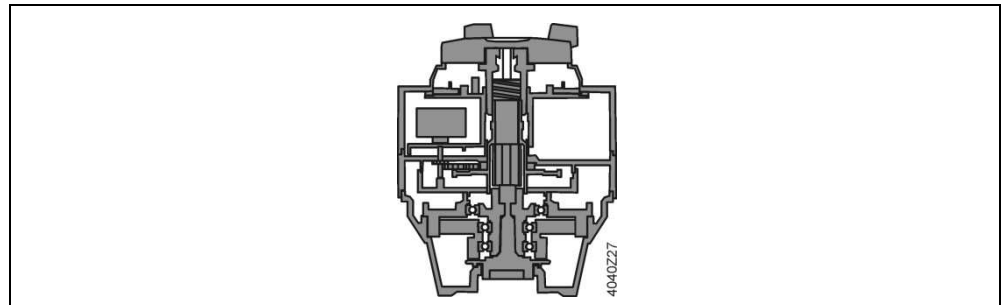
#### Function principle

Incoming positioning signals are translated to positioning commands for the motor.

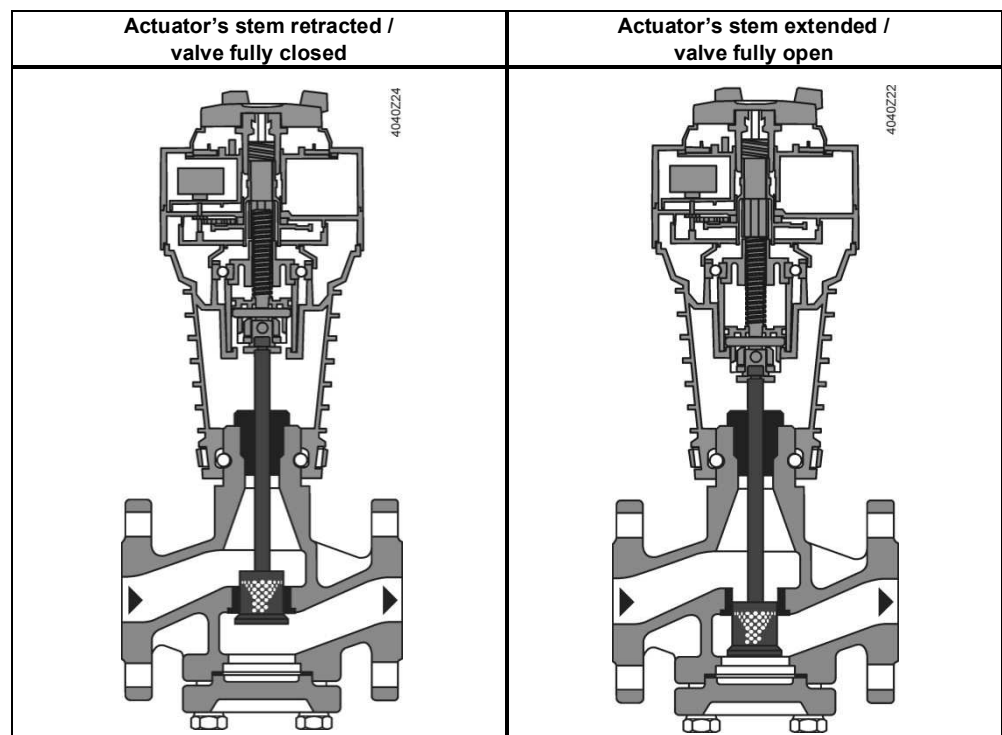
A gear train transmits the motor's positioning steps to the output stage (valve coupling). Attached to the gear train are the electrical and mechanical accessory items and the manual adjuster.

In the case of the rotary actuators, the adjustment to the required torque is made in the output stage. With the stroke actuators, the translation from rotary to stroke movement takes place in the output stage.

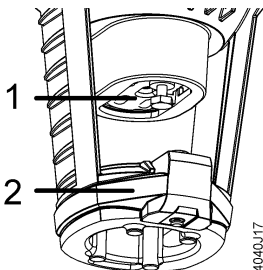
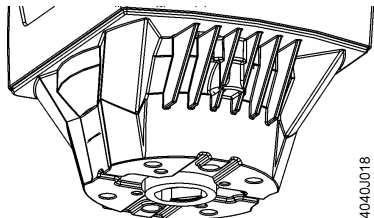
SAL..



SAX..

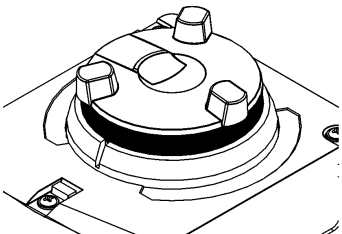


### 4.13.2 Coupling

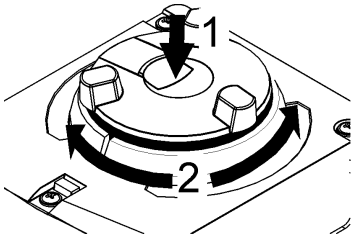
| SAX.., SAV..  | SAL..   |
|---|---|
|  <p style="text-align: right; font-size: small;">4040J17</p>             |  <p style="text-align: right; font-size: small;">4040J18</p> |
| <p>The stem coupling (1) and neck coupling (2) ensures full backward compatibility with all types of Siemens large-stroke valves produced since 1975.</p> | <p>Mounting sets are available for use with butterfly and slipper valves.</p>   |

### 4.13.3 Manual adjuster

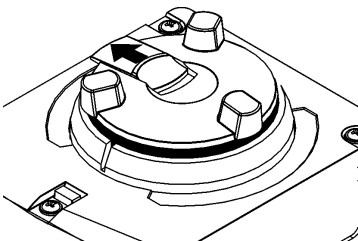
#### Automatic

|  |  |
|--|--|
|  <p style="text-align: right; font-size: small;">4040J12</p> | <p>When the motor drives the manual adjuster turns. Thus in automatic mode, the manual adjuster is used for indication of travel. If the manual adjuster is held firm in this mode, there is no transmission of power to the gear train.</p> |
|--|--|

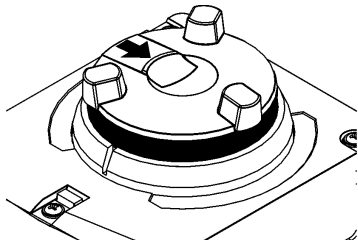
#### Manual operation

|   |  |
|---|--|
|  <p style="text-align: right; font-size: small;">4040J14</p> | <p>When pushing the manual adjuster down (1), it engages and the actuator can be manually operated.</p> <p>Stroke actuator: When turning the manual adjuster in clockwise / counterclockwise direction (2), the actuator's stem retracts / extends.</p> <p>Rotary actuator: The actuator spindle turns in the same direction.</p> <p>An overload protection prevents damage to the manual adjuster</p> |
|---|--|

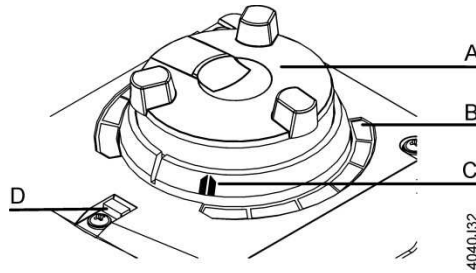
#### Fixing the position

|   |   |
|---|---|
|  <p style="text-align: right; font-size: small;">4040J16</p> | <p>Upon actuation and locking the slide switch, the manual adjuster remains engaged.</p> <p>When in this mode, do not turn the manual adjuster.</p> |
|---|---|

#### Disengaging the fixing

|   |  |
|---|--|
|  <p style="text-align: right; font-size: small;">4040J20</p> | <p>When resetting the slide switch, the manual adjuster returns to automatic mode.</p> <p>-&gt;The modulating SAX61.. will automatically start a Zero Position Synchronisation</p> |
|---|--|

## 4.13.4 Indicators



|          |                       |                     |
|----------|-----------------------|---------------------|
| <b>A</b> | Indication of travel  |                     |
| <b>B</b> | Scale                 | Position indication |
| <b>C</b> | Indicator             |                     |
| <b>D</b> | LED Status indication |                     |

### Operational status indication

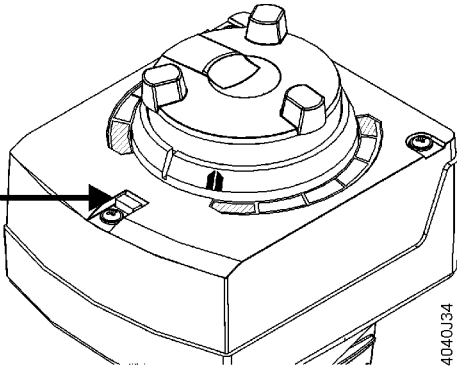
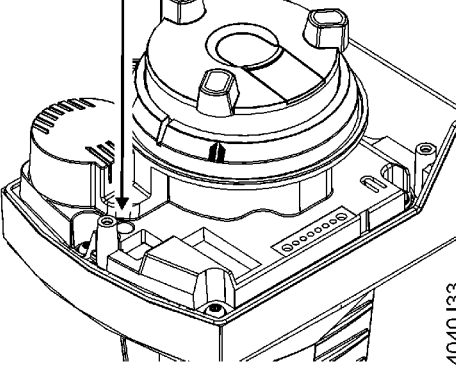
In Automatic mode, the manual adjuster serves for the indication of travel. See "Automatic" (page 51).

### Position indication

Position indication is on 2 opposite sides. When turning the manual adjuster, the indicator moves in the same direction.

The scale indicates the stroke. When reaching the stops, the valve is either fully open or fully closed.

### Status indication (LED)

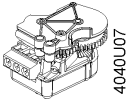
| Housing cover fitted   | Housing cover removed   |
|--|---|
|  |  |
| When the housing cover is fitted, the LED can be viewed through a light conductor. | When the housing cover is removed, the LED can be viewed through a hole.            |

The status indication informs about the operational state of the actuator.

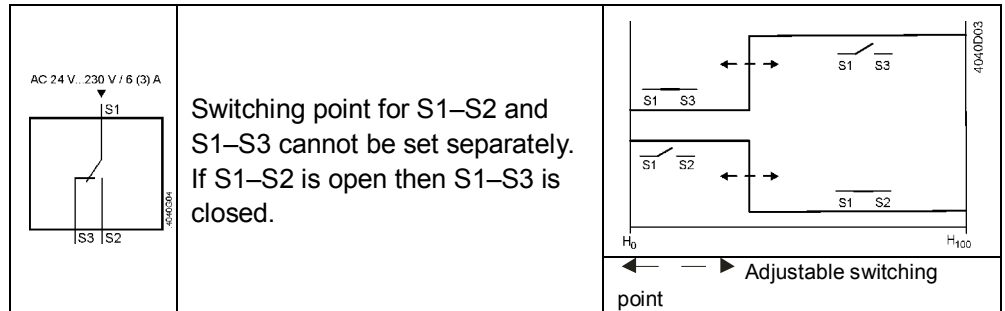
| LED          | Indication | Operating state   | Remarks, troubleshooting                                     |
|--------------|------------|---|--|
| <b>Green</b> | On         | Automatic mode  | Normal operation   |
|              | Blinking   | Calibration (page 33).                                  | Wait until calibration is finished (then green or red light) |
|              |            | In manual mode<br>Detection of foreign bodies (page 48) | Manual adjuster in MAN position<br>Check valve / actuator    |
| <b>Red</b>   | On         | Calibration error                                       | Start calibration again (page 33)                            |
|              | Blinking   | Clogged valve   | Check valve  |
| <b>Dark</b>  | Dark       | No power or electronics faulty                          | Check operating voltage                                      |

### 4.13.5 Electrical accessories

#### Auxiliary switch ASC10.51



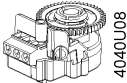
The auxiliary switch ASC10.51 switches on or off when a certain position is reached. The switching point can be set between 0...100%.



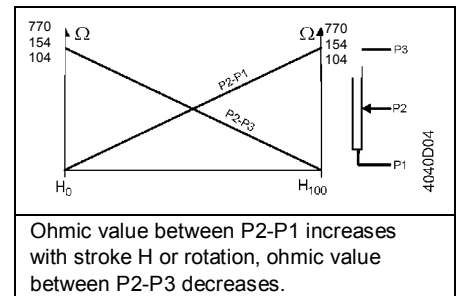
Application example:

When using an auxiliary switch, position feedback can trigger an automatic stop of the circulating pump in the end position "Fully closed".

#### Potentiometer ASZ7.5/..



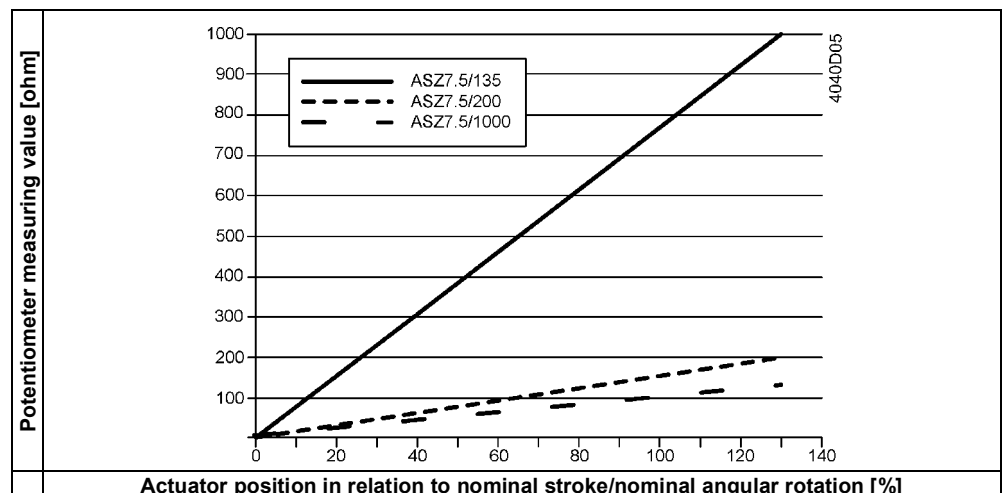
Potentiometer ASZ7.5/.. (1000 Ω, 200 Ω, 135 Ω) delivers an ohmic value to the controller giving the exact position of the actuator (continuous position feedback). A slip clutch prevents damage to the potentiometer in the mechanical end positions. This is also used for accurate balancing of the potentiometer in the fully closed position.



Flow characteristic

The end values of the potentiometers refer to the maximum stroke / maximum angular rotation of the actuators. For this reason, the resulting values in operation deviate, depending on the type of valve used in combination with the actuator. The potentiometer's starting point can be very accurately adjusted during installation (refer page 26).

|       | ASZ7.5/135  | ASZ7.5/200  | ASZ7.5/1000  |
|-------|---|---|--|
|       | 104 Ohm at nominal stroke/nominal angular rotation                                    | 154 Ohm at nominal stroke/nominal angular rotation                                    | 770 Ohm at nominal stroke/nominal angular rotation                                   |
|       | $R = 0 + 1.04 \text{ Ohm} \times \text{nominal stroke/nominal angular rotation (\%)}$ | $R = 0 + 1.54 \text{ Ohm} \times \text{nominal stroke/nominal angular rotation (\%)}$ | $R = 0 + 7.7 \text{ Ohm} \times \text{nominal stroke/nominal angular rotation (\%)}$ |
| SAX.. | $R = 0 + 5.2 \text{ Ohm} \times \text{stroke (mm)}$                                   | $R = 0 + 7.71 \text{ Ohm} \times \text{stroke (mm)}$                                  | $R = 0 + 38.5 \text{ Ohm} \times \text{stroke (mm)}$                                 |
| SAL.. | $R = 0 + 1.15 \text{ Ohm} \times \text{rotary angle (°)}$                             | $R = 0 + 1.71 \text{ Ohm} \times \text{rotary angle (°)}$                             | $R = 0 + 8.55 \text{ Ohm} \times \text{rotary angle (°)}$                            |



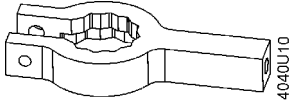
### Function module AZX61.1



Function module AZX61.1 offers the following choices for changing control:

- Changeover of acting direction (page 42)
- Connection terminals (page 58)
- Sequence control (page 41)

### Stem heating element ASZ6.6



Stem heating element ASZ6.6 prevents the formation of ice on the stem when medium temperatures drop below 0 °C. It is suited for universal use with valves having a stem diameter of 10 or 14 mm.



**The stem heating element heats up to 120 °C.**

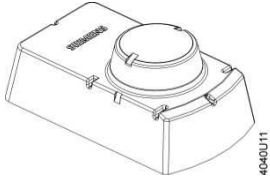


**This is a PTC element, which means it shows up with a low resistance at power up – inrush current may reach 13 A at low temperatures / high voltage level**

## 4.13.6 Mechanical accessories

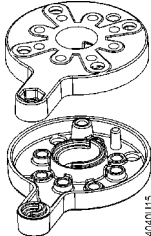
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### Weather shield ASK39.1



Weather shield ASK39.1 protects the actuator when installed outdoors. This does not lead to a change of IP class (IP54).

### Mounting sets ASK3..N



Mounting sets ASK31N, ASK33N and ASK35N enable the actuators to be fitted to slipper valves VBF21.., DN65...150 and butterfly valves VKF41.. and VKF45 (page 21-25).

## 5 Technical data

|                             |  | SAX..   | SAL..  |
|-----------------------------|--|---|--|
| <b>Power supply</b>         | Operating voltage<br>SA..31..<br>SA..61..<br>SA..81..                      | AC 230 V ± 15 %<br>AC 24 V ± 20 % / DC 24 V + 20 % / -15%<br>AC 24 V ± 20 % / DC 24 V + 20 % / -15% |  |
|                             | Frequency  | 45...65Hz   |  |
|                             | Fusing ac. DIN 57100 part 430 (supply lines)                               | Max. 10 A slow  | Max. 10 A slow   |
|                             | Power consumption at 50 Hz   |   |  |
|                             | SAX31.00 Stem retracts / extends   | 3.5 VA / 2 W  | -  |
|                             | SAX31.03 Stem retracts / extends   | 6 VA / 3.5 W  | -  |
|                             | SAX61.03.. Stem retracts / extends   | 8 VA / 3.75 W   | -  |
|                             | Holding state  | 3.5 VA / 1.5 W  | -  |
|                             | SAX81.00.. Stem retracts / extends   | 3.5 VA / 2.25 W   | -  |
|                             | SAX81.03.. Stem retracts / extends   | 5 VA / 3.75 W   | -  |
|                             | SAL31.00T10 Rotary actuator turns  | -   | 3.5 VA / 2 W   |
|                             | SAL31.00T20 Rotary actuator turns  | -   | 4.5 VA / 2.75 W  |
|                             | SAL31.00T40 Rotary actuator turns  | -   | 7 VA / 4 W   |
|                             | SAL31.03T10 Rotary actuator turns  | -   | 5.5 VA / 3.25 W  |
|                             | SAL61.00T10 Rotary actuator turns  | -   | 5 VA / 2.5 W   |
|                             | Holding state  | -   | 3.5 VA / 1.5 W   |
|                             | SAL61.00T20 Rotary actuator turns  | -   | 6 VA / 2.75 W  |
|                             | Holding state  | -   | 3.5 VA / 1.5 W   |
|                             | SAL61.00T40 Rotary actuator turns  | -   | 9 VA / 4 W   |
|                             | Holding state  | -   | 3.5 VA / 1.5 W   |
|                             | SAL61.03T10 Rotary actuator turns  | -   | 7.5 VA / 3.5 W   |
|                             | Holding state  | -   | 3.5 VA / 1.5 W   |
|                             | SAL81.00T10 Rotary actuator turns  | -   | 3 VA / 2 W   |
|                             | SAL81.00T20 Rotary actuator turns  | -   | 4 VA / 2.75 W  |
|                             | SAL81.00T40 Rotary actuator turns  | -   | 6 VA / 3.75 W  |
|                             | SAL81.03T10 Rotary actuator turns  | -   | 5 VA / 3.5 W   |
| <b>Function data</b>        | Positioning times with specified nominal stroke / nominal angular rotation |   |  |
|                             |  | SAX..00, SAL..00  | 120 s  |
|                             |  | SAX..03, SAL..03  | 30 s   |
|                             | Positioning force  |   | 800 N  |
| Torque                      | SAL..T10   | -   | 10 Nm running  |
|                             | SAL..T20 <sup>5)</sup>   | -   | 20 Nm running  |
|                             | SAL..T40 <sup>5)</sup>   | -   | 40 Nm running  |
| Nominal stroke              |  | 20 mm   | -  |
| Angular rotation            |  | -   | 90°  |
| <b>Signal inputs</b>        | Positioning signal "Y" SA..31.., SA..81..                                  |   | 3- position  |
|                             | SA..31..   | Voltage   | AC 230 V ± 15 %  |
|                             | SA..81..   | Voltage   | AC 24 V ± 20 % / DC 24 V + 20 % / -15%                           |
|                             | SA..61.. (DC 0...10 V)   | Current draw  | ≤ 0,1 mA   |
|                             | SA..61.. (DC 4...20 mA)  | Input impedance   | ≥ 100 kΩ   |
|                             |  | Current draw  | DC 4...20 mA ± 1 %   |
|                             |  | Input impedance   | ≤ 500 Ω  |
| <b>Parallel operation</b>   | SA..61..   | ≤ 10 (depending on controller output)   |  |
| <b>Forced control</b>       | Positioning signal "Z"   | SA..61..  | R = 0...1000 Ω, G, G0  |
|                             |  | R = 0...1000 Ω  | Stroke / rotation proportional to R                              |
|                             | Z connected to G   |   | Max. stroke 100% <sup>1)</sup>   90° <sup>1)</sup>               |
|                             | Z connected to G0  |   | Min. stroke 0% <sup>1)</sup>   0° <sup>1)</sup>                  |
|                             | Voltage  |   | Max. AC 24 V ± 20 %  |
|                             | Current draw   |   | Max. DC 24 V + 20 % / -15%                                       |
|                             |  |   | ≤ 0,1 mA   |
| <b>Position feedback</b>    | Position feedback U  | SA..61..  | DC 0...10 V ± 1 %  |
|                             | Load impedance   |   | >10 kΩ res.  |
|                             | Load   |   | Max. 1 mA  |
| <b>Connecting cable</b>     | Wire cross-sectional areas   | 0.13...1.5 mm <sup>2</sup> , AWG 24...16 <sup>2)</sup>  |  |
|                             | Cable entries  | SA..  | EU: 2 entries Ø 20.5 mm (for M20)<br>1 entry Ø 25.5 mm (for M25) |
|                             |  | SA..U   | US: 3 entries Ø 21.5 mm for ½" tube connection                   |
| <b>Degree of protection</b> | Housing from vertical to horizontal  | IP54 as per EN 60529 <sup>3)</sup>  |  |
|                             | Insulation class   | As per EN 60730   |  |
|                             | Actuators SA..31..   | AC 230 V  | II   |
| Actuators SA..61..          | AC / DC 24 V   | III   |  |
| Actuators SA..81..          | AC / DC 24 V   | III   |  |

|                                 |   |  |
|---------------------------------|---|--|
| <b>Environmental conditions</b> | Operation<br>Climatic conditions<br>Mounting location<br>Temperature General<br>-<br>Humidity (noncondensing) | IEC 60721-3-3<br>Class 3K5<br>Indoors (weather-protected)<br>-5...55 °C   -15...55 °C<br>-   not applicable<br>5...95 % r.h. |
|                                 | Transport<br>Climatic conditions<br>Temperature<br>Humidity   | IEC 60721-3-2<br>Class 2K3<br>-25...70 °C<br><95 % r.h.  |
|                                 | Storage<br>Climatic conditions<br>Temperature<br>Humidity   | IEC 60721-3-1<br>Klasse 1K3<br>-15...55 °C<br>5...95 % r.h.  |
|                                 | Max. media temperatur when mounted on valve   | 130 °C   120 °C  |
| <b>Standards</b>                | CE conformity<br>As per EMC directive<br>Immunity<br>Emmissions   | 2004/108/EC<br>EN 61000-6-2:[2005] Industrial <sup>4)</sup><br>EN 61000-6-3:[2007] Residential                               |
|                                 | Electrical safety   | EN 60730-1   |
|                                 | Low-voltage directive<br>AC 230 V<br>C-tick   | 2006/95/EC<br>N 474  |
|                                 | UL conformity<br>AC 230 V ( SA..3..) -<br>AC/DC 24 V ( SA..6.. ; SA..8..)                                     | -<br>UL 873  |
|                                 | <b>Environmental compatibility</b>  | ISO 14001 (environment)<br>ISO 9001 (quality)<br>SN 36350 (environment-compatible products)<br>RL 2002/95/EG (RoHS)          |
| <b>Dimensions</b>               |   | See "Dimensions" (page 60)   |
| <b>Weight</b>                   | Excl. packaging   | See "Dimensions" (page 60)   |
| <b>Accessories</b>              | Potentiometer ASZ7.5/135<br>Voltage<br>Current rating   | 0...135 Ω ± 5%<br>DC 10 V<br>< 4 mA  |
|                                 | Potentiometer ASZ7.5/200<br>Voltage<br>Current rating   | 0...200 Ω ± 5%<br>DC 10 V<br>< 4 mA  |
|                                 | Potentiometer ASZ7.5/1000<br>Voltage<br>Current rating  | 0...1000 Ω ± 5%<br>DC 10 V<br>< 4 mA   |
|                                 | Auxiliary switch ASC10.51<br>Switching capacity   | AC 24...230 V, 6 A res., 3 A ind.  |
|                                 | Stem heating element ASZ6.6<br>power supply<br>Power consumption at 50 Hz<br>Inrush current (cold)            | AC / DC 24 V<br>40 VA / 30 W<br>Max. 13 A  |

<sup>1)</sup> Observe acting direction of DIL switches

<sup>2)</sup> AWG = American wire gauge

<sup>3)</sup> Also with weather shield ASK39.1

<sup>4)</sup> Transformer 160 VA (e.g. Siemens 4AM 3842-4TN00-0EA0) for actuators operating on AC 24 V

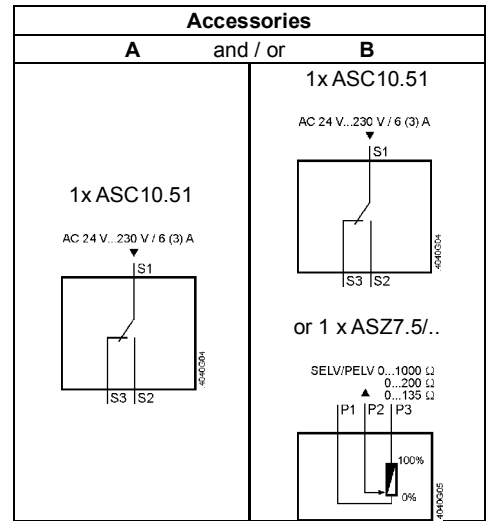
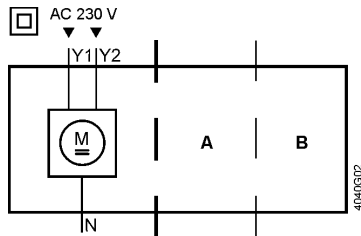
<sup>5)</sup> SAL.T20 / T40 have a minimum holding torque of 14 Nm



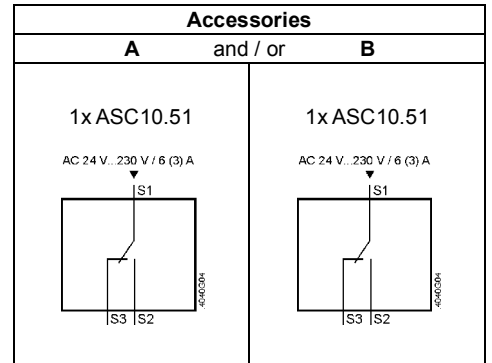
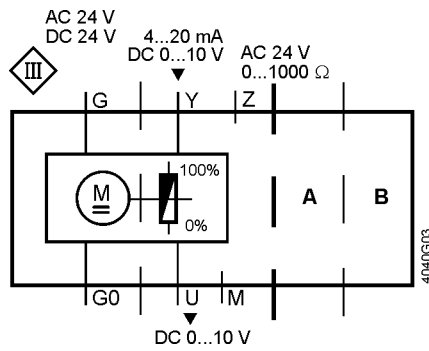
# 6 Connection diagrams and dimensions

## 6.1 Internal diagrams

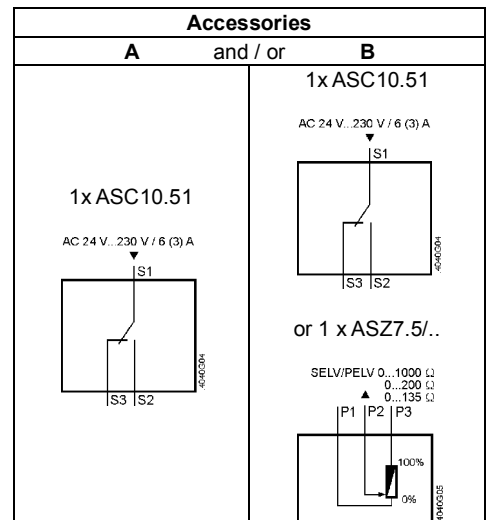
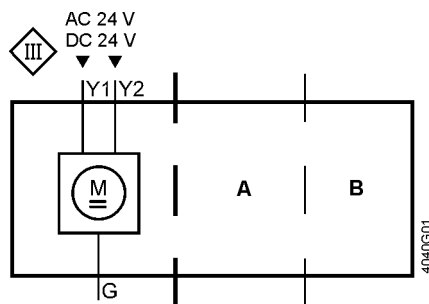
SA..31..



SA..61..



SA..81..

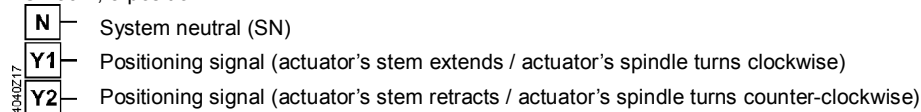


## 6.2 Connection terminals

### 6.2.1 Actuators

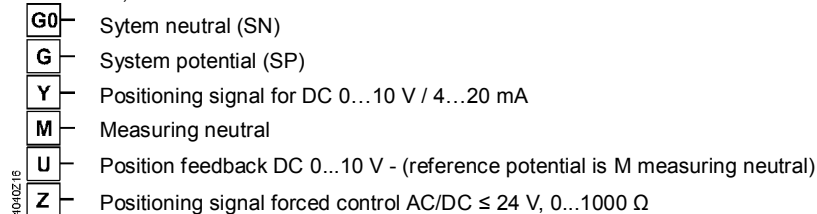
SA..31..

AC 230 V, 3-position



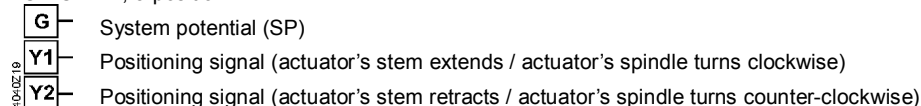
SA..61..

AC/DC 24 V, DC 0...10 V / 4...20 mA / 0...1000 Ω



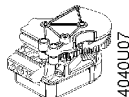
SA..81..

AC/DC 24 V, 3-position

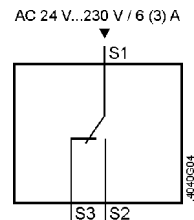
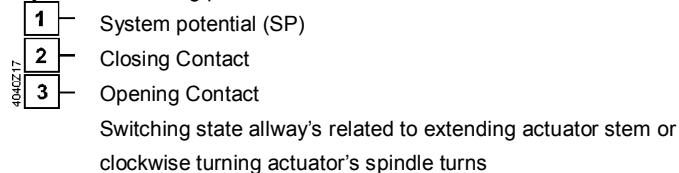


### 6.2.2 Electrical accessories

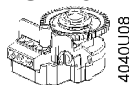
**Auxiliary switch**  
**ASC10.51**



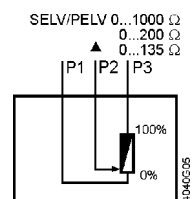
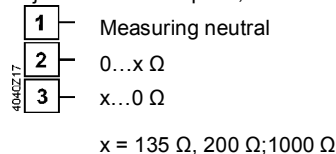
Adjustable switching points, AC 24...230 V



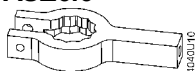
**Potentiometer**  
**ASZ7.5/..**



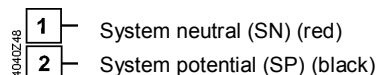
Adjustment of zero point, DC 10 V



**Stem heating element**  
**ASZ6.6**

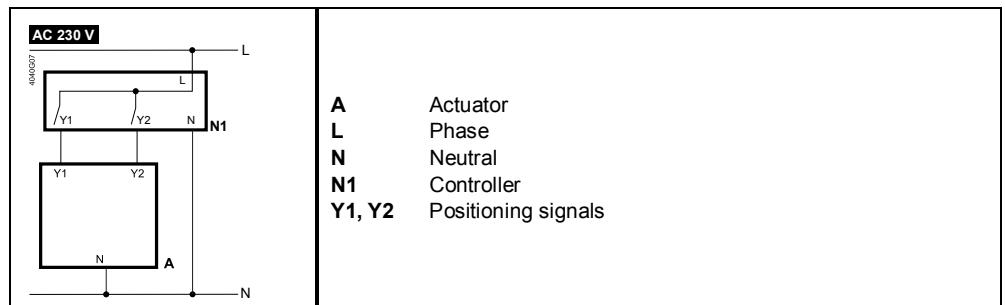


AC 24 V / 30 W / 40 VA / inrush current max. 13A

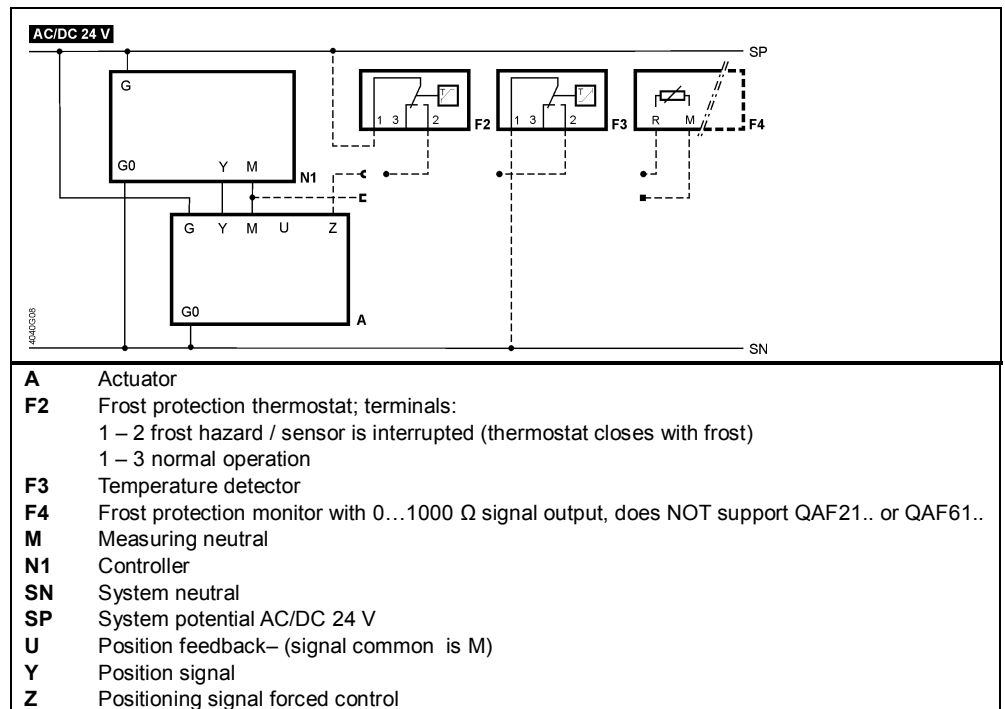


## 6.3 Connection diagrams

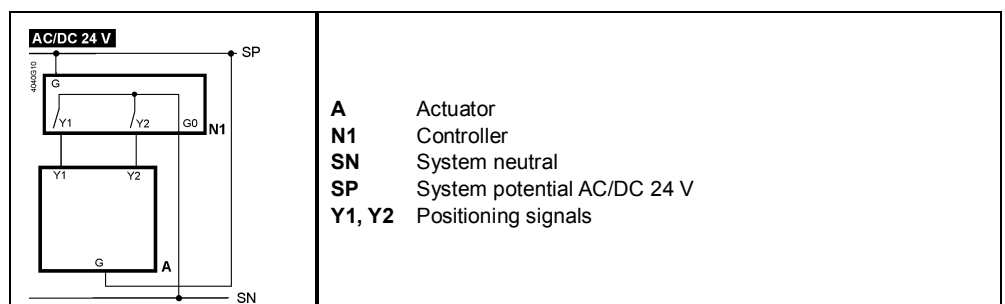
SA..31..



SA..61..



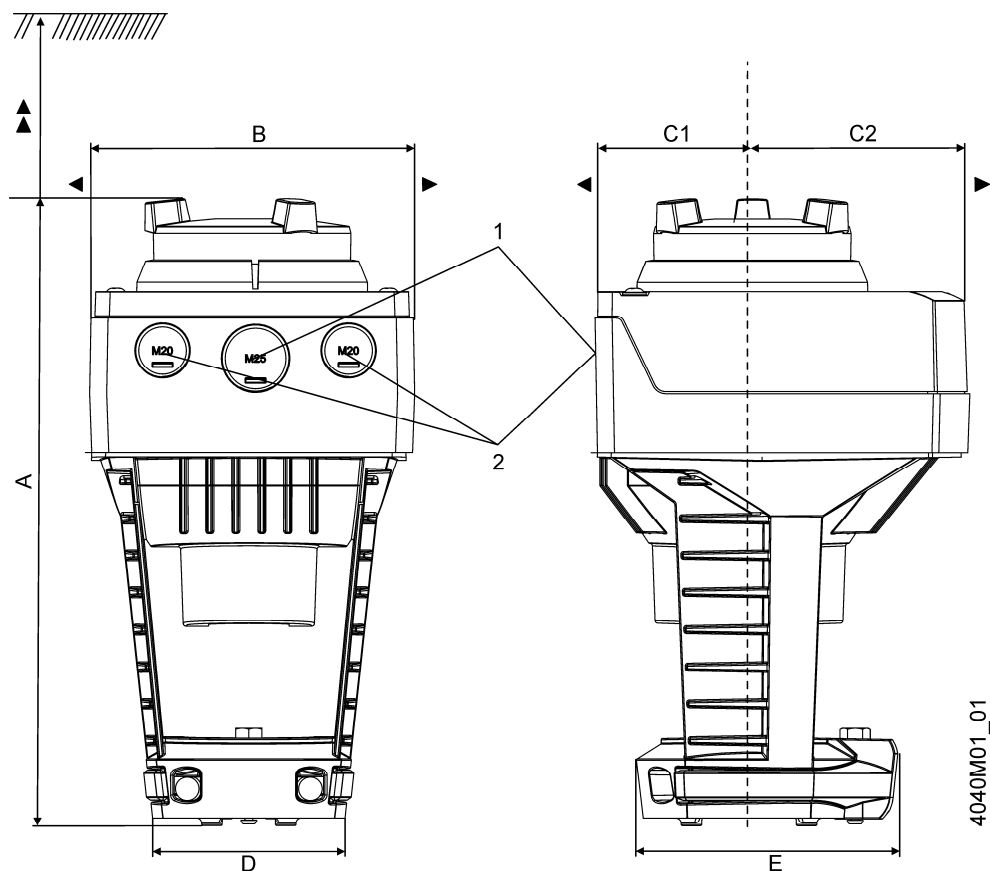
SA..81..



## 6.4 Dimensions

### 6.4.1 Stroke actuators

Dimensions in mm

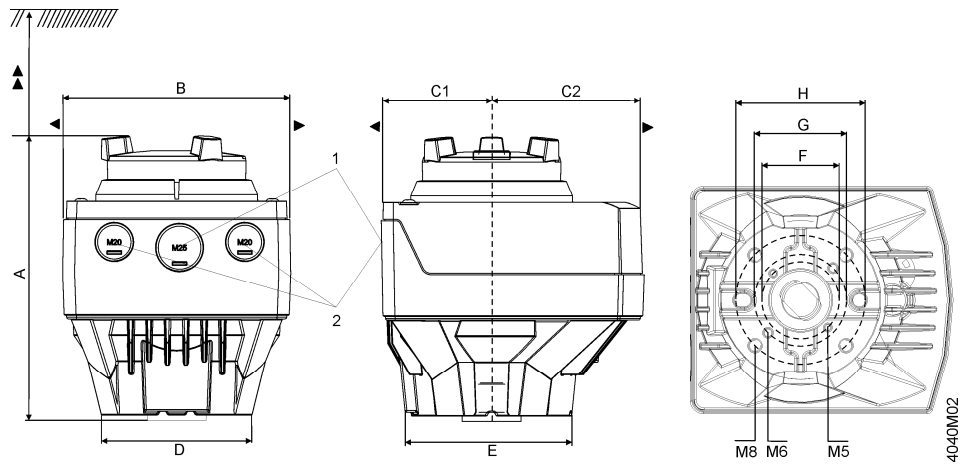


- 1 SAX.: M25  
SAX..U: ½" (Ø 21.5 mm)
- 2 SAX.: M20  
SAX..U: ½" (Ø 21.5 mm)

| Type                       | A   | B   | C   | C1  | C2  | D  | E   | ▶   | ▶▶  | kg    |
|----------------------------|-----|-----|-----|-----|-----|----|-----|-----|-----|-------|
| <b>SAX..00 und SAX..03</b> | 242 | 124 | 150 | 68  | 82  | 80 | 100 | 100 | 200 | 1,850 |
| <b>Mit ASK39.1</b>         | +25 | 154 | 300 | 200 | 100 | -  | -   | -   | -   | 2,080 |

## 6.4.2 Rotary actuators

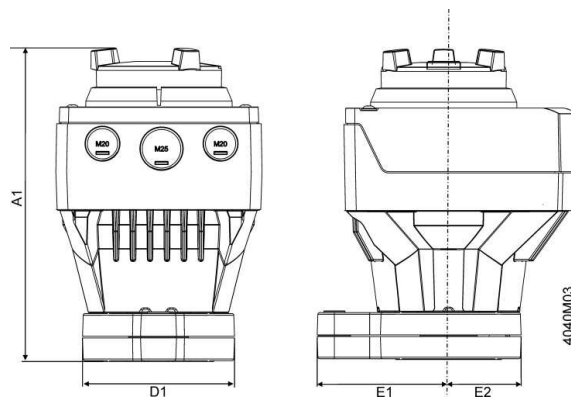
Dimensions in mm



- 1 SAL...: M25
- 2 SAL...: M20

| Typ         | A   | B   | C   | C1  | C2  | D  | E  | F  | G  | H  | ▶   | ▶▶  | kg       |          |          |
|-------------|-----|-----|-----|-----|-----|----|----|----|----|----|-----|-----|----------|----------|----------|
|             |     |     |     |     |     |    |    |    |    |    |     |     | SAL..T10 | SAL..T20 | SAL..T40 |
| SAL..       | 160 | 124 | 150 | 68  | 82  | 82 | 88 | 42 | 50 | 70 | 100 | 200 | 1.475    | 1.600    | 1.625    |
| Mit ASK39.1 | +25 | 154 | 300 | 200 | 100 | -  | -  | -  | -  | -  | -   | -   | 1.710    | 1.835    | 1.860    |

With mounting set  
ASK3..N



| Type               | A1  | D1 | E1 | E2 |
|--------------------|-----|----|----|----|
| SAL.. with ASK3..N | 188 | 88 | 80 | 44 |
| With ASK39.1       | +25 | -  | -  | -  |

## 7 Revision numbers

| Product no.       | Valid from rev. no. | Product no.        | Valid from rev. no. |
|-------------------|---------------------|--------------------|---------------------|
| <b>SAX31.00</b>   | ..G                 | <b>SAL31.00T10</b> | ..D                 |
|                   |                     | <b>SAL31.00T20</b> | ..C                 |
|                   |                     | <b>SAL31.00T40</b> | ..A                 |
| <b>SAX31.03</b>   | ..G                 | <b>SAL31.03T10</b> | ..D                 |
|                   | ..G                 | <b>SAL61.00T10</b> | ..D                 |
|                   | ..G                 | <b>SAL61.00T20</b> | ..C                 |
|                   |                     | <b>SAL61.00T40</b> | ..A                 |
| <b>SAX61.03..</b> | ..G                 | <b>SAL61.03T10</b> | ..D                 |
|                   |                     | <b>SAL81.00T10</b> | ..D                 |
| <b>SAX81.00..</b> |                     | <b>SAL81.00T20</b> | ..C                 |
|                   |                     | <b>SAL81.00T40</b> | ..A                 |
| <b>SAX81.03..</b> | ..G                 | <b>SAL81.03T10</b> | ..D                 |

# 8 Glossary

## 8.1 Symbols

---



Caution, general danger – read the notes!



Caution, hot surface – read the notes!



Condition as supplied to customer



Crosstip screwdriver (Pozidriv)



Slotted screwdriver



Screw wrench



Allen key

## 8.2 Terms

---

### DIL switches

A DIL switch shows the switching choices in the form of a place value system (dual in line) in relation to basis 2 (on and off).

### DN

Nominal size: Characteristic for matching parts of the piping system.

### Forced control

Forced control serves for overriding automatic mode and is implemented in the structure.

### HEX switches

A HEX switch shows the switching choices in the form of a place value system (hexadecimal system) in relation to basis 16 (0...9 and A...F).

### kPa

Unit of pressure: 100 kPa = 1 bar = 10 mWS.

### $k_{vs}$

Nominal flow rate: Nominal flow rate of cold water (5...30 °C) through the fully open valve ( $H_{100}$ ) at a differential pressure of 100 kPa (1 bar).

### LED

Light emitting diode.

### PN

PN class: Characteristic relating to the combination of mechanical und dimensional properties of a component in the piping system.

### Position feedback

Signal used to acquire the position, fed back via an input.

### Spring return facility

Refer "fail safe function".

### $\Delta p_{max} / \Delta p_{maxV}$

Maximum permissible differential pressure across the valve's control path, valid for the entire actuating range of the motorized valve (V = diverting mode).

### $\Delta p_s$

Maximum permissible differential pressure at which the motorized valve will close securely against the pressure (close off pressure).

### slotted screwdriver

# Index

|   |                           |  |                         |
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| A/D conversion .....  | 37, 40                    | Document use .....   | <b>7</b>                |
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| Electrical accessories .....  | 13                        | <b>Engineering</b> .....   | <b>8</b>                |
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