

# 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>					Page 37-38		
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>					Page 37-38		
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	22.12.2010	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	14.09.2011	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	12.09.2013	Corrections regarding SAX..Series „G“ “	2.4, 4.1, 4.7, 4.13, 5, 6.4
3.1	10.10.2013	SAL..T40 is added	...

## 1.3 Reference documents

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

## 1.4 Before you start

### 1.4.1 Trademarks

The table below lists the third-party trademarks used in this document and their legal owners. The use of trademarks is subject to international and domestic provisions of the law.

Trademarks	Legal owner
Acvatix™	Siemens Switzerland Ltd

All product names listed in the table are registered (®) or not registered (™) trademarks of the owner listed in the table. We forgo the labeling (e.g. using the symbols ® and ™) of trademarks for the purposes of legibility based on the reference in this section.

### 1.4.2 Copyright

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### 1.4.3 Quality assurance

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These documents were prepared with great care.

- The contents of all documents are checked at regular intervals
- 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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The addresses of the Siemens regional companies are available at [www.siemens.com/acvatix](http://www.siemens.com/acvatix).

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## 1.5 Scope of this documentation

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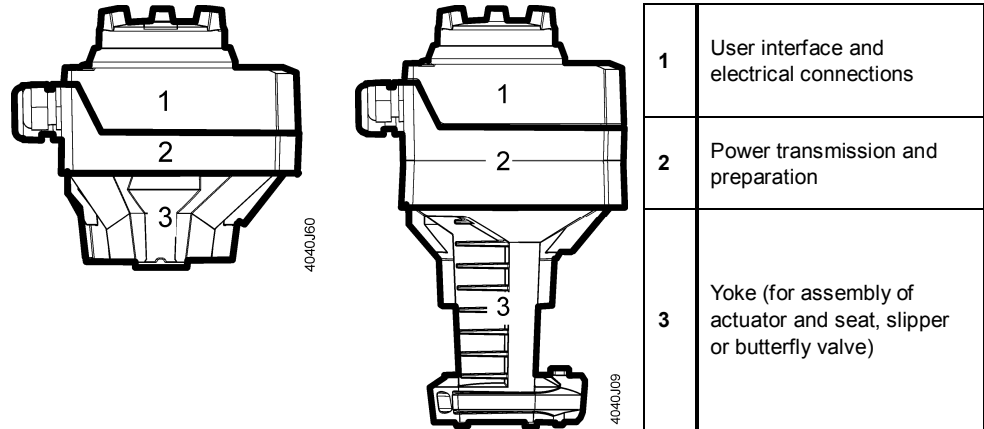
This document shall serve as a source of knowledge. In addition to basic information, it provides general technical information about the actuators used in HVAC plants. It is also targeted at engineering staff, HVAC electrical planners, system integrators and service engineers and provides all information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

## 2 Engineering

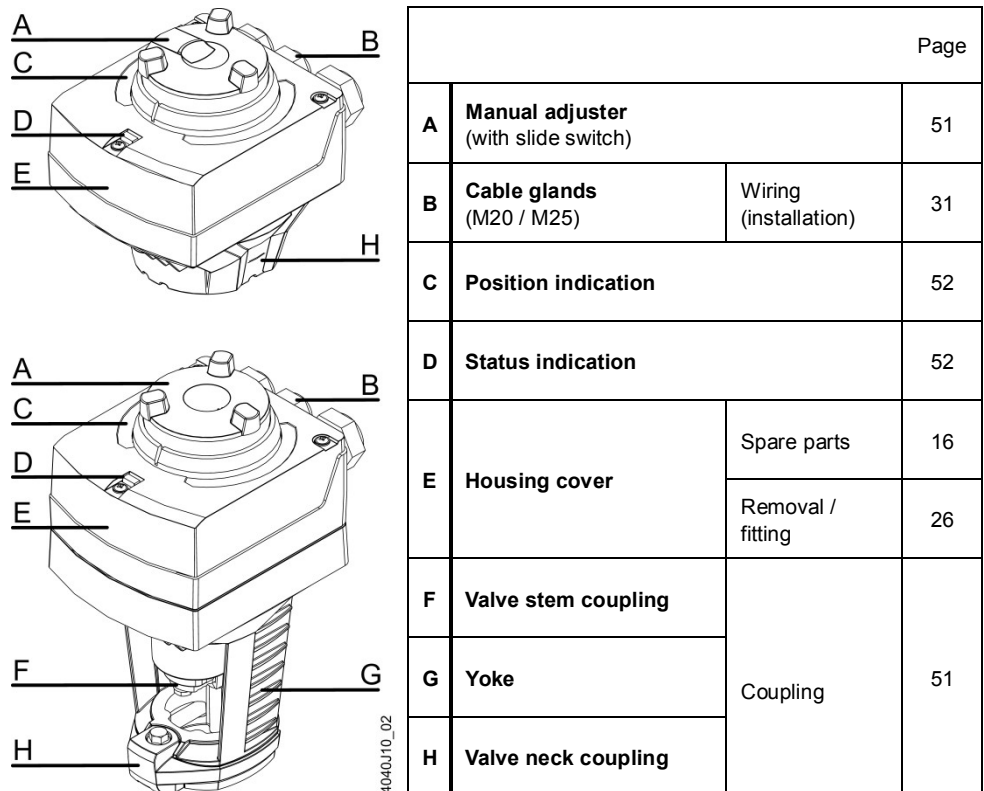
### 2.1 Product description

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 DC 4...20 mA 0...1000 Ω		3-position	30 s		✓	Position feedback, forced control, change of characteristic
<b>SAX61.03</b> <b>SAX61.03U</b>	S55150-A100 S55150-A100-A100							120 s		-	-
<b>SAX81.00</b> <b>SAX81.00U</b>	S55150-A102 S55150-A102-A100							30 s		-	-
<b>SAX81.03</b> <b>SAX81.03U</b>	S55150-A103 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 DC 4...20 mA 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 DC 4...20 mA 0...1000 Ω	3-position	120 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						

## 2.4 Ordering

Example

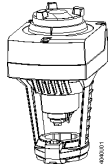






Product no.	Stock no.	Description	Quantity
SAX81.03	S55150-A103	Actuator	1
ASZ7.5/1000	S55845-Z106	Potentiometer	1

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>						
<b>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>Δp<sub>maxV</sub><sup>5)</sup> [kPa]</b>	<b>Δp<sub>max</sub> [kPa]</b>	
<b>PN6</b>  -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>  -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>  -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>  -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			
		VXF41.39...40 <sup>1)</sup>	40	12 / 19			
		VXF41.49...50 <sup>1)</sup>	50	19 / 31			
<b>PN25/16</b>  -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					
<b>PN16</b>  -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<sub>vs</sub> value

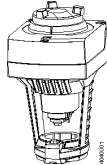







2) .. = insert k<sub>vs</sub> value

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) Δp<sub>maxV</sub> = 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>  -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>  -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>  -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>  -10...130 °C <sup>3)</sup>	N4340	VVF41.49	50	19	350	300	
		VVF41.50	50	31			
<b>PN25</b>  -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>  -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>  -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			
		VVG41.32	32	16			1'550
		VVG41.40	40	25	875		525
		VVG41.50	50	40	300		300

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

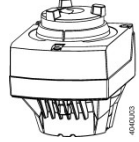

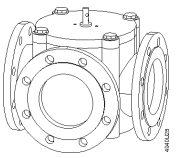

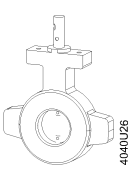

<sup>2)</sup> .. = insert  $k_{vs}$  value

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

## 2.5.3 Stroke Actuators – combi valves

Valves				Actuators SAX..P..	
		DN	H <sub>100</sub> [mm]	Δp <sub>max</sub> [kPa]	Δp <sub>s</sub> [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			
	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							1'600	800

<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 ASC10.51	Potentiometer ASZ7.5/.. <sup>1)</sup>	Function module AZX61.1	Stem heating element ASZ6.6
Stock no.	S55845-Z103	S55845-Z104 (ASZ7.5/135) S55845-Z105 (ASZ7.5/200) 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 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.. VVF31../VXF31.. VVF40../VXF40..	VVF41../VXF41.. VVG41../VXG41..	VVF51.. 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
SQL32..	SQL32.10	125	12,5	SAL31.00T10	120
	SQL32.12	70	12,5	SAL31.00T10 or SAL31.03T10 <sup>1)</sup>	120
	SQL32.13	30	5	SAL31.03T10	30
SQL33..	SQL33.00	125	12,5	SAL31.00T10	120
	SQL33.03	30	10	SAL31.03T10	30
SQL83..	SQL83.00	125	12,5	SAL81.00T10	120
	SQL83.04	30	10	SAL81.03T10	30
SQL35..	SQL35.00	125	20	SAL31.00T20 <sup>2)</sup>	120
	SQL35.00	125	20	SAL31.00T40 <sup>2)</sup>	120
SQL85..	SQL85.00	125	20	SAL81.00T20 <sup>2)</sup>	120
	SQL85.00	125	20	SAL81.00T40 <sup>2)</sup>	120

<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.. SQL83..	SQL35.. SQL85..	SAL31.00T10 SAL31.03T10 SAL81.00T10 SAL81.03T10	SAL31.00T20 SAL81.00T20	SAL31.00T40 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, 1 potentiometer (1000 Ω)	ASZ7.4	-	ASZ7.4	-	<b>ASC10.51 + 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 SQL85.00	-	SAL31.00T20 / T40 SAL81.00T20 / T40
ASZ7.4	1 auxiliary switch, 1 potentiometer (1000 Ω)	-	-	ASZ7.4	ASZ7.4	<b>ASC10.51 + ASZ7.5/1000</b>	<b>ASC10.51 + 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>	-

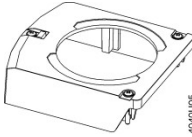
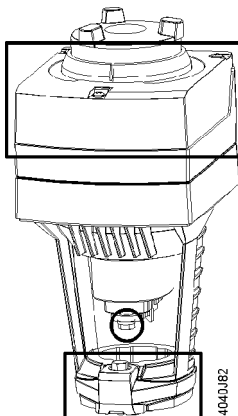

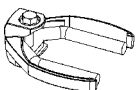
<sup>1)</sup> Used auxiliary switches or potentiometer (order accessories additionally were applicable):

- Check used functionality
- Check compatibility with controller

## 2.8 Spare parts

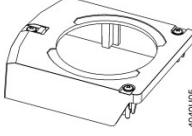
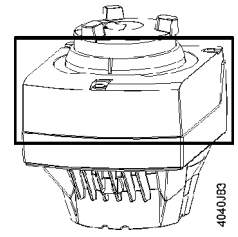


The following spare part sets are available:

**SAX..**

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

Single components from the spare part sets are not available.

**SAL..**

<b>Stock number</b> 8000060844	<b>Housing cover</b> 	
	<b>2 adapters</b>  <ul style="list-style-type: none"> <li>1 pc. 14 mm</li> <li>1 pc. 11 mm</li> </ul>	
	<b>4 screws</b>  <ul style="list-style-type: none"> <li>2 pcs. M5 x 20 mm</li> <li>2 pcs. M6 x 20 mm</li> </ul>	

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

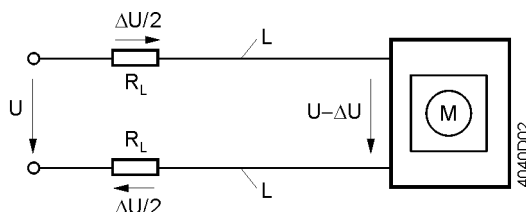
When determining the cable length and the wire cross-sectional area, adherence to the permissible operating voltage tolerance at the actuator is of importance, in addition to the permissible voltage drop across the operating voltage and signal lines (see table below).

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:

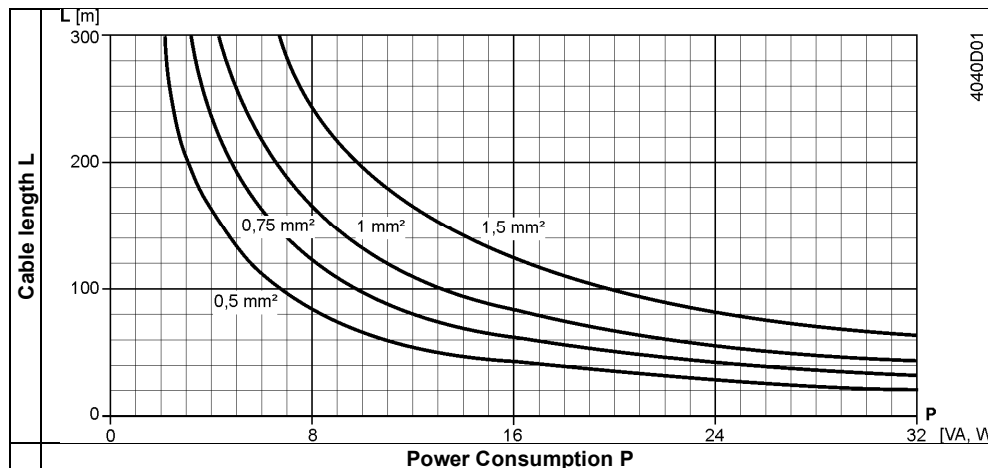
- With modulating control, the permissible positioning signal error must not exceed 1%, the reason being the voltage drop on the G0 wire.
- The voltage drop, caused by charging current peaks in the actuator's DC circuit, must not exceed 2 Vpp.
- If the G0 line is not correctly sized, load changes of 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.

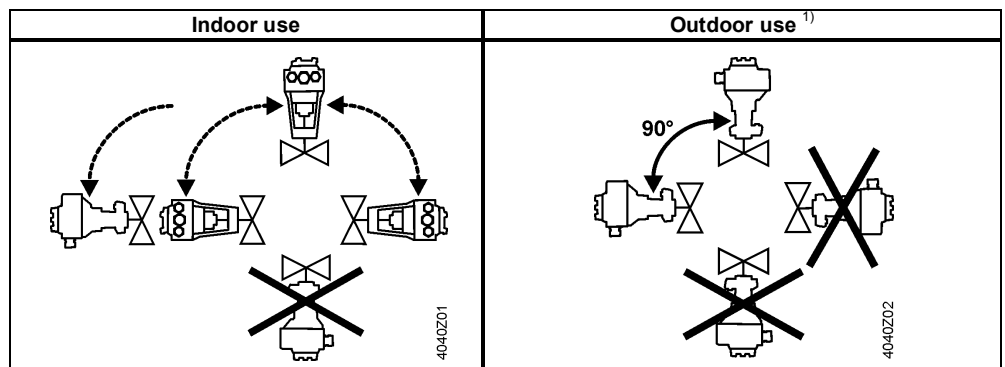
**Note**

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

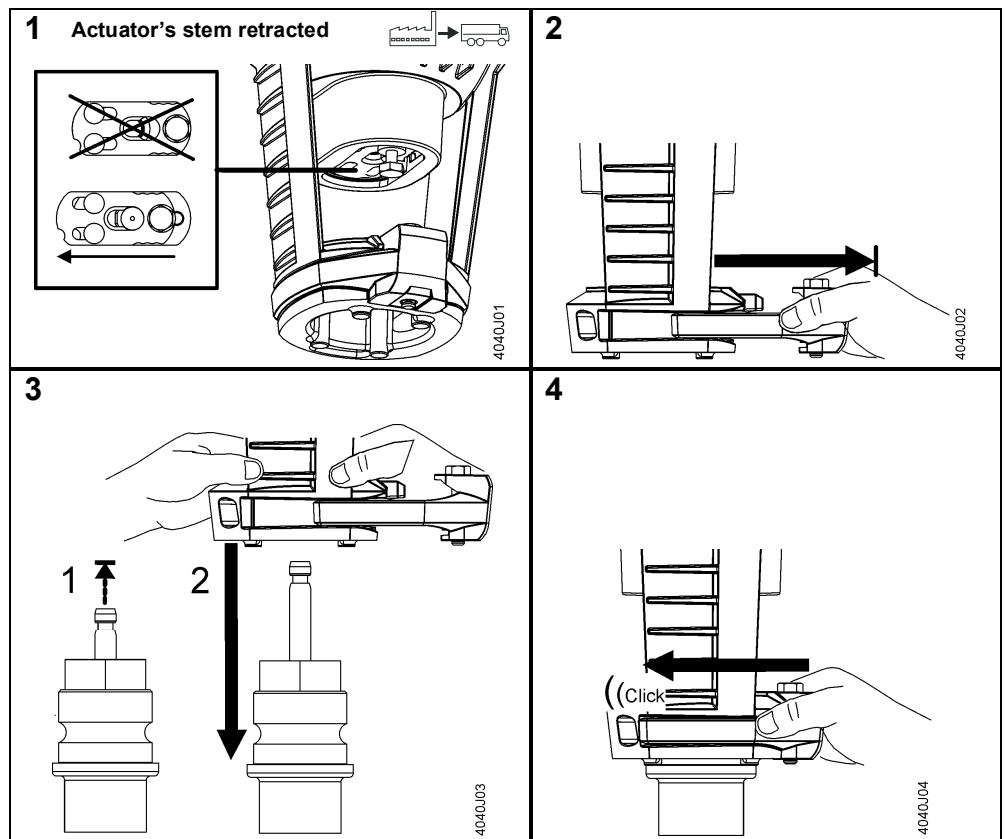
##### 3.1.1 Mounting positions

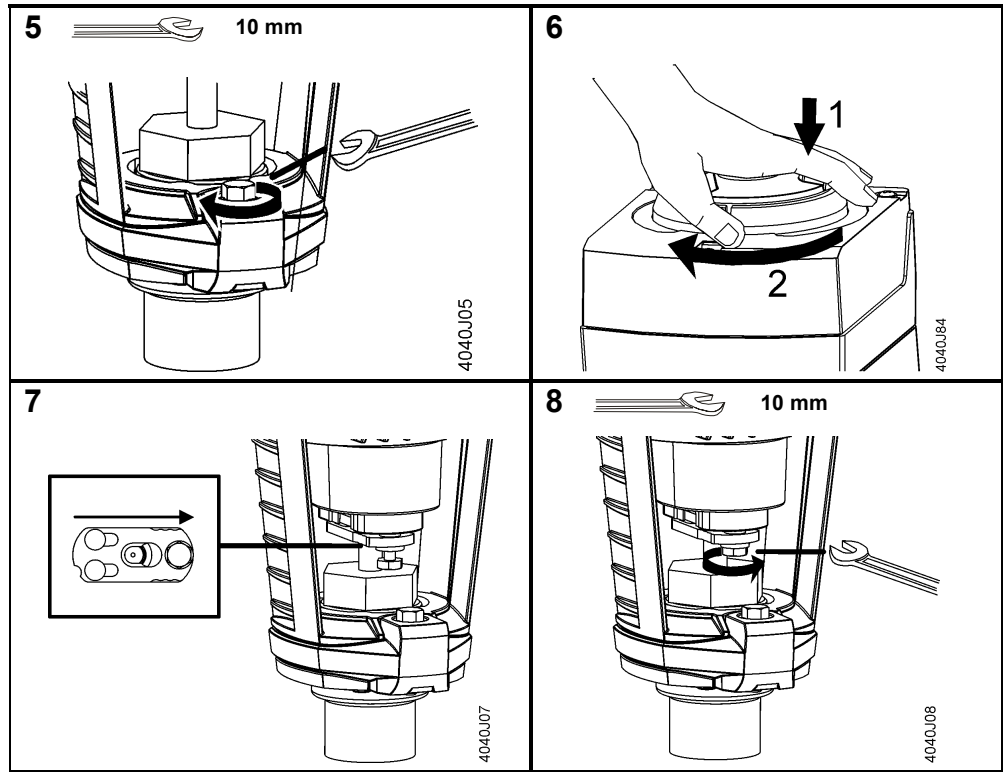


<sup>1)</sup> Only in connection with weather shield ASK39.1

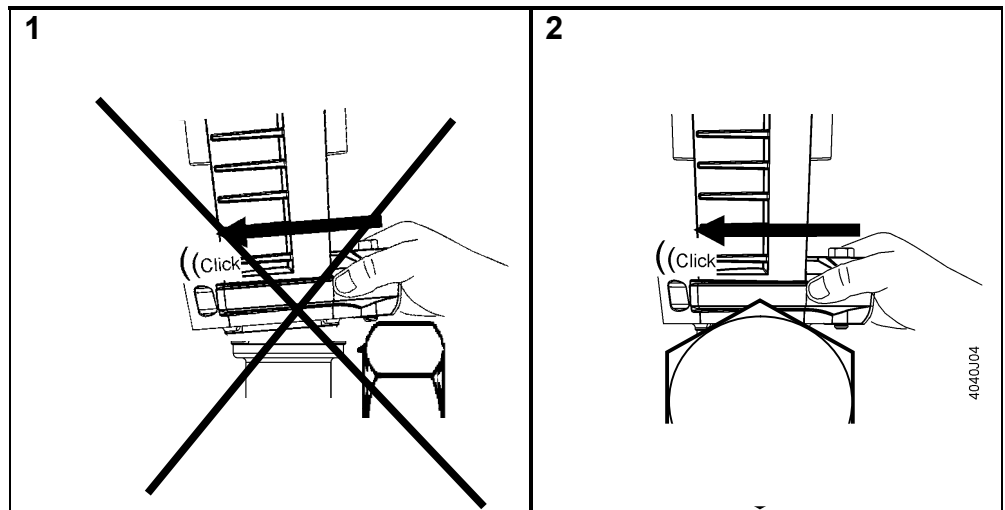
##### 3.1.2 Fitting stroke actuators to seat valves VVF.. / VXF.. or VVG.. / VXG..

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





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

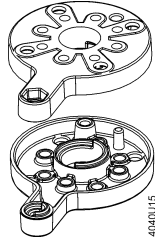
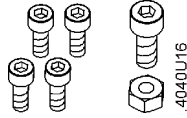
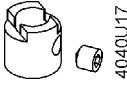
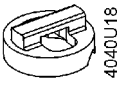


On threaded valves it's possible that the actuator is missaligned on the valve due to a collision with the fitting. If so, please take care for correct mounting, either by turning the actuator or by adjusting the fitting (e.g. use a second sealing to change fitting position).

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

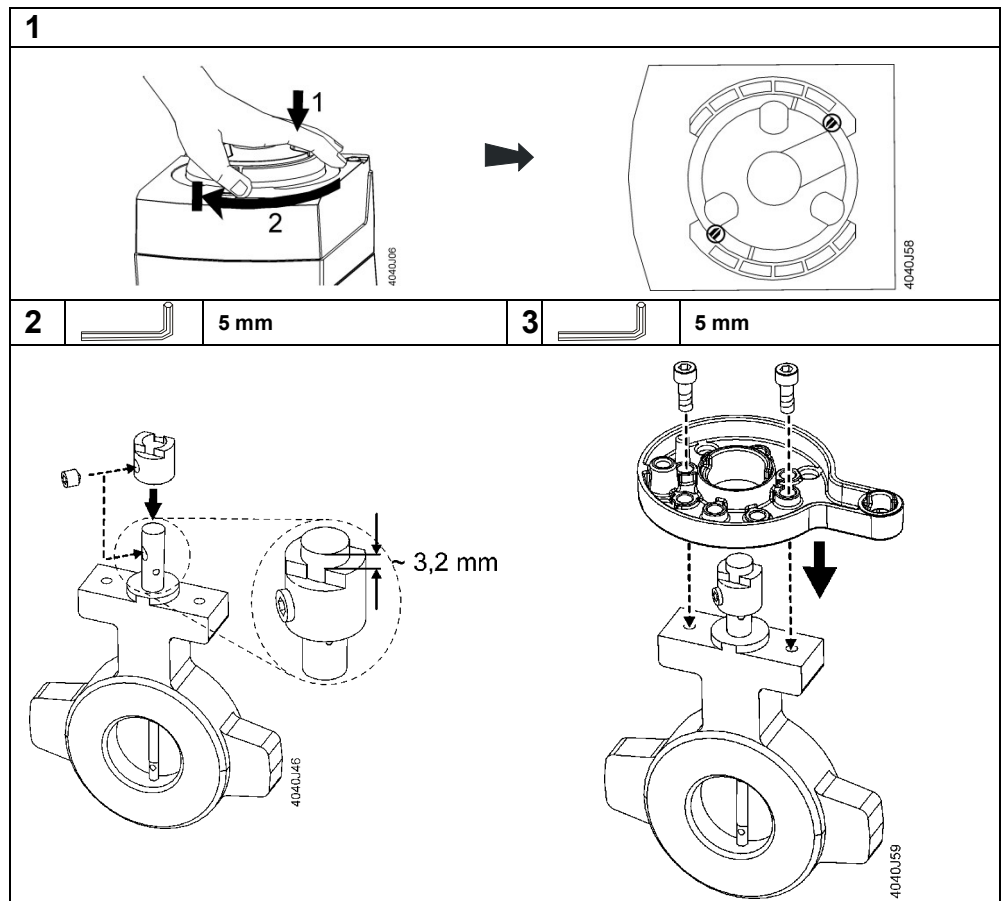
First, observe "Mounting positions" (page 19).

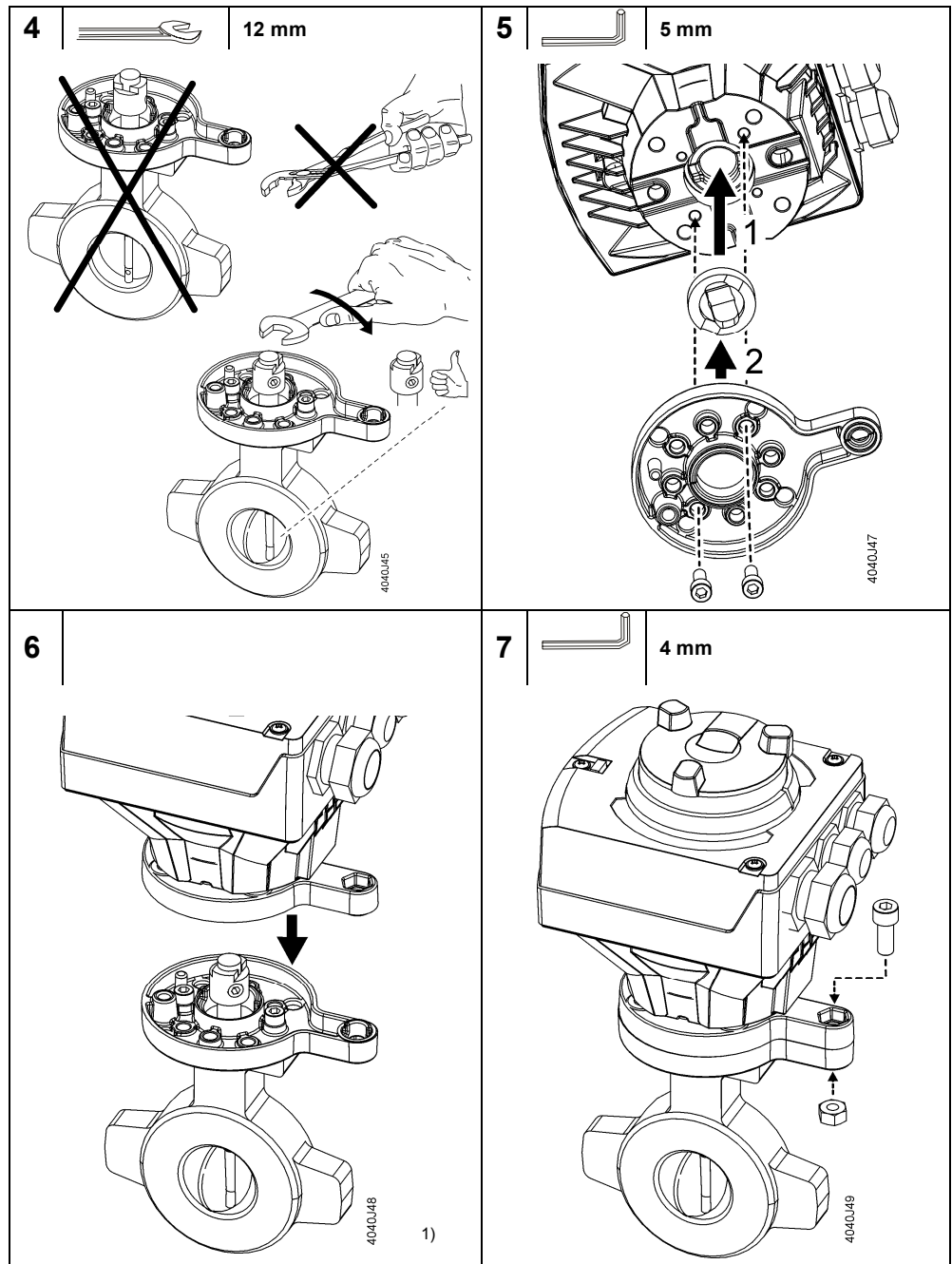
#### Mounting set ASK33N

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

#### Note

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



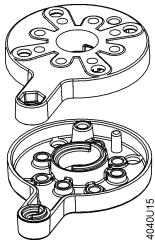
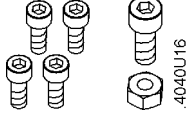
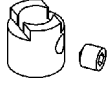
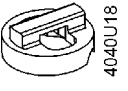


<sup>1)</sup> Angle position errors between actuator shaft and valve stem must be corrected via manual control (refer to "Manual adjuster" page 51).

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

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

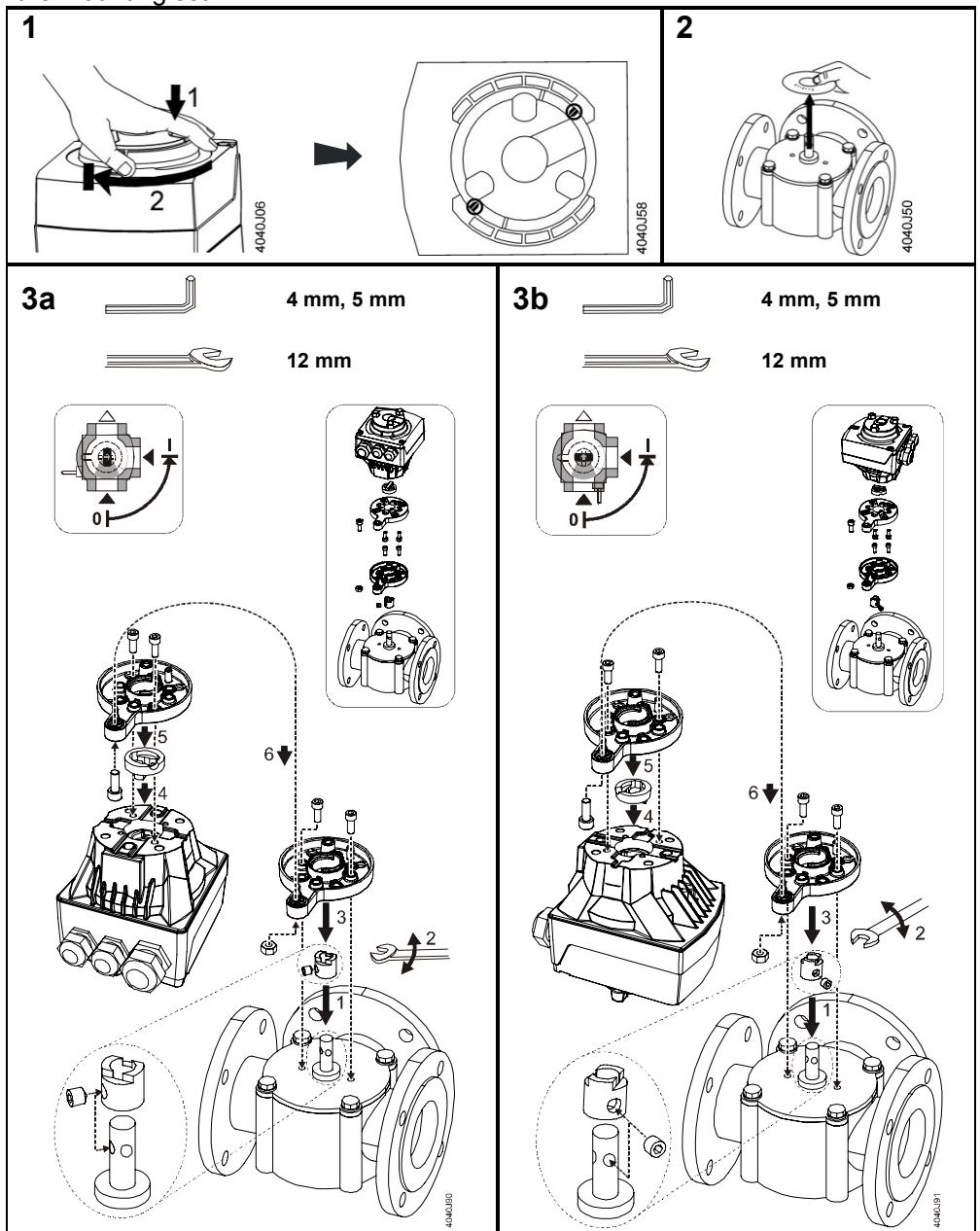
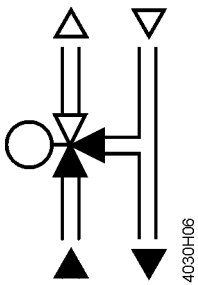
#### Mounting set ASK31N

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

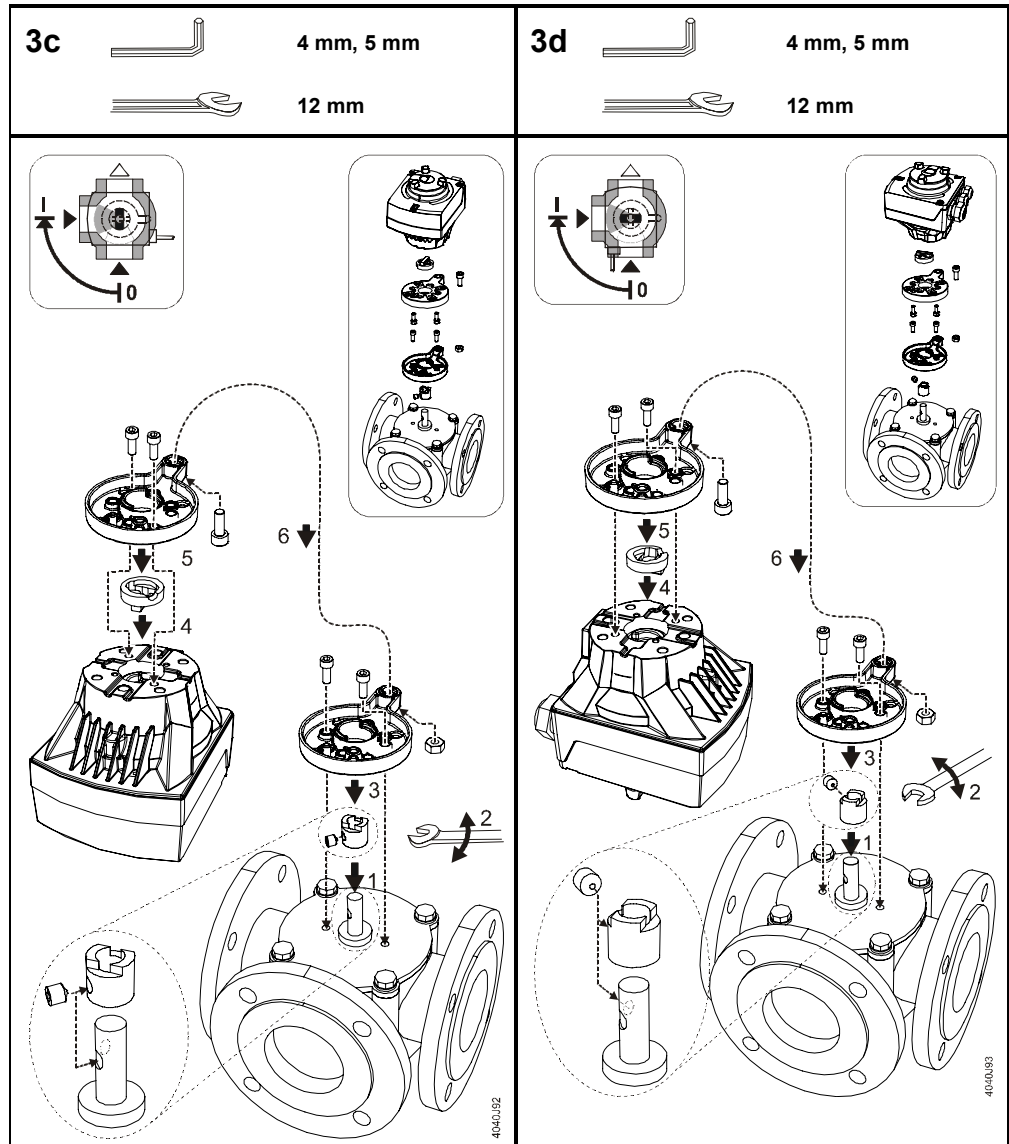
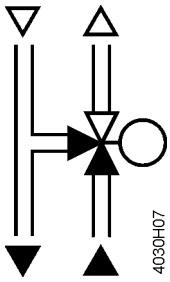
SAL..T10 rotary actuators only fit on VBF21.., DN65...150. For VBF21.., DN40/50 use SQK34.., SQK84.. or SQK33.00 rotary actuators.

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

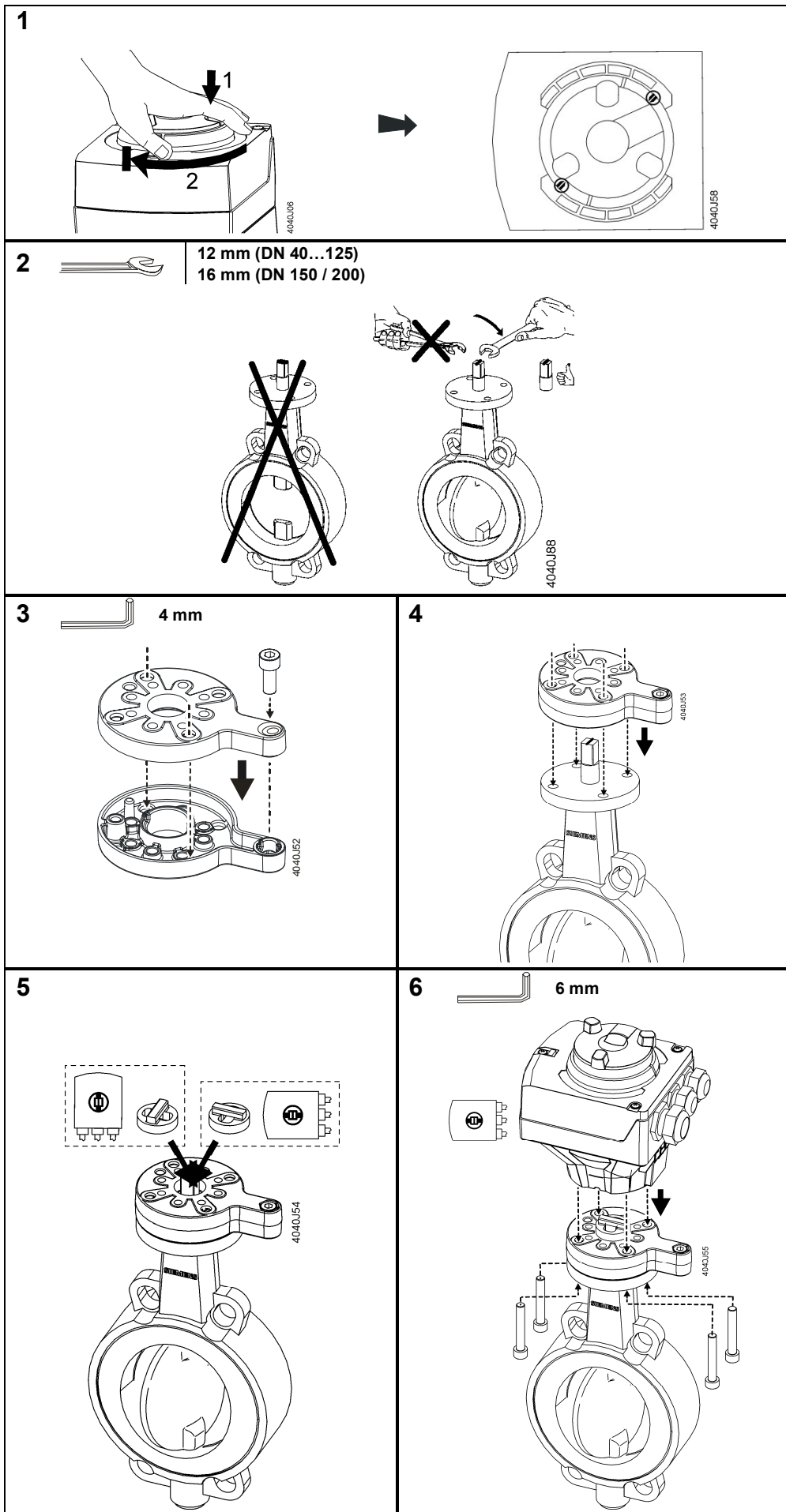
For VKF45..

Scope of delivery		
Mounting set (2 parts)	5 screws	2 adapters
<p>4040U15</p>	<p>2 pcs. M8 x 50 mm 1 pc. M5 x 20 mm incl. nut</p> <p>4040U19</p>	<p>1 pc. 12 mm 1 pc. 16 mm</p> <p>16 mm 12 mm</p>

#### Note

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





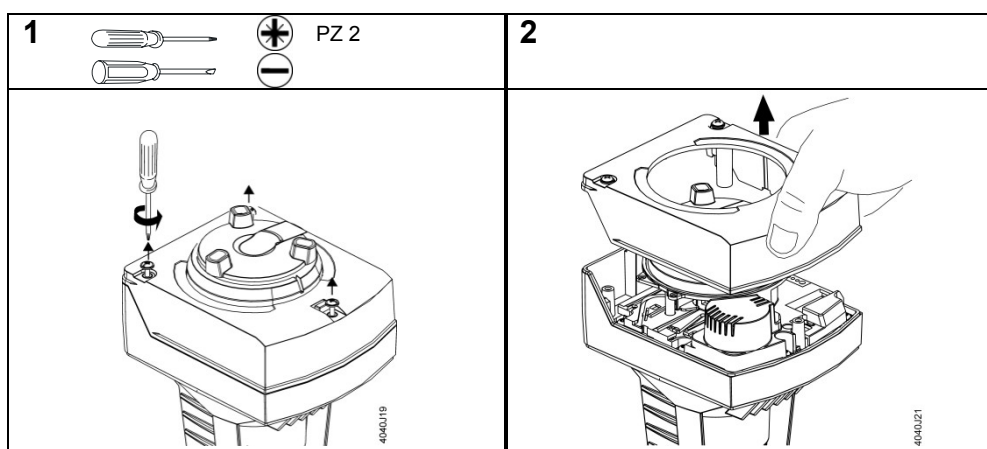
### 3.1.7 Accessories

#### Special notes on mounting

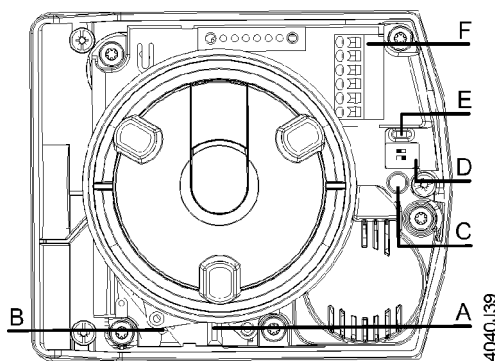


Before fitting the accessory items shown below, the following steps must be performed:

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.

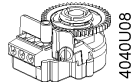


Interior view of setting elements and plug-in spaces



	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/..

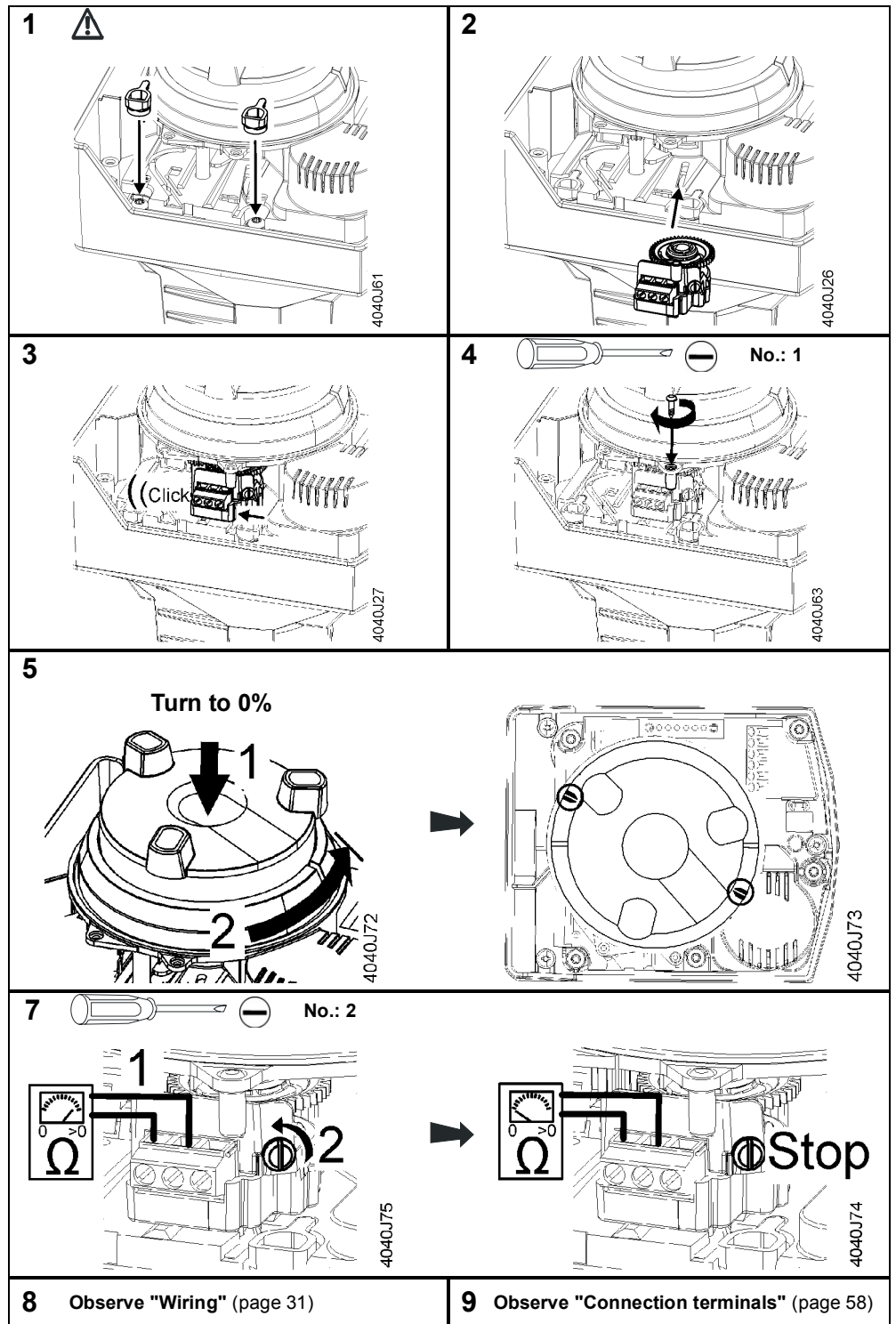


Scope of delivery		
1 potentiometer ASZ7.5/..	1 screw	2 screw covers
4040U08	1 pc. 	4040U29



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

Plug-in space A



## Function module

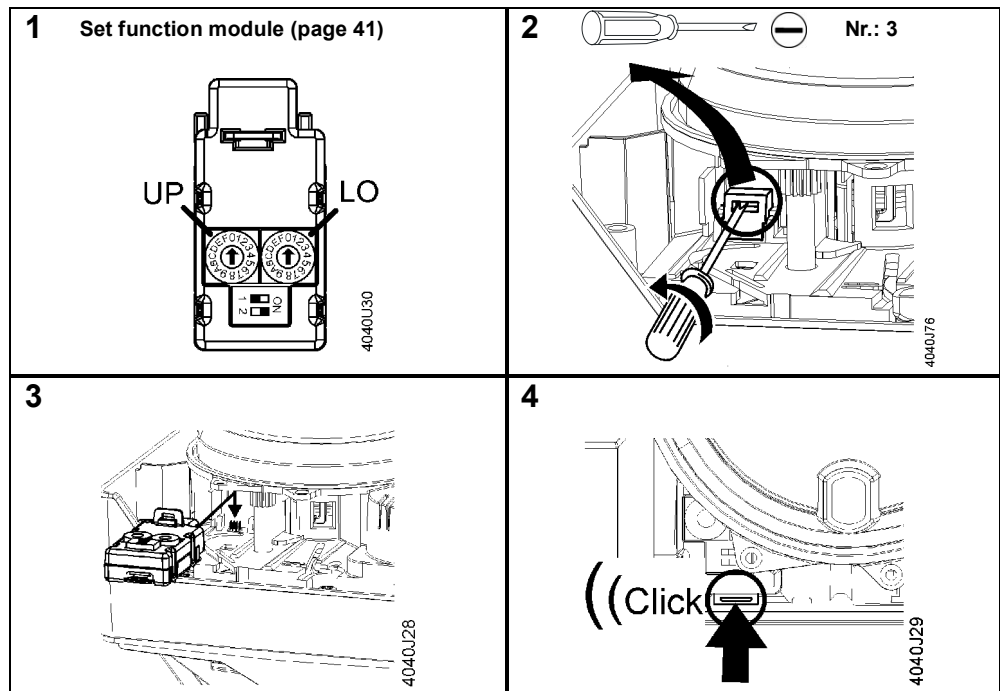
### AZX61.1



4040U09

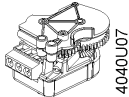
Plug-in space B

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



## Auxiliary switch

### ASC10.51



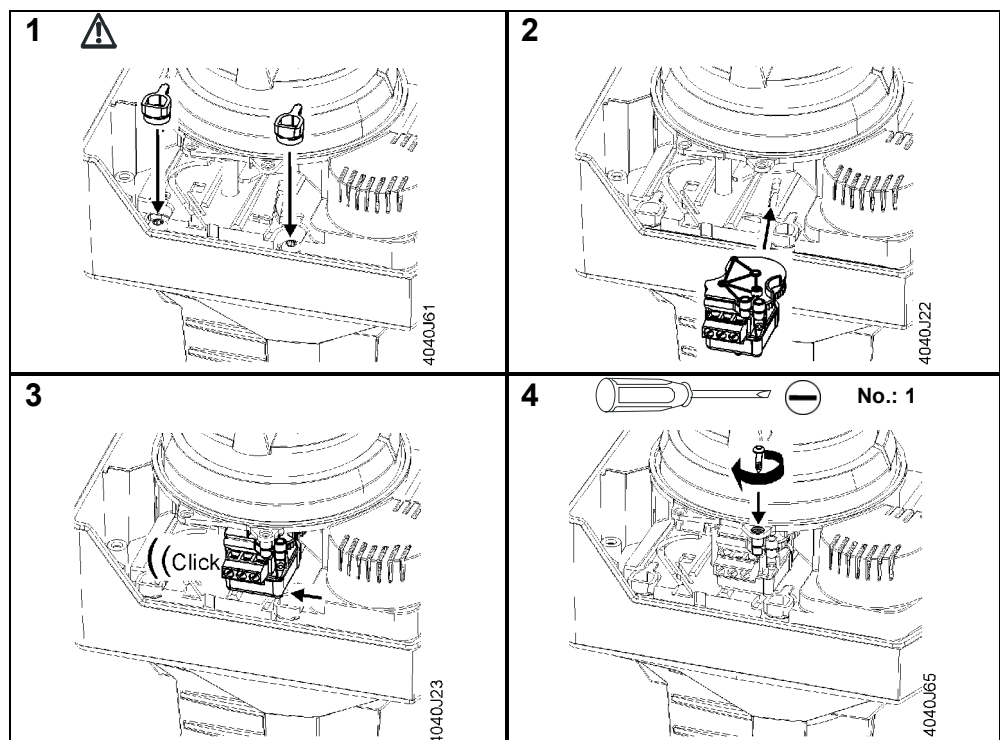
4040U07

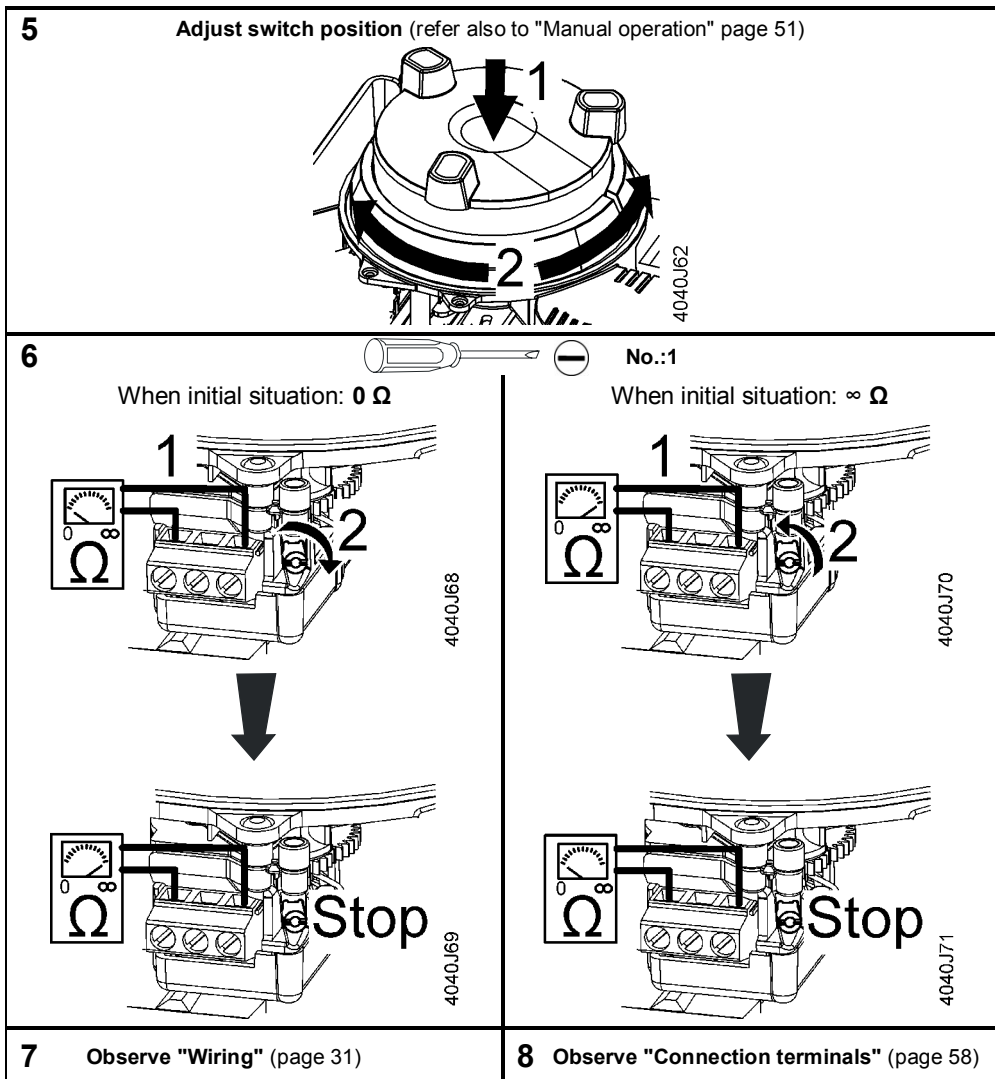
Plug-in space A



Scope of delivery		
1 auxiliary switch ASC10.51	1 screw	2 screw covers
4040U07	1 pc. 4040U28	4040U29

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

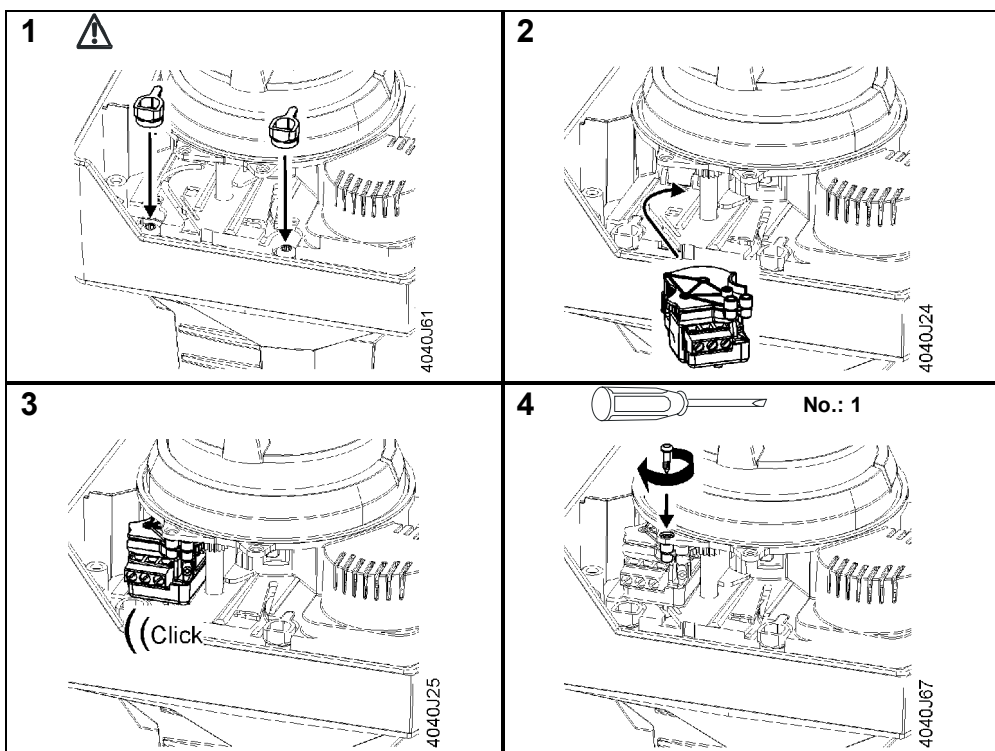


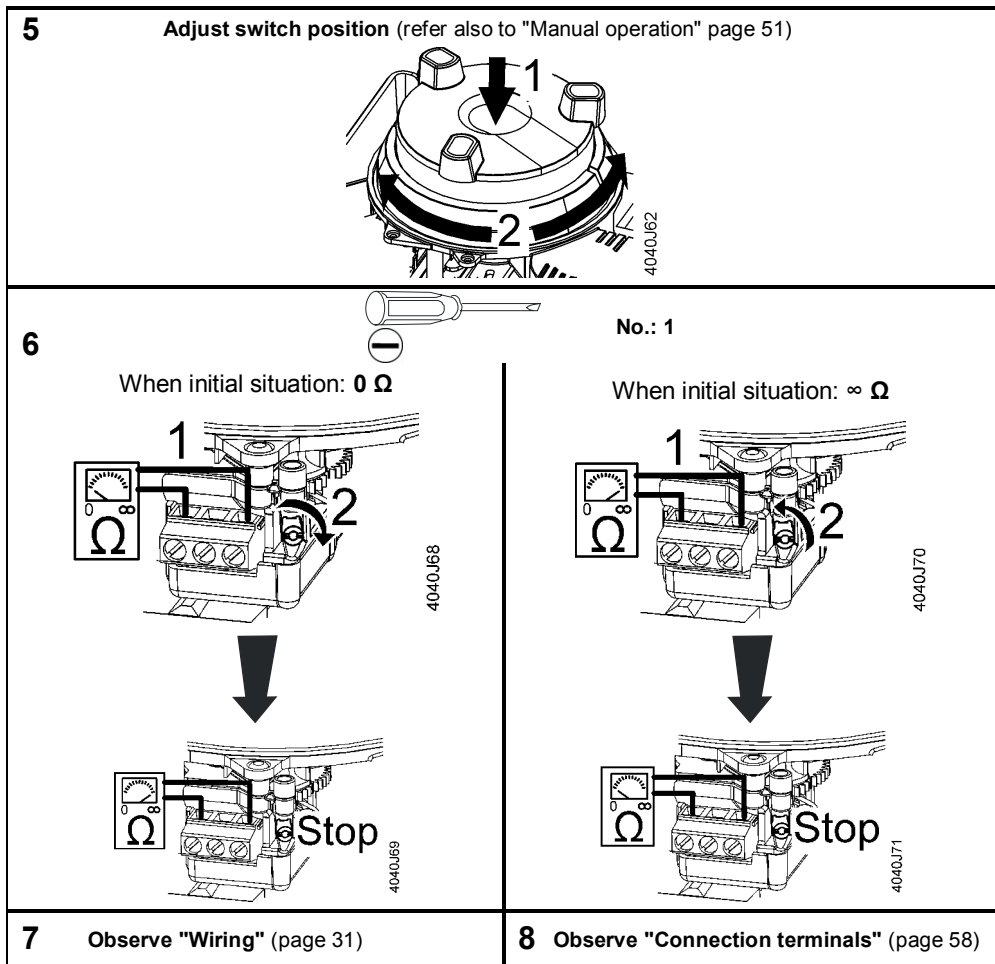


Plug-in space B

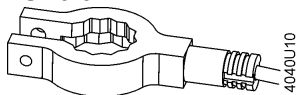


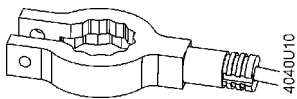

- First, observe "Special notes on mounting" (page 26).
- **First, fit the screw covers – otherwise danger of life!**





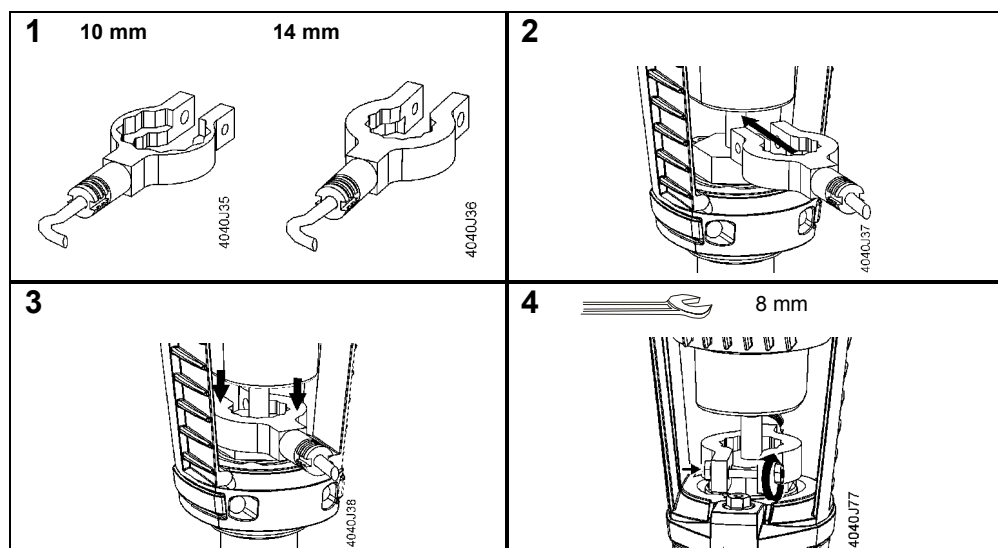
**Stem heating element ASZ6.6**



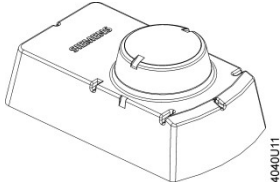
Scope of delivery	
1 stem heating element ASZ6.6	1 screw
	1 pc. M4 x 30 incl. nut 

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

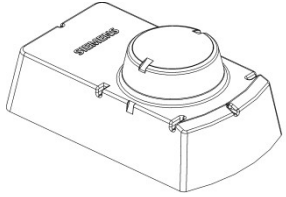
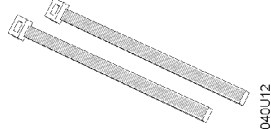
First, observe "Special notes on mounting" (page 26).



**Weather shield ASK39.1**

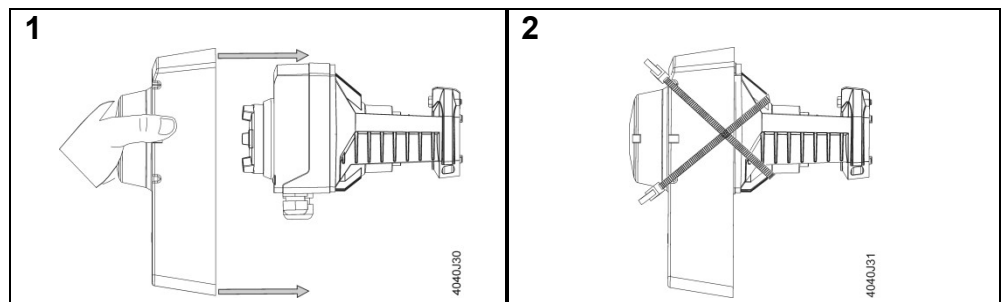


First, observe "Special notes on mounting" (page 26).

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.

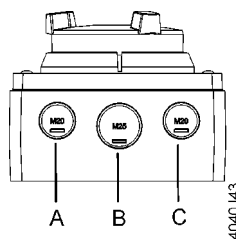
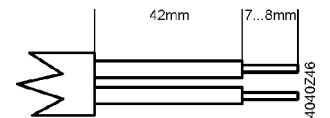


**3.1.8 Wiring (installation)**

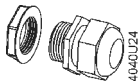
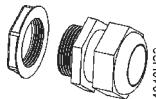
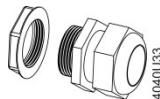
Conduct the electrical connections in accordance with local regulations on electrical installations as well as the "Connection diagrams" on page 58.

**Preparation of wire endings**

The cable endings must be prepared before as follows.



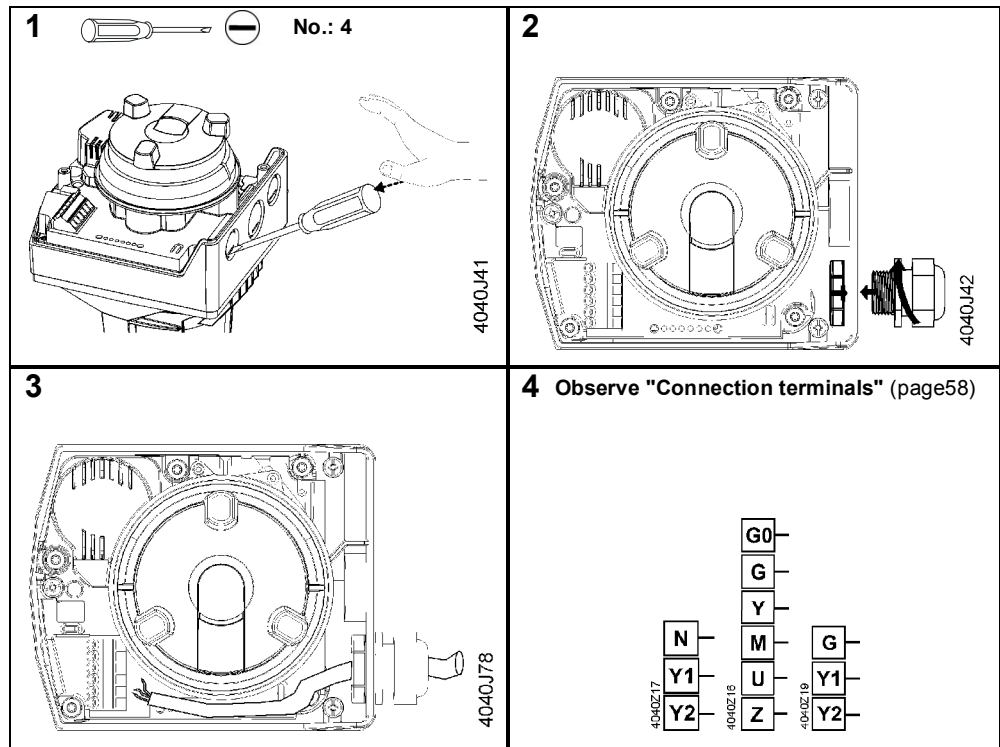
<b>A</b>	EU: M20 US: 1/2"	Standard	Connection actuator
<b>B</b>	EU: M25 US: 1/2"	Ground cable for outdoor installation	
<b>C</b>	EU: M20 US: 1/2"		Connection accessories

Cable glands (not contained in scope of delivery)		
Metric	Metric	Inch thread
M20	M25	1/2"
		

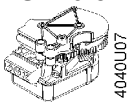
Prior to installation, the following preconditions must be satisfied:

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

### Actuator

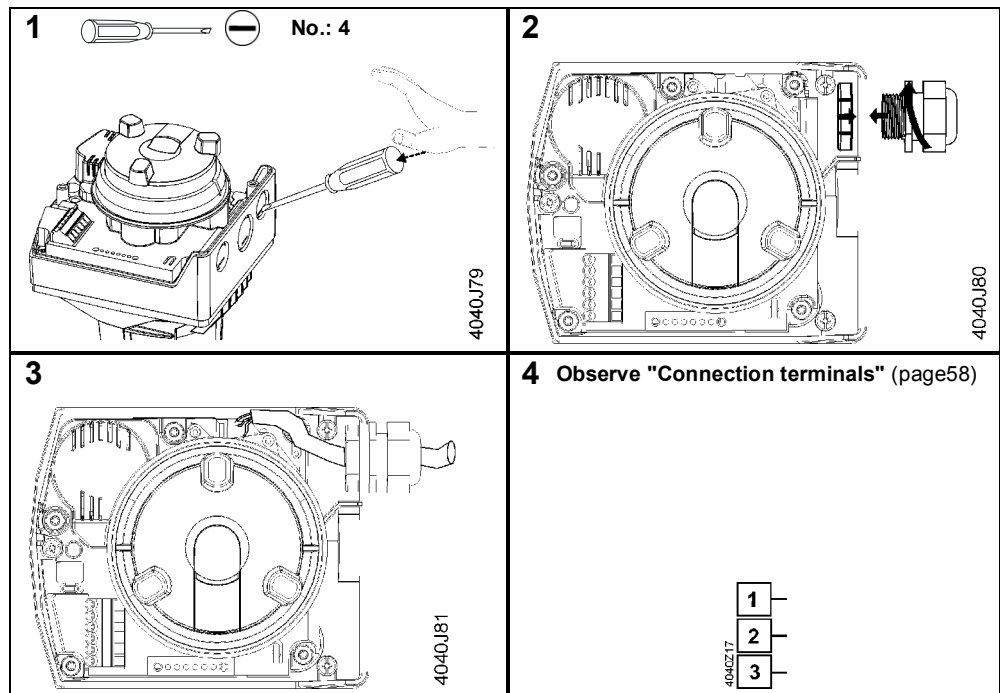
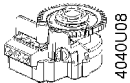


### Auxiliary switch ASC10.51



and

### Potentiometer ASZ7.5/..





## 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.

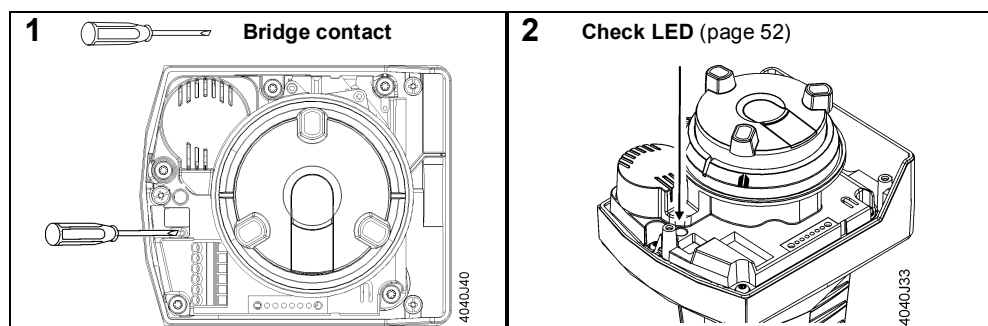
#### SA..61..

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 13.6 mA	Actuator's stem extends (60%)	Actuator's spindle turns in clockwise direction (60 %)	Opening	Closing	6 V
Y 5 V 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..

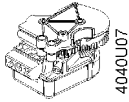
Make the function check for 3-position actuators according to the following table:

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.

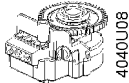
Auxiliary switch  
ASC10.51



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 <b>Example:</b> SAX31.00 = 27% x 120 sec = 32.5 sec	Valve position % + 2% 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 <b>Example:</b> 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 <b>Example:</b> 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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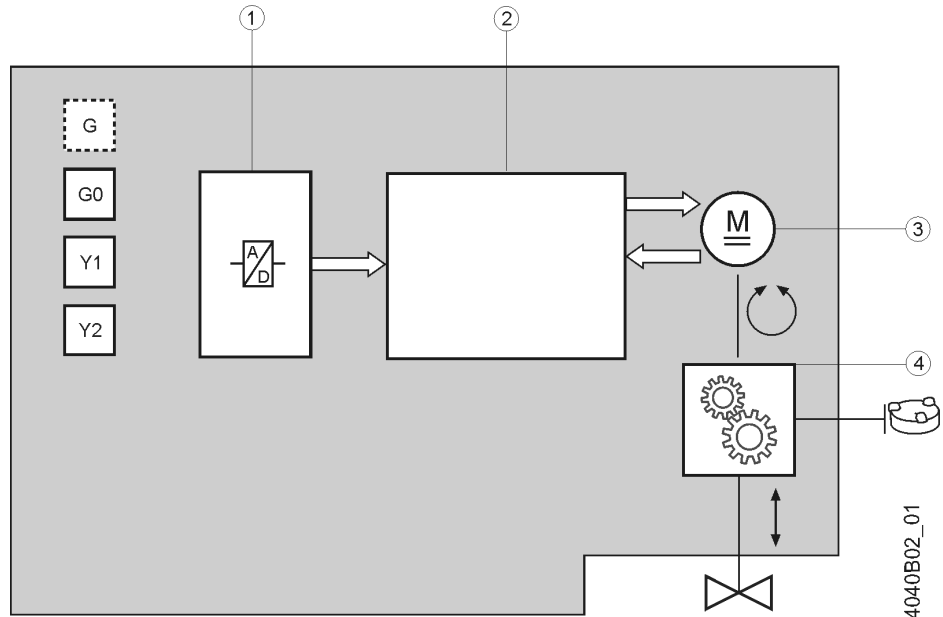
The products contain electrical and electronic components and must not be disposed of together with domestic waste. This applies in particular to the printed circuit board.

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
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

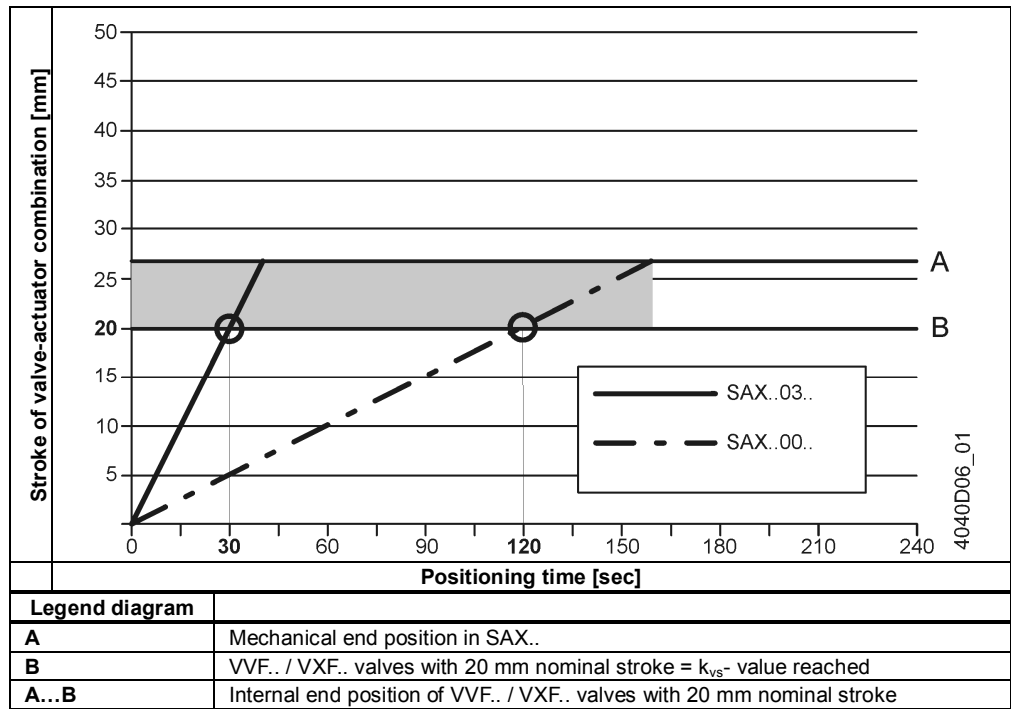
Observe information given in chapter "Acting direction and flow characteristic" on page 44.

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.

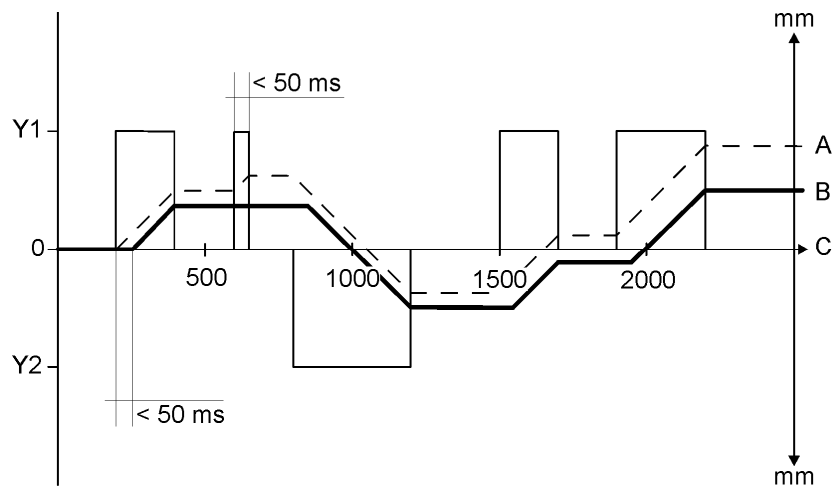
The resulting effective strokes vary, depending on the type of valve, resulting in shorter or longer actuator positioning times.



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.

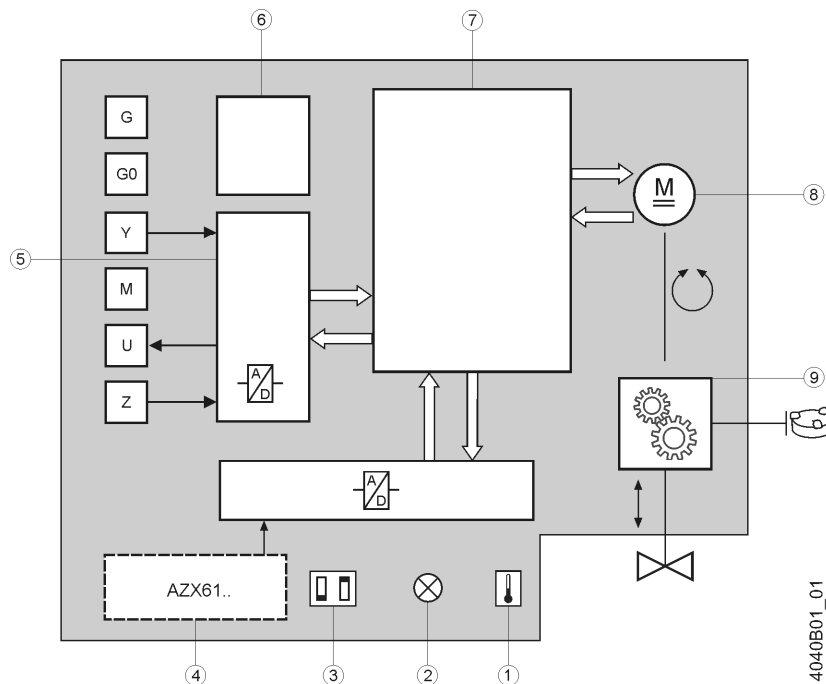
Especially the direct domestic hot water control does not allow such long control pulses. The specific optimized control loops – equipped with an SIGMAGYR RVD.. controller and Acvatix SQS359.05 actuator– work with pulses down to 40 ms.

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	

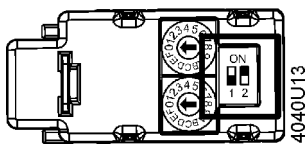
### Notes

- 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			
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

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

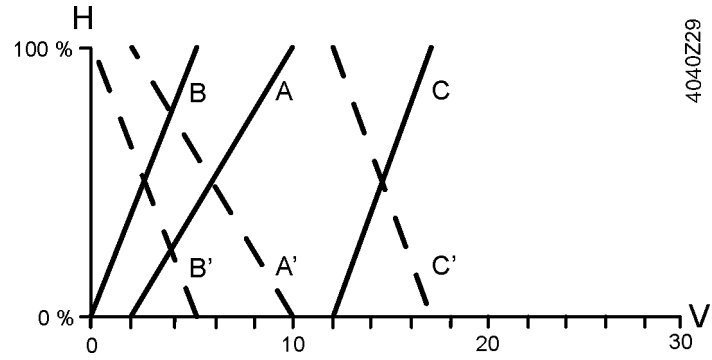
4040Z08

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	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

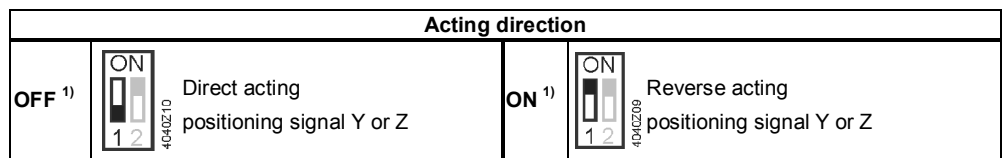


4040Z29

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



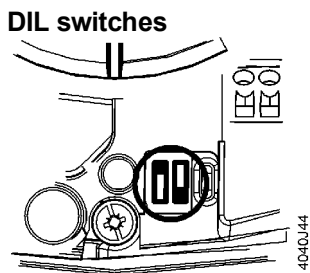
<sup>1)</sup> Factory setting: All switches set to OFF



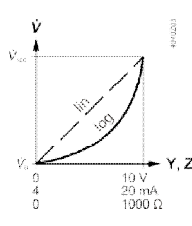


Selecting the acting direction

- 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.

	<p><b>Direct acting</b></p>	<p><b>Reverse acting</b></p>
	<p>Positioning signal Y: DC 0...10 V</p> <p>Positioning signal Z: 4...20 mA</p>	<p>Positioning signal Y: DC 0...10 V</p> <p>Positioning signal Z: 0...1000 Ω</p>
Y, Z	Positioning signal	
V	Volumetric flow	
	Acting direction: Direct	
	Acting direction: Reverse	

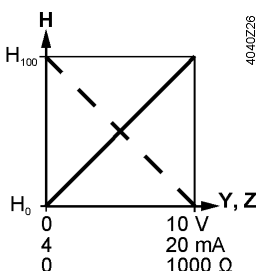
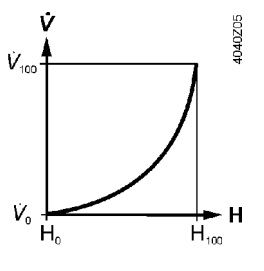
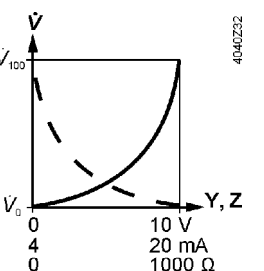
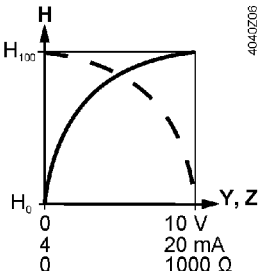
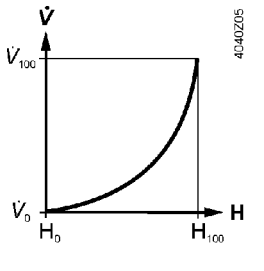
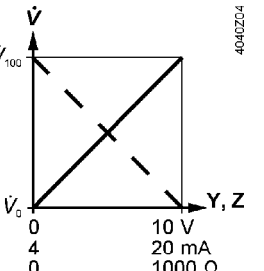
## 4.4 Positioning signal and flow characteristic selection



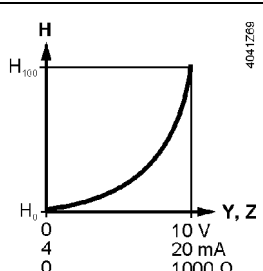
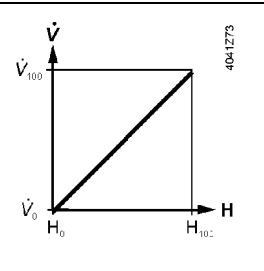
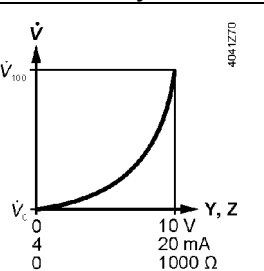
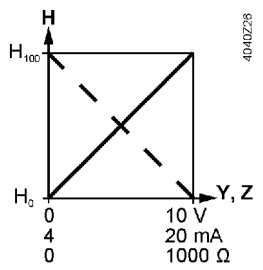
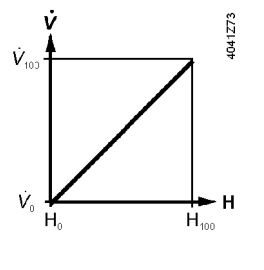
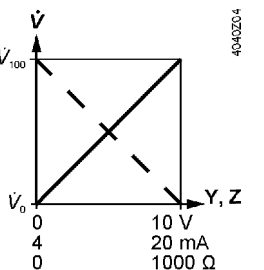
	Positioning signal "Y"	Position feedback "U"	Flow characteristic	
OFF <sup>1)</sup>	 DC 0...10 V	DC 0...10 V	 log = equal-percentage	
ON	 DC 4...20 mA	DC 0...10 V	 lin = linear	

<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..

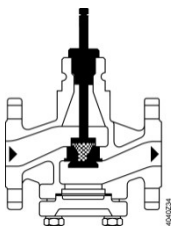
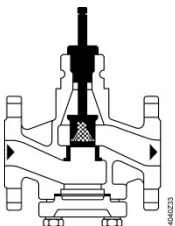


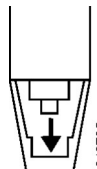
	Actuator	Combi-Valve VPF43/VPF53	Totally
log			
lin			

Y, Z	Positioning signal
H	Stroke
V	Volumetric flow
—————	Acting direction: Direct
- - - - -	Acting direction: Reverse

## 4.5 Acting direction and flow characteristic


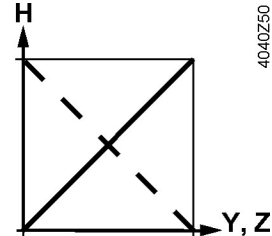
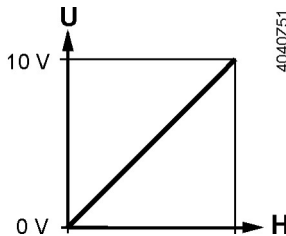

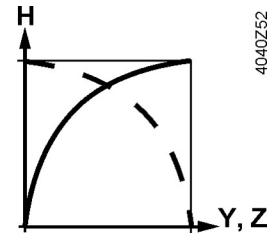
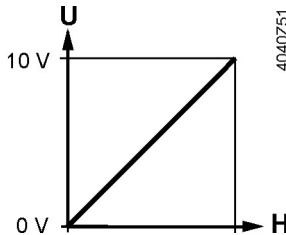
The selection of changeover of acting direction and characteristic with the DIL switches depends on the type of actuator (with or without fail safe function) and the associated type of valve (valve characteristic, push to open, pull to open).

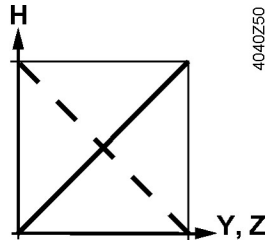
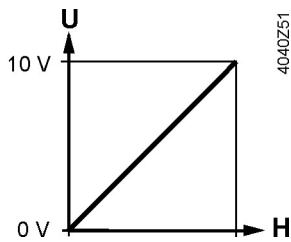
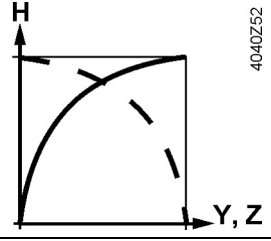
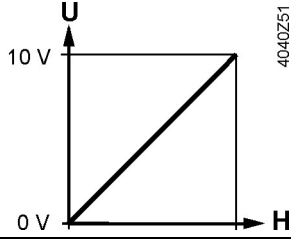
When the positioning signal increases (DC 0...10 V, DC 4...20 mA, 0...1000  $\Omega$ ), the objective is to have the valve's volumetric flow  $V$  rising, but to fully open the valve,  $V = 100\%$  (NO = normally open), or to fully close it,  $V = 0\%$  (NC = normally closed) in the event of a power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

						
						
 4040Z35	<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 $U$
 4040Z12	log = equal-percentage	 4040Z50	 4040Z51
 4040Z11	lin = linear	 4040Z52	 4040Z51

	Actuator Positioning signal Y, Z	Actuator 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.

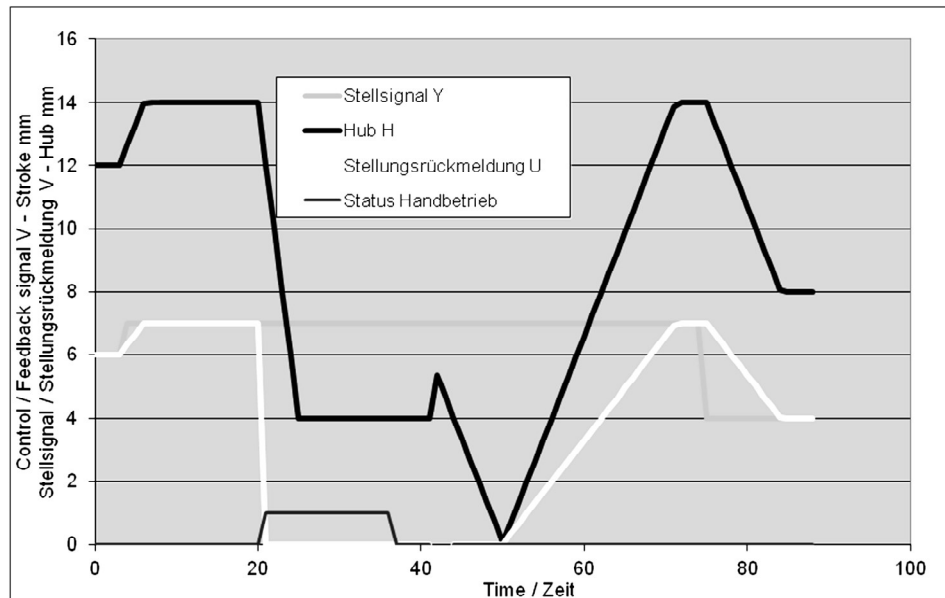
During manual operation the motor is declutched from the geartrain and the internal position control get's not sensor pulses. So real position will deviate from the internally calculated position. As a consequence the position feedback on terminal U is set to "0V" during manual operation.

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.

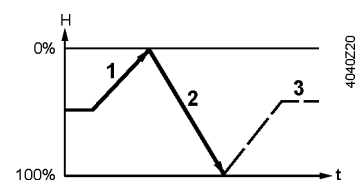
If the customer likes synchronization also after a power failure he should take care that the plant restarting routine drives the actuator automatically into an end position. This will also synchronise the internal position control and the real position.

## 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> (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> (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.

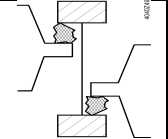
This means: New position 0%, Y = 2 V, actuator travels 20% of the stored valve stroke in the direction "Actuator's stem extended".

## 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".

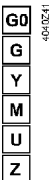
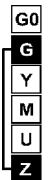
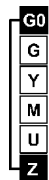
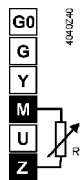
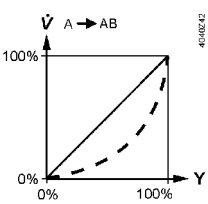
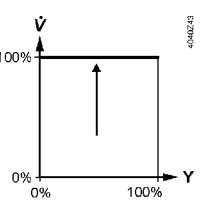
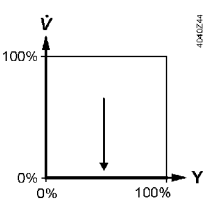
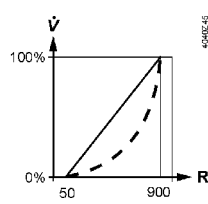
After detection of clogging, 3 attempts are made to overcome clogging by traveling about 15% in the opposite direction and then trying again to overcome the position of clogging. If the attempts made are unsuccessful, the actuator continues to follow the positioning signal within the restricted range 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

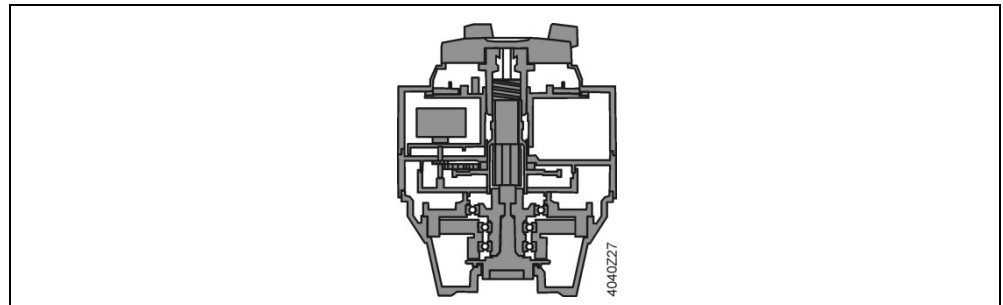
#### Function principle

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

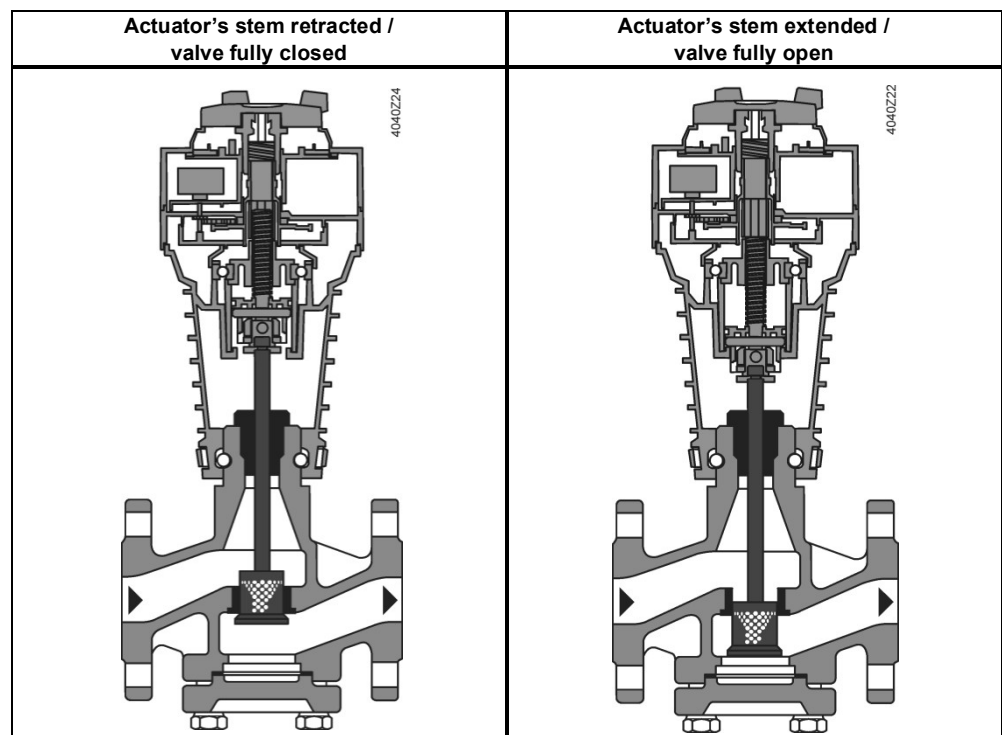
A gear train transmits the motor's positioning steps to the output stage (valve coupling). Attached to the gear train are the electrical and mechanical accessory items and the manual adjuster.

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.

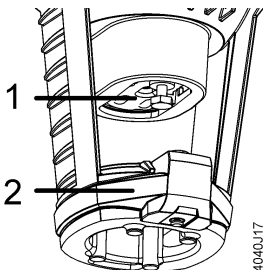
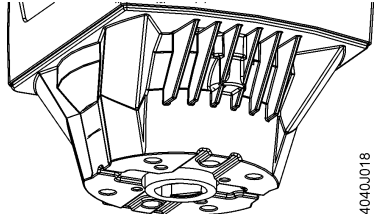
SAL..



SAX..

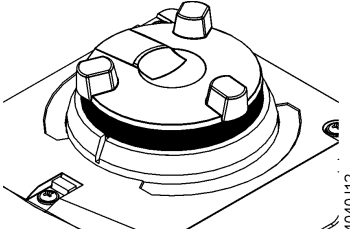


### 4.13.2 Coupling

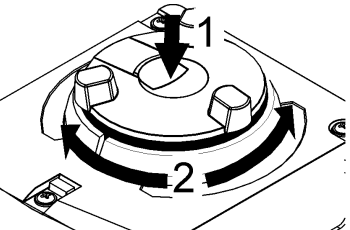
SAX.., SAV..	SAL..
 <p style="text-align: right; font-size: small;">4040J17</p>	 <p style="text-align: right; font-size: small;">4040J18</p>
<p>The stem coupling (1) and neck coupling (2) ensures full backward compatibility with all types of Siemens large-stroke valves produced since 1975.</p>	<p>Mounting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

### 4.13.3 Manual adjuster

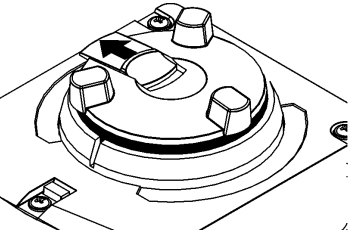
#### Automatic

 <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>
--	--

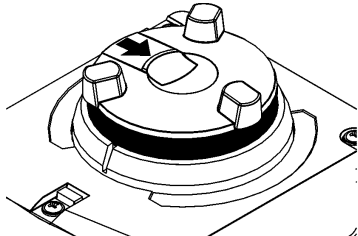
#### Manual operation

 <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>
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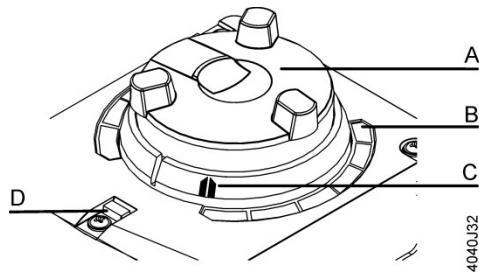
#### Fixing the position

 <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

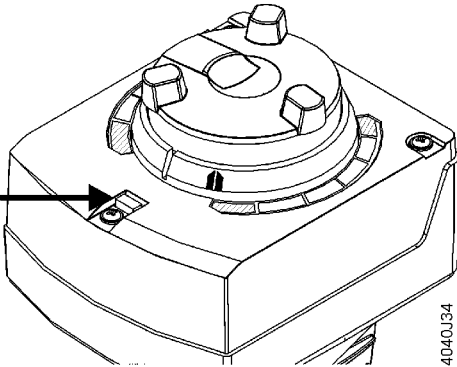
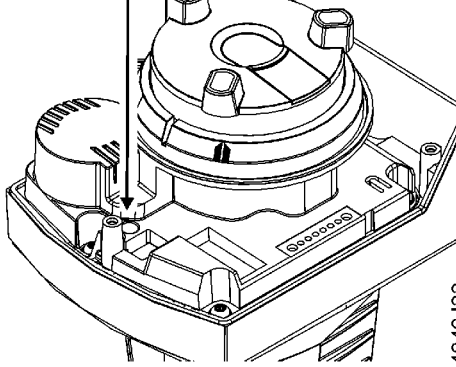
In Automatic mode, the manual adjuster serves for the indication of travel. See "Automatic" (page 51).

### 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)

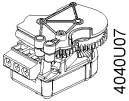
Housing cover fitted	Housing cover removed
	
When the housing cover is fitted, the LED can be viewed through a light conductor.	When the housing cover is removed, the LED can be viewed through a hole.

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

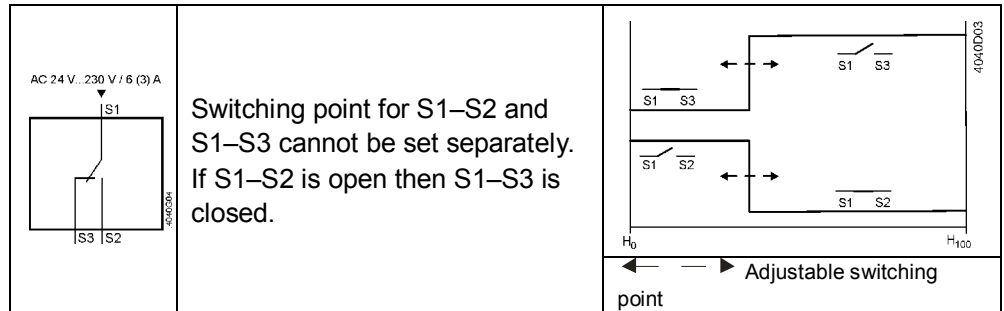
LED	Indication	Operating state	Remarks, troubleshooting
<b>Green</b>	On	Automatic mode	Normal operation
	Blinking	Calibration (page 33).	Wait until calibration is finished (then green or red light)
		In manual mode Detection of foreign bodies (page 48)	Manual adjuster in MAN position Check valve / actuator
<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



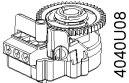
The auxiliary switch ASC10.51 switches on or off when a certain position is reached. The switching point can be set between 0...100%.



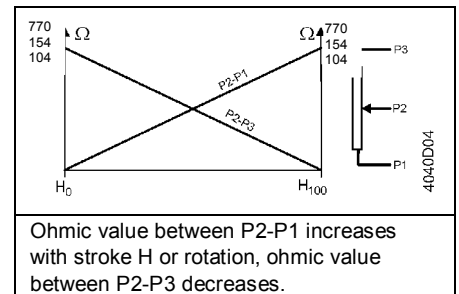
Application example:

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/..



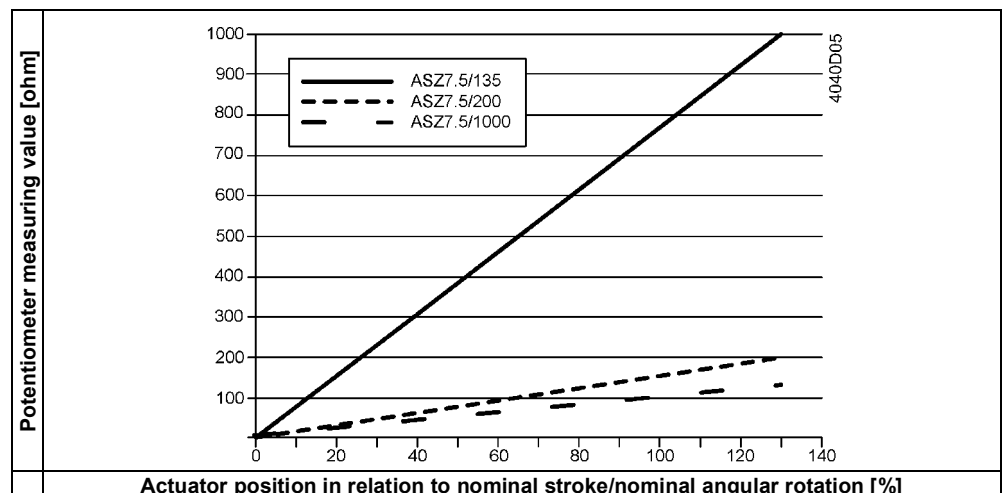
Potentiometer ASZ7.5/.. (1000 Ω, 200 Ω, 135 Ω) delivers an ohmic value to the controller giving the exact position of the actuator (continuous position feedback). A slip clutch prevents damage to the potentiometer in the mechanical end positions. This is also used for accurate balancing of the potentiometer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



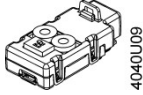
Flow characteristic

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..	$R = 0 + 1.15 \text{ Ohm} \times \text{rotary angle (°)}$	$R = 0 + 1.71 \text{ Ohm} \times \text{rotary angle (°)}$	$R = 0 + 8.55 \text{ Ohm} \times \text{rotary angle (°)}$



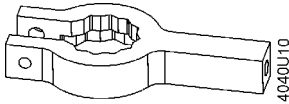
### Function module AZX61.1



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.



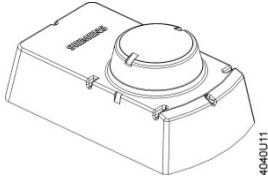
**The stem heating element heats up to 120 °C.**



**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**

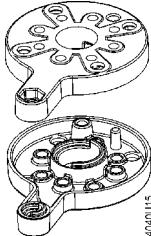
## 4.13.6 Mechanical accessories

### 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 SA..31.. SA..61.. SA..81..	AC 230 V ± 15 % AC 24 V ± 20 % / DC 24 V + 20 % / -15% 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	-
	SAL..T20 <sup>5)</sup>	10 Nm running	
	SAL..T40 <sup>5)</sup>	20 Nm running	
		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 % Max. DC 24 V + 20 % / -15%
	Current draw	≤ 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 ∅ 20.5 mm (for M20) 1 entry ∅ 25.5 mm (for M25)
		SA..U	US: 3 entries ∅ 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 Climatic conditions Mounting location Temperature General - Humidity (noncondensing)	IEC 60721-3-3 Class 3K5 Indoors (weather-protected) -5...55 °C   -15...55 °C -   not applicable 5...95 % r.h.
	Transport Climatic conditions Temperature Humidity	IEC 60721-3-2 Class 2K3 -25...70 °C <95 % r.h.
	Storage Climatic conditions Temperature Humidity	IEC 60721-3-1 Klasse 1K3 -15...55 °C 5...95 % r.h.
	Max. media temperatur when mounted on valve	130 °C   120°C
<b>Standards</b>	CE conformity As per EMC directive Immunity Emmissions	2004/108/EC EN 61000-6-2:[2005] Industrial <sup>4)</sup> EN 61000-6-3:[2007] Residential
	Electrical safety	EN 60730-1
	Low-voltage directive AC 230 V C-tick	2006/95/EC N 474
	UL conformity AC 230 V ( SA..3..) - AC/DC 24 V ( SA..6.. ; SA..8..)	- UL 873
	<b>Environmental compatibility</b>	ISO 14001 (environment) ISO 9001 (quality) SN 36350 (environment-compatible products) 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 Voltage Current rating	0...135 Ω ± 5% DC 10 V < 4 mA
	Potentiometer ASZ7.5/200 Voltage Current rating	0...200 Ω ± 5% DC 10 V < 4 mA
	Potentiometer ASZ7.5/1000 Voltage Current rating	0...1000 Ω ± 5% DC 10 V < 4 mA
	Auxiliary switch ASC10.51 Switching capacity	AC 24...230 V, 6 A res., 3 A ind.
	Stem heating element ASZ6.6 power supply Power consumption at 50 Hz Inrush current (cold)	AC / DC 24 V 40 VA / 30 W 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

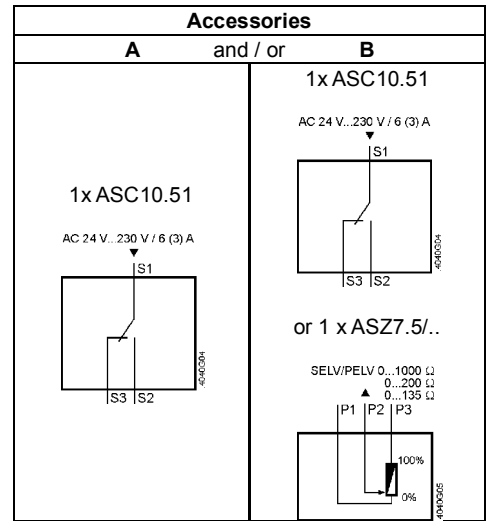
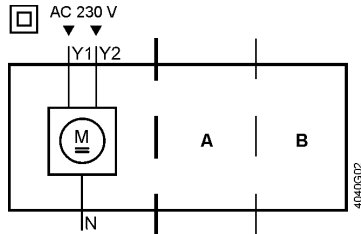
<sup>5)</sup> SAL.T20 / T40 have a minimum holding torque of 14 Nm



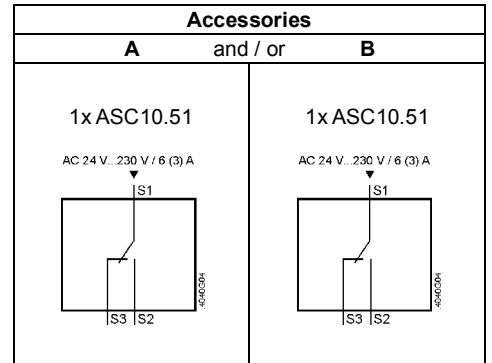
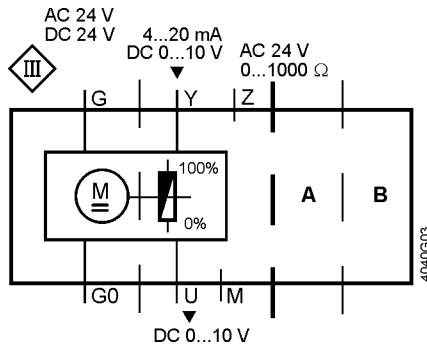
# 6 Connection diagrams and dimensions

## 6.1 Internal diagrams

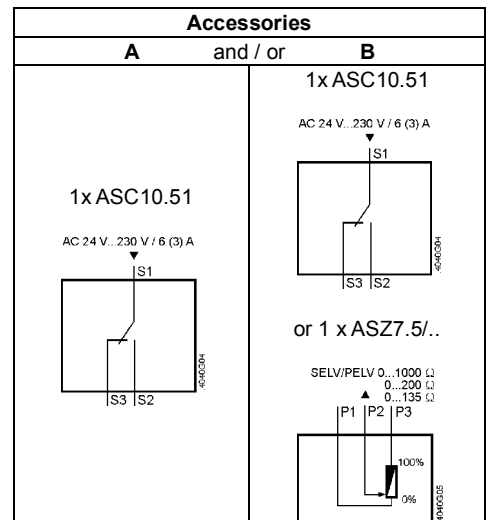
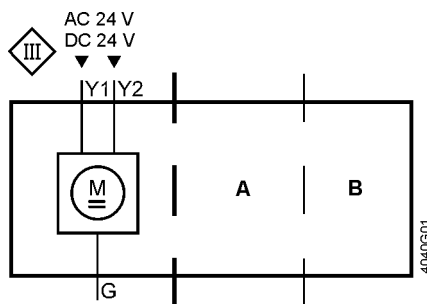
SA..31..



SA..61..



SA..81..

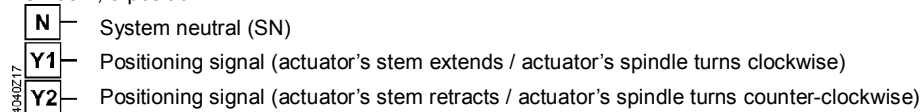


## 6.2 Connection terminals

### 6.2.1 Actuators

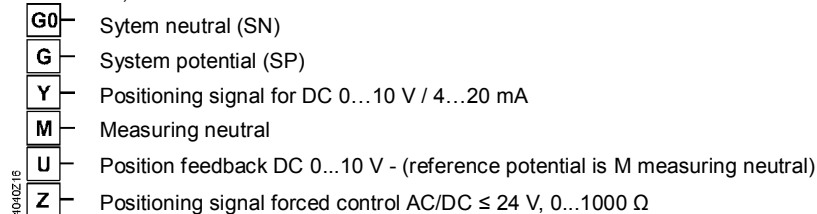
SA..31..

AC 230 V, 3-position



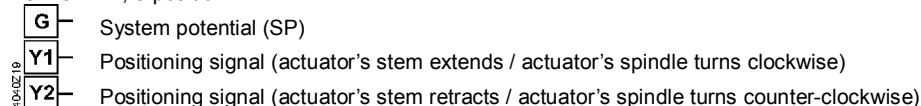
SA..61..

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



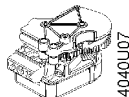
SA..81..

AC/DC 24 V, 3-position

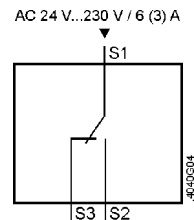
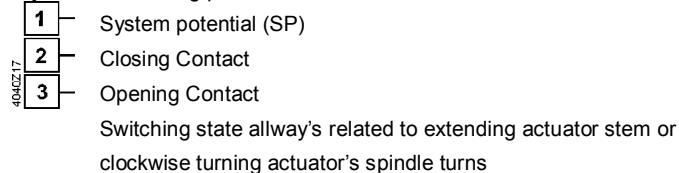


### 6.2.2 Electrical accessories

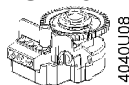
#### Auxiliary switch ASC10.51



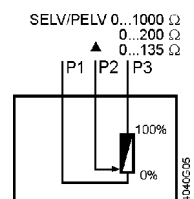
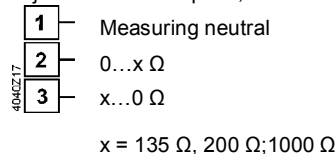
Adjustable switching points, AC 24...230 V



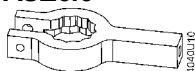
#### Potentiometer ASZ7.5/..



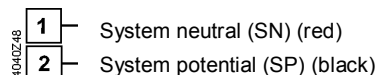
Adjustment of zero point, DC 10 V



#### Stem heating element ASZ6.6

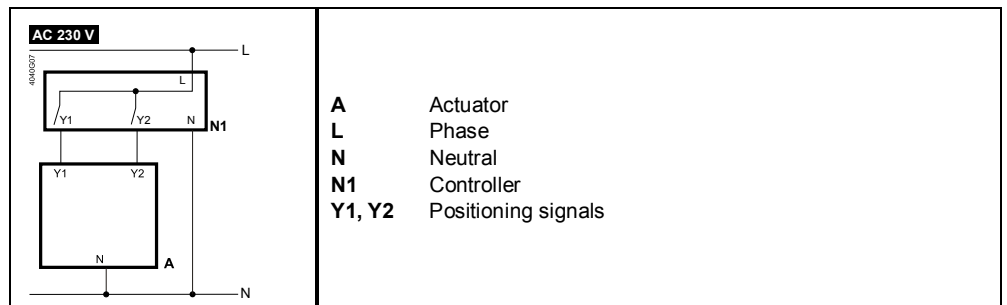


AC 24 V / 30 W / 40 VA / inrush current max. 13A

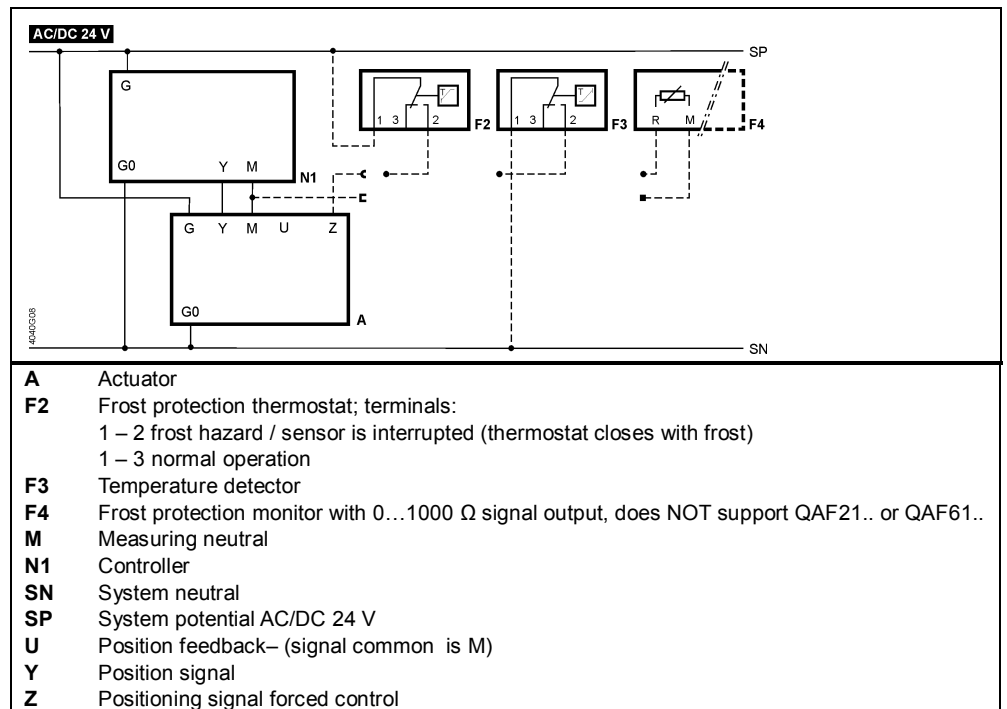


## 6.3 Connection diagrams

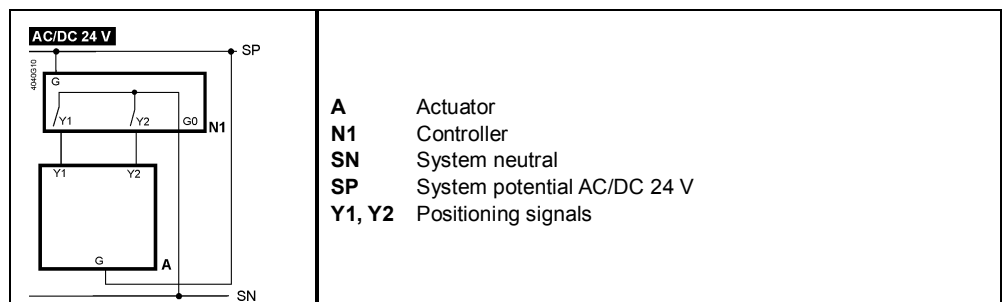
SA..31..



SA..61..



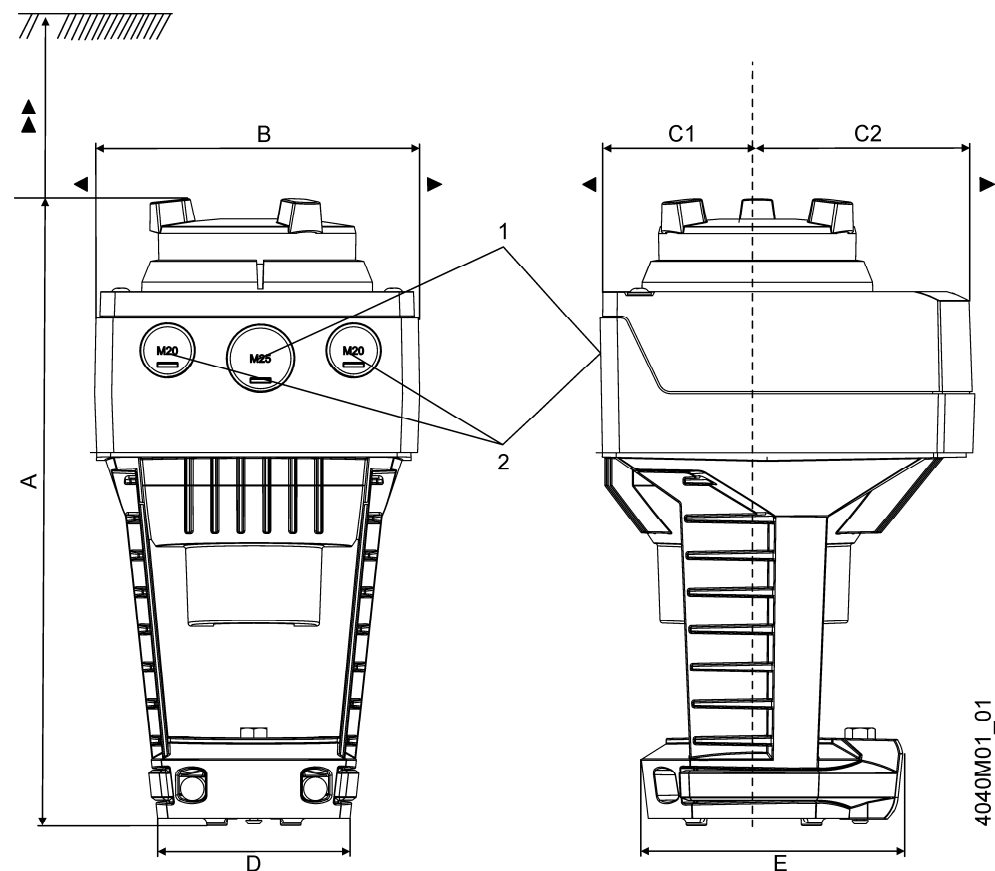
SA..81..



## 6.4 Dimensions

### 6.4.1 Stroke actuators

Dimensions in mm



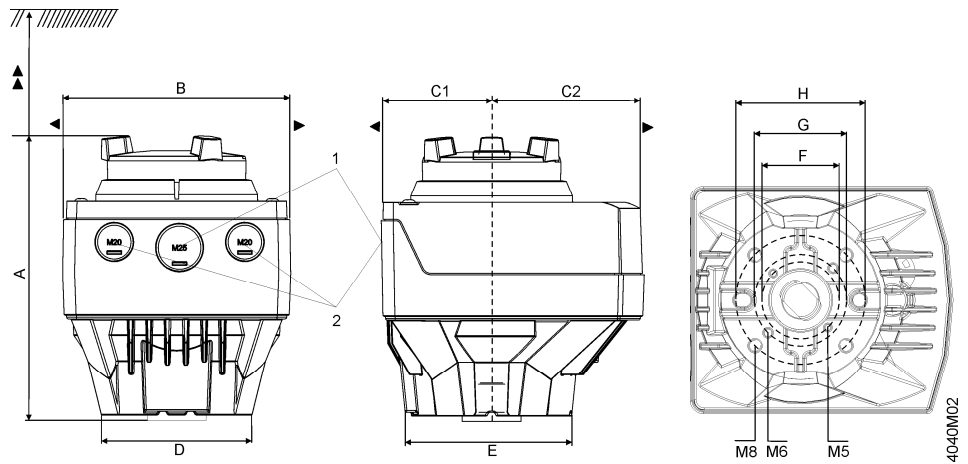
4040M01\_01

- 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

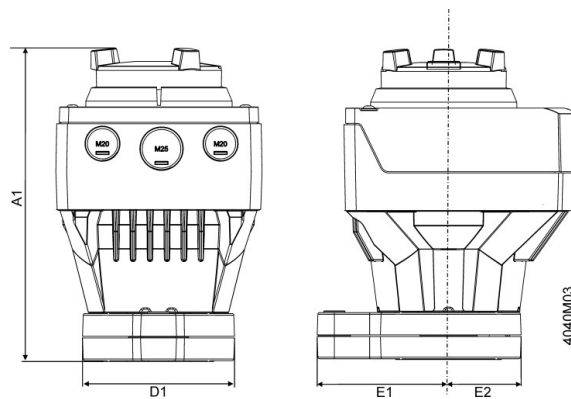
Dimensions in mm



- 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

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Caution, general danger – read the notes!



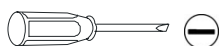
Caution, hot surface – read the notes!



Condition as supplied to customer



Crosstip screwdriver (Pozidriv)



Slotted screwdriver



Screw wrench



Allen key

## 8.2 Terms

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### 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

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