



SAX.., SAY..



SAV..



SAL..



SAX61../MO,  
SAY61../MO



SAV61../MO

**Acvatix™**

## **Actuators SAX.., SAY.., SAV.., SAL.. for valves** **Basic Documentation**

Siemens Switzerland Ltd  
Smart Infrastructure  
Global Headquarters  
Theilerstrasse 1a  
6300 Zug  
Switzerland  
Tel. +41 58-724 24 24  
[www.siemens.com/sbt](http://www.siemens.com/sbt)

© Siemens Switzerland Ltd, 2010 - 2024  
Subject to change

# Contents

<b>1</b>	<b>About this documentation .....</b>	<b>5</b>
1.1	Navigation / Quick access.....	5
1.2	Revision history.....	7
1.3	Reference documents .....	8
1.4	Before you start.....	8
1.4.1	Trademarks .....	8
1.4.2	Copyright.....	8
1.4.3	Quality assurance .....	9
1.4.4	Document use / request to the reader .....	9
1.5	Scope of this documentation.....	9
<b>2</b>	<b>Engineering .....</b>	<b>10</b>
2.1	Product description .....	10
2.2	Use.....	11
2.3	Type summary.....	11
2.3.1	Stroke actuators .....	11
2.3.2	Stroke actuators – combi valves .....	12
2.3.3	Rotary actuators.....	12
2.4	Ordering .....	13
2.5	Equipment combinations.....	15
2.5.1	Stroke actuators – 3-port valves .....	15
2.5.2	Stroke actuators – 2-port valves .....	17
2.5.3	Stroke Actuators – combi valves.....	19
2.5.4	Rotary actuators – slipper and butterfly valves .....	20
2.6	Accessories.....	21
2.6.1	Electrical accessories .....	21
2.6.2	Mechanical accessories .....	22
2.7	Product replacements .....	22
2.7.1	Stroke actuators SQX.. to SAX.....	22
2.7.2	Rotary actuators SQL.. to SAL.....	23
2.7.3	Electrical accessories .....	23
2.8	Spare parts.....	24
2.9	Sizing .....	25
2.9.1	Parallel operation of actuators .....	25
2.9.2	Permissible cable lengths and wire cross-sectional areas .....	25
2.10	Warranty.....	26
<b>3</b>	<b>Handling.....</b>	<b>27</b>
3.1	Mounting and installation .....	27
3.1.1	Mounting positions .....	27
3.1.2	Fitting stroke actuators to seat valves VVF.. / VXF.. or VVG.. / VXG.....	27
3.1.3	Avoid misalignment on V_G41 valves with fittings.....	28
3.1.4	Fitting rotary actuators to butterfly valves VKF41.....	29
3.1.5	Fitting rotary actuators to slipper valves VBF21.....	31
3.1.6	Fitting rotary actuators to butterfly valves VKF46.....	34
3.1.7	Fitting rotary actuators to butterfly valves VKF45.....	35
3.1.8	Fitting rotary actuators to butterfly valves VFL41.....	37
3.1.9	Fitting rotary actuators to butterfly valves VFW41.....	38
3.1.10	Fitting rotary actuators to butterfly valves VFW41U.....	39
3.1.11	Fitting accessories .....	40
3.1.12	Wiring (installation) .....	46
3.2	Commissioning and operation .....	49
3.2.1	Function check and Calibration.....	49
3.2.2	Commissioning Modbus RTU .....	52
3.2.3	Maintenance.....	55
3.2.4	Disposal .....	55

<b>4</b>	<b>Functions and control .....</b>	<b>56</b>
4.1	3-position control .....	56
4.1.1	Combination with RVD.. controller for direct domestic hot water distribution by heat exchanger .....	58
4.2	Modulating control .....	59
4.3	Function module AZX61.1 .....	60
4.3.1	Sequence control (signal adaptation) .....	60
4.3.2	Changeover of acting direction .....	61
4.4	Positioning signal and flow characteristic selection .....	62
4.5	Acting direction and flow characteristic .....	63
4.6	Position Feedback U .....	63
4.7	Position control with ClosedPosition-Synchronization .....	64
4.7.1	ClosedPosition-Synchronization .....	64
4.8	Calibration .....	65
4.9	Signal priorities .....	66
4.10	Detection of valve seat .....	66
4.11	Detection of foreign bodies .....	67
4.12	Forced control Z .....	68
4.13	Communicating actuators Modbus RTU .....	68
4.13.1	Detection of valve seat .....	68
4.13.2	Detection of foreign bodies .....	69
4.13.3	Calibration .....	70
4.13.4	Manual adjustment .....	70
4.13.5	Modbus Registers .....	71
4.13.6	Function description .....	73
4.14	Technical and mechanical design .....	75
4.14.1	Transmission of power .....	75
4.14.2	Coupling .....	76
4.14.3	Manual adjuster .....	76
4.14.4	Indicators .....	77
4.14.5	Electrical accessories .....	78
4.14.6	Mechanical accessories .....	79
<b>5</b>	<b>Technical data .....</b>	<b>80</b>
<b>6</b>	<b>Connection diagrams and dimensions .....</b>	<b>83</b>
6.1	Internal diagrams .....	83
6.2	Connection terminals .....	84
6.2.1	Actuators .....	84
6.2.2	Electrical accessories .....	84
6.3	Connection diagrams .....	85
6.4	Dimensions .....	87
6.4.1	Stroke actuators .....	87
1)	SAX..U: 1.850 kg .....	87
6.4.2	External Modbus converter .....	88
6.4.3	Rotary actuators .....	88
<b>7</b>	<b>Revision numbers .....</b>	<b>90</b>
<b>8</b>	<b>Glossary .....</b>	<b>91</b>
8.1	Symbols .....	91
8.2	Terms .....	91



# 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 Projektierung	geräteorientiert
2.1 Produktbeschreibung	
2.2 Anwendung	
3 Handhabung	handlungsorientiert
3.1 Montage und Installation	
3.2 Inbetriebnahme und Betrieb	
4 Funktionen und Steuerung	baugruppenorientiert
4.1 3-Punkt-Ansteuerung	
4.2 Stetige Ansteuerung	

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 15 - 19	Page 21	-	Page 40-46	Page 56-57	-	Page 78 - 79		
SAX31.03									
SAX61.03 <sup>1)</sup>			Page 49		Page 59	Page 65			
SAX61.03U <sup>1)</sup>						Page 70			
SAX61.03/MO <sup>1)</sup>					Page 56-57	-			
SAX81.00 <sup>1)</sup>									
SAX81.03 <sup>1)</sup>			Page 49		Page 59	Page 65			
SAX81.03U <sup>1)</sup>						Page 70			
SAX31P03			-		Page 56-57	-			
SAX61P03 <sup>1)</sup>									
SAX61P03/MO <sup>1)</sup>									
SAX81P03 <sup>1)</sup>									
SAY31P03			Page 19		Page 21	Page 49		Page 40-46	Page 56-57
SAY61P03 <sup>1)</sup>									
SAY61.03U <sup>1)</sup>	Page 70								
SAY61P03/MO <sup>1)</sup>									
SAY81P03 <sup>1)</sup>	Page 65								
SAY81.03U <sup>1)</sup>									
SAV31.00	Page 15 - 19	Page 21	-	Page 40-46	Page 56-57	-	Page 78 - 79		
SAV61.00 <sup>1)</sup>			Seite 49		Page 59	Page 65			
SAV61.00U <sup>1)</sup>						Page 70			
SAV61.00/MO <sup>1)</sup>					Page 56-57	-			
SAV81.00 <sup>1)</sup>									
SAV81.00U <sup>1)</sup>			Page 49		Page 59	Page 65			
SAV31P00						Page 70			
SAV61P00 <sup>1)</sup>									
SAV61P00/MO <sup>1)</sup>									
SAV81P00 <sup>1)</sup>									

Product no.	2 Engineering		3 Handling		4 Function and control		
	Equipment combinations	Accessories	Calibration	Accessories (mounting)	Control	Calibration	Accessories
SAL31.00T10	Page 19	Page 21	-	Page 40-46	Page 56-57	-	Page 78 - 79
SAL31.00T20							
SAL31.00T40							
SAL31.03T10							
SAL31.03T10/F05							
SAL61.00T10 <sup>1)</sup>			Page 49		Page 59	Page 65	
SAL61.00T20 <sup>1)</sup>							
SAL61.00T40 <sup>1)</sup>							
SAL61.03T10 <sup>1)</sup>							
SAL61.03T10/F05 <sup>1)</sup>							
SAL81.00T10 <sup>1)</sup>			-		Page 56-57	-	
SAL81.00T20 <sup>1)</sup>							
SAL81.00T40 <sup>1)</sup>							
SAL81.03T10 <sup>1)</sup>							
SAL81.03T10/F05 <sup>1)</sup>							

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

Note

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

## 1.2 Revision history

Revision	Date	Changes	Chapter
First edition	16.07.2010	-	-
2.0	2010-12-12	Rotary actuator SAL..T10 integrated	
		Mounting and installation of butterfly valves and slipper valves corrected and expanded	3.1
		New chapter „Position feedback U“	4.6
		Technical data corrected	5
2.1	2011-09-14	V..F53.. valves added	2.5
		SAL..T20 rotary actuators added	1.1, 1.2, 2.3, 2.4, 2.5, 2.6, 3, 3.1, 4.12, 5, 7
3	2012-09-12	Corrections regarding SAX..Series „G“ “ VVF53.50-40K valve added	2.4, 4.1, 4.7, 4.13, 5, 6.4
3.1	2013-12-17	SAL..T40 is added	...
3.2	2014-11-20	Supplemented with new valves V..F22, V..F32.., V..F42..	1.1, 1.3, 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 3.1, 4.1, 4.3, 4.4 4.13, 5, 6.1, 6.4, 7
		Supplemented with actuators SAV..	1.1, 1.3, 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.8, 4.1, 4.4, 4.7, 4.13, 5, 6.4, 7
3.3	2015-10-26	Supplemented with actuators SAY..P..	Various
3.4	2016-10-04	Actualization of headings with SAY.., added SAY.. to information on content and accessories	Various
3.5	2017-05-26	New: Communicating actuators (SAX61.03/MO)	Whole document
3.6	2020-01-30	New: Communicating actuators SAX61P03/MO, SAY61P03/MO, SAV61.. /MO New accessory: ASK32N	Various
		Update to communicating actuators (parameters and functions)	4.13
3.7	2022-05-19	Changes for SA..31P, SA..61P and SA..81P Valve types: VXF43, VPF43, VFW41, FVL41, VFW41U and SAL../F05 added	Various
3.8	2024-01-16	Replaced various pictures (better quality) Footnote for hand-lever ASK41.. added LED-status “dark” added Corrections to connector diagram SA..61../MO Pictures SAL..T.. corrected Update revision numbers	Various 2.5.4 3.2.2 6.3 3.1.8, 3.1.9 7
3.9	2024-07-03	Supplement: Power consumption values	5
3.10	2024-09-04	Reference document Characteristics	1.3
		Modified: Modbus – Pushbutton operation, Parameter and function description	3.22, 4.13.5
		Modified: Power consumption values New: UKCA conformity	5 5
3.11	2024-11-28	Added: SAL..T10/F05	2.4
		Added: Marginal	3.1.6, 3.1.8, 3.1.9, 3.1.10
		Modified: Content, illustration corrected	5
		Modified: Stem heating element and function module	
3.12	2025-01-16	Modified: Function module	5
3.13	2025-02-27	Modified: 515 Backup timeout maximum	4.13.5

## 1.3 Reference documents

Type of document		SAX..	SAV..	SAY..	SAL..
Data Sheet		N4501, N4509, Q4501	N4503, N4510	A6V10628469	N4502
Data Sheet Modbus communication profiles		A6V101037195	-	-	-
Commissioning/Configuration, valve actuator DIL switch characteristic overview		A6V12050595			
Mounting Instructions		-	-	-	ASK31N: M4502.1 ASK32N: A6V11558817 ASK33N: M4502.2 ASK35N: M4502.3
		ASC...: M4040.1 ASZ7.5: M4040.2 AZX61...: M4040.3 ASK39...: M4040.3 ASZ6.6: M4501			-
Mounting Instructions S..6../MO and G..161../MO		A5W00027551	-	-	-
CE Declaration of Conformity	AC 230 V	T4501X1	T4503X1	A5W00000333	T4502X1
	AC/DC 24 V	T4501X2	T4503X2	A5W00000333	T4502X2
Environmental Declaration		E4501	E4503	7173310559B	E4502
Environmental Declaration, external Modbus converter		A6V101083254	-	-	-
Modbus over serial line - Specification and Implementation Guide		www.modbus.org			-

## 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

This document may be duplicated and distributed only with the express permission of Siemens, and may be passed on only to authorized persons or companies with the required technical knowledge.

### 1.4.3 Quality assurance

---

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.

If you find lack of clarity while using this document, or if you have any criticisms or suggestions, please contact the product manager in your nearest branch office.

The addresses of the Siemens regional companies are available at [www.siemens.com/acvatix](http://www.siemens.com/acvatix).

### 1.4.4 Document use / request to the reader

---

Before using our products, it is important that you read the documents supplied with or ordered at the same time as the products (equipment, applications, tools etc.) carefully and in full.

We assume that persons using our products and documents are authorized and trained appropriately and have the technical knowledge required to use our products as intended.

More information on the products and applications is available:

- On the intranet (Siemens employees only) at <https://workspace.sbt.siemens.com/content/00001123/default.aspx>.
- From the Siemens branch office near you [www.siemens.com/acvatix](http://www.siemens.com/acvatix) or from your system supplier.
- From the support team at headquarters [fieldsupport-zug.ch.sbt@siemens.com](mailto:fieldsupport-zug.ch.sbt@siemens.com) if there is no local point of contact.

Siemens assumes no liability to the extent allowed under the law for any losses resulting from a failure to comply with the aforementioned points or for the improper compliance of the same.

## 1.5 Scope of this documentation

---

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

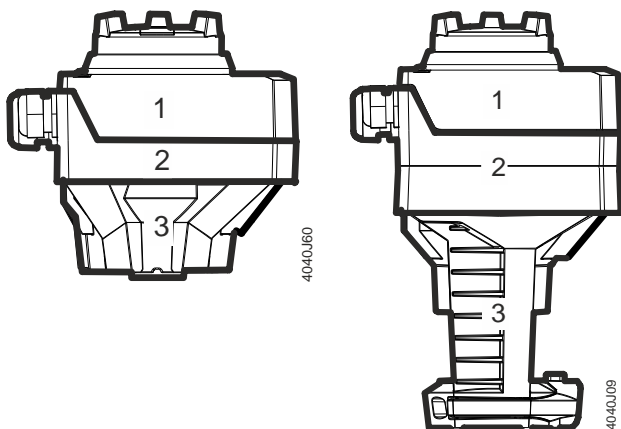
Engineering

2.1

Product description

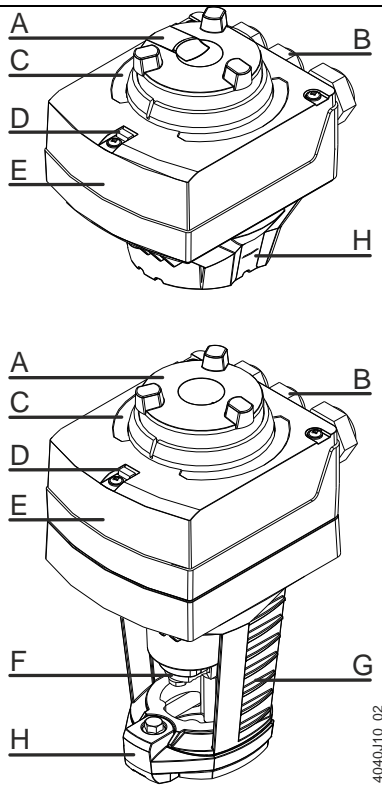
The line of large actuators is comprised of stroke actuators SAX., SAY., SAV.. and rotary actuators SAL..

Mechanical design



1	User interface and electrical connections
2	Power transmission and preparation
3	Yoke (for assembly of actuator and seat, slipper or butterfly valve)

Components



A	Manual adjuster (with slide switch)		76
B	Cable glands (M20 / M25)	Wiring (installation)	46
C	Position indication		77
D	Status indication		77
E	Housing cover	Spare parts	24
		Removal / fitting	40
F	Valve stem coupling	Coupling	76
G	Yoke		
H	Valve neck coupling		

Network functions

See Section 3.2.2 Commissioning Modbus RTU

## 2.2 Use

### SAX..., SAV..

For use in connection with Siemens 2-port or 3-port valves with 20/40 mm stroke, as control or shutoff valves for HVAC plants.

### SAY..

For the operation of Siemens combi valves of type VPI46.40F9.5Q and VPI46.50F12Q with 15 mm stroke as control valves in ventilation, air conditioning, and district heating systems.

### 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. SA..61../MO are not suitable for outdoor applications.

## 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 ad-juster <sup>1)</sup>	Extra functions	
SAX31.00	S55150-A105	20 mm	800 N	AC 230 V	3-position	-	120 s	-	Press and fix	-	
SAX31.03	S55150-A106						30 s	✓		Position feedback, forced control, change of characteristic	
SAX61.03 SAX61.03U	S55150-A100 S55150-A100-A100			AC 24 V / DC 24 V	DC 0...10 V DC 4...20 mA 0...1000 Ω						Position feedback, forced control
SAX61.03/MO <sup>2)</sup>	S55150-A140				Modbus RTU						
SAX81.00	S55150-A102			3-position	120 s						-
SAX81.03 SAX81.03U	S55150-A103 S55150-A103-A100				30 s		-	-			
SAV31.00 <sup>3)</sup>	S55150-A112	40 mm	1600 N	AC 230 V	3-position	-	120 s	-	Press and fix	-	
SAV61.00 <sup>3)</sup> SAV61.00U <sup>3)</sup>	S55150-A110 S55150-A110-A100			AC 24 V / DC 24 V	DC 0...10 V DC 4...20 mA 0...1000 Ω			✓		Position feedback,forced control, change of characteristic	
SAV61.00/MO <sup>2)</sup>	S55150-A141				Modbus RTU						-
SAV81.00 <sup>3)</sup> SAV81.00U <sup>3)</sup>	S55150-A111 S55150-A111-A100			3-position	-			-		-	

<sup>1)</sup> Not designed for continuous operation.

<sup>2)</sup> Fixed connection cable 5 x 0.75 mm<sup>2</sup>

<sup>3)</sup> SAV... This product line of actuators might not be available in all countries. Please talk to your local contact or consult your local internet pages of [www.buildingtechnologies.siemens.com](http://www.buildingtechnologies.siemens.com).

## 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 <sup>1)</sup>	Extra functions
<b>SAY31P03</b>	S55150-A132	15 mm	500 N	AC 230 V	3-Point	-	30 s	-	Press and fix	-
<b>SAY61P03</b>	S55150-A133			AC 24 V /DC 24 V	DC 0...10 V DC 4...20 mA 0...1000 Ω			✓		Position feedback, forced control, change of characteristic
<b>SAY61.03U</b>	S55150-A135				Modbus RTU					
<b>SAY61P03/MO</b>	S55150-A145				3-Point			-		-
<b>SAY81P03</b>	S55150-A134	20 mm	500 N	AC 230 V	3-position	-	30 s	-	Press and fix	-
<b>SAX61P03</b>	S55150-A114			AC 24 V /DC 24 V	DC 0...10 V DC 4...20 mA 0...1000 Ω			✓		Position feedback, forced control, change of characteristic
<b>SAX61P03/MO</b>	S55150-A143				Modbus RTU					
<b>SAX81P03</b>	S55150-A116				3-position			-		-
<b>SAV31P00</b>	S55150-A121	40 mm	1100 N	AC 230 V	3-position	-	120 s	-	Press and fix	-
<b>SAV61P00</b>	S55150-A119			AC 24 V /DC 24 V	DC 0...10 V DC 4...20 mA 0...1000 Ω			✓		Position feedback, forced control, change of characteristic
<b>SAV61P00/MO</b>	S55150-A144				Modbus RTU					
<b>SAV81P00</b>	S55150-A120				3-position			-		-

<sup>1)</sup> Not designed for continuous operation.

## 2.3.3 Rotary actuators

Product no.	Stock no.	Angular rotation	Torque	Operating voltage	Positioning signal	Spr. ret. time	Pos. time	LED	Manual adjuster <sup>1)</sup>	Extra functions
SAL31.00T10	S55162-A108	90°	10 Nm	AC 230 V	3-position	-	120 s	-	Press and fix	-
SAL31.00T20	S55162-A110		20 Nm							
SAL31.00T40	S55162-A111		40 Nm							
SAL31.03T10	S55162-A109		10 Nm				30 s			
SAL31.03T10/F05	S55162-A121									
SAL61.00T10	S55162-A100		AC 24 V DC 24 V	DC 0...10 V DC 4...20 mA 0...1000 Ω	120 s		✓	Position feedback, forced control		
SAL61.00T20	S55162-A102									20 Nm
SAL61.00T40	S55162-A103				40 Nm					
SAL61.03T10	S55162-A101				10 Nm					30 s
SAL61.03T10/F05	S55162-A123									
SAL81.00T10	S55162-A104		3- position		120 s		-	-		
SAL81.00T20	S55162-A106									20 Nm
SAL81.00T40	S55162-A107				40 Nm					
SAL81.03T10	S55162-A105									10 Nm
SAL81.03T10/F05	S55162-A122									

<sup>1)</sup> Not designed for continuous operation.



## 2.4 Ordering


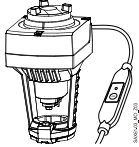
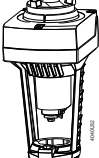
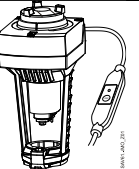
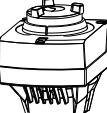
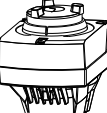


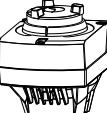


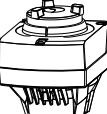


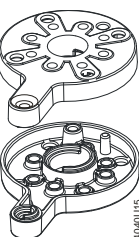



Example

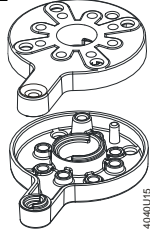
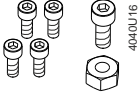

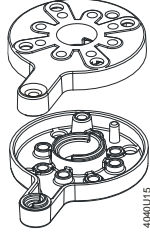
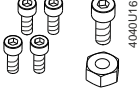
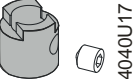

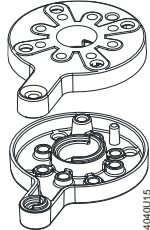
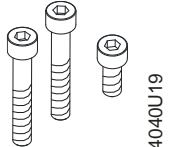
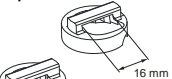
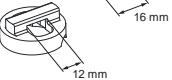
Product no.	Stock no.	Description	Quantity
SAX81.03	S55150-A103	Actuator	1
ASZ7.5	S55845-Z106	Potentiometer	1

Delivery

Actuators, valves and accessories are supplied in individual packs.


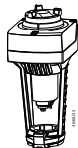




Scope of delivery


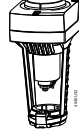











Type	Device	Screws	Waveinsert
SAX.. SAY..P..		-	-
SAX../MO, SAY../MO		-	-
SAV..		-	-
SAV../MO		-	-
SAL..T10		-	-
SAL..T10/F05		2 pcs. M6 x 20 mm 	1 pc. 14 mm 
SAL..T20		2 pcs. M5 x 20 mm 	1 pc. 11 mm 
SAL..T40		2 pcs. M6 x 20 mm 	1 pc. 14 mm 
ASK31N		4 pcs. M6 x 16 mm 1 pc. M5 x 20 mm incl. nut 	1 pc. 12 mm  1 pc. 12 mm 

Type	Device	Screws	Waveinsert
ASK32N		<p>4 pcs. M6 x 16 mm 1 pc. M5 x 20 mm incl. nut</p> 	<p>1 pc. 12 mm</p> 
ASK33N		<p>4 pcs. M6 x 16 mm 1 pc. M5 x 20 mm incl. nut</p> 	<p>1 pc. 12 mm</p>  <p>1 pc. 12 mm</p> 
ASK35N		<p>2 pcs. M8 x 50 mm 1 pc. M5 x 20 mm incl. nut</p> 	<p>1 pc. 12 mm</p>  <p>1 pc. 16 mm</p> 

## 2.5 Equipment combinations

### 2.5.1 Stroke actuators – 3-port valves

Typical applications	Stroke actuators	Data Sheet	Stroke		20 mm		40 mm			
			Positioning force		800 N		1600 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.. SAV.. <sup>8)</sup>	N4501 N4503								
					SAX..		SAV..			
Valves	Basic Doc. (P4030)				$\Delta p_{\max}^{5)}$ [kPa] AB→A B	$\Delta p_{\max}$ [kPa] A→B B	$\Delta p_{\max}^{5)}$ [kPa] AB→A B	$\Delta p_{\max}$ [kPa] A→B B		
Valves	Data Sheet	Valve type	DN	$k_{vs}$ [m³/h]						
<b>PN6</b> 	N4410	VXF21.22...25 <sup>1) 7)</sup>	25	1.9 / 3 / 5 / 7.5	100	300	-	-		
		VXF21.25... <sup>2) 7)</sup>		2.5 / 4 / 6.3 / 10						
		VXF21.39-40 <sup>7)</sup>	40	12 / 19						
		VXF21.40... <sup>2) 7)</sup>		16 / 25						
		VXF21.50 <sup>7)</sup>	50	31						
		VXF21.50-40 <sup>7)</sup>		40						
		VXF21.65 <sup>7)</sup>	65	49	60	175				
		VXF21.65-63 <sup>7)</sup>		63						
		VXF21.80-78 <sup>7)</sup>	80	78	40	100				
		VXF21.80-100 <sup>7)</sup>		100						
-10...130 °C <sup>4)</sup>		VXF21.90 <sup>9)</sup>	100	124	-	-				
		VXF21.100-160 <sup>9)</sup>		160						
		<b>PN6</b>	N4401	VXF22.25... <sup>2)</sup>	25	2.5 / 4 / 6.3 / 10			100	300
VXF22.40... <sup>2)</sup>	40			16 / 25	100	300				
VXF22.50-40	50			40						
VXF22.65-63	65			63	50	150	50	225		
VXF22.80-100	80			100						
VXF22.100-160	100			160	-	-	50	125		
<b>PN10</b> 	N4420	VXF31.15... <sup>2) 7)</sup>	15	2.5 / 4	100	300	-	-		
		VXF31.24...25 <sup>1) 7)</sup>	25	5 / 7.5						
		VXF31.25... <sup>2) 7)</sup>		6.3 / 10						
		VXF31.39...40 <sup>1) 7)</sup>	40	12 / 19						
		VXF31.40... <sup>2) 7)</sup>		16 / 25						
		VXF31.50 <sup>7)</sup>	50	31	60	175				
		VXF31.50-40 <sup>7)</sup>		40						
		VXF31.65 <sup>7)</sup>	65	49						
		VXF31.65-63 <sup>7)</sup>		63						
		VXF31.80 <sup>7)</sup>	80	78	40	100				
VXF31.80-100 <sup>7)</sup>	100									
<b>PN 10</b>	N4402	VXF32.15... <sup>2)</sup>	15	1.6 / 2.5	100	400	-	-		
		VXF32.25... <sup>2)</sup>	25	6.3 / 10			100	400		
		VXF32.40... <sup>2)</sup>	40	16 / 25						
		VXF32.50-40	50	40			50	300	100	400
		VXF32.65-63	65	63						
		VXF32.80-100	80	100	50	150	50	225		
		VXF32.100-160	100	160						
		VXF32.125-250	125	250	-	-				
		VXF32.150-400	150	400						
<b>PN16</b> 	N4430	VXF40.15... <sup>2) 7)</sup>	15	1.9 / 2.5 / 3 / 4	100	300			-	-
		VXF40.25... <sup>2) 7)</sup>	20	5 / 6.3 / 7.5 / 10						
		VXF40.40... <sup>2) 7)</sup>	40	12 / 16 / 19 / 25						
		VXF40.50... <sup>2) 7)</sup>	50	31 / 40						
		VXF40.65... <sup>2) 7)</sup>	65	49 / 63	60	175				
		VXF40.80... <sup>2) 7)</sup>	80	78 / 100	40	100				
<b>PN16</b> 	N4440	VXF41.14...15 <sup>1) 7)</sup>	15	1.9 / 3	200	800	-	-		
		VXF41.24...25 <sup>1) 7)</sup>	25	5 / 7.5						
		VXF41.39...40 <sup>1) 7)</sup>	40	12 / 19	150	500				
		VXF41.49...50 <sup>1) 7)</sup>	50	19 / 31	100	350				

Typical applications	Stroke actuators	Data Sheet	Stroke	20 mm	40 mm								
			Positioning force	800 N	1600 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.. SAV.. <sup>8)</sup>	N4501 N4503											
Valves	Basic Doc. (P4030)		SAX.. 		SAV.. 								
Valves	Data Sheet	Valve type	DN	k <sub>vs</sub> [m³/h]	$\Delta p_{\max}^{5)}$ [kPa] 	$\Delta p_{\max}^{5)}$ [kPa] 	$\Delta p_{\max}^{5)}$ [kPa] 	$\Delta p_{\max}^{5)}$ [kPa] 					
          -10...130 °C <sup>4)</sup>	N4403	VXF42.15-.. <sup>2)</sup>	15	1.6 / 2.5 / 4	100	400	-	-					
		VXF42.20-6.3	20	6.3									
		VXF42.25-.. <sup>2)</sup>	25	6.3 / 10									
		VXF42.40-.. <sup>2)</sup>	40	16 / 25									
		VXF42.50-.. <sup>2)</sup>	50	31.5 / 40	50	150	100	400					
		VXF42.65-.. <sup>2)</sup>	65	50 / 63									
		VXF42.80-.. <sup>2)</sup>	80	80 / 100									
		VXF42.100-.. <sup>2)</sup>	100	125 / 160									
		VXF42.125-.. <sup>2)</sup>	125	200 / 250	-	-	50	225 125 90 60					
		VXF42.150-.. <sup>2)</sup>	150	315 / 400									
          -20...130 °C <sup>4)</sup>	N4404	VXF43.65-50	65	50	-	-	100	400					
		VXF43.65-63	65	63									
		VXF43.80-80	80	80									
		VXF43.80-100	80	100									
		VXF43.100-125	100	125			50	125 90 60					
		VXF43.100-160	100	160									
		VXF43.125-200	125	200									
		VXF43.125-250	125	250									
		VXF43.150-315	150	315									
		VXF43.150-400	150	400									
          -20...130 °C <sup>4)</sup>	N4405	VXF53.15-.. <sup>2)</sup>	15	1.6 / 2.5 / 4	200	1200	-	-					
		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	100	500 300	200	1150 700					
		VXF53.50-40	50	40									
		VXF53.65-63	65	63									
          -20...130 °C <sup>4)</sup>	N4406	VXF53.80-100	80	100	-	-	100	400					
		VXF53.100-160	100	160									
		VXF53.125-250	125	250									
		VXF53.150-400	150	400									
		          -25...130 °C <sup>4)</sup>	N4463	-			15	VXG41.1301 <sup>3)</sup>	1.6	-	800	-	-
				VXG41.1401 <sup>3)</sup>				2.5					
				VXG41.15			VXG41.1501 <sup>3)</sup>	4					
VXG41.20	VXG41.2001 <sup>3)</sup>			20	6.3								
VXG41.25	VXG41.2501 <sup>3)</sup>			25	10								
VXG41.32	VXG41.3201 <sup>3)</sup>			32	16								
VXG41.40	VXG41.4001 <sup>3)</sup>			40	25								
VXG41.50	VXG41.5001 <sup>3)</sup>			50	40								

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

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

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

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

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

6) DN 15...50: Flange dimensions for PN 16 and PN 25


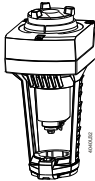






DN 65...150: Flange dimensions only for PN 25


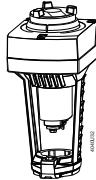







7) Valves no longer in the active sale

8) SAV..: This product line of actuators might not be available in all countries. Please talk to your local contact or consult your local internet pages of [www.buildingtechnologies.siemens.com](http://www.buildingtechnologies.siemens.com).

9) Only in combination with SKC..

## 2.5.2 Stroke actuators – 2-port valves

Typical applications	Stroke actuators	Data Sheet	Stroke	20 mm		40°mm				
			Positioning force	800 N		1600 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.. SAV.. <sup>5)</sup>	N4501 N4503								
Valves	Basic Doc. (P4030)		Δp <sub>s</sub> [kPa]		Δp <sub>max</sub> [kPa]	Δp <sub>s</sub> [kPa]	Δp <sub>max</sub> [kPa]			
Valves	Data Sheet		Valve type	DN	k <sub>vs</sub> [m³/h]					
<b>PN6</b> 	N4310		VVF21.22...25 <sup>1) 4)</sup>	25	1.9 / 3 / 5 / 7,5	600	300	-	-	
			VVF21.25... <sup>2) 4)</sup>		2.5 / 4 / 6.3 / 10					
			VVF21.39...40 <sup>1) 4)</sup>	40	12 / 19	500				
			VVF21.40... <sup>2) 4)</sup>		16 / 25					
			VVF21.50 <sup>4)</sup>	50	31	300				
			VVF21.50-40 <sup>4)</sup>		40					
			VVF21.65 <sup>4)</sup>	65	49	175	175			
			VVF21.65-63 <sup>4)</sup>		63					
			VVF21.80-78 <sup>4)</sup>	80	78	100	100			
			VVF21.80-100 <sup>4)</sup>		100					
			VVF21.90 <sup>6)</sup>	100	124	-	-			
			VVF21.100-160 <sup>6)</sup>	100	160					
<b>PN6</b> 	N4401		VVF22.25... <sup>2)</sup>	25	2.5 / 4 / 6.3 / 10	600	300	-	-	
			VVF22.40... <sup>2)</sup>	40	16 / 25	550		600	300	
			VVF22.50-40	50	40	350				
			VVF22.65-63	65	63	200	150			450
			VVF22.80-100 <sup>1)</sup>	80	100	125	75	250	225	
			VVF22.100-160 <sup>1)</sup>	100	160	-	-	160	160	
<b>PN10</b> 	N4320		VVF31.15... <sup>2) 4)</sup>	15	2.5 / 4	1000	300	-	-	
			VVF31.24...25 <sup>1) 4)</sup>	25	5 / 7,5					
			VVF31.25... <sup>2) 4)</sup>		6.3 / 10					
			VVF31.39...40 <sup>1) 4)</sup>	40	12 / 19	525				
			VVF31.40... <sup>2) 4)</sup>		16 / 25					
			VVF31.50 <sup>4)</sup>	50	31	325				
			VVF31.50-40 <sup>4)</sup>		40					
			VVF31.65 <sup>4)</sup>	65	49	175	175			
			VVF31.65-63 <sup>4)</sup>		63					
			VVF31.80 <sup>4)</sup>	80	78	100	100			
VVF31.80-100 <sup>4)</sup>	100									
<b>PN10</b> 	N4402		VVF32.15... <sup>2)</sup>	15	1.6 / 2.5 / 4	1000	400	-	-	
			VVF32.25... <sup>2)</sup>	25	6.3 / 10			1000		
			VVF32.40... <sup>2)</sup>	40	16 / 25				550	
			VVF32.50-40	50	40	350	300		750	400
			VVF32.65-63	65	63	200	150	450		
			VVF32.80-100 <sup>2)</sup>	80	100	125	75	250	225	
			VVF32.100-160 <sup>2)</sup>	100	160	-	-	160	125	
			VVF32.125-250	125	250			125	90	
			VVF32.150-400 <sup>2)</sup>	150	400			80	80	
<b>PN16</b> 	N4330		VVF40.15... <sup>2) 4)</sup>	15	1.9 / 2.5 / 3 / 4	1600	300	-	-	
			VVF40.25... <sup>2) 4)</sup>	20	5 / 6.3 / 7.5 / 10	1550				
			VVF40.40... <sup>2) 4)</sup>	40	12 / 16 / 19 / 25	525				
			VVF40.50... <sup>2) 4)</sup>	50	31 / 40	325				
			VVF40.65... <sup>2) 4)</sup>	65	49 / 63	175				175
			VVF40.80... <sup>2) 4)</sup>	80	78 / 100	100				100
<b>PN16</b> 	N4340		VVF41.49 <sup>4)</sup>	50	19	350	300	-	-	
			VVF41.50 <sup>4)</sup>		31					

Typical applications	Stroke actuators	Data Sheet	Stroke	20 mm		40°mm					
			Positioning force	800 N	1600 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.. SAV.. <sup>5)</sup>	N4501 N4503									
				SAX..		SAV..					
Valves	Basic Doc. (P4030)			$\Delta p_s$ [kPa]	$\Delta p_{max}$ [kPa]	$\Delta p_s$ [kPa]	$\Delta p_{max}$ [kPa]				
Valves	Data Sheet	Valve type	DN	$k_{vs}$ [m³/h]							
  -10...130 °C <sup>3)</sup>	N4403	VVF42.15-.. <sup>2)</sup>	15	1,6 / 2,5 / 4	1600	400	-	-			
		VVF42.20-6.3	20	6,3							
		VVF42.25-.. <sup>2)</sup>	25	6,3 / 10							
		VVF42.32-16	32	16							
		VVF42.40-.. <sup>2)</sup>	40	16 / 25	900	1250	400				
		VVF42.50-.. <sup>2)</sup>	50	31,5 / 40	550						
		VVF42.65-.. <sup>2)</sup>	65	50 / 63	350			300	750		
		VVF42.80-.. <sup>2)</sup>	80	80 / 100	200			150	450		
		VVF42.100-.. <sup>2)</sup>	100	80 / 100	125	75	250	160	225		
		VVF42.125-.. <sup>2)</sup>	125	200 / 250	-	-	125	125			
VVF42.150-.. <sup>2)</sup>	150	315 / 400	-	-	80	80					
  -10...130 °C <sup>3)</sup>	N4403	VVF42.50-40K	50	40	1600	400	-	-			
		VVF42.65-63K	65	63							
		VVF42.80-100K	80	100							
		VVF42.100-160K	100	160	-	-	1600	400			
		VVF42.125-250K	125	250			1400				
		VVF42.150-360K	150	360							
  20...130 °C <sup>3)</sup>	N4404	VVF43.65-.. <sup>2)</sup>	65	50 / 63	-	-	450	400			
		VVF43.80-.. <sup>2)</sup>	80	80 / 100			250	225			
		VVF43.100-.. <sup>2)</sup>	100	125 / 160			160	125			
		VVF43.125-.. <sup>2)</sup>	125	200 / 250			125	90			
		VVF43.150-.. <sup>2)</sup>	150	315 / 400			80	60			
  -20...130 °C <sup>3)</sup>	N4373	VVF52.15-.. <sup>2) 4)</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	2500	1600	-	-			
		VVF52.25-.. <sup>2) 4)</sup>	25	5 / 6.3 / 8 / 10	1500	1200	-	-			
		VVF52.40-.. <sup>2) 4)</sup>	40	12.5 / 16 / 20 / 25	500	400	-	-			
  -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	2500	1200	-	-			
		VVF53.20-6.3	20	6.3	1600						
		VVF53.25-.. <sup>2)</sup>	25	5 / 6.3 / 8 / 10							
		VVF53.32-16	32	16	900	750	1250	1150			
		VVF53.40-.. <sup>2)</sup>	40	12.5 / 16 / 20 / 25	550	500					
		VVF53.50-.. <sup>2)</sup>	50	31.5 / 40	350	300			750	700	
		  -20...130 °C <sup>3)</sup>		VVF53.65-63 <sup>3)</sup>	65	63	-	-	450	400	
VVF53.80-100 <sup>3)</sup>	80			100	250	225					
VVF53.100-160	100			160	160	125					
VVF53.125-250	125			250	125	90					
VVF53.150-360	150			360	80	60					
  -25...130 °C <sup>3)</sup>	N4363	VVG41.11...12 <sup>1)</sup>	15	0.63 / 1	1600	800	-	-			
		VVG41.13	15	1.6							
		VVG41.14	15	2.5							
		VVG41.15	15	4							
		VVG41.20	20	6.3	1550	800	-	-			
		VVG41.25	25	10							
		VVG41.32	32	16							
		VVG41.40	40	25							
		VVG41.50	50	40	525	525					

<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).

<sup>4)</sup> Valves no longer in the active sale

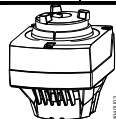

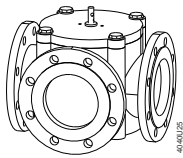







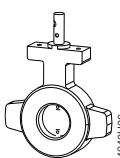

<sup>5)</sup> SAV..: This product line of actuators might not be available in all countries. Please talk to your local contact or consult your local internet pages of [www.buildingtechnologies.siemens.com](http://www.buildingtechnologies.siemens.com)

<sup>6)</sup> Only in combination with SKC..

## 2.5.3 Stroke Actuators – combi valves

	Valves				Actuators					
	Standard flow rate	High flow rate	DN	H <sub>100</sub> [mm]	SAY..P..		SAX..P..		SAV..P..	
					$\Delta p_{\max}$ [kPa]	$\Delta p_s$ [kPa]	$\Delta p_{\max}$ [kPa]	$\Delta p_s$ [kPa]	$\Delta p_{\max}$ [kPa]	$\Delta p_s$ [kPa]
<b>PN25</b> N4855	VPI46.40F9.5Q	-	40	15	400	400	-	-	-	-
	VPI46.50F12Q	-	50							
<b>PN16</b> A6V12273951	VPF43.50F16	VPF43.50F25	50	20	-	-	600	600	-	-
	VPF43.65F24	VPF43.65F35	65							
	VPF43.80F35	VPF43.80F45	80							
	VPF43.100F70	VPF43.100F90	100	40	-	-	-	-	600	600
	VPF43.125F110	VPF43.125F135	125							
	VPF43.150F160	VPF43.150F200	150	43	-	-	-	-	600	600
	VPF43.200F210	VPF43.200F280	200							
	VPF44.50F15	VPF44.50F25	50	20	-	-	600	700	-	-
	VPF44.65F25	VPF44.65F35	65							
	VPF44.80F35	VPF44.80F45	80							
	VPF44.100F70	VPF44.100F90	100	40	-	-	-	-	600	700
<b>PN25</b> A6V12273951	VPF53.50F16	VPF53.50F25	50	20	-	-	600	600	-	-
	VPF53.65F24	VPF53.65F35	65							
	VPF53.80F35	VPF53.80F45	80							
	VPF53.100F70	VPF53.100F90	100	40	-	-	-	-	600	600
	VPF53.125F110	VPF53.125F135	125							
	VPF53.150F160	VPF53.150F200	150	43	-	-	-	-	600	600
	VPF53.200F210	VPF53.200F280	200							
	VPF54.50F15	VPF54.50F25	50	20	-	-	600	700	-	-
	VPF54.65F25	VPF54.65F35	65							
	VPF54.80F35	VPF54.80F45	80							
	VPF54.100F70	VPF54.100F90	100	40	-	-	-	-	600	700

## 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..T10/ F05	SAL..T20	SAL..T40			
Slipper valves	Data Sheet	Valve type	DN	k <sub>vs</sub> [m³/h]	Mounting set	Δp <sub>max</sub> [kPa]					
  1 °C...120 °C	N4241	VBF21.40	40	25	ASK32N	30	-	-	-		
		VBF21.50	50	40							
		VBF21.65	65	63							
		VBF21.80	80	100	ASK31N						
		VBF21.100	100	160							
		VBF21.125	125	550							
		VBF21.150	150	820							
Butterfly valves						Δp <sub>s</sub> [kPa]					
  -10 °C...120 °C	A6V101029242	VFL41.40 <sup>1)</sup>	40	40	ASK41NF04SP <sup>6)</sup>	-	-	1600	-		
		VFL41.50 <sup>1)</sup>	50	100							
		VFL41.65 <sup>1)</sup>	65	155							
		VFL41.80 <sup>1)</sup>	80	260	ASK41NF05SP <sup>6)</sup>			-	-	1600	1200
		VFL41.100 <sup>1)</sup>	100	520							
		VFL41.125 <sup>1)</sup>	125	820							
  -10 °C...120 °C	A6V101029242	VFW41.40 <sup>1)</sup>	40	40	ASK41NF04SP <sup>6)</sup>	-	-	1600	-		
		VFW41.50 <sup>1)</sup>	50	100							
		VFW41.65 <sup>1)</sup>	65	155							
		VFW41.80 <sup>1)</sup>	80	260	ASK41NF05SP <sup>6)</sup>			-	-	1600	1200
		VFW41.100 <sup>1)</sup>	100	520							
		VFW41.125 <sup>1)</sup>	125	820							
  -10 °C...120 °C	A6V101029254	VFW41.40U <sup>2)</sup>	40	40	-	-	500	-	-		
		VFW41.50U <sup>2)</sup>	50	100	-						
		VFW41.65U <sup>2)</sup>	65	155	-						
		VFW41.80U <sup>2)</sup>	80	260	-						
		VFW41.100U <sup>2)</sup>	100	520	-						
		VFW41.125U <sup>2)</sup>	125	820	-						
		VFW41.150U <sup>3)</sup>	150	1600	-						
		VFW41.200U <sup>3)</sup>	200	4000	-						
  -10 °C...120 °C	N4131	VKF41.40 <sup>4)</sup>	40	50	ASK33N	500	-	-	-		
		VKF41.50 <sup>4)</sup>	50	80	ASK33N						
		VKF41.65 <sup>4)</sup>	65	200	ASK33N						
		VKF41.80 <sup>4)</sup>	80	400	ASK33N						
		VKF41.100 <sup>4)</sup>	100	760	ASK33N						
		VKF41.125 <sup>4)</sup>	125	1000	ASK33N						
		VKF41.150 <sup>5)</sup>	150	2100	ASK33N			-	400		
		VKF41.200 <sup>5)</sup>	200	4000	ASK33N			-	300		
 -10 °C...120 °C	N4136	VKF46.40 <sup>1)</sup>	40	50	-	-	-	1600	-		
		VKF46.50 <sup>1)</sup>	50	85	-						
		VKF46.65 <sup>1)</sup>	65	215	-						
		VKF46.80 <sup>1)</sup>	80	420	-			-	1600		
		VKF46.100 <sup>1)</sup>	100	800	-					1200	
		VKF46.125 <sup>1)</sup>	125	1010	-					800	

<sup>1)</sup> VFW41..., VFL41..., VKF46.. maximum flow speed water = 4.5 m/s, air 40 m/s

<sup>2)</sup> VFW41..U maximum flow speed water for SAL31.. and SAL81.. = 4 m/s and SAL61.. = 2.5 m/s

<sup>3)</sup> VFW41.150U and VFW41.200U maximum flow speed for SAL31.. and SAL81.. = 2.5 m/s and SAL61.. = 1.5 m/s

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

<sup>5)</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>6)</sup> Only the hand lever ASK41.. or an actuator can be mounted, not both.



## 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-Z106	S55845-Z107	S55845-Z108
		Max. 2		Max. 1
SAX31..	Max. 2	Max. 1	-	Max. 1
SAX61..		-	Max. 1	
SAX61.03/MO		-	-	
SAX81..		Max. 1	-	
SAX31P..	Max. 2	Max. 1	-	-
SAX61P..		-	Max. 1	
SAX61P03/MO		-	-	
SAX81P..		Max. 1	-	
SAV31..	Max. 2	Max. 1	-	Max. 1
SAV61..		-	Max. 1	
SAV61.00/MO		-	-	
SAV81..		Max. 1	-	
SAV31P..	Max. 2	Max. 1	-	-
SAV61P..		-	Max. 1	
SAV61P00/MO		-	-	
SAV81P..		Max. 1	-	
SAL31..	Max. 2	Max. 1	-	-
SAL61..		-	Max. 1	
SAL81..		Max. 1	-	
SAY31P..	Max. 2	Max. 1	-	-
SAY61P..		-	Max. 1	
SAY61P03/MO		-	-	
SAY81P..		Max. 1	-	

Notes on ASZ7.5 <sup>1)</sup>

For the combination SIMATIC S5/S7 and position feedback message, we recommend actuators with DC 0...9.8 V feedback signals.

The signal peaks that occur in the potentiometer ASZ7.5 may result in error messages on Siemens SIMATIC.

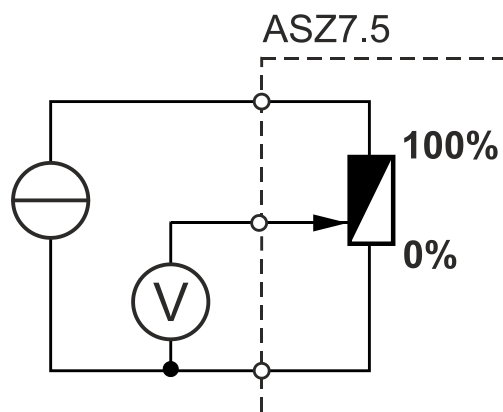
This is not the case when combined with Siemens HVAC controllers.

The reason is that SIMATIC has a higher resolution and faster response time.

Use a 3-wire connection as the voltage divider for the potentiometer.

Powering the potentiometer over the wiper may result in a shorter lifecycle.

Signal peaks occurring in this operating mode increase in frequency and severity throughout its lifecycle.



## 2.6.2 Mechanical accessories

Product no.	Weather shield ASK39.1 <sup>1)</sup>	Mounting set				
		ASK31N for VBF21..	ASK32N for VBF21..	VBI31.. <sup>2)</sup> VCI31.. <sup>2)</sup> VBG31.. <sup>2)</sup>	ASK33N for VKF41..	ASK35N for VKF45.. <sup>3)</sup>
Stock no	S55845-Z109	S55845-Z100	S55845-Z211		S55845-Z101	S55845-Z102
SAY..	Max. 1	-	-	-	-	-
SAX..						
SAV..						
SAL..						
SAL..T10	Max. 1	DN 65...150	DN 40...50	✓	✓	-
SAL..T20		-	-		-	DN 40...65
SAL..T40					DN 150...200	DN 80...200

<sup>1)</sup> SA..61../MO are not suitable for outdoor applications.

<sup>2)</sup> Types VBI31.., VCI31.., and VBG31.. are available only while stock lasts from 2019 on.

<sup>3)</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..		Pos. time [s]	Pos. force [N]	VVF21../VXF21.. VVF31../VXF31.. VVF40../VXF40..	VVF41../VXF41.. VVG41../VXG41..	VVF51.. VVF52..
								DN15...80	DN15...50	DN15...40
SQX31.. <sup>1)</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> SQX31.06: Actuator for gas valves. Either replace complete valve-actuator combination or clarify required positioning time and replace only actuator. Consider if mounting set is required.

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

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

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

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

Rotary actuators		SQL..				SAL..		
		SQL31..	SQL32..	SQL33.. 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	-	ASK32N	.. <sup>1)</sup>	.. <sup>1)</sup>
	DN 65...150	-	-	ASK31	-	ASK31N	-	-
VBF31..	DN 40 / DN 50 <sup>2)</sup>	-	-	ASK32	-	ASK32N	.. <sup>2)</sup>	.. <sup>2)</sup>
	DN 65...100	-	-	ASK31	-	ASK31N	-	-
B3f..	DN 40 / DN 50 <sup>2)</sup>	Direct	ASK25	ASK31	-	-	-	-
	DN 65...150	Direct	ASK25	ASK31	-	ASK31N	-	-
C1f..	DN 40 / DN 50 <sup>2)</sup>	Direct	-	ASK31	-	-	-	-
	DN 65...100	Direct	-	ASK31	-	ASK31N	-	-
K1i..	DN 20...32	Direct	ASK24	ASK33	-	ASK33N	-	-
K1f..	DN 40...200	Direct	ASK24	ASK33	-	ASK33N	-	-
VKF41..	DN 40...125	-	-	ASK33	-	ASK33N	-	-
	DN 150 / DN 200	-	-	ASK33	ASK35	ASK33N	-	ASK33N
VKF45..	DN40...65	-	-	-	ASK35	-	ASK35N	ASK35N
	DN80...200	-	-	-	-	-	-	ASK35N

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

<sup>2)</sup> Replace with rotary actuators SQK33.00 + ASK32

Note

D 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	ASZ6.6	ASZ6.6
ASZ7.4	1 auxiliary switch, 1 potentiometer (1000 Ω)	ASZ7.4	-	ASZ7.4	-	ASC10.51 + ASZ7.5	-
ASC9.4	Double auxiliary switch	ASC9.4	-	ASC9.4	-	2x ASC10.51	-
ASC9.5	Auxiliary switch	ASC9.5	-	ASC9.5	-	ASC10.51	-

Rotary actuators		SQL..				SAL..	
		SQL31..	SQL32..	SQL33..	-	SAL31..T10	-
		-	-	SQL83..	-	SAL81..T10	-
		-	-	-	SQL35.00	-	SAL31.00T20 / T40
		-	-	-	SQL85.00	-	SAL81.00T20 / T40
ASZ7.4	1 auxiliary switch, 1 potentiometer (1000 Ω)	-	-	ASZ7.4	ASZ7.4	ASC10.51 + ASZ7.5	ASC10.51 + ASZ7.5
ASC9.4	Double auxiliary switch	-	-	ASC9.4	ASC9.4	2x ASC10.51	2x ASC10.51
ASC9.5	Auxiliary switch	-	-	ASC9.5	ASC9.5	ASC10.51	ASC10.51
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	-	-	ASC10.51	-

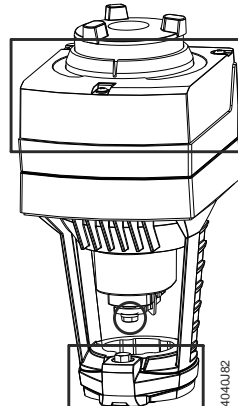
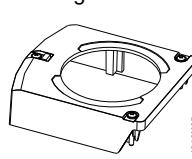

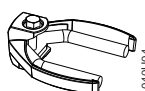
<sup>1)</sup> Used auxiliary switches or potentiometer (order accessories additionally were applicable):

- Check used functionality
- Check compatibility with controller

## 2.8 Spare parts

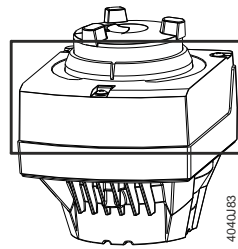
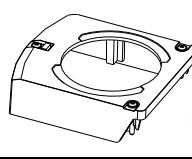


The following spare part sets are available:

**SAY.., SAX.., SAV..**

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

Single components from the spare part sets are not available.

**SAL..**

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

Single components from the spare part sets are not available.

## 2.9 Sizing

### 2.9.1 Parallel operation of actuators

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

3-position actuators must have one specific controller each, refer to "Connection diagrams" (page 85).

#### 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.

#### SA..61../MO

The Modbus converter is designed for analog control on 0..10 V on the actuator side.

**Note:** Keep the setting of the analog signal on the actuator as is (switch 1 to "OFF"), adjustment is not allowed.

The actuators are factory-set to equal-percentage characteristic curve.

**Note:** The DIL switch (actuator-internal changeover of characteristic curve) must be set to "log" (switch 2 to "OFF").

### 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

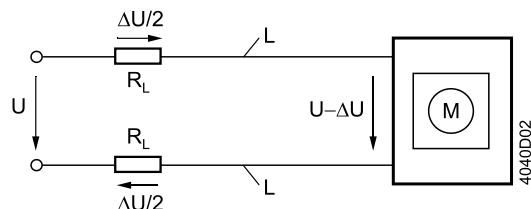
When determining the cable length and the wire cross-sectional area, adherence to the permissible operating voltage tolerance at the actuator is of importance, in addition to the permissible voltage drop across the operating voltage and signal lines (see table below).

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%)
		G0, Y, U	1% each (at DC 0...10 V)
SA..81..		G, Y1, Y2	4% each (total of 8%)

The following criteria must be considered:

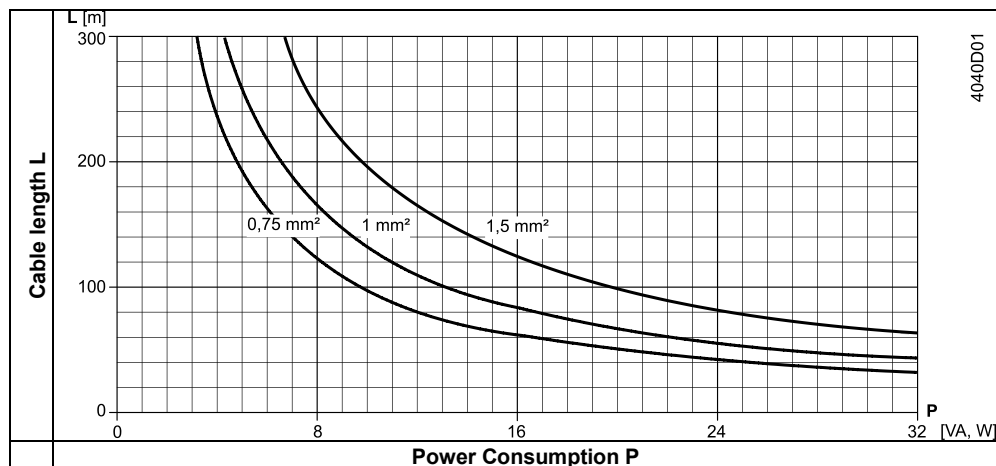
- With modulating control, the permissible positioning signal error must not exceed 1%, the reason being the voltage drop on the G0 wire.
- The voltage drop, caused by charging current peaks in the actuator's DC circuit, must not exceed 2 Vpp.
- If the G0 line is not correctly sized, load changes of 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	$L = 46 \cdot \frac{1313 \cdot A}{P} \text{ [m]}$
AC/DC 24 V	4% of AC 24 V	$L = \frac{1313 \cdot A}{P} \text{ [m]}$
	1% of DC 10 V	$L = \frac{5.47 \cdot A}{I(\text{DC})} \text{ [m]}$

$A$  Cross-sectional area of wire in  $\text{mm}^2$

$L$  Permissible wire length in m

$P$  Power consumption in VA (AC) or W (DC) (see actuator's rating plate)

$I(\text{DC})$  DC current part (in A) on G0 wire

## 2.10 Warranty

The engineering data specified in chapter "Equipment combinations" (page 15) are only guaranteed in connection with the Siemens valves listed.

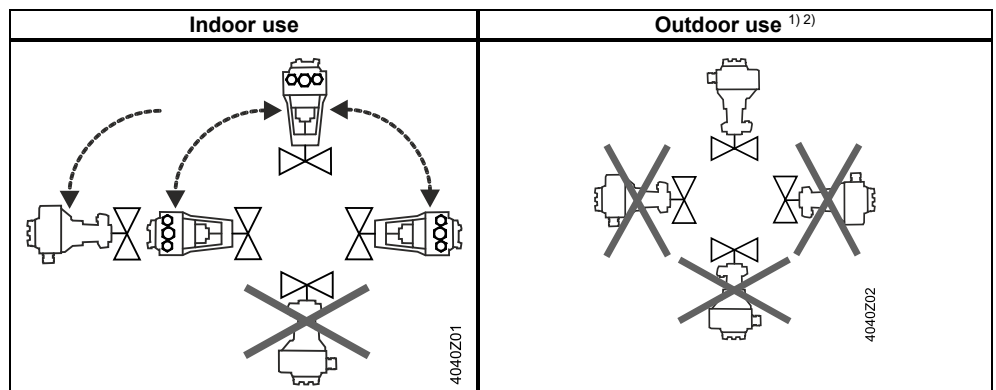
## Note

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



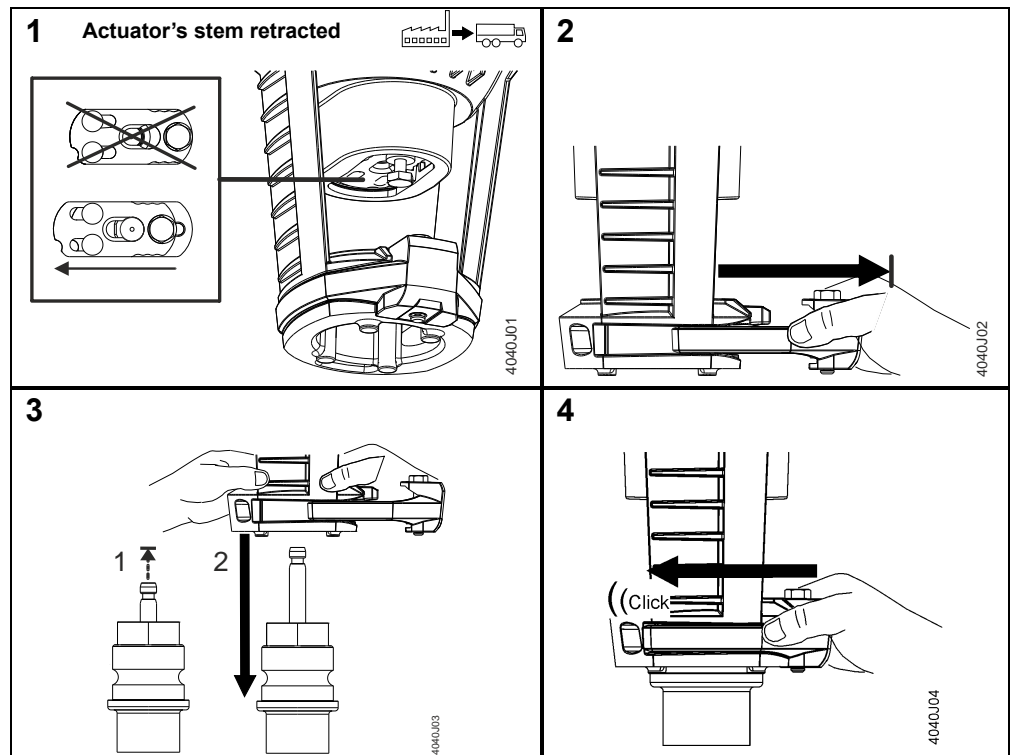
<sup>1)</sup> Only in connection with weather shield ASK39.1

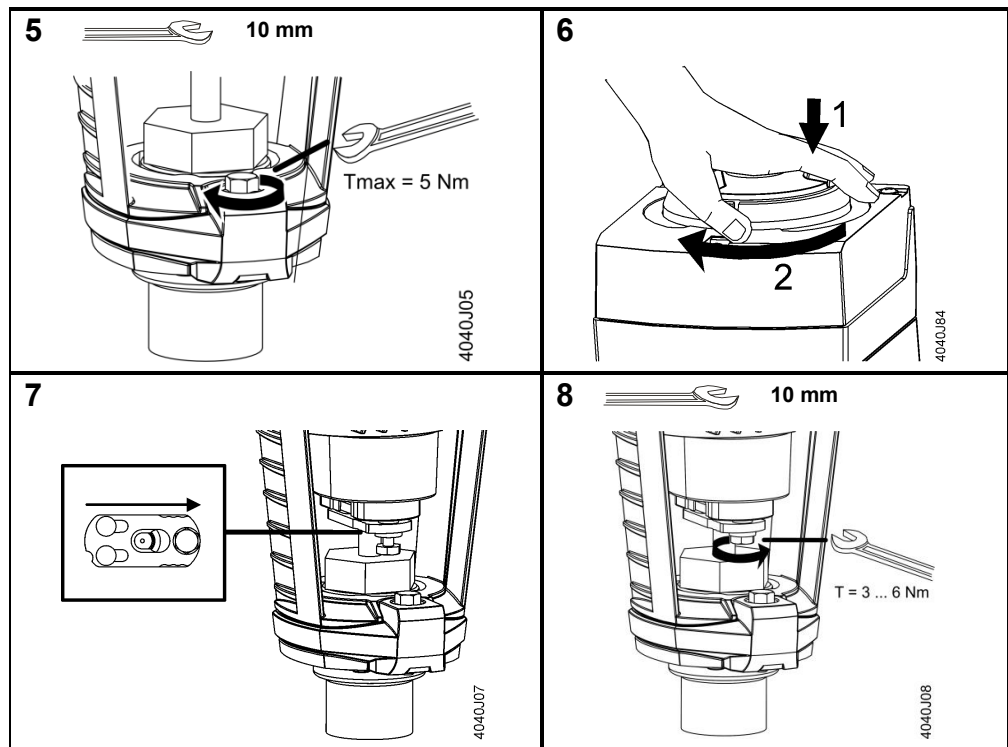
<sup>2)</sup> SA..61../MO are not suitable for outdoor applications.

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

First, observe "Mounting positions" (page 27).

	<b>Caution!</b>
	<b>Risk of burns from hot surfaces!</b> If you touch heated parts, you will get burns as result. <ul style="list-style-type: none"> <li>• Allow to cool parts.</li> <li>• Wear protective gloves.</li> </ul>





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

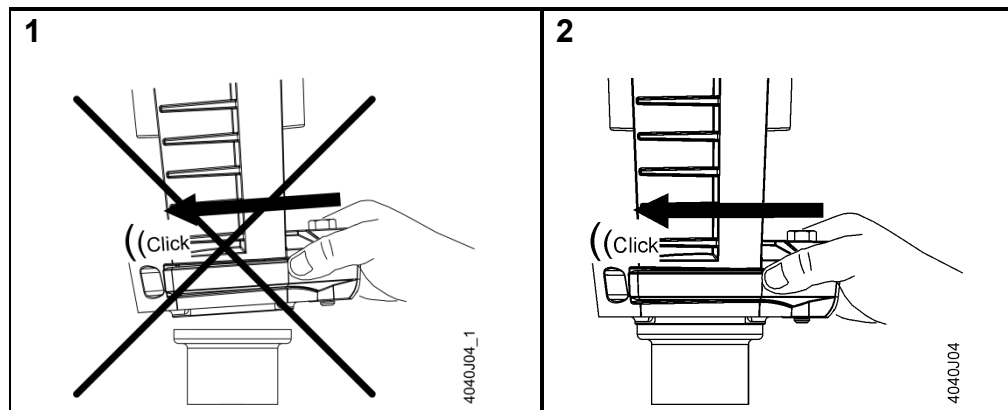


#### Caution!

#### Risk of burns from hot surfaces!

If you touch heated parts, you will get burns as result.

- Allow to cool parts.
- Wear protective gloves.



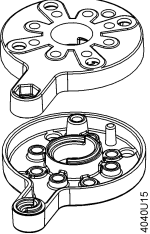
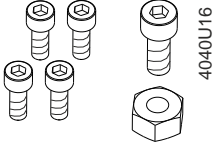
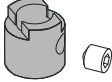
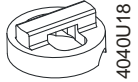
On threaded valves it's possible that the actuator is missaligned on the valve due to a collision with the fitting. If so, please take care for correct mounting, either by turning the actuator or by adjusting the fitting (e.g. use a second sealing to change fitting position).



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


First, observe "Mounting positions" (page 27).

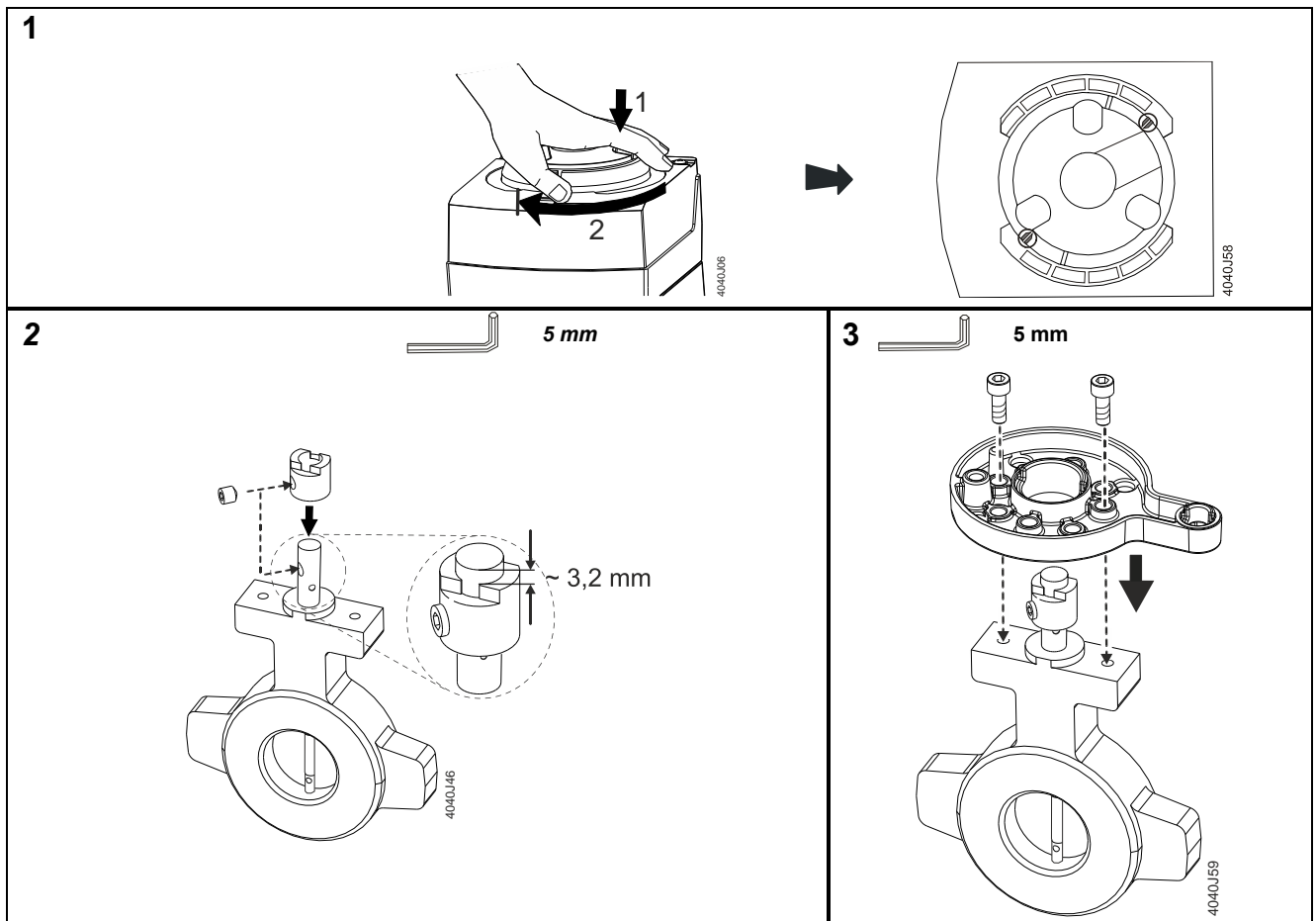
#### Mounting set ASK33N

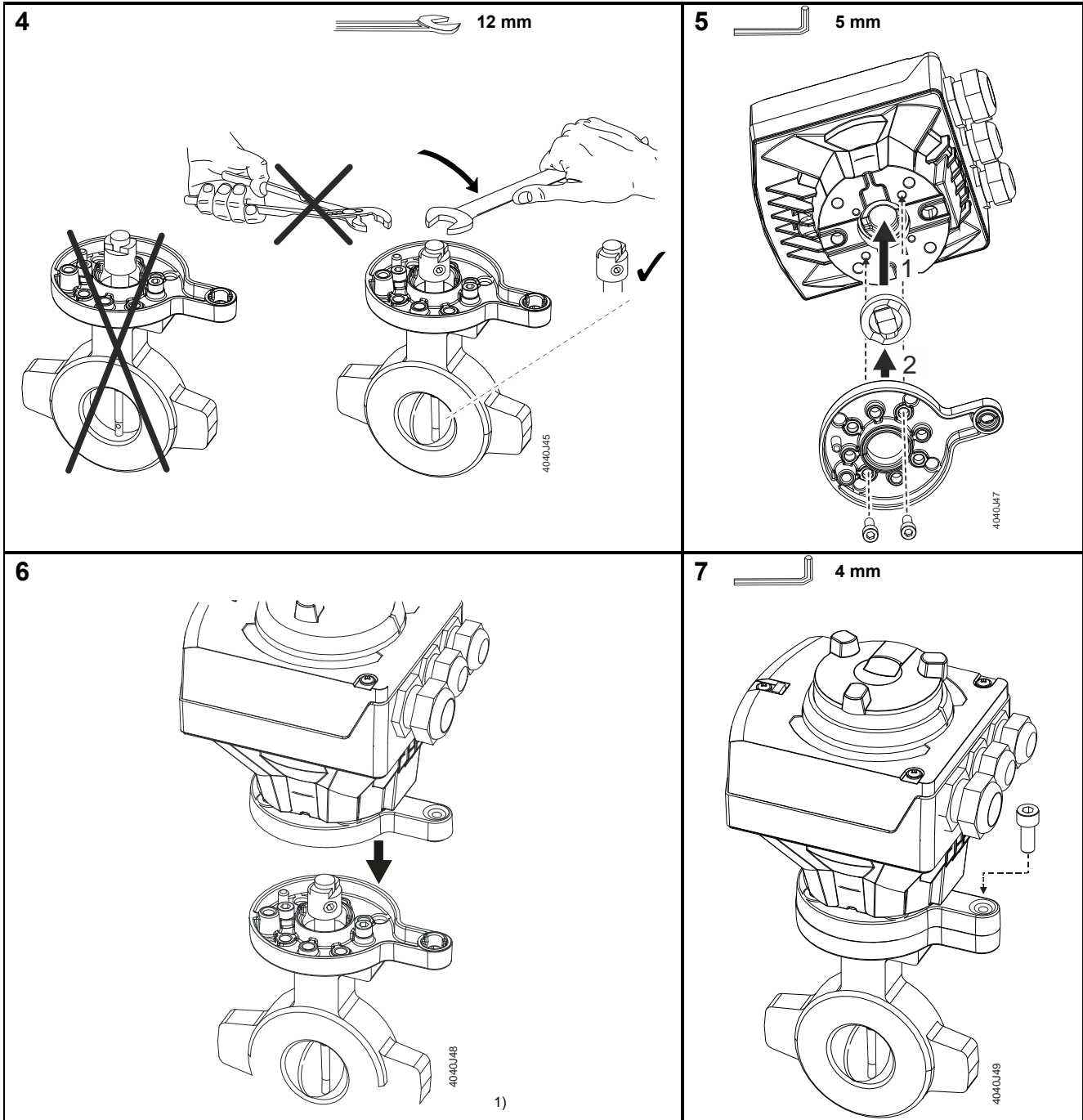
Scope of delivery			
Mounting set (2 parts)	5 screws	1 adapter inc. fixing screw	1 adapter
	4 pcs. M6 x 16 mm 1 pc. M5 x 20 incl. nut 		

#### Note

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

	<b>Caution!</b>
	<b>Risk of burns from hot surfaces!</b> If you touch heated parts, you will get burns as result. <ul style="list-style-type: none"> <li>• Allow to cool parts.</li> <li>• Wear protective gloves.</li> </ul>



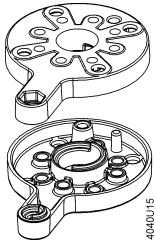
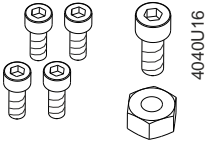
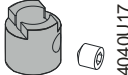
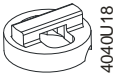


<sup>1)</sup> Angle position errors between actuator shaft and valve stem must be corrected via manual control (refer to "Manual adjuster" page 76).

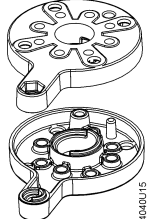
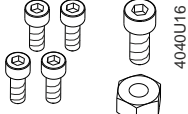

3.1.5 Fitting rotary actuators to slipper valves VBF21..

First, observe "Mounting positions" (page 27).

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 		

Mounting set ASK32N  
for VBF21.., DN 40...50

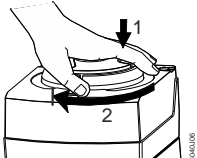
Mounting set (2 parts)	5 screws	1 adapter
	4 pcs. M6 x 16 mm 1 pc. M5 x 20 mm incl. nut 	

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

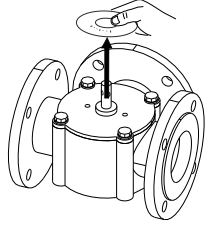



**Caution!**  
**Risk of burns from hot surfaces!**  
If you touch heated parts, you will get burns as result.  
• Allow to cool parts.  
• Wear protective gloves.

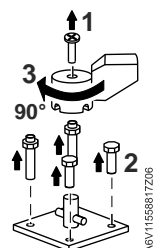
**1**



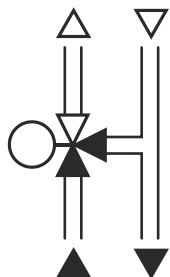
**2a ASK31N**



**2b ASK32N**  10 mm, 13 mm

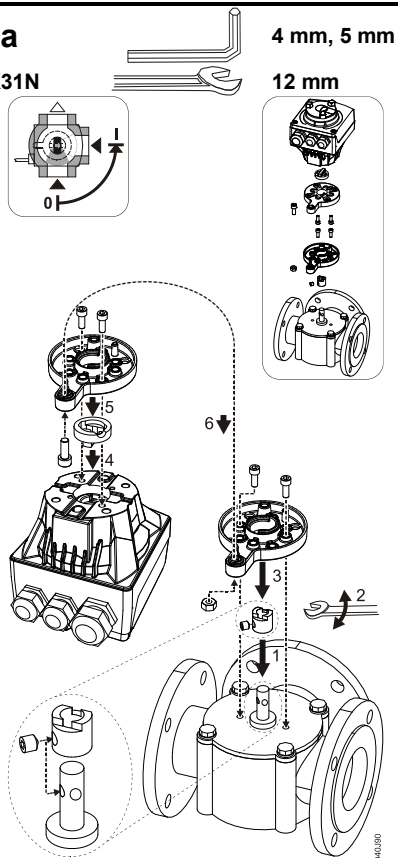


Opening  
counterclockwise



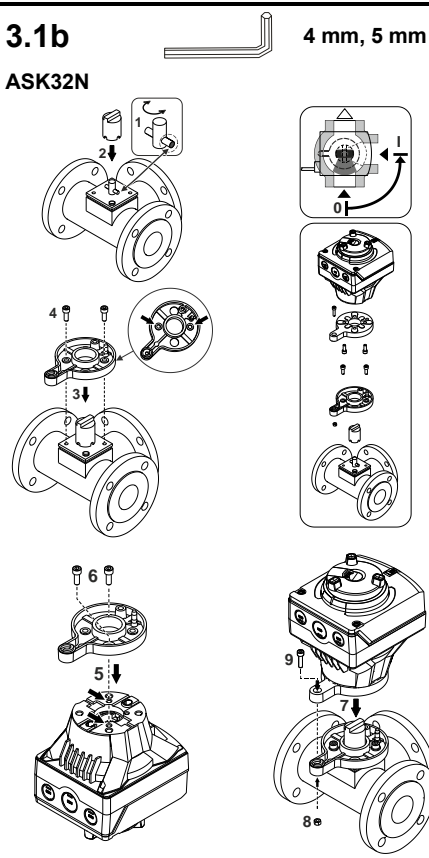
### 3.1a

ASK31N



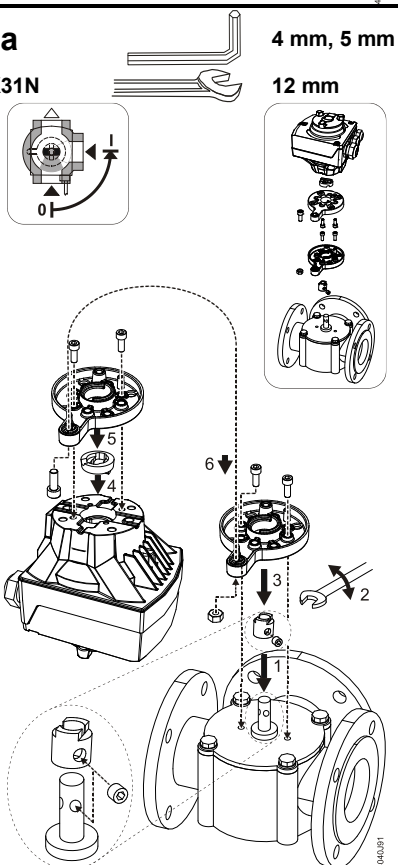
### 3.1b

ASK32N



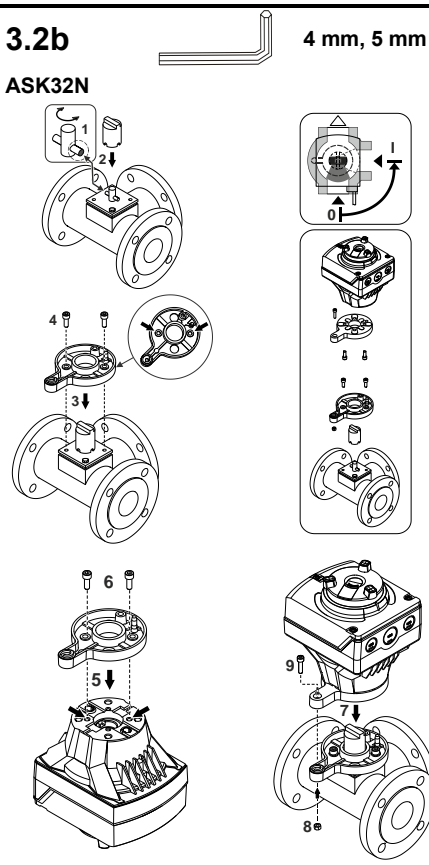
### 3.2a

ASK31N

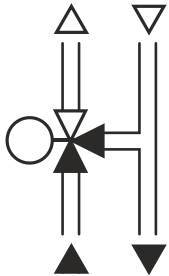


### 3.2b

ASK32N



Opening clockwise

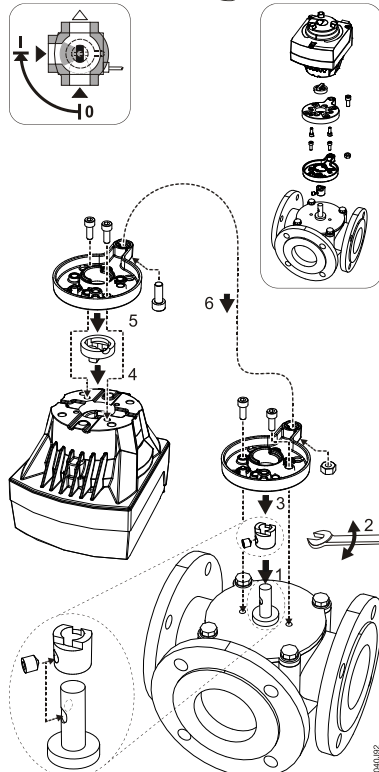


### 3.3a

ASK31N

4 mm, 5 mm

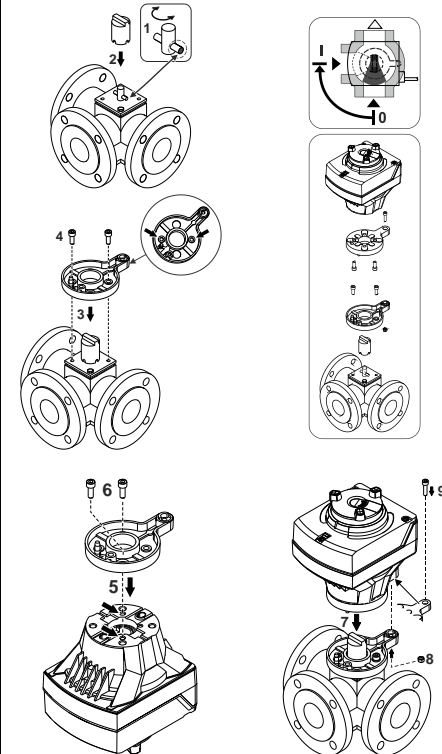
12 mm



### 3.3b

ASK32N

4 mm, 5 mm

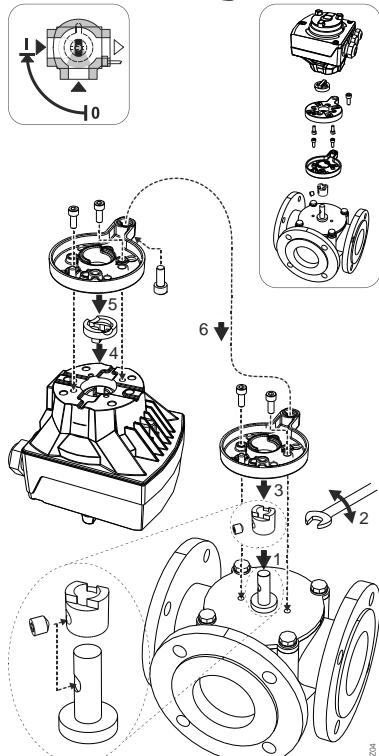


### 3.4a

ASK31N

4 mm, 5 mm

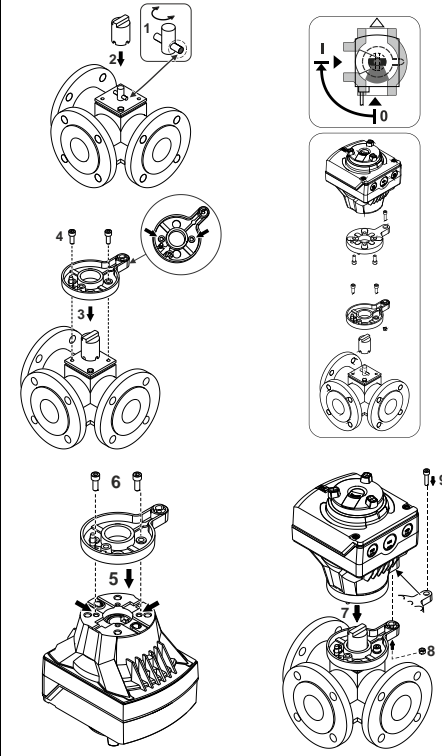
12 mm



### 3.4b

ASK32N

4 mm, 5 mm




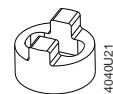
For further mounting positions of VBF 21.. and routing of the connection cables the rotary actuators and adapters must be mounted according to the sketches above.

### 3.1.6 Fitting rotary actuators to butterfly valves VKF46..

First, observe "Mounting positions" (page 27).

**Standard scope of delivery**  
VKF46..

Product no.	Scope of delivery		
	2 screws		1 dapter
<b>SAL..T20</b>	2 pcs. M5 x 20 mm	 4040U20	1 pc. 11 mm
<b>SAL..T40</b>	2 pcs. M6 x 20 mm		1 pc. 14 mm



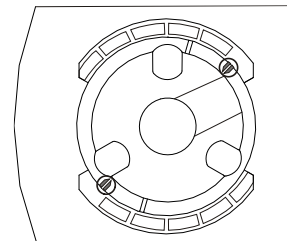
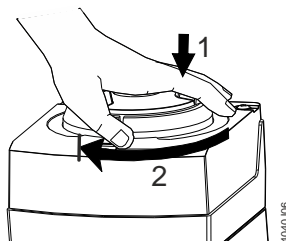
#### Caution!

#### Risk of burns from hot surfaces!

If you touch heated parts, you will get burns as result.

- Allow to cool parts.
- Wear protective gloves.

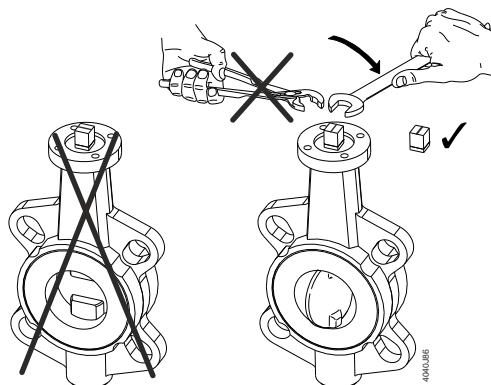
1



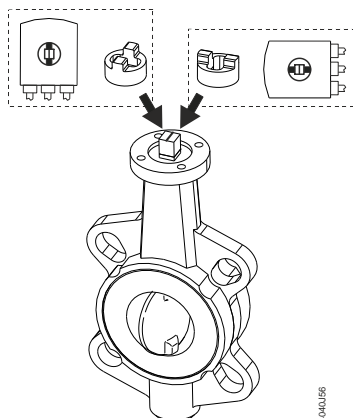
2



- 11 mm (DN 40...65)
- 14 mm (DN 80...125)



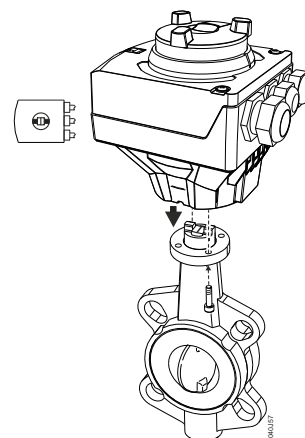
3



4



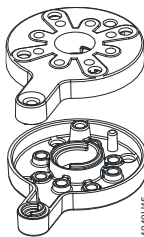
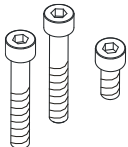
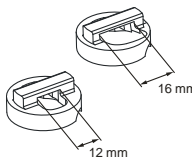
- 4 mm (DN 40...65)
- 5 mm (DN 80...125)



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


First, observe "Mounting positions" (page 27).

#### Mounting set ASK35N For VKF45..

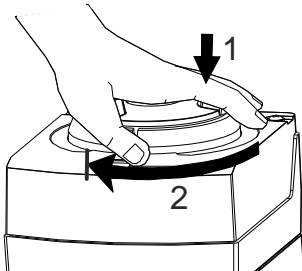

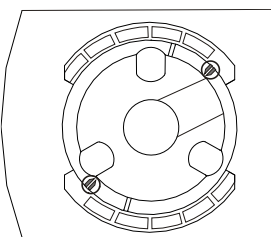
Scope of delivery		
Mounting set (2 parts)	5 screws	2 adapters
	2 pcs. M8 x 50 mm 1 pc. M5 x 20 mm incl. nut 	1 pc. 12 mm 1 pc. 16 mm
		

#### Note


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

	<b>Caution!</b>
	<b>Risk of burns from hot surfaces!</b> If you touch heated parts, you will get burns as result. <ul style="list-style-type: none"> <li>• Allow to cool parts.</li> <li>• Wear protective gloves.</li> </ul>

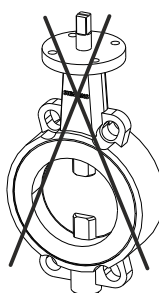
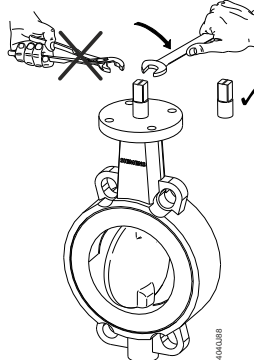
**1**

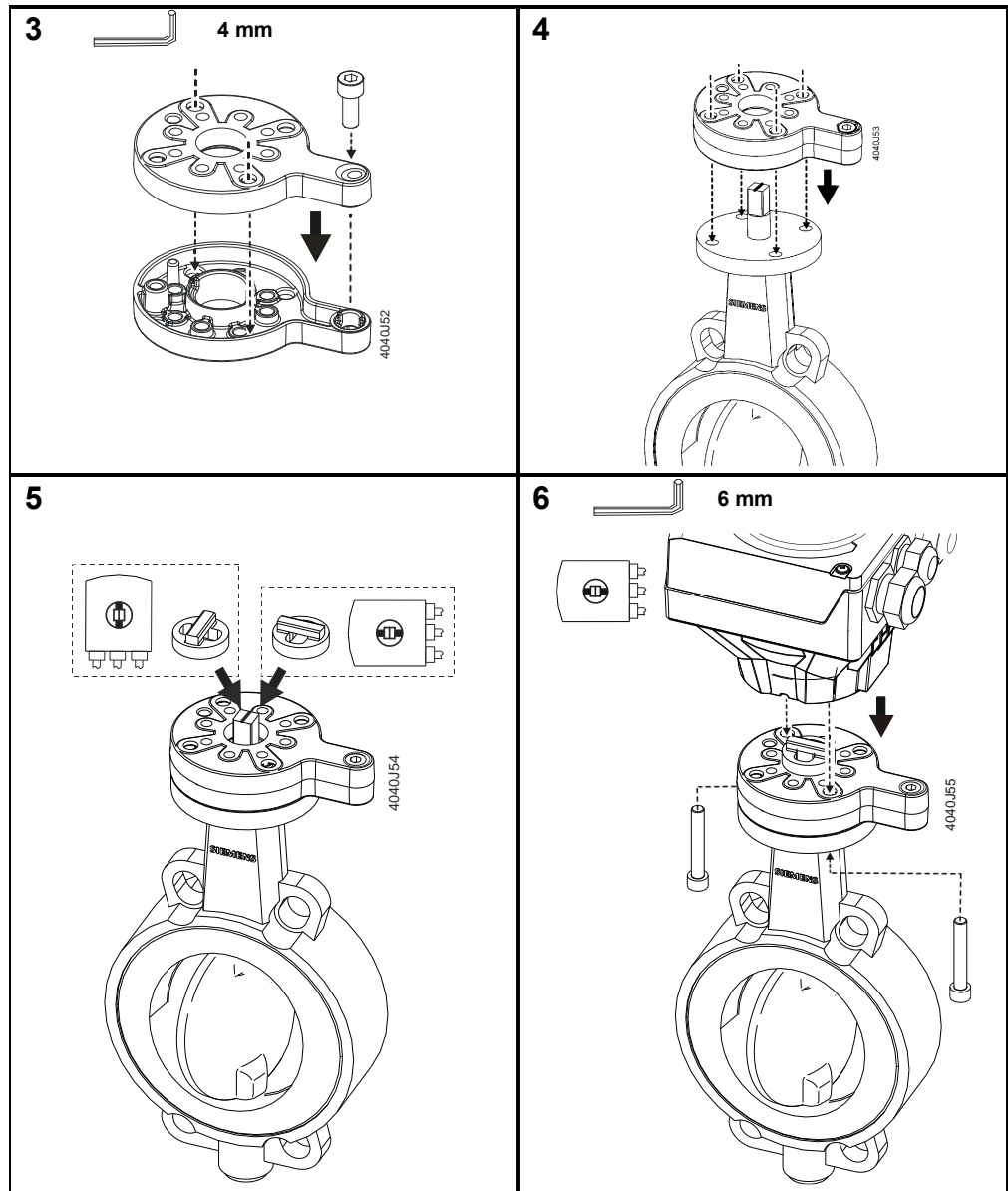
**2**



12 mm (DN 40...125)  
16 mm (DN 150 / 200)










### 3.1.8 Fitting rotary actuators to butterfly valves VFL41..

First, observe "Mounting positions" (page 27).

**Standard scope of delivery**  
VFL41..

Product no.	Scope of delivery			
	2 screws		1 dapter	
<b>SAL..T20</b>	2 pcs. M5 x 20 mm	 4040U20	1 pc. 11 mm	 4040U41
<b>SAL..T40</b>	2 pcs. M6 x 20 mm		1 pc. 14 mm	 4040U06



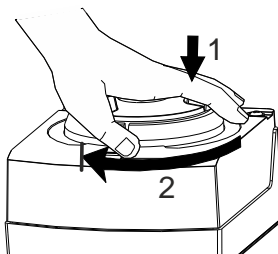
#### Caution!

#### Risk of burns from hot surfaces!

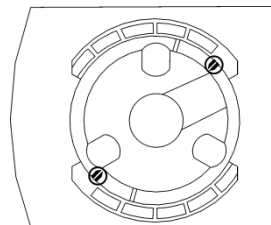
If you touch heated parts, you will get burns as result.

- Allow to cool parts.
- Wear protective gloves.

1



4040U06

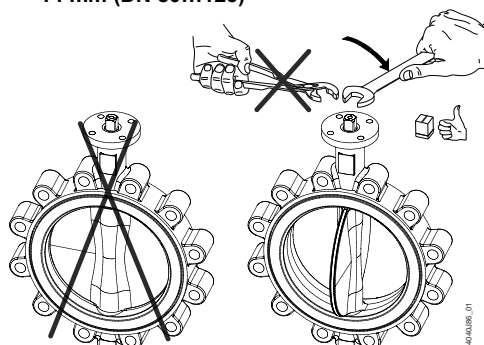


4040U06

2

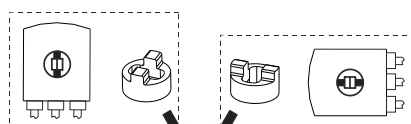


- 11 mm (DN 40...65)
- 14 mm (DN 80...125)



4040U06\_01

3

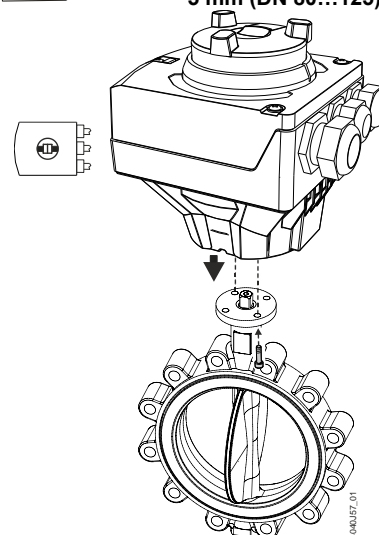


4040U06\_01

4



- 4 mm (DN 40...65)
- 5 mm (DN 80...125)






4040U07\_01

### 3.1.9 Fitting rotary actuators to butterfly valves VFW41..

First, observe "Mounting positions" (page 27).

**Standard scope of delivery**  
VFW41..

Product no.	Scope of delivery			
	2 screws		1 dapter	
<b>SAL..T20</b>	2 pcs. M5 x 20 mm	 4040U20	1 pc. 11 mm	 4040U41
<b>SAL..T40</b>	2 pcs. M6 x 20 mm		1 pc. 14 mm	 4040U06

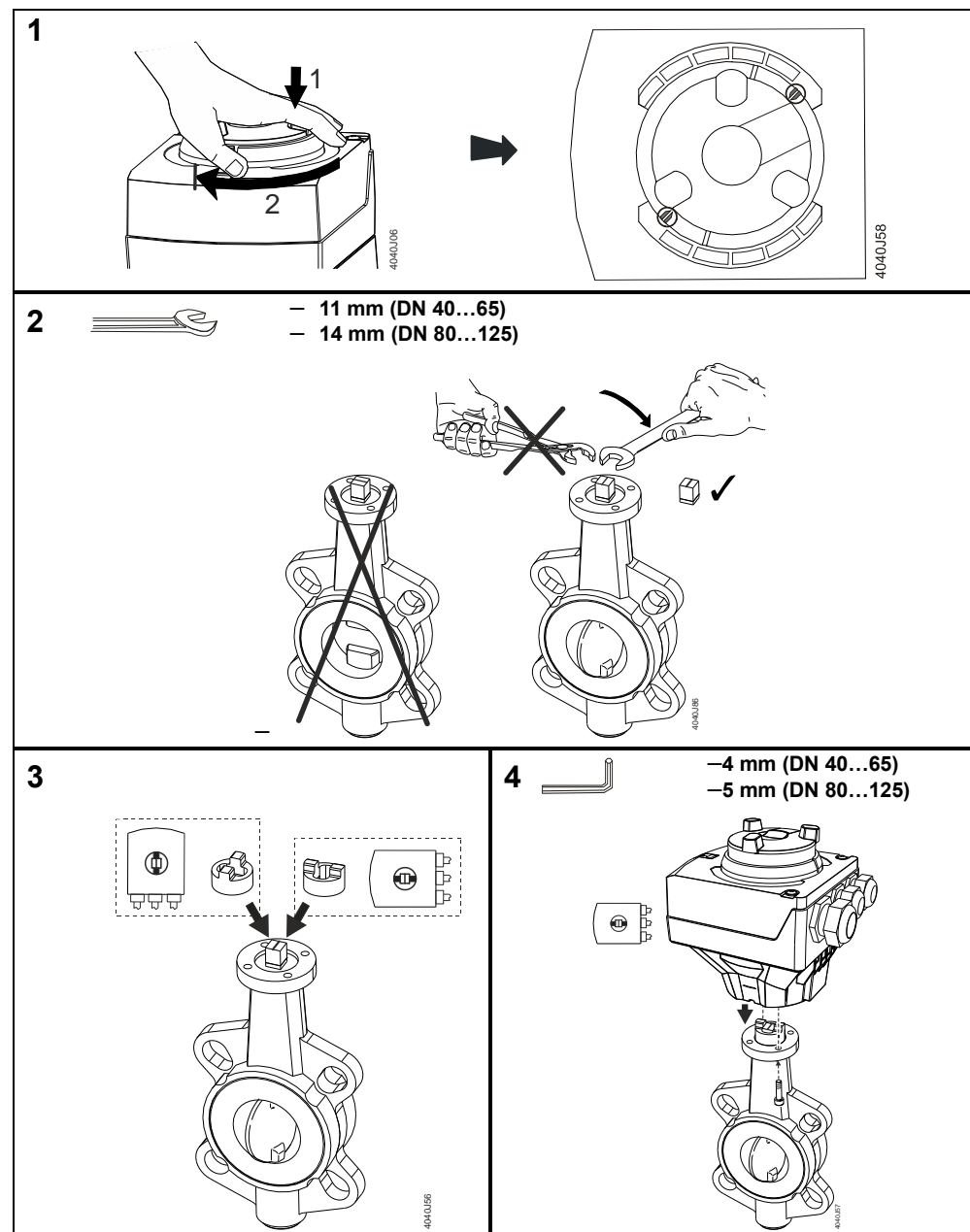


#### Caution!

#### Risk of burns from hot surfaces!

If you touch heated parts, you will get burns as result.



- Allow to cool parts.
- Wear protective gloves.




### 3.1.10 Fitting rotary actuators to butterfly valves VFW41U..

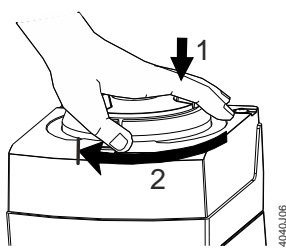
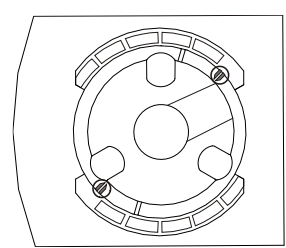
First, observe "Mounting positions" (page 27).


**Standard scope of delivery**  
VFW41U..

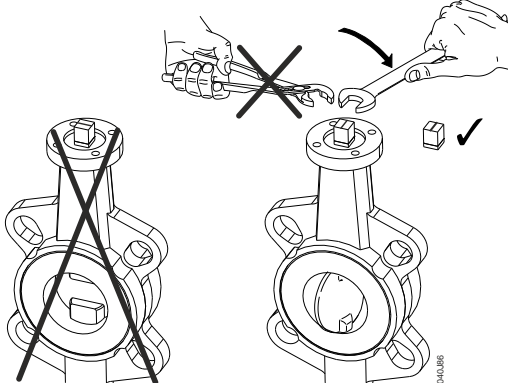
Product no.	Scope of delivery			
	2 screws		1 dapter	
SAL..T10/F05	2 pcs. M6 x 20 mm	 4040U20	1 pc. 14 mm	 4040U06

	<b>Caution!</b>
	<b>Risk of burns from hot surfaces!</b> If you touch heated parts, you will get burns as result. <ul style="list-style-type: none"> <li>• Allow to cool parts.</li> <li>• Wear protective gloves.</li> </ul>

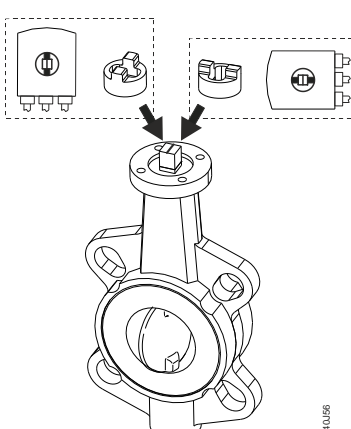
**1**





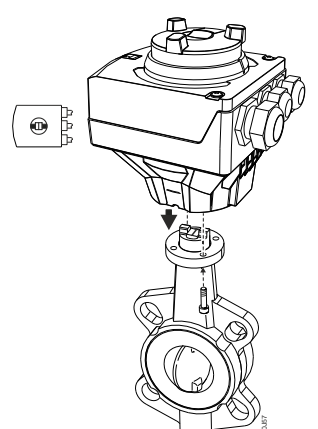
**2**  — 14 mm (DN 40...125)



**3**



**4**  — 5 mm (DN 40...125)




### 3.1.11 Fitting accessories

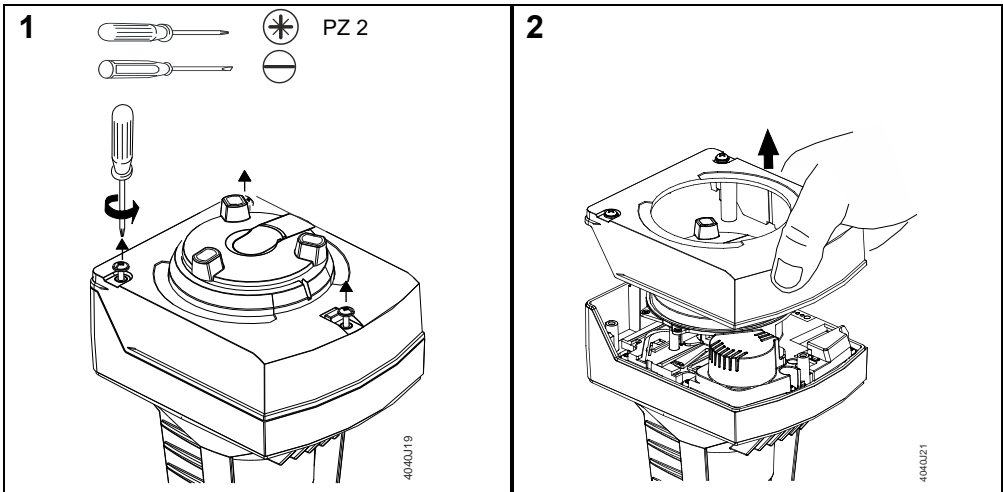
#### Special notes on mounting

SA..31..

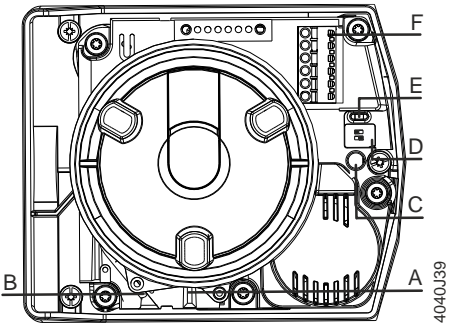
Before fitting the accessory items shown below, the following steps must be performed:

	<b>Danger!</b>
	<b>Danger to life from electrical current!</b> There is an immediate risk of fatal injury in case of contact with live parts of SA..31... <ul style="list-style-type: none"><li>• Disconnect actuator from power.</li></ul>

1. Actuator is mechanically connected to a Siemens valve.
2. Observe compatibility and choice of combinations. Refer to "Accessories" (page 21).
3. Disconnect actuator from power.
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 76).
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.

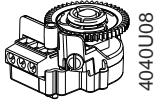


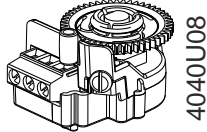

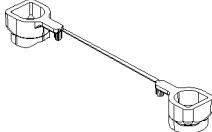
Interior view of setting elements and plug-in spaces



	Plug-in space for...
<b>A</b>	<ul style="list-style-type: none"><li>• <b>Potentiometer</b> ASZ7.5, or</li><li>• <b>Auxiliary switch</b> ASC10.51</li></ul>
<b>B</b>	<ul style="list-style-type: none"><li>• <b>Function module</b> AZX61.1 , or</li><li>• <b>Auxiliary switch</b> 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
	1 pc. 	



First, observe "Special notes on mounting" (page 40).  
Also observe "Notes on ASZ7.5" (page 21).



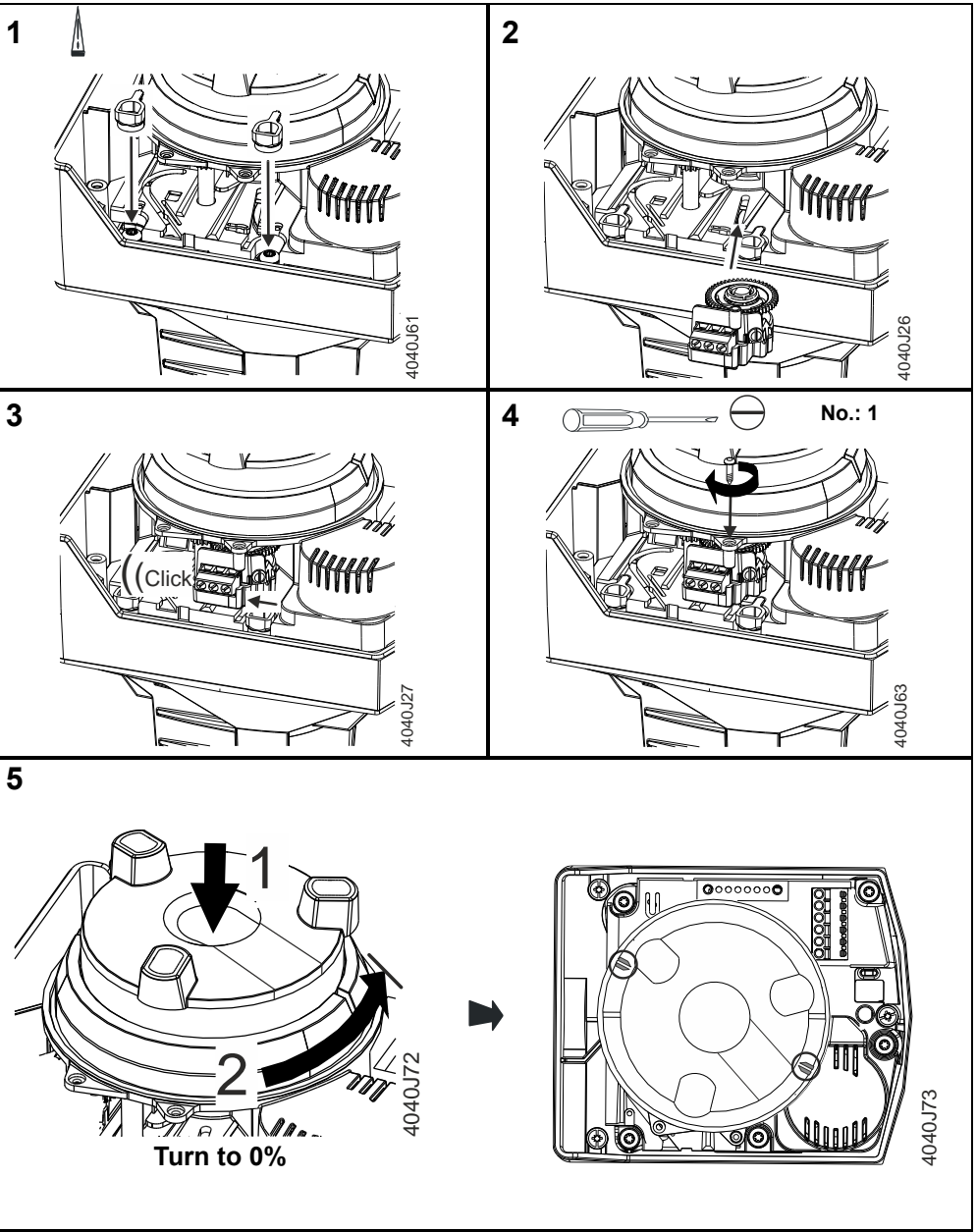
**Danger!**

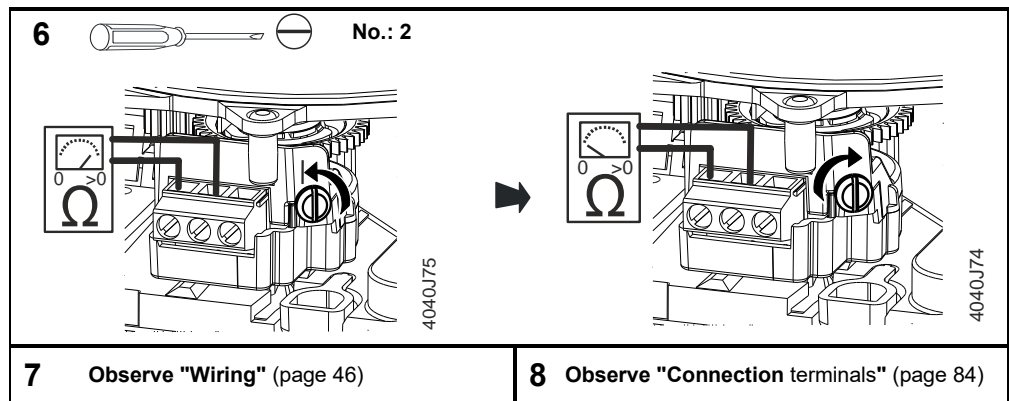
**Danger to life from electrical current!**

If a live wire gets in contact with the screws the whole actuator housing is a live.

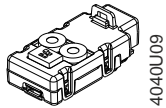
- Fit the screw covers first.

Plug-in space A



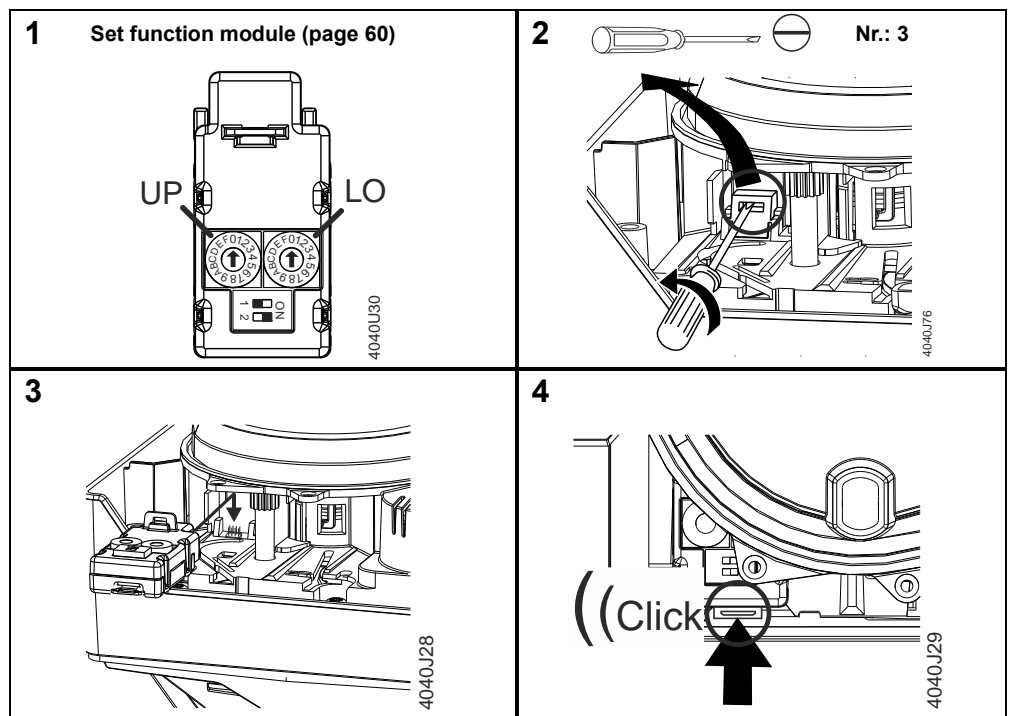


**Function module  
AZX61.1**

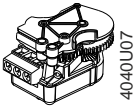


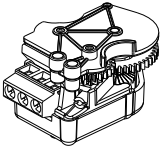

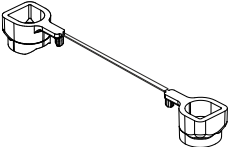
Plug-in space B

First, observe "Special notes on mounting" (page 40).




**Auxiliary switch  
ASC10.51**



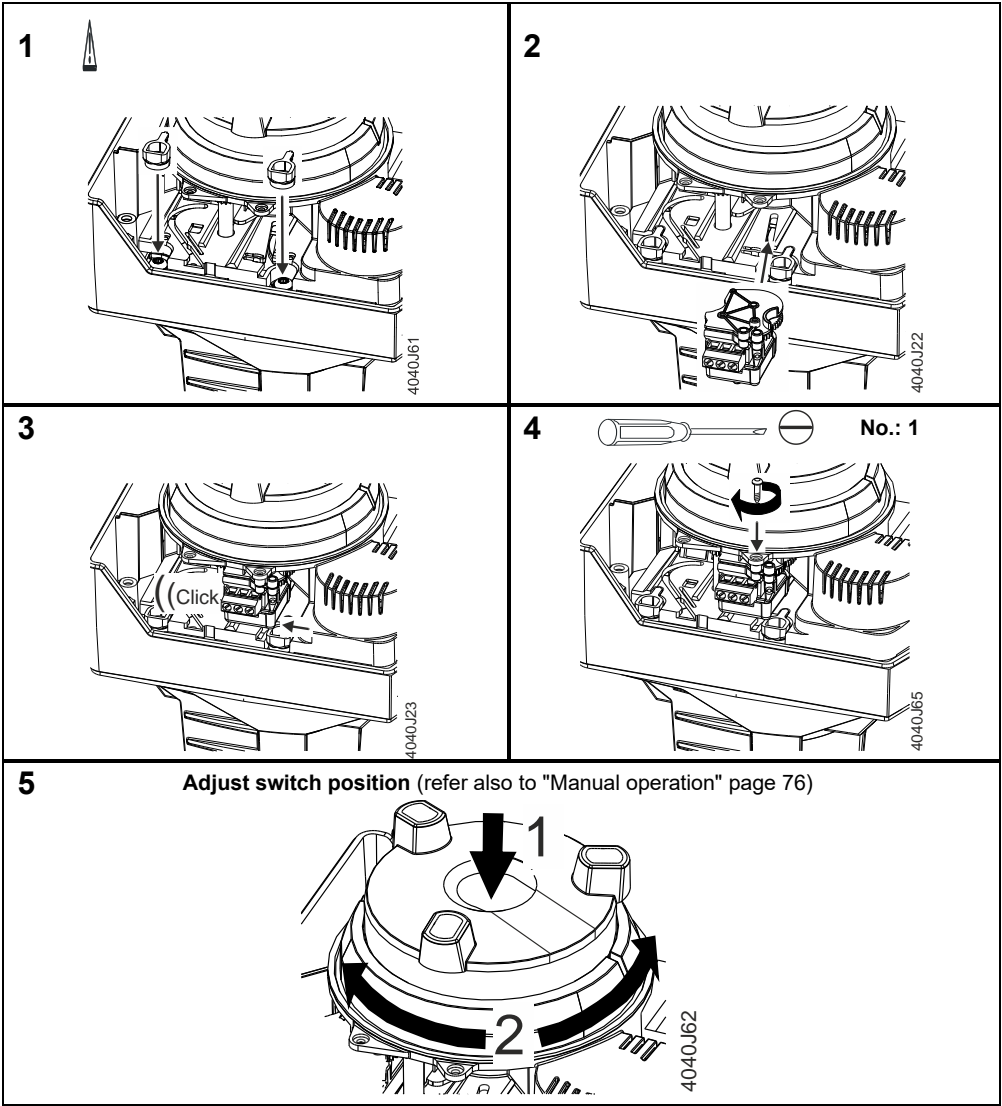
Scope of delivery		
1 auxiliary switch ASC10.51	1 screw	2 screw covers
	1 pc. 	



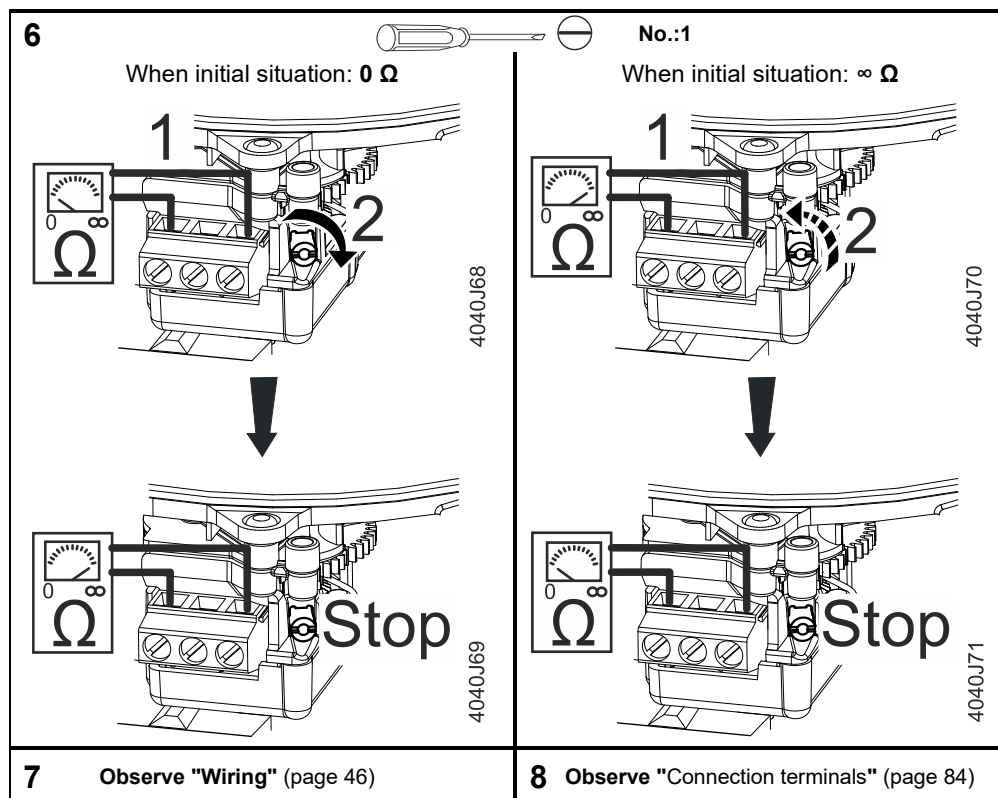
First, observe "Special notes on mounting" (page 40).

	<b>Danger!</b> <b>Danger to life from electrical current!</b> If a live wire gets in contact with the screws the whole actuator housing is a live. <ul style="list-style-type: none"><li>• Fit the screw covers first.</li></ul>
---	--

Plug-in space A







First, observe "Special notes on mounting" (page 40).



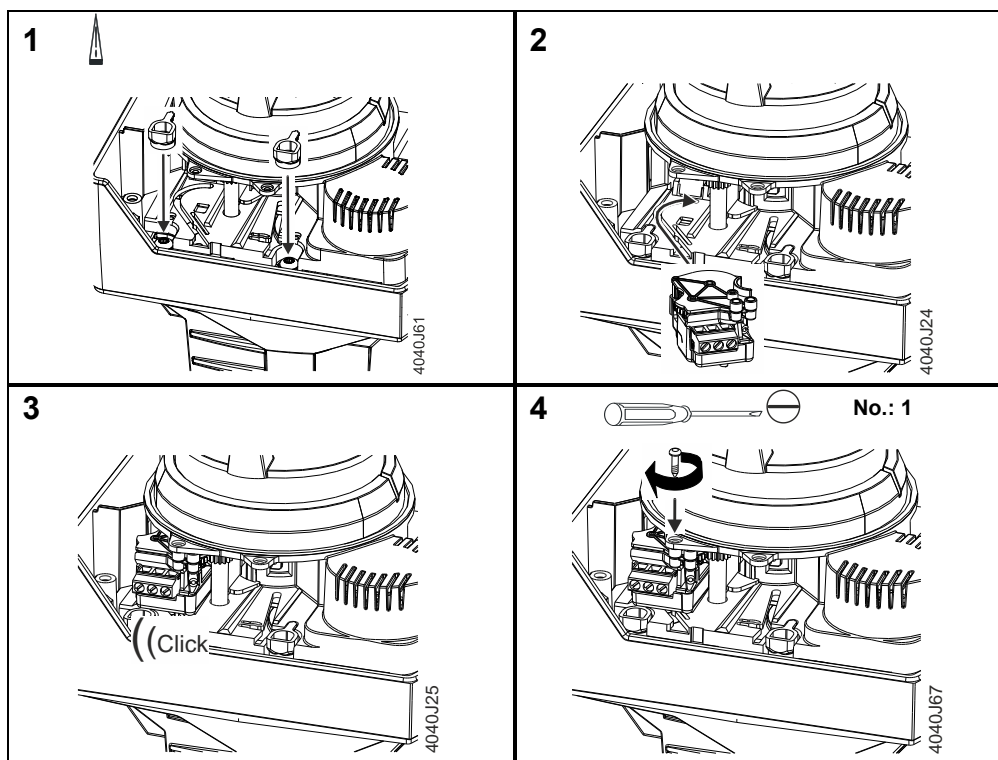
**Danger!**

**Danger to life from electrical current!**

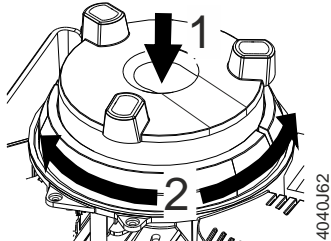
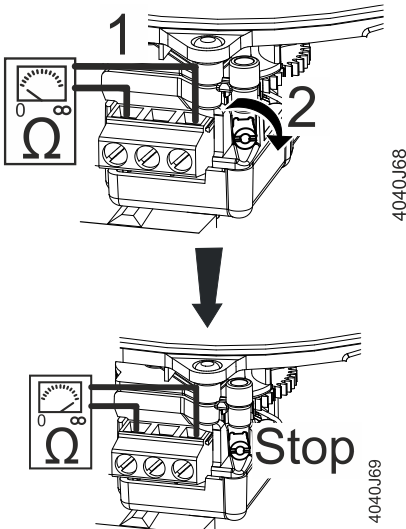
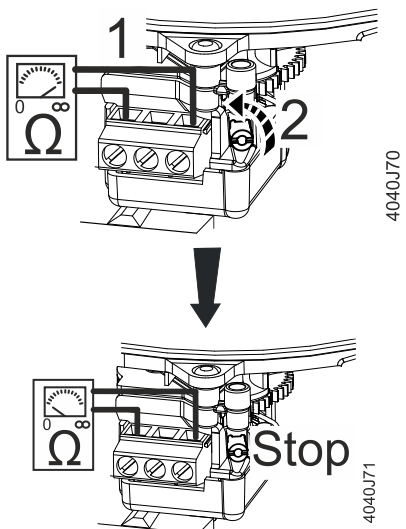
If a live wire gets in contact with the screws the whole actuator housing is a live.

- Fit the screw covers first.

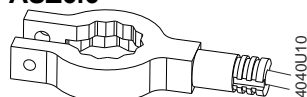
Plug-in space B

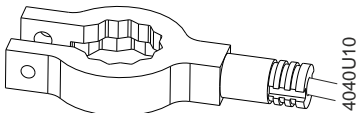
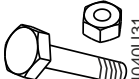




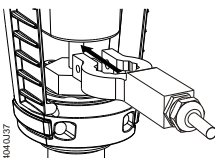
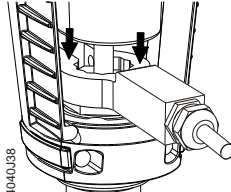
<b>5</b> Adjust switch position (refer also to "Manual operation" page 76)	
<b>6</b> When initial situation: $0\ \Omega$ 	<b>No.: 1</b> When initial situation: $\infty\ \Omega$ 
<b>7</b> Observe "Wiring" (page 46)	<b>8</b> Observe "Connection terminals" (page 84)

### Stem heating element ASZ6.6

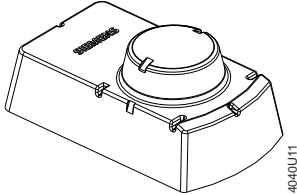


Scope of delivery	
1 stem heating element ASZ6.6	1 screw
	1 pc. M4 x 30 incl. nut 

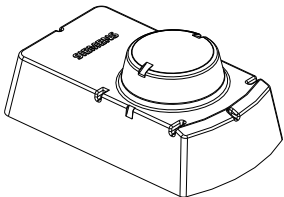
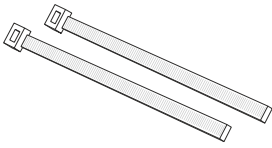
When fitting the stem heating element, stroke actuator and valve must be assembled. The stem heating element is powered separately. First, observe "Special notes on mounting" (page 40).

<b>1</b> 10 mm 14 mm	<b>2</b> 
<b>3</b> 	<b>4</b> 8 mm

Weather shield  
ASK39.1

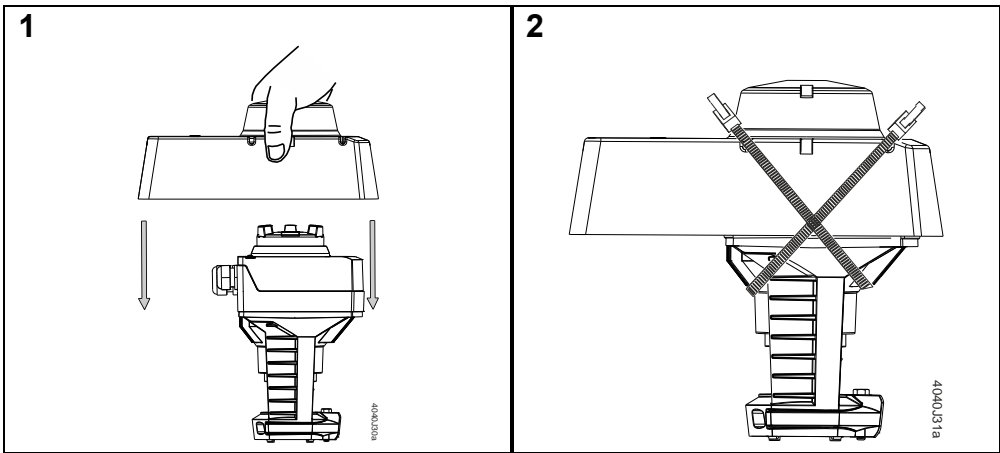


First, observe "Special notes on mounting" (page 40).

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 cannot be used when the weather shield is mounted.
- SA..61../MO are not suitable for outdoor applications.

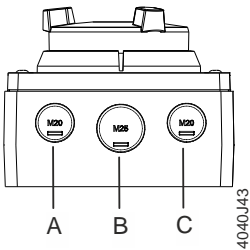
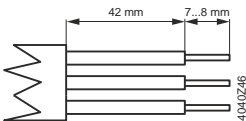


3.1.12 Wiring (installation)

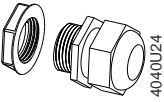
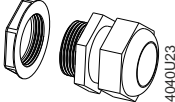
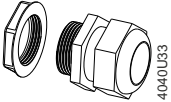
Conduct the electrical connections in accordance with local regulations on electrical installations as well as the "Connection diagrams" on page 84.

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 M20	Metric M25	Inch thread 1/2"
 4040U24	 4040U23	 4040U33

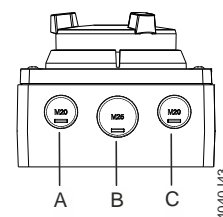
Prior to installation, the following preconditions must be satisfied:

- Actuator is mechanically connected to a Siemens valve.
- Housing cover is removed (step 6 "Special notes on mounting", page 40).

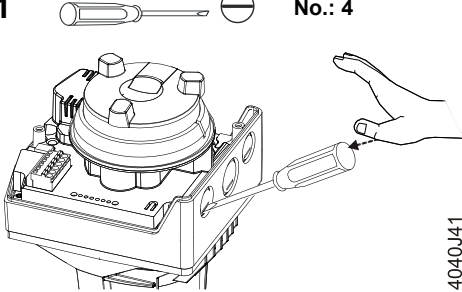
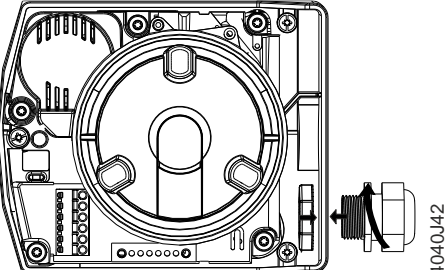
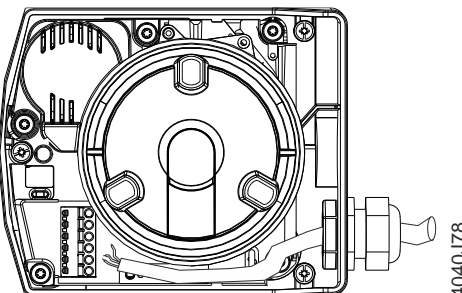
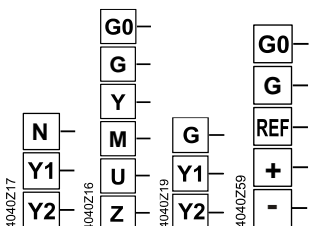
## Communicating actuators



Device contains fixed connecting cable. Left cable duct used (A).



## Actuator

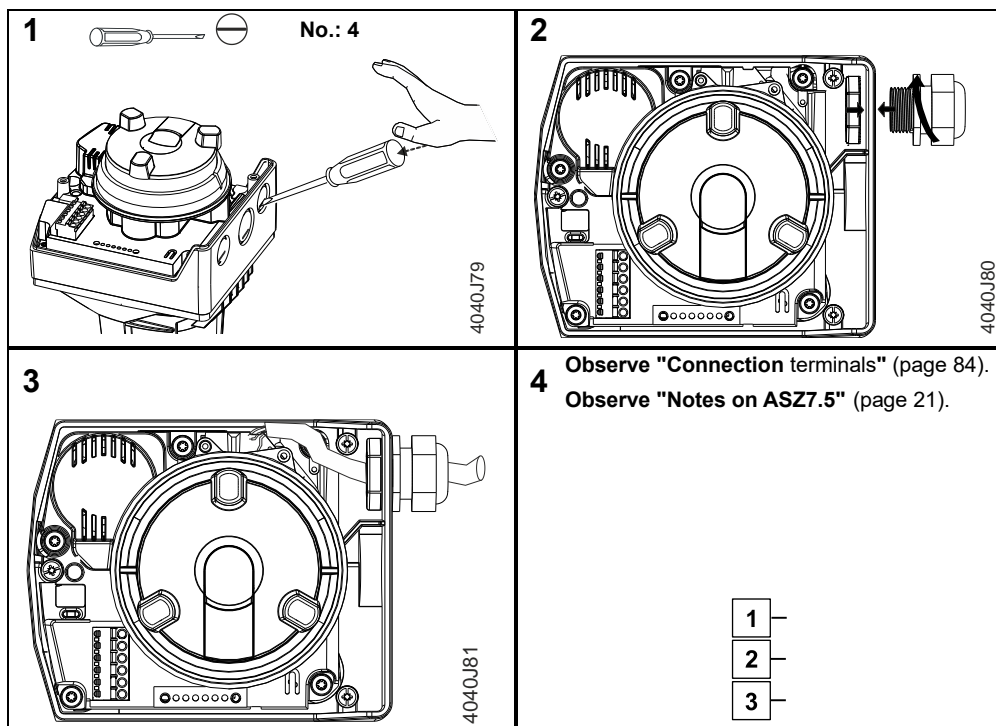
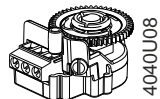
<p><b>1</b></p>  <p>4040J41</p>	<p><b>2</b></p>  <p>4040J42</p>
<p><b>3</b></p>  <p>4040J78</p>	<p><b>4</b> Observe "Connection terminals" (page 84)</p> 

## 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 80)
- Actuator is mechanically connected to a Siemens valve
- **Actuator is in "Manual operation" mode** (page 76).

The actuator can be operated with the help of the "Manual adjuster" (see page 76).

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 63.

#### Electrically

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

- Environmental conditions specified in chapter "Technical data" (page 80).
- Actuator is mechanically connected to a Siemens valve.
- **Actuator is in "Automatic" mode** (page 76).

Actuator and, if required, accessories are correctly fitted and connected. Also refer to "Connection Terminals" (page 84)

- Power is applied.

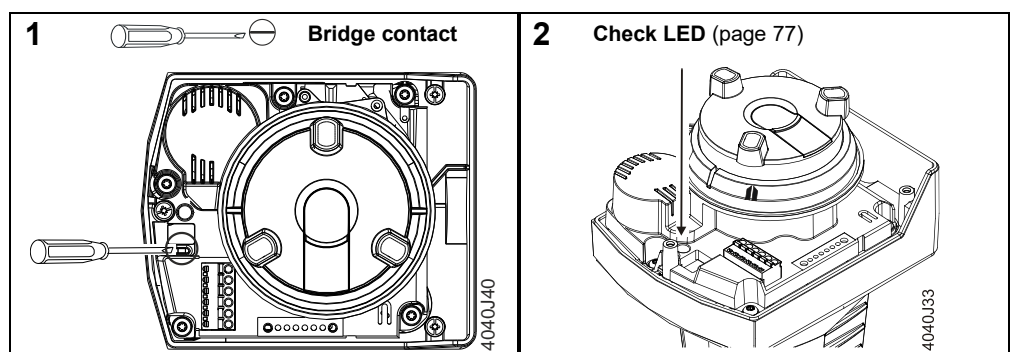
#### SA..61..

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 65 for non-Modbus actuators, page 70 for Modbus actuators).
- Housing cover is removed (step 6 "Special notes on mounting", page 40).



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:

**SAX61.03/03U, SAV61.00/00U and SAL61..**

Connection terminals	Stroke actuator		Rotary actuator	Control path valve A→AB	Bypass valve B → AB	Position feedback U	
	log <sup>1)</sup>	lin <sup>1)</sup>				log <sup>1)</sup>	lin <sup>1)</sup>
Y□ 6 V□ 13,6 mA	Actuator's stem extends (60%)	Actuator's stem extends (82%)	Actuator's spindle turns in clockwise direction (60 %)	Opening	Closing	6 V	8,2 V
Y 5 V□ 12 mA	Actuator's stem retracts (50%)	Actuator's stem retracts (75%)	Actuator's spindle turns in counterclockwise direction (50 %)	Closing	Opening	5 V	7,5 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	

<sup>1)</sup> SAX61.03.. and SAV61.00.. factory setting **log**, SAL61.. factory setting **lin**

**SAY61P.., SAX61P03..., SAV61P00...**

Connection terminals	Stroke actuator		Rotary actuator	Control path valve A→AB	Bypass valve B → AB	Position feedback U	
	log <sup>1)</sup>	lin <sup>1)</sup>				log <sup>1)</sup>	lin <sup>1)</sup>
Y□ 6 V□ 13,6 mA	Actuator's stem retracts (30%)	Actuator's stem retracts (60%)	-	Opening	Closing	2.95 V	6 V
Y 5 V□ 12 mA	Actuator's stem extends (23%)	Actuator's stem extends (50%)	-	Closing	Opening	2.3 V	5 V
Z connected to G	Actuator's stem retracts		-	Opening	Closing	10 V	
Z connected to G0	Actuator's stem extends		-	Closing	Opening	0 V	

<sup>1)</sup> SAY61P.., SAX61P.., SAV61P.. factory setting **log**

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

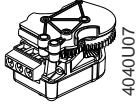
Connection terminals	Stroke actuator	Rotary actuator	Control path valve A→AB	Bypass valve B → AB
Voltage at Y1	Actuator's stem extends <sup>1)</sup>	Actuator's spindle turns in clockwise direction	Opening	Closing
Voltage at Y2	Actuator's stem retracts <sup>1)</sup>	Actuator's spindle turns in counter-clockwise direction	Closing	Opening
No voltage at Y1 and Y2	Actuator's stem maintains the position	Actuator's spindle maintains the position	Maintains the position	

<sup>1)</sup> The opposite is true for SA...1P..

**Notes**

- If function module AZX61.1 is used, observe information given in chapter "Changeover of acting direction" (page 61).
- Observe information given in chapter "Acting direction and flow characteristic" on page 63.

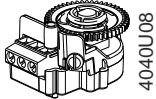
## Auxiliary switch ASC10.51



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	$Y = 0 \text{ V}$	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	$Y = 0 \text{ V}$	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> $\text{SAX31.00} = 27\% \times 120 \text{ sec} = 32.5 \text{ sec}$	Valve position % + 2% $Y = 2.7 \text{ V}$	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):

First, observe "Notes on ASZ7.5" (page 21).

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	$< 1 \Omega$	$> 996 \Omega$
Voltage at Y1 for desired valve position % positioning time <b>Example:</b> $\text{SAX31.00} = 75\% \times 120 \text{ sec} = 90 \text{ sec}$		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	$\sim 560 \Omega$	$\sim 436 \Omega$
Voltage at Y2 for desired change of valve position % x positioning time <b>Example:</b> $\text{SAX31.00} = 10\% \times 120 \text{ sec} = 12 \text{ sec}$		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	$\sim 485 \Omega$	$\sim 511 \Omega$

## 3.2.2 Commissioning Modbus RTU

The devices were developed specifically for use with Climatix pushbutton configuration as described in document CE1A3975 <sup>1)</sup>.

Alternatively, the bus can be configured via the local HMI; see section "User interface", pg. 53.

Check the following during commissioning:

- *Bus configuration* (address, baud rate, transmission format and optional termination). The initial address 255 <sup>2)</sup> allows multiple actuators to be mounted and commissioned at the same time without interfering with each other.
- *Actuator parameters* (opening direction, position limits, position adaption etc.). These values can be read via the Modbus register. Parameters may not be written cyclically.

<sup>1)</sup> Documents can be downloaded at <http://www.siemens.com/bt/download>

<sup>2)</sup> The address 255 means "unassigned", and must be adjusted for the adapter to be operable.

### Full or partial configuration via bus

The actuators can be configured via bus connection if the settings prior to commissioning allow for a connection to the Modbus client/programming tool and peripheral devices (i.e. non-conflicting addresses and matching baud rate/transmission format).

- *Full configuration via bus*: Given a unique Modbus address, the client/programming tool can establish a connection after start-up using the presets for transmission format and baud rate (or auto-baud).
- *Partial configuration via bus*: Given a non-unique Modbus address, the address must first be set to a unique value, either by inputting it with the pushbutton (cf. page 54) or by setting the address to 246 by pressing the pushbutton 5...10 seconds (cf. page 53). Subsequently, the client/programming tool can establish a connection after start-up using the presets for transmission format and baud rate (or auto-baud).

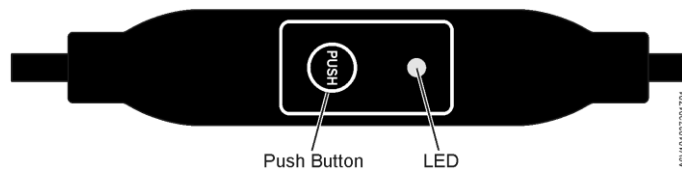
Once a connection is established, the bus and actuator parameters can be set via bus to the intended values. When writing to the bus parameters, "1 = Load" must be written to register 768 within 30 seconds; otherwise, the changes are discarded.

Example: The table shows the register values before and after the change via bus access.

Reg.	Name	Before change	After change
764	Modbus address	246	12
765	Baud rate	0 = auto	1 = 9600
766	Transmission format	0 = 1-8-E-1	3 = 1-8-N-2
767	Bus termination	0 = Off	0 = Off
768	Bus conf. command	0 = Ready	1 = Load



## User interface



### Pushbutton operation

Action	Pushbutton operation	Feedback
Return current Modbus address (starting from lowest digit)	Briefly press button 1 x (<1 s)	<ul style="list-style-type: none"> <li>1st digit (single digit): red</li> <li>10-digit (double digit): green</li> <li>100-digit (triple digit): orange</li> </ul> LED blinks blue 1 x after address indication if bus termination is switched on. Example: 124 = 4 x red, 2 x green, 1 x orange
Switch bus termination on/off	Switch on 1. Press button 3 x Wait >1 s	LED stops blinking/flashing.
	Within 10 s: 2. Briefly press button 1 x (<1 s)	LED flashes blue 1 x blue (termination mode on). Button not pressed within 10 s: <ul style="list-style-type: none"> <li>Address (and bus termination, if applicable) is indicated.</li> <li>Device enters normal mode.</li> </ul>
	Within 10 s: 3. Press and hold button until LED turns red	LED is lit red (confirmation). Button not pressed within 10 s: <ul style="list-style-type: none"> <li>Address (and bus termination, if applicable) is indicated.</li> <li>Device enters normal mode.</li> </ul>
	4. Release button	LED turns off. Address is indicated. LED blinks blue 1 x after address indication (termination mode on). Device enters normal mode.
	Switch off 1. Press button 3 x Wait >1 s	LED stops blinking/flashing.
	Within 10 s: 2. Press and hold button until LED turns red	LED is lit red (confirmation). Button not pressed within 10 s: <ul style="list-style-type: none"> <li>Address (and bus termination, if applicable) is indicated.</li> <li>Device enters normal mode.</li> </ul>
	3. Release button	LED turns off. Address is indicated. [LED DOES NOT flash blue following address indication (termination mode off).] Device enters normal mode.
Enter Modbus address with pushbutton	Press and hold button 1...5 s	See "Enter address using pushbutton", pg. 54
Enable pushbutton addressing (use with Climatix™ controllers)	1. Press and hold button 5...10 s	LED is lit red and turns off after 5 s.
	2. Release button	LED is lit orange.
Reset to factory settings	Press and hold button >10 s	LED flashes orange.

## LED colors and blinking patterns

Color	Blinking pattern	Description
Green	1 s on / 5 s off	Normal mode without bus traffic
	Flickering	Normal mode with bus traffic
Orange <sup>1)</sup> / green	1 s orange / 1 s green	Override control mode
Orange <sup>1)</sup>	1 s on / 1 s off	Bus parameters not yet configured
	1 s on / 5 s off	Backup mode (replacement mode)
Red	Permanently lit	<ul style="list-style-type: none"> <li>• Mechanical error</li> <li>• Device jammed</li> <li>• Manual intervention</li> <li>• Calibration</li> </ul>
	1 s on / 5 s off	Internal error
	0.1 s on / 1 s off	Invalid configuration, e.g. Min = Max
Blue	Flickering 1 x after address indication	Bus termination active

<sup>1)</sup> The color of the orange LED can vary depending on the viewing angle, and appear more yellow or greenish.

## Reset actuator with pushbutton

1. Press button >10s → LED blinking **orange**
2. Release button *while* blinking → LED blinking for another 3s
3. Reset is interrupted if the pushbutton is pressed *during* the 3s
4. After 3s, → LED is lit **red** (reset) while the device restarts.

## Enter address using pushbutton

The Modbus address can be set without extra tool by means of pushbutton addressing.

To display the current Modbus address, press the button <1s.

## Enter new address (starting from the lowest address position)

Colors		
1st digit: <b>red</b>	2nd digit: <b>green</b>	3rd digit: <b>orange</b>
Example for address 124:		
LED		
<b>Note</b>	The address is entered and displayed beginning at the lowest digit (1st digit), see figure above. (Example: 124 starts with 4x red)	

## Enter new address (starting from lowest address position)

1. **Enable addressing mode:** Press button > 1s until the LED is **red**, then release button (before LED goes off).
2. **Enter the numbers:** Push button n-times → LED blinks each time the button is pressed as a feedback.  
Colors: 1st digit: **red** / 2nd digit: **green** / 3rd digit: **orange**
3. **Save digits:** Press button until LED is lit in the color of the next digit, then release the button,
4. **Save address:** Press button until LED is **red** (confirmation) → then release button.  
An address can be saved any time, i.e., after entering the 1st digit or after entering the 1st digit and 2nd digit.
5. The entered address is displayed again 1x for confirmation.

**Note:** Address entry is interrupted when the button is released before the LED is red, address entry is interrupted.

## Example

Set address "124":

1. Enable addressing mode
2. Enter the 1st digit: Press button 4x → LED blinks **red** each time the button is pressed
3. Save 1st digit: Press button until LED is **green** – release button
4. Enter the 2nd digit: Press button 2x → LED blinks **green** each time the button is pressed
5. Save 2nd digit: Press button until LED is **orange** – release button
6. Enter the 3rd digit: Press button 1x → LED blinks **orange** each time the button is pressed
7. Save address: Press button until LED is **red** – release button  
→ The address is saved and displayed 1x for confirmation

Set address "50":

1. Enable addressing mode
2. Skip over 1st digit: Press button until LED is **green** – release button
3. Enter the 2nd digit: Press button 5x → LED blinks **green** each time the button is pressed
4. Save address (skip 3rd digit): Press button until LED is **red** – release button  
→ The address is saved and displayed 1x for confirmation

Set address "5":

1. Enable addressing mode
2. Enter the 1st digit: Press button 5x → LED blinks **red** each time the button is pressed  
Save address: Press button until LED is **red** – release button  
→ The address is saved and displayed 1x for confirmation

### 3.2.3 Maintenance

---

The actuators are maintenance-free.

### 3.2.4 Disposal

---

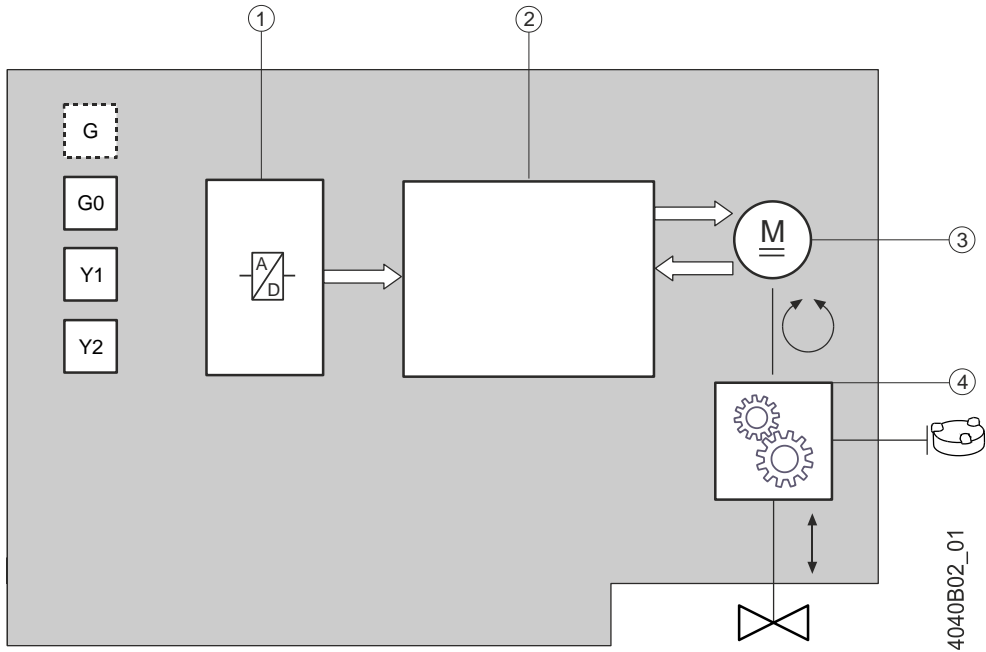


The device is considered electrical and electronic equipment for disposal in terms of the applicable European Directive and may not be disposed of as domestic garbage.

- Dispose of the device through channels provided for this purpose.
- Comply with all local and currently applicable laws and regulations.

# 4 Functions and control

## 4.1 3-position control



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

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

Positioning signal	Stroke actuator	Rotary actuator	Control path valve A→AB	Bypass valve B → AB
Voltage at Y1	Actuator's stem extends <sup>1)</sup>	Actuator's spindle turns in clockwise direction	Opening	Closing
Voltage at Y2	Actuator's stem retracts <sup>1)</sup>	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	
Voltage at Y1 and Y2	Actuator's stem maintains the position	Actuator's spindle maintains the position	Maintains the position	

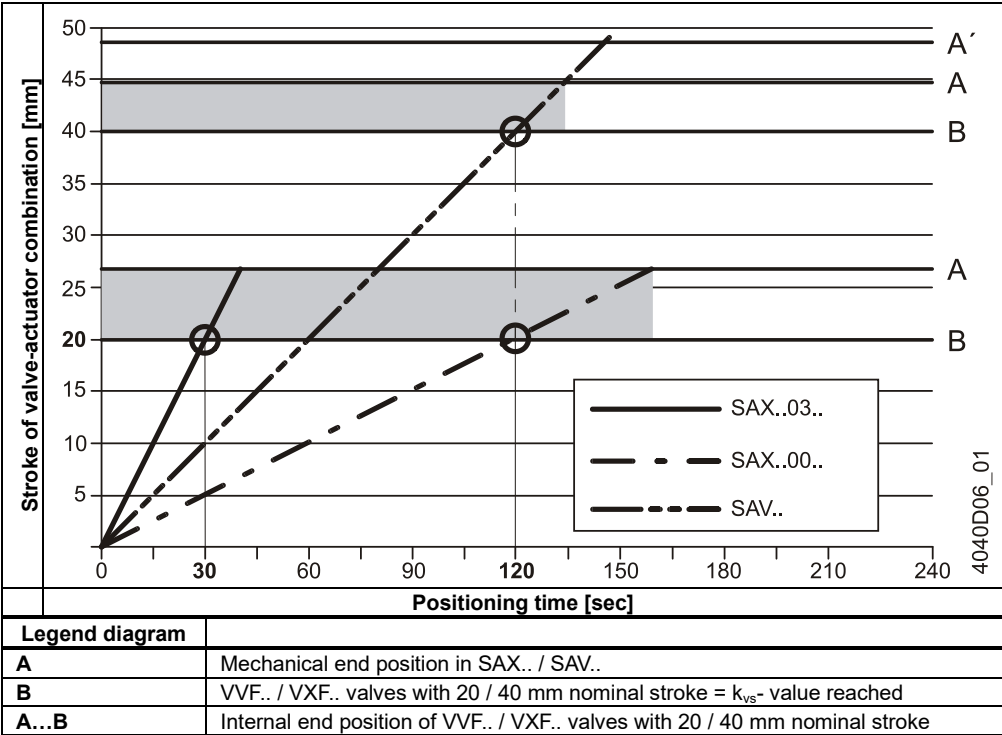
<sup>1)</sup> The opposite is true for SA...1P..

Note

Observe information given in chapter "Acting direction and flow characteristic" on page 63.  
Internal control ensures very constant positioning times and determination of the actuator's position.

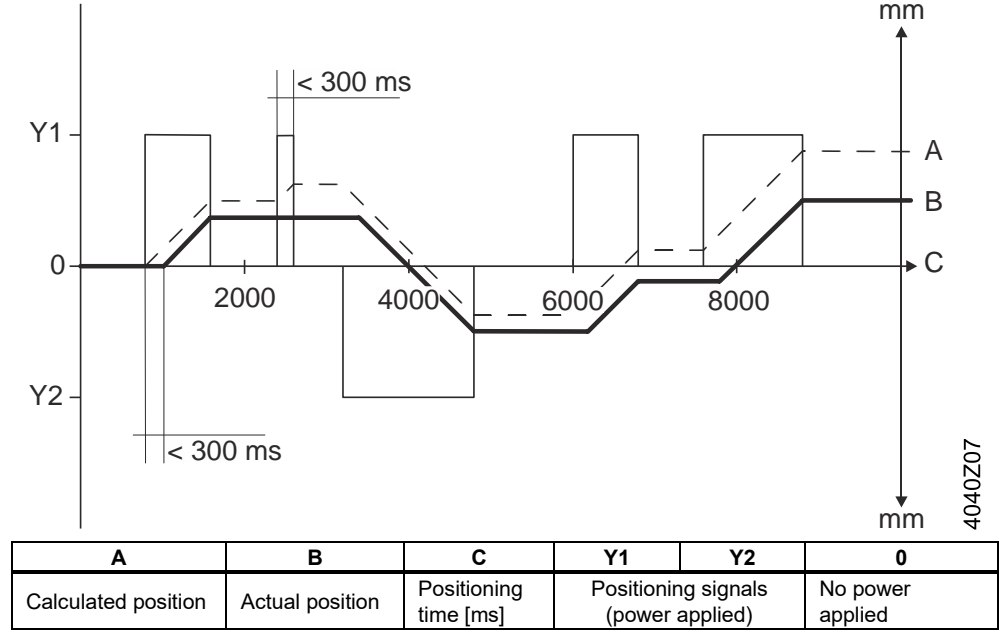
Positioning times stroke model

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 300 ms.
  - when positioning signals Y1 and Y2 are active for less than 300 ms since the stroke movement cannot be made in that case.



Notes

Accurate position feedback is made possible with the help of a potentiometer (page 78).

#### 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.., SAX81.., SAV31.., SAV81.., SAY31.., SAY81.., SAL31.. und SAL81.. actuators doesn't allow the actuator to react on very short control pulses. Only control pulses with a length greater than 300 ms allow a sufficient reaction.

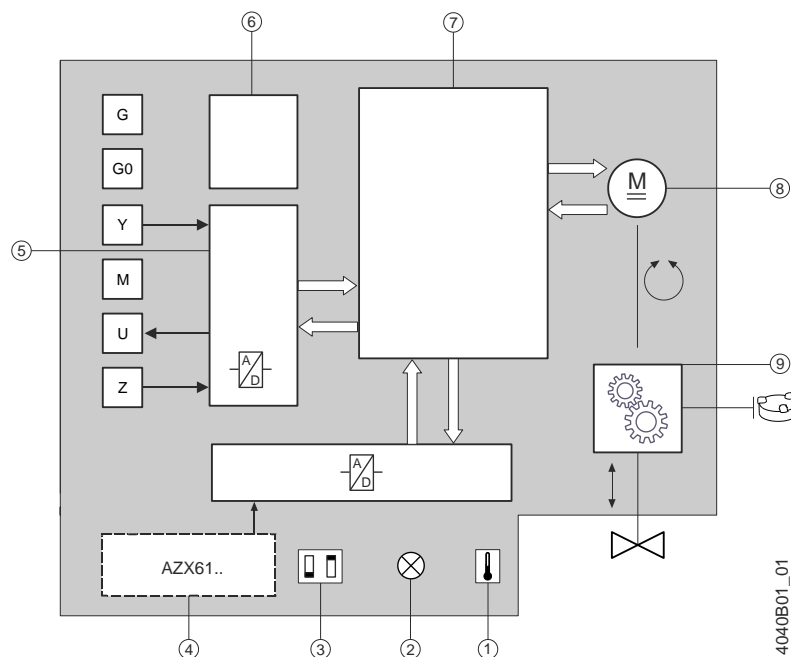
Especially the direct domestic hot water control does not allow such long control pulses. The specific optimized control loops – equipped with an SIGMAGYR RVD.. controller and Acvatix SQS359.05 actuator– work with pulses down to 40 ms.

the actuators mentioned above 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	Preferred actuator	Valve line	DN	kvs
RVD130 <sup>1)</sup> RVD135/109 <sup>1)</sup> RVD135/309 <sup>1)</sup> RVD140 RVD144/109 RVD145/109 RVD139 <sup>1)</sup>	4 and 5	SQS35.53 <sup>1)</sup> SAS31.53 <sup>1)</sup>	VVG44..	DN15 ..40	0.25 .. 25
		SQS359.05 <sup>1)</sup> SAT31.008	VVG549..	DN15 ..25	0.25 .. 6.3
		SQS359.54 <sup>1)</sup> SAT31.51	VVG549..	DN15 ..25	0.25 .. 6.3
		SKD32.21	VVG41.. VVF53..	DN15 ..50	0.63 .. 40 0.16 .. 40
		SKD32.21E		DN15 ..50	0.63 .. 40 0.16 .. 40
RVD230 <sup>1)</sup> RVD235/109 <sup>1)</sup> RVD250 RVD255/109 RVD240 <sup>1)</sup> RVD245/109 <sup>1)</sup> RVD260 RVD265/109	.. - 4	SQS35.53 <sup>1)</sup> SAS31.53	VVG44..	DN15 ..40	0.25 .. 25
		SQS359.05 <sup>1)</sup> SAT31.008	VVG549..	DN15 ..25	0.25 .. 6.3
		SQS359.54 <sup>1)</sup> SAT31.51	VVG549..	DN15 ..25	0.25 .. 6.3
		SKD32.21	VVG41.. VVF53..	DN15 ..50	0.63 .. 40 0.16 .. 40
		SKD32.21E	VVG41.. VVF53..	DN15 ..50	0.63 .. 40 0.16 .. 40

<sup>1)</sup> not available

## 4.2 Modulating control



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 68). 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	Manual adjustment
9	Gear train	
	Manual adjuster	

Positioning signal	Stroke actuator	Rotary actuator	Control path valve A→AB	Bypass valve B→AB
Signal Y, Z increasing	Actuator's stem extends <sup>1)</sup>	Actuator's spindle turns in clockwise direction	Opening	Closing
Signal Y, Z decreasing	Actuator's stem retracts <sup>1)</sup>	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	

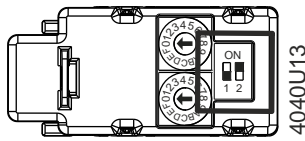
<sup>1)</sup> The opposite is true for SA...1P..





### Notes

- If function module AZX61.1 is used, observe the information given in chapter "Changeover of acting direction" (page 61).
- Observe the information given in chapter "Acting direction and flow characteristic" on page 63.

## 4.3 Function module AZX61.1

### DIL switches




	Acting direction	Sequence control
OFF <sup>1)</sup>	 4040Z10 Direct acting positioning signal Y or Z	 4040Z12 Sequence control <b>not</b> active
ON <sup>1)</sup>	 4040Z09 Reverse acting positioning signal Y or Z	 4040Z11 Sequence control (signal adaptation)

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

The function module may not be used in combination with SA..61../MO.

### 4.3.1 Sequence control (signal adaptation)

### DIL switches

	Sequence control
ON <sup>1)</sup>	 4040Z11 Sequence control (signal adaptation)

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

### HEX switches

Nr.: 1

## Setting sequence control

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

4040U14

100 %

0...15 V

3...30 V

LO

UP

4040Z08

## Invalid HEX switches combinations

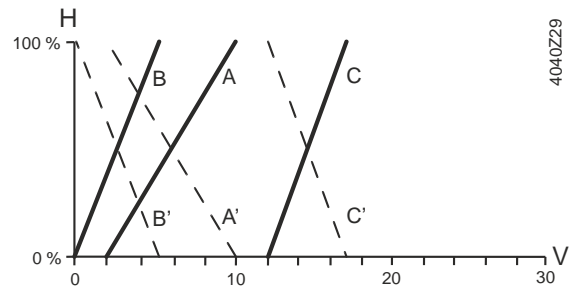
LO	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
UP		F	F	F	F	F	F	F	F	F	F	D	D	C	C	B
UP							E	E	E	E	E	E	E	D	D	C
UP												F	F	E	E	D
UP														F	F	E
UP																F

### 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



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

Acting direction	
OFF <sup>1)</sup>	ON <sup>1)</sup>
Direct acting positioning signal Y or Z	Reverse acting positioning signal Y or Z

<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 actuator's stem is retracted when positioning signal Y = 0 V resp. Z = 0 Ω. This applies to all Siemens valves according to "Equipment combinations" (page 15).
- With valves whose stem is retracted in the fully closed position, "direct acting" means that the actuator's stem is extended when positioning signal Y = 0 V resp. Z = 0 Ω.

SAX61.03  
SAV61.00

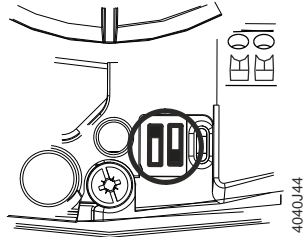
	Direct acting	Reverse acting
	Positioning signal Y: DC 0...10 V	Positioning signal Y: DC 0...10 V
	Positioning signal Z: 4...20 mA	Positioning signal Z: 4...20 mA
	Positioning signal Z: 0...1000 Ω	Positioning signal Z: 0...1000 Ω





SAY61P03  
SAX61P03  
SAV61P00

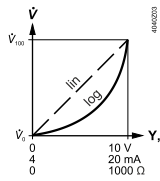
	Direct acting	Reverse acting
	Positioning signal Y: DC 0...10 V	Positioning signal Y: DC 0...10 V
	Positioning signal Z: 4...20 mA	Positioning signal Z: 4...20 mA
	Positioning signal Z: 0...1000 Ω	Positioning signal Z: 0...1000 Ω

## 4.4 Positioning signal and flow characteristic selection

DIL switches

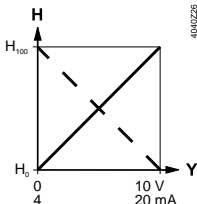
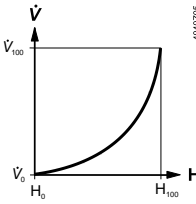
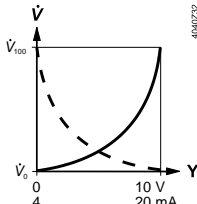
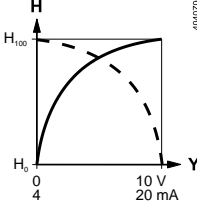
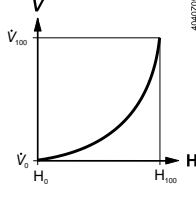
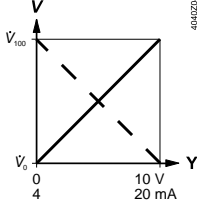


	Positioning signal "Y"		Position feedback "U"	Flow characteristic	
OFF <sup>1)</sup>		DC 0...10 V	DC 0...10 V		log = equal-percentage
ON		DC 4...20 mA	DC 0...10 V		lin = linear

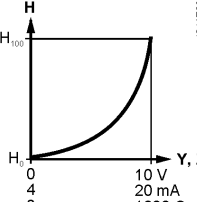
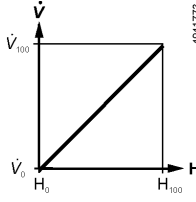
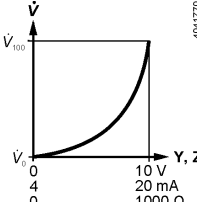
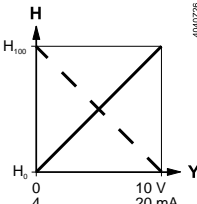
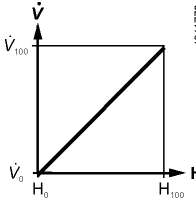
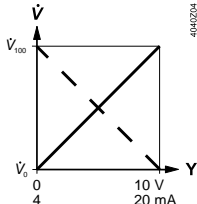


<sup>1)</sup> Factory setting: All DIL switches set to OFF  $\Omega$

Flow characteristic  
SAX61.03 / SAV61.00  
with VVF..

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

Flow characteristic  
SAY61P03 / SAX61P03 /  
SAV61P00 with VPF..

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

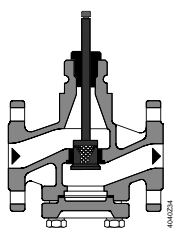
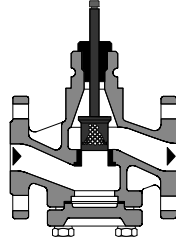




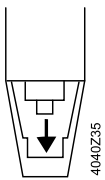
### Note

SAX61.03/MO: Positioning signal and flow characteristic selection are not permissible.

## 4.5 Acting direction and flow characteristic


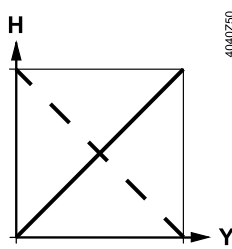
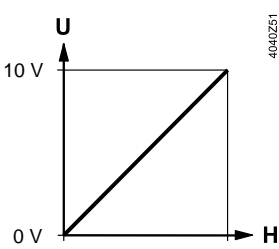

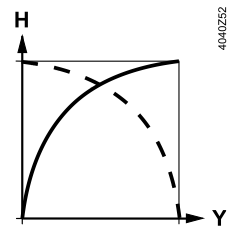
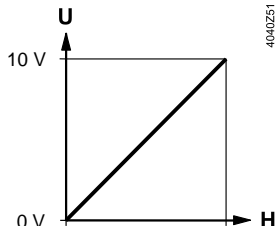
The selection of changeover of acting direction and characteristic with the DIL switches of the function module AZX61.1 depends on the type of actuator (with or without fail safe function) and the associated type of valve (valve characteristic, push to open, pull to open).

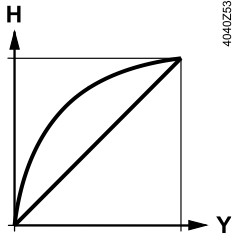
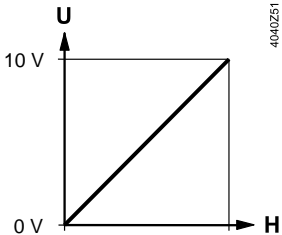
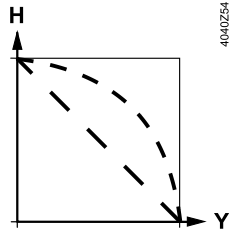
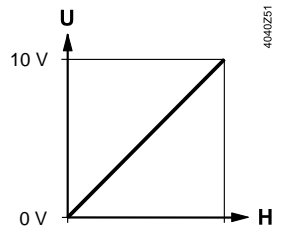
When the positioning signal increases (DC 0...10 V, DC 4...20 mA, 0...1000 Ω), the objective is to have the valve's volumetric flow  $V$  rising, but to fully open the valve,  $V = 100\%$  (NO = normally open), or to fully close it,  $V = 0\%$  (NC = normally closed) in the event of a power failure.

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

## 4.6 Position Feedback U

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

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

	Actuator Positioning signal Y, Z	Actuator Position feedback U
Direct acting	 4040Z53	 4040Z51
Reverse acting	 4040Z54	 4040Z51
Y, Z	Positioning signal	
H	Stroke	
U	Position feedback	
—————	Acting direction: direct	
- - - - -	Acting direction: reverse	

## 4.7 Position control with ClosedPosition-Synchronization

Within SAX/SAV/SAL61/SAY61.. 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 gear train 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.

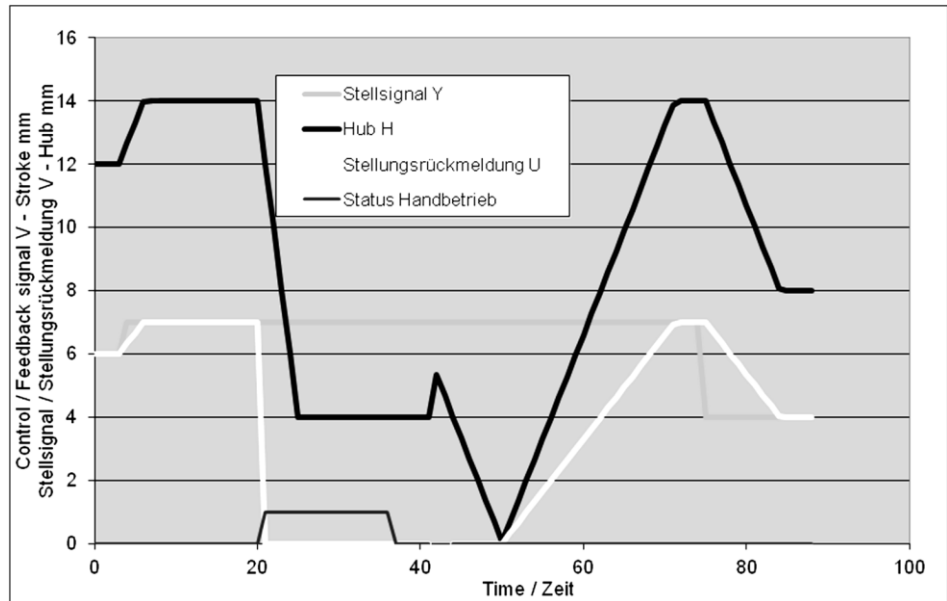
To grant – after manual operation – that real mechanical position and internal position control are matching all SA..61.. operate after manual operation an automatic ClosedPosition-Synchronization.

### 4.7.1 ClosedPosition-Synchronization

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 mechanical 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-Synchronization is deactivated as long as the signal on Z remains.

After Z is deactivated the ClosedPosition-Synchronization will be performed.

Note

ClosedPosition-Synchronization 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.

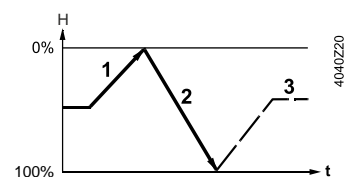
If the customer likes synchronization also after a power failure he should take care that the plant restarting routine drives the actuator automatically into an end position. This will also synchronize the internal position control and the real position.

## 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 49). 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.



- Observe status indication (actuator LED) during and after calibration (page 77).
- If the actuator does not detect the second end position within an appropriate stroke range (SAX.., SAY.. max. 25 mm; SAV.. max. 45 mm), the first end stop will be adopted and the actuator operates with a working range of 20 mm, respectively 40 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 counterclockwise 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%,  $Y = 2\text{ V}$ , 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.

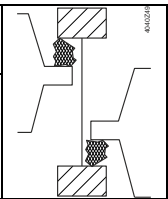
From now on, the actuator follows the changed valve stroke position.

This means: New position 0%,  $Y = 2\text{ V}$ , 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 actuator 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 actuator LED continues to blink green (refer to "Indicators" on page 77).

## 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 Communicating actuators Modbus RTU

### 4.13.1 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 without fail safe function define their stroke position upon return of power at 50% and



automatically set their internal setpoint in register 1 to the startup setpoint (register 516). The actuator closes at this setting. There is a short-term deviation between the setpoint and the internal stroke position.

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

#### Example

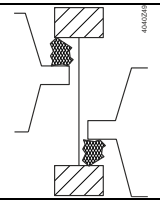
Setpoint prior to power outage 35%, no manual adjustment during the power outage. Internal stroke position value after return of power 50%. Internal setpoint after return of power equal to startup setpoint (register 516, here 0%). The actuator moves 35% in the direction of "Retract actuator stem" and reaches the valve seat (if the setpoint has not been changed in the meantime). The internal stroke position is set to 0%.

The actuator now follows the changed valve stroke position effective immediately.

### 4.13.2 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 actuator 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 actuator LED continues to blink green (refer to "Indicators" on page 77).

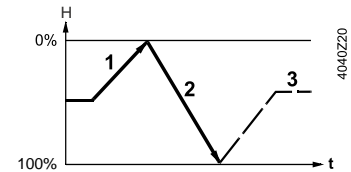
As long as the external setpoint is greater than the position of the high limit valve clogging, the deviation between the setpoint and position feedback in register 769 is displayed with the warning "Mechanical error, device jammed, manual intervention or calibration." The LED on the cable adapter is red. The warning is reset if the external setpoint drops below the high limit valve clogging, since the setpoint and stroke position are once again the same. The LED on the cable adapter switches to green blinking (=communication).

### 4.13.3 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 49). 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.
- 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.



The internal position feedback is set to 0% during calibration. For a setpoint  $> 0\%$ , the actuator detects calibration based on the deviation between setpoint and stroke position and reports this in Register 769 with the warning “Mechanical error, device jammed, manual intervention or calibration”. The LED on the actuator cover blinks green, the LED on the cable adapter is red.

After calibration is completed, the actuator follows the external setpoint, the warning is reset, the LED on the cover changes to continuous green and the cable adapter blinks green (communication active).

#### Note

Observe status indication (LED) during and after calibration (page 77).  
The calibration cannot be started via the bus.

### 4.13.4 Manual adjustment

The actuator's internal stroke position measurement is inactive during manual adjustment.

The position feedback changes to 0% once the manual adjuster is pressed and remains on the value during manual adjustment. The actuator detects manual action based on the deviation between the setpoint and the stroke position and after 10 seconds reports in register 769 with the warning “Mechanical error, device jammed, manual intervention or calibration”. The LED on the actuator cover blinks green, the LED on the cable adapter is red.

Upon return to automatic mode, the actuator synchronizes to stroke position 0%. After the synchronization, the actuator follows the pending setpoint, the LED on the cover changes to continuous green and, on the cable adapter, blinking green (communication active). The warning in register 769 is reset.

## 4.13.5 Modbus Registers

Reg.	Addr.	Name	R/W	Unit	Scaling	Range / listing	Factory setting
Process values							
1	0	Setpoint	RW	%	0.01	0...100 % = 0...10000	--
2	1	Forced control	RW	--	--	0 = Off / 1 = Open / 2 = Close 3 = Stop	
3	2	Actual value position	R	%	0.01	0...100 % = 0...10000	
256	255	Command	RW	--	--	0 = Ready / 1 = Calibration in process / 2 = Self-test / 3 = Reinitialize / 4 = Remote reset	
Parameters <sup>1)</sup>							
262	261	Actuator runtime	R	s	1	30	30 s
263	262	Positioning signal characteristic between Y and U	RW	--	--	See A6V12050595 ("Reference documents" page 8)	[dependent on type]
264	263	Valve jam monitoring	RW	%	0.01	0...100 % = 0...10000	4 %
513	512	Backup mode	RW	--	--	0 = Move to backup position / 1 = Maintain last position / 2 = Deactivated	2 = Deactivated
514	513	Backup position	RW	%	0.01	0...100 % = 0...10000	0 %
515	514	Backup timeout	RW	s	1	0...900	900 s
516	515	Startup setpoint	RW	%	0.01	0...100 % = 0...10000	0 %
764	763	Modbus address	RW	--	--	1...245 / 255 = "unassigned" <sup>2)</sup>  246 = On-event addressing 248 → 255 = "unassigned"	255
765	764	Baud rate	RW	--	--	0 = Auto / 1 = 9600 / 2 = 19200 / 3 = 38400 / 4 = 57600 / 5 = 76800 / 6 = 115200	0 = Auto
766	765	Transmission format	RW	--	--	0 = 1-8-E-1 / 1 = 1-8-O-1 / 2 = 1-8-N-1 / 3 = 1-8-N-2	0 = 1-8-E-1
767	766	Bus termination	RW	--	--	0 = Off / 1 = On	0 = Off
768	767	Bus config. command	RW	--	--	0 = Ready / 1 = Load / 2 = Discard	0 = Ready
769	768	Status	R	--	--	See Section, Register 769 "State"	--

<sup>1)</sup> Parameters may not be written cyclically!

<sup>2)</sup> If the address is set to 248 or higher, it is instead automatically set to the initial address 255 as soon as Reg. 268 is set to 1 ("Load").

Reg.	Name	R/W	Value	Example
<b>Statistics/Counters</b>				
1025	Cumulated up time (HWord)	R	HWord + LWord = cumulated time device has been on (hex), i.e. the motor has been running or holding, in seconds	<ul style="list-style-type: none"> <li>• 1025 = 00 12 (hex)</li> <li>• 1026 = A2 E1 (hex)</li> <li>• 12A2E1 (hex) → 1221345 (dec)</li> </ul> → Cum. up time = 1'221'345 s
1026	Cumulated up time (LWord)	R		
1027	Cumulated running time (HWord)	R	HWord + LWord = cumulated running time (hex), i.e. for how long has the motor run, in seconds	<ul style="list-style-type: none"> <li>• 1027 = 00 08 (hex)</li> <li>• 1028 = 12 51 (hex)</li> <li>• 81251 (hex) → 528977 (dec)</li> </ul> → Cum. running time = 528.977 s
1028	Cumulated running time (LWord)	R		
1029	Repositioning counter (HWord)	R	HWord + LWord = how often has the positioning signal been changed	<ul style="list-style-type: none"> <li>• 1029 = 00 00 (hex)</li> <li>• 1030 = A0 01 (hex)</li> <li>• A001 (hex) → 40961 (dec)</li> </ul> → Repositioned = 40.961 times
1030	Repositioning counter (LWord)	R		
1031	Power-up counter	R	How often (hex) has the device been started up	<ul style="list-style-type: none"> <li>• 1031 = 00 A2 (hex) → 162 (dec)</li> </ul> → Powered up = 162 times
1032	Jam counter	R	How often (hex) has the device breached the valve jam tolerance (reg. 264)	<ul style="list-style-type: none"> <li>• 1032 = 00 02 (hex) → 2 (dec)</li> </ul> → Jams counted = 2

Reg.	Name	R/W	Value	Example																				
Device information																								
1281	Factory index	R	Two bytes, each encoding an ASCII character	<ul style="list-style-type: none"><li>1281 = 00 5A (hex) → 0Z</li></ul> → Device is of series = "Z"																				
1282	Factory date (HWord)	R	Two bytes, the lower encoding the year (hex)	<ul style="list-style-type: none"><li>1282 = 00 18 (hex)</li><li>1283 = 02 0F (hex)</li></ul>																				
1283	Factory Date (LWord)	R	Two bytes, HByte encoding the month (hex), LByte encoding the day (hex)	<table><tr><td></td><td colspan="2">HWord</td><td colspan="2">LWord</td></tr><tr><td></td><td>--</td><td>YY</td><td>MM</td><td>DD</td></tr><tr><td>Hex</td><td>00</td><td>18</td><td>02</td><td>0F</td></tr><tr><td>Dec</td><td>00</td><td>24</td><td>02</td><td>15</td></tr></table> → Device was manufactured = February 15, 2024		HWord		LWord			--	YY	MM	DD	Hex	00	18	02	0F	Dec	00	24	02	15
	HWord		LWord																					
	--	YY	MM	DD																				
Hex	00	18	02	0F																				
Dec	00	24	02	15																				
1284	Serial number (HWord)	R	HWord + LWord = Serial no. (hex)	<ul style="list-style-type: none"><li>1284 = 00 0A (hex)</li><li>1285 = A2 06 (hex)</li><li>→ AA206 (hex) = 696838 (dec)</li></ul> → Device has serial no. = "696838"																				
1285	Serial number (LWord)	R																						
1289	Firmware version (HWord)	R	Two bytes, HByte corresponds to the major version, LByte corresponds to the minor version	<ul style="list-style-type: none"><li>1289 = 03 01 (hex)</li><li>1290 = 03 07 (hex) → 775 (dec)</li></ul> → Firmware version = "03.01.0775"																				
1290	Firmware revision (LWord)	R	Two bytes, encoding the patch version (hex)																					
1291	Hardware version	R	Two bytes, each encoding an ASCII character	<ul style="list-style-type: none"><li>1291 = 42 00 (hex)</li></ul> → Hardware version = "B"																				
1409...16	ASN [characters 16...1]	R	Two bytes per register, each of which encodes an ASCII character. First characters encoded in Reg. 1409.	<ul style="list-style-type: none"><li>1409 = 53 41 (hex) → SA</li><li>1410 = 58 36 (hex) → X6</li><li>1411 = 31 2E (hex) → 1.</li><li>1412 = 30 33 (hex) → 03</li><li>1413 = 2F 4D (hex) → /M</li><li>1414 = 4F 00 (hex) → O</li></ul> → ASN = "SAX61.03/MO"																				

## Communication properties

Communication		
Communications protocol	Modbus RTU	RS-485, not galvanically separated
	Number of nodes	Max. 32
	Address range	1...245 / 255 Factory settings: 255
	Transmission formats	1-8-E-1 / 1-8-O-1 / 1-8-N-1 / 1-8-N-2 Factory settings: 1-8-E-1
	Baud rates (kBaud)	Auto / 9.6 / 19.2 / 38.4 / 57.6 / 76.8 / 115.2 Factory settings: Auto
	Bus termination	120 $\Omega$ electronically switchable Factory settings: Off

## Supported function codes

Function codes	
03 (0x03)	Read Holding Registers
04 (0x04)	Read Input Registers
06 (0x06)	Write Single Register
16 (0x10)	Write Multiple Registers (Limitation: Max. 120 registers on one write access)

### 4.13.6 Function description

#### Register 1 / 3 “Setpoint / actual value”

The setpoint of the controller for the position to move to, 0...100% stroke/angle of rotation, resolution 0.01, i.e. 0% = 0 and 100% = 10000.

The actual value reported by the device, with the same resolution.

#### Register 2 “Override control”

The actuator can be operated in override control for commissioning / maintenance purposes or system-wide functions (e.g. night-cooling).

- Manual override: When the manual adjuster is used, a mechanical jam will be detected if a mismatch between setpoint and actual position persists for more than 10s.
- Remote override: The actuator enters this state when an override command is sent over the bus.
- Available commands:
  - Extend / Retract
  - Stop (with braking distance compensation)

#### Register 256 “Restarting the device”

Restarting is possible by:

- Power-reset (turning operating voltage off and on) or
- “Reinitialize” command.

→ Device re-initializes and sets all process values except actual value (= 50%) and setpoint (= startup setpoint) to defaults.

#### Register 256 “Self test”

When triggered, the self test drives the actuator to the detected limits and sets the flags in register 769 according to the result (bit 09 = 1 → “failed” or bit 10 = 1 → “passed”).

The self test is not passed when the limits were not reached from the lower end (results in jam). If the Min/Max limits can be exceeded, the self test is not evaluated as failed.

#### Notes

- The self test can only be performed if bit 4 = 0 in register 769 “Status”, meaning there is concurrently no clogging or manual operation.
- If clogging/a valve jam occurs during the self test, the test is failed, even if the device clears it within 3 tries.

<b>Register 256</b> <b>“Reset”</b>	<p>The actuator supports the following re-initialization / reset behaviour:</p> <ul style="list-style-type: none"> <li>• Local reset by pushbutton</li> <li>• Remote reset: Using “Remote-Reset” command.</li> </ul> <p>Effect of reset:</p> <ul style="list-style-type: none"> <li>• Process values except actual value and setpoint: set to ex-works default values.</li> <li>• Network parameters (register 513...516 and 764...768) are reset only in case of local reset, not by remote reset (otherwise loss of communication).</li> <li>• Not reset are: Counters, device info, and factory data.</li> </ul>
<b>Register 259</b> <b>“Operating mode”</b>	Read value only, set to „Position control“ for valve actuators.
<b>Register 260 / 261</b> <b>“Minimum and maximum position”</b>	Electronic positioning limitation
<b>Register 262</b> <b>“Actuator runtime”</b>	Read value only, positioning time from one stop to another.
<b>Register 263</b> <b>“Positioning signal characteristic betw. Y and U”</b>	Depending on the valve type, this function can be used to compensate a logarithmic characteristic, in order to achieve a linear input/output signal relation (cf. “Modbus Registers” table, page 71).
<b>Register 264</b> <b>“Tolerance valve jam monitoring”</b>	If the setpoint does not reach the tolerance limit set within this parameter, bit 4 is set in register 769 “Status” and can be used for alarming in the building automation system.
<b>Register 513...515</b> <b>“Backup mode”</b>	<p>In case the communication to the controller is lost, the device can be configured to go into a defined state.</p> <ul style="list-style-type: none"> <li>• Waiting time to recognize communication loss → Register 515</li> <li>• Reaction: <ul style="list-style-type: none"> <li>– Go to a predefined backup position → Register 514</li> <li>– Deactivated (factory setting): “keep last setpoint”, i.e. in case of communication loss, the device controls to the last received setpoint, until a new valid setpoint is received.</li> </ul> </li> </ul>
<b>Register 516</b> <b>“Startup setpoint”</b>	In this parameter a setpoint can be defined, which the actuator moves to at first commissioning or after a power reset, before receiving a new valid setpoint.
<b>Register 764...766</b> <b>“Modbus configuration”</b>	Configuring the RS-485 address and transmission parameters
<b>Register 767</b> <b>“Bus termination”</b>	Electronically switchable 120 Ω resistance for bus termination
<b>Register 768</b> <b>“Bus config. Command”</b>	If the parameters in registers 764...766 „Modbus configuration“ are changed via bus, they are only saved if the function “Load” is called within 60 seconds in this register. Otherwise, all changes are discarded.

Register 769 “State”

In register, 769 the bits are set according to the table below, representing the current status information.

Service flags			
Bit 00	1 = Not available	Bit 06	1 = Not available
Bit 01	1 = Backup mode active	Bit 07	1 = Not available
Bit 02	1 = Not available	Bit 08	1 = Not available
Bit 03	1 = Not available	Bit 09	1 = Self test failed
Bit 04	1 = Mechanical error, device jammed, manual intervention <sup>1)</sup> or calibration <sup>1)</sup>	Bit 10	1 = Self test successful
Bit 05	1 = Not available	Bit 11	1 = Not available

<sup>1)</sup> After 10 seconds

4.14 Technical and mechanical design

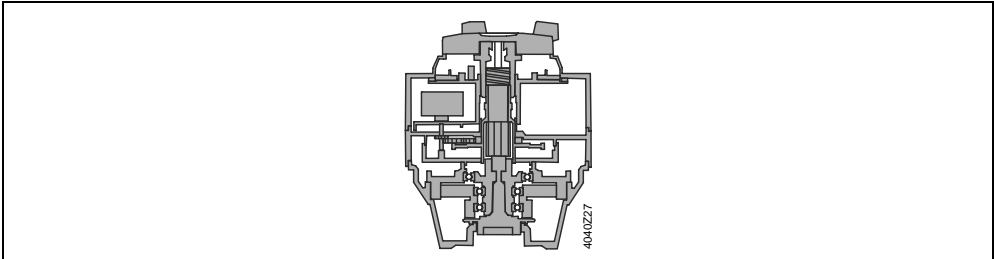
4.14.1 Transmission of power

Function principle

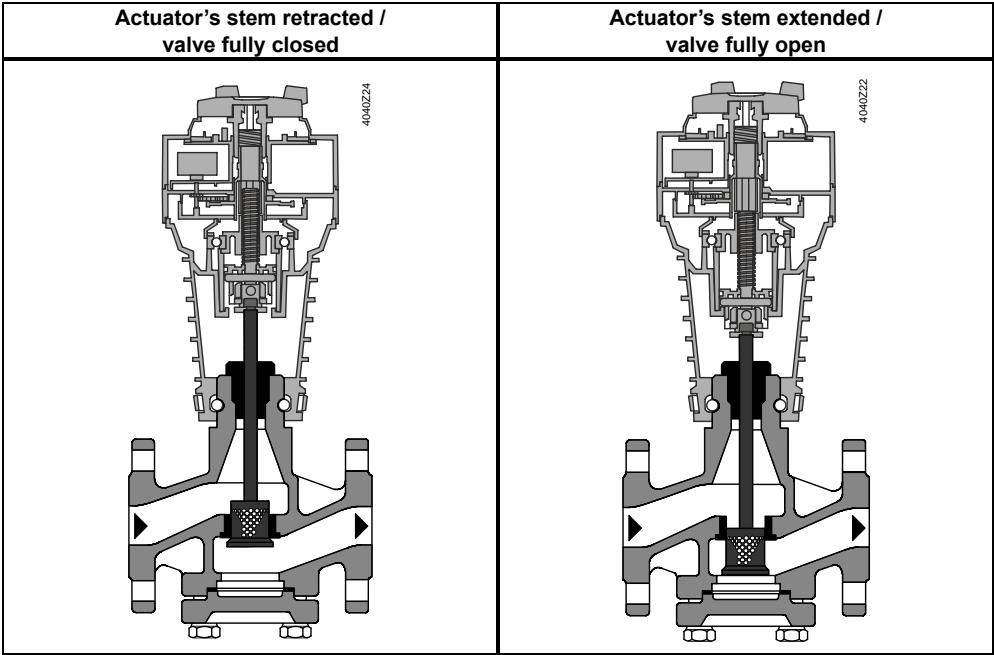
Incoming positioning signals are translated to positioning commands for the motor. A gear train transmits the motor’s positioning steps to the output stage (valve coupling). Attached to the gear train are the electrical and mechanical accessory items and the manual adjuster.

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.

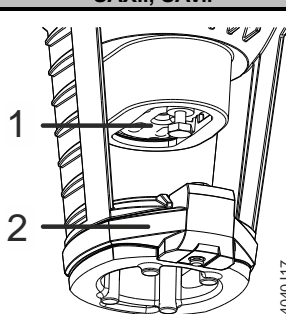
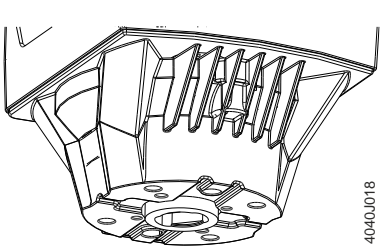
SAL..



SAX..., SAV..

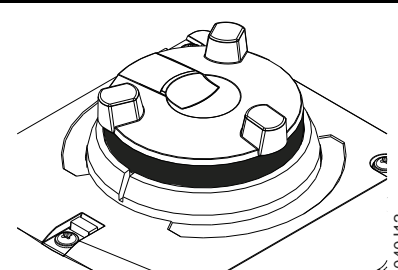


## 4.14.2 Coupling

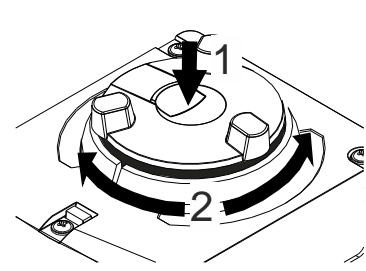
SAX..., SAV...	SAL...
	
<p>The stem coupling (1) and neck coupling (2) ensures full backward compatibility with all types of Siemens large-stroke valves produced since 1975.</p>	<p>Mounting sets are available for use with butterfly and slipper valves.</p>

## 4.14.3 Manual adjuster

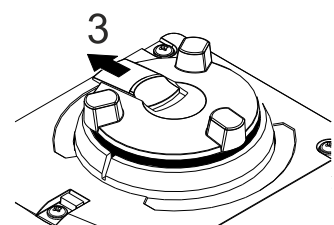
### Automatic

	<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>
--	--

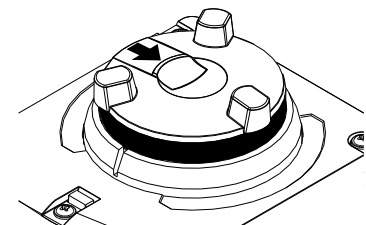
### Manual operation

	<p>When pushing the manual adjuster down (1), it engages and the actuator can be manually operated.</p> <p>Stroke actuator: When turning the manual adjuster in clockwise / counterclockwise direction (2), the actuator's stem retracts / extends.</p> <p>Rotary actuator: The actuator spindle turns in the same direction.</p> <p>An overload protection prevents damage to the manual adjuster</p>
---	--

### Fixing the position

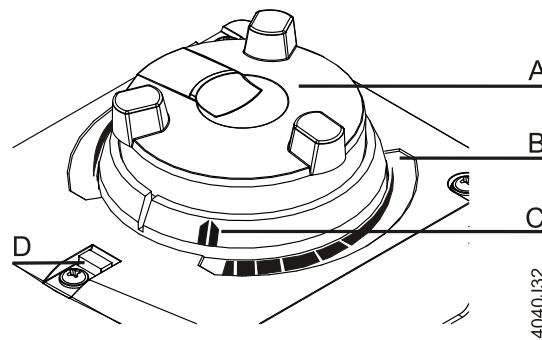
	<p>Upon actuation and locking the slide switch, the manual adjuster remains engaged.</p> <p>When in this mode, do not turn the manual adjuster.</p>
---	---

### Disengaging the fixing

	<p>When resetting the slide switch, the manual adjuster returns to automatic mode.</p> <p>-&gt;The modulating SA..61.. will automatically start a Zero Position Synchronization</p>
---	---



## 4.14.4 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

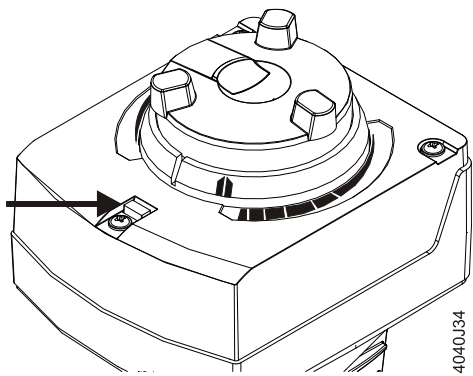
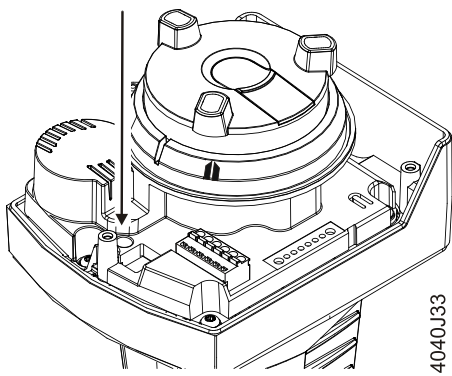
In Automatic mode, the manual adjuster serves for the indication of travel. See "Automatic" (page 76).

### 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)

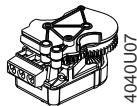
Housing cover fitted	Housing cover removed
	
When the housing cover is fitted, the LED can be viewed through a light conductor.	When the housing cover is removed, the LED can be viewed through a hole.

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

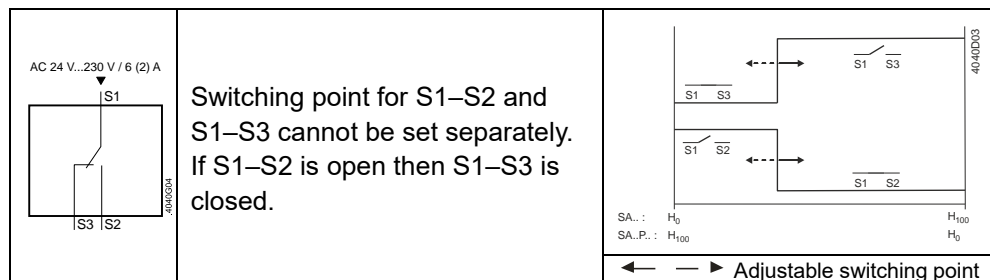
LED	Indication	Operating state	Remarks, troubleshooting
<b>Green</b>	On	Automatic mode	Normal operation
	Blinking	Calibration (page 49).	Wait until calibration is finished (then green or red light)
		In manual mode Detection of foreign bodies (page 67 / page 69).	Manual adjuster in MAN position Check valve / actuator
<b>Red</b>	On	Undervoltage	Check voltage
		Maximum stroke exceeded	Start calibration again (page 49). If error re-occurs immediately: actuator faulty.
	Blinking	Calibration error Clogged valve	Start calibration again. If error re-occurs immediately: check valve
<b>Dark</b>	Dark	No power or electronics faulty	Check operating voltage

## 4.14.5 Electrical accessories

### Auxiliary switch ASC10.51



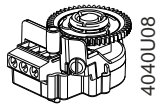
The auxiliary switch ASC10.51 switches on or off when a certain position is reached. The switching point can be set between 0...100%.



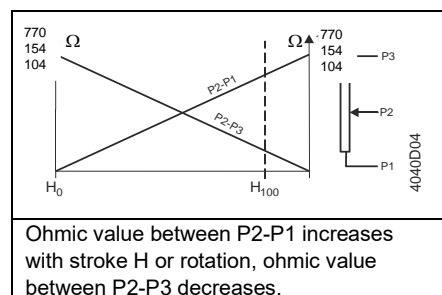
Application example:

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/..



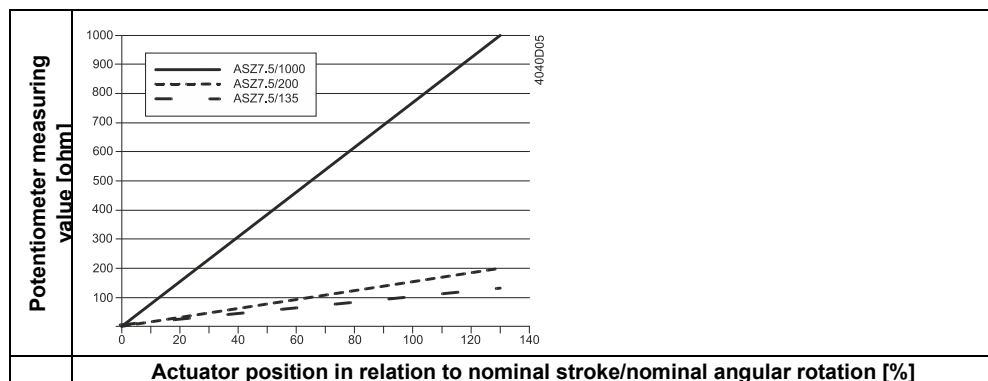
Potentiometer ASZ7.5 delivers an ohmic value to the controller giving the exact position of the actuator (continuous position feedback). A slip clutch prevents damage to the potentiometer in the mechanical end positions. This is also used for accurate balancing of the potentiometer in the fully closed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



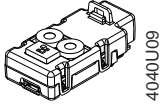
Flow characteristic

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 41).

	ASZ7.5
	770 Ohm at nominal stroke/nominal angular rotation
	$R = 0 + 7.7 \text{ Ohm} \times \text{nominal stroke/nominal angular rotation (\%)}$
SAX..	$R = 0 + 38.5 \text{ Ohm} \times \text{stroke (mm)}$
SAV..	$R = 0 + 19.3 \text{ Ohm} \times \text{stroke (mm)}$
SAL..	$R = 0 + 8.55 \text{ Ohm} \times \text{rotary angle (°)}$



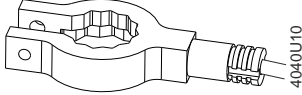
### Function module AZX61.1



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

- Changeover of acting direction (page 61)
- Sequence control (page 60)

### 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.



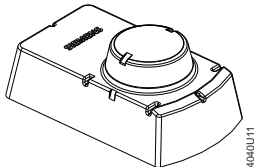
**The stem heating element heats up to 85 °C.**



**This is a PTC element, which means it shows up with a low resistance at power up – inrush current may reach 8.5 A at low temperatures / high voltage level**

## 4.14.6 Mechanical accessories

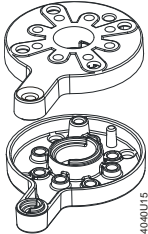
### Weather shield ASK39.1



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

SA..61../MO are not suitable for outdoor applications

### Mounting sets ASK3..N



Mounting sets ASK31N, ASK32N, ASK33N and ASK35N enable the actuators to be fitted to slipper valves VBF21..., DN65...150 and butterfly valves VKF41.. and VKF45 (page 29-36).

## 5 Technical data

Power consumption at 50Hz		Running		Holding	
Type	Stock no.	[W]	[VA]	[W]	[VA]
Stroke actuators					
SAX31.00	S55150-A105	2.2	3.9	1.3	2.2
SAX31.03	S55150-A106	4.6	7.9		
SAX61.03	S55150-A100	2.5	6.3	1.7	4.6
SAX61.03U	S55150-A100-A100				
SAX61.03/MO	S55150-A140	3	7.0	2.2	6.0
SAX81.00	S55150-A102	2.3	4.0	1.5	2.7
SAX81.03	S55150-A103	4.3	7.2		2.6
SAX81.03U	S55150-A103-A100				
SAV31.00	S55150-A112	4.1	7.2	1.3	2.3
SAV61.00	S55150-A110	4.0	9.5	1.7	4.4
SAV61.00U	S55150-A110-A100				
SAV61.00/MO	S55150-A141	4.5	10.2	2.2	5.8
SAV81.00	S55150-A111	4.0	6.9	1.5	2.7
SAV81.00U	S55150-A111-A100				
Stroke actuators – combi valves					
SAY31P03	S55150-A132	2.2	4.0	1.3	2.2
SAY61P03	S55150-A133	2.7	6.5	1.7	4.5
SAY61.03U	S55150-A135	2.6			
SAY61P03/MO	S55150-A145	3.2	7.2	2.2	5.9
SAY81P03	S55150-A134	2.4	4.2	1.5	2.6
SAY81.03U	S55150-A136	2.5	4.3		2.5
SAX31P03	S55150-A118	3.9	7.0	1.3	2.2
SAX61P03	S55150-A114	3.8	9.0	1.7	4.5
SAX61P03/MO	S55150-A143	4.3	9.7	2.2	5.9
SAX81P03	S55150-A116	3.5	6.2	1.5	2.7
SAV31P00	S55150-A121	4.0	7.1	1.3	2.3
SAV61P00	S55150-A119	3.5	8.4	1.7	4.5
SAV61P00/MO	S55150-A144	4.0	9.1	2.2	5.9
SAV81P00	S55150-A120	3.4	5.9	1.5	2.7
Rotary actuators					
SAL31.00T10	S55162-A108	1.9	3.4	1.2	2.1
SAL31.00T20	S55162-A110	2.7	4.9	1.3	2.5
SAL31.00T40	S55162-A111	3.7	6.6	1.4	2.4
SAL31.03T10	S55162-A109			1.3	2.2
SAL31.03T10/F05	S55162-A121				
SAL61.00T10	S55162-A100	2.2	5.7	1.7	4.5
SAL61.00T20	S55162-A102	3.1	7.6	2	5.1
SAL61.00T40	S55162-A103	3.9	9.2	4.8	4.8
SAL61.03T10	S55162-A101	4.0	9.5	1.8	4.6
SAL61.03T10/F05	S55162-A123				
SAL81.00T10	S55162-A104	2.3	3.9	1.5	2.6
SAL81.00T20	S55162-A106	3.0	5.1		2.7
SAL81.00T40	S55162-A107	4.1	7.0	1.7	2.9
SAL81.03T10	S55162-A105	3.6	6.1	1.5	2.6
SAL81.03T10/F05	S55162-A122				

		SAY..	SAX..	SAV..	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 % (SELV) AC 24 V ± 20 % / DC 24 V + 20 % / -15 % (SELV)			
	Frequenz	45...65Hz			
	External supply line protection (EU)	<ul style="list-style-type: none"> <li>6 A...10 A slow</li> <li>Circuit breaker max. 13 A</li> <li>Characteristic B, C, D according to EN 60898</li> <li>Power source with current limitation of max. 10 A</li> </ul>			
	Switch-on current 3-position actuators (typical) <sup>1)</sup> SA..31.. SA..81..	2.3 A 4.5 A	2.3 A 4.5 A	2.3 A 4.5 A	2.3 A 4.5 A
<b>Function data</b>	Positioning times with specified nominal stroke / nominal angular rotation SAX..00, SAV.., SAL..00 SAY..03, SAX..03.., SAL..03	30 s	120 s 30 s	120 s -	120 s 30 s
	Positioning force	200 N	800 N	1600 N	-
	Torque SAL..T10 SAL..T20 <sup>2)</sup> SAL..T40 <sup>2)</sup>		- - -	- - -	10 Nm running 20 Nm running 40 Nm running
	Nominal stroke	15 mm	20 mm	40 mm	-
	Angular rotation		-	-	90°
<b>Signal inputs</b>	Positioning signal "Y" SA..31.., SA..81.. SA..31.. Voltage SA..81.. Voltage SA..61.. (DC 0...10 V) Current draw Input impedance SA..61.. (DC 4...20 mA) Current draw Input impedance	3- position AC 230 V ± 15 % AC 24 V ± 20 % / DC 24 V + 20 % / -15% ≤ 0,1 mA ≥ 100 kΩ DC 4...20 mA ± 1 % ≤ 500 Ω			
<b>Communication</b>	<b>Communications protocol</b> Modbus RTU Number of nodes Address range Transmission formats Baud rates (kBaud) Bus termination	RS-485, not galvanically separated Max. 32 1...245 / 255 Factory settings: 255 1-8-E-1 / 1-8-O-1 / 1-8-N-1 / 1-8-N-2 Factory settings: 1-8-E-1 Auto / 9.6 / 19.2 / 38.4 / 57.6 / 76.8 / 115.2 Factory settings: Auto 120 Ω electronically switchable Factory settings: Off			
<b>Parallel operation</b>	SA..61..	≤ 10 (depending on controller output)			
<b>Forced control</b>	Positioning signal "Z" SA..61.. R = 0...1000 Ω	R= 0...1000 Ω, G, G0 Stroke / rotation proportional to R			
	Z connected to G Z connected to G0	Max. stroke 100% <sup>3)</sup> Min. stroke 0% <sup>3)</sup>			90° <sup>3)</sup> 0° <sup>3)</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.. Load impedance Load	DC 0...10 V >10 kΩ res. Max. 1 mA			
<b>Connecting cable</b>	Wire cross-sectional areas	0.13...1.5 mm <sup>2</sup> , AWG 24...16 <sup>4)</sup>			
	Cable entries SA.. SA..U SA..61../MO	EU: 2 entries Ø 20.5 mm (for M20) 1 entry Ø 25.5 mm (for M25) US: 3 entries Ø 21.5 mm for ½" tube connection Fixed connecting cable: 0.9 m Number of wires: 5 x 0.75 mm <sup>2</sup>			

		SAY..	SAX..	SAV..	SAL..
Degree of protection	Housing from vertical to horizontal	IP54 as per EN 60529 <sup>5)</sup>			
	Insulation class	As per EN 60730			
	Actuators SA..31..	AC 230 V	II		
	Actuators SA..61..	AC / DC 24 V	III		
Environmental conditions	Actuators SA..81..	AC / DC 24 V	III		
	Operation	IEC 60721-3-3			
	Climatic conditions	Class 3K5			
	Mounting location	Indoors (weather-protected) <sup>6)</sup>			
	Temperature General	-15...55 °C			
	Humidity (noncondensing)	5...95 % r.h.			
	Transport	IEC 60721-3-2			
	Climatic conditions	Class 2K3			
	Temperature	-25...70 °C			
	Humidity	<95 % r.h.			
Storage	IEC 60721-3-1				
	Climatic conditions	Class 1K3			
	Temperature	-15...55 °C			
	Humidity	5...95 % r.h.			
Max. media temperatur when mounted on valve	130 °C	130 °C	130 °C <sup>7)</sup>	120 °C	
Directives and Standards	Product standard	EN60730-x			
	Electromagnetic compatibility (Application)	For residential, commercial and industrial environments			
	EU Conformity (CE)	A5W00000333 <sup>8)</sup>	CE1T4501x1 <sup>8)</sup>	CE1T4503xx <sup>8)</sup>	CE1T4502X1 <sup>8)</sup>
	UK Conformity (UKCA)	A5W00198022A <sup>8)</sup>	A5W00185581A <sup>8)</sup>	A5W00197822A <sup>8)</sup>	A5W00196130A <sup>8)</sup>
	RCM Conformity AC 230 V	A5W00000334 <sup>8)</sup>	CE1T4515X4 <sup>8)</sup>	CM1T4503_C1 <sup>8)</sup>	-
	EAC Conformity	Eurasia conformity for all SA.. variants			
UL, cUL	AC 230 V	-			
	AC/DC 24 V				
Environmental compatibility	UL 873 <a href="http://ul.com/database">http://ul.com/database</a> ; File number E35198				
	The product environmental declarations contain data on environmentally compatible product designs and assessments (RoHS compliance, materials composition, packaging, environmental benefit, disposal):				
Dimensions	7173310559Ben <sup>7)</sup>	7173310559Ben <sup>7)</sup>	7173310522A <sup>7)</sup>	CE1E4502en <sup>7)</sup>	
	A6V101083254 <sup>7)</sup>				
Weight	Excl. packaging	See "Dimensions" (page 87)			
Accessories	Potentiometer ASZ7.5 <sup>9)</sup>	0...1000 Ω ± 5%			
	Voltage	DC 10 V (SELV)			
	Current rating	< 4 mA			
	Auxiliary switch ASC10.51 <sup>9)</sup>	AC 24...230 V, 6 (2) A, floating			
	Switching capacity	See section power supply			
	External supply line protection	AC 24 V class 2, 5 A general purpose			
	US installation, UL & cUL	Stem heating element ASZ6.6 cannot be combined with SAL..			
Stem heating element ASZ6.6	AC / DC 24 V ± 20 %				
	Power supply	50 VA / 30 W			
	Power consumption at 50 Hz	Max. 8.5 A (max. Temperature 85 °C / 185 F)			
	Inrush current (cold)	Is supplied by the actuator. Function module AZX61.1 cannot be combined with SA..61../MO.			
Function module AZX61.1 for SA..61.. <sup>9)</sup>					

<sup>1)</sup> Switching time for RMS of the sine wave at nominal voltage

<sup>2)</sup> SAL.T20 / T40 have a minimum holding torque of 14 Nm

<sup>3)</sup> Observe acting direction of DIL switches

<sup>4)</sup> AWG = American wire gauge

<sup>5)</sup> Also with weather shield ASK39.1

<sup>6)</sup> SA..61../MO are not suitable for outdoor applications.

<sup>7)</sup> Up to 150 °C with horizontal mounting position

<sup>8)</sup> The documents can be downloaded from <http://siemens.com/bt/download>.

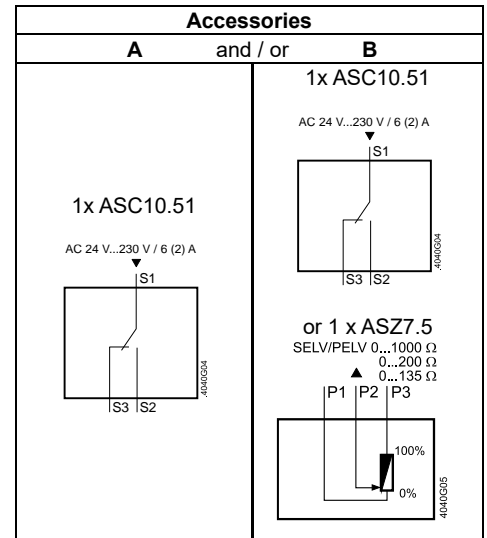
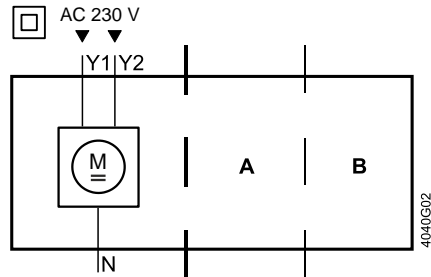
<sup>9)</sup> UL recognized component



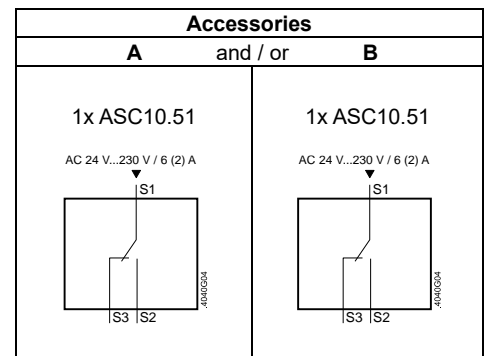
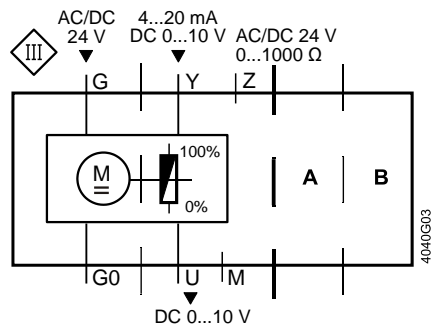
## 6 Connection diagrams and dimensions

### 6.1 Internal diagrams

SA..31..

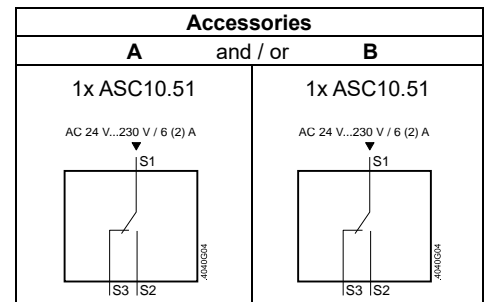
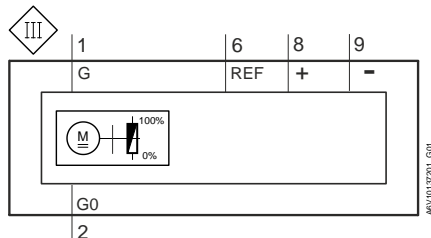


SA..61..

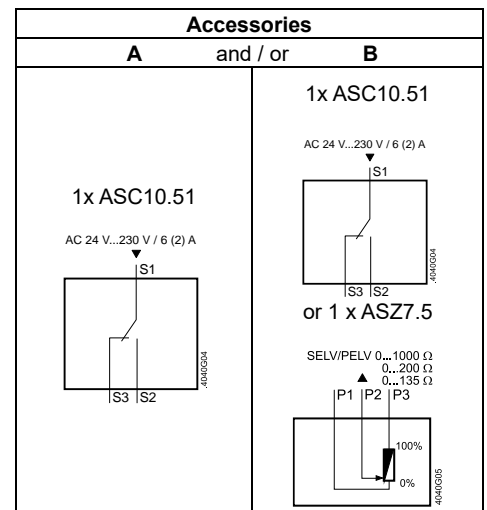
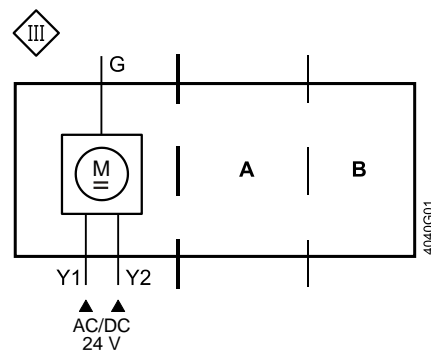


SA..61../MO

AC 24 V / DC 24 V



SA..81..



## 6.2 Connection terminals

### 6.2.1 Actuators

#### SA..31

AC 230 V, 3-position

<b>N</b>	System neutral (SN)
<b>Y1</b>	Positioning signal (actuator's stem extends / actuator's spindle turns clockwise)
<b>Y2</b>	Positioning signal (actuator's stem retracts / actuator's spindle turns counter-clockwise)

#### SA..31P

AC 230 V, 3-position

<b>N</b>	System neutral (SN)
<b>Y1</b>	Positioning signal (actuator's stem retracts)
<b>Y2</b>	Positioning signal (actuator's stem extends)

#### SA..61..

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

<b>G0</b>	System neutral (SN)
<b>G</b>	System potential (SP)
<b>Y</b>	Positioning signal for DC 0...10 V / 4...20 mA
<b>M</b>	Measuring neutral
<b>U</b>	Position feedback DC 0...10 V - (reference potential is M measuring neutral)
<b>Z</b>	Positioning signal forced control AC/DC ≤ 24 V, 0...1000 Ω

#### SA..61../MO

Fixed connecting cable  
5 x 0.75 mm<sup>2</sup>

AC/DC 24 V, Modbus RTU connection cable

<b>G0</b>	System neutral (SN)	black
<b>G</b>	System potential (SP) AC 24 V ~ / DC 24 V =	red
<b>REF</b>	Reference (Modbus RTU)	violet
<b>+</b>	Bus + (Modbus RTU)	grey
<b>-</b>	Bus - (Modbus RTU)	pink

#### SA..81

AC/DC 24 V, 3-position

<b>G</b>	System potential (SP)
<b>Y1</b>	Positioning signal (actuator's stem extends / actuator's spindle turns clockwise)
<b>Y2</b>	Positioning signal (actuator's stem retracts / actuator's spindle turns counter-clockwise)

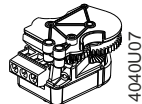
#### SA..81P

AC/DC 24 V, 3-position

<b>G</b>	System potential (SP)
<b>Y1</b>	Positioning signal (actuator's stem retracts)
<b>Y2</b>	Positioning signal (actuator's stem extends)

### 6.2.2 Electrical accessories

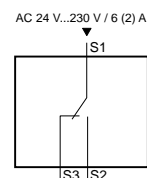
#### Auxiliary switch ASC10.51



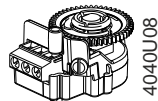
Adjustable switching points, AC 24...230 V

<b>1</b>	System potential (SP)
<b>2</b>	Closing Contact
<b>3</b>	Opening Contact

Switching state allway's related to extending actuator stem or clockwise turning actuator's spindle turns



#### Potentiometer ASZ7.5

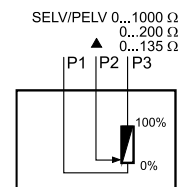


Adjustment of zero point, DC 10 V

<b>1</b>	Measuring neutral
<b>2</b>	0...x Ω
<b>3</b>	x...0 Ω

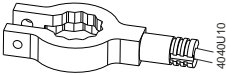
x = 135 Ω, 200 Ω, 1000 Ω

First, observe "Notes on ASZ7.5" (page 21).





**Stem heating element  
ASZ6.6**

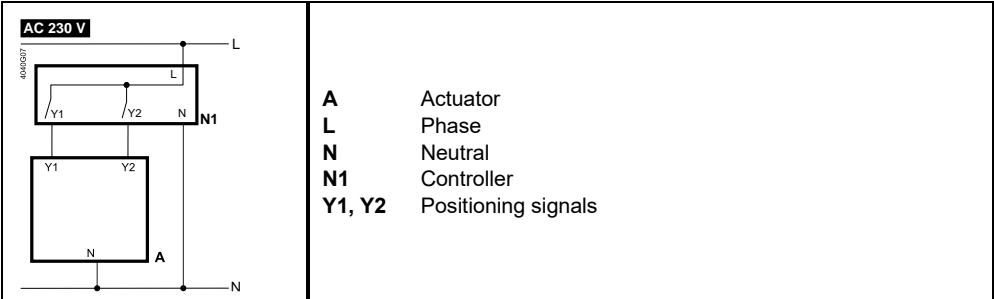


AC/DC 24 V / 30 W / 50 VA / inrush current max. 8.5 A

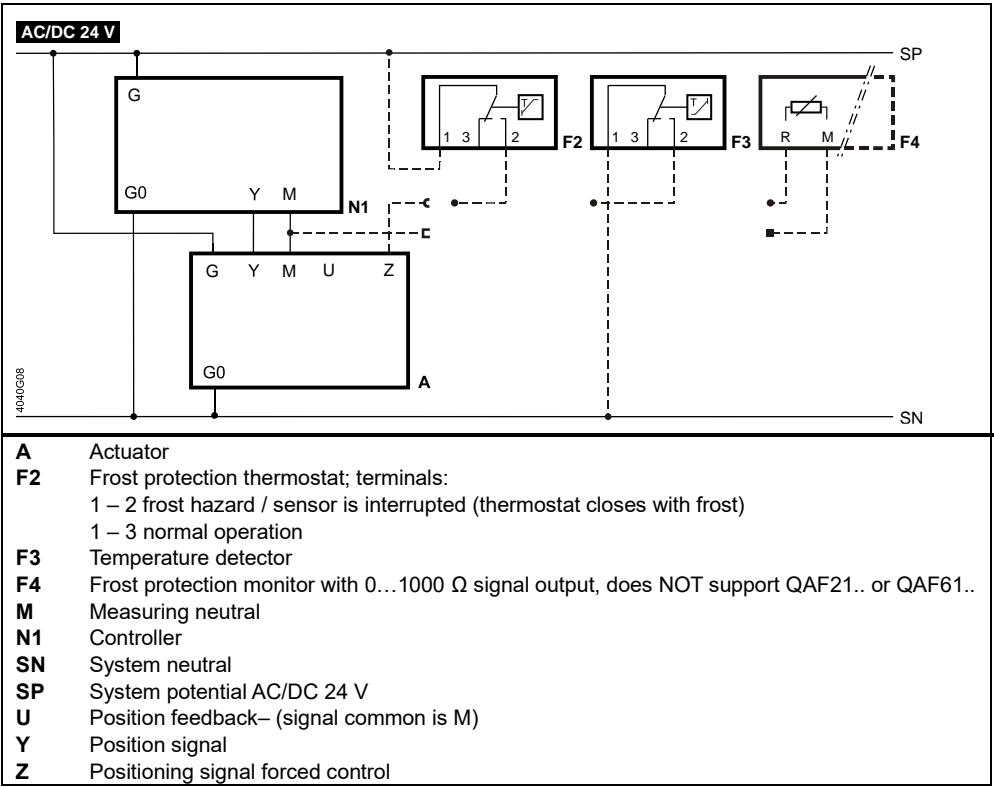
- |   |                               |
|---|-------------------------------|
| 1 | System neutral (SN) (red)     |
| 2 | System potential (SP) (black) |

## 6.3 Connection diagrams

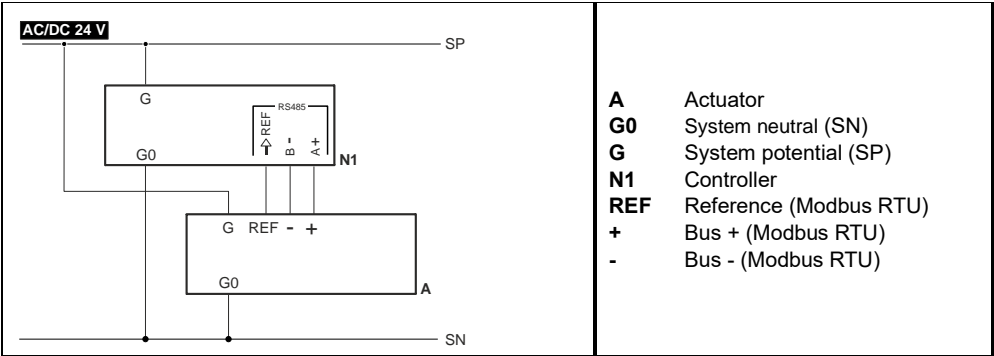
**SA..31..**

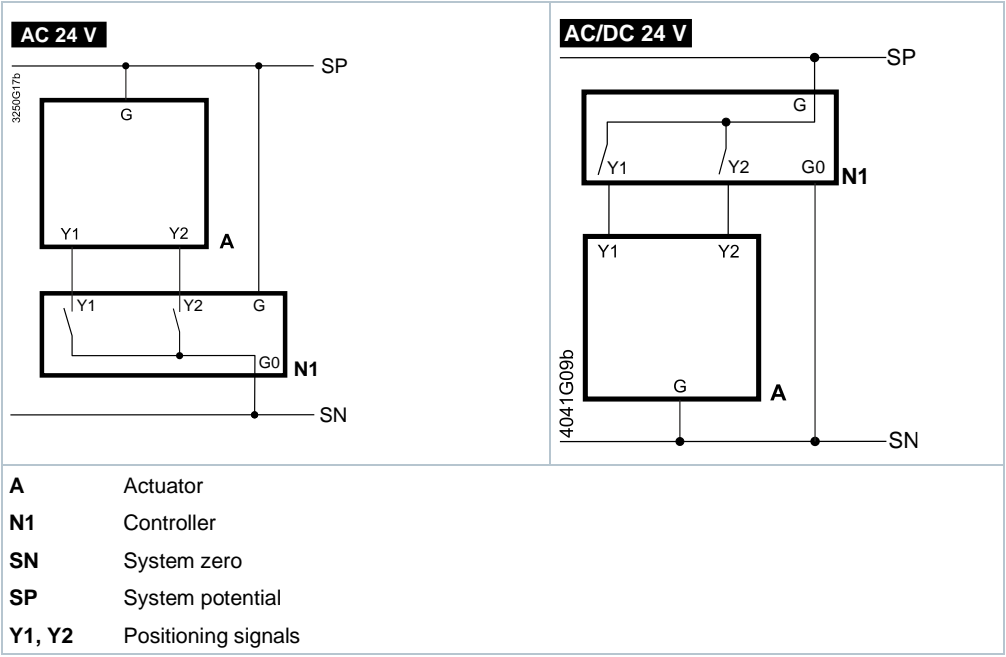


**SA..61..**



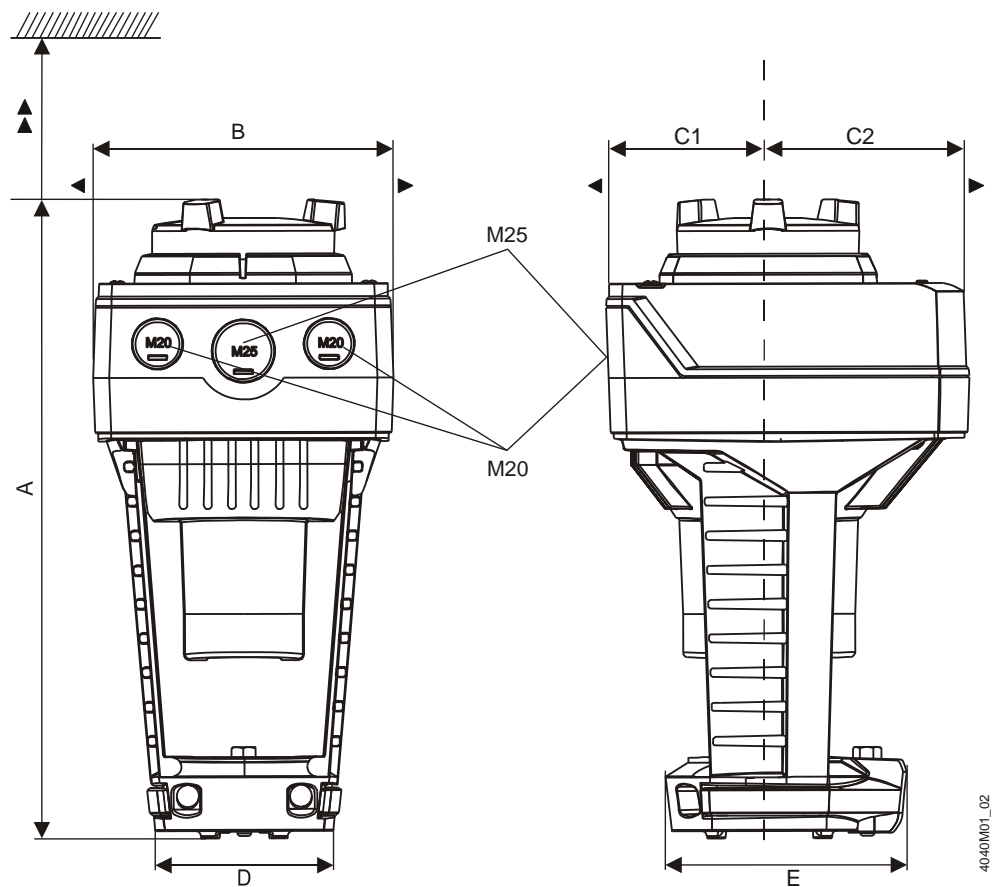
**SA..61../MO**





## 6.4 Dimensions

### 6.4.1 Stroke actuators



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

Type	A	B	C	C1	C2	D	E	▶	▶▶	kg
SAX.. (U <sup>1)</sup> )	242	124	150	68	82	80	100	100	200	1.780
SAX../MO <sup>3)</sup>										1.930
Mit ASK39.1	+25	154	300	200	100	-	-	-	-	2.010
SAV.. (U <sup>1)</sup> )	265	124	150	68	82	80	100	100	200	1.920
SAV../MO										2.070
Mit ASK39.1	+25	154	300	200	100	-	-	-	-	2.150
SAY.. (U <sup>1)</sup> )	242	124	150	68	82	80	100	100	200	1.780
SAY../MO										1.930

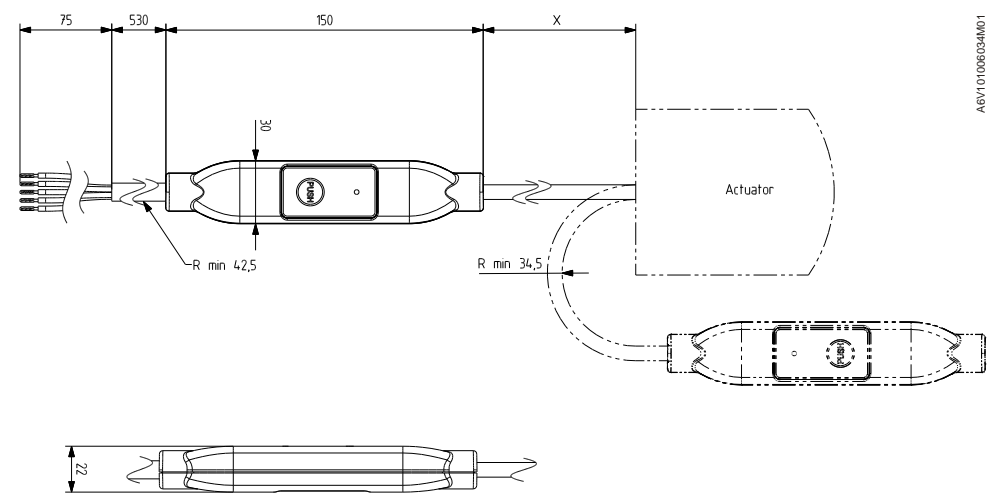
<sup>1)</sup> SAX..U: 1.850 kg


<sup>2)</sup> SAY..U: 1.850 kg

<sup>3)</sup> Device equipped with a fixed connection cable – Left cable entry is used

Dimensions in mm

6.4.2 External Modbus converter

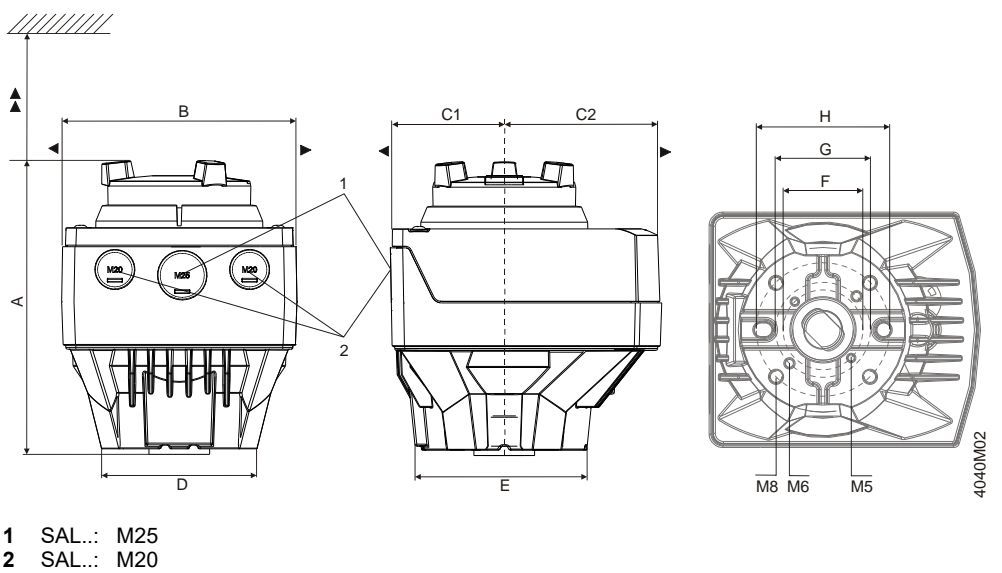



Type	X [mm]	 [kg]
SA../MO	250	0.15 <sup>1)</sup>

<sup>1)</sup> Already included in total weight

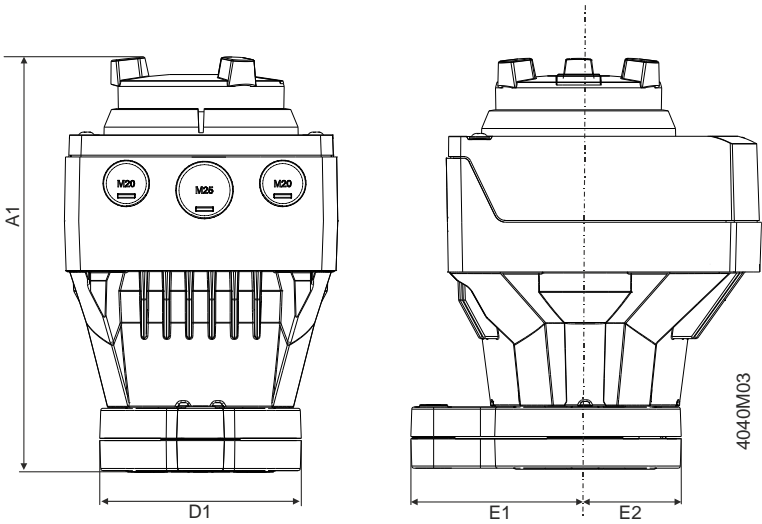
Dimensions in mm

6.4.3 Rotary actuators



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
With 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	-	-	-

Dimensions in mm

## 7 Revision numbers

Product no.	Valid from rev. no.	Product no.	Valid from rev. no.
SAX31.00	..K	SAL31.00T10	..F
SAX31.03	..K	SAL31.00T20	..E
SAX31P03	..K	SAL31.00T40	..C
SAX81.00	..H	SAL31.03T10	..F
SAX81.03	..H	SAL31.03T10/F05	..A
SAX81.03U	..H	SAL61.00T10	..E
SAX81P03	..H	SAL61.00T20	..D
SAX61.03	..H	SAL81.00T40	..B
SAX61.03U	..H	SAL61.03T10	..E
SAX61P03	..H	SAL61.03T10/F05	..A
SAX61.03/MO	..C	SAL81.00T10	..E
SAX61P03/MO	..B	SAL81.00T20	..D
		SAL81.00T40	..B
SAV31.00	..C	SAL81.03T10	..E
SAV61.00	..B	SAL81.03T10/F05	..A
SAV61.00U	..B		
SAV61P00	..D	SAY31P03	..B
SAV81.00	..B	SAY61P03	..A
SAV81.00U	..B	SAY81P03	..A
SAV81P00	..B	SAY61P03/MO	..A
SAV61.00/MO	..A		
SAV61P00/MO	..A		

## 8 Glossary

### 8.1 Symbols

---



Caution, general danger – read the notes!



Caution, hot surface – read the notes!



Condition as supplied to customer



Crosstip screwdriver (Pozidriv)



Slotted screwdriver



Screw wrench



Allen key

### 8.2 Terms

---

#### **Climatix™**

The complete product range of flexible and scalable control solutions, standardized up to and including freely programmable solutions.  
Specialized for HVAC applications.

#### **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<sub>vs</sub>**

Nominal flow rate: Nominal flow rate of cold water (5...30 °C) through the fully open valve (H<sub>100</sub>) at a differential pressure of 100 kPa (1 bar).

#### **LED**

Light emitting diode.

#### **Modbus RTU**

Open communications protocol (client/server architecture), transmits data as binary data.  
RTU: Remote Terminal Unit.

#### **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".

#### **$\Delta p_{\max}$ / $\Delta p_{\max V}$**

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

#### **$\Delta p_s$**

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

#### **slotted screwdriver**

# Index

3-position control .....	56
A/D conversion.....	56, 59
About this documentation .....	5
Accessories.....	21, 82
Electrical accessories.....	21
Mechanical accessories .....	22
Acting direction .....	61, 63
Angular rotation.....	12
Anschlussklemmen	
Stetig .....	84
Auxiliary switch ASC10.51 .....	21, 40, 43, 48, 51, 54, 55, 78, 82, 83, 84
Before you start.....	8
Brushless DC motor.....	56, 59
Cable entries.....	81
Cable glands .....	10, 47
cable lengths.....	25
Calibration .....	49, 59, 65, 70
Calibration slot .....	40, 59
Changeover of acting direction .....	61
Changeover of characteristic .....	59
Characteristics function .....	59
Commissioning .....	49
Connecting cable .....	81
Connection diagrams .....	83, 85
Connection terminals .....	40, 84
3-position .....	84
Actuators .....	84
Auxiliary switch ASC10.51.....	84
Electrical accessories.....	84
Modulating .....	84
Potentiometer ASZ7.5.....	84
Stem heating element ASZ6.6 .....	85
Contents.....	3
Control .....	56
Control functions .....	56
Control functions .....	59
Control of direction.....	56
Copyright.....	8
Coupling.....	10, 76
Cross-sectional area of wire .....	26
cross-sectional areas.....	25
Degree of protection .....	82
Delivery .....	13
Detection of foreign bodies .....	59, 67, 69
Detection of valve seat .....	66
Deviations .....	57
DIL switches.....	40, 59, 60, 61
Dimensions .....	82, 87, 88
Modbus converter.....	88
Rotary actuators .....	88
Stroke actuators .....	87
Direct acting.....	61, 63

Directives .....	82
Disposal.....	55
DN.....	15, 17, 20
Document use .....	9
Electrical accessories .....	78
Electrical planners .....	9
Engineering .....	10
Environmental compatibility.....	82
Environmental conditions .....	82
Equipment combinations .....	15
2-port valves.....	17
3-port valves.....	15
combi valves .....	19
slipper and butterfly valves .....	20
Extra functions .....	11, 12
Flow characteristic.....	62, 63, 78
Equal-percentage.....	62, 63
Linear .....	62, 63
Flow characteristic selection .....	11, 62
Force .....	15
Forced control.....	11, 12, 59, 68, 81
Formulas for wire lengths .....	26
Function check .....	49
Function data .....	81
Function description .....	73
Function module AZX61.1 .....	21, 40, 42, 59, 60, 79
Function principle .....	75
Functions .....	56
Gear train.....	56, 59
Glossary .....	91
Handling .....	27
HEX switches .....	60
Housing cover.....	10
HVAC plants .....	9
Identification of seat.....	56, 59
Indicators .....	77
LED .....	77
Operational status indication.....	77
Position indication .....	77
Status indication.....	77
Indoor use.....	27
Installation .....	10, 27, 46
Interior view .....	40
Internal diagrams.....	83
k <sub>vs</sub> .....	15, 17, 20
L/P-diagram .....	26
LED.....	11, 12, 40, 59, 77
Maintenance .....	52, 55
Manual adjuster .....	10, 11, 12, 56, 59, 76
Automatic .....	76
Disengaging the fixing.....	76
Fixing the coupling .....	76
Manual operation .....	76



Manual adjustment .....	56, 59, 70	Product replacements .....	22
Mechanical accessories .....	79	Quality assurance.....	9
Modbus RTU.....	52	Quick access .....	5
External converter .....	53	Reference documents .....	8
Modulating control .....	59	Request to the reader.....	9
Motor control.....	56, 59	Reverse acting .....	61, 63
Mounting .....	27	Revision history .....	7
Accessories .....	40	Revision numbers.....	90
Auxiliary switch ASC10.51 .....	43	Scope of this document.....	9
Fitting actuators to butterfly valves. 29, 34, 35, 37, 38, 39		Selecting the acting direction .....	61
Fitting actuators to seat valves.....	27	Sequence control .....	60
Fitting actuators to slipper valves.....	31	Setting elements.....	40
Function module AZX61.1 .....	42	Signal adaptation.....	60
Mounting positions .....	27	Signal error .....	25
Potentiometer ASZ7.5 .....	41	Signal inputs .....	81
Stem heating element ASZ6.6 .....	45	Signal priorities.....	66
Weather shield ASK39.1 .....	46	Sizing.....	25
Mounting set ASK3..N.....	20, 79, 89	Spare parts .....	24
Mounting set ASK31N.....	22, 31	Spring return time.....	11, 12
Mounting set ASK33N.....	22, 29	Standards .....	82
Mounting set ASK35N.....	22, 35	Status indication .....	10
Navigation.....	5	Stem heating element ASZ6.6 ....	21, 45, 79, 82, 85
Operating voltage .....	26, 81	Stroke .....	11, 12
Operating voltage .....	11, 12	Supported function codes .....	73
Ordering .....	13	Symbols.....	91
Outdoor use .....	27	Technical .....	75
Parallel operation.....	81	Technical data .....	80
Parallel operation of actuators .....	25	Technical design.....	68
Parameters .....	71	Technology .....	68
Permissible voltage drop .....	26	Terms.....	91
Permissible wire length.....	26	Torque .....	12, 20, 23
Plug-in space A.....	40, 41, 43	Trademarks .....	8
Plug-in space B.....	40, 42, 44	Transmission of power .....	75
PN .....	15, 17, 20	Type summary.....	11
Position control .....	59	Rotary actuators.....	12
Position feedback .....	11, 12, 62, 81	Stroke actuators.....	11
Position indication.....	10	Use .....	11
Positioning force .....	11, 12, 15, 17, 22	User interface .....	10
Positioning signal.....	11, 12, 59	Valve neck coupling.....	10
Positioning signal (Z) .....	81	Valve seat detection .....	68
Positioning signal selection .....	62	Valve stem coupling .....	10
Positioning time .....	11, 12, 22	Voltage drop .....	25
Positioning times stroke model.....	57	Volumetric flow .....	61, 62
Potentiometer ASZ7.5.....	21, 40, 41, 51, 78	Warranty .....	26
Potentiometer ASZ7.5. ....	48, 82, 83, 84	Weather shield ASK39.1 .....	22, 46, 79
Power consumption .....	26	Weight .....	82
Power supply .....	59, 81	Wiring .....	46
Power transmission .....	10	Actuator.....	47
Product description .....	10	Auxiliary switch ASC10.51 .....	48, 51
Product replacements		Potentiometer ASZ7.5.....	48
Electrical accessories.....	23	Preparation of wire endings .....	46
Rotary actuators SQL.. to SAL.....	23	Yoke.....	10
Stroke actuators SQX.. to SAX..	22	$\Delta p_{\max}$ .....	15, 17, 20
		$\Delta p_s$ .....	17, 20

Issued by  
Siemens Switzerland Ltd  
Smart Infrastructure  
Global Headquarters  
Theilerstrasse 1a  
6300 Zug  
Switzerland  
Tel. +41 58-724 24 24  
[www.siemens.com/sbt](http://www.siemens.com/sbt)

© Siemens Switzerland Ltd, 2010 - 2024  
Technical specifications and availability subject to change without notice