SIEMENS

ACVATIX™

# Electromotoric actuators for valves

SAX..P..

**Actuators with 20 mm stroke and 500 N force**

- SAV31P03 Operating voltage AC 230 V, 3-position positioning signal
- SAV61P03 Operating voltage AC/DC 24 V, positioning signal 0...10V, 4...20 mA
  With position feedback, forced control, characteristic changeover
- SAV61P03/MO operating voltage AC/DC 24 V,
  RS-485 for Modbus RTU communication
- SAV81P03 Operating voltage AC/DC 24 V, positioning signal 3-position
- For direct mounting on valves; no adjustments required
- Manual adjuster, position and status indication (LED)
- Optional functions with auxiliary switches, potentiometer

## Use

Electromotoric actuators to operate Siemens combi valves for type series VPF43.. and VPF53.. with 20 mm stroke, as control valves on ventilation, air conditioning, district heating and refrigeration plants.

## Functions

| Function | Description | Type |
|---|---|---|
| 3-position control | A 3-position signal controls the actuator via connection terminals Y1 or Y2. The desired position is transmitted to the valve. | SAX31P03, SAX81P03 |
| Modulating control | The modulating positioning signal provides stepless motor control. The positioning signal range (DC 0...10 V / DC 4...20 mA / 0...1000 Ω) corresponds to the positioning range (closed...open, or 0…100% stroke) in a linear manner. | SAX61P03 |
| Positioning signal and characteristic changeover | Setting with DIL switch.<br>Factory setting:<br>● Characteristic curve: log = Equal percentage (switch set to Off)<br>● Positioning signal: DC 0...10 V (switch set to Off) | SAX61 P03, SAX61P03/MO |
| Position feedback U | Signal returned to acquire the position via input. | |
| Forced control (Z-mode) | Forced control helps override automatic mode and is implemented via higher control. | |
| Calibration | Carry out during initial commissioning. The actuator drives to the top or bottom end position; the measured values are saved. | |
| Valve seat detection | The actuators have power-dependent seat detection. After calibration, the exact valve stroke is stored in the actuator's memory. | |
| Foreign body detection | After clogging is detected, three attempts are made to get past clogging. If unsuccessful, the actuator continues to following the positioning signal only within a limited range, and the LED blinks red. | |
| Modbus RTU (RS-485), not galvanically isolated | Setpoint 0..100 % valve position<br>Actual value 0...100 % for valve position<br>Override control Open / Close / Min / Max / Stop<br>Setpoint monitoring and backup mode | SAX61P03/MO |

## Type summary

| Type | Item No. | Stroke | Positio-ning force | Operating voltage | Positioning signal | Spring return time | Positio-ing time | LED | Manual adjust-ment [3] | Auxiliary functions |
|---|---|---|---|---|---|---|---|---|---|---|
| SAX31P03 [1] | S55150-A118 | 20 mm | 500 N | AC 230 V | 3-position | - | 30 s | - | Push and fix | [4] |
| SAX61P03 [2] | S55150-A114 | | | AC 24 V DC 24 V | DC ...10 V DC 4...20 mA 0...1000 Ω | | | Yes | | [5] [6] |
| SAX61P03/MO [2] | S55150-A143 | | | | Modbus RTU | | | | | |
| SAX81P03 [2] | S55150-A116 | | | | 3-position | | | - | | [4] |

1) Approbation: CE

2) Approbation: CE, UL

3) Not designed for continuous operation.

4) Optional accessories: Auxiliary switch, potentiometer

5) Position feedback, forced control, characteristic changeover

6) Optional accessories: Auxiliary switch, sequence control, control action changeover

### Scope of delivery

Actuators, valves and accessories are supplied in individual packs.

## Accessories/spare parts

### Electrical accessories

| Type | Auxiliary switch ASC10.51 | Potentiometer ASZ7.5 | Function module AZX61.1 |
|---|---|---|---|
| Item No. | S55845-Z103 | S55845-Z106 | S55845-Z107 |
| | Max. 2 | | |
| **SAX31P..** | Max. 2 | Max. 1 | - |
| **SAX61P..** | | - | Max. 1 |
| **SAX61P../MO** | | - | |
| **SAX81P..** | | Max. 1 | - |

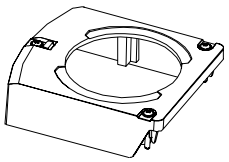
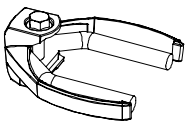
### Mechanical accessory

| Type | Weather shield ASK39.1 |
|---|---|
| Item No. | S55845-Z109 |

### Ordering (example)

| Type | Stock number | Designation | Number of pieces |
|---|---|---|---|
| SAX81P03 | S55150-A116 | Actuator | 1 |
| ASZ7.5 | S55845-Z106 | Potentiometer | 1 |

## Spare parts

| Product number / Stock number | | |
|---|---|---|
| 8000060843 | Housing cover  | Screw (valve stem coupling)  |
| | | U-bracket  |

## Equipment combinations

### VPF43..

| Valve type | | | DN | $H_{100}$ [mm] | $\dot{V}_{Min.}$ [$m^3/h$] | $\dot{V}_{m100}$ [$m^3/h$] | $\Delta p_{min}$ [kPa] | Data sheet |
|---|---|---|---|---|---|---|---|---|
| Standard flow | VPF43.50F16 | S55266-V100 | 50 | 20 | 2.3 | 15 | 35 | N4315 |
| | VPF43.65F24 | S55266-V102 | 65 | | 4.4 | 25 | | |
| | VPF43.80F35 | S55266-V104 | 80 | | 5.3 | 34 | | |
| High flow rate | VPF43.50F25 | S55266-V101 | 50 | | 4.3 | 25 | 70 | |
| | VPF43.65F35 | S55266-V103 | 65 | | 6 | 35 | | |
| | VPF43.80F45 | S55266-V105 | 80 | | 7 | 43 | | |

### VPF53..

| Valve type | | | DN | $H_{100}$ [mm] | $\dot{V}_{Min.}$ [$m^3/h$] | $\dot{V}_{m100}$ [$m^3/h$] | $\Delta p_{min}$ [kPa] | Data sheet |
|---|---|---|---|---|---|---|---|---|
| Standard flow | VPF53.50F16 | S55266-V112 | 50 | 20 | 2.3 | 15 | 35 | N4316 |
| | VPF53.65F24 | S55266-V114 | 65 | | 4.4 | 25 | | |
| | VPF53.80F53 | S55266-V116 | 80 | | 5.3 | 34 | | |
| High flow rate | VPF53.50F25 | S55266-V113 | 50 | | 4.3 | 25 | 70 | |
| | VPF53.65F35 | S55266-V115 | 65 | | 6 | 35 | | |
| | VPF53.80F45 | S55266-V117 | 80 | | 7 | 43 | | |

## Product documentation

| Title | Contents | Document ID |
|---|---|---|
| Electromotoric actuators for valves SAX..P.. | Data sheet:<br>Product description SAX..P.. | CE1N4509 |
| Actuators SAX.., SAY.., SAV.., SAL.. for valves | Basic documentation:<br>Detailed information on stroke actuators including Modbus types<br>Stroke actuators for valves with 20/40 mm stroke and rotary actuators for butterfly valves | CE1P4040en |
| Electromotoric actuators for valves SA.., Modbus RTU | Data sheet:<br>Modbus communication profiles | A6V101037195 |
| Mounting instructions G..161../MO and S..6/MO | Mounting instructions:<br>Mounting and installation instructions for Modbus actuators | A5W00027551 |
| Valve Actuator DIL Switch Characteristic Overview | Commissioning / Configuration:<br>Describes the characteristics of valve and actuator combinations, it describes the DIL Switch function. | A6V12050595 |

Related documents such as environmental declarations, CE declarations, etc., can be downloaded at the following Internet address:

http://siemens.com/bt/download

## Notes

### Safety

**⚠ CAUTION**

**National safety regulations**

Failure to comply with national safety regulations may result in personal injury and property damage.

- Observe national provisions and comply with the appropriate safety regulations.

**⚠ WARNING**

**Risk of burns from hot actuator brackets**

The actuator brackets on heating plants can also become hot from the contact with the hot valve during operation. The temperature of the actuator bracket can reach 100 °C.

When servicing the actuator:

- Switch off both pump and operating voltage.
- Close the main shutoff valve in the piping.
- Allow the piping to cool off.

### Engineering

**SAX31P03 / SAX81P03**

3-position actuators must be controlled by a controller, see Connection diagrams [→ 14].

**SAX61P03**

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.

**SAX61P03/MO**

The Modbus converter is designed for analog control at 0...10 V.

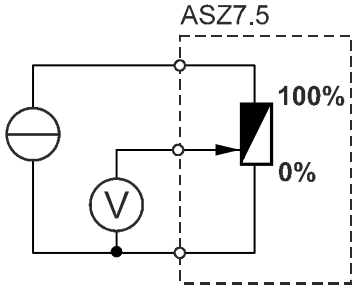
Keep the analog signal setting on the actuator as is (switch 1 to OFF); adjustment not permitted.

**ASZ7.5**

Actuators with a DC 0...9.8 V feedback signal are recommend for the combination SIMATIC S5/S7 and position feedback.

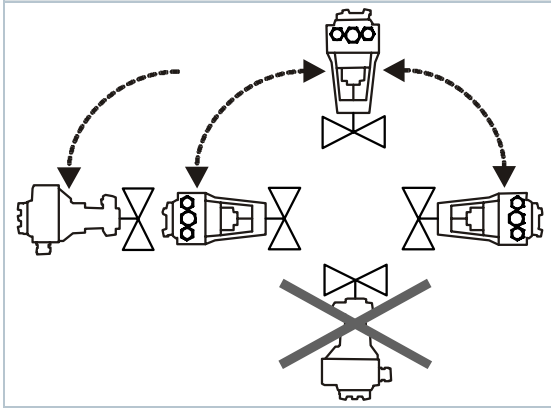
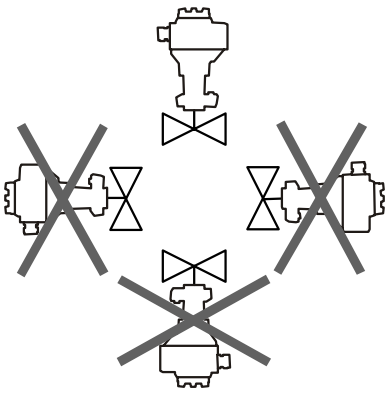
Signal peaks in potentiometer ASZ7.5 may result in error messages on Siemens SIMATIC. This is not the cause, however, when combined with Siemens HVAC controllers. The reason is the higher resolution and faster reaction time on SIMATIC.

Use the potentiometer as voltage divider on the 3-wire connection. Powering the potentiometer over the wiper may shorten the life cycle of the potentiometer. Signal peaks increase in frequency and scope over the lifespan in this operating mode.




## Mounting

### Mounting positions

| Indoor application | Outdoor application [1) 2)] |
|---|---|
|  |  |

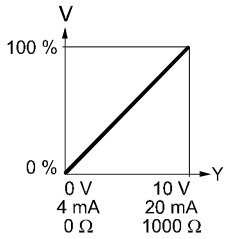
1) Only together with weather shield ASK39.2. IP54 housing protection remains unchanged.

2) SA../MO is not intended for outdoor use.

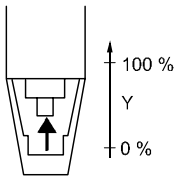
## Operation

### Direction of control action

On valves where the stem retracts to the close position, "direct acting" means that the value is fully closed at positioning signal Y = 0 V or Z = 0 Ω (i.e. 100 %).




**Direct acting**



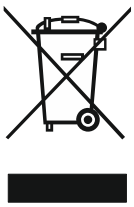

| | |
|---|---|
| Positioning signal Y | DC 0...10 V, 4...20 mA |
| Positioning signal Z | 0...1000 Ω |

| | |
|---|---|
| Y, Z | Positioning signal |
| V | Volume flow |
| _____ | Control action: Direct acting |

## Maintenance

The actuators are maintenance-free.

## Disposal



The device is considered an electronic device for disposal in accordance with the European Guidelines 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.

## Warranty service

Technical data on specific applications are valid only together with Siemens products listed under "Equipment combinations". Siemens rejects any and all warranties in the event that third-party products are used.

## Technical data

| Power | | | |
|---|---|---|---|
| Operating voltage | | | |
| | SAX31P03 | | AC 230 V ±15% |
| | SAX61P03.. | | AC 24 V ± 20 % / DC 24 V +20 % / -15 % (SELV) |
| | SAX81P03 | | |
| Frequency | | | 45...65 Hz |
| External supply line fusing (EU) | | | • Non-renewable fuse 6...10 A slow<br>• Circuit break max. 13 A, tripping characteristic B, C, D to EN 60898<br>• Power source with current limitation of max. 10 A |
| Power consumption at 50 Hz | | | |
| | SAX31P03 | Stem retracts/extends | 6.5 VA / 4 W |
| | SAX61P03 | | 9.5 VA / 4.5 W |
| | SAX61P03/MO | | 10.2 VA / 5 W |
| | SAX81P03 | | 7 VA / 4.5 W |
| Typical switch-on current [1] (3-position actuators) | | | |
| | SAX31P03 | | 2.3 A |
| | SAX81P03 | | 4.5 A |

| Operating data | | |
|---|---|---|
| Positioning times (with the specified nominal stroke) | | The positioning time may vary depending on the type of valve<br>(Type summary [→ 3]) |
| | SAX31P03, SAX61P03, SAX81P03 | 30 s |
| Positioning force | | 500 N |
| Nominal stroke | | 20 mm |
| Permissible media temperature (valve fitted) | | 1...120 °C |

| Signal inputs | | | |
|---|---|---|---|
| Positioning signal ”Y” | | | |
| | SAX31P03, SAX81P03 | | 3-position |
| | SAX31P03 | Voltage | AC 230 V ±15% |
| | SAX81P03 | | AC 24 V ± 20% / DC 24 V + 20% / - 15% |
| | SAX61P03 | | |
| | DC 0...10 V | Power consumption | ≤ 0.1 mA |
| | | Input impedance | ≥100 kΩ |
| | DC 4...20 mA | Power consumption | DC 4...20 mA ± 1% |
| | | Input impedance | ≤ 500 kΩ |

| Communication SAX61P../MO | | | |
|---|---|---|---|
| Communication protocol | | | |
| | Modbus RTU | | RS-485, not galvanically isolated |
| | Number of nodes | | Max. 32 |
| | Address range | | 1...248 / 255 |
| | | Factory setting | 255 |
| | Transmission formats | | 1-8-E-1 / 1-8-O-1 / 1-8-N-1 / 1-8-N-2 |
| | | Factory setting | 1-8-E-1 |
| | Baud rates (kbaud) | | Auto / 9.6 / 19.2 / 38.4 / 57.6 / 76.8 / 115.2 |
| | | Factory setting | Auto |
| | Bus termination | | 120 Ω electronically switchable |
| | | Factory setting | Off |

| Parallel connection | |
|---|---|
| SAX61P03 | ≤ 10 (depending on controller output) |

| Forced control | | | |
|---|---|---|---|
| Z positioning signal | | | |
| | SAX61P03 | | R = 0...1000 Ω, G, G0 |
| | | R = 0...1000 Ω | Stroke proportional to R |
| | | Z connected to G | Max. stroke 100 % [2] |
| | | Z connected to G0 | Max. stroke 0 % [2] |
| | | Voltage | Max. AC 24 V ± 20 % |
| | | | Max. DC 24 V +20% / -15% |
| | | Power consumption | ≤ 0.1 mA |

| Position feedback | | | |
|---|---|---|---|
| Position feedback U | | | |
| | SAX61P03 | | DC 0...10 V |
| | | Load impedance | > 10 kΩ resistive |
| | | Load | Max. 1 mA |

| Connection cables | | | |
|---|---|---|---|
| Wire cross-sectional areas | | | 0.75 $mm^2$, AWG 20...16 [3] |
| Cable entries | | | |
| | SAX..P.. | | • 2 entries Ø 20.5 mm (for M20)<br>• 1 entry Ø 25.5 mm (for M25) |
| | SAXP61../MO | | |
| | | Fixed connection cable | 0.9 m |
| | | Number of cores | 5 x 0.75 $mm^2$ |

| Degree of protection and class | | | |
|---|---|---|---|
| Housing from vertical to horizontal | | | IP 54 as per EN 60529 [4] |
| Protection class | | | As per EN 60730 |
| | SAX31P03 | AC 230 V | II |
| | SAX61P03 | AC / DC 24 V | III |
| | SAX81P03 | | |

| Environmental conditions | | | |
|---|---|---|---|
| Operation | | | IEC 60721-3-3 |
| | Climatic conditions | | Class 3K5 |
| | | Mounting location | Indoors (weather-protected) [4] |
| | | Temperature, general | 5...< 55 °C |
| | | Humidity (non-condensing) | 5...95 % r.h. |
| Transportation | | | 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 temperature when mounted on valve | | | 120 °C |

| Directives and standards | | |
|---|---|---|
| Product standard | | EN 60730-x |
| Electromagnetic compatibility (field of use) | | For residential, commercial, and industrial environments |
| EU conformity (CE) | | CE1T4501X1 [5] |
| RCM conformity | | CE1T4515X4 [5] |
| EAC compliance | | Eurasian compliance for all SAX..P.. |
| UL, cUL | AC 230 V | - |
| | AC / DC 24 V | UL 873 http://ul.com/database; file number E35198 |

| Environmental compatibility |
|---|
| Product environmental declarations 71 7331 0559 [5] und A6V101083254 [5] include data on environmentally friendly product design and testing (RoHS compliance, material composition, packaging, environmental benefits, disposal). |

| Dimensions |
|---|
| See Dimensions [→ 16] |

| Accessories [6] | | |
|---|---|---|
| Potentiometer ASZ7.5 | | 0...1000 Ω ± 5 % |
| | Voltage | DC 10 V |
| | Current rating | <4 mA |
| Auxiliary switch ASC10.51 | Switching capacity | AC 24…230 V, 6 (2) A, potential free |
| External fusing of supply line | | • Non-renewable fuse 6...10 A slow<br>• Circuit break max. 13 A, tripping characteristic B, C, D to EN 60898<br>• Power source with current limitation of max. 10 A |
| US installation, UL & cUL | | AC 24 V class 2, 5 A general purpose |

1) Switching time for RMS value of the sine wave at nominal voltage

2) Observe acting direction of DIL switches

3) AWG = American wire gauge

4) For outdoor operation, always use weather shield ASK39.1, housing protection class IP 54 remains as is. SAX61../MO is not intended for outdoor use.

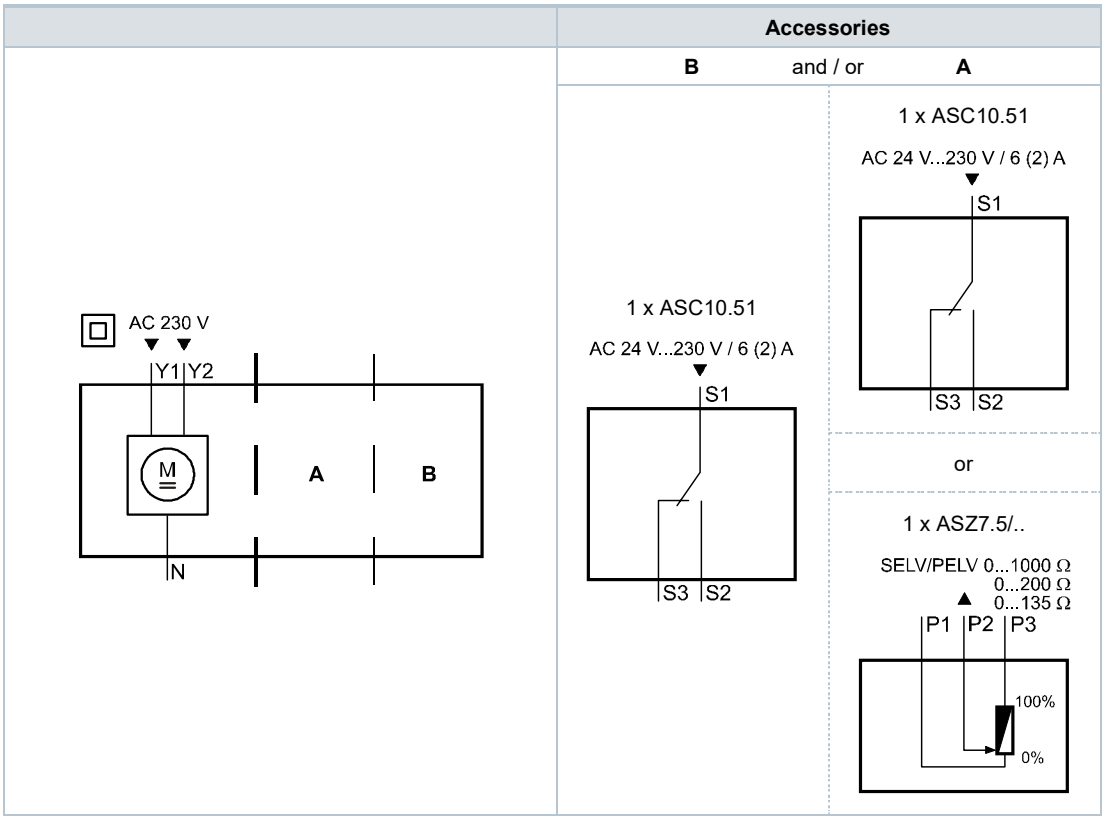
5) Documents can be downloaded at http://www.siemens.com/bt/download

6) UL-approved component

## Connection diagrams

### Internal Diagrams

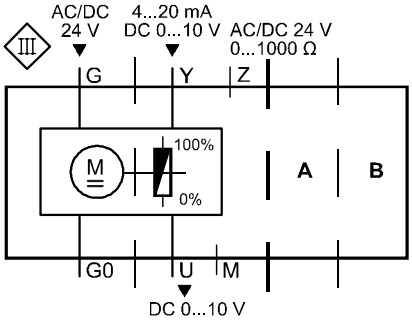
#### SAX31P03



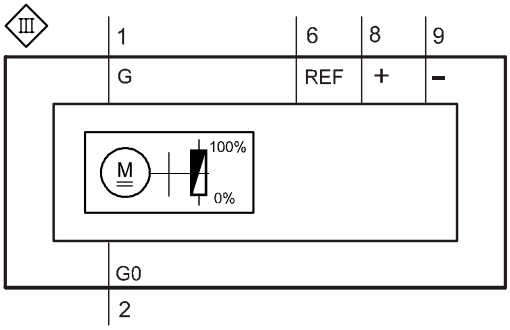
## SAX61P..

| | Accessories |
|---|---|
| | **B** and / or **A** |

**SAX61P03**

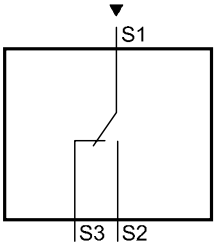



**SAX61P03/MO**



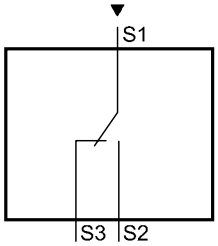

1 x ASC10.51

AC 24 V...230 V / 6 (2) A



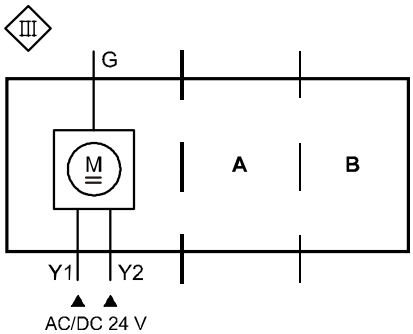

1 x ASC10.51

AC 24 V...230 V / 6 (2) A



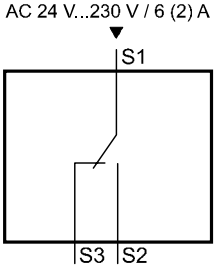

## SAX81P03

| | Accessories |
|---|---|
| | **B** and / or **A** |



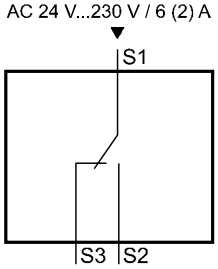

1 x ASC10.51

AC 24 V...230 V / 6 (2) A




1 x ASC10.51

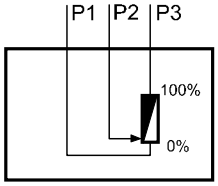
AC 24 V...230 V / 6 (2) A




or

1 x ASZ7.5/..

SELV/PELV 0...1000 Ω
0...200 Ω
0...135 Ω



## Connection terminals

### SAX31P03

| | AC 230 V | 3-position |
|---|---|---|
| N | System neutral (SN) | |
| Y1 | Positioning signal (actuator's stem extends) | |
| Y2 | Positioning signal (actuator's stem retracts) | |

### SAX61P03

| | AC / DC 24 V | D 0...10 V<br>4...20 mA<br>0...1000 |
|---|---|---|
| G0 | System neutral (SN) | |
| G | System potential (SP) | |
| Y | Positioning signal for DC 0...10 V / 4...20 mA | |
| M | Measuring neutral | |
| U | Position feedback DC 0…10 V - (System neutral is measuring ground M) | |
| Z | Control signal forced control | |

### SAX61P03/MO

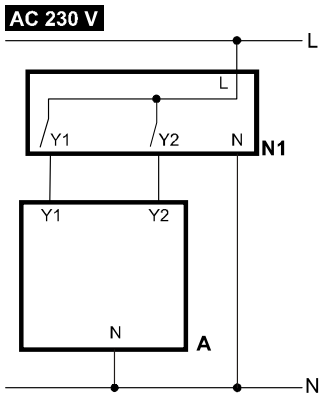
| | AC / DC 24 V | Modbus RTU connecting cable |
|---|---|---|
| G0 | System neutral (SN) | black |
| G | System potential (SP) AC 24 V / DC 24 V | red |
| REF | Reference line (Modbus RTU) | violet |
| + | Bus + (Modbus RTU) | gray |
| - | Bus - (Modbus RTU) | pink |

### SAX81P03

| | AC / DC 24 V | 3-position |
|---|---|---|
| G | System potential (SP) | |
| Y1 | Positioning signal (actuator's stem extends) | |
| Y2 | Positioning signal (actuator's stem retracts) | |

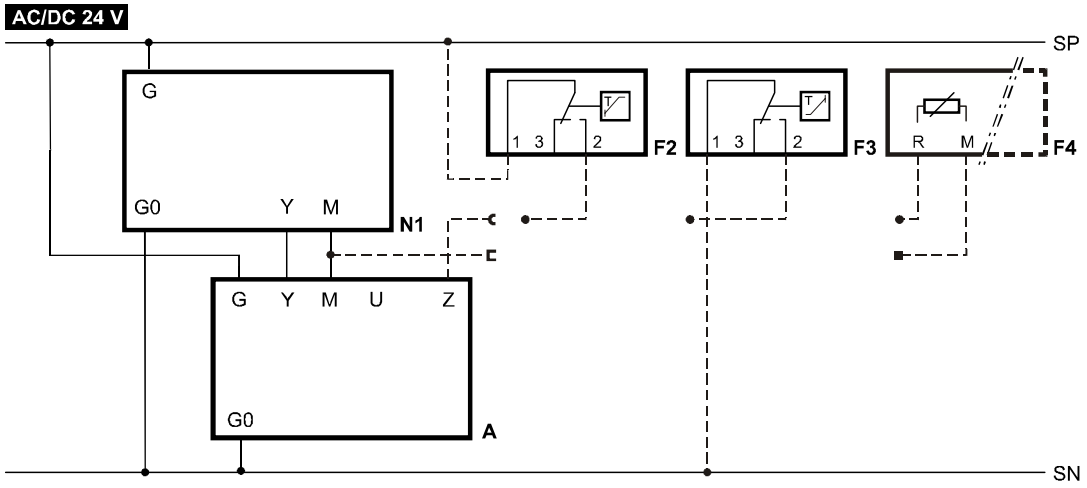
## Connection diagrams

### SAX31P03



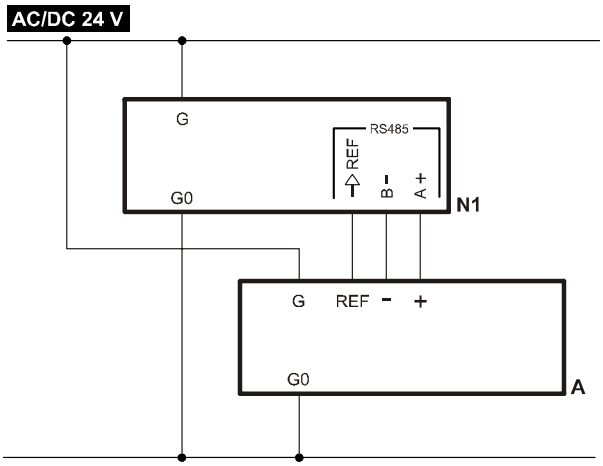

| | |
|---|---|
| **A** | Actuator |
| **L** | Phase |
| **N** | Neutral |
| **N1** | Controller |
| **Y1, Y2** | Positioning signals |

### SAX61P03



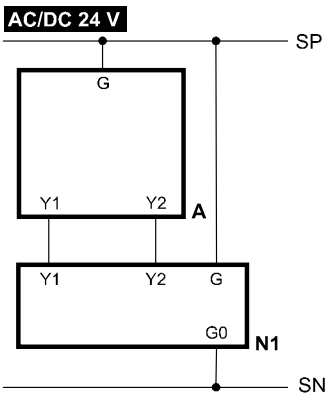

| | |
|---|---|
| **A** | Actuator |
| **F2** | Frost protection thermostat: terminals:<br>1 – 2 frost hazard / sensor is interrupted (thermostat closes with frost)<br>1 – 3 normal operation |
| **F3** | Thermal reset limit thermostat |
| **F4** | Frost protection monitor with 0…1000 Ω signal output, does **NOT** support QAF21.. or QAQ61.. |
| **M** | Measuring neutral |
| **N1** | Controller |
| **SN** | System zero |
| **SP** | System potential AC/DC 24 V |
| **U** | Position feedback - (System neutral is measuring ground M) |
| **Y** | Positioning signal |
| **Z** | Control signal forced control |

## SAX61P03/MO




| | |
|---|---|
| **A** | Actuator |
| **N1** | Controller |
| **G** | System potential AC/DC 24 V |
| **G0** | System zero |
| **REF** | Reference line (Modbus RTU) |
| **+** | Bus + (Modbus RTU) |
| **-** | Bus - (Modbus RTU) |

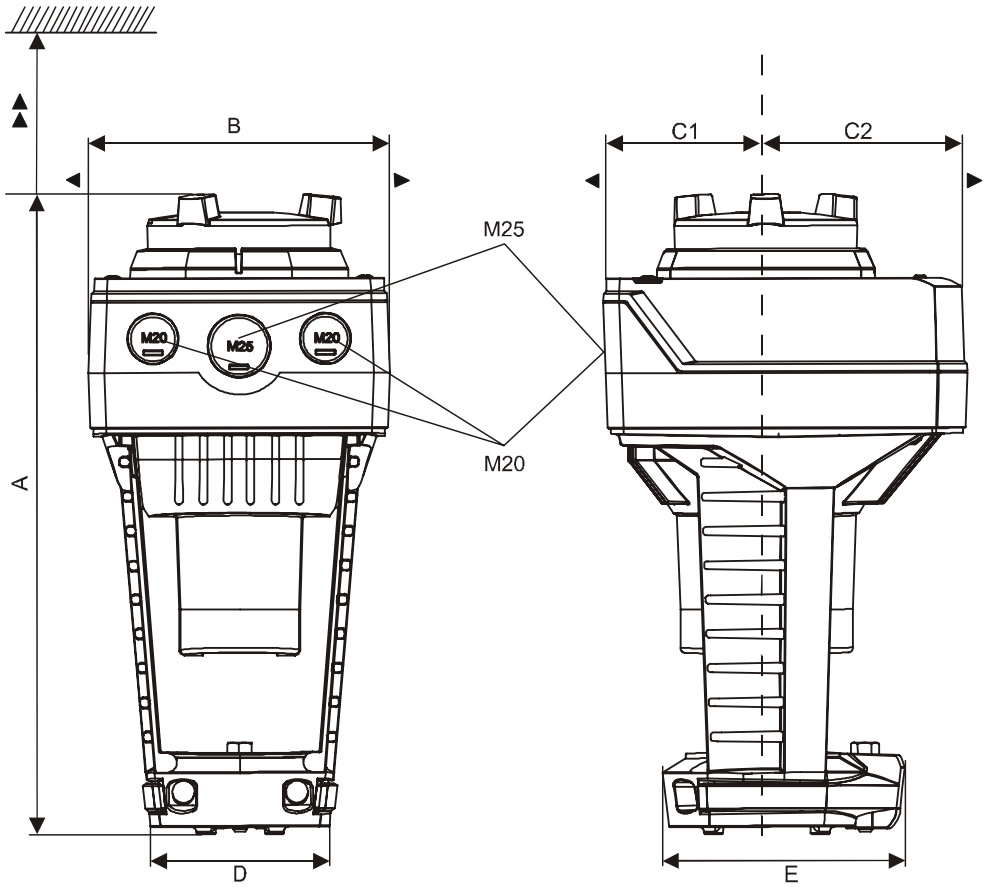
## SAX81P03




| | |
|---|---|
| **A** | Actuator |
| **N1** | Controller |
| **SN** | System zero |
| **SP** | System potential |
| **Y1, Y2** | Positioning signals |

## Dimensions

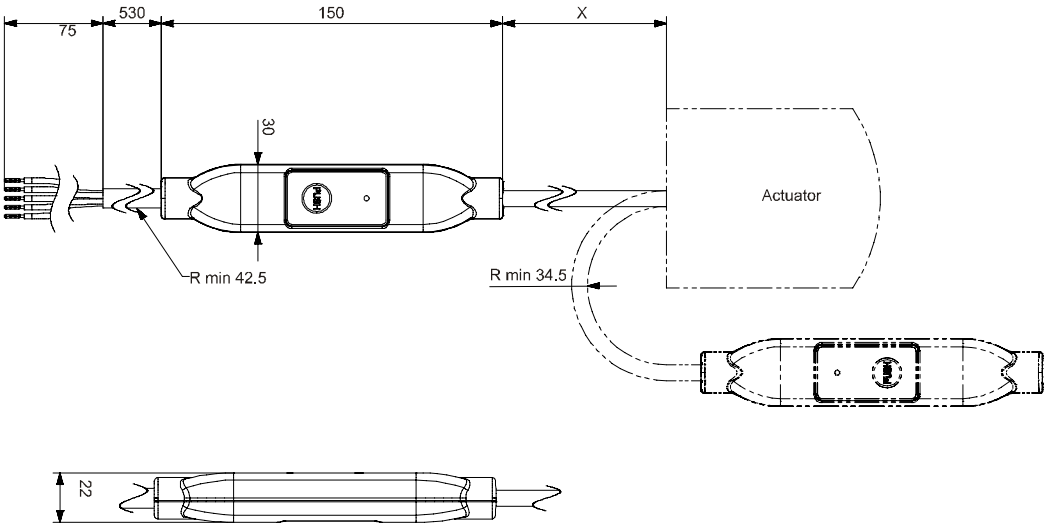
### Actuator




| Type | A | B | C | C1 | C2 | D | E | ► | ►► | kg |
|---|---|---|---|---|---|---|---|---|---|---|
| | [mm] | | | | | | | | | [kg] |
| SAX..P.. | 242 | 124 | 150 | 68 | 82 | 80 | 100 | 100 | 200 | 1.780 |
| SAX61P03/MO [1] | | | | | | | | | | 2.930 |
| With ASK39.1 | 267 | 154 | 300 | 200 | 100 | - | | | | 2.010 |

[1] Device has fixed connection cable – left cable entry occupied

## External Modbus converter




Dimensions in mm

| Type | X | kg |
|---|---|---|
| | [mm] | [kg] |
| SAX61P03/MO | 250 | 0.15 [1] |

[1] Included in total weight.

## Revision numbers

| Type | Valid from rev. no. |
|---|---|
| SAX31P03 | ..H |
| SAX61P03 | ..H |
| SAX61P03/MO | ..A |
| SAX81P03 | ..H |

Issued by
Siemens Switzerland Ltd
Smart Infrastructure
Global Headquarters
Theilerstrasse 1a
CH-6300 Zug
Tel. +41 58 724 2424
www.siemens.com/buildingtechnologies



Document ID CE1N4509en
Edition 2020-07-01