

ACVATIX™

## Electromotive actuators for valves

Modbus communication profiles



### Actuators

- SAS61.../MO operating voltage AC 24 V / DC 24 V  
RS485 for Modbus RTU communication
- SAX61.../MO operating voltage AC 24 V / DC 24 V  
RS485 for Modbus RTU communication

This document describes the network functions of the actuator series S..6../MO

## Functions

Function	Description
<b>Communication</b>	Modbus RTU (RS-485), not galvanically isolated
<b>Functions</b>	<ul style="list-style-type: none"> <li>- Setpoint 0..100% valve position</li> <li>- Actual value 0..100% for valve position</li> <li>- Override control Open / Close / Min / Max / Stop</li> <li>- Setpoint monitoring and backup mode</li> </ul>
<b>Supported baud rates</b>	9.6, 19.2, 38.4, 57.6, 78.4, 115.2 kbaud
<b>Transmission formats</b>	1-8-E-1, 1-8-N-1-, 1-8-O-1, 1-8-N-2
<b>Bus termination</b>	120 Ω electronically switchable

A detailed description of device functions and operation is available in the documentation on basics, CE1P4040 and CE1P4041.

The documents can be downloaded at <http://www.siemens.com/bt/download>; see Section "Product documentation".

## Product documentation

Title	Content	Document no.
Electromotive actuators for valves SAX..	Data sheet: Product description SAX..	CE1N4501
Actuators SAX.., SAY.., SAV.., SAL.. for valves	Basic documentation: Detailed information on stroke actuators including Modbus types Stroke actuators for valves with 20/40 mm stroke and rotary actuators for butterfly valves	CE1P4040en
Electromotive actuators for valves SAS..	Data sheet: Product description SAS..	CE1N4581
Actuators SAS.., SAT.. for valves	Basic documentation: Detailed information on stroke actuators including Modbus types Stroke actuators for valves with 5.5 mm stroke	CE1P4041en
Climatix, standard application for air handling units	Overview / Description: Climatix air conditioning application	CE1A3975
Mounting instructions S..6../MO and G..161../MO	Mounting instructions: Mounting and installation instructions	On the device and A5W00027551

The documents including related documents such as environmental declaration, CE declaration etc. are available at the following Internet address: <http://siemens.com/bt/download>

## 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.

## Commissioning

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

As an alternative, the bus can be parameterized via the local HMI; see Section 'User interface'.

Check the following during commissioning:

- Bus configuration (address, baud rate, type of transmission and optional termination). Standard address 255 allows for installation and commissioning of several actuators simultaneously without mutual interference.
- The actuator parameters (direction for opening, position limits, position adjustment etc.) can be read via the Modbus register.

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

### 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 master/programming tool (no address conflicts and correct baud rates/transmission format settings).

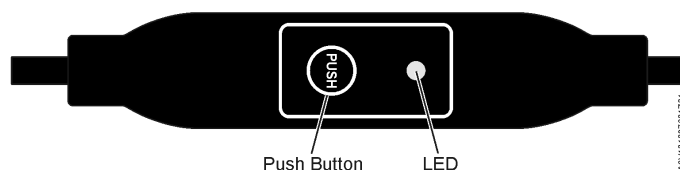
- Full configuration via bus: With a unique Modbus address, a connection can be established from Modbus master/programming tool following startup by means of the preset transmission format and baud rate (or auto-baud).
- Partial configuration via bus: If the Modbus address is not unique, it must first be set to a unique value, either by using the address input with push button (cf. page 5) or by setting the address to 246 with push button press > 5s und < 10s (cf. page 4).  
Full configuration via bus: With a unique Modbus address, a connection can be established from Modbus master/programming tool following startup by means of the preset transmission format and baud rate (or auto-baud).

With an existing connection, the bus and actuator parameters can be set to target values via the bus. During write access to the bus parameters,

"1 = Load" must be written to register 768 within 30 seconds to ensure the changes are not 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



### Pushbutton operation

Action	Pushbutton operation	Feedback message
Current Modbus address (starting from lowest address position)	Button pressure < 1s	1st digit: red 2nd digit: green 3rd digit: orange The LED blinks blue once after address indication and when bus termination is On Example: 124 = 4x red, 2x green, 1x orange
Switches bus termination On/Off	Switch-on	1. Press button 3x 2. Press button 1x briefly 3. Press button until the LED turns red 4. Release button  Blinking or flickering of LED stops (termination mode) Blue LED blinks once RED LED is lit (confirmation)  LED not lit Address is indicated LED blinks blue once following address indication Device enters normal mode
	Switch-off	1. Press button 3x 2. Press button until the LED turns red 3. Release button  Blinking or flickering of LED stops (termination mode) RED LED is lit (confirmation)  Device enters normal mode
Enter Modbus address using pushbutton	Press button > 1s and < 5s	See Section 'Enter address using pushbutton'
Enable pushbutton addressing (together with Climatix™ controllers)	1. Press button > 5s and < 10s 2. Release button	Red LED is lit and goes off after 5 s Orange LED is lit
Reset to factory settings	Press button > 10s	Orange LED blinking

### LED colors and blinking patterns

Color	Blinking pattern	Description
Green	1s On / 5s Off	Normal mode without bus traffic
	Flickering	Normal mode with bus traffic
Orange / green	1s orange / 1s green	Device is in override control mode
Orange	1s On / 5s Off	Bus parameter not yet configured
	1s On / 5s Off	Device is in backup mode (replacement mode)
Red	Permanently lit	Mechanical error, device blocked, manual intervention or calibration
	1s On / 5s Off	Internal error
	0.1s On / 1s Off	Invalid configuration, e.g. Min = Max
Blue	Flickering once after address indication	Bus termination active

## 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

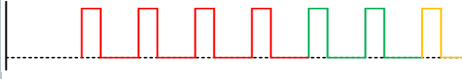
### Display current address (starting from lowest address position)

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

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

Colors		
1st digit: <b>red</b>	2nd digit: <b>green</b>	3rd digit: <b>orange</b>

Example for address 124:

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

## Examples

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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

## Modbus registers

Reg.	Name	R/W	Unit	Scaling	Range/Listing
<b>Process values</b>					
1	Setpoint	RW	%	0.01	0..100
2	Forced control	RW	--	--	0 = Off / 1 = Open / 2 = Close 3 = Stop / 4 = Min / 5 = Max
3	Actual value position	R	%	0.01	0..100
256	Command	RW	--		0 = Ready / 1 = Adapt / 2 = Self-test 3 = Reinitialize / 4 = Remote reset

<b>Parameter</b>					
259	Operating mode	RW	--	--	1 = POS
260	MinPosition	RW	%	0.01	0..100
261	MaxPosition	RW	%	0.01	0..100
262	Actuator runtime	R	--- S ---	1	30
263	Positioning signal curve between Y and U	RW	--	--	0 = Linear (e.g. SAX61../MO + V_G41) 1 = Logarithmic (e.g. SAS61../MO + V_G44)
264	Tolerance blockage monitoring	RW	%	0.01	0..10
513	Backup mode	RW	--	--	0 = Go to backup position 1 = Hold last position / 2 = Deactivated
514	Backup position	RW	%	0.01	0..100
515	Backup timeout	RW	--- S ---	1	0..65535
516	Startup setpoint	RW	%	0.01	0..100
764	Modbus address	RW	--	--	1..247 / 255 = "Unassigned"
765	Baud rate	RW	--	--	0 = Auto / 1 = 9600 / 2 = 19200 3 = 38400 4 = 57600 / 5 = 76800 / 6 = 115200
766	Transmission format	RW	--	--	0 = 1-8-E-1 / 1 = 1-8-O-1 / 2 = 1-8-N-1 / 3 = 1-8-N-2
767	Bus termination	RW	--	--	0 = Off / 1 = On
768	Bus conf. command	RW	--	--	0 = Ready / 1 = Load / 2 = Discard
769	Status	R	--	--	See Section Register 769 "Status".

<b>Device information</b>					
1281	Index	R	--	--	Basic documentation CE1P4040; CE1P4041 <sup>1)</sup>
1282-83	Manufacturing date	R	--	--	
1284-85	Serial number	R	--	--	
1292	Actuator type	R	--	--	
1409-16	ASN [characters 16..1]	R	--	--	

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

## Register 769 "Status"

<b>Status</b>			
Bit 00	1 = Reserved	Bit 06	1 = Adaptation done
Bit 01	1 = Backup mode active	Bit 07	1 = Adaptation in progress
Bit 02	1 = Reserved	Bit 08	1 = Adaptation error
Bit 03	1 = Reserved	Bit 09	1 = Self-test failed
Bit 04	1 = Mechanical error, device blocked manual intervention or calibration	Bit 10	1 = Self-test successful
Bit 05	1 = End of life reached	Bit 11	1 = Invalid configuration

## Supported function codes

Function codes	
03 (0x03)	Read holding register
04 (0x04)	Read input registers
06 (0x06)	Write single register
16 (0x10)	Write multiple registers (limitation: Max. 120 registers within one message)

## Communication properties

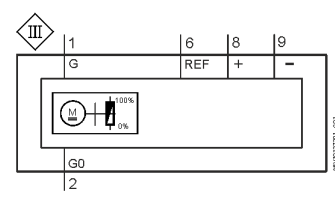
Communication		
Communication protocol	Modbus RTU	RS-485, not galvanically isolated
	Number of nodes	Max. 32
	Address range	1...247 / 255 Factory setting: 255
	Transmission formats	1-8-E-1 / 1-8-O-1 / 1-8-N-1 / 1-8-N-2 Factory setting: 1-8-E-1
	Baud rates (kbaud)	Auto / 9,6 / 19,2 / 38,4 / 57,6 / 76,8 / 115,2 Factory setting: Auto
	Bus termination	120 Ω electronically switchable Factory setting: Off

## Connection diagrams

### Device diagram/Connecting cable

The actuators come with a prewired connecting cable. All devices connected to it must be connected also to the same neutral line G0.

Core code	Core color	Terminal code	Meaning
1	Red (RD)	G	Voltage phase AC 24 V
2	Black (BK)	G0	Voltage neutral line AC 24 V
6	Purple (VT)	REF	Reference line (Modbus RTU)
8	Gray (GY)	+	Bus + (Modbus RTU)
9	Pink (PK)	-	Bus - (Modbus RTU)



### Note

Operating voltage on terminals G and G0 must comply with the requirements for SELV or PELV.

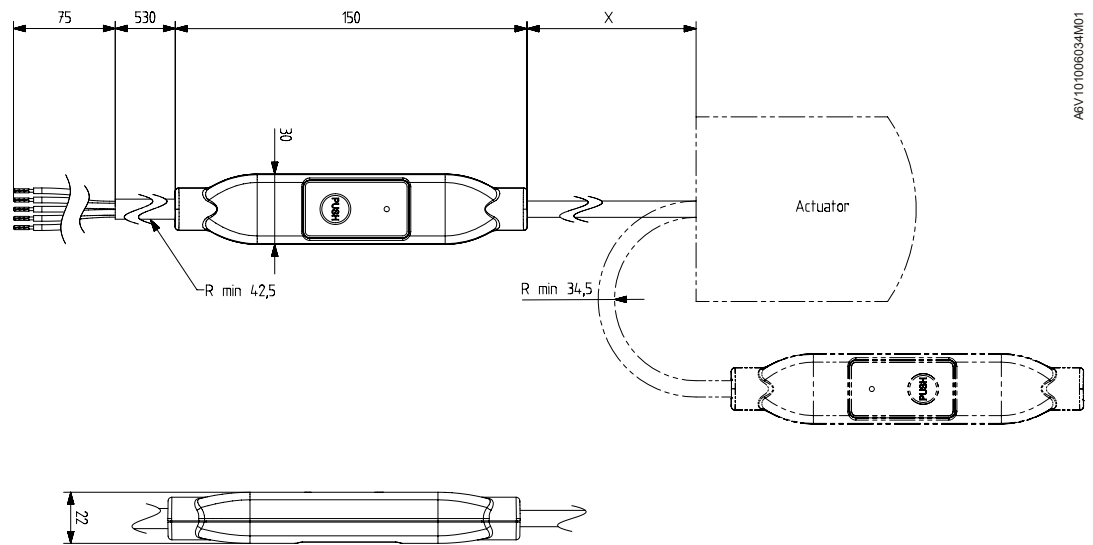
Safety transformers featuring twofold insulation must be used as per EN 61558; they must be designed for 100% duty.

Connection cables		
Cable length		0.9 m
Voltage supply / Communication	Core number and cross-section	5 x 0.75 mm <sup>2</sup>



## Dimensions

### External Modbus converter



X = 250 mm

Dimensions in mm

## Revision numbers

Type	Valid from rev. no.
SAS61.03/MO	A
SAX61.03/MO	A

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