

ACVATIX™

Electromotive actuators for valves

Modbus communication profiles



SAS61../MO



SAT61../MO



SAX61../MO



SAY61../MO



SAV61../MO

Actuators SA../MO

- SAS61../MO operating voltage AC 24 V / DC 24 V
[SEP]RS-485 for Modbus RTU communication
- SAT61../MO operating voltage AC 24 V / DC 24 V
[SEP]RS-485 for Modbus RTU communication
- SAX61../MO operating voltage AC 24 V / DC 24 V
[SEP]RS-485 for Modbus RTU communication
- SAY61../MO operating voltage AC 24 V / DC 24 V
[SEP]RS-485 for Modbus RTU communication
- SAV61../MO operating voltage AC 24 V / DC 24 V
[SEP]RS-485 for Modbus RTU communication

This document describes the network functions of the actuator series SA..61../MO.

Functions

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

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


The documents can be downloaded at <http://siemens.com/bt/download>, see “Product documentation” [→ 2].

Product documentation

Title	Contents	Document no.
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
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
Electromotive actuators for valves SAX..	Data sheet: Product description SAX..	CE1N4501
Electromotive actuators for valves SAX..P..	Data sheet: Product description SAX..P..	CE1N4509
Electromotive actuators for valves SAY..P..	Data sheet: Product description SAY..P..	A6V10628469
Electromotive actuators for valves SAV..	Data sheet: Product description SAV..	CE1N4503
Electromotive actuators for valves SAV..P..	Data sheet: Product description SAV..P..	CE1N4510
Electromotive actuators for valves SAS..	Data sheet: Product description SAS..	CE1N4581
Electromotive actuators for valves SAT..	Data sheet: Product description SAT..	CE1N4584
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
Valve Actuator DIL Switch Characteristic Overview	Commissioning / Configuration: 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>

Safety

	<p>⚠ CAUTION</p>
	<p>National safety regulations</p> <p>Failure to comply with national safety regulations may result in personal injury and property damage.</p> <ul style="list-style-type: none"> Observe national provisions and comply with the appropriate safety regulations.

Commissioning

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

The bus configuration can alternatively be configured by the local HMI, see section User interface [→ 4]

Check the following during commissioning:

- Bus configuration (address, baudrate, transmission mode, and optional bus termination). The default address 255 allows mounting and commissioning of multiple actuators at the same time without interfering with each other.
- Actuator parameters (Opening direction, position limits, position adaptation, etc.). The value can be read over the Modbus register.

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

Full or partial configuration via bus

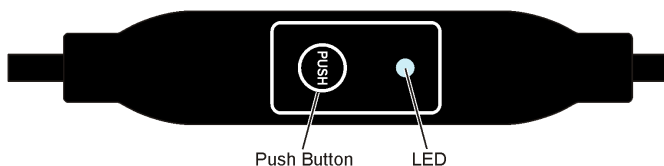
The devices can be configured over bus if the pre-commissioning settings allow for a connection between the Modbus master / programming tool and peripheral devices (i.e. non-conflicting addresses and matching baudrate / transmission format).

- Full configuration via bus: A unique Modbus address can connect by the Modbus master/programming tool after startup using the presets for transmission format and baud rate (or auto-baud).
- Partial configuration over the bus: A Modbus address that is not unique must be first set to a unique address, either by using the address input with pushbutton (see Enter address using pushbutton [→ 5]) or by setting the address to 246 by pressing the pushbutton > 5s and < 10s (see Pushbutton operation [→ 4]). The Modbus master/programming tool can then connect after startup using the the presets for transmission format and baud rate (or auto-baud).

The bus and actuator parameters can be set to target values on an existing connection over the bus. For write operations to the bus parameters, "1 = Load" must be written to Reg 768 within 30 seconds; the changes are otherwise discarded.

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

Regs	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 press <1 s	<ul style="list-style-type: none"> 1st digit (single digit): red 10-digit (double digit): green 100-digit (triple digit): orange The LED blinks 1 x blue after the address indication if bus termination is switched on Example: 124 = 4 x red, 2 x green, 1 x orange	
Switch on/off bus termination	Switch-on	Press the button 3 times	Blinking or flashing of LED stops (termination mode).
		Briefly press the button 1 x	Blue LED flashes 1 x.
		Press button until the LED turns red	RED LED is lit (confirmation).
		Release button	LED not lit. Address is indicated. LED blinks 1 x blue after the address indication Device enters normal mode.
	Switch off	Press the button 3 times	Blinking or flashing of LED stops (termination mode).
		Briefly press the button 1 x	RED LED is lit (confirmation).
Release button		Device enters normal mode.	
Enter Modbus address using pushbutton	Button press >1 s and <5 s	See Enter address using pushbutton [→ 5]	
Enable pushbutton addressing (together with Climatix™ controllers)	Button press >5 s and <10 s	Red LED is lit and goes off after 5 s.	
	Release button	Orange LED lit.	
Reset to factory settings	Button press >10 s	LED flashes orange.	

LED colors and flashing patterns

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

Reset actuator with pushbutton


1. Press button > 10 s
⇒ LED flashes **orange**
2. Release the button *while* LED is still flashing
⇒ LED flashes another 3 s
3. Press button *within* these 3 s
⇒ Reset is cancelled
4. Press button *after* these 3 s
⇒ LED is **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 an extra tool using pushbutton addressing. To display the current Modbus address, press the button <1s.

Colors		
1-digit: red	10-digit: green	100-digit: orange

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 4 x red)

Enter new address (starting from lowest address position)

1. **Enable addressing mode:** Press button > 1 s
⇒ LED is **red**
– Release pushbutton (before LED turns off).
2. **Enter digits:** Press button n-times.
⇒ LED flashes 1 x for each press of the button as feedback
1st digit: **red** / 2nd digit: **green** / 3rd digit: **orange**
3. **Save digits:** Hold pushbutton
⇒ LED lights in the color of the following digits
– Release button
4. **Save address:** Hold pushbutton
⇒ LED is **red** (confirmation)
– Release button
⇒ The entered address is displayed again 1x for confirmation.



The address is discarded if the button is released before the LED lights red.

Set address "124":

1. Enable addressing mode
 2. Set 1-digit: Press button 4 x.
 - ⇒ LED flashes **red** for each press of the button
 3. Save digits: Hold pushbutton
 - ⇒ LED is lit **green**
 - Release button
 4. Set 10-digits: Press button 2 x.
 - ⇒ LED flashes **green** for each press of the button
 5. Save double digits: Hold pushbutton
 - ⇒ LED is lit **orange**
 - Release button
 6. Set 100-digit: Press button 1 x.
 - ⇒ LED flashes **orange** for each press of the button
 7. Save address: Hold pushbutton
 - ⇒ LED is **red**
 - Release button
- ⇒ The address is saved and is repeated 1 x for confirmation

Set address "50":

1. Enable addressing mode
 2. Skip 1-digit: Hold pushbutton
 - ⇒ LED is lit **green**
 - Release button
 3. Set 10-digits: Press button 5 x.
 - ⇒ LED flashes **green** for each press of the button
 4. Saved address (skip 100-digit): Hold pushbutton
 - ⇒ LED is **red**
 - Release button
- ⇒ The address is saved and is repeated 1 x for confirmation

Set address "5":

1. Enable addressing mode
 2. Set 1-digit: Press button 5 x.
 - ⇒ LED flashes **red** for each press of the button
 3. Saved address (skip 10-digit and 100-digit): Hold pushbutton
 - ⇒ LED is **red**
 - Release button
- ⇒ The address is saved and is repeated 1 x for confirmation

Modbus registers

Reg.	Name	R/W	Range/Listing	Factory setting
Process values				
1	Setpoint	RW	0...100 % = 0...10000	-
2	Forced control	RW	0 = Off / 1 = Extend / 2 = Retract / 3 = Stop	
3	Actual Value.	R	0...100 % = 0...10000	
256	Command	RW	0 = Ready or calibrating / 1 = Not available / 2 = Self-test / 3 = Reinitialize / 4 = Remote reset	

Parameter				
259	Control mode	R	1 = POS	-
260	MinPosition	R	0...100 % = 0...10000	0 %
261	MaxPosition	R	0...100 % = 0...10000	100 %
262	Actuator runtime	R	30	30 s
263	Positioning signal curve between Y and U	R	0 = Linear (e.g. SAX61../MO + V..G41..) 1 = Logarithmic (e.g. SAS61../MO + V..G44..)	-
264	Tolerance blockade monitoring	R	0...100 % = 0...10000	4 %
513	Backup mode (replacement mode)	RW	0 = Go to backup position / 1 = Not available / 2 = Deactivated	2 = Deactivated
514	Backup position	RW	0...100 % = 0...10000	0 %
515	Backup timeout	RW	0...65535	900 [s]
516	Start-up setpoint	RW	0...100 % = 0...10000	0 %
764	Modbus address	RW	1...248 / 255 = "Unassigned"	255 = "Unassigned"
765	Baud rate	RW	0 = Auto / 1 = 9600 / 2 = 19200 / 3 = 38400 / 4 = 57600 / 5 = 76800 / 6 = 115200	0
766	Transmission format	RW	0 = 1-8-E-1 / 1 = 1-8-O-1 / 2 = 1-8-N-1 / 3 = 1-8-N-2	0
767	Bus termination	RW	0 = Off / 1 = On 120 Ω electronically switchable	0
768	Bus conf. command	RW	0 = Ready / 1 = Load / 2 = Discard	0
769	Status	R	See Register 769 "State" [→ 8]	-

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

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

Register 769 "State"

Status			
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 blocked manual intervention ¹⁾ or calibration ¹⁾	Bit 10	1 = Self-test successful
Bit 05	1 = Not available	Bit 11	1 = Not available

¹⁾ After 10 seconds

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 (Limit: Max. 120 registers within one write operation)

Communication properties

Communication		
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-N-1, 1-8-O-1, 1-8-N-2
	Factory setting	1-8-E-1
	Baud rates (kbaud)	Auto / 9.6 / 19.2 / 38.4 / 57.6 / 78.4 / 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 to the same neutral line G0.

Wire code	Wire color	Terminal code	Meaning	Connection diagram
1	red RD	G	Voltage phase AC 24 V	
2	black BK	G0	Voltage neutral line AC 24 V	
6	violet VT	REF	Reference line (Modbus RTU)	
8	gray GY	+	Bus + (Modbus RTU)	
9	pink PK	-	Bus - (Modbus RTU)	

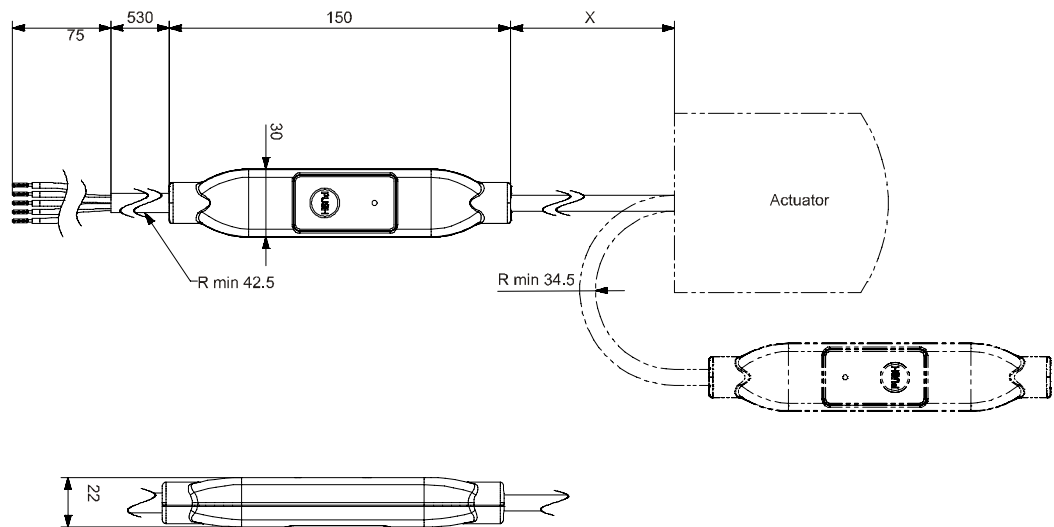
Note

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	Wire number and diameter	5 x 0.75 mm ²

Dimensions

External Modbus converter



Dimensions in mm

X [mm]	kg [kg]
250	0.15

Revision numbers

Type	Valid from rev. no.
SAS61.03/MO	..A
SAS61.33/MO	..A
SAT61.008/MO	..A
SAT61.51/MO	..A
SAX61.03/MO	..A
SAX61P03/MO	..A
SAY61P03/MO	..A
SAV61.00/MO	..A
SAV61P00/MO	..A