

Electro-hydraulic actuators for valves

Modbus communication profiles



Stellantriebe SK../MO

- SKB62/MO
 - Operating voltage AC 24 V
 - RS-485 for Modbus RTU communication
- SKC62/MO
 - Operating voltage AC 24 V
 - RS-485 for Modbus RTU communication
- SKD62/MO
 - Operating voltage AC 24 V
 - RS-485 for Modbus RTU communication

This document describes the network functions of the actuator series SK..62../MO.

Functions

Function	Description
Communication	Modbus RTU (RS-485), not galvanically isolated
Number of nodes	Max. 32
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

See also Modbus registers [→ 7] and Function description [→ 9].

Product documentation

Title	Content	Document no.
Electro-hydraulic actuators for valves SKB..	Data sheet: Product description SKB32.., SKB82.., SKB62.., SKB62/MO, SKB60	CE1N4564
Electro-hydraulic actuators for valves SKC..	Data sheet: Product description SKC32.., SKC82.., SKC62.., SKC62/MO, SKC60	CE1N4566
Electro-hydraulic actuators for valves SKD..	Data sheet: Product description SKD32.., SKD82.., SKD62.., SKD62/MO, SKD60..	CE1N4561
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 Modbus converter	A5W00027551

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

<http://siemens.com/bt/download>

Safety

	⚠ CAUTION
	<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 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

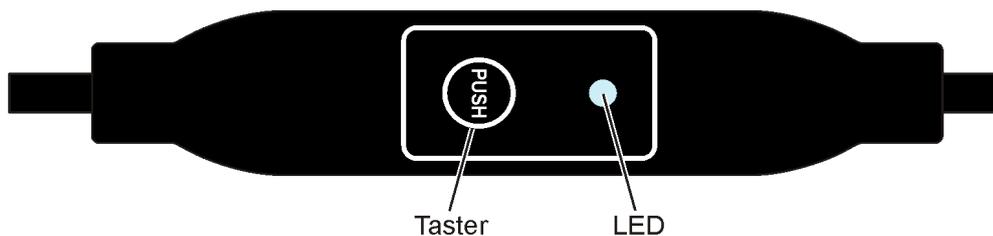
The devices can be configured over bus if the pre-commissioning settings allow for a connection between the Modbus master / programming tool and peripheral devices (i.e. non-conflicting addresses and matching baudrate / transmission format).

- 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.

Register	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 [→ Error! Bookmark not defined.]	
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 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 / 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 blinks **orange**
2. Release the button *while* LED is still blinking
⇒ LED blinks another 3 s
3. Release the 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.

Examples

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 1 = Logarithmic	-
264	Tolerance blockade monitoring	R	0...100 % = 0...10000	4 %

Parameter				
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 "Status" [→ 10]	-

Reg.	Name	R/W	Value	Example																				
Device information																								
1281	Factory Index	R	2 Bytes Each coding an ASCII character	5A 00 → Z 00 Device is of series "Z"																				
1282	Factory Date HWord	R	2 Bytes The lower coding the year (hex)	Reg. 1282 → 000F Reg. 1283 → 0418																				
1283	Factory Date LWord	R	2 Bytes HByte coding the month (hex) LByte coding the day (hex)	<table border="1"> <thead> <tr> <th></th> <th colspan="2">HWord</th> <th colspan="2">LWord</th> </tr> <tr> <th></th> <th>--</th> <th>YY</th> <th>MM</th> <th>DD</th> </tr> </thead> <tbody> <tr> <td>Hex</td> <td>00</td> <td>0F</td> <td>04</td> <td>18</td> </tr> <tr> <td>Dec</td> <td>00</td> <td>15</td> <td>04</td> <td>24</td> </tr> </tbody> </table> → Date of manufacture = April 24, 2015		HWord		LWord			--	YY	MM	DD	Hex	00	0F	04	18	Dec	00	15	04	24
	HWord		LWord																					
	--	YY	MM	DD																				
Hex	00	0F	04	18																				
Dec	00	15	04	24																				
1284	Factory sequence no. HWord	R	Hword + LWord = hex representation of sequence number.	Reg. 1284 → 000A Reg. 1285 → A206																				
1285	Factory sequence no. LWord	R		AA206(hex) → 696838 (dec) → Device has sequence number 696838																				
1409	ASN [Character 16...15]	R	Each register 2 Bytes Each coding an ASCII character ASN is coded beginning with reg. 1409	0x53 4B = SK 0x42 36 = B6 0x32 2F = 2/ 0x4D 4F = MO → ASN is SKB62/MO																				
1410	ASN [Char. 14...13]	R																						
1411	ASN [Char. 12...11]	R																						
1412	ASN [Char. 10...9]	R																						
1413	ASN [Char. 8...7]	R																						
1414	ASN [Char. 6...5]	R																						
1415	ASN [Char. 4...3]	R																						
1416	ASN [Char. 2...1]	R	Reserve																					

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 (limit: max. 120 registers within one write operation)

Register 1/3 "Setpoint/actual value"

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

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

Register 2 "Override control"

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

- Manual override: When the manual adjuster (if present) is used, a mechanical jam will be detected if a mismatch between setpoint and actual position persists for longer than 10 s.
- 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"

A restart is possible by:

- resetting the power (turning operating voltage off and on)
- sending "Reinitialize" command.

⇒ Actuator restarts and sets all process values except actual value (= 50%) and setpoint (= startup setpoint) to factory settings.

Register 256 "Self-test"

The self-test drives the actuator to the limits and sets the status values in register 769 (bit 09 / bit 10) according to the result.

The self-test fails, if the limits were not reached from the lower end (equates to a jam). Exceeding the min/max values does not fail the self-test.



The self-test can only be performed, if bit 04 = 0 in register 769 "Status". Meaning there is currently no blockage or manual operation.

Register 256 "Reset"

The actuator supports the following reset/reinitializing behavior:

- Local reset by pushbutton
- Reset by bus using "Remote-Reset" command

Effect of reset:

- Process values except actual value and setpoint are reset to factory settings.
- Network parameters (register 513...516 and 764...768) are reset only in case of a local reset. If reset is done by bus, network parameters are retained, as otherwise communication would be lost.
- Counters, device info and factory data are not reset.

Register 259 "Operating mode"

Read value only; set to "Position control" for valve actuators.

Register 260/261 "Minimum and maximum position"

Electronic positioning limitation

Register 262 "Actuator runtime"

Read value only; positioning time from one stop to another.

Register 263 "Positioning signal characteristic between Y and U"

Depending on the valve type, a logarithmic characteristic can be compensated using this function, in order to achieve a linear input/output signal (see Modbus registers [→ 7]).

Register 264 "Tolerance blockage monitoring"

If the setpoint does not reach the tolerance limit set within this parameter, bit 04 is set in register 769 and can be used for alarming in the building automation system.

Register 513...515 "Backup mode"

In case the communication to the controller is lost, the device can be configured to go into a defined state.

- Waiting time to recognize communication loss → Register 515
- Reaction:
 - Go to a predefined backup position → Register 514
 - Deactivated (factory setting): The actuator controls to the last received setpoint, until a new valid setpoint is received.

Register 516 "Startup setpoint"

In this parameter, a setpoint can be defined, which the actuator moves to at initial commissioning or after a power reset, before receiving a new valid setpoint from the controller.

Register 794...766 "Modbus configuration"

Configuring the RS-485 address and transmission parameters.

Register 767 "Bus termination"

Electronically switchable 120 Ω resistance for bus termination.

Register 768 "Bus config. command"

If the parameters in registers 764...766 "Modbus configuration" are changed via bus, they are only saved if the function "Load" is called within 30 s in this register. Otherwise, all changes are discarded.

Register 769 "Status"

In register 76, the bits are set as described in the table below, in order to reflect the respective status information.

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 s

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	
2	black	BK	G0	
6	violet	VT	REF	
8	gray	GY	+	
9	pink	PK	-	

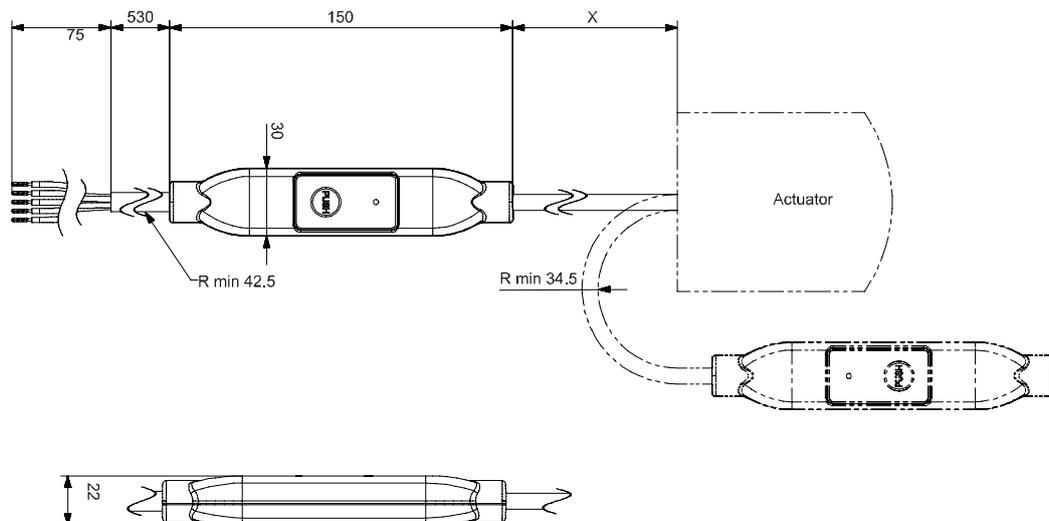
Note

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		
Cable length		0.9 m
Voltage supply / Communication	Wire number and diameter	5 x 0.75 mm ²

Dimensions

External Modbus converter



Masse in mm

X [mm]	kg [kg]
250	0,15

Revision numbers

Type	Valid from rev. no.
SKB62/MO S55195-A127	..H
SKC62/MO S55195-A128	..H
SKD62/MO S55195-A129	..I