SIEMENS

ACVATIX™

Electro-hydraulic actuators for valves

Modbus communication profiles

SKB62/MO *SKC62/MO* *SKD62/MO*

Actuators 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

Use

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	• 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 / 76.8 / 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

When the temperature limiter is triggered, the drive can no longer be addressed via the bus.

See also "Modbus registers [▶ 9]" and "Function description [▶ 11]".

Type summary

Type	Stock no.	Operating voltage	Positioning signal	Spring return		Positioning time	
				Function	Time	Opening	Closing
SKB62/MO	S55195-A127	AC 24 V	Modbus RTU	yes	10 s	120 s	10 s
SKC62/MO	S55195-A128				20 s		20 s
SKD62/MO	S55195-A129				15 s	30 s	15 s

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
Valve Actuator DIL Switch Characteristic Overview	Commissioning / Configuration: Illustration/description of the characteristic curves of valve/actuator combinations depending on the DIL switch settings	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.

Commissioning

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

The bus configuration can alternatively be parameterized via the local HMI, see "User interface [▶ 4]".

Check the following during commissioning:

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

[1] Documents can be downloaded at http://siemens.com/bt/download.

[2] The address 255 means "unassigned» and must be adjusted for the adapter to be operable.

Full or partial configuration via bus

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

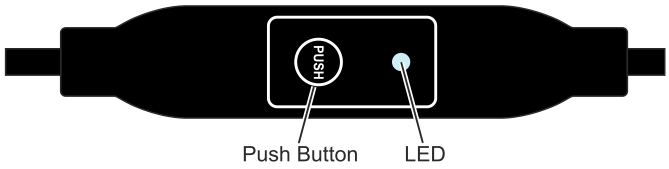
- *Full configuration via bus:* Given a unique Modbus address, the client/programming tool can establish a connection after start-up using the presets for transmission format and baud rate (or auto-baud).
- *Partial configuration via bus:* Given a non-unique Modbus address, the address must first be set to a unique value, either by inputting it with the pushbutton (cf. "Enter address using pushbutton [▶ 7]") or by setting the address to 246 by pressing the pushbutton 5...10 seconds (cf. "Pushbutton operation [▶ 4]"). Subsequently, the client/programming tool can establish a connection after start-up using the preset 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 changing them 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

User interface



Pushbutton operation

Action		Pushbutton operation	Feedback
Return current Modbus address (starting from lowest digit)		Briefly press button 1 x (<1 s)	• 1-digit (single digit): red • 10-digit (double digit): green • 100-digit (triple digit): orange 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	Press button 3 x	LED stops blinking/flashing.

Action		Pushbutton operation	Feedback
		Wait >1 s	
		Within 10 s: Briefly press button 1 x (<1 s)	LED blinks blue 1 x (termination mode on). Button not pressed within 10 s: ● Address (and bus termination, if applicable) is indicated. ● Device enters normal mode.
		Within 10 s: Press and hold button until LED turns red	LED is lit red (confirmation). Button not pressed within 10 s: ● Address (and bus termination, if applicable) is indicated. ● Device enters normal mode.
		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	Press button 3 x Wait >1 s	LED stops blinking/flashing.
		Within 10 s: Press and hold button until LED turns red	LED is lit red (confirmation). Button not pressed within 10 s: ● Address (and bus termination, if applicable) is indicated. ● Device enters normal mode.
		Release button	LED turns off. Address is indicated. [*LED DOES NOT blink blue after 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 [▶ 7]"
Enable pushbutton addressing (when using Climatix™ controllers)		Press and hold button 5...10 s	LED is lit red and turns off after 5 s.
		Release button	LED is lit orange.
Reset to factory settings		Press and hold button >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 [1] / Green	1 s orange / 1 s green	Override control mode
Orange [1]	1 s on / 1 s off	Bus parameters not yet configured
	1 s on / 5 s off	Backup mode (replacement mode)
Red	Steady	• Mechanical error • Device jammed • Manual intervention • 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

[1] 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 and hold button >10 s.
   ⇨ LED flashes **orange**.
2. Release button *while* LED is flashing.
   ⇨ LED continues flashing for 3 s.
   ⇨ If the button is pressed again *during* these 3 s, **the reset is canceled**.
3. Press button *after* these 3 s.

⇨ 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 an extra tool using pushbutton addressing.

◈ Briefly press button (<1 s).

⇨ Current Modbus address is indicated.

Colors / blinking pattern			
	1-digit: **red**	10-digit: **green**	100-digit: **orange**
Example for address **124**:			
LED			
Note	The address is both entered and indicated starting at the lowest digit (1-digit), see figure above. (Example: 124 starts with 4 x red)		

Enter new address (starting from lowest address position)

1. **Enter addressing mode:**
   - Press button >1 s, until LED is lit **red**.
   - Release button (before LED turns off).
2. **Enter digits:** Press button n times.

   ⇨ LED flashes 1 x per press of the button as feedback.
   Colors: 1-digit: **red** / 10-digit: **green** / 100-digit: **orange**
3. **Save digits:**
   - Press and hold button, until LED is lit the color of the following digit.
   - Release button.
4. **Save address:**
   - Press and hold button, until LED is lit **red** (confirmation).
   - Release button.

⇨ Address is saved and repeated 1 x as confirmation.

Digits are skipped by holding the button until the LED is lit the color of the next digit to be entered.

An address can be saved at any point, i.e. already after setting the 1-digit, or after setting the 1- and 10-digits.

If after entering the address, the button is released before the LED is lit red, the entered address is discarded.

Examples

Set address "124"

1. Enter addressing mode: press button 1...5 s.
2. Enter 1-digit: press button 4 x.
   ⇨ LED flashes **red** 4 x *(1 x per press of the button)*.
3. Save 1-digit: press and hold button.
   ⇨ LED is lit **green**.
4. Release button.
5. Enter 10-digit: press button 2 x.
   ⇨ LED flashes **green** 2 x *(1 x per press of the button)*.
6. Save 10-digit: press and hold button.
   ⇨ LED is lit **orange**.
7. Release button.
8. Enter 100-digit: press button 1 x.
   ⇨ LED flashes **orange** 1 x *(1 x per press of the button)*.
9. Save address: press and hold button.
   ⇨ LED is lit **red**.
10. Release button.

⇨ Address is saved and repeated 1 x as confirmation.

Set address "50"

1. Enter addressing mode: press button 1...5 s.
2. Skip 1-digit: press and hold button.
   ⇨ LED is lit **green**.
3. Release button.
4. Enter 10-digit: press button 5 x.
   ⇨ LED flashes **green** 5 x.
5. Save 10-digit: press and hold button.
   ⇨ LED is lit **orange**.
6. Release button.
7. Save address (skip 100-digit): press and hold button.
   ⇨ LED is lit **red**.
8. Release button.

⇨ Address is saved and repeated 1 x as confirmation.

Set address "7"

1. Enter addressing mode: press button 1...5 s.
2. Enter 1-digit: press button 7 x.
   ⇨ LED flashes **red** 7 x.
3. Save address (skip 10- and 100-digits): press and hold button.
   ⇨ LED is lit **red**.
4. Release button.

⇨ Address is saved and repeated 1 x as confirmation.

Modbus registers

Reg.	Addr.	Name	R/W	Range / Listing	Factory setting
Process values					
1	0	Setpoint	RW	0...100 % = 0...10000	-
2	1	Override control	RW	0 = Off / 1 = Extend / 2 = Retract / 3 = Stop	
3	2	Actual value	R	0...100 % = 0...10000	
256	255	Command	RW	0 = Ready / 1 = Calibration in process / 2 = Self-test / 3 = Reinitialize / 4 = Remote reset	

Reg.	Addr.	Name	R/W	Range / Listing	Factory setting
Parameters [1]					
262	261	Actuator runtime	R	30	30 s
263	262	Positioning signal characteristic between Y and U	RW	0 = linear / 1 = logarithmic For detailed information: see "Valve Actuator DIL Switch Characteristic Overview" / A6V12050595 ("Product documentation [▶ 3]")	[Dependent on type]
264	263	Valve jam monitoring tolerance	RW	0...100 % = 0...10000	4 %
513	512	Backup mode (replacement mode)	RW	0 = Go to backup position / 1 = Not available / 2 = Deactivated	Deactivated
514	513	Backup position	RW	0...100 % = 0...10000	0 %
515	514	Backup timeout	RW	0...900	900 s
516	515	Start-up setpoint	RW	0...100 % = 0...10000	0 %
764	763	Modbus address	RW	1...245 / 255 = "unassigned" [1] 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	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-	1-8-E-1
767	766	Bus termination	RW	0 = Off / 1 = On 120 Ω, electronically switchable	Off
768	767	Bus conf. command	RW	0 = Ready / 1 = Load / 2 = Discard	Ready
769	768	Status	R	See "Register 769 "State" [▶ 13]"	-

[1] Parameters may not be written cyclically!

[2] 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").

Statistics/Counters				
Reg.	**Name**	**R/W**	**Meaning**	**Example**
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	• 1025 = 00 12 (hex) • 1026 = A2 E1 (hex) • 12A2E1 (hex) → 1221345 (dec) → 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	• 1027 = 00 08 (hex) • 1028 = 12 51 (hex) • 81251 (hex) → 528977 (dec) → 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 (hex)	• 1029 = 00 00 (hex) • 1030 = A0 01 (hex) • A001 (hex) → 40961 (dec) → Repositioned = 40.961 times
1030	Repositioning counter (LWord)	R		
1031	Power-up counter	R	How often (hex) has the device been started up	• 1031 = 00 A2 (hex) → 162 (dec) → Powered up = 162 times
1032	Jam counter	R	How often (hex) has the device breached the valve jam tolerance (reg. 264)	• 1032 = 00 02 (hex) → 2 (dec) → Jams counted = 2

Device information				
Reg.	**Name**	**R/W**	**Meaning**	**Example**
1281	Factory index	R	Two bytes, each encoding an ASCII character	• 1281 = 00 5A (hex) → 0Z → Device is series = "Z"
1282	Factory date (HWord)	R	Two bytes, the lower encoding the year (hex)	• 1282 = 00 18 (hex) • 1283 = 02 0F (hex)
1283	Factory date (LWord)	R	Two bytes, HByte encoding the month (hex), LByte encoding the day (hex)	→ Device manufactured = February 15, 2024
1284	Serial number (HWord)	R	Hword + LWord = Serial no. (hex)	• 1284 = 00 0A (hex) • 1285 = A2 06 (hex) • → AA206 (hex) = 696838 (dec) → Device 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	• 1289 = 03 01 (hex) • 1290 = 03 07 (hex) → 775 (dec) → 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	• 1291 = 42 00 (hex) → Hardware version = "B"
1409...16	ASN [characters 16...15]	R	Two bytes per register, each encoding an ASCII character. First character encoded in reg. 1409	• 1409 = 53 4B (hex) → SK • 1410 = 42 36 (hex) → B6 • 1411 = 32 2F (hex) → 2/ • 1412 = 4D 4F (hex) → MO → ASN = "SKB62/MO"

	HWord		LWord	
	--	YY	MM	DD
Hex	00	18	02	0F
Dec	00	24	02	15

Supported function codes

Supported 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)

Function description

Register 1/3 "Setpoint/Actual value"

- Controller setpoint for the position to move to, 0...100 % stroke/rotation angle, scaling 0.01, i.e. 0 % = 0 and 100 % = 10000.
- Actual value reported by the device (same scaling).

Register 2 "Override control"

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

- Manual override: When the manual crank is used, a mechanical jam will be detected if a mismatch between setpoint and actual position persists for more 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 "Restart" / "Self-test" / "Reset"

"Restart"

A restart is possible by:

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

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

"Self-test"

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

The self-test fails, if the limits were not reached from the lower end (equivalent 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 jam or manual operation.

If a jam occurs during the self-test, the self-test is failed, even if the actuator clears it within 3 tries.

"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.
- Bus parameters (registers 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 between client/server.
- Counters, device info and factory data are not reset.

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 [▶ 9]").

Register 264 "Valve jam monitoring tolerance"

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

Register 513...515 "Backup mode"

In case 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 behavior:
  - 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 "Start-up 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 764...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 conf. command"

If the parameters in registers 764...766 "Modbus configuration" are changed over 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"

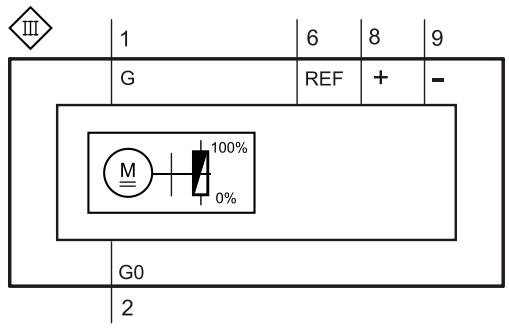
In register 769, the bits are set as described in the table below, in order to reflect the respective status information.

Service flags			
Bit 00	1 = Reserved	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, spring return active, 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

Connection diagram

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

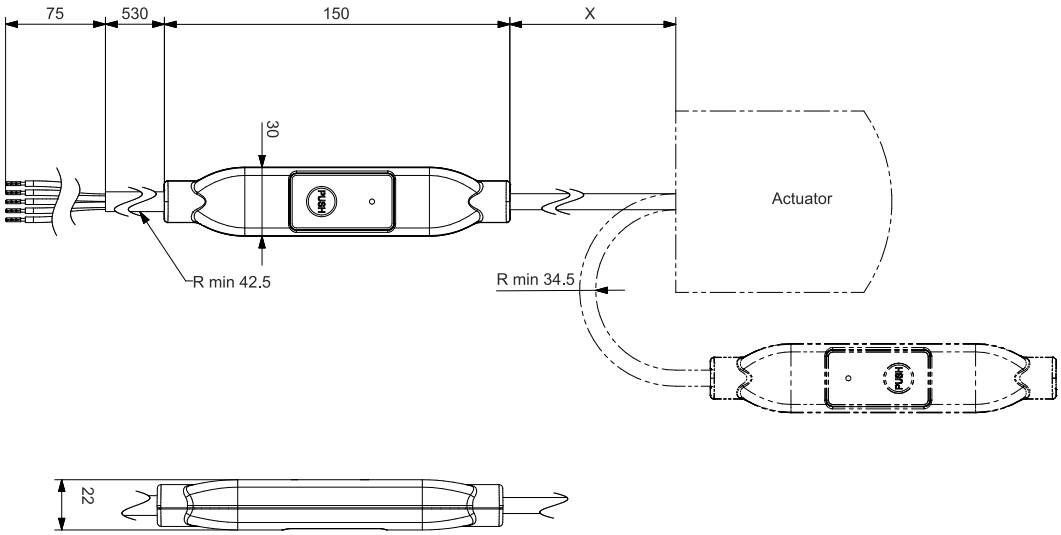
Connection diagram	Wire code	Wire color		Terminal code	Meaning
	Cable 1: Supply				
	1	red	RD	G	Voltage phase AC 24 V
	2	black	BK	G0	Voltage neutral line AC 24 V
	Cable 2: Communication				
	6	purple	VT	REF	Reference line (Modbus RTU)
	8	gray	GY	+	Bus + (Modbus RTU)
	9	pink	PK	-	Bus - (Modbus RTU)

NOTICE	
!	The operating voltage on terminals G and G0 must comply with the requirements for SELV or PELV. Safety transformers featuring double insulation must be used as per EN 61558; they must be designed for 100 % duty-cycles.

Connecting cables - supply / communication	
Cable length	0.9 m
Wire number and diameter	5 x 0.75 mm^2

Dimensions

External Modbus converter



Dimensions in mm

	X	kg
	[mm]	[kg]
	250	0.15

Revision numbers

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

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