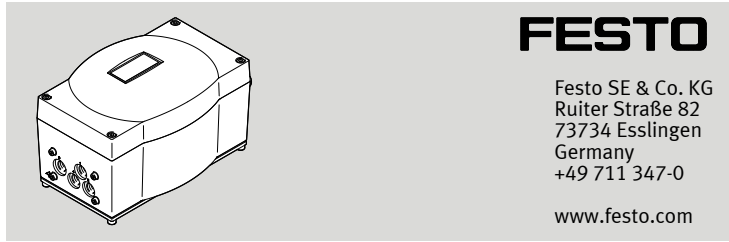


CMSX-...-C-U-F1 Positioner



Brief instruction

8140967
2020-08d
[8140969]



Translation of the original instructions

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1 About this document

This document describes the use of the above-mentioned product. Certain aspects of use and a detailed description of the mode of operation of the product are described in other documents and must be observed

→ 1.1 Applicable documents.

1.1 Applicable documents

All available documents for the product → www.festo.com/sp.

Document	Contents
Operating instructions positioner CMSX	Function, assembly, installation, commissioning, fault clearance, technical data

Tab. 1

2 Safety

2.1 General safety instructions

- Only use the product in original status without unauthorised modifications.
- Only use the product if it is in perfect technical condition.
- Observe labelling on the product.
- Only use the product in an industrial environment.
- The included cable fitting conforms to degree of protection IP65 if lines with the specified cross-section are used → 15 Technical data.
- Seal unused openings with blanking plugs.

Return to Festo

Hazardous substances can endanger the health and safety of personnel and cause damage to the environment. To prevent hazards, the product should only be returned upon explicit request by Festo.

- Consult your regional Festo contact.
- Complete the declaration of contamination and attach it to the outside of the packaging.
- Comply with all legal requirements for the handling of hazardous substances and the transport of dangerous goods.

2.2 Intended use

The positioner is intended for regulating the position of the following actuators in process automation systems:

- single-acting or double-acting quarter turn actuators with standardised mechanical interface → 15 Technical data
- pneumatic actuators with connected external path/angle sensor

2.3 Training of qualified personnel

Work on the product should only be conducted by qualified personnel. The specialized personnel must be familiar with the installation and operation of electrical and pneumatic control systems.

3 Further information

- Accessories → www.festo.com/catalogue.
- Spare parts → www.festo.com/spareparts.

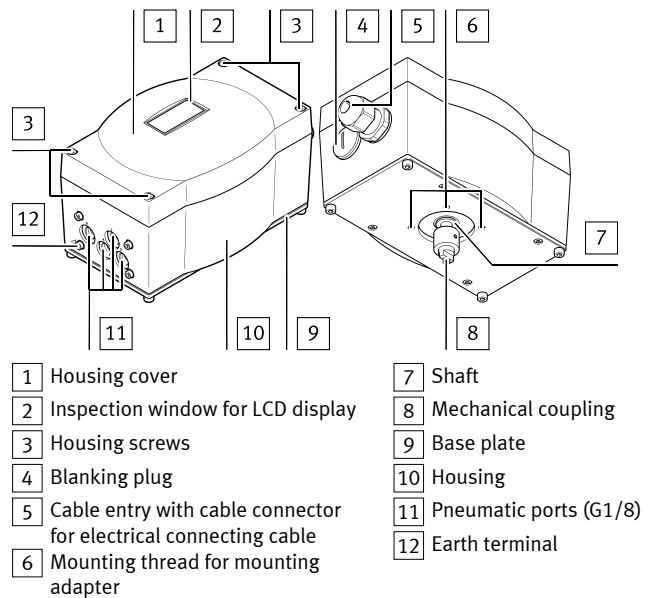
4 Service

Contact your regional Festo contact person if you have technical questions → www.festo.com.

5 Product overview

5.1 Design

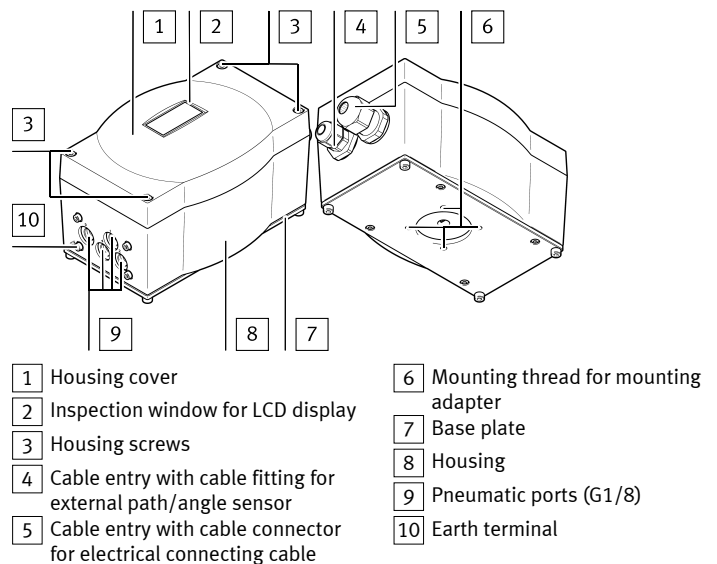
CMSX-P-S-...



- | | |
|--|---------------------------|
| 1 Housing cover | 7 Shaft |
| 2 Inspection window for LCD display | 8 Mechanical coupling |
| 3 Housing screws | 9 Base plate |
| 4 Blanking plug | 10 Housing |
| 5 Cable entry with cable connector for electrical connecting cable | 11 Pneumatic ports (G1/8) |
| 6 Mounting thread for mounting adapter | 12 Earth terminal |

Fig. 1 Product design CMSX-P-S-...

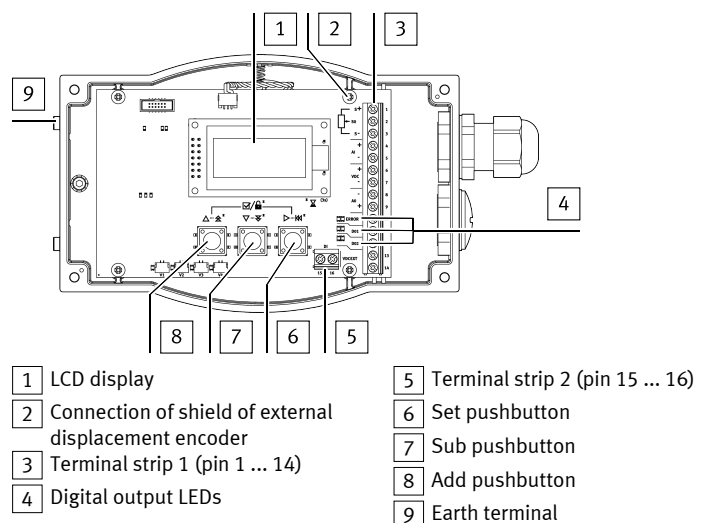
CMSX-P-SE-...



- | | |
|--|--|
| 1 Housing cover | 6 Mounting thread for mounting adapter |
| 2 Inspection window for LCD display | 7 Base plate |
| 3 Housing screws | 8 Housing |
| 4 Cable entry with cable fitting for external path/angle sensor | 9 Pneumatic ports (G1/8) |
| 5 Cable entry with cable connector for electrical connecting cable | 10 Earth terminal |

Fig. 2 Product design CMSX-P-SE-...

Operating elements and connections in the device – example: CMSX-P-SE-...





- | | |
|---|------------------------------------|
| 1 LCD display | 5 Terminal strip 2 (pin 15 ... 16) |
| 2 Connection of shield of external displacement encoder | 6 Set pushbutton |
| 3 Terminal strip 1 (pin 1 ... 14) | 7 Sub pushbutton |
| 4 Digital output LEDs | 8 Add pushbutton |
| | 9 Earth terminal |

Fig. 3 Operating elements and connections

LED display

The meaning of the LED display is identical for the 3 digital outputs.

LED	Meaning
 LED left	Digital output switched
 LED right	ON: PNP OFF: NPN

Tab. 2 Meaning of the LEDs

5.2 Function

The CMSX digital electropneumatic positioner enables simple and efficient position control based on the PID control algorithm. Positions are specified via an analogue setpoint signal. The current position of the actuator is detected as follows:

- CMSX-P-S-... : through an integrated potentiometer
- CMSX-P-SE-... : through an external path/angle sensor

The PID controller compares the measurement value with the specified analogue setpoint value and controls the solenoid valves.

6 Transport and storage

Store the product in a cool, dry, UV-protected and corrosion-protected environment. Ensure that storage times are kept to a minimum.

7 Assembly

General information

- Select the mounting position so the underside of the device is protected from spray and moisture.
- Note the direction of motion of the drive.
- Use only mounting adapters DARQ-K-P-A1-F05 or DADG-AK-F6-A2
→ www.festo.com/sp.

7.1 Mounting CMSX-P-S-... on the drive

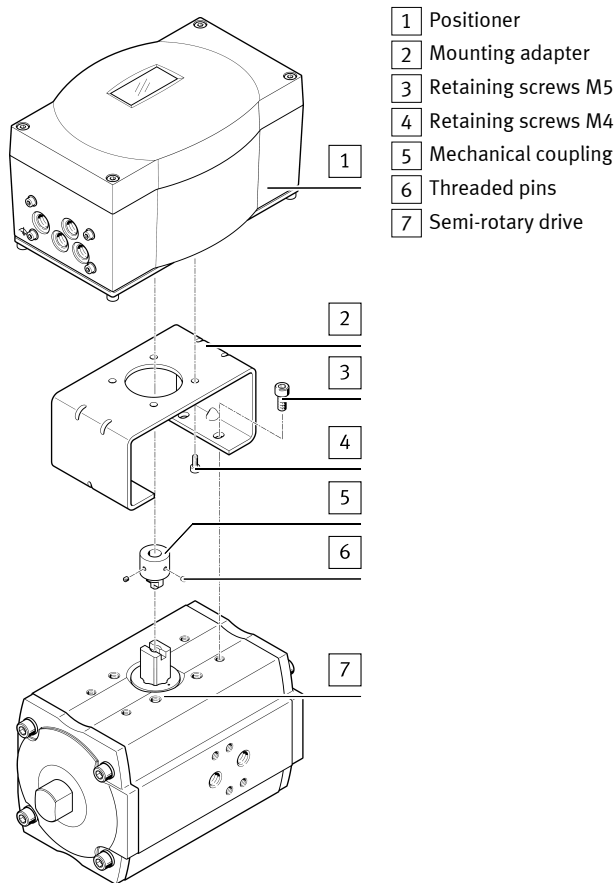
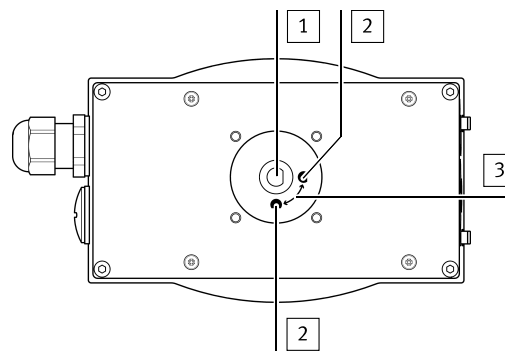


Fig. 4 Mounting CMSX-P-S-... on the drive

1. Determine the direction of rotation of the semi-rotary drive.
2. Close process valve.
3. Switch off compressed air and power supply.
4. Fasten the mounting adapter to the positioner:
 - 4 housing screws M4
 - Tightening torque 1.5 Nm ± 20%
5. Fasten the mechanical coupling to the shaft of the positioner:
 - 2 threaded pins
 - Tightening torque 0.5 Nm ± 10%
6. Place the positioner with the mounting adapter and coupling on the semi-rotary drive and align. The angle of rotation of the drive must be within the sensing range of the positioner → 7.1.1 Sensing range of the positioner.

7. Fasten the positioner with mounting adapter to the semi-rotary drive:
 - 4 retaining screws M5
 - Tightening torque 3 Nm ± 20%

7.1.1 Sensing range of the positioner



- 1 Flat spot of the shaft
- 2 Identification of the alignment of the flat spot
- 3 Identification for sensing range

Fig. 5 Sensing range of the positioner

The angle position of the semi-rotary drive is detected by the shaft of the positioner. The shaft of the positioner can be freely rotated and does not have a mechanical stop. The permissible sensing range is 100° → 15 Technical data.

7.2 Mounting CMSX-P-SE-... on the drive DFPI-...-E-NB3-...

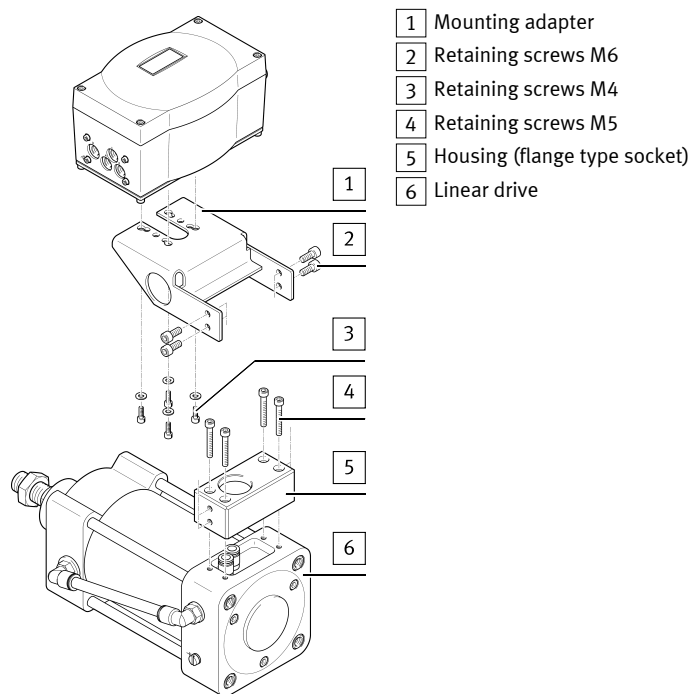
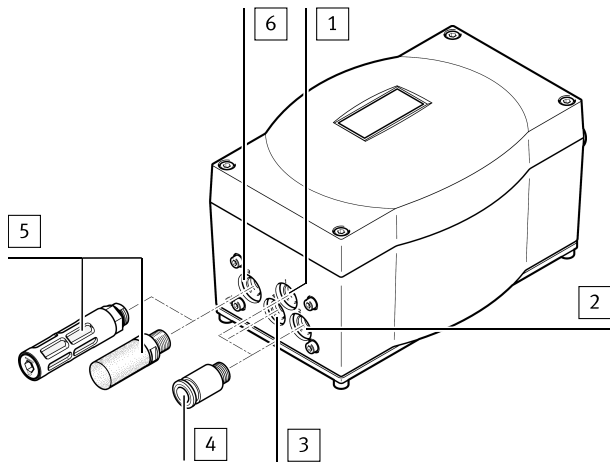


Fig. 6 Mounting CMSX-P-SE-... on the drive DFPI-...-E-NB3-...

1. Close process valve.
2. Switch off compressed air and power supply.
3. Fasten the mounting adapter to the positioner:
 - 4 housing screws M4
 - Tightening torque 1.5 Nm ± 20%
4. Secure the housing (flange socket) to the linear drive:
 - 4 retaining screws M5
 - Tightening torque 2.7 Nm ± 10%
5. Secure the positioner with mounting adapter to the housing (flange type socket):
 - 4 retaining screws M6
 - Tightening torque 3 Nm ± 20%

8 Installation

8.1 Pneumatic installation



- | | |
|--------------------|--|
| 1 Supply port (1) | 4 QS-1/8-...-I push-in fitting (accessory) |
| 2 Working port (2) | 5 Silencer (accessory) |
| 3 Working port (4) | 6 Exhaust port (3) |

Fig. 7 Pneumatic installation

Recommendation: use push-in fittings of type QS-1/8-...-I and tubing of type PUN. Keep tubing short.

- Switch off compressed air and power supply.
- Connect working port (2) and working port (4) to the working ports of the pneumatic drive.
For single-acting drives: only connect working port (4), seal working port (2) with a blanking plug.
- Connect the supply port (1) to the compressed air source.
- Screw a suitable silencer into the exhaust port (3).

8.2 Electrical installation

Establish electrical connection

⚠ WARNING!

Risk of injury due to electric shock.

- For the electric power supply, use only PELV or SELV circuits that guarantee a reliable electric disconnection from the mains network.
- Observe IEC 60204-1/EN 60204-1.
- Connect all circuits for operating and load voltage supplies.

⚠ WARNING!

Fire risk from overheating.

Injury resulting from fire.

- The device must have a limited power supply in accordance with the following standard.
 - IEC/EN/UL/CSA 61010-1 Safety of measuring, control and laboratory equipment

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The power supply for the device must be limited in accordance with EN 61010-1. The power can be restricted by using previously limited circuits or by installing fuses. The total fuse value of 3.2 A must not be exceeded downstream from limited or fuse-protected circuits.

- 24 V DC operating voltage/system voltage (pin 6)
- Current/voltage input signal (pin 4)
- Load voltage supply for the outputs (pin 13)
- Digital input (pin15)

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The IP65 degree of protection depends on the type of electrical connection. Unsuitable cables or incorrect installation reduce the degree of protection of the product.

- Switch off compressed air and power supply.
- Unscrew housing screws (→ Fig.1, [3] or → Fig.2, [3]) and remove the housing cover.
- With CMSX-S-...: run the electrical connecting cable to the terminal strip through the cable fitting.
 - max. length of connecting cable: 30 m
 - Outside diameter of electrical connecting cable: 7 ... 13 mm
 - Cable cross-section: max. 1.5 mm²
 - Use wire end sleeves.
- With CMSX-SE-...: run connecting cable for external path/angle sensor to the terminal strip through the cable fitting (→ Fig.2, [4]).
 - Outside diameter of electrical connecting cable: 3 ... 6.5 mm
 - Cable cross-section: max. 1.5 mm²
 - Use wire end sleeves.

- Wire the electrical connections → Tab..
 - Tightening torque: max. 0.6 Nm
- Connect the earth terminal (→ Fig.3, [9]) to the earth potential with low impedance (short cable with large cross-section).
 - Tightening torque: 0.7 Nm
- Tighten the union nut on the cable connector.
 - Tightening torque: 1.5 Nm
- Place the housing cover in position and tighten the 4 housing screws.
 - Note the correct position of the seal.
 - Tightening torque: 1.5 Nm
- Optional: place shield of an external displacement encoder on the printed circuit board → Fig.3, [2].
 - Tightening torque: 0.7 Nm

Pin allocation

Pin	Identifier	Description	
Terminal strip 1 (pin 1 ... 14)			
1	+5 V DC	Operating voltage of sensor +	Connection of external potentiometric path/angle sensor with a total resistance of at least 5 kΩ
2	U+	Sensor signal actual value (0 ... 5 V DC)	
3	0 V DC	Operating voltage of sensor – galvanically connected to 0 V DC	
4	Isp+ / Usp+	Current/voltage input signal +	Setpoint input 4 ... 20 mA, 0 ... 20 mA Setpoint input 0 ... 10 V
5	Isp-/Usp–	Current/voltage input signal – galvanically connected to 0 V DC	
6	+24 V DC	Operating voltage	System supply
7	0 V DC		
8	I–	Current output signal – galvanically connected to 0 V DC	Actual value (position feedback) 4 ... 20 mA
9	I+	Current output signal +	
10	ALARM	Alarm digital output	Alarm output – Initialisation not successful – Setpoint value outside specification – Actuator cannot reach required target position
11	D-OUT1	Digital output Out 1	
12	D-OUT2	Digital output Out 2	
13	+24 V DC	Load voltage outputs	Supply to digital outputs
14	0 V DC		
Terminal strip 2 (pin 15, 16)			
15	D-IN+	Digital input +	Digital input
16	D-IN–	Digital input –	

Tab. 3 Pin allocation of terminal strips

Connection, digital inputs

The digital input can be connected as PNP or NPN input.

Connection as PNP input:

- The PNP input is positive reading.
- Switch is located between 24 V DC and digital input.

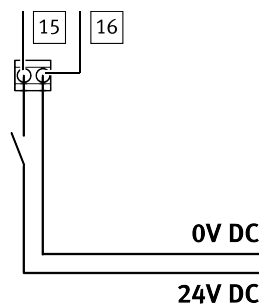


Fig. 8 PNP connection

Connection as NPN input:

- The NPN input is negative reading.
- Switch is located between digital input and 0 V DC.

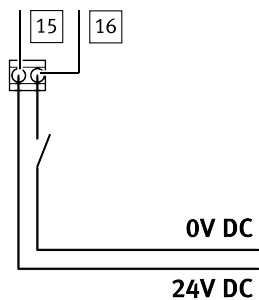


Fig. 9 NPN connection

Connection, digital outputs

The digital outputs (ALARM, D-OUT1, D-OUT-2) can be connected as PNP or NPN outputs.

Connection of ALARM, D-OUT1, D-OUT-2 as PNP outputs:

- The PNP outputs are positive switching.
- Connect negative load pole to pin 14.

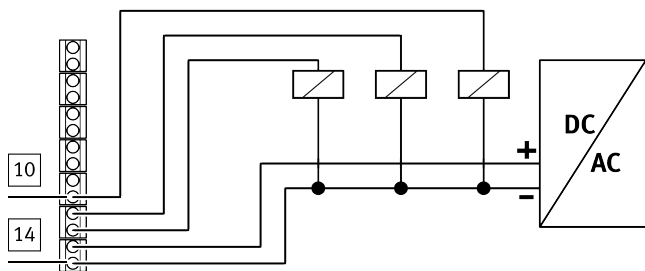


Fig. 10 PNP output

Connection of ALARM, D-OUT1, D-OUT-2 as NPN outputs:

- The NPN outputs are negative switching.
- Connect positive load pole to pin 13.

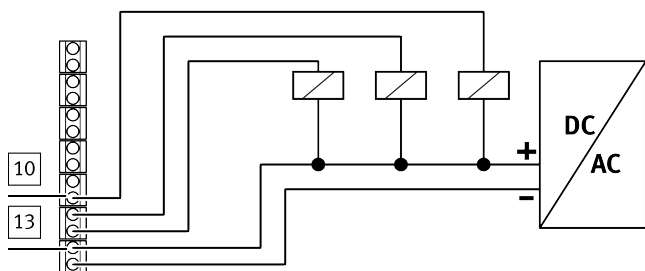


Fig. 11 NPN output

9 Commissioning



Detailed instructions for commissioning → Operating instructions for positioner CMSX → 1.1 Applicable documents

9.1 Commissioning positioner

Requirements:

- The positioner is fully mounted and connected.
- Familiarise yourself with the menu system, the functions of the keys and the parameters prior to commissioning.
- Ensure there is a stable compressed air supply, particularly during the commissioning phase.

1. Check operating conditions and critical limits → 15 Technical data.
2. Check that the connection points are tight.
3. Switch on the operating voltage supply.
4. Switch on the setpoint specification.
5. Switch on the compressed air.

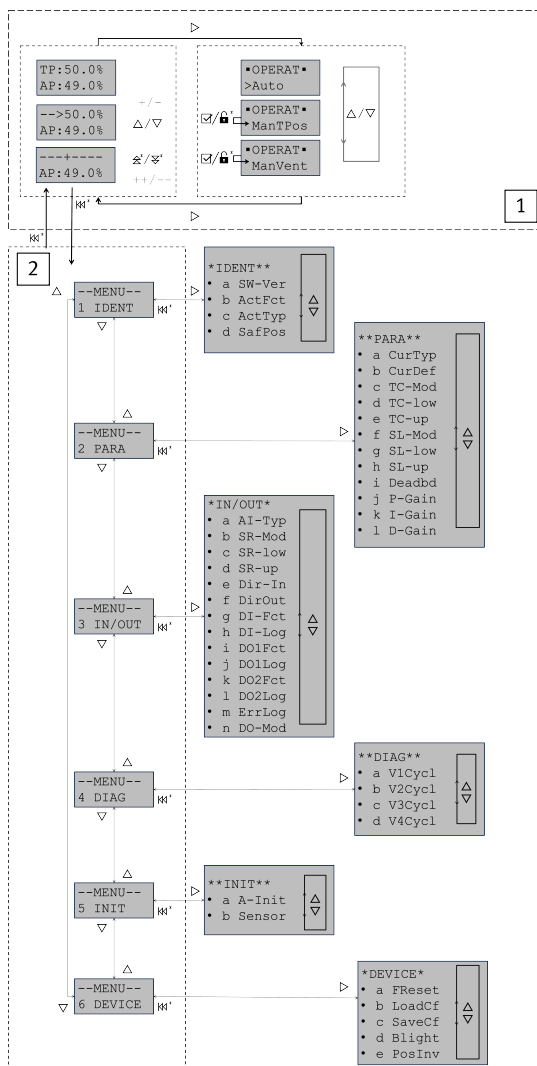
⚡ During initial commissioning:

- Positioner starts in automatic mode with the factory settings.
- Positioner is not initialised (display "NO INIT").
- The positioner does not respond to external setpoint specifications.

During subsequent commissioning:

- Positioner starts in the last effective mode of operation.
- If the closed-loop controller (automatic mode or manual setpoint position specification) is activated, the current setpoint value is valid immediately.

9.2 Menu structure



1 Base menu

2 Main menu

Fig. 12 Menu structure

9.3 Function of pushbuttons

Use the "Add", "Sub" and "Set" pushbuttons to run the following 2 functions:

- Navigation through the menu structure
- Selection and input of parameter values

Explanation of symbols

	Press Add
	Press Sub
	Press Set
	Press and hold Add for 3 seconds
	Press and hold Sub for 3 seconds
	Press and hold Set for 3 seconds
	Press and hold Add and Set for 3 seconds

Tab. 4 Explanation of symbols

9.4 Check sensing range of the path/angle sensor

1. Open "Sensor" submenu level → Fig.12.
2. Approach both end positions of the drive with the "Add" and "Sub" pushbuttons.
3. If the entire work space is traversed without an error message, continue commissioning with the initialisation → 9.5 Perform initialisation. If one of the end positions lies outside the sensing range, an error message is displayed. Mount the positioner so the sensing range of the sensor completely covers the work space of the actuator.

9.5 Perform initialisation

The permissible stroke range and the controller parameters are determined during initialisation. Both end positions are approached in succession independently from the pending setpoint value. The positioner can only be initialised automatically.

Automatic initialisation ("A-Init") must be performed in the following cases:

- during commissioning
- after changes in the system structure
- after reset to factory settings (Factory Reset)

9.6 Configuration

Menu	Value	Description
Base menu		
"•OPERAT•"	"Auto"	Automatic mode
Main menu		
"1 IDENT"		
"ActTyp"		Drive type
	"linear"	linear
	"rotary"	rotary
"2 PARA"		
"CurTyp"		Type of setpoint characteristic curve
	"linear"	linear (factory setting)
	"1:25"	equal percentage
	"1:33"	
	"1:50"	
	"25:1"	inverse equal percentage
	"33:1"	
	"50:1"	
	"userdef"	User-defined
"CurDef"		Support point
	"0% 0.0... 100"	Support point at 0% Factory setting: 0.0
	"100% 0.0 ... 100"	Support point at 100% Factory setting: 100
"TC-Mod"		
	"inactiv"	deactivated (factory setting)
	"bothact"	active for lower and upper end positions
	"up_act"	active for upper end position
	"low_act"	active for lower end position
"TC-low"		Value for the lower tight-closing limit
	"0.0 ... 45.0%"	Factory setting: 2.0%
"TC-up"		Value for the upper tight-closing limit
	"55.0 ... 100.0%"	Factory setting: 98.0%
"SL-Mod"		
	"inactiv"	deactivated (factory setting)
	"bothact"	active for bottom and top stroke limitation
	"up_act"	active for upper stroke limitation
	"low_act"	active for lower stroke limitation
"SL-low"		Lower stroke limitation value
	"0.0 ... 90.0"	Factory setting: 0.0%
"SL-up"		Upper stroke limitation value
	"10.0 ... 100.0"	Factory setting: 100.0%
"Deadbd"		Deadband
	"0.5 ... 10.0%"	Factory setting: 1.0%
"P-Gain"		P-proportion
	"0 ... 25000"	
"I-Gain"		I-proportion
	"0 ... 25000"	
"D-Gain"		D-proportion
	"0 ... 25000"	
"3 IN/OUT"		
"AI-Typ"		analogue input
	"0 ... 10 V"	Voltage input 0 ... 10 V
	"0 ... 20 mA"	Current input 0 ... 20 mA
	"4 ... 20 mA"	Current input 4 ... 20 mA (factory setting)
"SR-Mod"		
	"inactiv"	deactivated (factory setting)
	"bothact"	active for lower and upper boundaries
	"up_act"	active for upper boundary
	"low_act"	active for lower boundary
"SR-low"		Value for lower boundary of the split-range
	"0 ... 99%"	Factory setting: 0%
"SR-up"		Value for upper boundary of the split-range
	"1 ... 100%"	Factory setting: 100%

Menu	Value	Description
"Dir-In"		
	"rising"	The setpoint position is incremented with increasing setpoint value (factory setting).
	"falling"	The setpoint position is incremented with falling setpoint value.
"DirOut"		
	"rising"	The position feedback is incremented with increasing actual position (factory setting).
	"falling"	The position feedback is incremented with falling actual position.
"DI-Fct"		
	"inactiv"	deactivated (factory setting)
	"stop"	Pneumatic outputs 2 and 4 are closed.
	"exhaust"	Exhaust pneumatic outlet 2/pressurise pneumatic outlet 4
	"pressur"	Pressurise pneumatic outlet 2/exhaust pneumatic outlet 4
	"a-init"	Performing initialisation
"DI-Log"		
	"lowact"	Switching logic active low
	"highact"	Switching logic active high (factory setting)
"DO1Fct"		
	"inactiv"	Deactivated (factory setting)
	"lowlmt"	Feedback of reaching the lower position limit value (2%).
	"uplmt"	Feedback of reaching the lower position limit value (98%).
	"bothlmt"	Feedback of reaching the upper or lower position limit value.
"DO1Log"		
	"lowact"	Switching logic active low
	"highact"	Switching logic active high (factory setting)
"DO2Fct"		
	"inactiv"	deactivated (factory setting)
	"lowlmt"	Feedback of reaching the lower position limit value (2%).
	"uplmt"	Feedback of reaching the lower position limit value (98%).
	"bothlmt"	Feedback of reaching the upper or lower position limit value.
"DO2Log"		
	"lowact"	Switching logic active low
	"highact"	Switching logic active high (factory setting)
"ErrLog"		
	"lowact"	Switching logic active low
	"highact"	Switching logic active high (factory setting)
"DO-Mod"		
	"PNP"	PNP polarity of switching outputs (factory setting)
	"NPN"	NPN polarity of switching outputs
"6 DEVICE"		
"FReset"		Reset parameter to factory setting
"BLight"		
	"onpress"	switched on with actuation of control buttons (factory setting)
	"onerror"	switched on with system error
	"always"	always switched on
"PosInv"		
	"inactive"	Inversion of the position indicator on the display is inactive
	"active"	Inversion of the position indicator on the display active

Tab. 5 Relevant parameters

10 Operation

10.1 Restoring factory settings

1. Open "Device" menu.
2. Select "FReset" function.
3. Press "Set" pushbutton.
↳ The display shows "PROCEED...YES...NO".
4. Press "Add" to confirm the reset to factory settings.
↳ After the successful reset the display shows "FRESET success".

11 Maintenance

When used as intended, the product is maintenance-free.

12 Malfunctions



Detailed instructions for fault clearance → Positioner CMSX operating instructions → 1.1 Applicable documents

13 Disassembly

⚠ CAUTION!

Pressurised lines

Even if the compressed air feed is shut off the pneumatic ports of the positioner may still be under pressure.

- Exhaust the pneumatic ports (working ports) before disconnecting the hose assemblies.

Dismantling CMSX-...

- Switch off compressed air.
- Activate in the manual operation base menu: "ManVent".
- Move drive until the working ports are completely exhausted.
- Switch off power supply.
- Unscrew housing screws (→ Fig.1, [3] or → Fig.2, [3]) and remove the housing cover.
- Loosen electrical and pneumatic connections.
- Unscrew 4 retaining screws (→ Fig.4, [3] or → Fig.6, [4]) and remove the positioner with the mounting adapter.

14 Disposal

♻ ENVIRONMENT!

Send the packaging and product for environmentally sound recycling in accordance with the current regulations → www.festo.com/sp.

15 Technical data

Type	CMSX-...-C-U-F1	
General information		
Design	digital, electro-pneumatic positioner	
Mode of operation		
CMSX-P-...-C-U-F1-S-...	single-acting	
CMSX-P-...-C-U-F1-D-...	double-acting	
Design characteristics		
CMSX-P-...-C-U-F1-S-...-A	Safety position – pneumatic outlet 4 exhausted	
CMSX-P-S-C-U-F1-D-...-A	Safety position – pneumatic outlet 4 exhausted, pneumatic outlet 2 pressurised	
CMSX-P-...-C-U-F1-...-C	Safety position - pneumatic outlets closed	
Mounting position	any	
Type of mounting	With accessories	
Mode of operation of displacement encoder	Potentiometer	
Sensing range	[°]	0 ... 100
Display	LCD, backlight 7-segment display	
Setting options	via display and keys	
Deadband size	[%]	0.5 ... 10
Pneumatics		
Operating pressure	[bar]	3 ... 8
Operating medium	Compressed air in accordance with ISO 8573-1:2010 [7:4:4]	
Note on the operating medium	lubricated operation not possible	
Standard nominal flow rate		
CMSX-...-50	[l/min]	50
CMSX-...-130	[l/min]	130
Pneumatic port	G1/8	
Electrics		
Nominal operating voltage	[V]	24
Operating voltage range DC	[V]	21.6 ... 26.4
max. current consumption	[mA]	600
Reverse polarity protection	for operating voltage connection	
Connection resistance	[kΩ]	< 80
Analogue input		
Signal range	[mA]	4 ... 20 0 ... 20
	[V]	0 ... 10
Linearity error at 25 °C	[%]	< 0.5
Temperature coefficient	[%FS/K]	< 0.02
Resolution	[bit]	16
Overload protection	Yes	
Galvanic isolation	no	

Type	CMSX-...-C-U-F1	
Analogue output		
Signal range	[mA]	4 ... 20
max. load resistance	[Ω]	≤ 600
Linearity error at 25 °C	[%]	< 0.5
Temperature coefficient	[%FS/K]	< 0.02
Resolution	[bit]	12
Reverse polarity protection	Yes	
Short circuit current rating	Yes	
Overload protection	Yes	
Electrical isolation	no	
Digital input		
Input characteristics	as per IEC 61131-2, type 3	
Switching input	PNP (positive switching) NPN (negative switching)	
Reverse polarity protection	Yes	
Electrical isolation	yes, optocoupler	
Digital output		
Supply voltage	[V]	24
Switching output	3 x PNP or 3 x NPN switchable	
max. output current	[mA]	100
Reverse polarity protection	Yes	
Short circuit current rating	Yes	
Overload protection	Yes	
Electrical isolation	yes, optocoupler	
Electrical connection		
Electrical connection 1		
Function	Power Supply Power supply load Analogue input Analogue output 3x digital output 2x digital input	
Connection type	Terminal strip	
Connection technology	Screw terminal	
Number of pins/wires	14	
Tightening torque	[Nm]	< 0.6
Conductor cross section	[mm²]	< 1.5
Electrical connection 2 (for CMSX-P-SE-CU-F1-...)		
Function	Connection of external path/angle sensor	
Connection type	Terminal strip	
Connection technology	Screw terminal	
Number of pins/wires	3	
Cable connector		
approved cable diameter	[mm]	7 ... 13 for electrical connection 1 3 ... 6.5 for electrical connection 2
max. cable length	[m]	30 for electrical connection 1 3 for electrical connection 2
Ambient conditions		
Ambient temperature	[°C]	-5 ... +60
Storage temperature	[°C]	-20 ... +60
Relative humidity	[%]	5 ... 95, non-condensing
Degree of protection	IP65	
Shock resistance	in accordance with EN 60068 part 2-29	
Vibration resistance	in accordance with EN 60068 part 2-6	
Contamination level	3	
Approval	RCM compliance mark	
Materials		
Housing	PC reinforced	
Inspection window material	PC	
Base plate	Aluminium	
Shaft	high-alloy stainless steel	
Coupling	high-alloy stainless steel	
Screws	high-alloy stainless steel	
Seals	NBR	
Cable connector	PA	
Blanking plug	PA	
PWIS criterion	PWIS-free	
Information on materials	RoHS-compatible	

Tab. 6 Technical data