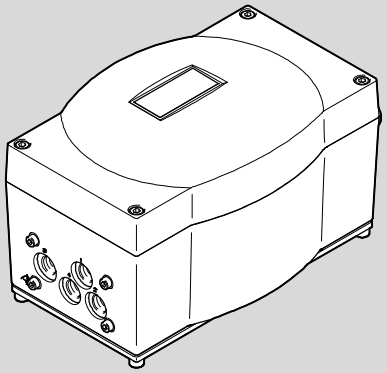
Positioner
CMSX-...-C-U-F1-...



Festo AG & Co. KG
Postfach
73726 Esslingen
Germany
+49 711 347-0
www.festo.com

(en) Operating instructions

8044838
1509NH
[8044840]

Original: de

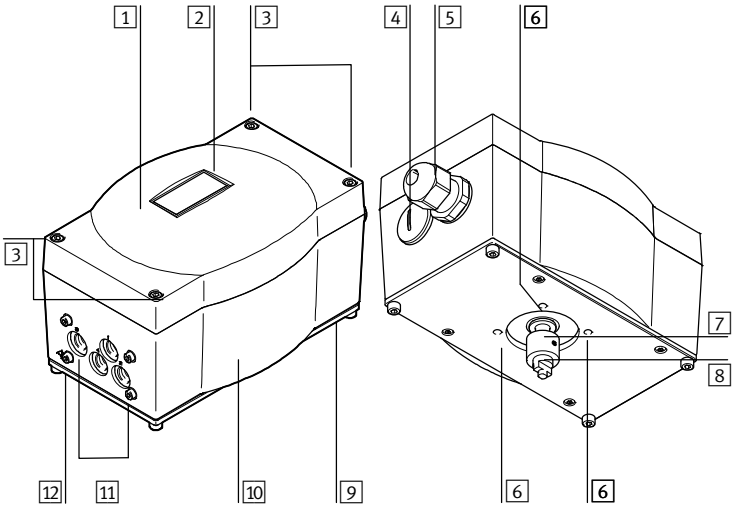
Positioner CMSX ..... English

Note

For detailed specifications on the product, a complete description and the declaration of conformity ➔ www.festo.com.

1 Layout

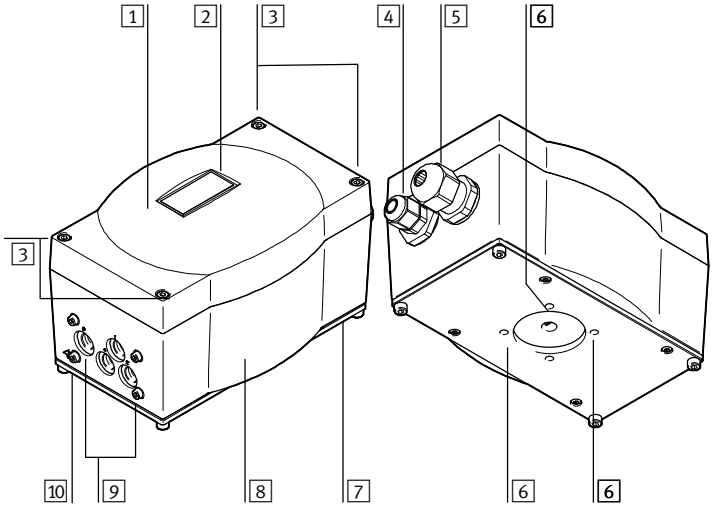
1.1 CMSX-S-... (rotary)



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

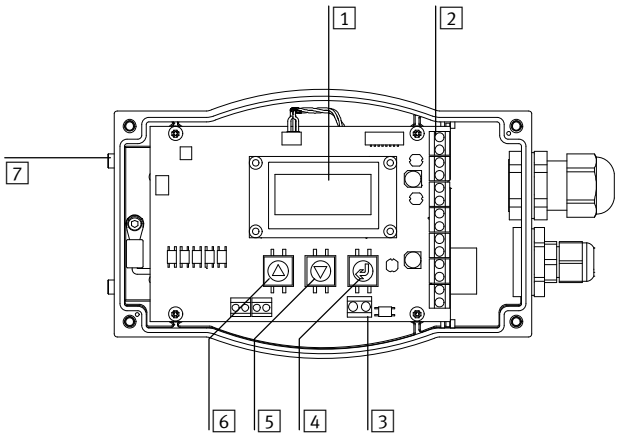
Fig. 1

1.2 CMSX-SE-... (linear)



1 Housing cover
2 Inspection window for LCD display
3 Housing screws
4 Cable entry with cable connector
5 Cable entry with cable connector
6 Mounting thread
7 Base plate
8 Housing
9 Pneumatic ports (G1/8)
10 Earth terminal

Fig. 2



1 LCD display
2 Terminal strip (pin 1 ... 14)
3 Terminal strip (pin 15, 16)
4 Set key
5 Sub key
6 Add key
7 Earth terminal

Fig. 3 Example of a linear version

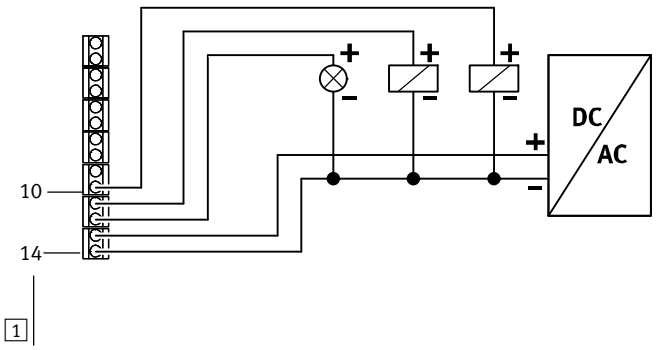
Pin	Designation	Description	
1	Vsp+	Voltage input signal +	Input setpoint value 0...10 V
2	Vsp-	Voltage input signal -	
3	Isp+	Current input signal +	Input setpoint value 0 ... 20 mA, 4 ... 20 mA
4	Isp-	Current input signal -	
5	+24 V DC	Operating voltage supply; 24 V DC	Supply to electronics and valves
6	0 V DC	Operating voltage supply; 0 V DC	
7	i-	Current output signal -	Output actual value 4 ... 20 mA
8	I+	Current output signal +	
9	–	Connected at plant to earth terminal	–
10	ALARM	Alarm digital output	Alarm output
11	D-OUT1	Digital output Out 1	Status output
12	D-OUT2	Digital output Out 2	
13	+ 24 V DC	Load voltage supply for outputs; 24 V DC	Supply to digital outputs
14	0 V DC	Load voltage supply for outputs; 0 V DC	Supply to digital outputs
15	D-IN+	Digital input +	Control input[1)]
16	D-IN-	Digital input -	Control input[1)]

1) Permits split circuits if separate power supply units are used

Fig. 4

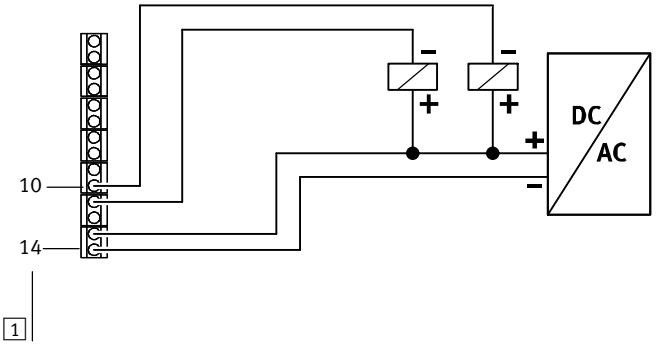
Setpoint value of inputs ➔ Pin 1 ... 4 (setpoint value of the controlled variable)
The setpoint value can be specified as an external voltage of current signal. Both setpoint inputs can be connected. But in all cases, only one of the two setpoint inputs is active – dependent on the parameterization.

Digital outputs; ALARM, D-OUT1, D-OUT2 ➔ Pin 10, 11, 12 and pin 14
The ALARM output delivers high level if the maximum positioning time is exceeded at initialization.
The outputs D-OUT1 and D-OUT2 can be wired as PNP or NPN outputs. Their behaviour can be configured. To operate the outputs as PNP outputs, the load must be connected between the output and 0 V (pin 14).



1 Pin numbering of the terminal strips
Fig. 5

To operate the outputs D-OUT1 und D-Out2 as NPN outputs, the load must be connected between the output and 24 V (pin 13).



1 Pin numbering of the terminal strips
Fig. 6

Digital input ➔ Pin 15, 16
The behaviour on a signal at the digital input can be configured. In the case of a control signal, the PID controller is deactivated. Dependent on the configuration, working ports of the device can be pressurized, exhausted or blocked.

Accessories
➔ www.festo.com/catalogue

Product variants and type code

Feature	Value	Description
Type	CMSX	Positioner for process automation
Design	S	Positioner, path/angle measurement integrated
	se	Positioner, path/angle measurement external
Display type	C	LCD, backlit
Setpoint value	U	Configurable (0 ...10 V , 0 ... 20 mA, 4 ... 20 mA)
Position feedback	F1	4 ... 20 mA
Function	D	Double-acting
	S	Single-acting
Nominal flow rate	50	50 l/min
	130	130 l/min
Safety function	A	Open or close in case of breakdown[1]
	C	Maintain position[2] in case of breakdown[1]

1) Failure of the operating voltage supply
2) Block air for quarter turn actuator on both sides
Fig. 7

2 Safety

Intended use
The positioner is intended for position control of pneumatic quarter turn actuators and double-acting linear actuators in process automation systems.
Quarter turn actuators with a mechanical interface in accordance with VDI/VDE Directive 3845 are suitable for operation.
- Installation and commissioning is to be carried out only by qualified personnel, in accordance with the documentation.
- Only use the product in its original status, without any unauthorised modifications.
- Only use the product if it is in perfect technical condition.
- Observe the product labelling.
- Comply with all applicable national and international regulations.
- Only use compressed air in accordance with the specifications (➔ Technical data).
- The supplied cable connector is used only for cable throughfeed. To ensure the specified degree of protection IP65, seal each cable entry tight (cable connector, blanking plug).

Returning 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.

3 Function
The positioner detects the position of the drive via a potentiometer as an electric signal. The positioner calculates the positioning signals for the quarter turn actuator from this actual value and the externally specified setpoint value.

4 Transport and storage
- Comply with all legal requirements for the handling of hazardous substances and the transport of dangerous goods.
  For return to Festo ➔ Chapter 2.
- Store the product in a cool, dry, UV- and corrosion-protected environment. Ensure storage times are short.

5 Installation

➔ **Note**

Installation should only be conducted by qualified specialized personnel.

5.1 Mechanical

➔ **Note**

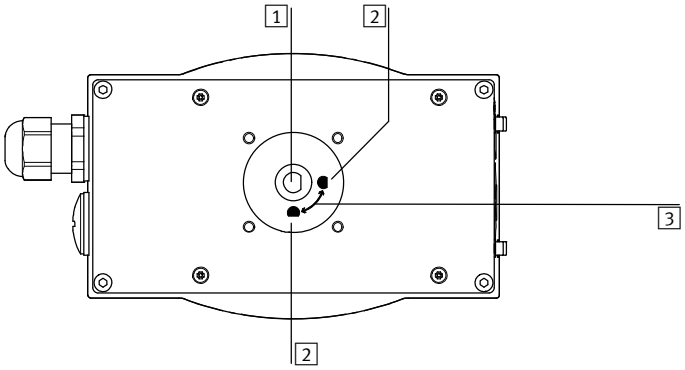
- Protect the underside of the device from splash water, rain and moisture by selecting an appropriate mounting position.

➔ **Note**

- Observe the direction of rotation of the quarter turn actuator.
- Only use appropriate mounting adapters.
  (Accessories ➔ www.festo.com/catalogue)

CMSX-S-... (rotary)

The orientation of the flat point [2] marks the end positions of the positioner. The sensing range is located between the end positions of the positioner.



[1] Flat spot of the shaft
[2] Marking for orientation of the flat spot
[3] Marking for sensing range

Fig. 8

CMSX-S-... (rotary)

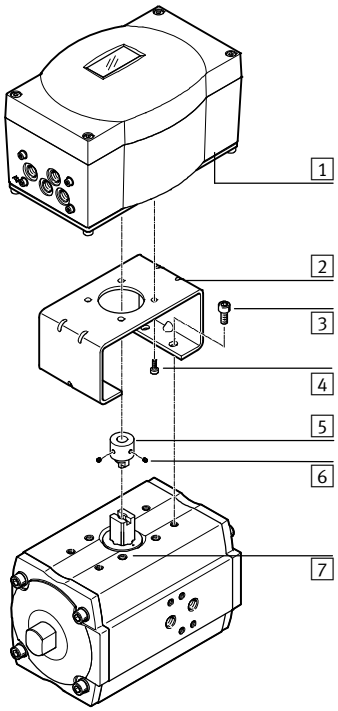


Fig. 9

1. Determine the direction of rotation of the quarter turn actuator.
2. Close process valve.
3. Switch off the compressed air and power supplies.
4. Secure the mounting adapter [2] to the positioner.
   – 4 housing screws [4]
   – Tightening torque 1.5 Nm ± 20 %.
5. Secure the mechanical coupling [5] to the shaft of the positioner [1].
   – 2 threaded pins [6]
   – Tightening torque 0.5 Nm ± 10 %.
6. Place the positioner with mounting adapter and coupling on the quarter turn actuator and align. The swivel angle of the actuator must be in the sensing range of the positioner (➔ Fig. 8).
7. Secure the positioner with mounting adapter to the quarter turn actuator.
   – 4 mounting screws [3]
   – Tightening torque 3 Nm ± 20 %.

CMSX-SE-... (linear)

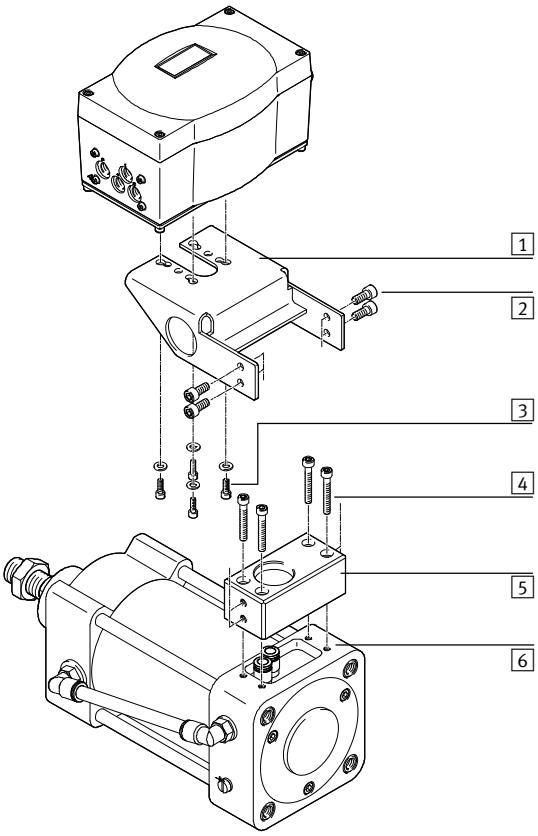


Fig. 10

1. Close process valve.
2. Switch off the compressed air and power supplies.
3. Secure the mounting adapter [1] to the positioner.
   – 4 housing screws [3]
   – Tightening torque 1.5 Nm ± 20 %.
4. Secure the housing (flange receptacle) [5] to the linear actuator [6].
   – 4 mounting screws [4]
   – Tightening torque (➔ Fig. 11)
5. Secure the mounting adapter [1] to the housing (flange receptacle) [5].
   – 4 mounting screws [4]
   – Tightening torque 1.5 Nm ± 20 %.
6. Secure the positioner with mounting adapter to the housing (flange receptacle)
   – 4 mounting screws [2]
   – Tightening torque 3 Nm ± 20 %.

Design		DFPI-100-...-E-P-G2 to DFPI-160-...-E-P-G2	DFPI-200-...-E-P-G2 to DFPI-320-...-E-P-G2
Tightening torque	[Nm]	2.7 ± 10 %	6 ± 10 %

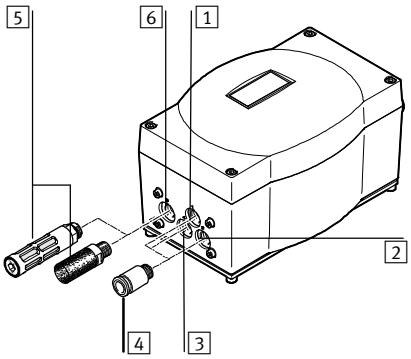
Fig. 11

5.2 Pneumatic

Note

- Use suitable fittings (G1/8) and tubes.

Recommendation: Push-in fittings of type QS-1/8-...-I and tubes of type PUN.



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

Fig. 12

1. Switch off the compressed air and power supplies.
2. Connect working port 2 [2] and working port 4 [3] to the working ports of the pneumatic actuator.
   When using single-acting drives only connect tubing to working port 2.
   – Keep the tubing short.
3. Connect the supply port [1] to the compressed air source.
4. Screw a suitable silencer into the exhaust port [6].

5.3 Electric

Warning

Electric voltage.
Injury due to electric shock.
- Switch off the power supply before opening the device.

Note

Electrostatically sensitive devices.
Damage to the internal electronics due to electrostatic discharge.
- Observe the handling specifications for electrostatically sensitive devices.
- Ensure assembly personnel are electrostatically discharged.

Note

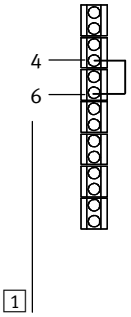
The IP65 degree of protection depends on the type of electrical connection.
Inappropriate cables or incorrect installation reduce the degree of protection of the positioner.

Note

Long signal lines reduce the resistance to interference.
- Keep signal lines shorter than 30 m.

Note

The signal value is unstable when different voltage sources are used for signal value and power supply.
- Provide a bridge to the earth terminals of the signal value and the power supply pin 4 and pin 6.



1 Pin numbering of the terminal strips

Fig. 13

1. Switch off the power supply and the compressed air supply.
2. Loosen the housing screws (➔ Fig. 1, [3]). Remove the cover of the housing.
3. Route the electric connecting cable through the cable connector to the terminal strips.
   – Outside diameter of the electric connecting cable: 10...14 mm.
   – Max. conductor cross-section: 2.5 mm²
   – Use wire end sleeves.

Note

Installation errors can damage the electronics and the valves or cause malfunctions.
- Leave the cable at pin 9 unchanged (➔ Fig. 4). This cable is internally connected to the earth terminal at the plant (➔ Fig. 3, [7]).

4. Wire connections (➔ Fig. 4).
   – Max. tightening torque: 0.6 Nm.
5. Connect the earth terminal (➔ Fig. 3, [7]) with low impedance (short cable with large cross section) to the earth potential.
6. Tighten the union nut on the cable connector.
   – Tightening torque: 2 Nm.
7. If commissioning is to be carried out immediately after installation, leave the cover dismounted.
8. Put on the housing cover and tighten the 4 housing screws (➔ Fig. 1, [3]).
   – Make sure the seal is positioned correctly.
   – Tightening torque: 1.5 Nm.

6 Commissioning

Note

Commissioning should only be conducted by qualified personnel.

Prerequisites
- The positioner is fully mounted and connected.

Check operating conditions
- Check operating conditions and limit values (➔ Technical data).
- Check connection points for tightness.

Warning

Uncontrolled movements of the drive can cause damage. If the operating voltage supply fails, the valves return to the normal position.
- Observe the switch-on sequence.

Switch-on sequence
1. Switch on the operating voltage supply.
2. Switch on the setpoint specification.
3. Switch on the compressed air.

Note

During initialization, movement takes place to both end positions in succession, independently of the present setpoint value.

Caution

If there is a failure of the operating voltage supply during commissioning, data records can be damaged in internal saving processes.
- Ensure there is a stable operating voltage supply, particularly during the commissioning phase.

Note

Parameter changes become effective immediately after the Set key is pressed.

6.1 Switch-on behaviour at initial commissioning

After the initial application of supply voltage, the positioner is normally in the following status:
- Operating mode: Automatic (Auto)
- Operating status: PID controller stopped (Stopped)

The positioner behaves as follows:
- The PID controller is inactive and does not react to setpoint value specifications.
- The positioner reacts to control signals at the digital input D-IN.
- The display shows the initial position.

  The setpoint position (SP) in the first line and the current valve position (VP) in the second line are displayed in percent. Example (operating status PID controller stopped; valve position 0 % – closed):

```
--- 0.0 %
VP: 0.0 %
```

Level	Menu	Presettings in the delivery status[1]		Brief description
Basic menu level	-	OPERAT	Auto	Automatic operation
		ACTUAT	Stopped	PID controller stopped
Main menu level	CONFIG	SIGNAL	4 ... 20 mA	Current input activated; 4 ... 20 mA
		OPEN[2]	anti-clk	Valve opens anti-clockwise
		DIRECT	increase	Open valve with rising setpoint value
		CHARACTE	linear	Character of the characteristics curve setpoint value: Linear
		D-OUT1 D-OUT2	power-L power-L	Low level if load voltage supply is present for outputs
		D-IN	stop-H	In case of High level, stop drive
	PARA	DEADBAND	1.0 %	Dead space of the controller: 1.0 %
		PID-P	1	Proportional share of the PID controller: 1
		PID-D	4	Differential share of the PID controller: 4
		MIN	0 %	Lower limit of the valve working area: 0 %
		MAX	100 %	Upper limit of the valve working area: 100 %
		SPMIN	0 %	Minimum setpoint signal: 0 %
		SPMAX	100 %	Maximum setpoint signal: 100 %
	CURVE	0 %	0 %	Support point for setpoint value 0 %: 0 %
		5 %	5 %	Support point for setpoint value 5 %: 5 %
		...	...	...
		100 %	100 %	Support point for setpoint value 100 %: 100 %

1) The command Fcty Rst (menu 6) resets all parameters to the delivery status (➔ Fig. 16).

2) Submenu only available for CMSX-S-... (rotary)

Fig. 14

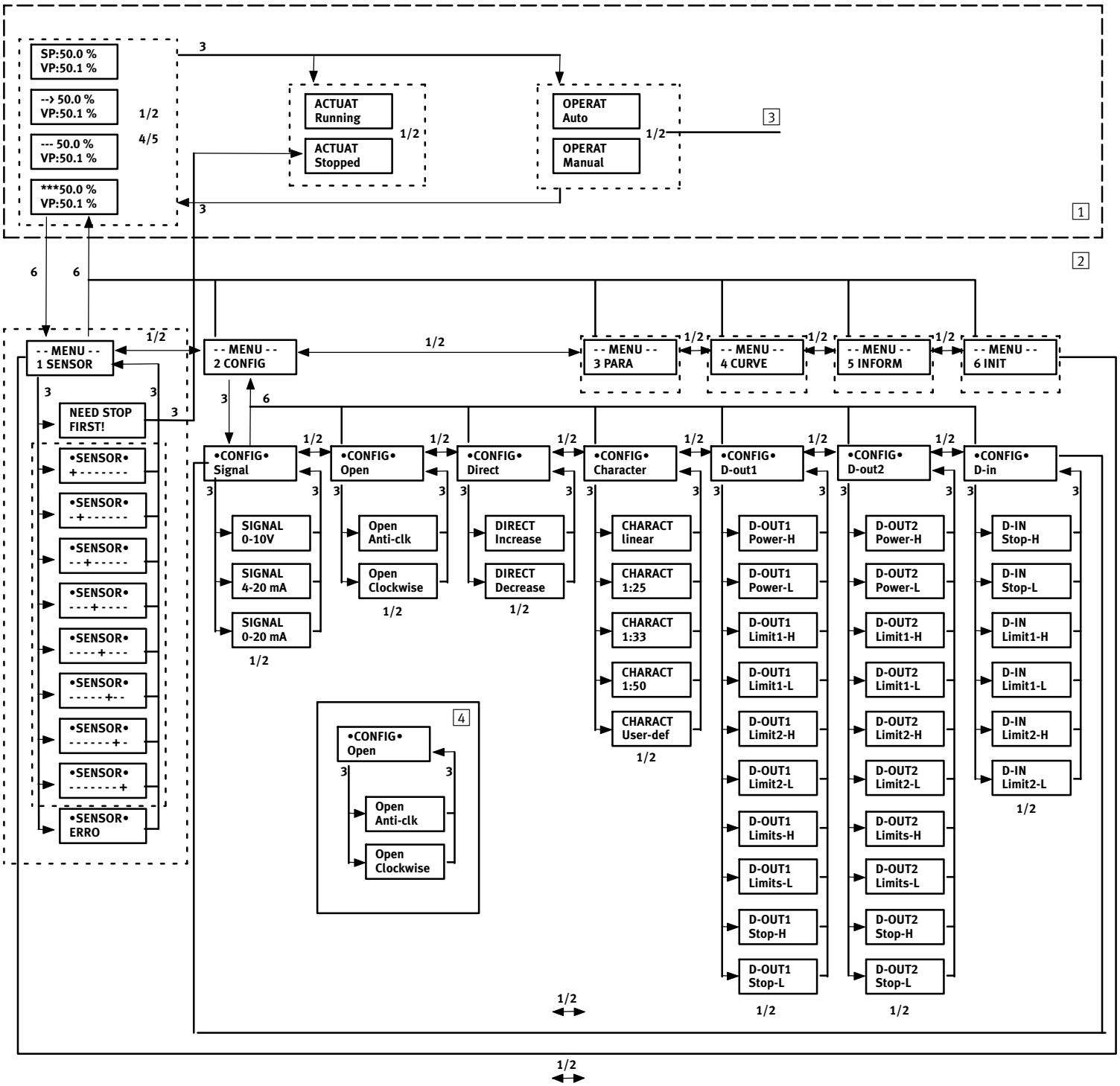
Note

Avoid accidental operational error.
- Familiarise yourself with the menu system, the key functions and parameters of the CMSX prior to commissioning. For further information ➔ Section 6.2.

Note

For detailed instructions on commissioning ➔ www.festo.com.

6.2 Menu structure

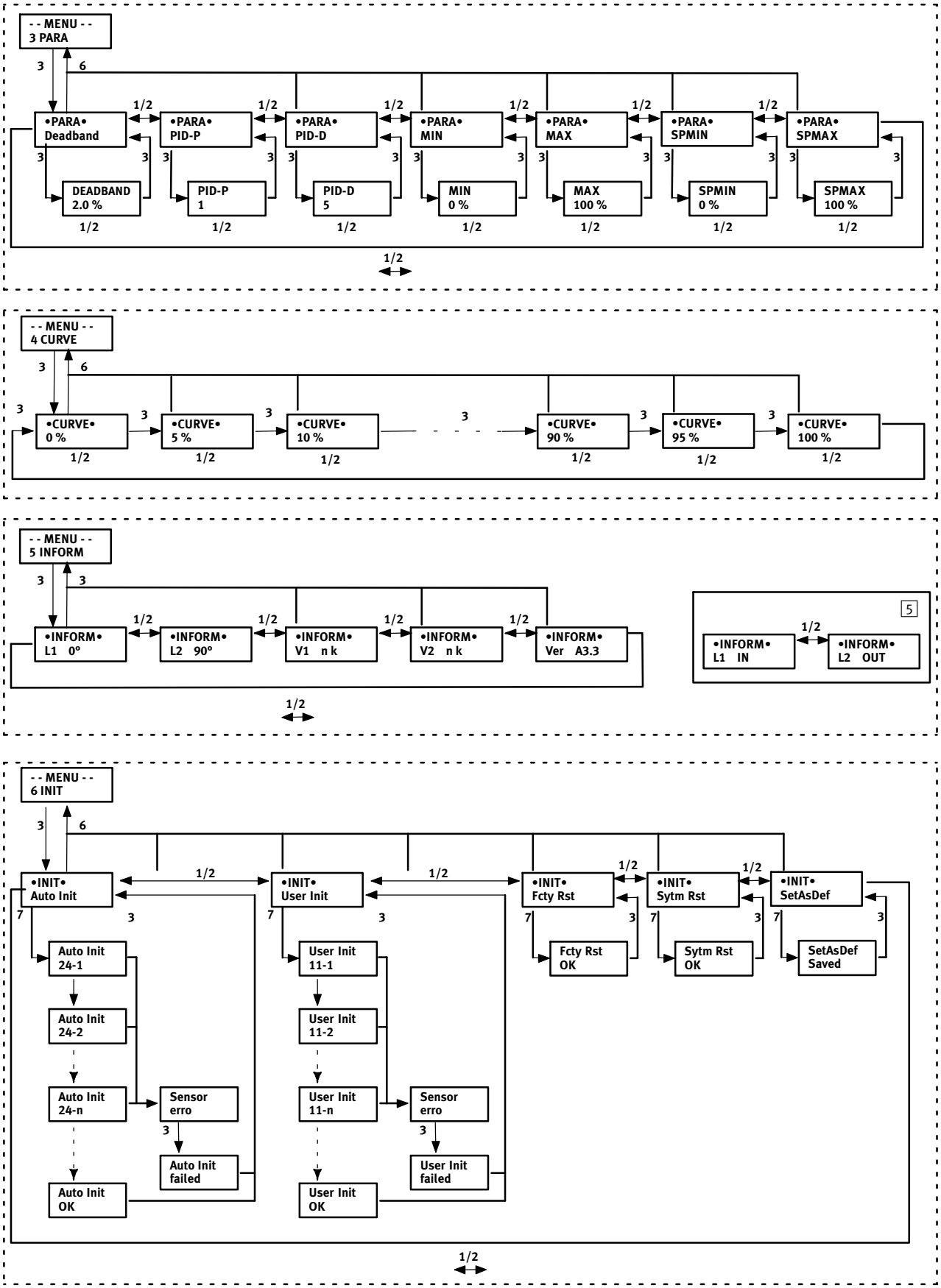


1 Basic menu level
2 Main menu level

3 1 = Press Add
2 = Press Sub
3 = Press Set
4 = Press and hold Add for 3 seconds
5 = Press and hold Sub for 3 seconds
6 = Press and hold Set for 3 seconds
7 = Press and hold Set and Add for 3 seconds

4 Submenu only available for CMSX-S-... (rotary)

Fig. 15



6 Basic menu level
2 Main menu level

3 1 = Press Add
2 = Press Sub
3 = Press Set
4 = Press and hold Add for 3 seconds
5 = Press and hold Sub for 3 seconds
6 = Press and hold Set for 3 seconds
7 = Press and hold Set and Add for 3 seconds

4 Submenu only available for CMSX-S-... (rotary)
5 CMSX-SE-... (linear)

Fig. 16

Menu configuration (2)

Advertisement	Description	
MENU 2 CONFIG		
Signal	Establishes the active setpoint value input and the type of setpoint value signal	
	0-10V	Voltage input (pin 1, 2); 0 ... 10 V
	4-20mA	Current input (pin 3, 4); 4 ... 20 mA (presetting)
	0-20mA	Current input (pin 3, 4); 0 ... 20 mA
Open	Specifies in which direction the process valve opens.	
	Clockwise	Clockwise
	Anti-clk	Anti-clockwise (presetting)
Direct	Establishes the signal direction for increasing the setpoint position (SP).	
	Increase	Increasing setpoint value signal (presetting)
	Decrease	Decreasing setpoint signal
Character	Character of the setpoint value characteristics curve	
	linear	Linear characteristic curve (presetting); linear ratio between analogue setpoint value and setpoint position
	1:25	Equal-percentage characteristic curve
	1:33	
	1:50	
	User-def	User-defined setpoint value characteristic curve
D-out1 D-out2	Establishes the behaviour of the two status outputs (D-OUT-1, D-OUT-2).	
	Power-H	High level if load voltage supply is present for outputs
	Power-L	Low level if load voltage supply is present for outputs (presetting)
	Limit1-H	High level, if end position 1 reached
	Limit1-L	Low level, if end position 1 reached
	Limit2-H	High level, if end position 2 reached
	Limit2-L	Low level, if end position 2 reached
	Limits-H	High level, if end position 1 or end position 2 reached
	Limits-L	Low level, if end position 1 or end position 2 reached
	stop-H	High level, if CMSX is in the operating status “Actuat stopped”
	stop-L	Low level, if CMSX is in the operating status “Actuat stopped”
D-IN	Establishes the reaction to a signal at the digital input D-IN. The PID controller is then inactive. Either both of the working ports of the device are pressurized in order to stop or one working port is pressurized and one is exhausted.	
	Stop-H	In the case of High level, stop drive (presetting)
	Stop-L	In the case of Low level, stop drive
	Limit1-H	In the case of High level, travel to stop 1
	Limit1-L	In the case of Low level, travel to stop 1
	Limit2-H	In the case of High level, travel to stop 2
	Limit2-L	In the case of Low level, travel to stop 2

Fig. 17

7 Operation

- Observe the operating conditions.
- Observe permitted limit values.

8 Disassembly

Note

Disassembly only by qualified specialized personnel.

1. Switch off the power supply and the compressed air supply.
2. Loosen the housing screws (➔ Fig. 1, 3). Remove the cover of the housing.
3. Disconnect electrical and pneumatic connection.
4. Loosen 4 mounting screws (Fig. 9, 3) from the actuator and and remove the positioner with mounting adapter.

9 Disposal

- Observe the local specifications for environmentally friendly disposal.
- Dispose of the product in an environmentally friendly manner.

10 Trouble-shooting

Note

For detailed instructions on fault clearance ➔ www.festo.com.

11 Technical data

CMSX-...-C-U-F1-...		
Sensing range in degrees	[°]	0 ... 100
Conforms to standard		VDI/VDE 3845 (Namur)
Protection against short circuit		yes
Measured variable		
– CMSX-S		Rotation angle
– CMSX-SE		Rotation angle or stroke
Protection against polarity reversal		– For setpoint value – For operating voltage connection
Display type		Backlit LCD
Setting options		Via display and keys
Type of process valve characteristic curves		– Linear – Equal percentage (1:25, 1:33, 1:50) – Freely adjustable over 21 support points
Leakproof characteristics		Adjustable via SPMIN and SPMAX
Control range adaptation		Adjustable
Alarm for exceeding limit value		no
Active direction		Adjustable, rising/falling
Operating pressure	[bar]	3 ... 8
Setpoint value	[mA]	0 ... 20; 4 ... 20
	[V]	0 ... 10
Safety instructions – behaviour in case of voltage failure		
– CSMX-...-A		Adjustable; opening, closing
– CMSX-...-C		Hold
Operating voltage range DC	[V DC]	21.6 ... 26.4
Max. load resistance of current output	[Ω]	500
Idle current	[mA]	100 ... 300
Max. current consumption	[A]	1
Max. output current	[mA]	500
Switching level	[V]	Signal 0: ≤ 5; Signal 1: ≥ 10
Max. current consumption of the digital inputs at 24 V	[mA]	6
Size of the dead zone	[%]	0.5 ... 10
Operating medium		Compressed air to ISO 8573-1:2010 [7:4:4]
Note on the operating medium		Lubricated operation not possible
CE marking, (Declaration of conformity ➔ www.festo.com)		To EU EMC Directive
Protection class - in mounted status		IP65
Ambient temperature	[°C]	-5 ... 60
Storage temperature	[°C]	-20 ... 60
UV resistance		yes
Vibration resistance to DIN/IEC 60068, part 2 - 6		0.15 mm path at 10 ... 58 Hz[1]; 2 g acceleration at 58 ... 150 Hz[2]
Shock resistance to DIN/IEC 60068, part 2 - 29		±15 g at 11 ms duration; 5 shocks per direction[1]
Cable connector		M20x1.5
Type of mounting		on flange to ISO 5211, with accessories
Max. product weight	[g]	970
Pneumatic port		G1/8
Nominal flow rate		
– CMSX-...-50	[l/min.]	50
– CMSX-...-130	[l/min.]	130
Materials		
– Housing		PCs
– Threaded coupling (coupling)		High-alloy stainless steel
– Seals		NBR
– Adapter plate		Aluminium
– Plate (back plate)		Aluminium
– Cable connection		PA

1) Only in combination with a mounting adapter according to accessories (➔ www.festo.com/catalogue)

Fig. 18 Technical data