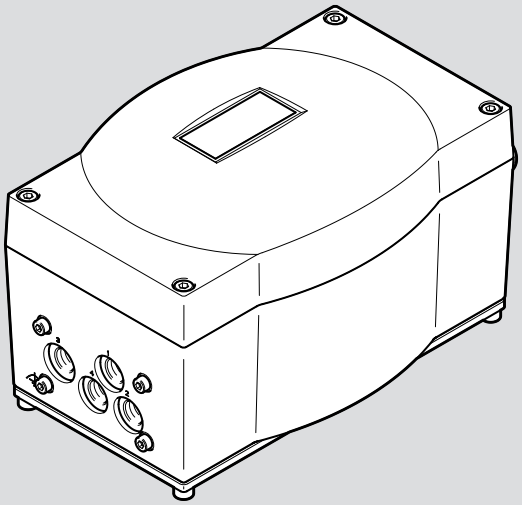
CMSX-...-C-U-F1

Positioner



FESTO

Operating instruction

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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	Content
Positioner CMSX Operating instruction	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.
- Do not open the product in a damp environment.
- Before carrying out assembly, installation and maintenance work: switch off the compressed air supply and secure it against being switched on again.
- After the compressed air supply is switched on, compressed air may be present directly at the pneumatic working ports.

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
- 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 Additional information

- Contact the regional Festo contact if you have technical problems ➔ www.festo.com.
- Accessories and spare parts ➔ www.festo.com/catalogue.

4 Product overview

4.1 Structure

4.1.1 Product design

CMSX-P-S-...

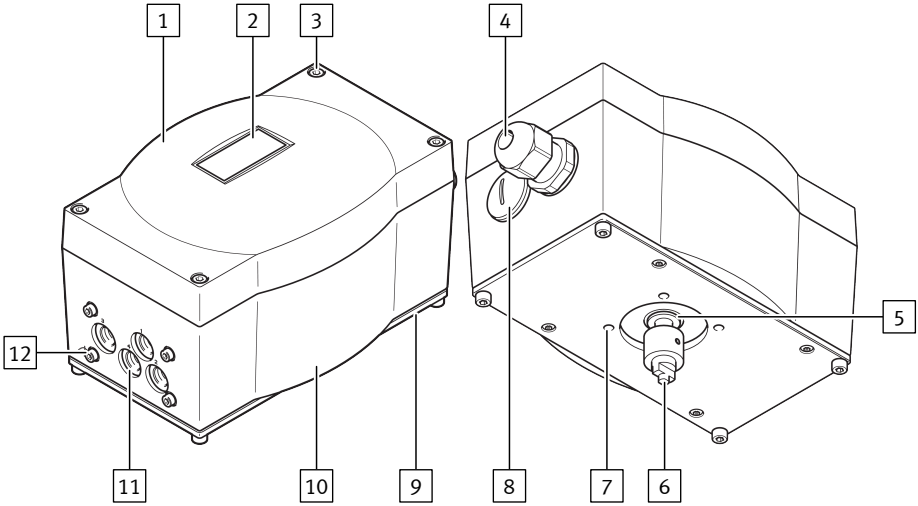


Fig. 1: Product design CMSX-P-S-...

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

CMSX-P-SE-...

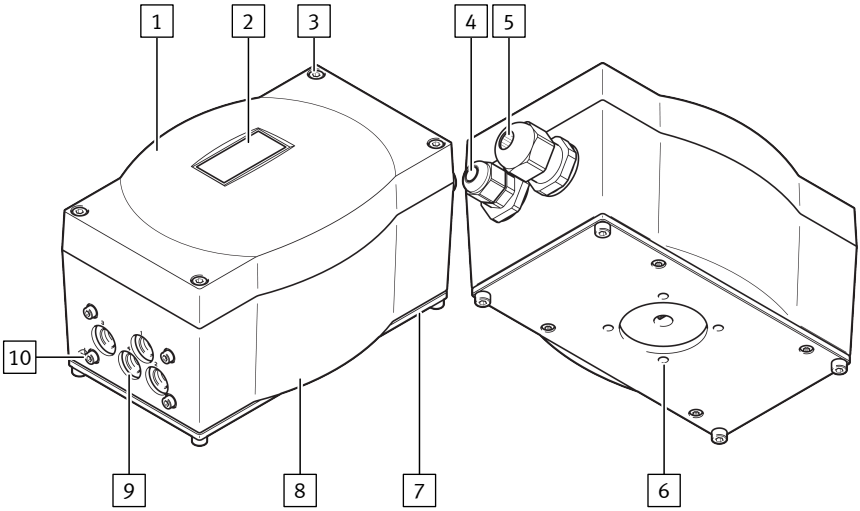


Fig. 2: Product design CMSX-P-SE-...

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

4.1.2 Operation and display

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

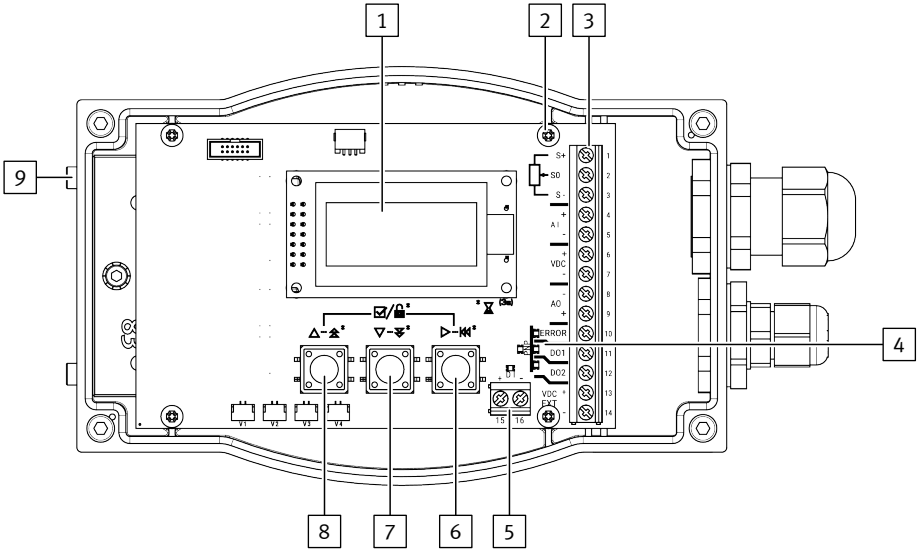


Fig. 3: Operating elements and connections

1 LCD display

2 Connection of shield of external displacement encoder

3 Terminal strip 1 (pin 1 ... 14)

4 Digital output LEDs

5 Terminal strip 2 (pin 15 ... 16)

6 Set button

7 Sub button

8 Add button

9 Earth terminal

LED display for the digital outputs

LED		Meaning
Right LED		ON: digital output switched
		OFF: digital output not switched
Left LED		ON: PNP, positive switching
		OFF: NPN, negative switching

Tab. 2: Meaning of the LEDs

4.2 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.

4.3 Safety functions

If the electrical power supply fails, the positioner will react differently depending on the product variants and drive system (failure of the operating voltage supply or the setpoint specification) ➔ Tab. 3 Threshold values for safety function and ➔ Tab. 4 Overview of safety position (pneumatic initial position).
If the operating voltage supply is switched back on, the last operating status is immediately effective.

Type of analogue input	Threshold value
0 ... 10 V	10.5 V
0 ... 20 mA	21 mA
4 ... 20 mA	3.6 mA or 21 mA

Tab. 3: Threshold values for safety function

	Safety position in case of electrical power failure, pneumatic compressed air supply present	**Safety position in case of failure of the pneumatic compressed air supply, electric power present**	**Safety position in case of failure of both pneumatic compressed air supply and electrical power**
Single-acting drives	CMSX-...-A: Regulating action opening/closing, dependent on the initial position of the drive	not defined	CMSX-...-A: Regulating action opening/closing, dependent on the initial position of the drive
Double-acting drives	CMSX-...-A: Regulating action opening/closing, dependent on the connection of working ports 2 and 4		CMSX-...-A: not defined Bring drive into the safety position as needed with an emergency pneumatic supply.
	CMSX-...-C: Regulating effect blocking		CMSX-...-C: regulating effect blocking

Tab. 4: Overview of safety position (pneumatic initial position)

4.3.1 CMSX-P-...-...-D-...-A (double-acting)

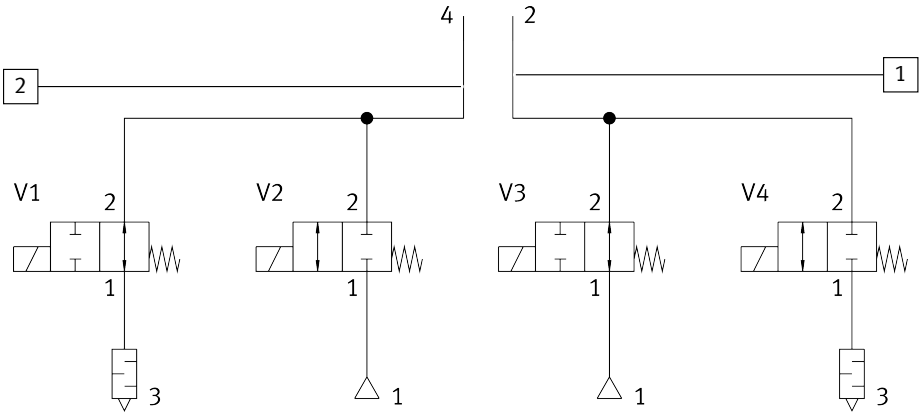


Fig. 4: Safety position CMSX-P-S-...-D-...-A

1 Working port (4)

2 Working port (2)

– Working port (2) is pressurised.
– Working port (4) is exhausted.

- The regulating effect is opening or closing.
- The process valve is opened or closed, dependent on the tubing connection of the positioner to the drive.

4.3.2 CMSX-P-...-...-D-...-C (double-acting)

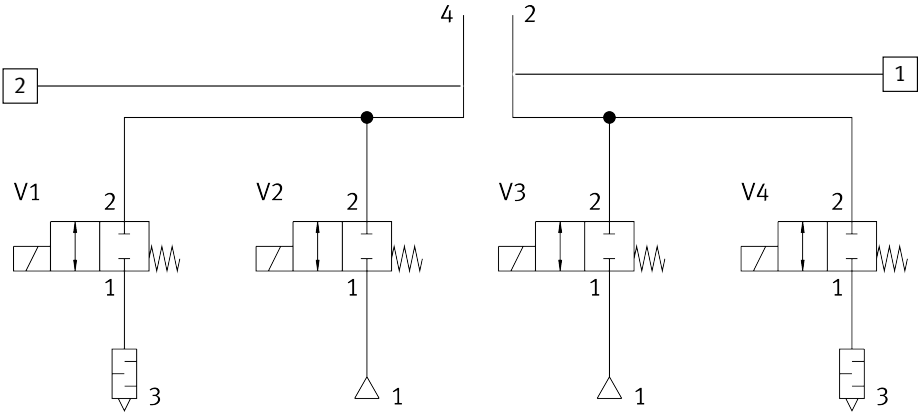


Fig. 5: Fail-safe position CMSX-P-S-...-D-...-C

1 Working port (4)

2 Working port (2)

- Working port (2) is blocked.
- Working port (4) is blocked.
- Compressed air is trapped in the drive.
- The regulating effect is blocking.
- The current position of the drive is blocked.

4.3.3 CMSX-P-...-...-S-...-A (single-acting)

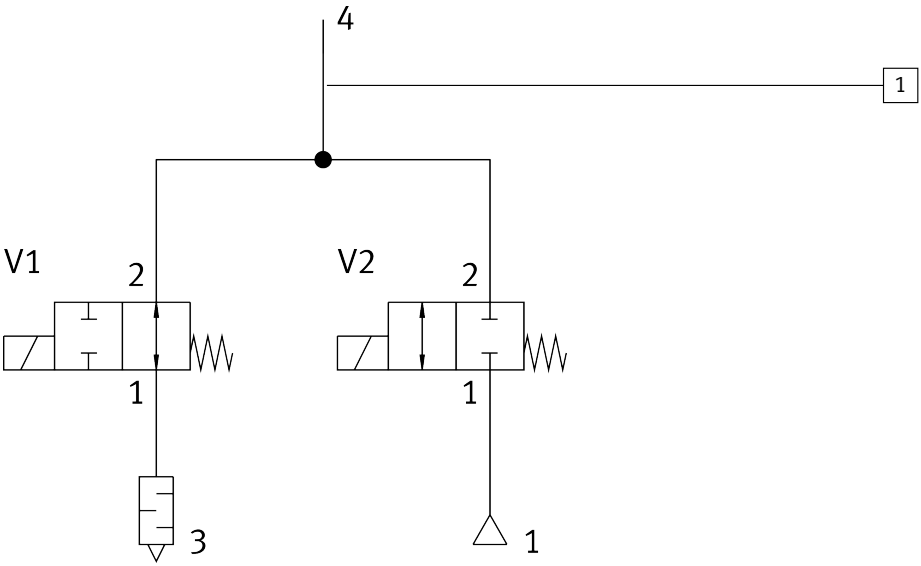


Fig. 6: Safety position CMSX-P-S-...-S-...-A

1 Working connection (4)

- Working port (4) is exhausted.
- The process valve is opened or closed depending on the drive.

5 Transport and storage

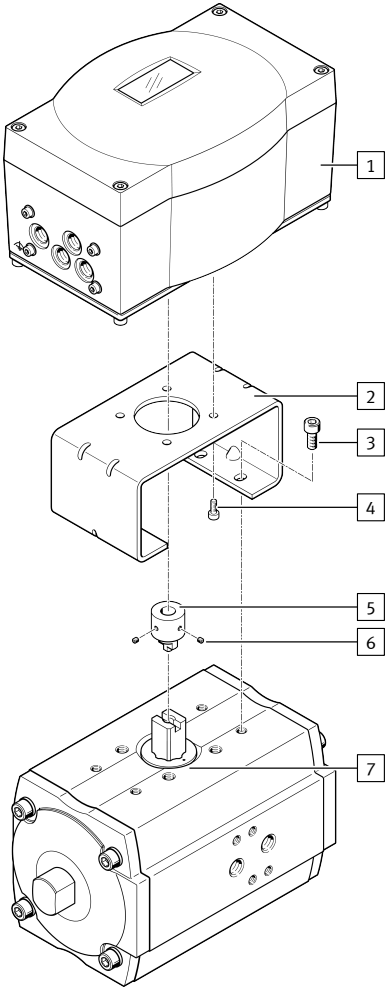
Store the product in a cool, dry, UV-protected and corrosion-protected environment. Ensure that storage times are kept to a minimum.

6 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.

6.1 Mounting CMSX-P-S-... on drive



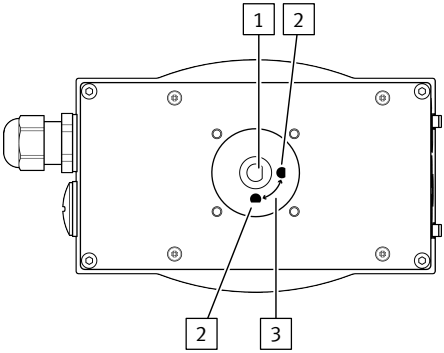
1 Positioner
2 Mounting adapter
3 M5 retaining screws
4 M4 retaining screws
5 Mechanical coupling
6 Threaded pins
7 Semi-rotary drive

Fig. 7: 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 M4 housing screws
   - 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 it. The angle of rotation of the drive must be within the sensing range of the positioner ➔ 6.1.1 Sensing range of the positioner.
7. Fasten the positioner with mounting adapter to the semi-rotary drive:
   – 4 M5 retaining screws
   – Tightening torque 3 Nm ± 20%

6.1.1 Sensing range of the positioner

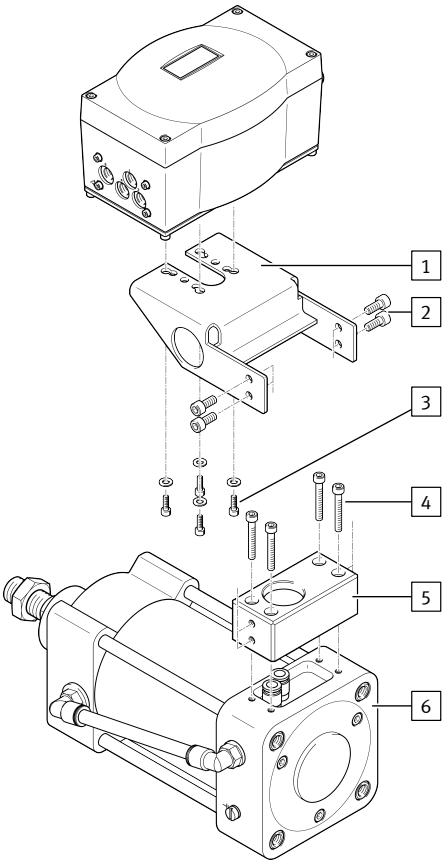


1 Flat spot of the shaft
2 Identification of the alignment of the flat spot
3 Identification for sensing range

Fig. 8: Sensing range of the positioner

The angular 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° .

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



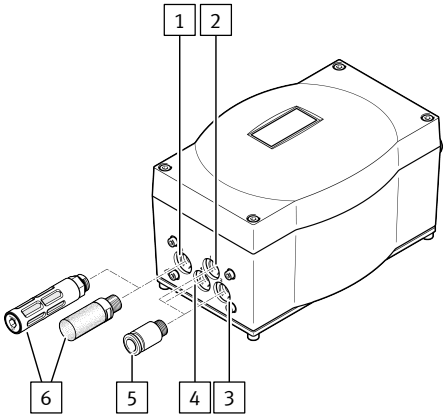
1 Mounting adapter
2 M6 retaining screws
3 M4 retaining screws
4 M5 retaining screws
5 Housing (flange-type socket)
6 Linear drive

Fig. 9: 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 M4 housing screws
   - Tightening torque 1.5 Nm ± 20%
4. Secure the housing (flange socket) to the linear drive:
   - 4 M5 retaining screws
   - Tightening torque 2.7 Nm ± 10 %
5. Secure the positioner with mounting adapter to the housing (flange type socket):
   - 4 M6 retaining screws
   - Tightening torque 3 Nm ± 20%

7 Installation

7.1 Pneumatic installation



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

Fig. 10: Pneumatic installation

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

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

7.2 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

i

The power supply for the device must be restricted 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 (pin 15)

i

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.

1. Switch off compressed air and power supply.
2. Unscrew housing screws and remove the housing cover.
3. With CMSX-S-...: run the electrical connecting cable to the terminal strips 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 mm^2
   - Use wire end sleeves.
4. With CMSX-SE-...: run connecting cable for external path/angle sensor to the terminal strip through the cable fitting.
   - Outside diameter of electrical connecting cable: 3 ... 6.5 mm
   - Cable cross-section: max. 1.5 mm^2
   - Use wire end sleeves.
5. Wire the electrical connections ➔ Tab. 5 Pin allocation of terminal strips.
   - Tightening torque: max. 0.6 Nm
6. Connect the earth terminal to the earth potential with low impedance (short cable with large cross-section).
   - Tightening torque: 0.7 Nm
7. Tighten the union nut on the cable connector.
   - Tightening torque: 1.5 Nm
8. Place the housing cover in position and tighten the 4 housing screws.
   - Make sure that the seal is positioned correctly.
   - Tightening torque: 1.5 Nm
9. Optional: place shield of an external displacement encoder on the printed circuit board.
   - Tightening torque: 0.7 Nm

Pin allocation

Pin	Designation	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	Status output
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. 5: 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.

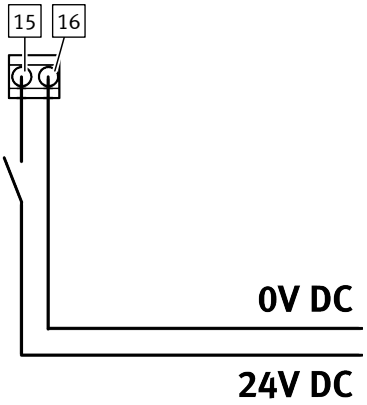


Fig. 11: PNP connection

Connection as NPN input:

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

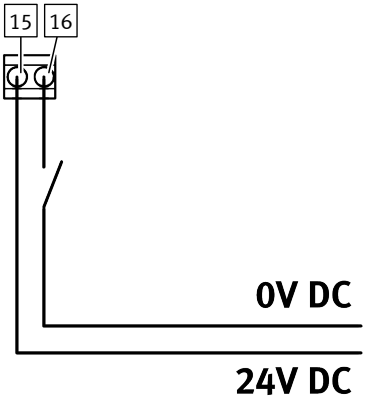


Fig. 12: NPN connection

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.

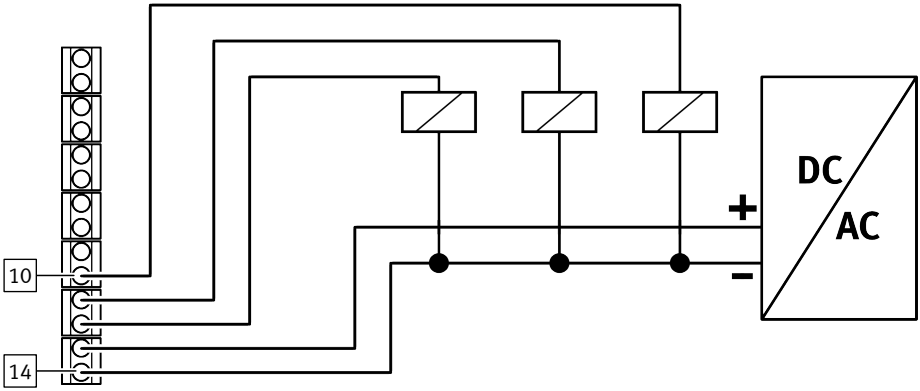


Fig. 13: PNP output

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

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

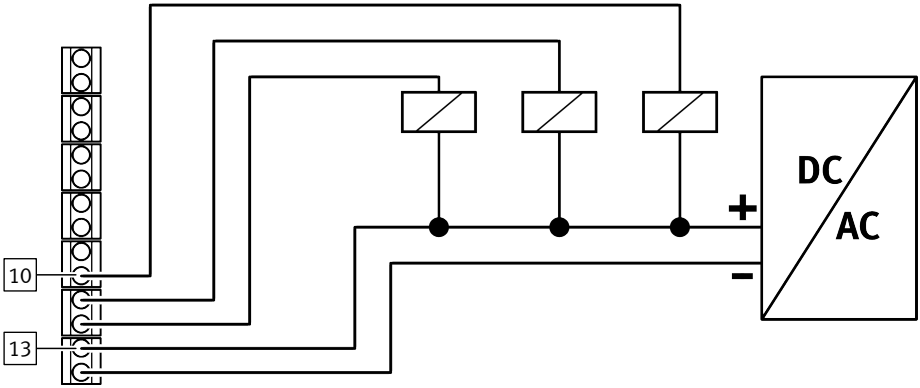


Fig. 14: NPN output

8 Commissioning

8.1 Menu structure

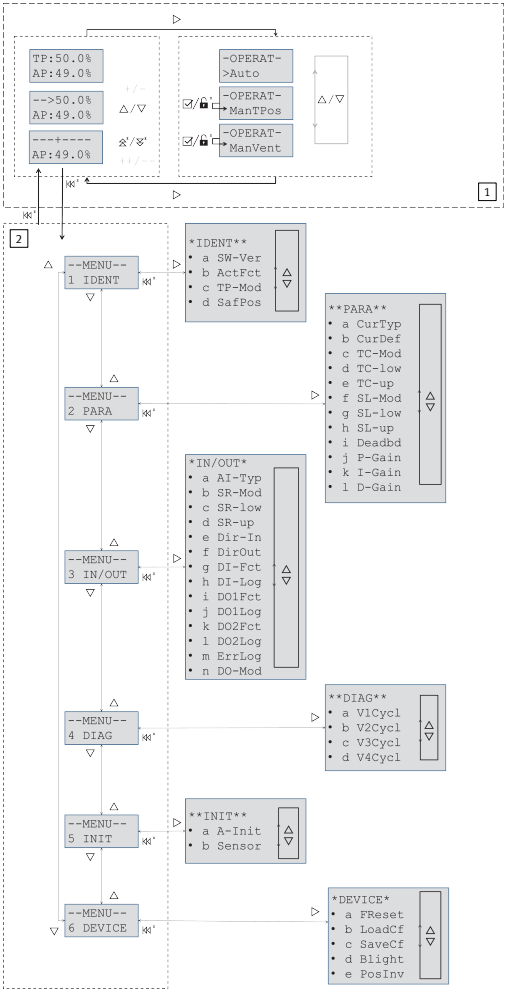


Fig. 15: Menu structure

1 Base menu

2 Main menu

8.2 Operation and display

The device is operated with 3 pushbuttons➔ 8.2.1 Function of pushbuttons.

8.2.1 Function of pushbuttons

Use the "Add", "Sub" and "Set" pushbuttons to run the following 2 functions:
- Navigation through the menu structure ➔ Tab. 6 Explanation of symbols
- Selection and input of parameter values

Symbol	Operation	Function
△	Press Add	– Switch to next menu item – Increment parameter values – In the manual setting mode: manual pressurisation (the drive is pressurised while Add is pressed and held)
▽	Press Sub	– Switch to previous menu item – Decrement parameter values – In the manual setting mode: manual exhaust (the drive is exhausted while Sub is pressed and held)
▷	Press Set	– Select a parameter or menu item – accept set value
△*	Press and hold Add for 3 seconds	– Fast incrementing of parameter values
▽*	Press and hold Sub for 3 seconds	– Fast decrementing of parameter values
⏮*	Press and hold Set for 3 seconds	– Exit submenus, switch between base and main menus
☑/🔓*	Press and hold Add and Set for 3 seconds	– Selection of an option – accept set parameter value – Switch mode of operation

Tab. 6: Explanation of symbols

Explanation of symbols	
△	Press Add
▽	Press Sub
▷	Press Set
△*	Press and hold Add for 3 seconds
▽*	Press and hold Sub for 3 seconds

Explanation of symbols	
⏮*	Press and hold Set for 3 seconds
☑/🔓*	Press and hold Add and Set for 3 seconds

Tab. 7: Explanation of symbols

8.2.2 Critical interactions

Critical interactions (interactions with far-reaching effects) are particularly protected. The query for function calls is intended to prevent accidental calling.

- Calling an initialisation routine (A-Init in the INIT submenu)
- Calling the sensor test (Sensor in INIT submenu)
- Reset parameters to factory settings (FReset in DEVICE submenu)
- Save the user-defined configuration (SaveCf in DEVICE submenu)
- Loading the last saved user-defined configuration (LoadCf in DEVICE submenu)

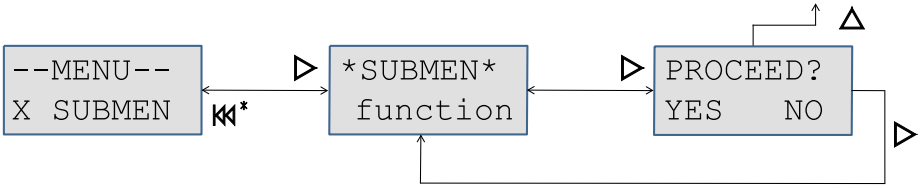


Fig. 16: Dialogue for critical interaction

8.2.3 Input of numerical values for parameters

Numerical values are entered via an incremental value input.

- To make large value changes: press and hold the "Add" or "Sub" pushbutton.

The values of the control parameters (P, I, D) are entered digit by digit ➔ Fig. 17.

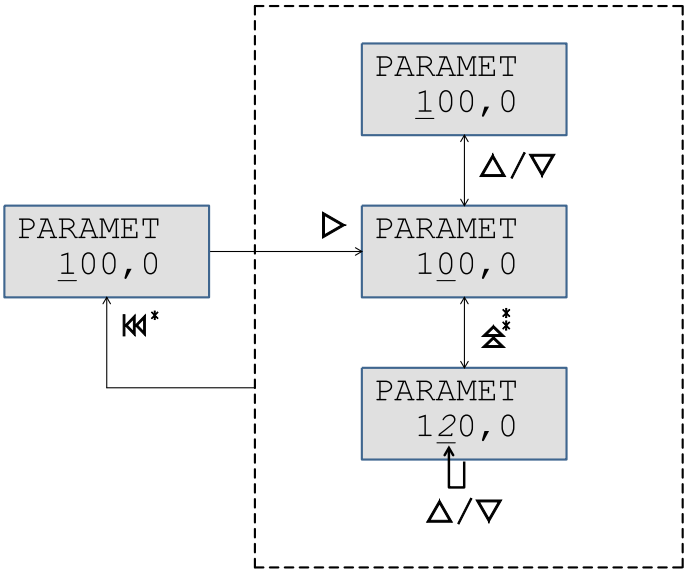


Fig. 17: Input of numerical values

8.2.4 Adoption of changes

Value input or selection of an option

- To confirm the change: press and hold the "Add" and "Set" pushbuttons for 3 seconds.
  - The change is saved. The display shows "saved".

If the entry is not confirmed: the changes are discarded when the menu is closed.

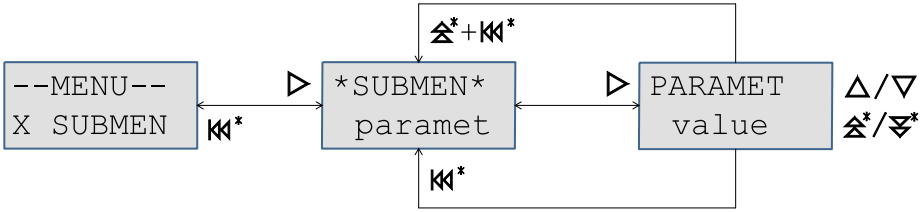


Fig. 18: Adoption of changes

Input of interpolation points

- To confirm the change of the interpolation point, press the "Set" pushbutton.
  - The change is saved. The next interpolation point is called.

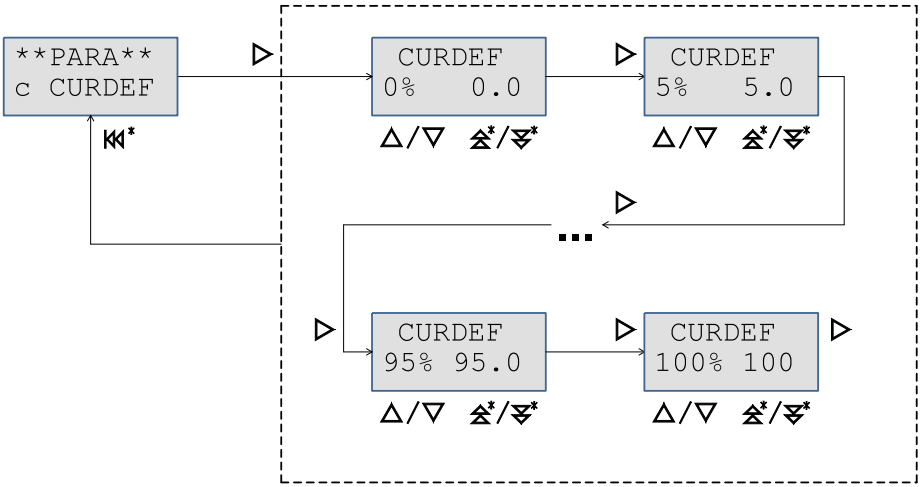


Fig. 19: Change of grid points

8.3 Base menu

The positioner is at the basic menu level after the operating voltage supply is switched on. The basic menu level consists of the following submenus:

- Default view
- Selection of operating mode

- To switch between the basic and main menus: press and hold the "Set" pushbutton for 3 seconds.
  The main menu can only be selected if the default view is activated.

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After 30 minutes without input, the device automatically switches to the default view.

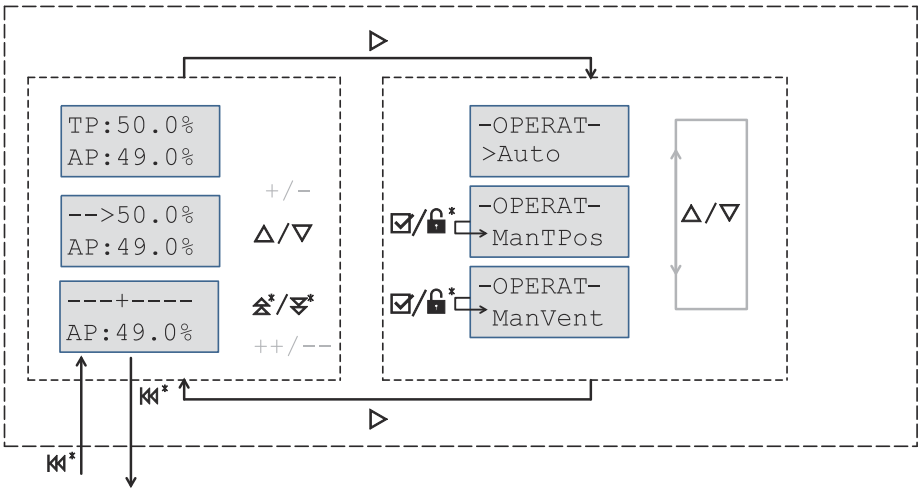

Fig. 20: Basic menu level

Selecting operating mode

1. Press "Set" button.
   The selection of operating modes is opened.
2. Select the operating mode with the "Add"/"Sub" buttons.
3. To confirm the selection: press and hold the "Add" and "Set" buttons for 3 seconds.

Changing setpoint position (ManTPos menu)/actual position (ManVent menu)

- To enter the position value: press the "Add"/"Sub" button.

8.3.1 Display of operating modes on the display

Default view	Operating mode	Description Operating mode	Display Display
TP:50.0% AP:49.0%	Automatic mode (preset)	The control mode is executed.	1st line: preset setpoint position at analogue input (TP = target position) 2nd line: actual position (AP = actual position)
-->50.0% AP:49.0%	manual setpoint position operation	Manual input of the setpoint position. The selected position is approached at the analogue input independently of the setpoint specification.	1st line: manually defined setpoint position (TP = target position) 2nd line: actual position (AP = actual position)
---+---- AP:49.0%	manual setpoint specification mode	Manual pressurisation and exhausting of the outlets by pressing "Add"/"Sub". The selected position is approached at the analogue input independently of the specified setpoint position (closed-loop controller inactive).	1st line: signal from the displacement/angle sensor as a plus sign[1)] 2nd line: actual position (AP = actual position)[2)]

1) The plus sign moves in accordance with the movement of the drive
2) only if positioner is initialised

Tab. 8: Operating modes on the display

8.3.2 View of system messages on the display

System messages are displayed as follows in the default views:

Display text	Meaning	Example
ERROR	System error: setpoint signal at the analogue input outside the valid range	TP:50.0% ERROR
NO INIT	Positioner not initialised	NO INIT AP:--.-%
NO INIT + ERROR	Initialisation not successful	NO INIT ERROR
DI*	Signal at the digital input	DI*50.0% AP:49.0%
A-INIT + running	Initialisation active	A-INIT running
A-INIT + success	Initialisation successful	A-INIT success
A-INIT + fail	Initialisation failed	A-INIT fail

Tab. 9: System messages

8.4 Main menu level

8.4.1 Parameter overview - 1 IDENT

Only the 'ActType' parameter can be changed. The other parameters are for display purposes.

Index	Parameters and value range	Description	Reference
a	SW-Ver	Software version	➔ 8.4.1.1 SW-Ver – software version
	– XX.YY.ZZ	Identification of the software version	
b	ActFct	Drive function	➔ 8.4.1.2 ActFct – drive function
	– single	Single-acting drives	
	– double	Double-acting drives	
c	TP-Mod	Target position mode	➔ 8.4.1.3 TP-Mod - setpoint position mode
	– cls-out	close outputs	
	– prs-out	pressurize outputs	
d	SafPos	Safety position of the positioner	➔ 8.4.1.4 SafPos – fail-safe position of the positioner
	– safe	Regulating effect opening/closing	
	– freeze	Regulating effect holding	

Tab. 10: 'IDENT' menu: identification of the positioner

8.4.1.1 SW-Ver – software version

This parameter can be used to display the software version of the positioner.
The identification is divided into three levels according to NE53.

Value range	Description
XX	– Compatibility is compromised. – Operating instructions as well as display and operating components change.
YY	– Changes in functionality and operation – Compatibility is maintained. – Operating instructions as well as display and operating components change.
ZZ	– minimal changes (e.g. fault clearance, availability) – Compatibility and functionality are maintained. – Operating instructions and display and operating components do not change.

Tab. 11: SW-Ver parameter – software version

8.4.1.2 ActFct – drive function

This parameter can be used to display the actuator function supported by the positioner.

Value range	Description
single	single-acting drives (CMSX-P-...-S-...)
double	double-acting drives (CMSX-P-...-D-...)

Tab. 12: ActFct parameter - drive function

8.4.1.3 TP-Mod - setpoint position mode

This parameter can be used to specify the response for double-acting drives when the setpoint position is reached. This parameter has no effect on a single-acting drive. Every parameter option has a specific response associated with it.

Setpoint position mode - cls-out:

- The air is trapped in the drive to retain the position.
- Mainly suitable for linear double-acting drives and very small drives (linear or rotary).

Setpoint position mode - prs-out:

- Both chambers of the drive are pressurised to retain the position.
- This control is more stable against external disturbances.
- Mainly suitable for rotary double-acting drives.

Value range	Description
cls-out	The air is trapped in the drive to retain the position.
prs-out	Both chambers of the drive are pressurised to retain the position.

Tab. 13: TP mode parameter - setpoint position mode

8.4.1.4 SafPos – fail-safe position of the positioner

This parameter is used to indicate the fail-safe position of the positioner.

Value range	Description
safe	Regulating effect opening/closing (CMSX-P-...-A)
freeze	Regulating effect holding (CMSX-P-...-C)

Tab. 14: SafPos parameter – fail-safe position of the positioner

8.4.2 Overview of parameters - 2 PARA

Index	Parameters and value range	Description	Reference
a	CurTyp	Type of setpoint characteristic curve	➔ 8.4.2.1 CurTyp – type of setpoint characteristic curve
	– linear (factory setting)	linear characteristic curve	
	– 1:25	equal-percentage characteristic curve	
	– 1:33		

Index	Parameters and value range	Description	Reference
a	– 1:50	equal-percentage characteristic curve	➔ 8.4.2.1 CurTyp – type of setpoint characteristic curve
	– 25:1	inverse equal-percentage characteristic curve	
	– 33:1		
	– 50:1		
	– userdef	user-defined characteristic curve	
b	CurDef	Interpolation points	➔ 8.4.2.2 CurDef – support points
	– 0% 0.0 ... 100%	Interpolation point with standardised setpoint value 0% (factory setting: 0%)	
	– 5% 0.0 ... 100%	Interpolation point with standardised setpoint value 5% (factory setting: 5%)	
	– ...	...	
	– 95% 0.0 ... 100%	Interpolation point with standardised setpoint value 95% (factory setting: 95%)	
	– 100% 0.0 ... 100%	Interpolation point with standardised setpoint value 100% (factory setting: 100%)	
c	TC-Mod	Tight-closing mode	➔ 8.4.2.3 TC-Mod – tight-closing mode
	– inactiv (factory setting)	Tight-closing mode deactivated	
	– bothact	Tight-closing mode for lower and upper value of tight-closing limit active	
	– up_act	Tight-closing mode for upper value of tight-closing limit active	
	– low_act	Tight-closing mode for lower value of tight-closing limit active	
d	TC-low	Value for the lower tight-closing limit	➔ 8.4.2.4 TC-low – value for lower tight-closing limit
	– 0.0 ... 45.0%	Factory setting: 2.0%	
e	TC-up	Value for the upper tight-closing limit	➔ 8.4.2.5 TC-up – value for upper tight-closing mode
	– 55.0 ... 100.0%	Factory setting: 98.0%	

Index	Parameters and value range	Description	Reference
f	SL-Mod	Stroke-limitation mode	➔ 8.4.2.6 SL-Mod – stroke-limitation mode
	– inactiv (factory setting)	Stroke-limitation mode deactivated	
	– bothact	Stroke-limitation mode for lower and upper stroke-limitation value active	
	– up_act	Stroke-limitation mode for upper stroke limitation value active	
	– low_act	Stroke limitation mode for lower stroke limitation value active	
g	SL-low	Lower stroke limitation value	➔ 8.4.2.7 SL-low – lower stroke limitation value
	– 0.0 … 90.0%	Factory setting: 0.0%	
h	SL-up	Upper stroke limitation value[1)]	➔ 8.4.2.8 SL-up – upper stroke limitation value
	– 10.0 … 100.0%	Factory setting: 100.0%	
i	Deadbd	Deadband	➔ 8.4.2.9 Deadbd - deadband
	– 0, 5 … 10.0 %	Factory setting: 1.0%	
j	P-Gain	P-proportion of the PID controller	➔ 8.4.2.10 P-Gain – P-proportion of the PID controller
	– 0 … 25000		
k	I-Gain	I-proportion of the PID controller	➔ 8.4.2.11 I-Gain – I-proportion of the PID controller
	– 0 … 25000		
l	D-Gain	D-proportion of the PID controller	➔ 8.4.2.12 D-Gain – D-proportion of the PID controller
	– 0 … 25000		

1) The value for the upper stroke limitation must be greater than the value for the lower stroke limitation.

Tab. 15: PARA menu: parameterisation of setpoint functions

8.4.2.1 CurTyp – type of setpoint characteristic curve

This parameter can be used to set the characteristic of the transfer characteristic curve between setpoint value and setpoint position. The transfer characteristic curve is used to correct the operating characteristic curve.

Value range	Description
inactiv	linear characteristic curve (factory setting)
1:25	equal-percentage characteristic curve
1:33	
1:50	
25:1	inverse equal-percentage characteristic curve
33:1	
50:1	
userdef	user-defined characteristic curve

Tab. 16: CurTyp parameter - type of setpoint characteristic curve

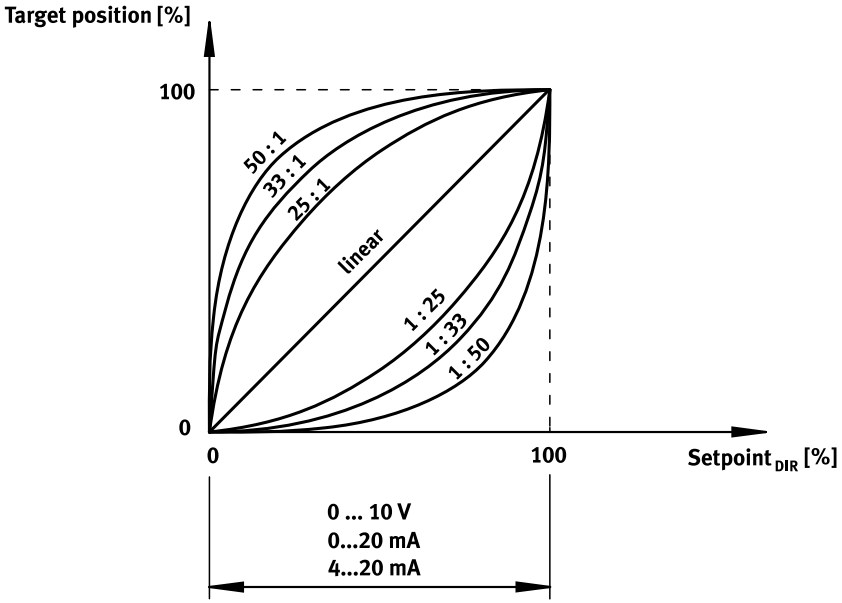

Fig. 21: Setpoint characteristic curves

8.4.2.2 CurDef – support points

With these parameters, user-defined setpoint value characteristic curves can be defined via 21 interpolation points. The interpolation points are distributed equidistantly over the setpoint range from 0 to 100%. The distance between the individual interpolation points is 5%. A setpoint position (setting range 0 to 100%) can be assigned to every interpolation point. The setpoint values of the interpolation points can only be selected in ascending order.

Value range	Description
0% 0.0 ... 100% Factory setting: 0%	Interpolation point with standardised setpoint value 0%
5 % 0.0 ... 100 % Factory setting: 5%	Interpolation point with standardised setpoint value 5%
...	
95% 0.0 ... 100% Factory setting: 95%	Interpolation point with standardised setpoint value 95%
100% 0.0 ... 100% Factory setting: 100%	Interpolation point with standardised setpoint value 100%

Tab. 17: CurDef parameter - support points

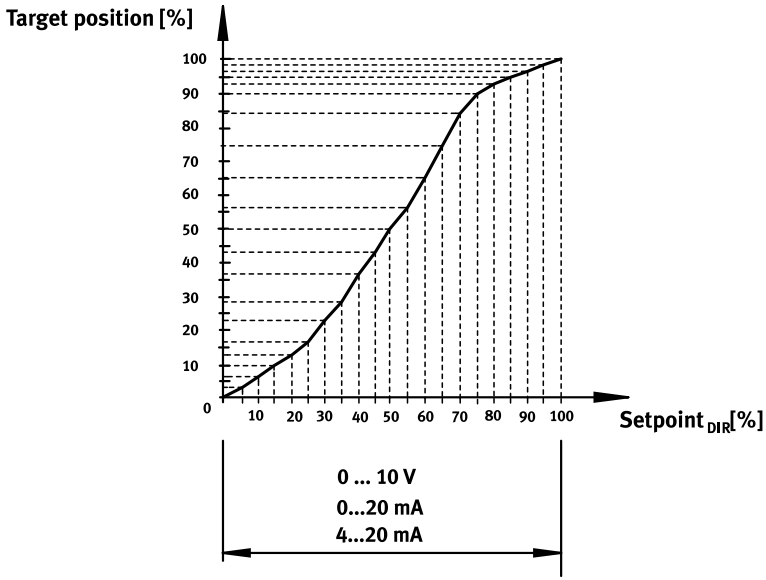

Fig. 22: Interpolation points

8.4.2.3 TC-Mod – tight-closing mode

Tight-closing mode can be activated with this parameter. If the tight-closing mode is active, the valve is moved to the end position with the maximum actuating force of the actuator. The tight-closing mode can be activated on one side or for both end positions. The tight-closing mode becomes effective when the setpoint value reaches the lower or upper value for tight-closing.

Value range	Description
inactiv	Tight-closing mode deactivated (factory setting)
bothact	Tight-closing mode for lower and upper value of tight-closing limit active
up_act	Tight-closing mode for upper value of tight-closing limit active
low_act	Tight-closing mode for lower value of tight-closing limit active

Tab. 18: TC-Mod parameter - tight-closing mode

i

Stroke limitation and tight closing cannot be active simultaneously in one end position. If it is not possible to change the mode, a message appears on the display.

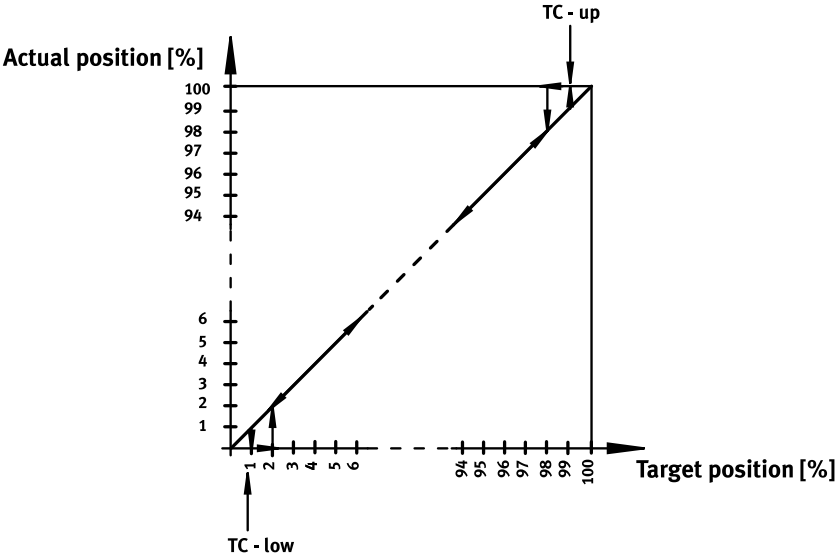

Fig. 23: Tight-closing mode

8.4.2.4 TC-low – value for lower tight-closing limit

The lower value of the tight-closing limit can be set with this parameter. If the setpoint position of the positioner is below the adjusted limit, the valve is moved to the lower end position with maximum positioning force.

Value range	Description
0.0 ... 45.0%	Factory setting: 2.0%

Tab. 19: TC-low parameter - value for tight closing limit below

8.4.2.5 TC-up – value for upper tight-closing mode

The upper value of the tight-closing limit can be set with this parameter. If the setpoint position of the positioner is above the adjusted limit, the valve is moved to the upper end position with maximum positioning force.

Value range	Description
55.0 ... 100.0%	Factory setting: 98.0%

Tab. 20: TC-up parameter - value for upper tight-closing limit

8.4.2.6 SL-Mod – stroke-limitation mode

You can use this parameter to restrict the work area. The restriction is independent of the character of the setpoint value characteristic curve (linear, equal percentage, user-defined). The setpoint position of the setpoint value characteristic curve corresponds to the setpoint position of the stroke limitation.

Value range	Description
inactiv	Stroke-limitation mode deactivated (factory setting)
bothact	Stroke-limitation mode for lower and upper stroke-limitation value active
up_act	Stroke-limitation mode for upper stroke limitation value active
low_act	Stroke limitation mode for lower stroke limitation value active

Tab. 21: SL-Mod parameter - stroke limiting mode

i

Stroke limitation and tight closing cannot be active simultaneously in one end position. If it is not possible to change the mode, a message appears on the display.

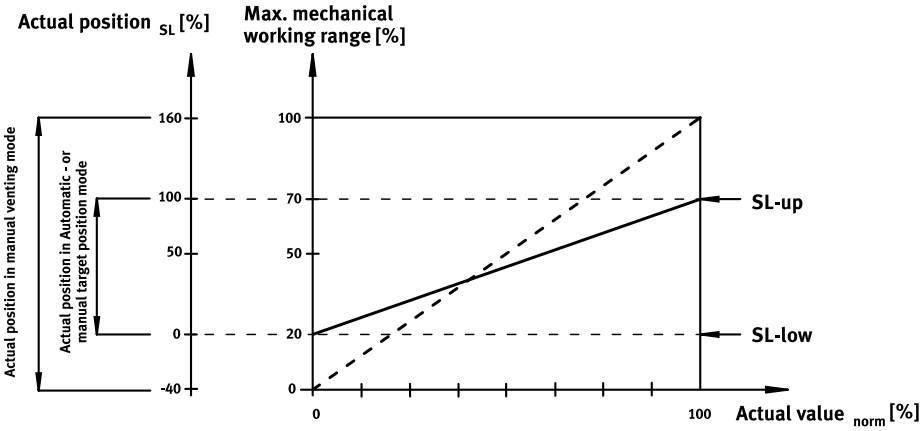

Fig. 24: Stroke limitation

8.4.2.7 SL-low – lower stroke limitation value

The lower value of the stroke limitation can be set with this parameter.

Value range	Description
0.0 ... 90.0%	Factory setting: 0.0%

Tab. 22: SL-low parameter - lower stroke limitation value

8.4.2.8 SL-up – upper stroke limitation value

The upper value of the stroke limitation can be set with this parameter.

Value range	Description
10.0 ... 100.0 %	Factory setting: 100.0%

Tab. 23: SL-up parameter - upper stroke limitation value

8.4.2.9 Deadbd - deadband

The deadband of the PID controller can be set with this parameter. The deadband defines a range around the setpoint position within which the closed-loop controller does not react to deviations.

- If the deviation is within the deadband, the closed-loop controller remains inactive.
- If the control deviation is outside the deadband, the closed-loop controller is active. The output value is changed until the control deviation lies within the deadband.

The size of the deadband influences the reaction of the positioner to a deviation:

- A deadband that is too small results in oscillations around the setpoint position up to permanent oscillations (instability). The process valve, drive and solenoid valves of the positioner are subjected to unnecessary loads.
- A deadband that is too large results in low positioning accuracy.

Value range	Description
0.5 ... 10.0%	Factory setting: 1.0%

Tab. 24: Deadbd parameter - deadband

i

If the deadband < 1% is selected: activate tight-closing mode TC-Mod ➔ 8.4.2.3 TC-Mod – tight-closing mode.

Recommended values:

- Lower tight-closing limit TC-low: ≤ 1%
- Upper tight-closing limit TC-up: ≥ 99%

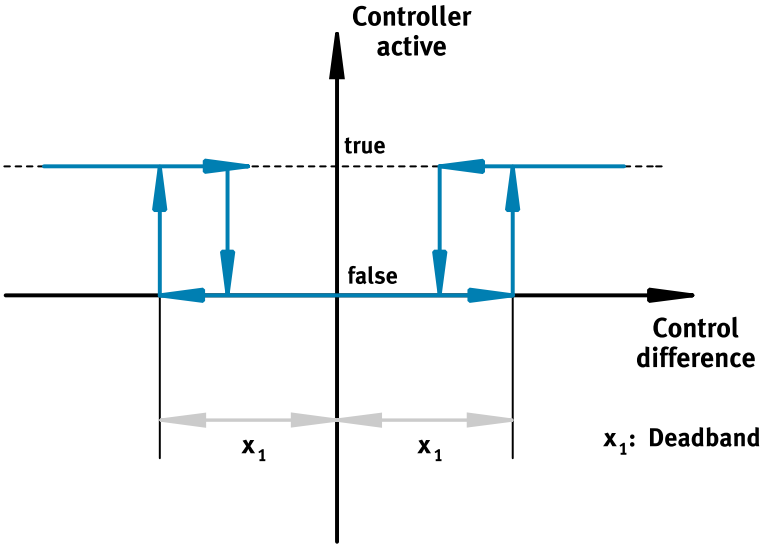

Fig. 25: Deadband

8.4.2.10 P-Gain – P-proportion of the PID controller

i

For most drives, the controller parameters are optimally determined during automatic initialisation. The parameters should only be changed if the automatic initialisation cannot be carried out or does not lead to satisfactory control behaviour.

This parameter can be used to set the P-proportion of the PID controller. The P-proportion is the proportional gain factor of a PID controller. The P-proportion influences the speed and stability of the closed-loop control.
- The higher the value the higher the setpoint specification change in the case of a deviation.
- A P-proportion that is too high results in overshoots.
- A P-proportion that is too low slows the closed-loop control.

Value range	Description
0 ... 25000	P-proportion of the PID controller

Tab. 25: P-Gain parameter - P-share of the PID controller

8.4.2.11 I-Gain – I-proportion of the PID controller

i

For most drives, the controller parameters are optimally determined during automatic initialisation. The parameters should only be changed if the automatic initialisation cannot be carried out or does not lead to satisfactory control behaviour.

The I-proportion of the PID controller can be set with this parameter. The I-proportion is the integral gain of a PID controller. The I-proportion dynamically counteracts the D-proportion. This influences the speed and stability of the closed-loop control.
- As the I-proportion increases, the speed of the closed-loop control decreases.

Value range	Description
0 ... 25000	I-proportion of the PID controller

Tab. 26: I-Gain parameter - I-proportion of the PID controller

8.4.2.12 D-Gain – D-proportion of the PID controller

i

For most drives, the controller parameters are optimally determined during automatic initialisation. The parameters should only be changed if the automatic initialisation cannot be carried out or does not lead to satisfactory control behaviour.

This parameter is used to set the D-proportion of the PID controller. The D-proportion is the differential gain of a PID controller.

- The higher the value the weaker the setpoint specification change with the same change in speed of the deviation.
- A D-proportion that is too high makes the closed-loop control more sluggish.
- A D-proportion that is too low makes the closed-loop control more dynamic.

Value range	Description
0 … 25000	D-proportion of the PID controller

Tab. 27: D-Gain parameter - D-proportion of the PID controller

8.4.3 Parameter overview - 3 IN/OUT

Index	Parameters and value range	Description	Reference
a	AI-Typ	Type of analogue input	➔ 8.4.3.1 AI-type – type of 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)	
b	SR-Mod	Split range mode (restriction of the setpoint range)	➔ 8.4.3.2 SR-Mod – split-range mode
	– inactiv	Split range mode deactivated (factory setting)	
	– bothact	Split range mode for lower and upper value limit split range active	
	– up_act	Split range mode for upper value limit split range active	
	– low_act	Split range mode for lower value limit split range active	
c	SR-low	Value for lower split range limit	➔ 8.4.3.3 SR-low – value for lower split-range limit
	– 0 … 99%	Factory setting: 0%	
d	SR-up	Value for upper split range limit	➔ 8.4.3.4 SR-up – value for upper slip-range limit
	– 1 … 100%	Factory setting: 100%	

Index	Parameters and value range	Description	Reference
e	Dir-In	Setpoint value direction	➔ 8.4.3.5 Dir-In – setpoint value direction
	– rising	The setpoint position is incremented with increasing setpoint value (factory setting)	
	– falling	The setpoint position is incremented with falling setpoint value	
f	DirOut	Position feedback direction	➔ 8.4.3.6 DirOut – position feedback direction
	– rising	The position feedback is incremented with increasing actual position (factory setting)	
	– falling	The position feedback is incremented with falling actual position	
g	DI-Fct	Digital input function	➔ 8.4.3.7 DI-Fct – digital input function
	– inactiv	Digital input function deactivated (factory setting)	
	– stop	Pneumatic outlets 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	Executing automatic initialisation	
h	DI-Log	Digital input logic	➔ 8.4.3.8 DI-Log – digital input logic
	– lowact	Switching logic active low	
	– highact	Switching logic active high (factory setting)	
i	DO1Fct	Digital output 1 function	➔ 8.4.3.9 DO1Fct – digital output 1 function
	– inactiv	Digital output 1 function 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 (2%) or lower (98%) position limit value	
j	DO1Log	Digital output 1 logic	➔ 8.4.3.10 DO1Log – digital output 1 logic
	– lowact	Switching logic active low	

Index	Parameters and value range	Description	Reference
j	– highact	Switching logic active high (factory setting)	➔ 8.4.3.10 DO1Log – digital output 1 logic
k	DO2Fct	Digital output 2 function	➔ 8.4.3.11 DO2Fct – digital output 2 function
	– inactiv	Digital output 2 function 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 (2%) or lower (98%) position limit value.	
l	DO2Log	Digital output 2 logic	➔ 8.4.3.12 DO2Log – digital output 2 logic
	– lowact	Switching logic active low	
	– highact	Switching logic active high (factory setting)	
m	ErrLog	Switching logic of digital alarm output	➔ 8.4.3.13 ErrLog – digital alarm output logic
	– lowact	active low	
	– highact	active high (factory setting)	
n	DO-Mod	Switching mode of digital outputs	➔ 8.4.3.14 DO-Mod – switching mode of digital outputs
	– PNP	PNP polarity of the switching outputs (D-OUT-1, D-OUT-2, ALARM)	
	– NPN	NPN polarity of the switching outputs (D-OUT-1, D-OUT-2, ALARM)	

Tab. 28: IN/OUT menu: configuration of analogue and digital I/Os

8.4.3.1 AI-type – type of analogue input

This parameter can be used to set the type of input signal at the analogue input.

Value range	Description
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)

Tab. 29: AI type parameter - type of analogue input

8.4.3.2 SR-Mod – split-range mode

This parameter can be used to restrict the setpoint range. The analogue setpoint value (4 ... 20 mA or 0 ... 10 V) cannot be divided among several positioners. The lower and upper limits are defined in separate parameters.

Value range	Description
inactiv	Split-range mode deactivated (factory setting)
bothact	Split-range mode for lower and upper limit active
up_act	Split-range mode for upper limit active
low_act	Split-range mode for lower limit active

Tab. 30: SR-Mod parameter - split-range mode

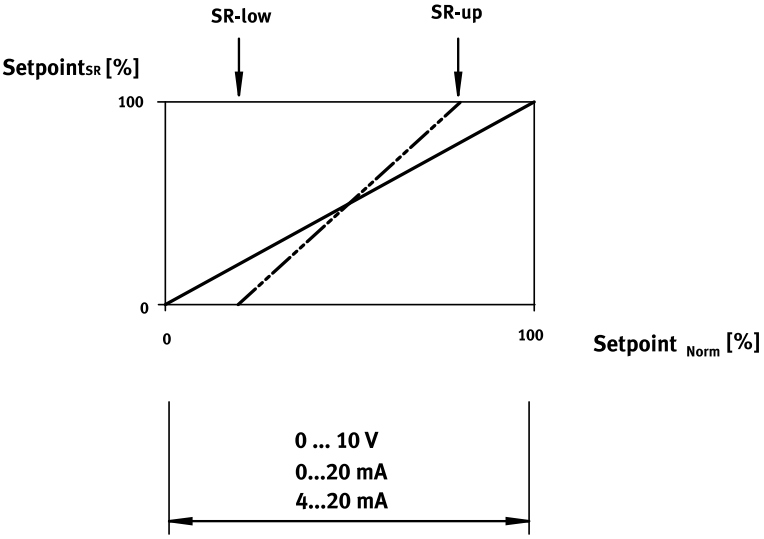

Fig. 26: Split range

8.4.3.3 SR-low – value for lower split-range limit

This parameter is used to set the lower limit value of the split range.

Value range	Description
0 ... 99%	Factory setting: 0%

Tab. 31: SR-low parameter - value for split-range lower limit

8.4.3.4 SR-up – value for upper slip-range limit

This parameter is used to set the upper limit value of the split range.

Value range	Description
0 ... 100%	Factory setting: 100%

Tab. 32: SR-up parameter - value for upper split-range limit

8.4.3.5 Dir-In – setpoint value direction

This parameter can be used to set the operating direction between setpoint value and setpoint position. The setting is independent of the setpoint characteristic curve (linear, equal percentage, user-defined).

Value range	Description
rising	The setpoint position is incremented with increasing setpoint value (factory setting).
falling	The setpoint position is incremented with falling setpoint value.

Tab. 33: Dir-In parameter - setpoint value direction

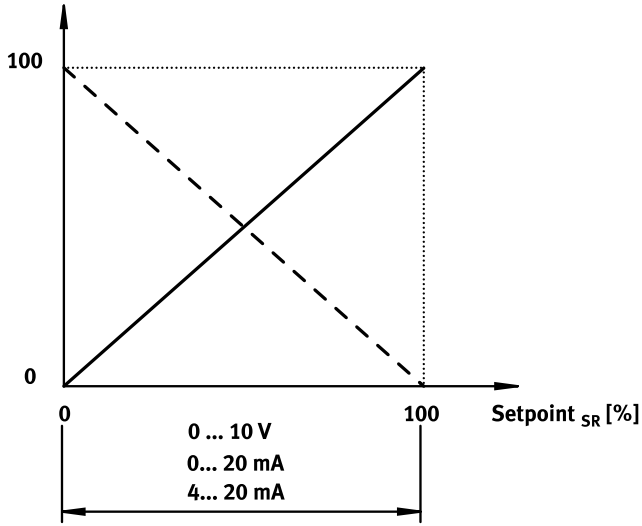

Fig. 27: Setpoint value direction

8.4.3.6 DirOut – position feedback direction

This parameter can be used to set the operating direction between actual value and actual position (position feedback).

Value range	Description
rising	The position feedback is incremented with increasing actual position (factory setting)
falling	The position feedback is incremented with falling actual position

Tab. 34: DirOut parameter - position feedback direction

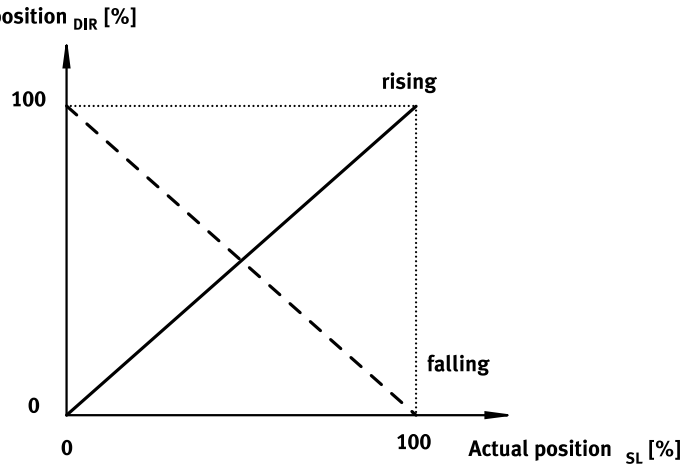

Fig. 28: Position feedback direction

8.4.3.7 DI-Fct – digital input function

This parameter is used to set the function to be performed when the digital input is activated.

Value range	Description
inactiv	Digital input function deactivated (factory setting)
stop	Pneumatic outputs 2 and 4 are closed.
exhaust	Exhausting pneumatic output 2 and pressurising pneumatic input 4
pressur	Pressurising pneumatic output 2 and exhausting pneumatic input 4
a-init	automatic initialisation

Tab. 35: DI-Fct parameter - digital input function

8.4.3.8 DI-Log – digital input logic

The switching logic at the digital input can be set with this parameter.

Value range	Description
lowact	Switching logic active low The set function is activated at a low level.
highact	Switching logic active high (factory setting) The set function is activated with a high level.

Tab. 36: DI-Log parameter - digital input logic

8.4.3.9 DO1Fct – digital output 1 function

This parameter can be used to set the action with which digital output 1 is activated.

Value range	Description
inactiv	Digital output 1 deactivated (factory setting)
lowlmt	Lower position limit reached (2%)
uplmt	Upper position limit reached (98%)
bothlmt	Upper (98%) or lower (2%) position limit reached

Tab. 37: DO1Fct parameter - digital output 1 function

8.4.3.10 DO1Log – digital output 1 logic

This parameter can be used to set the switching logic at digital output 1.

Value range	Description
lowact	Switching logic active low Low level is output when digital output 1 is activated.
highact	Switching logic active high (factory setting) High level is output when digital output 1 is activated.

Tab. 38: DO1Log parameter - digital output 1 logic

8.4.3.11 DO2Fct – digital output 2 function

This parameter can be used to set the action with which digital output 2 is activated.

Value range	Description
inactiv	Digital output 2 deactivated (factory setting)
lowlmt	Lower position limit reached (2%)
uplmt	Upper position limit reached (98%)
bothlmt	Upper (98%) or lower (2%) position limit reached

Tab. 39: DO2Fct parameter - digital output 2 function

8.4.3.12 DO2Log – digital output 2 logic

This parameter can be used to set the switching logic at digital output 2.

Value range	Description
lowact	Switching logic active low Low level is output when digital output 2 is activated.
highact	Switching logic active high (factory setting) High level is output when digital output 2 is activated.

Tab. 40: DO2Log parameter - digital output 2 logic

8.4.3.13 ErrLog – digital alarm output logic

The switching logic at the digital alarm input can be set with this parameter.
The digital alarm output is activated in the following cases:
- Initialisation not successful
- Setpoint value outside the specification
- Actuator cannot reach required target position

Value range	Description
lowact	Switching logic active low
highact	Switching logic active high (factory setting)

Tab. 41: ErrLog parameter - digital alarm output logic

8.4.3.14 DO-Mod – switching mode of digital outputs

The switching mode of the digital outputs (D-OUT-1, D-OUT-2, ALARM) can be set with this parameter.

Value range	Description
PNP	PNP polarity of the switching outputs (D-OUT-1, D-OUT-2, ALARM)
NPN	NPN polarity of the switching outputs (D-OUT-1, D-OUT-2, ALARM)

Tab. 42: DO-Mod parameter - switching mode of digital outputs

8.4.4 Parameter overview – 4 DIAG

Index	Parameters and value range	Description	Reference
a	V1CYCL – 0 ... 1E10	Number of switching cycles solenoid valve 1	➔ 8.4.4.1 V1CYCL, V2CYCL, V3CYCL, V4CYCL - number of switching cycles solenoid valve
b	V2CYCL – 0 ... 1E10	Number of switching cycles solenoid valve 2	
c	V3CYCL – 0 ... 1E10	Number of switching cycles solenoid valve 3	
d	V4CYCL – 0 ... 1E10	Number of switching cycles solenoid valve 4	

Tab. 43: DIAG menu: diagnostic functions

8.4.4.1 V1CYCL, V2CYCL, V3CYCL, V4CYCL - number of switching cycles solenoid valve

The counters sum up the control processes of the solenoid valves and serve to evaluate the switching frequency. The characteristic service life value of the valve block is load-dependent and averages about 10 million switching cycles for each of the solenoid valves.

8.4.5 Parameter overview – 5 INIT

Index	Parameter	Description	Reference
a	A-Init	Start automatic initialisation	➔ 8.4.5.1 A-Init – start automatic initialisation
b	Sensor	Start sensor test	➔ 8.4.5.2 Sensor – check sensing range of the path/angle sensor

Tab. 44: INIT menu: commissioning

8.4.5.1 A-Init – start automatic initialisation

The automatic initialisation can be started with this parameter. The following values are determined automatically during the initialisation routine:
– maximum possible mechanical stroke range
– control parameters
– minimum opening/closing times
Initialisation is required in the following cases:
– during commissioning
– after changes in the system structure

i

Every initialisation overwrites the existing initialisation. If the initialisation fails, the positioner is in the non-initialised state. The non-initialised state is indicated by a 'NO INIT' in the display ➔ 8.3.2 View of system messages on the display.

8.4.5.2 Sensor – check sensing range of the path/angle sensor

The sensor test can be started with this parameter. The sensor test corresponds to the manual setpoint specification operation. The outputs are pressurised and exhausted and checked for whether the operating range of the actuator lies within the detection range of the path/angle sensor ➔ 8.7 Checking sensing range of the path/angle sensor.

i

After the sensor test the device remains in the "ManVent" mode regardless of the prior operating status.

8.4.6 Parameter overview - 6 DEVICE

Index	Parameters and value range	Description	Reference
a	FReset	Reset the parameters to factory settings. The device is in the non-initialised state (NoInit)	➔ 8.4.6.1 FReset – reset parameters to factory setting
b	LoadCf	Loading the last saved user-defined configuration	➔ 8.4.6.2 LoadCf – load the last saved user-defined configuration
c	SaveCf	Saving the user-defined configuration[1)]	➔ 8.4.6.3 SaveCf – saving the user-defined configuration
d	BLight	Configuration of the backlight of the display	➔ 8.4.6.4 BLight – configuration of the display backlight
	– onpress	Backlight of the display switched on when the operating buttons are pressed	

Index	Parameters and value range	Description	Reference
d	– onerror	Display backlight flashes if a system error is pending	➔ 8.4.6.4 BLight – configuration of the display backlight
	– always	Display backlight always on	
e	PosInv	Inversion of the position indicator on the display	➔ 8.4.6.5 PosInv - inversion of the position indicator on the display
	– inactive	Inversion of the position indicator on the display is inactive	
	– active	Inversion of the position indicator on the display is active	

1) Recommendation: after successful commissioning, save user-defined configuration as individual presets.

Tab. 45: DEVICE menu: device configuration

8.4.6.1 FReset – reset parameters to factory setting

This function resets all parameters and user-defined configurations (SafeCF) to factory settings.

8.4.6.2 LoadCf – load the last saved user-defined configuration

This function can be used to load the last saved user-defined configuration.

8.4.6.3 SaveCf – saving the user-defined configuration

This parameter can be used to save the user defined configuration.

8.4.6.4 BLight – configuration of the display backlight

This parameter is used to set when the backlight of the display is on.

– onpress:
  The backlight of the display is switched on when the operating buttons are pressed.
– onerror:
  The display backlight flashes if a system error is pending.
– always:
  The backlight of the display is always on.

8.4.6.5 PosInv - inversion of the position indicator on the display

This parameter can be used to invert the position shown in the display in %. The direction of action of the setpoint value and the direction of action of the position feedback are not influenced by this parameter ➔ 8.4.3.5 Dir-In – setpoint value direction, ➔ 8.4.3.6 DirOut – position feedback direction.

– inactive:
  The inversion of the position indicator on the display is inactive.
– active:
  The inversion of the position indicator on the display is active. 0% becomes 100% and 100% becomes 0%.

8.5 Schematic view of the mode of action of the parameters

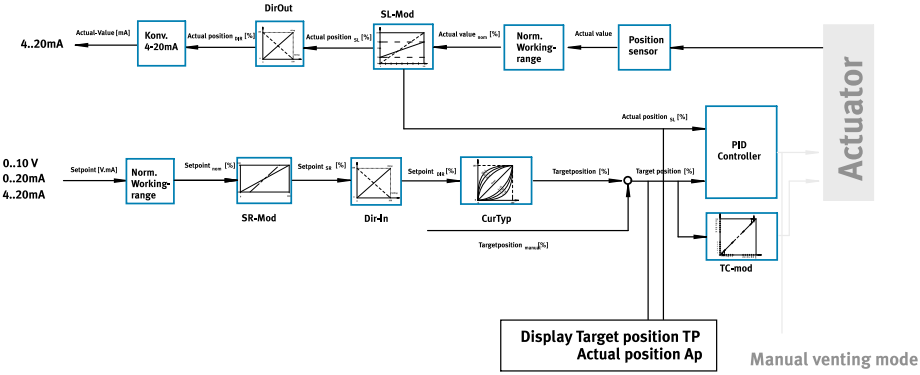

Fig. 29: Signal processing

8.6 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 ➔ 12 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.

8.7 Checking sensing range of the path/angle sensor

1. Use the "Add" and "Sub" buttons to approach the two end positions.
   - The signal from the position/angle sensor is shown as a plus sign in the upper line of the display. If the positioner has already been initialised, the actual position (AP = actual position) is also displayed in the bottom line ➔ 8.3.1 Display of operating modes on the display.
   - If the plus sign in the top line of the display moves steadily from one side of the display to the other as the actuator is moved from one end position to the other, the positioner has been correctly mounted on the actuator.
   - If the plus sign in the top line of the display jumps from the right side of the display to the left side of the display or vice versa when the actuator is moved from one end position to the other end position, align the flat part of the shaft so that it is in the detection zone over the complete path ➔ 6.1 Mounting CMSX-P-S-... on drive.
2. Continue commissioning with automatic initialisation ➔ 8.8 Perform initialisation.

8.8 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)

1. Press and hold the "Add" and "Set" pushbuttons for 3 seconds.
   The initialisation may take several minutes depending on the drive. During initialisation the display shows ‘running’.
   - After successful completion of the initialisation, the display shows ‘success’.
     If an error message is displayed (‘fail’), the initialisation has failed. Clear the causes of errors (➔ 10 Malfunctions) and restart automatic initialisation.
2. Go to the base menu level and start the positioner in operation ➔ 8.6 Commissioning positioner.

8.9 Completing commissioning

1. Position housing cover. Make sure that the seal is positioned correctly.
2. Tighten 4 housing screws.
   – Tightening torque: 1.5 Nm

9 Operation

- Observe the operating conditions.
- Observe limit values.

After the supply voltage is switched on, the positioner is in the same operating status and the same operating mode that was valid before the supply voltage was switched off.

10 Malfunctions

Fault description	Cause	Remedy
Error in positioning	Initialisation was not performed	Perform initialisation ➔ 8.8 Perform initialisation
	Solenoid valves of the positioner defective	Replace device.
	mechanical connection between positioner and drive defective	Restore mechanical connection ➔ 6 Assembly. If necessary, tighten coupling. Replace faulty coupling.
	Failure of compressed air supply	Establish compressed air supply ➔ 7.1 Pneumatic installation.
	unstable compressed air supply	Minimise pressure fluctuations.
Drive tends to overshoot or permanent oscillation	Controller parameters set incorrectly	Correct setting ➔ 8.4.2 Overview of parameters - 2 PARA
	Especially for smaller drives: too high a flow rate in the working lines of the positioner results in excessive positioning speed at the drive	Install flow control valves in the working lines of the positioner.
	With double-acting drives: setpoint position mode for defining the response when the setpoint position is reached was incorrectly set	➔ 8.4.1.3 TP-Mod - setpoint position mode
Drive does not move to the correct position if there is an operating voltage failure	Tubing connection between positioner and drive defective	Correct tubing connection between positioner and drive.
Device does not react to analogue setpoint specification	Type of analogue input incorrectly set	Correct type of analogue input (AI type) ➔ 8.4.3 Parameter overview - 3 IN/OUT
	Manual setpoint position mode (ManVent or ManTPos) is active	Activate automatic mode ➔ 8.3 Base menu
	Setpoint input defective	Check setpoint value. Replace device.

Fault description	Cause	Remedy
Device does not react to analogue setpoint specification	Device not initialised	Perform initialisation ➔ 8.8 Perform initialisation.
Drive travels to an end position, even though another setpoint value is specified	Safety setting active or digital input active	Deactivate digital input (DI-FCT) ➔ 8.4.3 Parameter overview - 3 IN/OUT. Check the electrical connection (setpoint specification within the permissible range).
'ERROR' display in the views of the basic menu level	Setpoint signal at the analogue input outside the valid range	Check analogue input signal.
'NO INIT' display in the views of the basic menu level	Initialisation was not performed or was unsuccessful	Perform initialisation ➔ 8.8 Perform initialisation.

Tab. 46

11 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-...

1. Switch off compressed air.
2. Activate in the manual operation base menu: 'ManVent'.
3. Move drive until the working ports are completely exhausted.
4. Switch off power supply.
5. Unscrew housing screws and remove the housing cover.
6. Disconnect electrical and pneumatic connections.
7. Unscrew 4 retaining screws and remove the positioner with the mounting adapter.

12 Technical data

12.1 General data

General data	
Design	digital, electro-pneumatic positioner
Mounting position	any
Type of mounting	with accessories

General data		
Mode of operation of displacement encoder		Potentiometer
Sensing range	[°]	0 ... 100
Status indicator		LCD, backlight 7-segment display
Setting options		Via display and buttons
Deadband size	[%]	0.5 ... 10
Mode of operation		
CMSX-P-...-C-U-F1-S-...		single-acting
CMSX-P-...-C-U-F1-D-...		double-acting
Design features		
CMSX-P-...-C-U-F1-S-...-A		Fail-safe position – pneumatic output 4 exhausted
CMSX-P-S-C-U-F1-D-...-A		Fail-safe position – pneumatic output 4 exhausted, pneumatic outlet 2 pressurised
CMSX-P-...-C-U-F1-...-C		Fail-safe position - pneumatic outputs closed

Tab. 47: General data

12.2 Pneumatic data

Pneumatic data		
Operating pressure	[bar]	3 ... 8
Operating medium		Compressed air to ISO 8573-1:2010 [7:4:4]
Information on the operating medium		lubricated operation not possible
Pneumatic port		G1/8
Standard nominal flow rate		
CMSX-...-50	[l/min]	50
CMSX-...-130	[l/min]	130

Tab. 48: Pneumatic data

12.3 Electrical data

Electrical		
Nominal operating voltage	[V]	24
Operating voltage range DC	[V]	21.6 ... 26.4
max. current consumption	[mA]	600

Electrical		
Reverse polarity protection		for operating voltage connection
Connection resistance	[kΩ]	‹ 80 for external potentiometer with CMSX-P-SE-...

Tab. 49: Electrical

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

Tab. 50: Analogue input

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

Tab. 51: Analogue output

Digital input	
Input characteristics	as per IEC 61131-2, type 3
Switching input	PNP (positive switching) NPN (negative switching)

Digital input		
Reverse polarity protection		yes
Electrical isolation		yes, optocoupler

Tab. 52: Digital input

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

Tab. 53: Digital output

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/cores		14
Tightening torque	[Nm]	‹ 0.6
Conductor cross section	[mm²]	‹ 1.5
Cable fitting		M20 x 1.5
Approved cable diameter	[mm]	7 ... 13
Max. cable length	[m]	30
Electrical connection 2 (for CMSX-P-SE-CU-F1-...)		
Function		Connection of external path/angle sensor
Connection type		Terminal strip

Electrical connection		
Connection technology		Screw terminal
Number of pins/cores		3
Cable fitting		M12 x 1.5
Approved cable diameter	[mm]	3 … 6.5
Max. cable length	[m]	3

Tab. 54: Electrical connection

12.4 Ambient conditions

Ambient conditions		
Ambient temperature	[°C]	–5 … +60
Storage temperature	[°C]	–20 … +60
Relative humidity	[%]	5 … 95, non-condensing
Degree of protection		IP65
Shock resistance		Shock test SL1 in accordance with FN/EN in accordance with EN 60068-2-29
Vibration resistance		Transport check and operational test SL2 in accordance with FN/EN in accordance with EN 60068-2-6
Pollution degree		3
Certification		RCM mark

Tab. 55: Ambient conditions

12.5 Materials

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

Materials	
Cable fitting	PA
Blanking plug	PA

Tab. 56: Materials

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