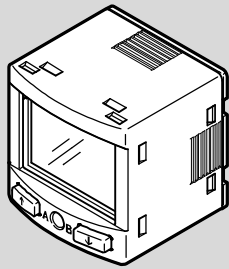


Signal converter SCDN



FESTO

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Operating instructions

8035575
2017-11a
[8035577]

Original: de



Signal converter SCDN **English**

1 Product description

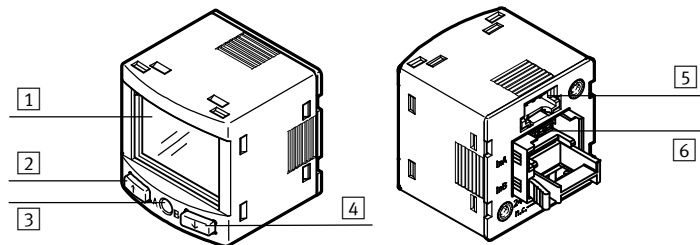
The operating instructions describe the entire function range. The function range is limited, depending on the product variant.



Note

You can find detailed specifications for the product, the device description file (IODD) with a description of the IO-Link® parameters and the declaration of conformity at: → www.festo.com/sp www.festo.com.

1.1 Overview



- 1 Display
- 2 A key
- 3 Edit button

- 4 B key
- 5 Output L1
- 6 Inputs EC

Fig. 1

1.2 Characteristics

Feature	Code	Type
Signal converter	SCDN	
Electrical input	-2 V -2 A	2 x 0 ... 10 V 2 x 0 ... 20 mA
Electrical connection, input	-EC	EC socket
Number of pins, input	4	4-pin
Electrical output	-PNLK	PNP or NPN or IO-Link®
Electrical connection	-L1	Plug connector, design L1

2 Safety

Intended use

The intended use of the signal converter SCDN is to monitor analogue current signals (SCDN-2A) or voltage signals (SCDN-2V).

General safety instructions

- Only use the product in its original condition, without any unauthorised modifications.
- Only use the product if it is in an excellent technical condition.
- The product is intended for use in industrial environments. Measures may need to be implemented in residential areas for radio interference suppression.
- Take the ambient conditions into consideration at the location of use.
- Observe the specifications on the rating plate.
- Comply with all applicable national and international regulations.

Disposal

- Observe the local specifications for environmentally friendly disposal.

Range of applications and certifications

In connection with the UL marking on the product, the information of this section is also applicable for compliance with the certification conditions of Underwriters Laboratories Inc. (UL) for the U.S.A. and Canada.

UL approval information

Product category code	QUYX (USA) QUYX7 (Canada)
File number	E322346
Considered standards	UL 61010-1 C22.2 No. 61010-1
UL mark	US LISTED

Fig. 2

Unit shall be supplied by a power source which complies with the requirements of a limited-energy circuit in accordance with IEC/EN/UL/CSA 61010-1 or a Limited Power Source (LPS) in accordance with IEC/EN/UL/CSA 60950-1 or IEC/EN/UL/CSA 62368-1 or a Class 2 circuit in accordance with NEC or CEC.

3 Function and application

The signal converter converts analogue signals into digital switching signals. Interfacing to the higher-level system is provided by 1 or 2 switching outputs, an optional analogue output and an optional IO-Link® interface. The switching output can be configured to monitor a threshold value, signal range or signal change. The outputs can be set as PNP or NPN and normally open (NO) or normally closed (NC). Via the IO-Link® interface, process values can be read out and parameters changed and transmitted to additional devices.

3.1 Operating statuses

Operating status	Function
RUN mode	- Basic status after the operating voltage is switched on - Display of the current measured value
SHOW mode	- Display of the current settings
EDIT mode	- Setting or modification of parameters
TEACH mode	- Acceptance of the current measured value to determine switching points

Fig. 3

3.2 Switching functions

Volume recording

e.g., pressure transmitter, vacuum transmitter, flow transmitter

Threshold value comparator Γ / (one-sided hysteresis on the left)

Function	NO (normally open)	NC (normally closed)
Switching function: - 1 switching point (SP1)		
TEACH mode: - 2 teach-in points (TP1, TP2) - $SP1 = \frac{1}{2} (TP1 + TP2)$		

Fig. 4

Window comparator $\Gamma \Gamma$ / (one-sided hysteresis on the left)

Function	NO (normally open)	NC (normally closed)
Switching function: - 2 switching points (SP1, SP2)		
TEACH mode ¹⁾ : - 2 teach-in points (TP1, TP2) - $TP1 = SP1, TP2 = SP2$		

1) SP1 = smaller signal value, SP2 = larger signal value, independent of the teach-in sequence

Fig. 5

Object detection

e.g., inductive sensors with analogue output, distance sensors

Threshold value comparator $\overline{\square}$ (one-sided hysteresis on the right)

Function	NO (normally open)	NC (normally closed)
Switching function: - 1 switching point (SP1)		
TEACH mode: - 2 teach-in points (TP1, TP2) - $SP1 = \frac{1}{2}(TP1+TP2)$		

Fig. 6

Window comparator $\overline{\square}$ (one-sided hysteresis on the right)

Function	NO (normally open)	NC (normally closed)
Switching function: - 2 switching points (SP1, SP2)		
TEACH mode ¹ : - 2 teach-in points (TP1, TP2) - $TP1 = SP1, TP2 = SP2$		

1) $SP1 =$ smaller signal value, $SP2 =$ larger signal value, independent of the teach-in sequence

Fig. 7

Position sensing

e.g., position transmitter for pneumatic cylinder

Threshold value comparator \square X (hysteresis on both sides)

Function	NO (normally open)	NC (normally closed)
Switching function: - 1 switching point (SP1)		
TEACH mode: - 2 teach-in points (TP1, TP2) - $SP1 = \frac{1}{2}(TP1+TP2)$		

Fig. 8

Position sensing window comparator \square X (hysteresis on both sides)

Function	NO (normally open)	NC (normally closed)
Switching function: - 2 switching points (SP1, SP2)		
TEACH mode ¹ : - 2 teach-in points (TP1, TP2) - $TP1 = SP1, TP2 = SP2$		

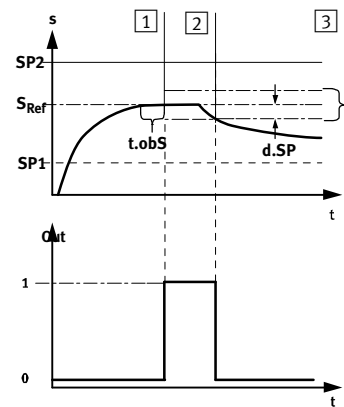
1) $SP1 =$ smaller signal value, $SP2 =$ larger signal value, independent of the teach-in sequence

Fig. 9

Auto difference monitoring $d \square$

This function permits monitoring of a signal value for constancy.

If the applied signal is constant in the range between [SP1] and [SP2], the reference signal S_{Ref} is automatically determined. The result is a switching operation at the output and signals the start of the signal monitoring procedure. If the signal remains in the monitoring range [d.SP] around S_{Ref} , the signal is stable. When the monitoring range is left (e.g. caused by a signal drift), the output switches back.



- 1) Reference value is determined
- 2) Measured value deviates by [d.SP] from the reference value
- 3) Monitoring area

Fig. 10 Signal curve in case of auto difference monitoring

The parameters [SP1], [SP2], [t.obS] and [d.SP] can be configured by the user. The greater [t.obS] is set, the more constant the signal must be to establish the reference value S_{Ref} .

Function	NO (normally open)	NC (normally closed)
Switching function: - 2 switching points (SP1, SP2) for setting the valid work range - 1 switching point (d.SP) for determination of the monitoring area		
TEACH mode ¹ : - 2 teach-in points (TP1, TP2) - $TP1 = SP1, TP2 = SP2$		

1) $SP1 =$ smaller signal value, $SP2 =$ larger signal value, independent of the teach-in sequence

Fig. 11

3.3 Scaling of the analogue inputs [In.Lo] and [In.Hi] (see Menu \rightarrow Fig. 26)

Both analogue inputs of the SCDN can record a maximum of 0...10 V (voltage variant SCDN-2V..) and/or 0...20 mA (current variant SCDN-2A...). If the entire voltage/current range is not used, the analogue inputs must be scaled to the actual signal range of the connected transmitter (e.g., 4...20 mA or 1...5 V). The difference between [In.Lo] and [In.Hi] cannot be set less than 2.5 V and/or 5 mA.

3.4 Scaling of the measured value indicator [MV.di] (see Menu \rightarrow Fig. 26)

The measured values recorded at the analogue input are shown on the display in RUN mode. 4 standard ranges can be selected or a customer-specific configuration can be made.

In case of a customer-specific setting of the measured value indicator (x...xx), the following parameters must be set: [Unit], [dec/Pt], [MV.Lo], [MV.Hi]

[MV.Lo] can be larger than [MV.Hi]. This results in a negative characteristic curve, e.g., for vacuum sensors. The difference between [MV.Lo] and [MV.Hi] cannot be set to be less than 100 display steps, e.g., in case of a vacuum transmitter: [MV.Lo] = 0.000; [MV.Hi] = -1.000; i.e., 1000 display steps.

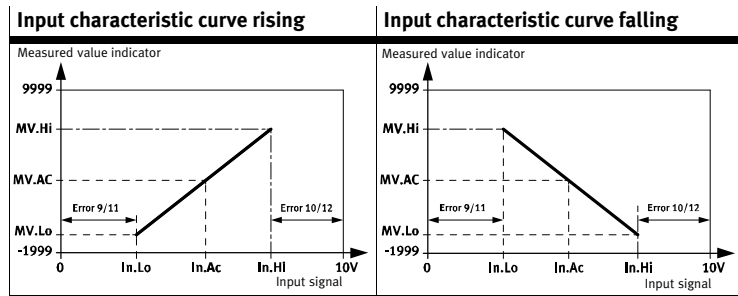


Fig. 12 Input characteristic curve SCDN-2V

3.5 Hiding of the zero range [blind] (see Menu \rightarrow Fig. 26)

In case of active zero range hiding, the measured value is hidden within the set range in the display (display value = 0). The display of the offset errors of the transmitter can be suppressed in this way. The settable range lies between $\pm 0.5\%$ and $\pm 5\%$ FS.

4 Installation



Note

Installation and commissioning is to be carried out only by qualified personnel.

- Remove all transport packaging. The material used in the packaging has been specifically chosen for its recyclability.

4.1 Mechanical



Note

An unfavourable mounting position can impair the function of the product.

- Install the signal converter so that it cannot be heated above the maximum permissible operating temperature (plan for convection possibilities).

Wall mounting

SAMH-PN-

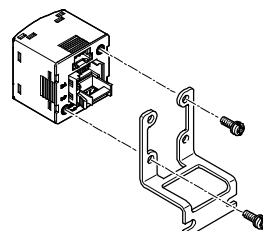


Fig. 13

Mounting bracket

SAMH-PU-A

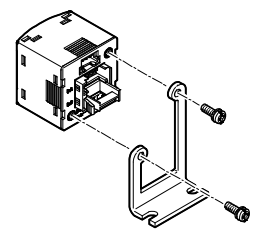


Fig. 14

Front panel insert SAMH-PN-F

- Size of the front panel cut-out in mm → Fig. 15.
- Fasten the panel frame on the signal converter.
- Guide the signal converter from the front into the cut-out on the front panel.
- Push on the clamping element and press until it catches.

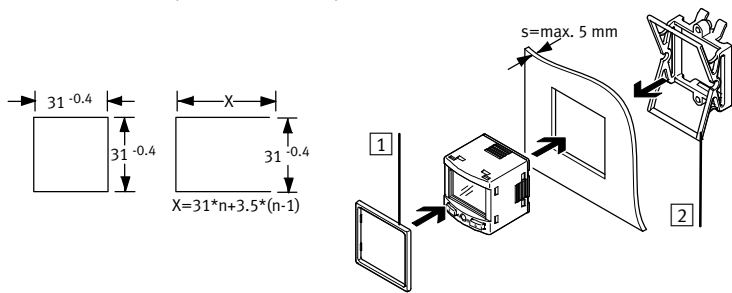


Fig. 15

1) Panel frame
2) Clamping element
Fig. 16

4.2 Electrical system



Warning

Use only power sources which guarantee reliable electrical isolation of the operating voltage in accordance with IEC/EN 60204-1. Consider also the general requirements for PELV circuits in accordance with IEC/EN 60204-1.

- Connect the signal converter.
- Consider the maximum permissible line length: 30 m (20 m for IO-Link®).

Pin	Colour ¹⁾	Allocation	Plug connector L1J
1	Brown (BN)	Operating voltage +24 V DC	
2	Black (BK)	Electrical output OutA or IO-Link® (C/Q line)	
3	White (WH)	Electrical output 2 OutB	
4	Blue (BU)	0 V DC	

1) Colours apply for connecting cables NEBS-L1...

Fig. 17

Pin	Ink	Allocation	EC socket
1	-	Operating voltage for the connected signal converter +24 V DC	
2	-	NC	
3	-	0 V DC	
4	-	Analogue input	

Fig. 18

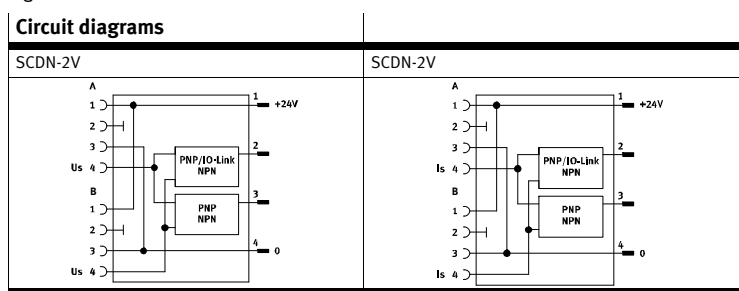
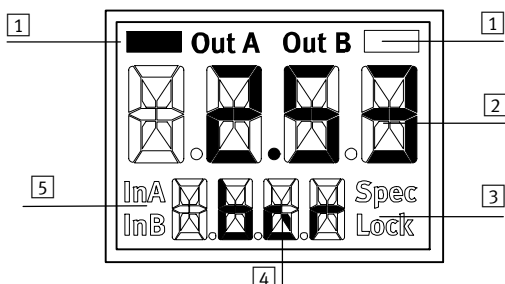


Fig. 19

Fig. 20

5 Commissioning

5.1 LCD display



- 1) Output display
2) Main display (e.g. measured value)
3) Status information
4) Lower display (e.g. unit)
5) Signal indicator

Fig. 21

Example for LCD display	Significance
Output display	
[OutA]	Switching output OutA selected (flashes with active IO-Link®)
█ [OutA]	Switching output OutA set
[OutB]	Switching output OutB selected
[OutB] █	Switching output OutB set
Status information / signal indicator	
[Lock]	Security code activated (→ Chap. 5.5)
[Spec]	Special menu selected
[InA]	Analogue signal InA is selected
	Graphic bar graph in the lower display [Sub.d]

Fig. 22

Example for LCD display	Meaning	
Main display	Lower display	
Measured value indicator and unit in the RUN mode		
[- 0.53]	[bar]	Measured value indicator (here: negative value) and unit
Menu for the switching outputs (OutA and OutB)		
[Edit]	[bin]	OutA/OutB: Edit menu for the switching outputs (binary)
INPt	[SIGN]	Zuordnung des Eingangssignals (InA/InB) zum jeweiligen Schaltausgang
_T /	[Fctn]	Threshold value comparator for volume recording
T\	[Fctn]	Window comparator for object recording
d_T_	[Fctn]	Auto difference monitoring
[1.80]	[SP1]	Value of (lower) switching point
[6.45]	[SP2]	Value of upper switching point
[0.50]	[HY]	Hysteresis value
[18]	[t.obS] / [MSEC]	Time interval for determination of the signal change, which is used to establish the reference value.
[0.25]	[d.SP]	Threshold value for determining the monitoring area
[NO]	[LOGC]	Switching characteristics: [NO] = normally open contact, [NC] = normally closed contact
[bLUE]	[COLR]	Display colour: [bLUE] = Blue, colour change function deactivated [R.ON] = Red, if switching output set [R.OFF] = Red, if switching output not set Note: Independent of the settings [COLR], the red colour change appears with some malfunctions.

Extreme values (only SHOW mode)

[1.64]	[MIN]	Minimum measured value since switch-on or the last reset
[8.50]	[MAX]	Maximum measured value since switch-on or the last reset

Menu for the analogue inputs InA and InB, as well as the measured value indicator MV

[Edit]	[SIGN]	InA/InB: Edit menu for the analogue input and measured value indicator
[1]	[In.Lo] / [V]	Scaling of the analogue input to the start value of the signal measuring range in V or mA
[5]	[In.Hi] / [V]	Scaling of the analogue input to the end value of the signal measuring range in V or mA
[0...-1]	[MV.di] / [bar]	Measuring range of the connected sensor transmitter
[bar]	[Unit]	Display unit
[x.xx]	[dec]/[Pt]	Position of the decimal point of the measured value indicator
[-5.00]	[MV.Lo]/[mm]	Display value for the start value of the input signal
[5.00]	[MV.Hi]/[mm]	Display value for the end value of the input signal
[1.00]	[blind]/[%]	Value of zero range hiding (in % FS)
[16]	[Filt] / [MSEC]	Value of the filter time constant for the measurement signal

Menu for device settings (Spec)

[Edit]	[MENU]	Spec: Edit menu for additional settings
[Unit]	[Sub.d]	Settings of the lower display in RUN mode: Gewählte Einheit oder Schaltpunkt von OutA oder Balkenanzeige oder zweiter Messwert (InA/InB)
[40]	[Eco] / [SEC]	Economy mode: period after which the display background lighting is switched off
[PNP]	[bin] / [Out]	Shift of the switching outputs (binary) between PNP and NPN
[OFF]	[Code]	Activation and determination of the security code
[OFF]	[MASt]	Activation of the IO-Link® master function for replication of parameters

Fig. 23

5.2 Switch on signal converter (RUN mode)

- Switch on the operating voltage.
 - The signal converter is in the basic state (RUN mode).
 - The signals active at the outputs are displayed.

The basic status can be reached from other modes by:

- Pressing edit button for 3 seconds
- Expiration of a monitoring time (timeout)

5.3 Switch over measured value indicator

- The measured value indicator is switched over by pressing button B on InB and/or button A on InA.

5.4 Displaying parameters (SHOW mode)

Requirement: The signal converter is ready for operation (RUN mode).

OutA

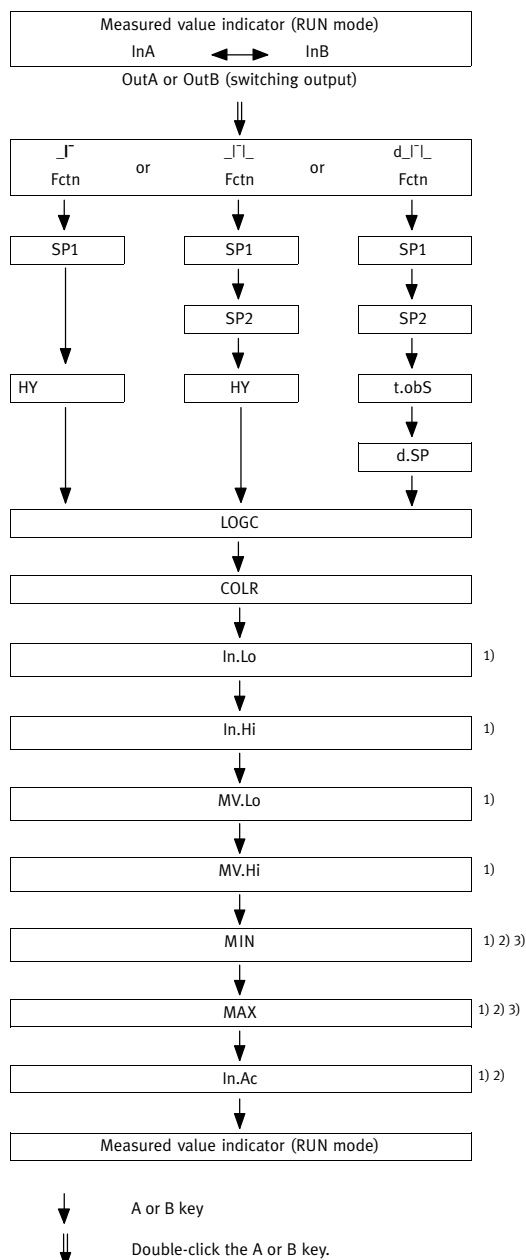
- Press the A key twice.
 - The first parameter set is displayed. [Fctn] flashes.

The subsequent parameters can be displayed by repeatedly pressing the A key (→ Fig. 24).

- At the end, the parameters of the input assigned to the output, the Min/Max values and the actual current or voltage value at the input are displayed. The Min/Max values can be reset by pressing the Edit button.

OutB

Approach for OutB with B key according to OutA



- The parameters are displayed for the input (InA, InB), which is assigned to the selected switching output (OutA, OutB). The corresponding input symbol (InA or InB) then lights up.
- Display without timeout
- Reset with Edit button

Fig. 24

5.5 Enter the security code (EDIT mode)

Requirement: The signal converter is ready for operation (RUN mode).

- Press the Edit button.
 - The EDIT mode is active. If the security code is activated, the parameter entry option is blocked: [Lock] flashes.
- Enter security code set with A or B key.
- Press the Edit button briefly.
 - [OutA] flashes. The parameter entry option is unblocked.

5.6 Configuring switching output (EDIT mode)



Note

The process is the same for configuring the switching outputs for [OutA] and [OutB]. Menu structure → Fig. 26.

Requirement: The signal converter is ready for operation (RUN mode).

- Press the Edit button briefly.
 - [Edit] appears. [OutA] flashes.
- Press the Edit button briefly.
 - [Fctn] flashes.
- Select the switching function for the A or B key.
- Press the Edit button briefly.
 - The set value is saved.
 - The next adjustable parameter is shown.
- Set parameters with A or B key.
- Repeat points 4 and 5 until all parameters are set.
 - Switching functions → Chapter 3.2

5.7 Setting the analogue input and measured value indicator (EDIT mode)



Note

The process is the same for configuring the switching outputs for [InA] and [InB]. Menu structure → Fig. 26.

Requirement: The signal converter is ready for operation (RUN mode).

- Press the Edit button briefly.
 - [Edit] appears. [OutA] flashes.
- Select [InA] and/or [InB] with the A or B key.
 - [InA] and/or [InB] flashes.
- Press the Edit button briefly.
 - [In.Lo] flashes.
- Set parameters with A or B key.
- Press the Edit button briefly.
 - The set value is saved.
 - The next adjustable parameter is shown.
- Repeat points 4 and 5 until all parameters are set.

5.8 Change device settings (EDIT mode)

Requirement: The signal converter is ready for operation (RUN mode).

- Press the Edit button briefly.
 - [Edit] appears. [OutA] flashes.
- With A or B key, select special menu [Spec].
 - [Spec] flashes.
- Press the Edit button briefly.
 - [Sub.b] flashes.
- Set parameters with A or B key.
- Press the Edit button briefly.
 - The set value is saved.
 - The next adjustable parameter is shown.
- Repeat points 4 and 5 until all parameters are set.

5.9 Replicating parameters (EDIT mode)

Prerequisite:

- The pre-configured signal converter (master signal converter) is ready for operation (RUN mode).
- The master signal converter and device signal converter have the same design (same device ID).
- The master signal converter is connected to the device signal converter (→ Fig. 25).
- Parameterisation of the device signal converter must not be blocked via IO-Link®.
- The device signal converter is in an unswitched state (switching output PNP, OutA is not switched).

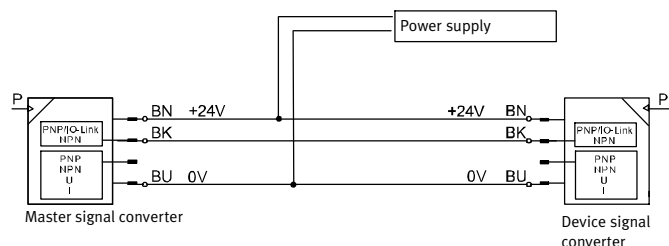


Fig. 25

1. Select special menu [Spec] at the master signal converter using the device settings.
2. Press the Edit button briefly until [MASt] appears.
3. With A or B key, select [ON].
4. Press the Edit button
→ [REPL] / [RedY] appears.
5. Press A or B key.
→ [REPL] / [RUN] appears briefly.
→ The parameters are transmitted to the device signal converter.
→ [REPL] / [RedY] appears.
If an error occurs, an error message appears (→ Fig. 27).

6. Repeat point 5 if an additional signal converter should be parameterised.
7. Press the Edit button briefly.
→ Switch to the RUN mode.

5.10 Menu structure (EDIT mode)

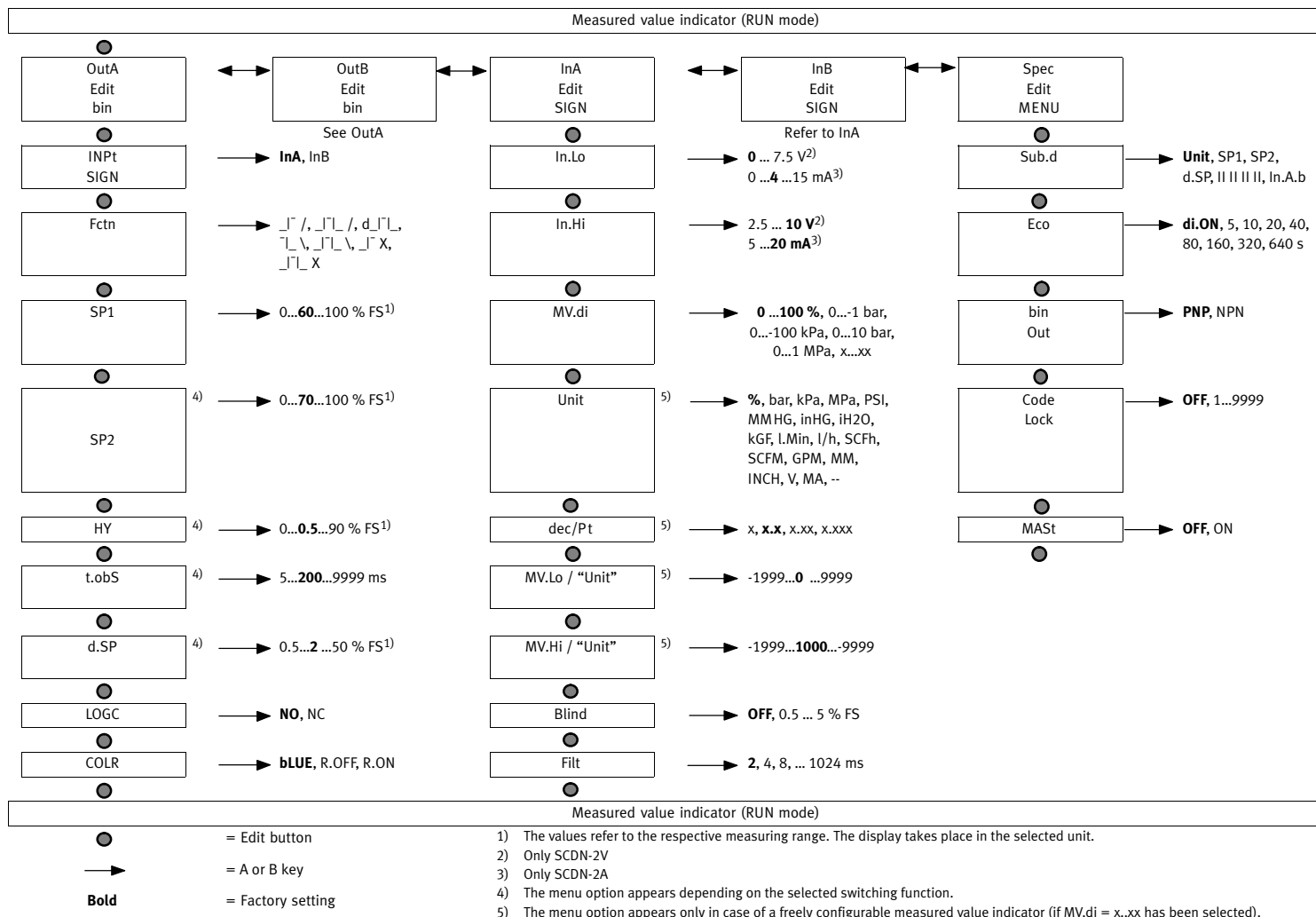


Fig. 26

5.11 Teach switching points (TEACH mode)



Note

The process for teach-in is the same for configuring the switching outputs for OutA and OutB. In the following, the process is described using the switching output OutA. The switching output is always taught to the assigned input. The factory setting for [OutA] and [OutB] is [InA].

Requirement: The signal converter is ready for operation (RUN mode).

If the security code is activated, the parameter entry option is blocked: [Lock] flashes.

- Enter the security code (→ Chap. 5.5).

1. Establish switching function in the EDIT mode (→ Chap. 5.6).

2. Apply signal value 1.

3. Press the A key and Edit button.

→ The current signal value will then be adopted as the first teach-in point (TP1).

→ [t-IN] flashes.

4. Apply signal value 2.

5. Press the A key and Edit button.

→ The current signal value will then be adopted as the first teach-in point (TP2).

→ Switch to the RUN mode.

There is no timeout in the TEACH mode. The signal converter switched to the RUN mode only after the entire teach-in process is ended.

6 Operation

Restoring factory settings (restore)



Note

By restoring the factory settings, the current settings are lost.

1. Switch off the operating voltage.

2. Keep the A and B keys pressed down simultaneously.

3. Switch on the operating voltage.

4. Additionally press the Edit button.

→ [Rsto PARM] appears. All parameters are reset to the factory settings (→ Fig. 26).

7 Maintenance and care

1. Turn off the energy source.

2. Clean the signal converter with non-abrasive cleaning agents.

8 Disassembly

1. Turn off the energy source.
2. Disconnect the ports from the signal converter.
3. Loosen the mountings.

9 Fault clearance

Malfunction	Possible cause	Remedy
No display	No operating voltage or impermissible operating voltage	• Apply permissible operating voltage
	Electrical connections swapped	• Connect the device in accordance with the circuit diagram
	Device defective	• Replace device
Indicator or switching output does not react in accordance with the settings	Short circuit or overload at the output	• Eliminate short circuit or overload
	Incorrect switching point taught (e.g. at 0 bar)	• Repeat teaching procedure
	Device defective	• Replace device
	Parameter incorrect	• Reset to factory settings
[Er01] / [FAIL] ¹⁾	Device defective	• Replace device
[Er02] / [ASIC] ¹⁾	Device defective	• Replace device
[Er09] / [UndR] ²⁾	Measuring range InA undershot	• Comply with the measuring range
[Er10] / [OVER] ²⁾	Measuring range InA exceeded	• Comply with the measuring range
[Er11] / [UndR] ²⁾	Measuring range InB undershot	• Comply with the measuring range
[Er12] / [OVER] ²⁾	Measuring range InB exceeded	• Comply with the measuring range
[Er20] / [tEMP] ³⁾	Switch driver temperature error	• Check operating conditions • Replace device
[Er21] / [SHRt] ³⁾	Short circuit at OutA	• Eliminate short circuit
[Er22] / [SHRt] ³⁾	Short circuit at OutB	• Eliminate short circuit
[Err] / [bUSY]	OutA is switched active	• Check device settings
[Err] / [Id]	Device ID error, Geräte unterschiedlicher Typen verwenden	• When replicating, use signal converters with the same type (same device ID)
[Err] / [COMM]	IO-Link® communication error	• Check the line of OutA • Check the settings of the device signal converter

1) Display flashes red

2) The error is triggered when the signal input is assigned to the switching output

3) Display illuminated red

Fig. 27

10 Accessories

Accessories: → www.festo.com/catalogue

11 Technical data

SCDN-	2 V	2 A
General remarks		
Approval certificate	c UL us – Listed (OL) RCM	
CE marking (→ Declaration of conformity)	According to EU-EMV-RL ¹⁾	
Note on materials	RoHS compliant	
Input signal/measuring element		
Measured variable	Voltage	Current
Input type	Against GND	
Signal range	[V] [mA]	0 ... 10 – 0 ... 20
Input impedance	[Ω]	80000 250
Ambient temperature	[°C]	0 ... +50
Max. permissible relative humidity	[% RH]	85
Max. current consumption	[mA]	220
Output, general		
Accuracy	[% FS]	±0.5
Repetition accuracy	[% FS]	±0.2
Switching output		
Switch-on/switch-off time	[ms]	Typ. 1, max. 2
Max. output current	[mA]	100
Capacitive load maximum DC	[nF]	100
Voltage drop	[V]	Max. 2.2
Pull-down/pull-up resistor		PNP: integrated NPN: not integrated
Inductive protective circuit		Yes
Short circuit protection		Yes
Overload protection		Yes
Electronics		
Operating voltage range DC	[V]	15... 30
Idle current	[mA]	Max. 20
Ready-state delay	[ms]	Typically 80
Reverse polarity protection		All connections
Mechanical safety		
Housing material		PA reinforced
Keypad material		TPE-O
Display/operation		
Threshold value setting range	[% FS]	0 ... 100 (recommended range 1 ... 99)

SCDN-	2 V	2 A
Immissions/emissions		
Storage temperature	[°C]	-20 ... +80
Degree of protection (in accordance with EN 60529)		IP40
Protection class (in accordance with DIN VDE 0106-1)		III
Shock resistance (in accordance with EN 60068-2)		30 g acceleration with 11 ms duration (half-sine)
Vibration resistance (in accordance with EN 60068-2)		10 ... 60 Hz: 0.35 mm / 60 ... 150 Hz: 5 g

1) The SCDN is protected against electrostatic discharge according to DIN EN 61000-4-2:2009-12. During the discharge of the charge, a maximum signal influence of 4 % FS can occur.

Fig. 28

UL Electrical and environmental ratings

Input voltage	max. 30 V DC, Class 2
Input current	max. 0.22 A
Power	max. 6.6 W
Ambient temperature	max. 50 °C / 122 °F
Pollution degree	3
Humidity range	85 %
Only for indoor use.	
Altitude up to 2000 m. Altitude up to 2000 m or above 2000 m if specified by the manufacturer.	

Fig. 29

IO-Link®

Protocol version	Device V1.1
Profiles	Smart sensor profile
Function classes	Binary data channel (BDC) Process data variable (PDV) Identification Diagnostics Teach channel
Communication mode	COM2 (38.4 kBaud)
Port class	0
Process data length IN	5 byte
Process data content IN	2 bit BDC (measured value monitoring) 14 bit PDV (measured value InA) 14 bit PDV (measured value InB)
IODD, IO-Link® device description	→ www.festo.com/sp

Fig. 30