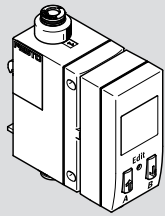# SFAB
Flow sensor

FESTO

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Operating instructions

8156241
2021-05d
[8156243]

1 About this document

1.1 Applicable Documents

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

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.
– Condensation, oil mist, foreign matter and other contaminants in the compressed air can damage the product. Only use media in accordance with the specifications ➜ Technical data.
– This product can generate high frequency malfunctions, which may make it necessary to implement interference suppression measures in residential areas.

2.2 Intended use

The SFAB is designed to monitor changes in the flow rate and air consumption of gaseous media in piping systems or terminals in industry.

2.3 Training of qualified personnel

Work on the product may only be carried out by qualified personnel who can evaluate the work and detect dangers. The qualified personnel have skills and experience in dealing with electropneumatic (open-loop) control technology.

2.4 Range of application and approvals

Certain configurations of the product have been certified by Underwriters Laboratories Inc. (UL) for the USA and Canada. These configurations bear the following mark:

C � US
Fig.1

UL Recognized Component Mark for Canada and the United States. Only for connection to an NEC Class 2 supply. Raccorder Uniquement a un circuit de Classe 2.

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Observe the following if the UL requirements are to be complied with in your application:
• Regulations for complying with the UL certification can be found in the separate UL-specific special documentation. The technical data listed there take priority.
• The technical data in this documentation may show values deviating from this.

3 Additional information

– Contact the regional Festo contact if you have technical problems ➜ www.festo.com.
– Accessories and spare parts ➜ www.festo.com/catalogue.
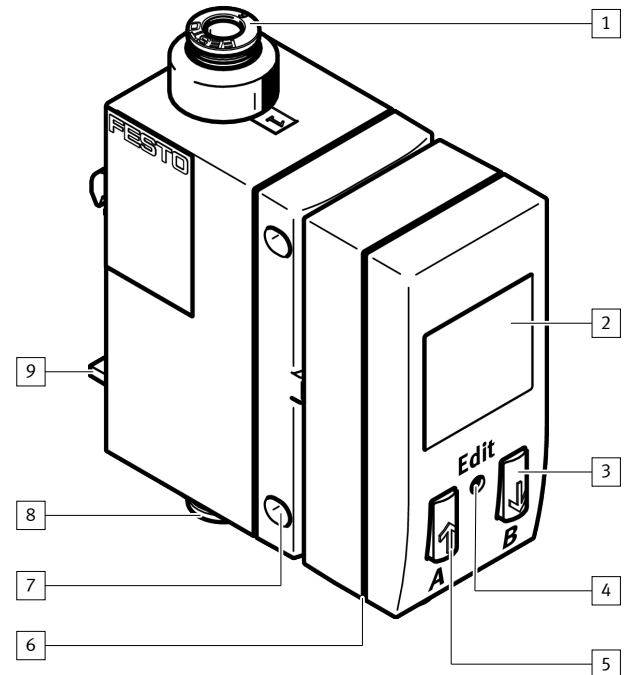
4 Product overview

4.1 Product design

Fig. 2: SFAB

|			
1	Supply port 1	6	Plug for the electrical connection (M12)
2	Display	7	Hole for plate mounting
3	B pushbutton	8	Supply port 2
4	Edit button	9	Mounting slide for H-rail and wall mounting (rear)
5	A pushbutton		

4.2 Functional principle

The SFAB uses a thermal measurement method. Here, the amount of heat drawn from a heated surface of the sensor by the medium flowing past it is calculated. Through the amount of heat removed, the flow rate or accumulated air consumption is determined and shown on the display. The connection to higher-level systems is implemented through 2 binary outputs (Out A/OutB) and one analogue output. Switching points can be defined for both binary outputs. Switching points for both binary outputs are possible for flow rate measurement, a consumption switching pulse for output A (OutA) is possible for cumulative air consumption measurement. The combination of cumulative air consumption measurement (OutA) and flow rate measurement (OutB) is possible. The flow value is output via the analogue output.
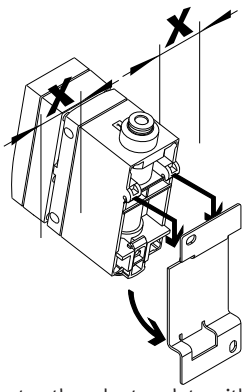
5 Assembly

5.1 H-rail (manifold assembly)

1. Maintain lateral distance x = 10 mm to earthed surfaces.
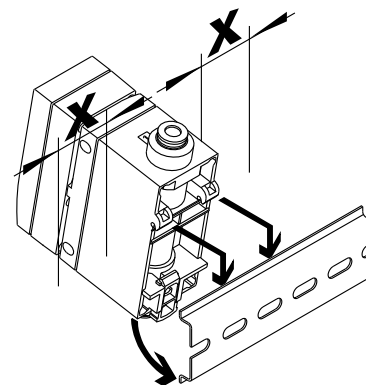
2. Hang SFAB in H-rail.
3. Press SFAB in the direction of the arrow.
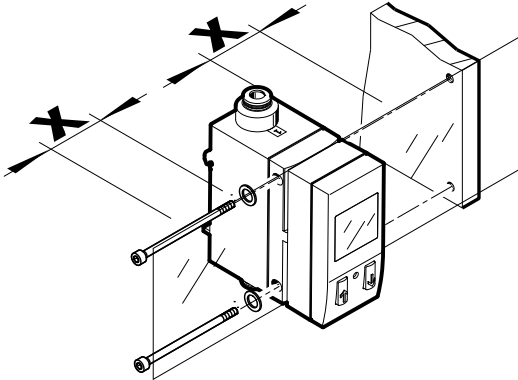   ➭ SFAB snaps into place.

5.2 Wall mounting

1. Maintain lateral distance x = mm to earthed surfaces.

2. Fasten the adapter plate with 2 screws M3.
3. Hang the SFAB in the adapter plate.
4. Press SFAB in the direction of the arrow.
   ↳ SFAB snaps into place.

5.3 Plate mounting

1. Maintain lateral distance x = mm to earthed surfaces.

2. Fasten SFAB with washers and 2 screws M4.
   – Tightening torque: 1 Nm

5.4 Rotate display

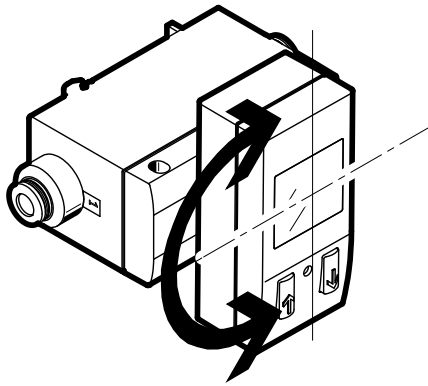The display can be rotated in 90º steps. The turning range is limited to approx. 270º by a stop.

Fig. 3: Rotate display

6 Installation

6.1 Pneumatic installation

- Mount the hoses to port 1 and port 2 (flow direction ➔ marked on the product).

If the tubing is incorrect, the measured values are shown flashing on the display.

6.2 Electrical installation

⚠ WARNING

Risk of injury due to electric shock.
- For the electrical power supply, use only PELV circuits in accordance with IEC 60204-1/EN 60204-1 (Protective Extra-Low Voltage, PELV).
- Observe the general requirements of IEC 60204-1/EN 60204-1 for PELV circuits.
- Only use voltage sources that ensure a reliable electric separation from the mains network in accordance with IEC 60204-1/EN 60204-1.

1. Use signal lines that are shorter than 10 m.
2. Configure binary outputs according to the wiring.
   – Tightening torque for the union nut at the plug: max. 0.5 Nm

Pin	Wire colour[1]	Allocation	Plug
1	Brown (BN)	Operating voltage +24 V DC	M12, 5-pin
2	White (WH)	Binary output B (OutB)	
3	Blue (BU)	0 V	
4	Black (BK)	Binary output A (OutA)	
5	Grey (GY)	Analogue output C	

1) When using the connecting cable from the accessories.
Tab. 1: Pin allocation

Circuit diagrams

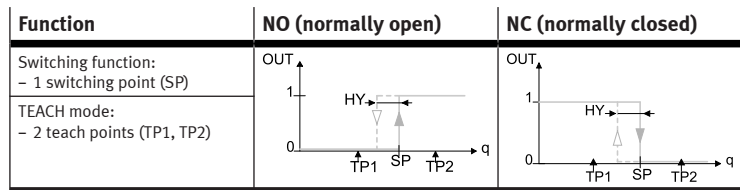| SFAB-...-2SA	SFAB-...-2SV
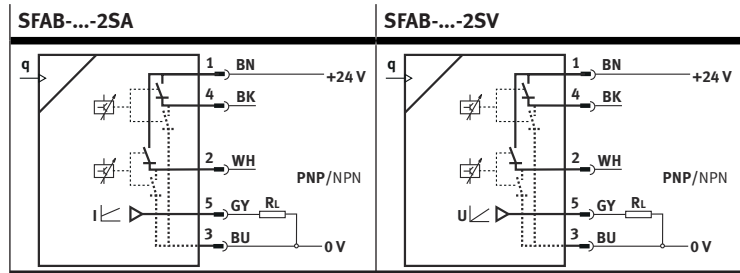
Tab. 2: Circuit diagrams

7 Commissioning

1. Switch on operating voltage.
   ↳ SFAB is in RUN mode.
2. Define the switching behaviour of the binary outputs.
   – For flow measurement [FLW]: switching points [SP] and hysteresis [Hy]
   – For cumulative air consumption measurement [ConS] with OutA only: consumption switching impulse [CI]
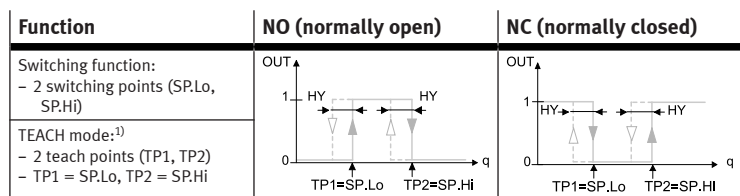
7.1 Switching outputs

7.1.1 Switching functions

7.1.1.1 Threshold value comparator in the flow rate measurement for OutA or OutB

Function	NO (normally open)	NC (normally closed)
Switching function: – 1 switching point (SP) TEACH mode: – 2 teach points (TP1, TP2)		

Tab. 3: Threshold value comparator

7.1.1.2 Window comparator in the flow rate measurement for OutA or OutB

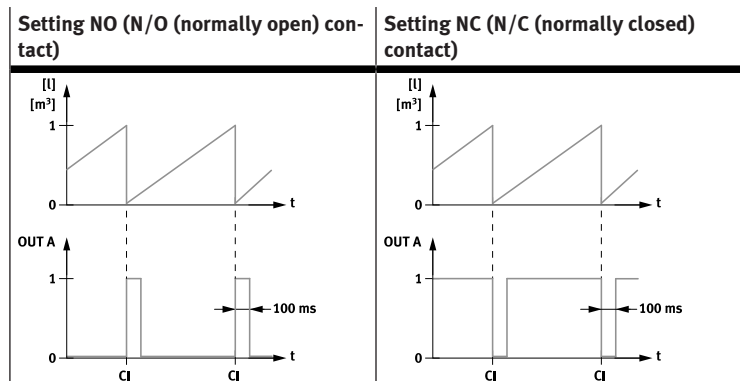| Function	NO (normally open)	NC (normally closed)
Switching function: – 2 switching points (SP.Lo, SP.Hi) TEACH mode:[1] – 2 teach points (TP1, TP2) – TP1 = SP.Lo, TP2 = SP.Hi		

1) SP.Lo = smaller value, SP.Hi = larger value, independent of the teach sequence
Tab. 4: Window comparator

7.1.1.3 Consumption switching pulses [CI] for cumulative air consumption measurement for OutB

A threshold value for air consumption can be set with the consumption switching impulse [CI]. If the set threshold value is reached, a switching impulse is emitted at the output Out A for 100 ms. With each switching impulse, measurement of the air consumption is started again.

Setting NO (N/O (normally open) contact)	Setting NC (N/C (normally closed) contact)

Tab. 5: Consumption switching pulses

7.2 Display components

| Symbol	Description
OutA/OutB	Switching output A/switching output B
Lock	Security code active (blocked against unauthorised programming)
Run	Accumulated air consumption measurement is active in RECORDER mode
Option	Sensor is set to a standard condition that differs from the factory setting
Stop	Air consumption measurement stopped
■ □	Switching output set/not set
⎍	Threshold value comparator
⎍⎍	Window comparator
ConS	Air consumption switching mode (consumption – only for OutA)
CI	Pulse for accumulated air consumption (consumption impulse)
SP	Switching point
SPLo	Lower switching point (switching point - low)
SPHi	Upper switching point (switching point - high)
HY	Hysteresis
no	N/O contact (normally open)
nc	N/C contact (normally closed)
FLW	Switching mode flow rate (flow - only for OutA)
FLo	Minimum flow rate (flow low)
FHi	Maximum flow rate (flow high)
SPEC	Special menu
AnAF	Analogue filter
dIGF	Digital filter
rOn	Display red with switching status ON and/or logic 1
rOFF	Display red with switching status OFF and/or logic 0
PnP	Positive switch output
nPn	Zero switch output
■■■■■□□□□□	Segments are lighted: graphic display of the current measured value related to the maximum measured value of the measuring range
□□■□□□□□□□	Running light (1 segment): air consumption measurement for OutA or RECORDER mode active
□□□■■■□□□□	3 segments flash: hysteresis value is displayed
□□□□□■□□□□	1 segment flashes: – Segment 6: switching point SP or SP.Lo is displayed – Segment 8: switching point SP.Hi is displayed – Segment 1: min. flow rate (F.Lo) is displayed – Segment 10: max. flow rate (F.Hi) is displayed

Tab. 6: Symbols on the display

7.3 Preparing commissioning

The product in basic status is in RUN mode. The current measurement values are displayed. The basic status can be reached from other modes by:
– Pressing Edit button for 3 seconds
– Expiration of monitoring time, timeout
1. Switch on operating voltage.
    ↳ The SFAB is in RUN mode.
2. Check the SFAB settings ➜ 7.6 SHOW mode.

7.4 Symbols for representing the menu structure

Symbol	Description
(Timeout) ⏱→80s	Automatic return to the basic status (RUN mode) when the monitoring time has expired (here 80 seconds)
EDIT(Cancel) ⏱→3s ○	In order to return manually to the basic status (RUN mode), press the EDIT button for 3 seconds.
Flow 1	Generate flow rate (for teaching the measured value - here Flow 1)
⌖ OutB	The symbol on the display flashes (here OutB)
🔒	Security code active (lock - blocked against unauthorised programming)
🔓	Security code inactive (lock)
↑	Press key (here A key).
↑ / ↓	Press A key or B key. SFAB switches to the setting indicated by the arrows.
↑ + ↓	Press A and B keys simultaneously.
↑ +EDIT ○	Press key (here A key) and EDIT button simultaneously.
↑↓ 0.00 A B	Press A key or B key to set the desired value.
SPLo 0.00	Display for a value or switching point. Value can be set.

Symbol	Description
○ EDIT	Press the Edit button.
◇ If	Branching in the menu

Tab. 7

7.5 RUN mode

The following values are displayed in RUN mode:
– Measurement values for the flow rate (in l/min, scfm or l/h)
– Measurement values for air consumption (in m³, scf or l)
– Signal states of the switching outputs OutA, OutB (set, not set)

ℹ️

If the measured value display flashes, one of the following errors has occurred:
• Measured value outside the permissible measuring range
• Incorrect tubing ➜ 6.1 Pneumatic installation

7.6 SHOW mode

In SHOW mode, the current settings for the switching outputs Out A and Out B are displayed.
The SFAB must be in RUN mode.
• To start the SHOW mode for the respective switching output, press the A key (OutA) or B key (OutB).

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If there are errors, the corresponding error numbers are displayed first after pressing the A / B pushbutton.

• To display the settings one by one, press the A/B pushbutton repeatedly.
When all settings have been displayed, the SFAB goes back into RUN mode when the A pushbutton / B pushbutton are pressed again and displays the current measurement value for the corresponding output.
Thus, the SHOW mode can also be used to switch the display, e. g. to switch between the displayed measured values for a combination of air consumption measurement and flow rate measurement.
The following settings will be displayed for outA:
– With flow measurement [FLW]:
    – Switching function [threshold value or window comparator]
    – Switching point [SP], Switching points [SP.Lo] and [SP.Hi]
    – Hysteresis [Hy]
    – Switching element function [no/nc] (N/O contact/N/C contact)
    – Minimum flow rate [F.Lo] (flow low)
    – Maximum flow rate [F.Hi] (flow high)
    To delete the minimum or maximum value, press the EDIT button.
– For air consumption measurement [ConS]:
    – Air consumption switching impulse [CI]
    – Switching element function [no/nc] (N/O contact/N/C contact)
    – Minimum value flow rate [F.Lo]
    – Maximum value flow rate [F.Hi]
    To delete the minimum or maximum value, press the EDIT button.
The following settings will be displayed for OutB:
– Switching function [threshold value or window comparator]
– Switching point [SP], Switching points [SP.Lo] and [SP.Hi]
– Hysteresis [Hy]
– Switching element function [no/nc] (N/O contact/N/C contact)
– Status colour change [bLUE/rON/rOFF]
– Minimum value flow rate [F.Lo]
– Maximum value flow rate [F.Hi]
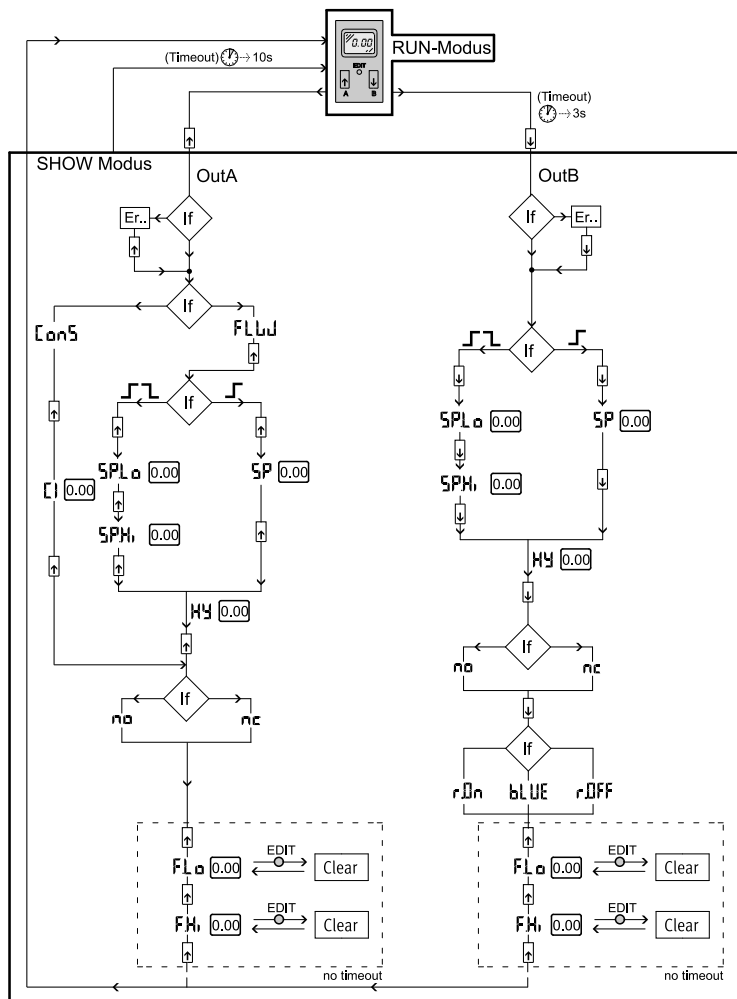   To delete the minimum or maximum value, press the EDIT button.

Fig. 4: Menu structure for SHOW mode

7.7 EDIT mode

The following settings can be made in EDIT mode:
– Switching mode for OutA (air consumption [ConS] or flow rate [FLW])
– Switching function (threshold value or window comparator for OutA and OutB)
– Switching points [SP] for OutA and OutB
– Air consumption switching impulse [CI] only for OutA in switching mode [ConS]
– Hysteresis [Hy] for OutA and OutB
– Switching element function [no/nc] for OutA and OutB
– Colour change of the display from blue to red for flow mode (for OutB)

In addition, the following settings can be made in the special menu:
– Switching of the standard conditions via [Option] (OFF, 1, 2)
– Physical units for flow rate [FLW] (l/h, scfm, l/min)
– Analogue filter [AnA.F]
– Digital filter [dIG.F]
– Physical units for air consumption [ConS] (m3, scf, l)
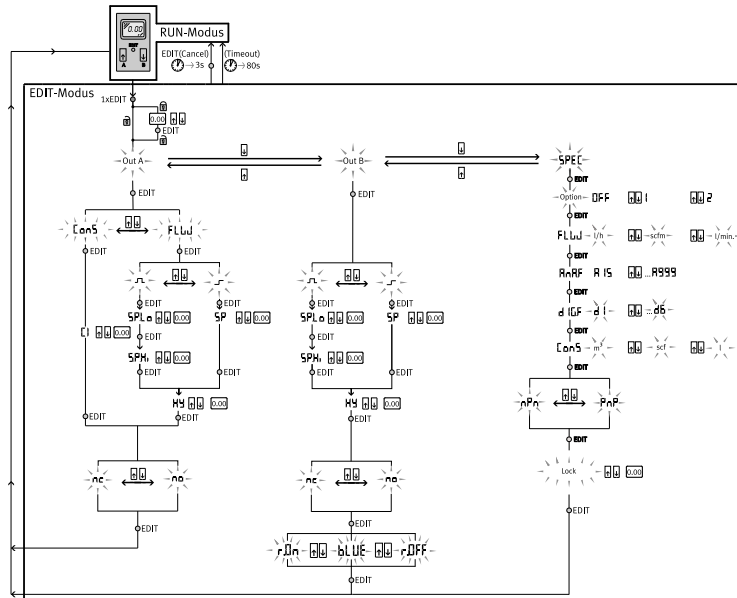– Switching output [nPn/PnP]
– Security code [Lock]

Fig. 5: EDIT mode menu structure

7.7.1 Starting EDIT Mode

⚠ WARNING

Manipulation of signal statuses may cause serious personal injury, depending on the functioning of the machine/system.
• Note that if the switching status of the outputs is modified in EDIT mode, the new status will be effective immediately.

The following settings can be selected with the control buttons (A/B pushbutton):
– Switching output for which the characteristics is to be set
– Special menu
1. Press the Edit button.
   ↳ EDIT mode is active and [OutA] flashes. Lock flashes with active security blocking.
2. Press the A/B pushbuttons until the chosen security code is set.
3. Press the Edit button.
   ↳ EDIT mode is active and [OutA] flashes.

7.7.2 Setting the switching characteristics of the switching outputs

Both switching outputs (OutA/OutB) can be set for flow measurement. Switching output OutA can alternatively be set for the cumulated air consumption measurement. The cumulative air consumption measurement (OutA) and flow rate measurement (OutB) can be combined.

7.7.2.1 Setting the switching function for flow measurement

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The process for setting the switching outputs is fundamentally the same. Additionally, the switching mode [FLW] must be selected for Out A since Out A can also be configured for air consumption measurement. The colour change for the display can also be set for OutB. In the following, the process is described using the switching output OutA.

Requirement
– SFAB is in EDIT mode and [OutA] flashes
1. Press the Edit button to confirm the selection.
   ↳ [FLW] or [ConS] flashes.
2. Select flow rate measurement (FLW) with the A-/B pushbuttons.
3. Press the Edit button to confirm the selection.
   ↳ The currently set switching function flashes.
4. Select the desired switching function with the A/B pushbuttons.
5. Press the Edit button to confirm the selection.
   ↳ [SP] or [SP.Lo] flashes.
6. Set the switching point (SP or SP.Lo) with the A/B buttons.
7. Press the Edit button to confirm the set value.
   ↳ With switching function window comparator: [SP.Hi] flashes. For switching function threshold value comparator: continue with step 10.
8. Set the value (SP.Hi) with the A/B pushbuttons.
9. Press the Edit button to confirm the set value.
   ↳ [Hy] flashes.
10. Set the value for the hysteresis (Hy) with the A/B pushbuttons.
11. Press the Edit button to confirm the set value.
    ↳ [N/O] or [N/C] flashes.
12. Select the switching element function N/O/N/C with the A/B pushbuttons.
13. Press the Edit button to confirm the set value.
    ↳ SFAB is in RUN mode.
14. Check whether the SFAB switches as desired with a test run (vary the flow rate).

7.7.2.2 Setting the switching function for air consumption measurement

Requirement
– SFAB is in EDIT mode and [OutA] flashes
1. Press the Edit button to confirm the selection.
   ↳ [FLW] or [ConS] flashes.
2. Select flow measurement [ConS] with the A/B buttons.
3. Press the Edit button to confirm the selection.
   ↳ [CI] flashes.
4. Set the value for the air consumption switching impulse [CI] with the A/B buttons.
5. Press the Edit button to confirm the set value.
   ↳ [N/O] or [N/C] flashes.
6. Select the switching element function N/O/N/C with the A/B pushbuttons.
7. Press the Edit button to confirm the set value.
   ↳ SFAB is in RUN mode.
8. Check whether the SFAB switches as desired with a test run (flow rate).

7.7.3 Setting the colour change (only for OutB)

In order to detect the system status over longer distances, a colour change can be set at the OutB output. If the set switching threshold is exceeded or not reached, the colour of the display changes.

The following settings can be selected:
– r.ON
  – Display is red when the switching output is High (1).
  – Display is blue if the switching output is Low (0).
– r.OFF
  – Display is red when the switching output is Low (0).
  – Display is blue if the switching output is High (1).
– bLUE

– Display is blue; the colour change function is switched off.

r.ON		r.OFF		bLUE	
blue	red	red	blue	blue	
Out B		Out B		Out B	
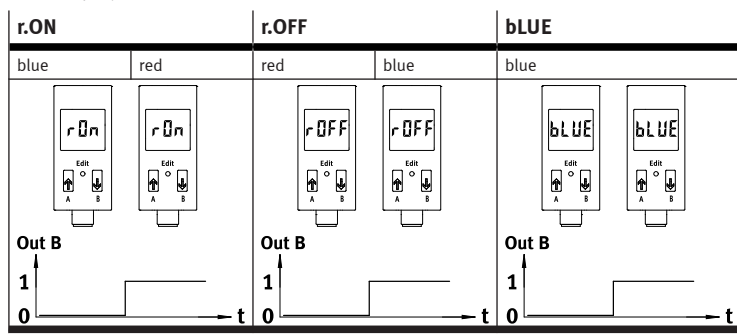
Tab. 8: Colour change

Requirement
– SFAB is in EDIT mode and [OutA] flashes
1. Press B button.
   ⮬ [OutB] flashes.
2. Press the Edit button to confirm the selection.
3. Press the Edit button repeatedly until [rON], [rOFF] or [bLUE] flashes in the display.
4. Select the desired setting (rON, rOFF or bLUE) using the A/B pushbuttons.
5. Press the Edit button to confirm the selection.
   ⮬ SFAB is in RUN mode.

7.7.4 Setting the special menu
The following settings can be undertaken in the special menu:
– Standard conditions
– Physical units for flow rate (l/h, scfm or l/min)
– Analogue filter [AnA.F] with filter time constant in ms
– Digital filter [dIG.F] with smoothing in 7 levels for display and switching output
– Physical units for air consumption (m3, scf or l)
– Select the switching output [PnP] or [nPn]
– Remove security blocking [Lock] with security code

Requirement
– SFAB is in EDIT mode and [OutA] flashes
1. Press the A or B pushbutton repeatedly until the menu (SPEC) is selected.
   ⮬ [SPEC] flashes.
2. Press the Edit button to confirm the selection.
   ⮬ [Option] flashes. The standard conditions (OFF, 1 or 2) can be set.

7.7.4.1 Setting standard conditions
The air mass flow measured and output by the SFAB refers to standard conditions. The SFAB is factory calibrated to the physical standard conditions according to DIN 1343.

> **i**
>
> Changing the reference standard only adjusts the display on the sensor. The analogue value at the analogue output still refers to DIN 1343 and must be converted.
> • Multiply the end value of the flow measurement range by the specified correction factor.
> • End value of the analogue output refers to the end value of the measuring range. This changes the transfer function.

REF/Cond		Off	1	2
Standard		DIN 1343	ISO 2533	ISO 6358
Air pressure (absolute)	[kPa]	101.325	101.325	100
Temperature	[°C]	0	15	20
Humidity	[%]	0	0	65
Correction factor, measurement range limit value		1	1.055	1.087

Tab. 9: Standard conditions for flow rate and volume units

1. Select the desired setting (OFF, 1 or 2) using the A-/B pushbuttons.
2. Press the Edit button to confirm the selection.
   ⮬ [FLW] is displayed and the set value flashes. The unit for the flow rate (l/h, scfm or l/min) can be set.

7.7.4.2 Setting the physical unit for the flow rate

> **i**
>
> For the types SFAB-600U and SFAB-1000U, the unit l/h cannot be set due to display reasons.

1. Select the desired setting (l/h, scfm or l/min) using the A-/B pushbuttons.
2. Press the Edit button to confirm the selection.
   ⮬ [AnA.F] and the set value are displayed. The analogue filter can be set.

> **i**
>
> The selected physical unit is shown in RUN mode in the display at the bottom right.

7.7.4.3 Setting filter time constant for the analogue filter
The rise time (filter time constant) of the analogue output can be changed (default value = 60 ms) with the analogue filter.

1. Select the value for the filter time constant (15 ms, 30 ms, 60 ms, 125 ms, 250 ms, 500 ms or 999 ms) with the A/B pushbuttons.
2. Press the Edit button to confirm the set value.
   ⮬ [dIG.F] and the set value flash. The digital filter can be set.

7.7.4.4 Setting smoothing for the digital filter
The display values can be smoothed with the digital filter. The degree of smoothing can be set in 6 steps from d1 = low smoothing to d6=maximum smoothing. The switch-on/switch-off time of the switching outputs rises as the smoothness is increased. With d.Off the smoothing is deactivated.
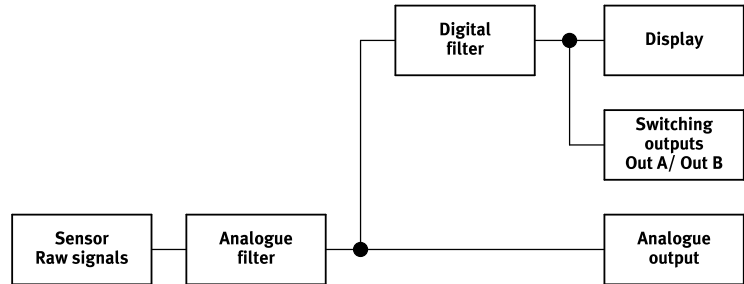

Fig. 6: Signal flow from the analogue filter to the digital filter

> **i**
>
> A high filter time constant and high smoothing can result in a switching time of several seconds.

1. Select the value for cushioning (d1 to d6 or d.OFF) with the A/B pushbuttons.
2. Press the Edit button to confirm the set value.
   ⮬ [ConS] is displayed and the currently selected value flashes. The unit for the air consumption (m3, scf or l) can be set.

7.7.4.5 Setting the physical unit for the air consumption
1. Select the desired setting (m3, scf or l) with the A/B pushbuttons.
2. Press the Edit button to confirm the set value.
   ⮬ The currently set value [PnP] or [nPn] for the switching element output flashes. The switching element output can be set.

7.7.4.6 Setting switching element output
The two switching outputs can be set as positive switches (PNP) or as zero switches (NPN) with the integrated push-pull step.
1. Select the desired setting (PNP or NPN) with the A/B pushbuttons.
2. Press the Edit button to confirm the selection.
   ⮬ [Lock] flashes. The security code can be set.

7.7.4.7 Setting the security code
A numerical code of up to 4 digits can be set to protect the setting from unauthorised access. The security code must be entered every time the settings are changed (EDIT mode and TEACH mode).
1. Set the desired security code with the A/B buttons.
2. Press the Edit button to confirm the selection.
   ⮬ The SFAB is in RUN mode.

7.8 TEACH mode

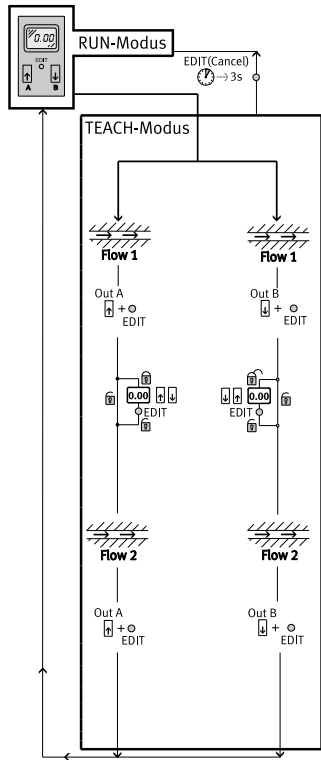The switching points can be set in the TEACH mode.

Fig. 7: TEACH mode menu structure

- Before teaching in EDIT mode, select the desired switching function (threshold value or window comparator) .

Threshold value comparator	Window comparator
The (taught) switching point is derived from the average of the two measured values: – SP = 1/2(Flow 1 + Flow 2) – Special case: SP = Flow 1 = Flow 2	The taught switching window is derived from the measured values: – SP.Lo = Flow 1 – SP.Hi = Flow 2

Tab. 10: Switching functions

7.8.1 Teaching switching variables

ℹ️

The process for teaching the switching outputs for OutA (A button) and OutB (B button) is the same. In the following, the process is described using the switching output OutA.

1. Generate flow rate (Flow 1).
2. Press the A button and the EDIT button simultaneously.
   - ↳ The measured value is accepted as the first teach point. [OutA] and the bar graph flash.
     Lock flashes with active security blocking. Set the security code with the A or B button. To accept the measured value, press the Edit button.
3. Generate flow rate (Flow 2).
4. Press the A button and the EDIT button simultaneously.
   - ↳ The measured value is accepted as the second teach point. The switching point (SP) or switching points (SP.Lo and SP.Hi) become valid. The SFAB is in RUN mode.

7.9 RECORDER mode

A manual accumulated air consumption measurement can be performed in RECORDER mode.
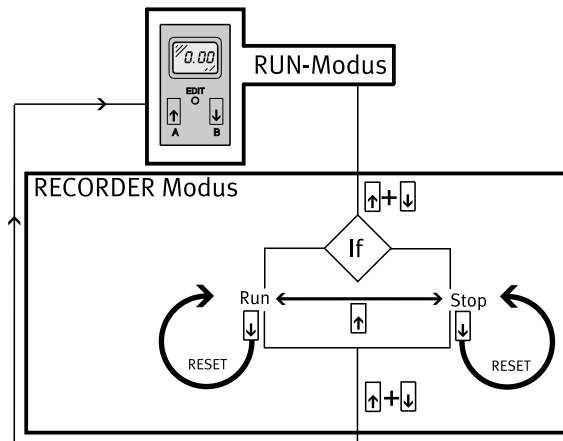

Fig. 8: RECORDER mode menu structure

1. Press the A and B buttons simultaneously.
   - ↳ The SFAB is in RECORDER mode. The status of the air consumption measurement [Run] or [Stop] is displayed.
2. When [Stop] is displayed, press the A button.
   - ↳ [Run] and a running light are displayed. The air consumption measurement has started.
3. Press the A button.
   - ↳ [Stop] is displayed. The air consumption measurement is stopped.
4. Press the A and B buttons.
   - ↳ The SFAB is in RUN mode.

ℹ️

If the RECORDER mode is left during the consumption measurement, the consumption measurement is continued in the background.

7.9.1 Resetting measured values to zero

- To reset a measure value to zero, press the B button in RECORDER mode.

8 Operation and use

ℹ️

Changes to the device settings take effect immediately at the outputs.

The air mass flow displayed by the SFAB refers to the standard condition set in the special menu under Options.
When comparing volumetric flow rates:
- Make sure that the volumetric flow rates to be compared (e.g. operating volumetric flow rate, amount supplied by a compressor, measured values of a flow sensor from another manufacturer) refer to the same standard conditions.
- After the supply voltage is switched on, the SFAB needs a warm-up time of 5 minutes before it reaches the specified accuracy.

8.1 Resetting SFAB to factory settings

ℹ️

By resetting to the factory settings, the current settings are lost. Note down current settings before resetting.

1. Switch off operating voltage.
2. Press and hold the A button, B button and Edit button.
3. Switch on operating voltage.
   - ↳ The SFAB is in RUN mode.

9 Service

1. Turn off energy source and compressed air.
2. Clean sensor with non-abrasive cleaning agents.

10 Fault clearance

Fault description	Cause	Remedy
Incorrect measured value indicator	SFAB operated with non-permitted medium	Operate SFAB only with permitted media.
	SFAB contaminated	Replace device.
In case of flow rate measurement: measured value is shown flashing	Measurement outside permitted measuring range	Maintain permitted measuring range ➔ 12 Technical data. Accuracy refers only to the permitted measuring range.
	incorrect flow direction	Correct the tubing ➔ 6.1 Pneumatic installation.
In case of air consumption measurement: measured value is shown flashing	Measuring range end value has been exceeded at least once. Specified accuracy can therefore probably not be maintained.	Make sure that the end value of the measuring range is not exceeded.
Outputs do not switch corresponding to the setting	Short circuit or overload at corresponding output	Correct short circuit or overload.
Settings cannot be edited (Lock)	Access protection active	Enter the security code.
O.FLO	Measurement range exceeded (displayed in RUN mode)	Check operating conditions.
Er1, Er3, Er4	Device faulty	Replace device.
Er2	Moisture or dirt in the compressed air	Replace device.
Er9	Measurement range undershot (displayed in SHOW mode)	Check operating conditions.
Er10	Measurement range exceeded (displayed in SHOW mode)	Check operating conditions.
Er17	Undervoltage	Maintain operating voltage. Check electrical wiring

Tab. 11

11 Disassembly

1. Turn off energy source and compressed air.
2. Separate connections from the sensor.

3. For panel mounting: loosen retaining screws.
   For H-rail or wall mounting: loosen the fixing slide ➔ Fig. 9
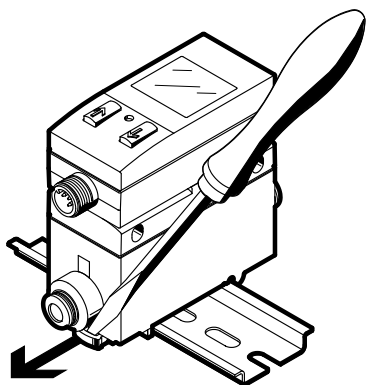

Fig. 9: Disassembly

12 Technical data

SFAB		-10U	-50U	-200U	-600U	-1000U
General						
Certification		RCM Mark, c UL us - Recognized (OL)				
CE marking		Declaration of Conformity ➔ www.festo.com/sp				
Measured variable		Flow rate, consumption				
Flow direction		unidirectional P1 ➔ P2				
Measurement principle		thermal				
Flow measuring range	[l/min]	0.1 … 10	0.5 … 50	2 … 200	6 … 600	10 … 1000
Operating pressure	[bar]	0 … 10				
Operating pressure	[kPa]	0 … 1000				
Nominal pressure	[kPa]	600				
Pressure drop	[kPa]	‹ 10				
Ambient temperature	[ºC]	0 … 50				
Temperature of medium	[ºC]	0 … 50				
Nominal temperature	[ºC]	23				
Operating medium		Compressed air in accordance with ISO 8573-1:2010 [6:4:4]		Compressed air in accordance with ISO 8573-1:2010 [7:4:4]		
		Nitrogen				
Output, general[1][2]						
Accuracy of zero point[3]	[% FS]	±0.3				
Accuracy of margin[3]	[% FS]	±3				
Repetition accuracy of zero point	[% FS]	±0.2				
Repetition accuracy of spread	[% FS]	±0.8				
Temperature coefficient of spread	[% FS/K]	≤ 0.1				
Pressure-dependent spread	[% FS/ 100 kPa]	±0.5				
Switching output						
Switching output		2x PNP or 2x NPN, adjustable				
Switching function		Window comparator or threshold value comparator, adjustable				
Switching element function		N/C or N/O contact, adjustable				
Max. output current	[mA]	100				
Voltage drop	[V]	max. 1.5				
Switch-on time		adjustable (factory setting: approx. 80 ms)				
Switch-off time		adjustable (factory setting: approx. 80 ms)				
Inductive protective circuit		adapted to MZ, MY, ME coils				
Analogue output						
Characteristic flow rate curve	[l/min]	0 … 10	0 … 50	0 … 200	0 … 600	0 … 1000
Output characteristic curve for current	[mA]	4 … 20				
Max. load resistance of current output	[Ω]	500				
Min. load resistance at voltage output	[kΩ]	10				
Rise time	[ms]	adjustable: 15, 30, 60 (factory setting), 125, 250, 500, 999				
Output, additional data						
Short circuit current rating		yes				
Overload protection		present				
Electronics						
Operating voltage range	[V DC]	15 … 30				
Reverse polarity protection		for all electrical connections				

SFAB		-10U	-50U	-200U	-600U	-1000U
Electromechanics						
Electrical connection		Straight plug, M12x1, 5-pin				
Max. connecting cable length	[m]	‹ 10				
Mechanics						
Mounting position		any				
Product weight	[g]	160				
Note on materials, housing		Reinforced polyamide, polycarbonate				
Display/operation						
Display type		Illuminated LCD, blue				
Displayable units		l/min, scf, scfm, l, m³, scf, l/h			l/min, scf, scfm, l, m³	
Setting range for flow rate threshold value		1% FS … 100% FS				
Setting range for consumption impulse threshold value	[l]	0.1 … 1999.9	0.2 … 1999.9	1 … 1999.9	2 … 1999.9	3 … 1999.9
	[m³]	0.01 … 199.99			0.1 … 1999.9	1 … 19999
	[scf]	0.01 … 199.99		0.03 … 199.99	0.1 … 999.9	
Hysteresis setting range		0% FS … 90% FS				
Immissions/emissions						
Storage temperature	[ºC]	−20 … +80				
Degree of protection		IP65				
Protection class		III				

1) Accuracy under nominal conditions (6 bar, 23 ºC and horizontal mounting position)
2) % FS =% of the flow rate range end value (full scale)
3) The accuracy of the zero point and accuracy of the spread together correspond to the accuracy of the flow rate: accuracy of the flow rate = ± (0.3% FS + 3% o.m.v.). % o.m.v. = % of measured value

Tab. 12: Technical data

12.1 Examples for calculating the maximum error of the display

– Flow rate measuring range: 10 … 1000 l/min (FS = 1000)
– Measured value: 600 l/min
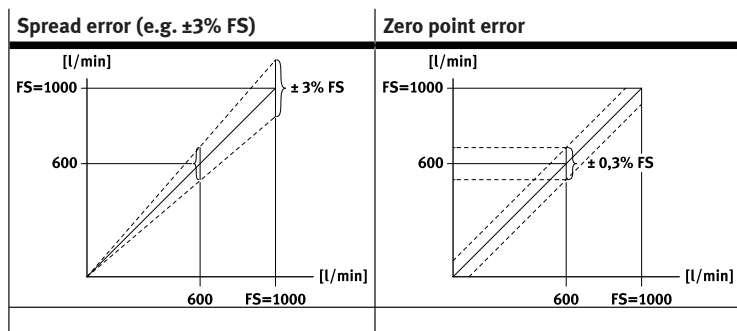
Tab. 13

Spread error and zero point error
The spread error is proportional to the measured value. At 600 l/min, the spread error is 3% of the measured value = 18 l/min.
The zero point error is independent of the measured value. It is 0.3% FS = 3 l/min.
Display error under nominal conditions (6 bar, 23 ºC):
The display error under nominal conditions is the result of adding the spread and zero point errors. The actual flow rate is in the range of 600 ± (18+3) l/min = 600 ± 21 l/min.
Display error under different nominal conditions (e.g. 8 bar, 40 ºC):
Temperature and pressure errors are spread errors. The temperature error at 40 ºC is ±0.1% FS/K x 17 K = ±1.7% of the measured value = ±10.2 l/min.
The pressure error at 8 bar is
±0.5% FS/bar x 2 bar = ±1% of the measured value = ±6 l/min.
The error of the display at deviating nominal conditions results from the addition of all error values (span, zero point, temperature, pressure). The actual flow rate is therefore in the range of 600 ± (18+3+10.2+6) l/min = 600 ± 37.2 l/min.