Flow sensors SFAW

FESTO

Key features

General

The SFAW is intended to measure and monitor the flow, volume and temperature of liquid media in piping systems or in terminals in industry. The flow velocity is recorded in accordance with the vortex principle. The flow rate and the accumulated volume are calculated from the flow velocity. An optional, integrated temperature sensor records the temperature of the media. Connection to higher-level systems is provided by 2 switching outputs, an analogue output and/or an IO-Link interface, depending on the type. The outputs can be configured as appropriate to the application.

The switching outputs can be configured to monitor a threshold value or a range. Either PNP or NPN and either normally open (NO) or normally closed (NC) can be set for the outputs. Process values can be read out and parameters changed and transmitted to additional devices via the IO-Link interface.

Application

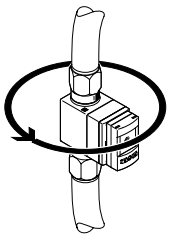
- Cooling circuit monitoring
- Monitoring for leaks and line breaks
- Process water monitoring
- Filling volume monitoring

Overview

An installation concept with short mounting and dismounting times that is easy to implement in all installation situations.

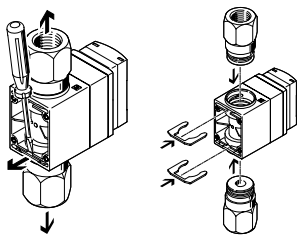
Mounting

The sensor can be rotated through 360° in the direction of flow, so that once it has been installed it can be aligned without the need for tools.



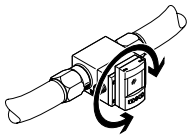
Dismounting

After the screwed-in locking plate (not shown) has been disconnected, it can be removed. The sensor can then be exchanged quickly by undoing the clamps on the sensor body and removing them. The fluid connections can then be detached from the sensor body.



Display

A large, illuminated LCD display increases the operational safety and makes the displayed values for flow rate or medium temperature and the accumulated volume easy to read. The rotatable display ensures ease of readability and usability when mounted either horizontally or vertically.



Change in colour

Depending on the switching status
(e.g. a flow threshold has not been achieved or media temperature exceeded) a change in colour to red can be set in the display for the switching outputs. As a result, it is possible to reliably identify the system status from a large distance or in inaccessible areas.

Media connections

- Free choice of various media connections:
  - Threaded connection (female thread) (G, R)
- Free choice of media connection type on sensor input and sensor output side
- Basic sensor body and media connections can be obtained separately
- Ultra-simple and fast mounting of media connections using clamps
- Option of designing dedicated, application-specific connections

Electronics

Maximum flexibility and reduced warehousing thanks to switchable electrical outputs:

- PNP/NPN
- NC/NO contact function
- Current output 4 ... 20 mA
  or voltage output
  1 ... 5 V, 0 ... 10 V

Sensor signal monitoring

Flow signal monitoring to detect unstable flows. Possible causes for unstable flows include:

- Air in the line
- Line filling during start-up
- Turbulent flows as a result of unfavourable or incorrect installation

Key features

Operation

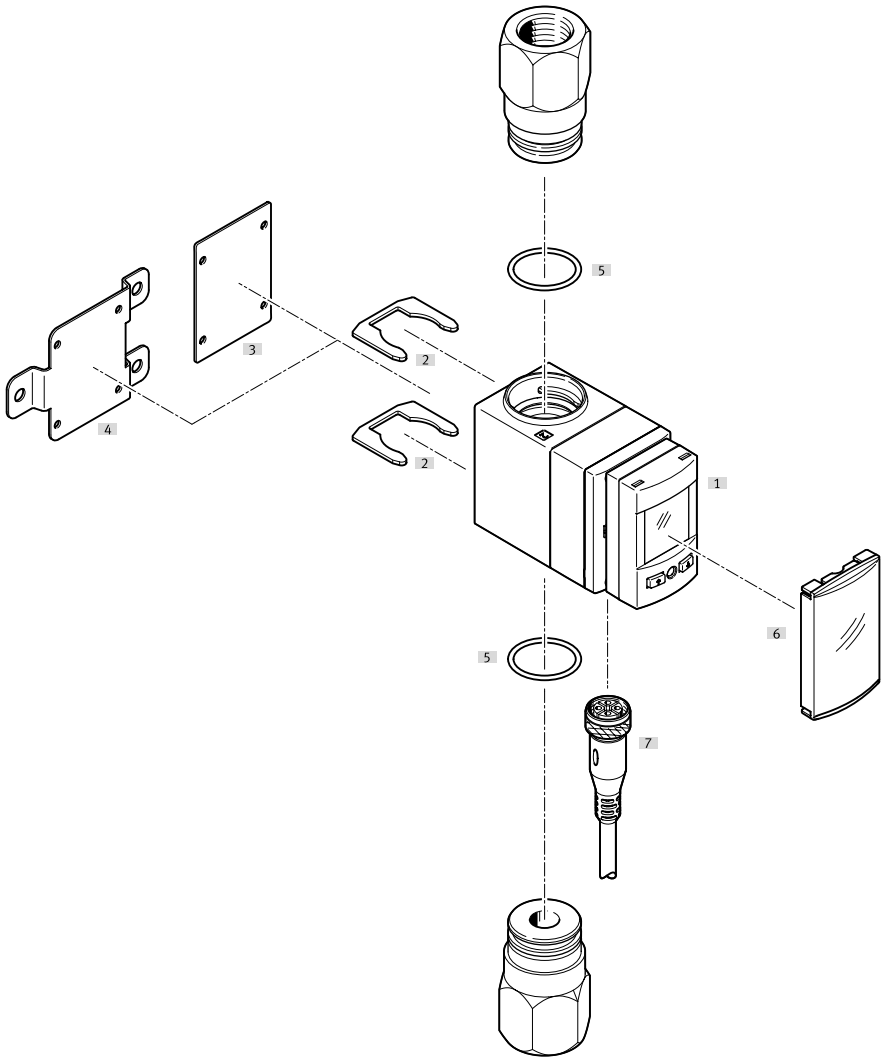
Monitoring and setting a flow threshold, a flow range, a temperature threshold and a temperature range using a teach-in function or by entering values.

- Flow indication, medium temperature indication, switching outputs and analogue value output for flow rates and temperature can be set on site in one device
- Fast commissioning of the flow sensor thanks to intuitive menu navigation
- Display colour red/blue as visual feedback that the flow rate or temperature thresholds are not met or have been exceeded
- Min./max. value memory for monitoring the flow and temperature (storage of flow and temperature peaks)
- To prevent undesirable switching status changes – an integrated adjustable filter damps the sensor signal generated by flow peaks
- Scaling the analogue output to increase the signal dynamics
- Switchable flow and volume units l/min, l/h, US gal/min, cfm, l, m^3, US gal, cft
- Switchable temperature units °C, °F
- ECO function with option to switch off the display
- Optional security code can be freely chosen (4-digit code)
- All settings that have been carried out on one sensor (master) can be transferred (replication) to other, identical sensors (device). This significantly shortens the commissioning time.
- Recorder mode for manual volume measurements with start, stop and reset functionality
- Adjustable volume pulse

IO-Link

- Serial communication integrated using IO-Link 1.1
- Analogue process values are provided digitally
- The sensor can be parameterised and maintained remotely at control level using an IO-Link master
- Automatic parameterisation following a sensor change means there is no need to repeat parameterisation and sensor settings after changing the sensor

Peripherals overview



Mounting components and accessories

		Description	→ Page
[1]	Flow sensor SFAW	For measuring and monitoring flow rate, volume and temperature of liquid media	6
[2]	Clamp SAMH-FW-SB	For mounting the fluid connections on the body of the flow sensors	13
[3]	Locking plate SFAW	For securing the clamps (locking plate is screwed to the sensor body)	–
[4]	Wall mounting SAMH-FW-W	For wall or surface mounting of the flow sensor	12
[5]	Seal SASF-FW-S-E	For sealing the fluid connections against the body of the flow sensors	12
[6]	Safety guard SACC-PU-G	For covering the display and operating components	13
[7]	Connecting cable NEBU	–	14

Type codes

001	Series	
SFAW	Flow sensor	

002	Flow measuring range	
32	Max. 32 l/min	
100	Max. 100 l/min	

003	Additional measured variable	
	None	
T	Temperature	

004	Connection type, input	
T	Female thread	
X	Connection provided by the user	

005	Connection size, input	
	Standard	
G1	G1	
G12	G1/2	
G34	G3/4	
N12	1/2 NPT	
R12	R1/2	
R34	R3/4	

006	Connection type, output	
E	As input	
T	Female thread	
X	Connection provided by the user	

007	Connection size, output	
	Standard	
G1	G1	
G12	G1/2	
G34	G3/4	
N12	1/2 NPT	
R12	R1/2	
R34	R3/4	

008	Type of mounting	
	None	
W	Wall mounting	

009	Electrical output 1	
PNLK	PNP/NPN/IO-Link	

010	Electrical output 2	
PN	PNP or NPN	
PNVBA	PNP or NPN or 0 ... 10 V or 1 ... 5 V or 4 ... 20 mA	

011	Electrical output 3	
	None	
VBA	0 ... 10 V or 1 ... 5 V or 4 ... 20 mA	

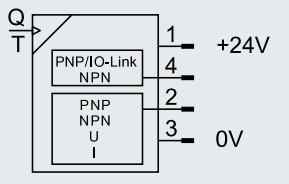
012	Electrical connection	
M12	Plug M12, A-coded	

013	Electrical accessories	
	None	
2.5S	Straight socket, cable 2.5 m	
5S	Straight socket, cable 5 m	

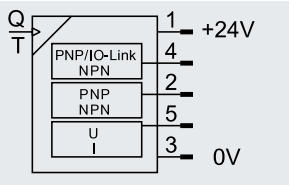
014	Protective devices	
	None	
G	Protective hood	

Data sheet

Function
SFAW-...-PNLK-PNVBA



SFAW-...-PNLK-PN-VBA



- Maximum flexibility and reduced warehousing thanks to switchable electrical outputs:
  - PNP/NPN, switchable
  - N/C or N/O contact, switchable
  - Current output 4 ... 20 mA or voltage output
    1 ... 5 V, 0 ... 10 V, switchable
- Pulse output for volume measurement can be freely selected
- Measuring signal filter for setting the rise time
- Additional filter for smoothing the display values

General technical data	
Certification	RCM
	c UL us listed (OL)
CE marking (see declaration of conformity)[1]	To EU EMC Directive
	To EU RoHS Directive
UKCA marking (see declaration of conformity)[1]	To UK instructions for EMC
	To UK RoHS instructions
Note on materials	RoHS-compliant

1) For information about the area of use, see the declaration of conformity at: www.festo.com/catalogue/... ➔ Support/Downloads.
If the devices are subject to usage restrictions in residential, commercial or light-industrial environments, further measures for the reduction of the emitted interference may be necessary.

Input signal, measuring element			
		-32	-100
Measured variable		Flow, temperature	
Flow direction		Unidirectional P1 } P2	
Measuring principle for flow		Vortex	
Measuring principle for temperature		PT1000	
Flow measuring range	[l/min]	1.8 ... 32	5 ... 100
Temperature measuring range	[°C]	0 ... 90	
Operating pressure	[bar]	0 ... 12; max. 12 bar at 40°C, max. 6 bar at 100°C	
Max. overload pressure	[bar]	40	
Operating medium[1]		Liquid media, neutral liquids, water	
Temperature of medium	[°C]	0 ... 90	
Ambient temperature	[°C]	0 ... 50	
Nominal temperature	[°C]	23	

1) Media with a kinematic viscosity ≤ 1.8 mm²/sec. [cSt]. Compatibility of the media with the substances in contact with the media must be ensured.

Data sheet

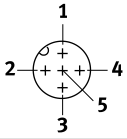
Electrical data			
		-32	-100
General output			
Accuracy of zero point Flow ≤ 50% FS[1)]	[% FS]	±2	
Accuracy of margin Flow ≥ 50% FS[1)]	[% FS]	±3	
Repetition accuracy of zero point Flow ≤ 50% FS[2)]	[% FS]	±0.5	
Repetition accuracy of spread Flow ≥ 50% FS[2)]	[% FS]	±1	
Accuracy of temperature	[°C]	±2	
Temperature coefficient of margin	[% FS]	Typ. ±0.05% FS/K	
Switching output			
Switching output		2 x PNP or 2 x NPN or IO-Link, switchable	
Switching function		Threshold value comparator or window comparator, freely programmable	
Switching element function		N/C contact or N/O contact, switchable	
Switch-on time	[ms]	400 with filter time constant 150 ms (adjustable)	
Switch-off time	[ms]	300 with filter time constant 150 ms (adjustable)	
Max. output current	[mA]	100	
Voltage drop	[V]	Max. 1.5	
Pull-down / pull-up resistor		PNP: integrated; NPN: not integrated	
Inductive protective circuit		Available	
Analogue output			
Characteristic flow rate curve	[l/min]	0 ... 32	0 ... 100
Characteristic curve for temperature	[°C]	0 ... 100	
Output characteristic curve for current	[mA]	4 ... 20	
Output characteristic curve for voltage	[V]	0 ... 10 or 1 ... 5, adjustable	
Rise time	[ms]	900 with filter time constant 150 ms (adjustable)	
Max. load resistance at current output	[ohm]	500	
Min. load resistance of voltage output	[kOhm]	15	
Output, additional data			
Short circuit current rating		Yes	
Overload protection		Available	
Electronics			
Operating voltage range DC	[v]	18 ... 30	
Max. current consumption	[mA]	260	
Reverse polarity protection		For all electrical connections	
Electromechanical systems			
Electrical connection			
Connection type		Plug	
Connection technology		M12x1, codificación A según EN 61076-2-101	
Number of pins/wires		5	
Type of mounting		Screw-type lock	
Max. cable length	[m]	30, for IO-Link operation 20	

1) Accuracy of flow rate value = ± 2% FS for flow rate ≤ 50% FS and ± 3% of measured value for flow rate ≥ 50% FS

2) Repetition accuracy of flow rate = < ± 0.5% FS for flow rate ≤ 50% FS < ± 1% of measured value for flow rate ≥ 50% FS

Data sheet

Pin allocation

	Pin	Meaning
Plug M12x1, 5-pin		
	1	Operating voltage +24 V DC
	2	Switching output OutB or OutD or analogue output
	3	0 V
	4	Switching output OutA or OutC or IO-Link (C/Q line)
	5	Analogue output or not assigned

Mechanics

	-32	-100
Type of mounting	Wall bracket	
Mounting position	Any	
Materials in contact with the media	ETFE, PA6T/6I reinforced, EPDM (perox.), stainless steel	
Information on materials		
Housing	Reinforced PA	
Wall bracket	Stainless steel	
Safety guard	PA	
Keypad	TPE-O	
Inspection window	PA	
Sealing ring	EPDM	

Display/operation

		-32	-100
Display type		Illuminated LCD, blue	
Displayable units		l/min, l/h, ft³/min, US gal/min, l, m³, ft³, US gal, °C, °F	
Switching status indication		Visual	
Setting options		Teach-in, IO-Link, via display and keys	
Tamper-proof		Electronic locking	
Setting range for threshold value	[l]	0.1 ... 1999.9	
Volume pulse	[m³]	0.01 ... 199.99	
	[ft³]	0.01 ... 199.9	
	[US gal]	1 ... 19999	
Adjustable hysteresis	[% FS]	0 ... 90	

Immissions/emissions

		-32	-100
Storage temperature	[°C]	–20 ... +80	
Degree of protection		IP65	
Protection class		III	
Shock resistance		Shock test SG2 to FN/EN	
Vibration resistance		EN60068-2-6/2-200Hz/0.7 mm	
Corrosion resistance class CRC[1)]		3	
PWIS conformity		VDMA24364-B2-L	

1) Corrosion resistance class CRC 3 to Festo standard FN 940070
High corrosion stress. Outdoor exposure under moderate corrosive conditions. Externally visible parts with primarily functional surface requirements which are in direct contact with a normal industrial environment.

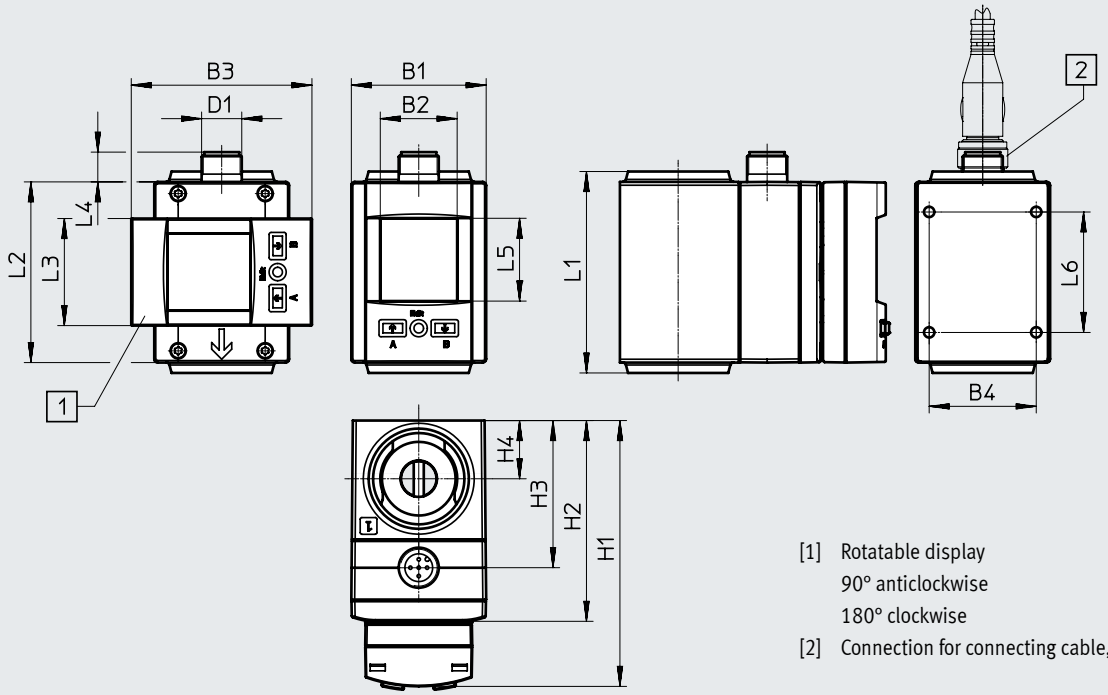
Data sheet

IO-Link	SFAW-...T-	SFAW-...-
Protocol	IO-Link	
Protocol version	Device V 1.1	
Profile	Smart sensor profile	
Function classes	Binary data channel (BDC)	
	Process data variable (PDV)	
	Identification	
	Diagnostics	
	Teach channel	
Communication mode	COM2 (38.4 kBd)	
SIO mode support	Yes	
Port class	A	
Process data width OUT	0 bytes	
Process data width IN	5 bytes	3 bytes
Process data content IN	1 bit BDC (temperature monitoring)	–
	14 bit PDV (measured temperature value)	–
	14 bit PDV (measured flow value)	
	2 bit BDC (flow monitoring)	
	1 bit BDC (volume monitoring)	
IO-Link, service data contents IN	32 bit PDV (measured volume value)	
IO-Link, minimum cycle time	5 ms	
IO-Link, data memory required	0.5 KB	

Data sheet

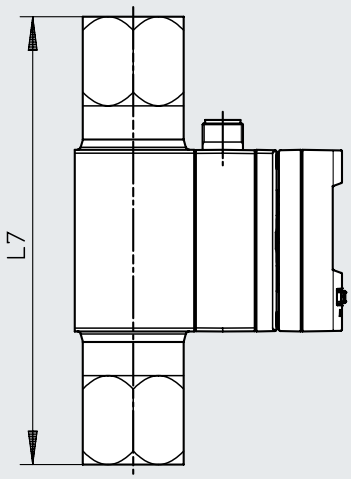
Dimensions Download CAD data ➔ www.festo.com

SFAW-...-PNLK-PNVBA-M12



[1] Rotatable display
90° anticlockwise
180° clockwise
[2] Connection for connecting cable, straight

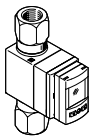
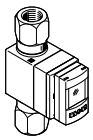
SFAW-...-T-...



Type	B1	B2	B3	B4	D1	H1	H2	H3	H4	L1	L2	L3	L4	L5	L6	L7
SFAW-32...-X-E-PNLK-PNVBA-M12	40.3	23	54	32	M12x1	79.5	60	44	17.4	60.2	54	32	8.9	24.8	36	–
SFAW-32...-T-E-PNLK-PNVBA-M12																133.2
SFAW-100...-X-E-PNLK-PNVBA-M12						83.5	64	48								–
SFAW-100...-T-E-PNLK-PNVBA-M12																133.2

Data sheet

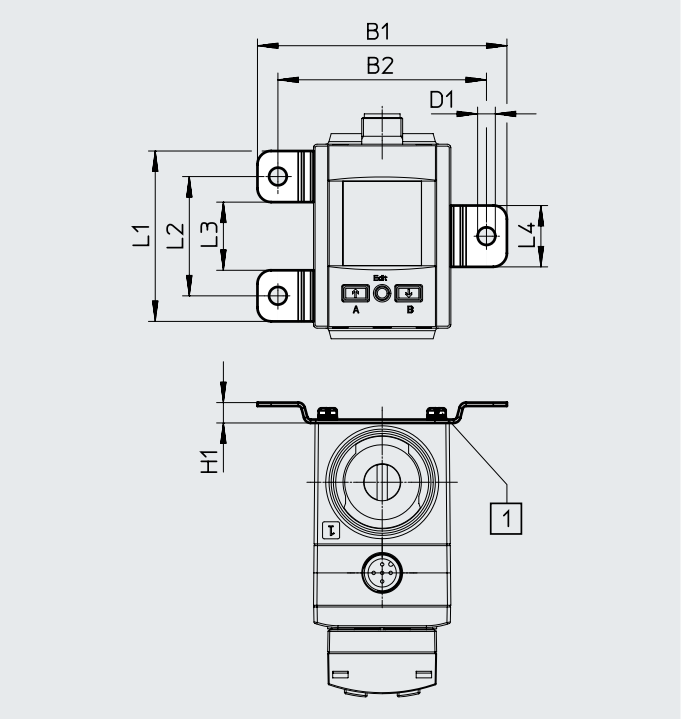
Ordering data

Design	Flow measuring range [l/min]	Measured variable	Connection type	Part no.	Type
	32	Without temperature measurement	Female thread	**8036871**	**SFAW-32-TG12-E-PNLK-PNVBA-M12**
				8036873	**SFAW-32-TG34-E-PNLK-PNVBA-M12**
			Connection by the user	**8036887**	**SFAW-32-X-E-PNLK-PNVBA-M12**
		With temperature measurement	Female thread	**8036872**	**SFAW-32T-TG12-E-PNLK-PNVBA-M12**
				8036874	**SFAW-32T-TG34-E-PNLK-PNVBA-M12**
			Connection by the user	**8036888**	**SFAW-32T-X-E-PNLK-PNVBA-M12**
	100	Without temperature measurement	Female thread	**8036877**	**SFAW-100-TG1-E-PNLK-PNVBA-M12**
				8036875	**SFAW-100-TG34-E-PNLK-PNVBA-M12**
			Connection by the user	**8036889**	**SFAW-100-X-E-PNLK-PNVBA-M12**
		With temperature measurement	Female thread	**8036878**	**SFAW-100T-TG1-E-PNLK-PNVBA-M12**
				8036876	**SFAW-100T-TG34-E-PNLK-PNVBA-M12**
			Connection by the user	**8036890**	**SFAW-100T-X-E-PNLK-PNVBA-M12**

Accessories

Wall mounting SAMH-FW-W
For wall or surface mounting

Material:
Stainless steel



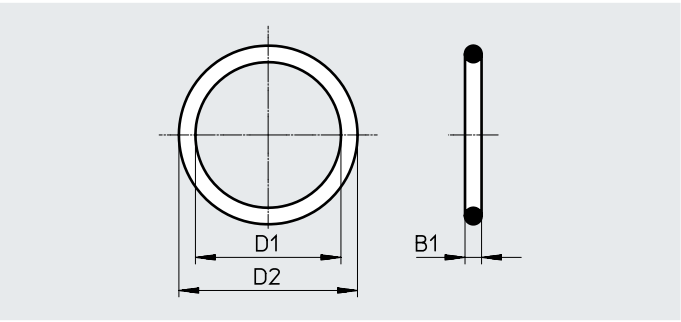
Dimensions

Type	B1	B2	D1 ø	H1	L1	L2	L3	L4
SAMH-FW-W	73.2	61.2	5.2	6	50	35	20	18

Ordering data

	Part no.	Type
Wall mounting	**8036909**	**SAMH-FW-W**

Seal SASF-FW-S-E
For sealing the fluid connections
against the body of the flow sensors



Dimensions

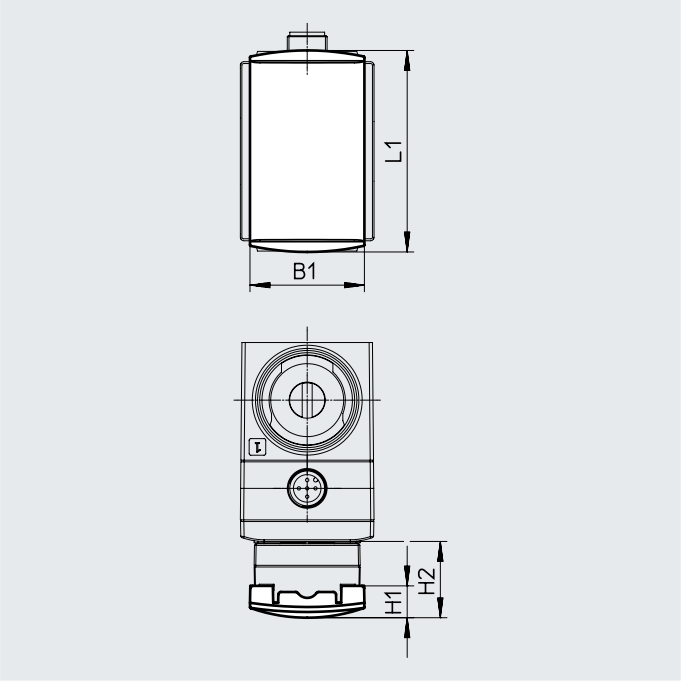
Type	B1	D1 ø	D2 ø
SASF-FW-S-E	2.5	22	27

Ordering data

	Part no.	Type
Seal	**8036907**	**SASF-FW-S-E**

Accessories

Safety guard SACC-PU-G
For covering the display and operating components



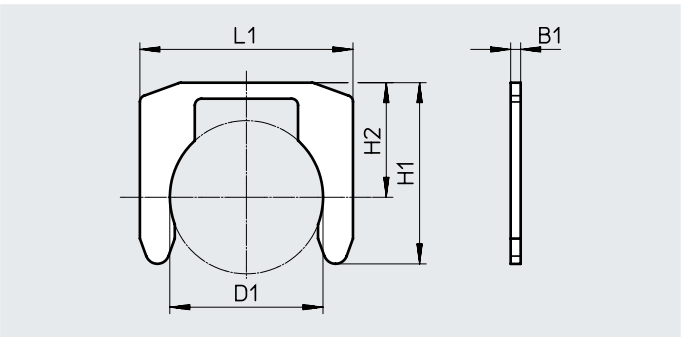
Dimensions

Type	B1	L1	H1	H2
SACC-PU-G	34.5	60.8	9.6	23

Ordering data

	Part no.	Type
Safety guard	**8003353**	**SACC-PU-G**

Clamp SAMH-FW-SB
For mounting the fluid connections on the body of the flow sensors



Dimensions

Type	B1	D1 ø	H1	H2	L1
SAMH-FW-SB	1.5	23	27.2	17.2	32

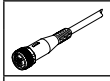
Ordering data

	Part no.	Type
Clamp	**8036908**	**SAMH-FW-SB**

Accessories

Ordering data – Connecting cables

Data sheets → Internet: nebu

	Number of wires	Cable length [m]	Part no.	Type
M12x1, straight socket				
	4	2.5	**550326**	**NEBU-M12G5-K-2.5-LE4**
		5	**541328**	**NEBU-M12G5-K-5-LE4**
M12x1, straight socket				
	5	2.5	**541330**	**NEBU-M12G5-K-2.5-LE5**
		5	**541331**	**NEBU-M12G5-K-5-LE5**