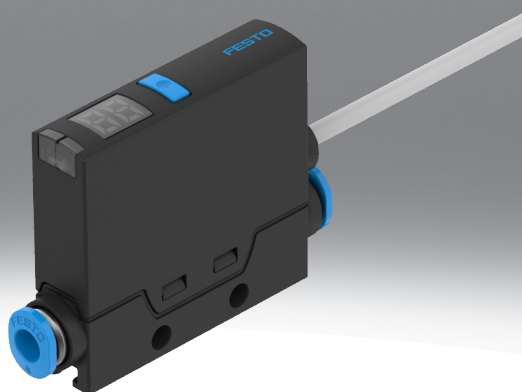


Flow sensor SFAE

FESTO



Characteristics

At a glance

The flow sensor SFAE is suitable for monitoring flows of up to 10 l/min in all pneumatic applications. Its extremely compact and lightweight design makes it ideal for all moving applications, especially end-of-arm processes. Thanks to its integrated IO-Link® communication and two-digit display it is really easy to parameterise and operate. The output signals can be flexibly set between analogue 0...10 V and 1...5 V or binary switching functions.

Overview

Applications at a glance

- Pick and place of very small workpieces thanks to better signal span than with a pressure sensor
- Monitoring air dosing for purge air, sealing air or air bearings
- Monitoring process or cooling gas
- Monitoring pneumatic objects and measuring distances
- Leakage detection, consumption measurements and energy monitoring
- Leak testing of components or workpieces

Product features in standard mode (SIO mode)

- Intuitive operation: Easy parameterisation and switching point teach-in directly on the device via one-button operation and the easy-to-read LED display.
- Lightweight and space-saving: thanks to a 10 mm grid width and a lightweight design they are suitable for use in dynamic applications.
- The switching output can be flexibly configured as PNP/NPN, NO, NC and the analogue output as 0...10V, 1...5V, which minimises the number of variants and reduces warehousing.
- Optimum readability: The numerical display can be rotated 180° for each mounting position.
- Precise process monitoring: Analysing anomalies via min/max values on the display or using the switching functions.
- Wide range of applications: Reliable flow measurement even in a vacuum (pressure range -0.9...10 bar).
- High dynamic response: Extremely fast response to flow rate changes with a rise time of only 10 ms.
- Flexible wiring: Optionally available with open cable end or M8 plug connector.
- Parameter replication: Easy to transfer complete parameter sets to identical sensors for fast commissioning of series applications

Extended functionality and diagnostics with IO-Link®

- Efficient remote parameterisation: Full access to all parameters for quick remote setup and adjustment.
- Increased process reliability: Malfunctions are recognised and immediately transmitted to the control system via an IO-Link® event.
- Volume sensor and pulse counter: Starting, stopping and reading out the cumulative consumption. Perfect for leakage detection or consumption analyses.
- High precision: Precision adjustment of the measurement by changing the zero point and slope as well as scaling the analogue output (zoom function) for a higher resolution in a specific range
- Adapting to the medium: Switching the gas coefficients for various gases such as compressed air (Air), nitrogen (N₂), argon (Ar) and CO₂.
- Display setting: Additional setting options such as adjusting the brightness of the display or switching off the display.
- Locator: Quickly located the sensor in large installations thanks to the device flashing.

Electrical output 1

[PNLK] PNP/NPN/IO-Link



Output can be used for IO-Link® communication or as an adjustable PNP/NPN switching output

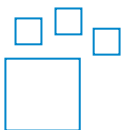
Electrical output 2

[PNVB] PNP or NPN or 0... 10 V or 1... 5 V

Analogue voltage output 0...10 V can be set to 1...5 V or as a switching output via IO-Link®.

Characteristics

Ordering data - modular system



Configurable product

This product and all its product options can be ordered online via the configurator.

Type code

001	Series	
SFAE	Flow sensor SFAE	

002	Flow measuring range	
1	Max. 1 l/min	
2	Max. 2 l/min	
5	Max. 5 l/min	
10	Max. 10 l/min	

003	Flow rate input	
U	Unidirectional	

004	Pneumatic connection	
M5	M5	
Q4	Push-in connector 4 mm	

005	Thread type	
	None	
F	Female thread	

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

007	Electrical output 2	
PNVB	PNP or NPN or 0... 10 V or 1... 5 V	

008	Electrical connection	
0.3M8	Cable 0.3 m, with plug M8	
2.5K	Cable 2.5 m, open end	

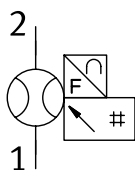
009	Mounting accessories	
	None	
A	Mounting bracket	

010	Connecting cable	
	None	
2.5S	Straight socket, cable 2.5 m	
5S	Straight socket, cable 5 m	

011	Certificate	
	None	
T	Test report	

Datasheet

General technical data



Approval	RCM
CE mark (see declaration of conformity)	To EU EMC Directive, In accordance with EU RoHS Directive
UKCA marking (see declaration of conformity)	To UK instructions for EMC, To UK RoHS instructions
Note on materials	RoHS compliant

Input signal, measuring element PNLK-PNVB

Flow measuring range	Max. 1 l/min [1]	Max. 2 l/min [2]	Max. 5 l/min [5]	Max. 10 l/min [10]
Start value for flow rate measuring range	0 l/min			
End value for flow rate measuring range	1 l/min	2 l/min	5 l/min	10 l/min
Measured variable	Volume, Volumetric flow rate			
Flow direction	Unidirectional			
Measuring principle	thermal			
Measurement method	Heat loss			
Operating pressure	-0.09 ... 1 MPa			
Operating pressure	-0.9 ... 10 bar			
Overload pressure	1.6 MPa			
Operating medium	Argon, Compressed air to ISO 8573-1:2010 [7:4:4], Carbon dioxide, Nitrogen			
Note on operating and pilot medium	Ester oil < 0.1mg/m ³ , according to ISO 8573-1:2010 [-::2]			
Media temperature	0 ... 50°C			
Ambient temperature	0 ... 50°C			
Nominal temperature	23°C			

Output, general

Accuracy of flow rate	± (5% o.m.v. + 2% FS)
Repetition accuracy offset in ± %FS	0.5 %FS
Repetition accuracy span in ± %FS	1 %FS
Temperature coefficient span in ± %FS/K	—

Switching output

Switching output	2 x PNP or 2 x NPN, switchable
Switching function	Window comparator, Threshold value comparator, Threshold value with variable hysteresis
Switching element function	NC or NO, switchable
Switch-on time	10 ms
Switch-off time	10 ms
Max. output current	100 mA

Datasheet

Analogue output				
Flow measuring range	Max. 1 l/min [1]	Max. 2 l/min [2]	Max. 5 l/min [5]	Max. 10 l/min [10]
Flow characteristic curve start value	0 l/min			
Flow characteristic curve end value	1 l/min	2 l/min	5 l/min	10 l/min
Analogue output	0 - 10 V, 1 - 5 V			
Output characteristic curve start value	0 V			
Output characteristic curve end value	10 V			
Rise time	10 ms			
Min. load resistance voltage output	10 kOhm			

Measured value display	
Display range start value	0 %FS
Display range end value	99 %FS

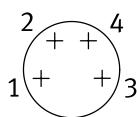
Output, additional data	
Short circuit current rating	Yes
Overload protection	Available

IO-Link® device according to IEC 61131-9	
Setting options	IO-Link®, Teach-in, Via display and buttons
Protection against tampering	IO-Link®, PIN code
IO-Link, Process data content IN	Flow rate measurement 16 bit MDC, Flow rate monitoring 2-bit SSC, Volume pulse 1 bit SSC
Protocol	IO-Link®
IO-Link, revision ID	V1.1
IO-Link, device profile	Firmware update, Function locator, Function Product URI, Function quantity detection, Identification and diagnostics, Smart Sensor - SSP 4.1.1
IO-Link, transmission rate	COM3
IO-Link, SIO-Mode support	Yes
IO-Link, port type	Class A
IO-Link, process data length output	0 bit
IO-Link, process data length input	32 bit
IO-Link, Data storage required	0.5 KB
IO-Link, minimum cycle time	0.7 ms
IO-Link, Service data IN	Device temperature 16 bit, Volume measurement 32 bit, Temperature of medium 16 bit

Electronics	
Operational voltage range DC	22 ... 26 V
No-load supply current	30 mA
Reverse polarity protection	For all electrical connections

Datasheet

Electromechanics



Pin 1: Operating voltage +24 V

Pin 2: Electrical output 2 (switching output SSC1.2 or analogue output)

Pin 3: Operating voltage 0V

Pin 4: Electrical output 1 (switching output SSC1.1, volume pulse or C/Q line with IO-Link®)

Electrical connection	Cable 0.3 m, with plug M8 [0.3M8]	Cable 2.5 m, open end [2.5K]
Electrical connection 1, connection type	Cable with plug	Cable
Electrical connection 1, function	Analogue output, Communication, Switching output, Power supply	
Electrical connection 1, connector system	M8x1, A-coded, to EN 61076-2-104	Open end
Electrical connection 1, number of connections/cores	4	
Electrical connection 1, type of mounting	Screw-type lock, Rotatable	–
Electrical connection 1, compatible type of mounting	Compatible with rotatable/non-rotatable screw-type lock	–
Material screw-type lock	Brass, nickel-plated	–
Cable length	0.3 m	2.5 m
Max. cable length	20 m with IO-Link® operation, 30 M	
Material cable sheath	TPE-U(PUR)	

Mechanics

Pneumatic connection	M5 [M5]	Push-in connector 4 mm [Q4]
Type of mounting	Inline installation, With through-hole, With accessories	
Mounting position	Any	
Pneumatic connection, outlet direction	Straight	
Product weight	20.1 ... 38.3 g	23 ... 41.2 g
Material housing	Reinforced PA	
Material in contact with the medium	Anodised wrought aluminium alloy, Epoxy, NBR, Reinforced PA, Process instruction, High-alloy stainless steel	Epoxy, Brass, nickel-plated, NBR, Reinforced PA, Process instruction, High-alloy stainless steel

Display/operation

Display type	LED indicator, 2 digits
Displayable units	%FS
Ready status indication	LED
Switching status indication	Yellow LED
Setting options	IO-Link®, Teach-in, Via display and buttons
Protection against tampering	IO-Link®, PIN code
Setting range threshold value	0 ... 99%

Datasheet

Immission/emission	
Degree of protection	IP40
Pressure drop	<50 mbar
Protection class	III
Corrosion resistance class CRC ¹⁾	2 - Moderate corrosion stress
Cleanroom suitability, measured according to ISO 14644-14	Class 4 according to ISO 14644-1
Pollution degree	3
LABS (PWIS) conformity	VDMA24364 zone III
Suitability for the production of Li-ion batteries ²⁾	Suitable for battery production with reduced Cu/Zn/Ni values (F1a)

1) Corrosion resistance class CRC 2 according to Festo standard FN 940070

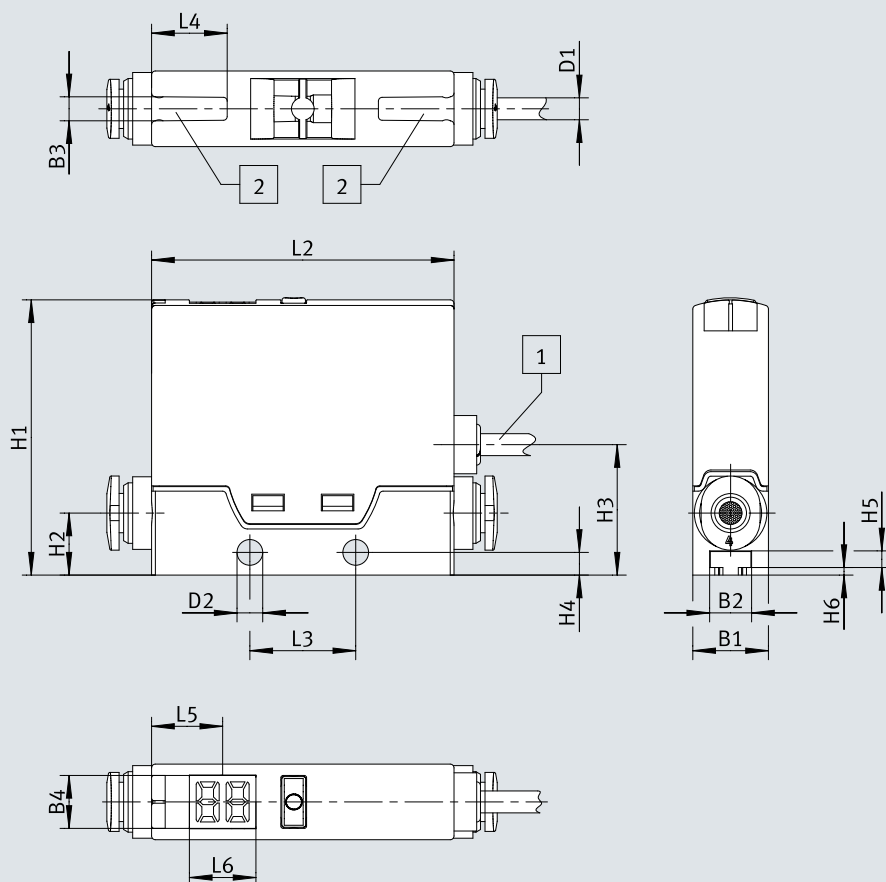
Moderate corrosion stress. Indoor applications in which condensation can occur. External visible parts with primarily decorative surface requirements that are in direct contact with a normal industrial environment.

2) Only with threaded connectionM5F...

Dimensions

Dimensions – SFAE-...

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[1] Cables

[2] T-slot for M3 hex-head bolts (EN ISO 4017). Hole spacing 27 mm to 33 mm

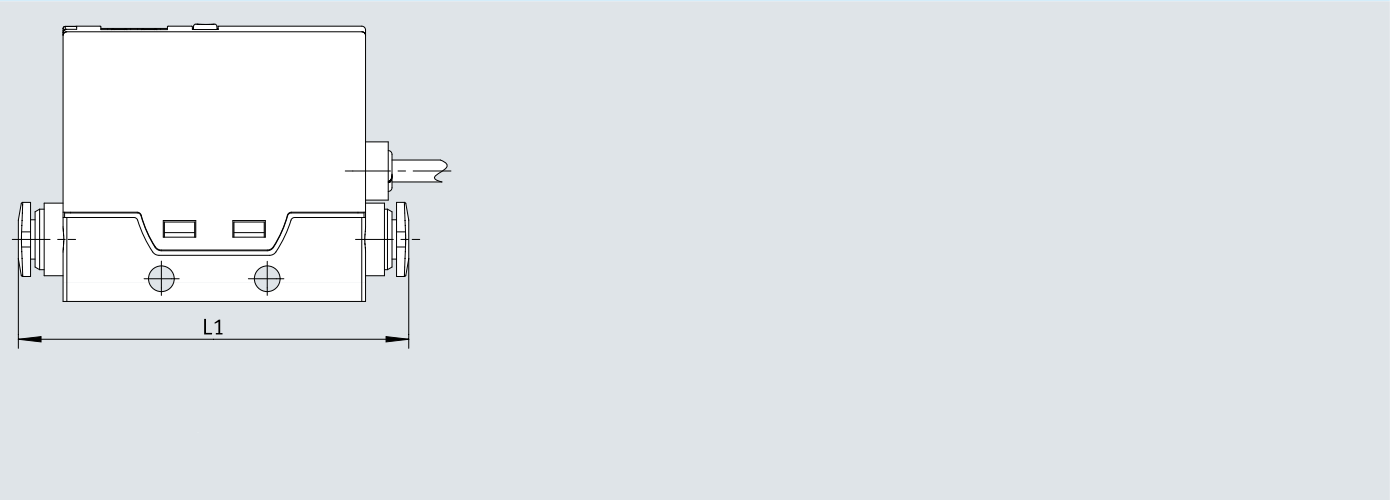
Dimensions

	B1	B2	B3	B4	D1 Ø	D2 Ø	H1	H2	
SFAE-1U-Q4-PNLK-PNVB-2.5K	10	5,6	3,2	7	2,9	3,4	36,4	8,2	
SFAE-1U-Q4-PNLK-PNVB-0.3M8									
SFAE-1U-M5F-PNLK-PNVB-2.5K									
SFAE-1U-M5F-PNLK-PNVB-0.3M8									
SFAE-2U-Q4-PNLK-PNVB-2.5K									
SFAE-2U-Q4-PNLK-PNVB-0.3M8									
SFAE-2U-M5F-PNLK-PNVB-2.5K									
SFAE-2U-M5F-PNLK-PNVB-0.3M8									
SFAE-5U-Q4-PNLK-PNVB-2.5K									
SFAE-5U-Q4-PNLK-PNVB-0.3M8									
SFAE-5U-M5F-PNLK-PNVB-2.5K									
SFAE-5U-M5F-PNLK-PNVB-0.3M8									
SFAE-10U-Q4-PNLK-PNVB-2.5K									
SFAE-10U-Q4-PNLK-PNVB-0.3M8									
SFAE-10U-M5F-PNLK-PNVB-2.5K									
SFAE-10U-M5F-PNLK-PNVB-0.3M8									
	H3	H4	H5	H6	L2	L3	L4	L5	L6
SFAE-1U-Q4-PNLK-PNVB-2.5K	17,3	3	2,2	1	40	14	10	9,4	8,8
SFAE-1U-Q4-PNLK-PNVB-0.3M8									
SFAE-1U-M5F-PNLK-PNVB-2.5K									
SFAE-1U-M5F-PNLK-PNVB-0.3M8									
SFAE-2U-Q4-PNLK-PNVB-2.5K									
SFAE-2U-Q4-PNLK-PNVB-0.3M8									
SFAE-2U-M5F-PNLK-PNVB-2.5K									
SFAE-2U-M5F-PNLK-PNVB-0.3M8									
SFAE-5U-Q4-PNLK-PNVB-2.5K									
SFAE-5U-Q4-PNLK-PNVB-0.3M8									
SFAE-5U-M5F-PNLK-PNVB-2.5K									
SFAE-5U-M5F-PNLK-PNVB-0.3M8									
SFAE-10U-Q4-PNLK-PNVB-2.5K									
SFAE-10U-Q4-PNLK-PNVB-0.3M8									
SFAE-10U-M5F-PNLK-PNVB-2.5K									
SFAE-10U-M5F-PNLK-PNVB-0.3M8									

Dimensions

Dimensions – SFAE-...-Q4-...

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	L1 max.
SFAE-1U-Q4-PNLK-PNVB-2.5K	55
SFAE-1U-Q4-PNLK-PNVB-0.3M8	
SFAE-2U-Q4-PNLK-PNVB-2.5K	
SFAE-2U-Q4-PNLK-PNVB-0.3M8	
SFAE-5U-Q4-PNLK-PNVB-2.5K	
SFAE-5U-Q4-PNLK-PNVB-0.3M8	
SFAE-10U-Q4-PNLK-PNVB-2.5K	
SFAE-10U-Q4-PNLK-PNVB-0.3M8	

Dimensions

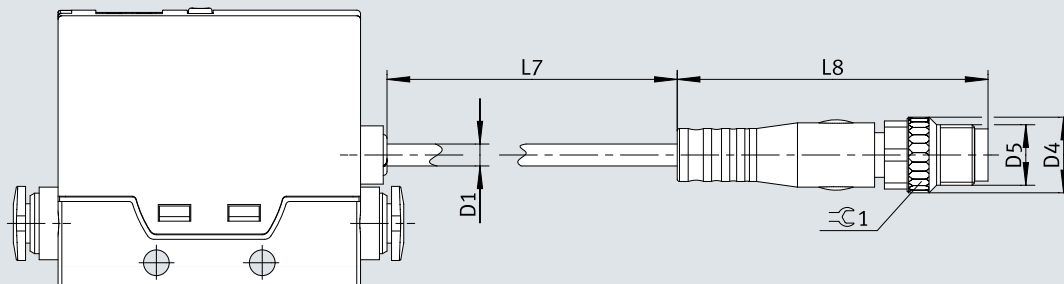
Dimensions – SFAE-...-M5F-... [Download CAD data](#) www.festo.com



	D3	L1 max.	T1
SFAE-1U-M5F-PNLK-PNVB-2.5K	M5	47	6
SFAE-1U-M5F-PNLK-PNVB-0.3M8			
SFAE-2U-M5F-PNLK-PNVB-2.5K			
SFAE-2U-M5F-PNLK-PNVB-0.3M8			
SFAE-5U-M5F-PNLK-PNVB-2.5K			
SFAE-5U-M5F-PNLK-PNVB-0.3M8			
SFAE-10U-M5F-PNLK-PNVB-2.5K			
SFAE-10U-M5F-PNLK-PNVB-0.3M8			

Dimensions

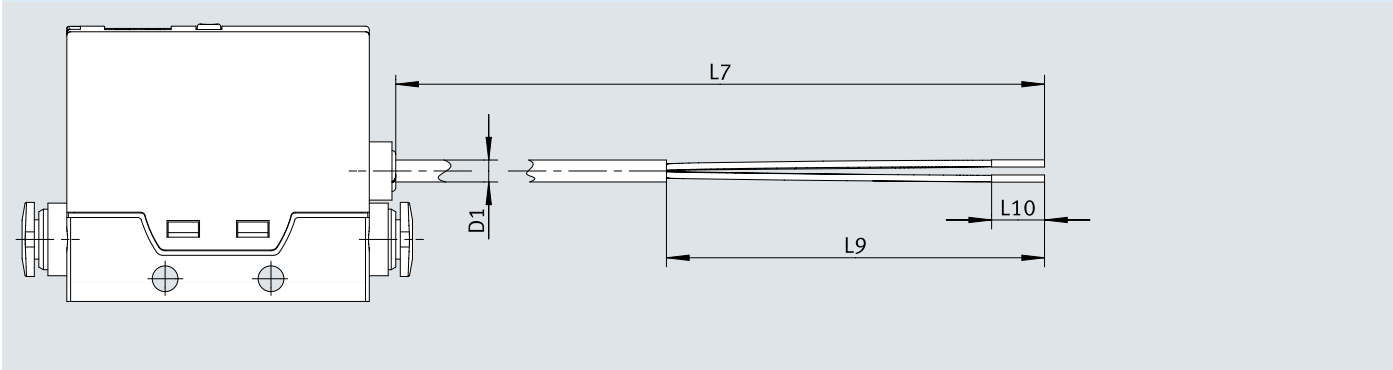
Dimensions – SFAE-...-0.3M8

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	D1 Ø	D4 Ø	D5	L7	L8	☞ 1
SFAE-1U-Q4-PNLK-PNVB-0.3M8	2,9	10	M8	~300	41,1	9
SFAE-1U-M5F-PNLK-PNVB-0.3M8						
SFAE-2U-Q4-PNLK-PNVB-0.3M8						
SFAE-2U-M5F-PNLK-PNVB-0.3M8						
SFAE-5U-Q4-PNLK-PNVB-0.3M8						
SFAE-5U-M5F-PNLK-PNVB-0.3M8						
SFAE-10U-Q4-PNLK-PNVB-0.3M8						
SFAE-10U-M5F-PNLK-PNVB-0.3M8						

Dimensions

Dimensions – SFAE-...-2.5K Download CAD data www.festo.com

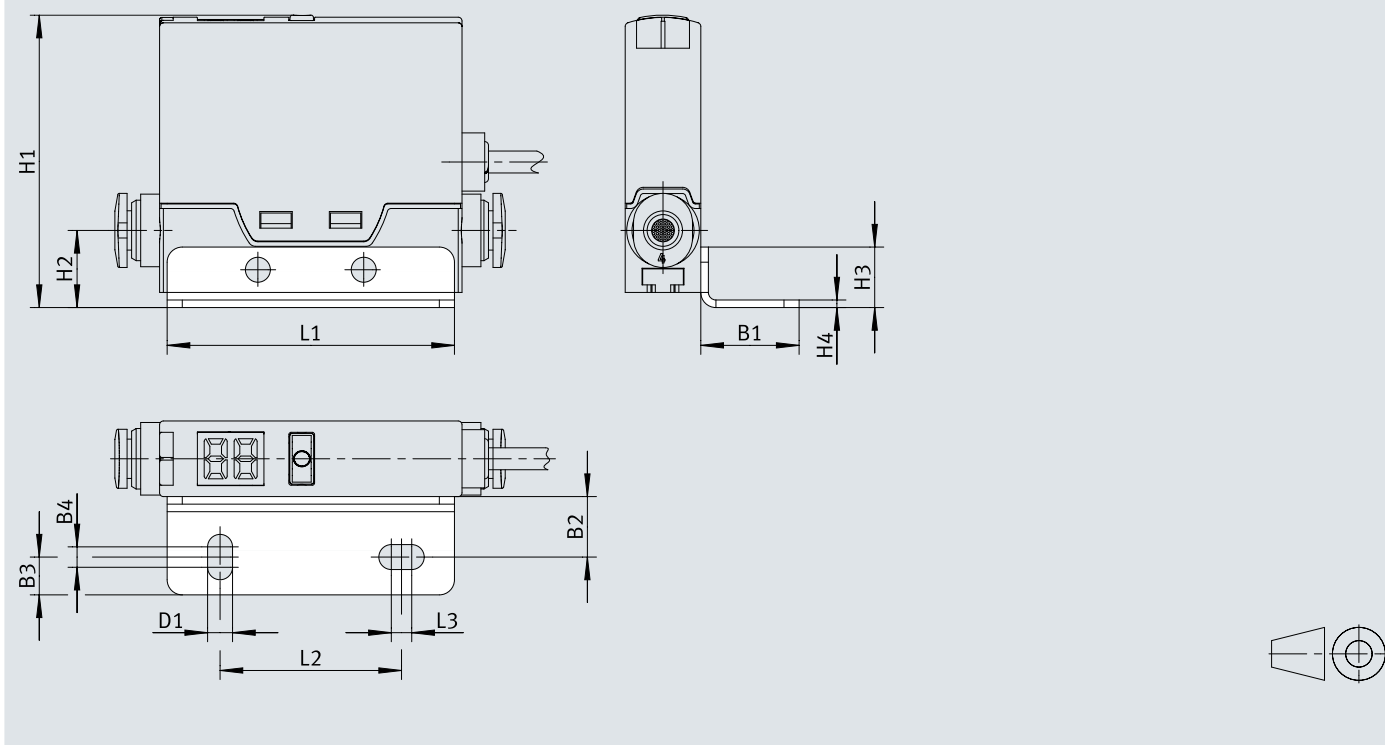


	D1 ø	L7	L9	L10
SFAE-1U-Q4-PNLK-PNVB-2.5K	2,9	~2500	50	7
SFAE-1U-M5F-PNLK-PNVB-2.5K				
SFAE-2U-Q4-PNLK-PNVB-2.5K				
SFAE-2U-M5F-PNLK-PNVB-2.5K				
SFAE-5U-Q4-PNLK-PNVB-2.5K				
SFAE-5U-M5F-PNLK-PNVB-2.5K				
SFAE-10U-Q4-PNLK-PNVB-2.5K				
SFAE-10U-M5F-PNLK-PNVB-2.5K				

Dimensions

Dimensions – SFAE with mounting bracket

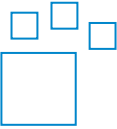
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	B1	B2	B3	D1	H1	H2	H3	H4	L1	L2	L3
SFAE-...+A	13	8	5	3,3	38,4	10,2	8	1	38	24	2,7

Ordering data

Ordering data						
	Pneumatic connection	Electrical connection 1, connector system	Start value for flow rate measuring range	End value for flow rate measuring range	Part no.	Type
	Female thread M5	M8x1, A-coded, to EN 61076-2-104	0 l/min	1 l/min	8058504	SFAE-1U-M5F-PNLK-PNVB-0.3M8
				2 l/min	8058508	SFAE-2U-M5F-PNLK-PNVB-0.3M8
				5 l/min	8207434	SFAE-5U-M5F-PNLK-PNVB-0.3M8
				10 l/min	8207438	SFAE-10U-M5F-PNLK-PNVB-0.3M8
		Open end		1 l/min	8058503	SFAE-1U-M5F-PNLK-PNVB-2.5K
				2 l/min	8058507	SFAE-2U-M5F-PNLK-PNVB-2.5K
				5 l/min	8207433	SFAE-5U-M5F-PNLK-PNVB-2.5K
				10 l/min	8207437	SFAE-10U-M5F-PNLK-PNVB-2.5K
	For push-in connector O.D. 4 mm	M8x1, A-coded, to EN 61076-2-104		1 l/min	8058502	SFAE-1U-Q4-PNLK-PNVB-0.3M8
				2 l/min	8058506	SFAE-2U-Q4-PNLK-PNVB-0.3M8
				5 l/min	8058516	SFAE-5U-Q4-PNLK-PNVB-0.3M8
				10 l/min	8207436	SFAE-10U-Q4-PNLK-PNVB-0.3M8
		Open end		1 l/min	8058501	SFAE-1U-Q4-PNLK-PNVB-2.5K
				2 l/min	8058505	SFAE-2U-Q4-PNLK-PNVB-2.5K
				5 l/min	8058509	SFAE-5U-Q4-PNLK-PNVB-2.5K
				10 l/min	8207435	SFAE-10U-Q4-PNLK-PNVB-2.5K

Ordering data – Modular product system					
	Flow measuring range	Pneumatic connection	Electrical connection 1, connector system	Part no.	Type
	Max. 1 l/min, Max. 2 l/min, Max. 5 l/min, Max. 10 l/min	Female thread M5, For push-in connector O.D. 4 mm	M8x1, A-coded, to EN 61076-2-104, Open end	8058500	SFAE-

Accessories

Connecting cables NEBA-M8, straight socket					
	Electrical connection 1, connector system	Electrical connection 2, connector system	Cable length	Part no.	Type
	M8x1, A-coded, to EN 61076-2-104	Open end	2.5 m	8078227	NEBA-M8G4-U-2.5-N-LE4
			5 m	8078228	NEBA-M8G4-U-5-N-LE4

Push-in fitting					
	Design	Pneumatic connection, port 1	Pneumatic connection, port 2	Part no.	Type
	Straight design	Male thread M5	For tubing outside diameter of 6 mm	153306	QSM-M5-6

Push-in fitting					
	Design	Pneumatic connection, port 1	Pneumatic connection, port 2	Part no.	Type
	L-shape	Male thread M5	For tubing outer diameter of 3 mm	153331	QSML-M5-3
			For tubing outside diameter of 4 mm	153333	QSML-M5-4
			For tubing outside diameter of 6 mm	153335	QSML-M5-6

Mounting bracket				
	Information on materials	Product weight	Part no.	Type
	High-alloy stainless steel	6 g	8058519	SAMH-FE-A