

SCHMIDT® Flow Sensor SS 20.415



Product description

Thermal flow sensor for the measurement in one or two directions of the flow velocity of air and gases with simultaneous detection of the flow direction.

Extremely compact because electronics are integrated in the sensor tube. Sensor element located in the chamber head and protected against mechanical load. Linear analog output to indicate the measurement values, two switching outputs to output the flow direction and the signal of the threshold value. An optional programming kit (RS232 with Windows PC) allows on-site the configuration of the sensor, with additional indication of temperature and flow quality (degree of turbulence) of the medium.

Special version for laminar flow monitoring in cleanrooms with quick mounting technique for easy installation in cleanroom ceiling systems and cleanroom walls.

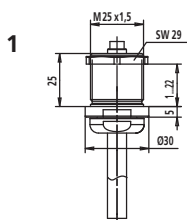
Application examples

- Laminar-flow monitoring in cleanrooms
- Flow monitoring in the production of pharmaceuticals, semiconductors, food stuffs, LCD and optical products
- Integrating in insulators, filter-fan-units and flowboxes

Product advantages

- Design according to GMP
- For disinfection with alcohols and H₂O₂
- High precision
- Quick mounting technique suitable for current ceiling systems
- Switching outputs
- With detection of direction
- With self-monitoring
- Assessment of flow quality

Mounting versions

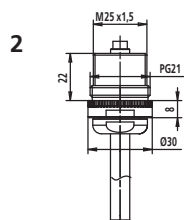


Type 1

For mounting in ceilings, walls or frames with thickness from 1 to 22 mm. Opening Ø 26 mm is necessary (mounting with counter-nut) or a thread M25 x 1.5 in ceiling frame.

Scope of delivery

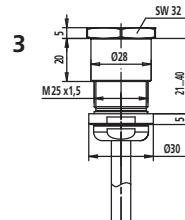
- threaded bush M25 (stainless steel)
- counter-nut



Type 2

For mounting in frames in existing opening with PG21 thread (e.g. sprinkler openings in profiles).

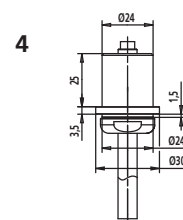
- threaded bush M25 (stainless steel)
- thread adaptor M25 x 1.5 on PG21



Type 3

For mounting in frames with a thickness of 21 to 40 mm, especially for hollow chamber ceiling profile. Openings Ø 26 mm and Ø 28.5 mm necessary.

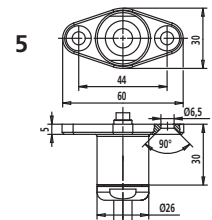
- threaded bush M25 (stainless steel)
- shank nut



Type 4

For welding in stainless steel ceilings or walls. For pressure-tight mounting.

- welding bush (stainless steel)



Type 5

For mounting under the ceiling or on the wall with two screws M6. Opening in ceiling / wall Ø 15 mm for cable necessary and 2 threads M6.

- flange bush (stainless steel)

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Technical data

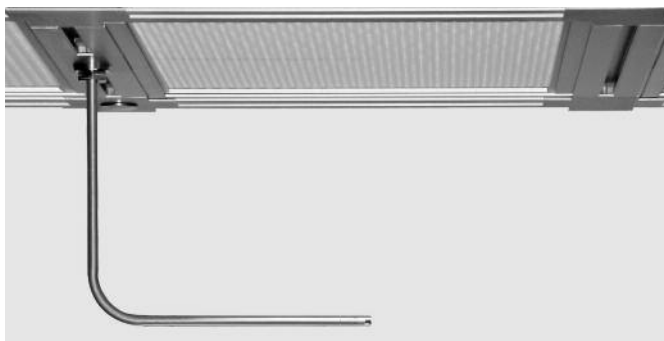
Measuring quantity	standard velocity w_N of air relative to standard conditions 20 °C and 1013.25 hPa
Medium to be measured	clean air or nitrogen, other gases on request
Measuring range w_N	0 ... 1 m/s 0 ... 2.5 m/s 0 ... 5 m/s 0 ... 10 m/s 0 ... 20 m/s unidirectional or bidirectional
Lower detection limit	0.05 m/s
Measuring inaccuracy	\pm (3 % of measuring value + 0.4 % of final value); min. \pm 0.05 m/s
Repeatability	\pm 2 % of measuring value
Response time (t_{90})	0.01 ... 10 s (configurable)
Storage temperature	-20 ... +85 °C
Operating temperature	0 ... +60 °C
Humidity range	0 ... 95 % rel. humidity (RH)
Pressure range	700 ... 1300 hPa
Supply voltage U_B	7.5 ... 24 V DC + 10 % ¹⁾
Current consumption	typ. < 10 mA (without electrical load)
Analog output	current ($R_L \leq 300 \Omega$): • 0 ... 20 mA • 4 ... 20 mA ²⁾ voltage ($R_L \geq 10 k\Omega$): • 0 ... 10 V • 0 ... 5 V • 0 ... 2 V
Switching outputs	OC1 and OC2
• Signal	OC1: direction or threshold value OC2: threshold value
• Model	open-collector, current-limited and short-circuit protected
• Electrical data	$U_{S, max} = 26.4$ V DC $I_{S, max} = 65$ mA
• Adjustment threshold value	0 ... 100 % of end value; min. \pm 0.05 m/s
• Switching hysteresis	5 % of switch threshold; min. 0.05 m/s
• Configuration	via RS232 (programming kit)
Electrical connection	plug-in connection M9, 7-pin type: male connector
Line length	15 m max. (voltage output) 100 m max. (current output)
Protection type	IP 67 (housing) IP 67 (connector)
Mounting	The sensor is mounted in the supplied mounting bush, welding bush or flange bush and can be adjusted under any rotation angle (see also mounting versions).
Dimensions / material	
• Sensor head	Ø 9 mm x 10 mm aluminium anodised
• Sensor tube	Ø 9 mm stainless steel 1.4571
• Sensor height H	65 / 300 mm (angled design)
• Sensor length L	300 mm
Weight	about 200 g (angled design)

¹⁾ For the analog output with 0 ... 10 V and for the current interface, the minimum voltage is $U_{B, min} = 12$ V.

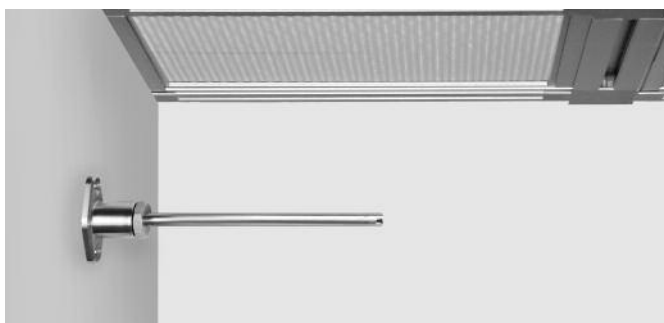
²⁾ Current output according to NAMUR NE43: Overflow ≤ 22 mA, error = 2 mA

³⁾ Extension cable must always be ordered

Mounting examples



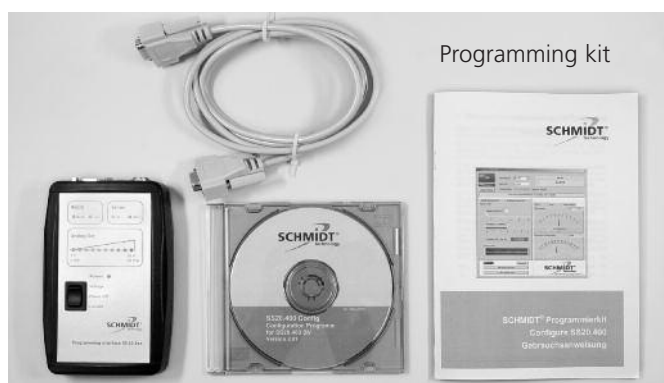
Sensor 300 mm x 300 mm, with mounting type 1:
mounting in ceiling (below a laminar flow unit)

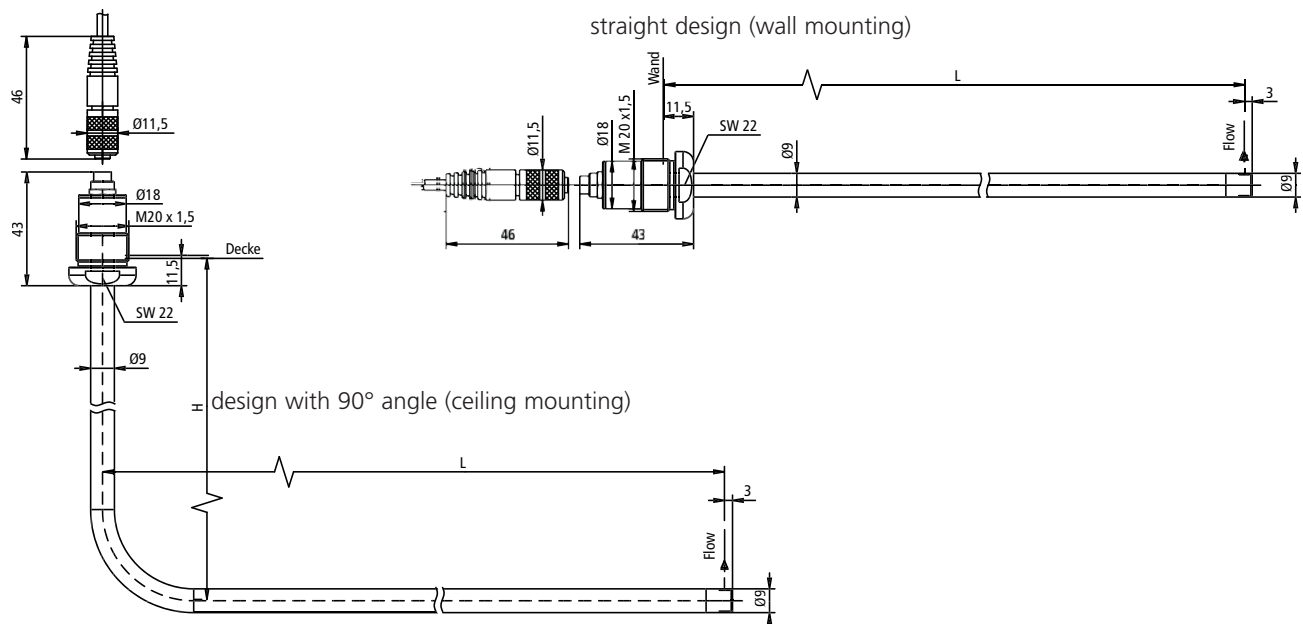


Sensor 300 mm straight, with mounting type 5: wall mounting

Accessories

Coupler socket M9, 7-pin, with soldering sleeves for cable 0.14 mm ²	507 150
Connecting cable (shielded), with coupler socket M9, 7-pin cable length: 2 m / 5 m / 10 m	505 911 -1 / -2 / -3
Programming kit, suitable for PC's with Windows 2000 or XP and with RS232 interface	505 960
Extension cable between programming kit and sensor ³⁾	506 944
ISO Calibration Certificate	506 247 -xx





Quick mounting technique

Each sensor is delivered with a mounting kit (see mounting versions), which makes it possible to install the sensor in nearly every conventional ceiling system. At the same time, it allows a quick mounting and dismounting of the sensor.

For mounting, proceed as follows:

- Mount the fixing socket in the wall or ceiling
- Lay the connection cable in the "Grey Room"
- Connect the cable to the sensor in the cleanroom
- Screw the sensor in the fixing socket

Self-monitoring

The sensor permanently monitors its function. If a fault, causing a measurement error, is detected, it will be signalled as follows:

- Analog: current interface (4 ... 20 mA) drops to 2 mA
- RS232: error diagnosis by programming kit

Detectable faults at the sensor element:

- Humidity: reversible error is signalled until sensor element has become dry
- Soiling: requires cleaning
- Defective: send for repair

Switching outputs

The individual switching outputs can be used as follows:

- Direct activation of digital inputs with integrated pull-up resistor (e.g. PLC input).
- Direct driving of ohmic or inductive loads (e.g. LED or relay) with a maximum power consumption of 65 mW.

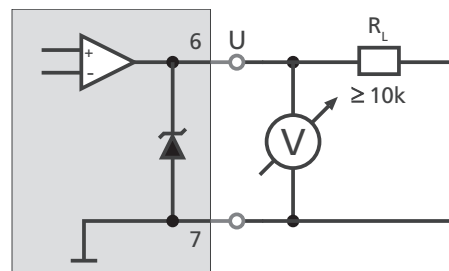
Note:

The internal resistance R_L under load may not fall below a minimum value, which can be calculated as follows:

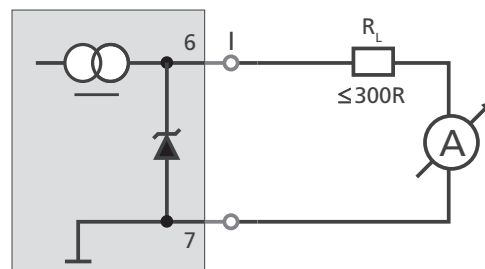
$$R_L \geq \frac{U_S [V] - 2.6 V}{0.065 A} \Omega$$

Example: $R_{L, \min} = 366 \Omega$ for $U_{S, \max} = 26.4 V$

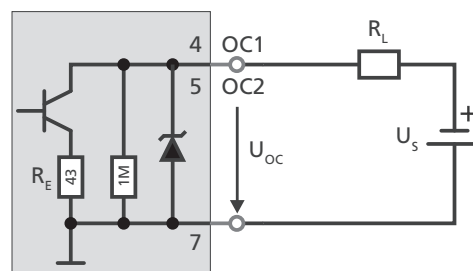
Output wiring



Analog output: 0 ... 2 / 5 / 10 V, $R_{L2} \geq 10 k\Omega$



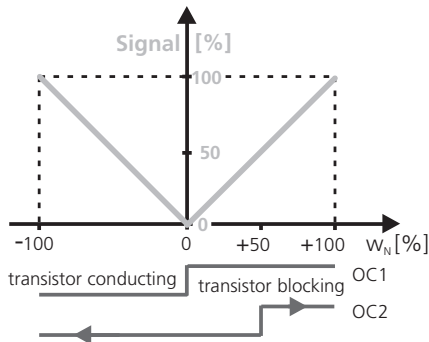
Analog output: 0 / 4 ... 20 mA, $R_{L1} \leq 300 \Omega$



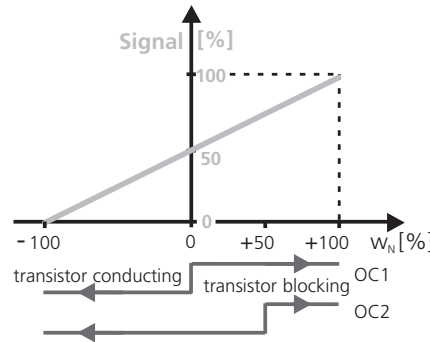
Switching outputs OC1, OC2

Display of analog and digital signals

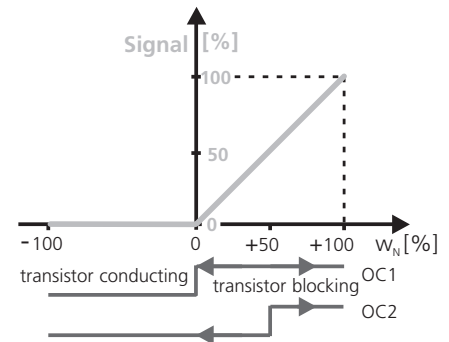
Bidirectional
direction display: switching output OC1



Bidirectional
direction display: 0 m/s = 50 % signal

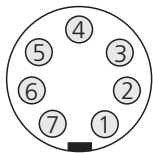


Unidirectional
direction display: none



Note: In an unidirectional design, the switching output OC1 is used as a flow indicator by default (configurable). It indicates a flow greater than 0 m/s by blocking and switches through in case flow is smaller or equal 0 m/s. The arrows in the figure of the switching outputs signify that the threshold value is configurable.

Pin assignment



View on sensor plug pins

Pin	Designation	Function	Wire color connecting cable
1	power	operating voltage U_B	white
2	TXD	RS232	brown
3	RXD	RS232	green
4	OC1	switching output 1: direction or switch threshold	yellow
5	OC2	switching output 2: switch threshold	grey
6	analog	velocity signal	pink
7	GND	ground connection	blue
	Shield	electromagnetic screening	shielding braid

¹⁾ The braiding shield is connected electrically to the metallic housings of connector and sensor and has to be coupled to protective potential, e. g. earth (depending on the shielding scheme).

Ordering information

Article No.	Mounting length X L	Measuring range Y w_N	Measuring direction D	Output Z	Indication of direction R	Mounting B	Programming P
505 790-XYDZRB-P	1 H 300 mm L 300 mm	1 0 ... 1 m/s	1 unidirectional	1 0 ... 10 V	1 OC1 = direction signal	1 threaded bush M25	S standard
	2 L 300 mm straight	2 0 ... 2.5 m/s	2 bidirectional	2 0 ... 5 V	2 analog signal contains direction 0 m/s = 50 % signal	2 threaded bush PG21	K customized
	3 H 65 mm L 300 mm	3 0 ... 5 m/s		3 0 ... 2 V		3 threaded bush + shank nut	
		4 0 ... 10 m/s		4 0 ... 20 mA	3 unidirectional	4 welding bush	
		5 0 ... 20 m/s		5 4 ... 20 mA		5 flange bush, sealed	

Programming kit

The following default settings can be changed using the programming kit or preprogrammed by factory (P = K):

Parameter	Factory setting	Setting range	Note
Response time	1 s	0.01 ... 10 s	
Threshold value OC1	0 m/s	(-100 ...) 0 ... +100 %	set to 0 m/s for bidirectional version with indication of direction via OC1
Threshold value OC2	50 % of measuring range.	(-100 ...) 0 ... +100 %	
Switching polarity OC1/2	see graphics above	polarity reversible	

The user interface displays the values of flow, temperature of the medium and status of switching outputs continuously, combined with the calculated degree of flow turbulence (operating manual art. no. 505 959.02). This kind of measurement transmission and evaluation is intended for configuration or testing purposes only and not suitable for continuous operating.