

Simply a question of
better measurement



SCHMIDT® Flow Sensor SS 20.415 LED and SS 20.515 LED

laminar flow monitoring:

- very precise
- LED operating status indicator
- quick installation

Industrial processes

Cleanroom and pharmaceuticals

**Laminar flow
safe operations
at a glance!**





Flow monitoring in clean rooms and clean zones

A direction-defined air-flow in clean rooms protects the products against contaminations and unwanted particles will safely be evacuated. To do so, a uniform air flow from the ceiling to the floor ("oriented, low-turbulence displacement flow") is maintained in clean rooms of strong purity levels. The monitoring range is from 0.36 to 0.54 m/s flow velocity (EU GMP guide, Annex 1 in class A). In the clean room the measurements are made behind terminal filters. Since the recirculation of air is reduced during standstill periods, an extremely precise measurement of the air velocity is mandatory from 0.1 m/s on.

The solution: Air flow measurement by SCHMIDT® Flow Sensors SS 20.515 LED or SS 20.415 LED

According to the standard EN ISO 14644-3, the air velocity is measured at a distance of approx. 150 to 300 mm below the front surface of the filter. To facilitate an installation into ceiling or wall systems, the thermal SCHMIDT® Flow Sensors SS 20.415 LED and SS 20.515 LED are supplied with a cleanroom-compliant quick assembly kit. Both sensors are extremely compact since all electronic components are installed in the sensor tube and therefore no turbulence is generated in the low-turbulence displacement flow. For a use of supply air systems, the SS 20.415 LED offers an option for simultaneous detection of the flow direction – which is interesting in case of back flows.

Measuring accuracy in black and white

One special feature of these sensors is the optional adjustment and calibration in a "vertical airflow wind tunnel". This offers the advantage that the sensor becomes adjusted for its dedicated and specialized use in a vertical downstream airflow and exactly adjusted to the relevant laminar airflow monitoring set-points (measuring range 0 ... 1 m/s; 0.45 m/s \pm 20 %). Furthermore the effects of self-convection of thermal anemometers become compensated and eliminated which is only possible by an adjustment in a vertical airflow. By this, highest precision will be achieved. The renowned laser doppler measurement process (LDA) is used as reference.

Upon request, the sensors will be supplied with an additional high-precision calibration. This enhances the precision even more by the use of more calibration points, and the documentation of the target and actual values in a factory calibration certificate. This calibration can be renewed in accordance with the specifications set by the user, which - in general - is after one year. Also DAkkS accredited calibrations can be offered to achieve the highest calibration level.

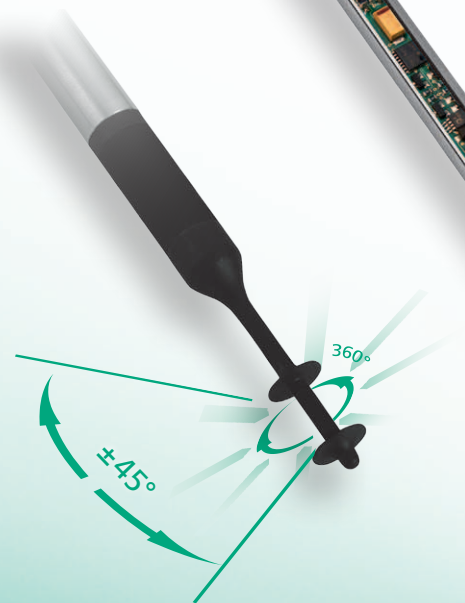


Output signal
4 ... 20 mA/0 ... 10 V

5 mechanical fixing options

SS 20.515 LED

with protecting cover



The extreme wide flow angle of 360 degrees radial and 90 degrees vertical eases the positioning in the gas flow.



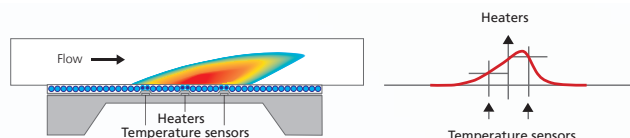
SS 20.415 LED

Precise measurement of small air velocities

Both SCHMIDT® Flow Sensors SS 20.415 LED and SS 20.515 LED are based on the thermal measurement principle. The mechanical architecture of the sensor element, however, varies.

SCHMIDT® Flow sensor SS 20.415 LED The "Thermopile" measurement principle

The thermal Flow Sensor SS 20.415 LED is based on and functions with a thermopile sensor. Its heated semi-conductor element detects the cooling air flowing by.



A heat bell forms on top of the "heater" and will be moved by the flow. At the left and right hand sides of the heater, two temperature probes measure the medium's temperature. The resulting measurement differences are used to determine the normal velocity. There, where the warmest area is detected, the sensor identifies the flow direction (as an option).

SCHMIDT® Flow Sensor SS 20.515 LED the dumb-bell head measurement principle

The Flow Sensor that is located in the stainless steel sleeve between the two "disks of the dumb-bell", is heated to more than 40 K above the medium temperature. Which is measured by a separate temperature sensor. The output required to maintain this excessive temperature is used as measure to determine the flow velocity that is presented as "normal velocity". This means that it is not necessary to perform an additional pressure or temperature measurement of the medium. Both dumb-bell disks serve as flow rectifiers so that it is also possible to measure comparably irregular flows.

Sensor operating status indicator	
● steady green light	sensor is ready for operation
● flashing red light	malfunction
● steady red light	Analog output connected incorrectly
● flashing orange light	Measured value outside monitoring window 0.45 m/s ± 20 % (as an order option)



Evaluation electronics

Temperature sensor

Flow sensor

Measuring chamber



Always the right choice

Both sensors, the SS 20.415 LED and the SS 20.515 LED, can be used in cleanrooms and comply with the GMP and offer mounting options geared to cleanrooms as well as plug connections allowing for a quick change on site. Depending on the application, both sensors offer additional advantages:

- Can be disinfected using alcohols and H₂O₂ (VHP-proof)
- Detection even of the smallest air flows from 0.05 and/or 0.06 m/s on
- Self-monitoring and transmission of error signals
- Special lengths of up to 1,000 mm (straight version)

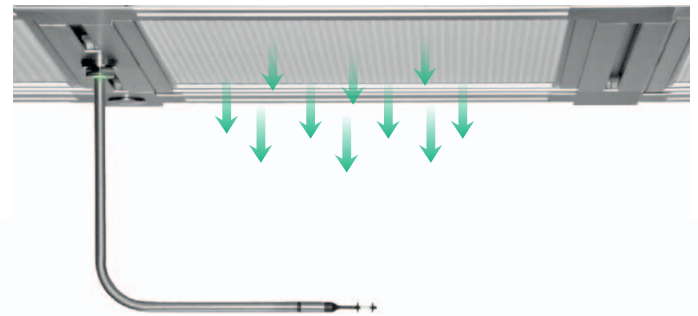
The differences at a glance

	SS 20.415 LED	SS 20.515 LED
Sensor version	Thermopile	Dumb-bell head
Temperature measurement	-	yes
Detection of the direction	yes, bi-directional (as an option)	-
Flow angle	±5°	360°/±45°
Switching outputs	2 x open collectors	-
For a use with:		
Aggressive media	no	+ ++ (with protective coating)
Alcohols	+	+ ++ (with protective coating)
H ₂ O ₂	++	++ (without protective coating)
Response time (t ₉₀)	from 0.01 s on	approx. 3 s
Resistance against mechanical load	++	+*
Cleaning when turned on	no	++
Customer-specific programming	yes (as an option)	-

* with safety bar; - not possible; + well-suited; ++ ideally suited

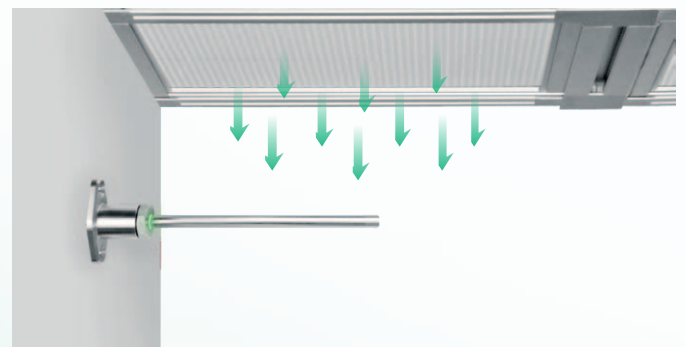
Both sensor types are available both, as 90° angular version for ceilings (150 x 300 mm or 270 x 300 mm) or straight for an integration into walls.

Example 1



SS 20.515 LED (angular; 270 mm x 300 mm), installation to the ceiling below a laminar flow unit (with a type 1 fixation)

Example 2

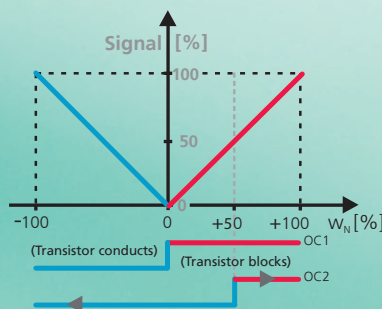


SS 20.415 LED (straight; ≥ 300 mm), installation to the wall (with a type 5 fixation)

Representation of the analog and digital signals SS 20.415 LED

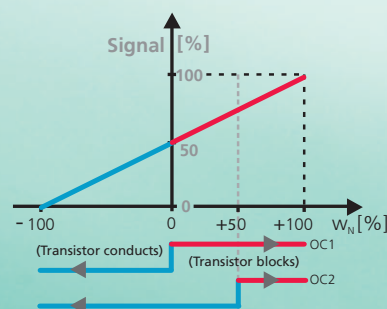
Bidirectional

Representation of the direction: Switching output OC1



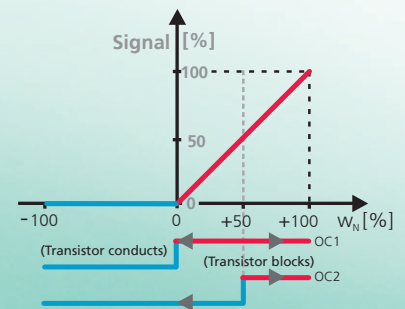
Bidirectional

Representation of the direction: 0 m/s = 50 % signal



Unidirectional

Representation of the direction: none



Remark: In an unidirectional design, the switching output OC1 is used as flow indicator by default (configurable). It will clearly show a flow higher than 0 m/s by blocking and will switch if this is less or equal to 0 m/s. Arrows in the representation of the switching outputs mean that the threshold value can be configured. The factory setting for the switching output OC2 is 50 % of the measurement range (option: customer-specific switch point).

Parameter	Factory setting	Setting range	Note
Response time	1 s	0,01 ... 10 s	
Switching output 1 (OC1)	0 m/s	(-100 ...) 0 ... +100 %	Fixed to 0 m/s in the bidirectional version with representation of the direction via switching output 1 (OC1)
Switching output 2 (OC2)	50 % of the measurement range	(-100 ...) 0 ... +100 %	
Switch polarity OC1/OC2	See graphs „analog and digital signals“	Polarity reversible	

Accessories



Connection cables are available in different lengths.



Coupler socket item no. 535 278

To be used with and to connect to already existing cables (shielded; Ø 0.14 mm)



LED display of the measurement values (see separate brochure)

To visualize the values directly on site, a LED measurement value display can be supplied.

Advantages:

- Display in m/s or m³/h
- Programmable output signal
- Two programmable relay outputs
- Supply 85 – 250 V AC or 24 V DC
- Power supply of the connected sensor
- Option with 2nd measuring input



2 wire safety bar
item no. 559 124

Safety bar item no. 531 026

To protect the bell head against strong mechanical impacts, it is possible to insert a safety bar made of stainless steel to the sensor tube. This is particularly useful for "clean workbenches", for example, to avoid unwanted contacts during working. This safety bar excludes any form of aerodynamic impact. Dimensions (WxHxL): 53 x 11 x 99 mm

Order information accessories SCHMIDT® Flow Sensor SS 20.415 LED and SS 20.515 LED

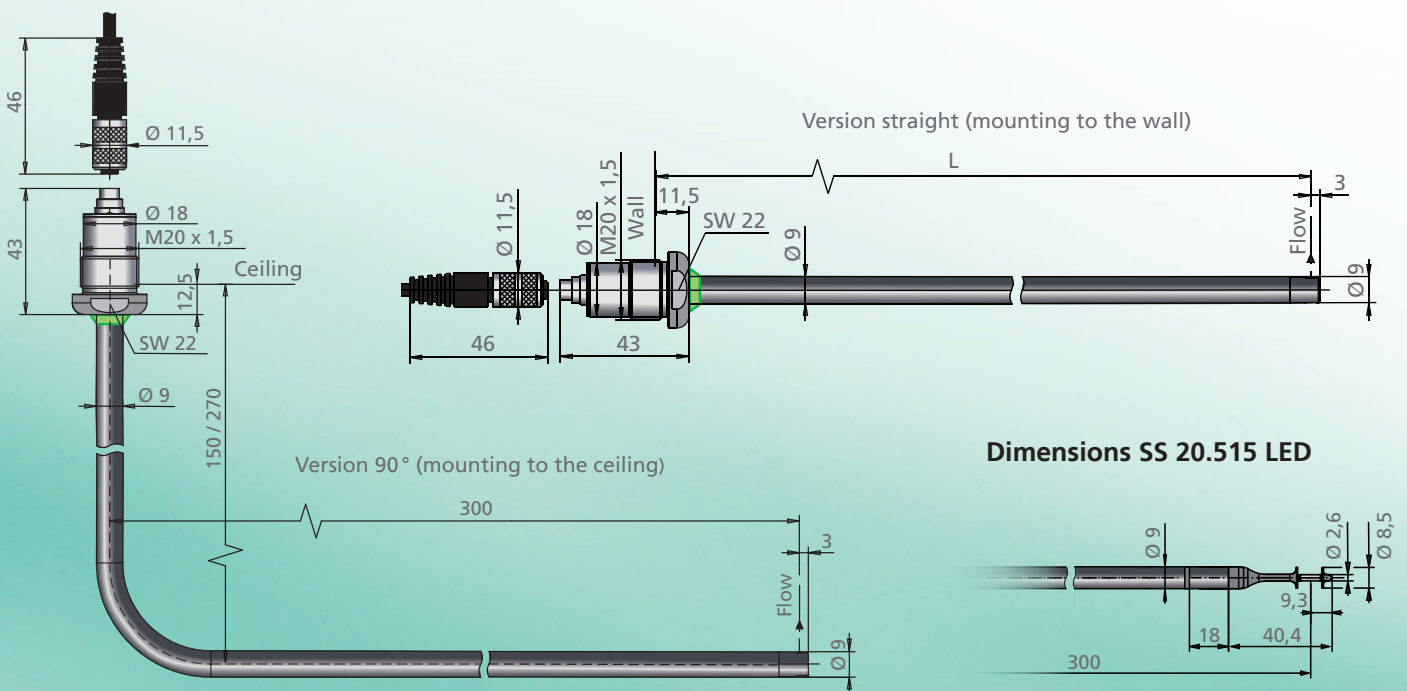
Description	Article number
Coupler socket, 7-pin with soldering sleeves for cable Ø 0.14 mm ²	535 278
Connecting cable Cleanroom 7-pin with coupler socket, 5 m length, open cable ends (PVC)	561 972
Connecting cable Cleanroom like 561 972 but with 20 m length	561 973
Connection cable with coupler socket, 5 m length, open cable ends, material PUR	535 279
Connection cable with coupler socket, length _____ m, open cable ends (length 2 ... 100 m; 1-m steps)	505 911-4
Connection cable, 7-pin with angle junction box, 10 m length, open cable ends, material PVC	535 281
Power supply: output 24 V DC / 1A; input 115 / 230 V AC	535 282
SCHMIDT® LED display MD 10.010 in wall housing to show volume flow and flow velocity, 85 ... 250 V AC and sensor power supply	527 320
SCHMIDT® LED display MD 10.010, similar to 527 320 but with 24 V DC voltage supply	528 240
SCHMIDT® LED display MD 10.015, similar to 527 320 but with an additional sum function and a second measuring input	527 330
SCHMIDT® LED display MD 10.015, similar to 527 330 but with 24 V DC voltage supply	528 250
Assembly kit for tube connection for MD 10.010/10.015 with hose clamps and band to adapt it to the tube's diameter	531 394
Measuring Section Calibrator set (8 / 12 / 16 mA)	546 741-4
Attachable protective clip for protection against mechanical influences, stainless steel	531 026
Attachable protective 2-wires-clip for protection against mechanical influences, stainless steel, H ₂ O ₂ -resistant	559 124



Selection of the mechanical fixing options

<p>Typ 1</p> <p>For mounting into ceilings, walls or frames of a thickness of 1 ... 22 mm. To insert a lock nut or a thread into the ceiling, an opening of Ø 26 mm will be required.</p> <p>Scope of supply</p> <ul style="list-style-type: none"> ■ Threaded bush M25 (stainless steel 1.4571) ■ Counternut 	<p>Typ 2</p> <p>To be installed to an opening with PG21 thread (e.g. sprinkler openings in profiles) in the frame.</p> <ul style="list-style-type: none"> ■ Threaded bushing M25 (stainless steel 1.4571) ■ Thread adapter M25 x 1.5 on PG21 	<p>Typ 3</p> <p>For mounting into a frame of a thickness of 21 ... 40 mm, especially for hollow chamber ceiling profiles. Openings of Ø 26 mm and Ø 28.5 mm will be required.</p> <ul style="list-style-type: none"> ■ Threaded bush M25 (stainless steel 1.4571) ■ Shank nut 	<p>Typ 4</p> <p>For welding into stainless steel ceilings or walls.</p> <ul style="list-style-type: none"> ■ Welding bush (stainless steel 1.4571) 	<p>Typ 5</p> <p>Will be installed by two M6 screws below the ceiling or to the wall. Opening in the ceiling/wall of Ø 15 mm required for cable plus 2 M6 threads. For pressure-tight mounting (max. 300 mbar).</p> <ul style="list-style-type: none"> ■ Flange bush (stainless steel 1.4404)
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Dimensions SCHMIDT® Flow Sensor SS 20.415 LED and SS 20.515 LED (mm)



Dimensions SS 20.515 LED

Min. immersion depth: 58 mm

Technical Data

Data	SS 20.415 LED	SS 20.515 LED
Measurement size w_N	Normal velocity w_N referred to standard conditions of $T_N = 20^\circ\text{C}$ and $p_N = 1,013.25\text{ hPa}$	
Measurement medium	Clean air / nitrogen / additional gases on request	
Measurement ranges flow w_N	0 ... 1/2.5/10 m/s	
Max. display range w_N	+ 10 % above measurement range	
Lower detection threshold w_N	0.05 m/s	0.06 m/s
Measurement range temperature T_M	-20 ... +70 °C	
Measurement precision		
Default w_N ¹⁾	$\pm(3\%$ of the measured value + 0.05 m/s)	
High precision (option) w_N ¹⁾	$\pm(1\%$ of the measured value + 0.04 m/s)	
Response time $t_{90} w_N$	0.01 ... 10 s (configurable), 1 s factory sett.	3 s (step from 0 to 5 m/s)
Temperature gradient w_N	< 2 K/min at 5 m/s	
Measurement precision T_M ($w_N > 1\text{ m/s}$)	$\pm 1\text{ K}$ (10 ... 30 °C) $\pm 2\text{ K}$ remaining measurement range	
Operational temperature		
Operating temperature	0 ... +60 °C	-20 ... +70 °C
Storage temperature	-20 ... +85 °C	
Material		
Sensor head	Stainless steel 1.4404	PBT reinforced by fiber glass, stainless steel 1.4404, protective coating (as an option)
Sensor tube	Stainless steel 1.4404	
General data		
Humidity	Measuring mode: Non-condensing (< 95 % RH)	
Operating pressure	atmospheric (700 ... 1.300 hPa)	
Supply voltage	24 V DC $\pm 10\%$	
Power consumption	typ. 30 mA/max. 150 mA	typ. 80 mA/max. 120 mA
Analog output	0 ... 10 V ($R_L \geq 10\text{ k}\Omega$) or 4 ... 20 mA/max. 21,6 mA ($R_L \leq 300\ \Omega$); protected against short-circuit	
Switching outputs	2 open collectors, current-limited and protected against short circuits ($\leq 26,4\text{ V DC}/55\text{ mA}$), configurable Channel 1 (OC1): direction or threshold value Channel 2 (OC2): threshold value switching hysteresis 5 % of the threshold value, min. $\pm 0.05\text{ m/s}$	
Error signal	Only with 4 ... 20 mA output: 2 mA (according to NAMUR NE43)	
Connection	Connector M9 screwed, 7-pin, male	
Maximum line length	Voltage signal: 10 m, current signal: 100 m	
Mounting position	downdraft direction	
Type / class of protection	IP 65/III (SELV or PELV EN 50178)	
Sensor length	angled 150 x 300 mm / 270 x 300 mm, straight 300 mm or customer specific 310 ... 1,000 mm	
Weight	approx. 200 g (angled version in 270 x 300 mm)	

¹⁾ under reference conditions, related to the calibration reference

Order information SCHMIDT® Flow Sensor SS 20.415 LED and SS 20.515 LED

	Description	Article number									
			A	1	C	D	E	F	G	H	I
Basic sensor	SCHMIDT® Flow Sensor SS 20.415 LED Version as thermopile head	551 490 -	A	1	C	D	E	F	G	H	I
	SCHMIDT® Flow Sensor SS 20.515 LED Version as dumb-bell head	551 550 -	A	B	C	D	1	1	G	H	1
	Options										
Mechanical type	Sensor length 150 mm x 300 mm		3								
	Sensor length 270 mm x 300 mm		1								
	Sensor length 300 mm (straight)		2								
	Special length (only straight: _____ mm (>300 ... 1,000 mm; 10 mm steps)		9								
Protection type	Without protective coating		1								
	With protective coating (only SS 20.515 LED)		2								
Mechanical fixing	Threaded bush M25 with counter nut				1						
	Threaded bush M25 with thread adaptor M25 x 1.5 to PG21				2						
	Threaded bush M25 with shank nut				3						
	Welding bush				4						
	Flange bush				5						
	Without fixation material				6						
Measurement range	Measurement range 0 ... 1 m/s					1					
	Measuring range 0 ... 1 m/s, unidirectional, with option LED indication of threshold monitoring (0.45 m/s ±20 %)					4					
	Measurement range 0 ... 2.5 m/s					2					
	Measurement range 0 ... 10 m/s					3					
Measurement direction	Unidirectional					1					
	Bidirectional (only SS 20.415 LED)					2					
Representation of the direction	Unidirectional							1			
	Switching output OC 1 = direction signal (only SS 20.415 LED, bidirectional)							2			
	Representation of the direction with halved analog signal: 0 m/s = 12 mA / 5 V (only SS 20.415 LED, bidirectional)							3			
Output signals	0 ... 10 V								1		
	4 ... 20 mA								2		
Adjustment accuracy and calibration	Standard adjustment									1	
	Standard adjustment unidirectional with factory calibration certificate									4	
	Standard adjustment bidirectional with factory calibration certificate (SS 20.415 LED only)									5	
	High precision adjustment with factory calibration certificate									2	
	High precision adjustment with factory calibration certificate, bidirectional (only SS 20.415 LED)									3	
Sensor programming	Factory setting										1
	Customer-specific programming (only SS 20.415 LED): switching polarity, threshold value, splitting signal, response time										2