Simply a question of
better measurement

SCHMIDT® Technology

SCHMIDT® Flow Sensor SS 20.415 and SS 20.515

The tried and tested measurement experts for the monitoring of laminar flows – extremely precise and quickly installed

- Industrial processes
- Cleanroom and pharmaceuticals

Flow monitoring in clean rooms and clean zones

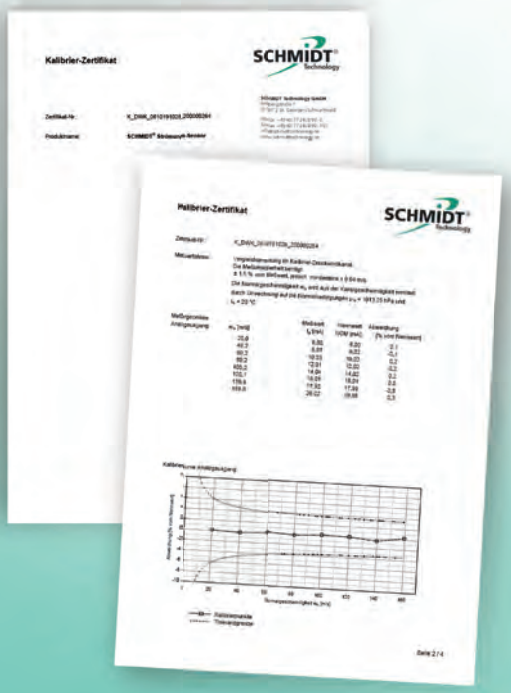
A direction-defined air-flow in clean rooms protects the products against contaminations and unwanted particles will safely be evacuated. To do so, a uniform air flow from the ceiling to the floor ("oriented, low-turbulence displacement flow") is maintained in clean rooms of strong purity levels. The 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 or SS 20.415

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 surfcae of the filter. To facilitate an installation into ceiling or wall systems, the thermal SCHMIDT® Flow Sensors SS 20.415 and SS 20.515 are supplied with a cleanroom-compliant quick assembly kit. Both sensors are extremely compact since all electronic components are integrated in the sensor tube preventing a formation of turbulences in the low-turbulence displacement flow. For a use of supply air systems, the SS 20.415 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 compensation and calibration in a novel "vertical flow channel". This offers the advantage that effects from the measurement steps on site are eliminated and highest precision will be achieved. The renowned laser doppler measurement process (LDA) is used as reference measurement process.
Upon request they will be supplied with an additional high-precision calibration system. This system enhances the precision even more by the use of more calibration points, and the documentation of the target and actual values as ISO calibration log. This calibration can be renewed in accordance with the specifications set by the user, which in – general is after one year.

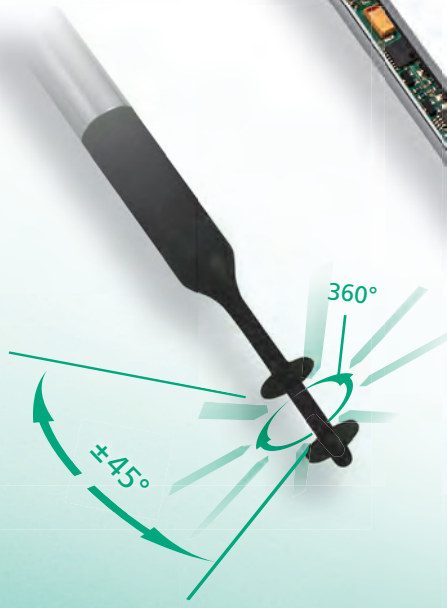


Output signal
4 ... 20 mA/0 ... 10 V

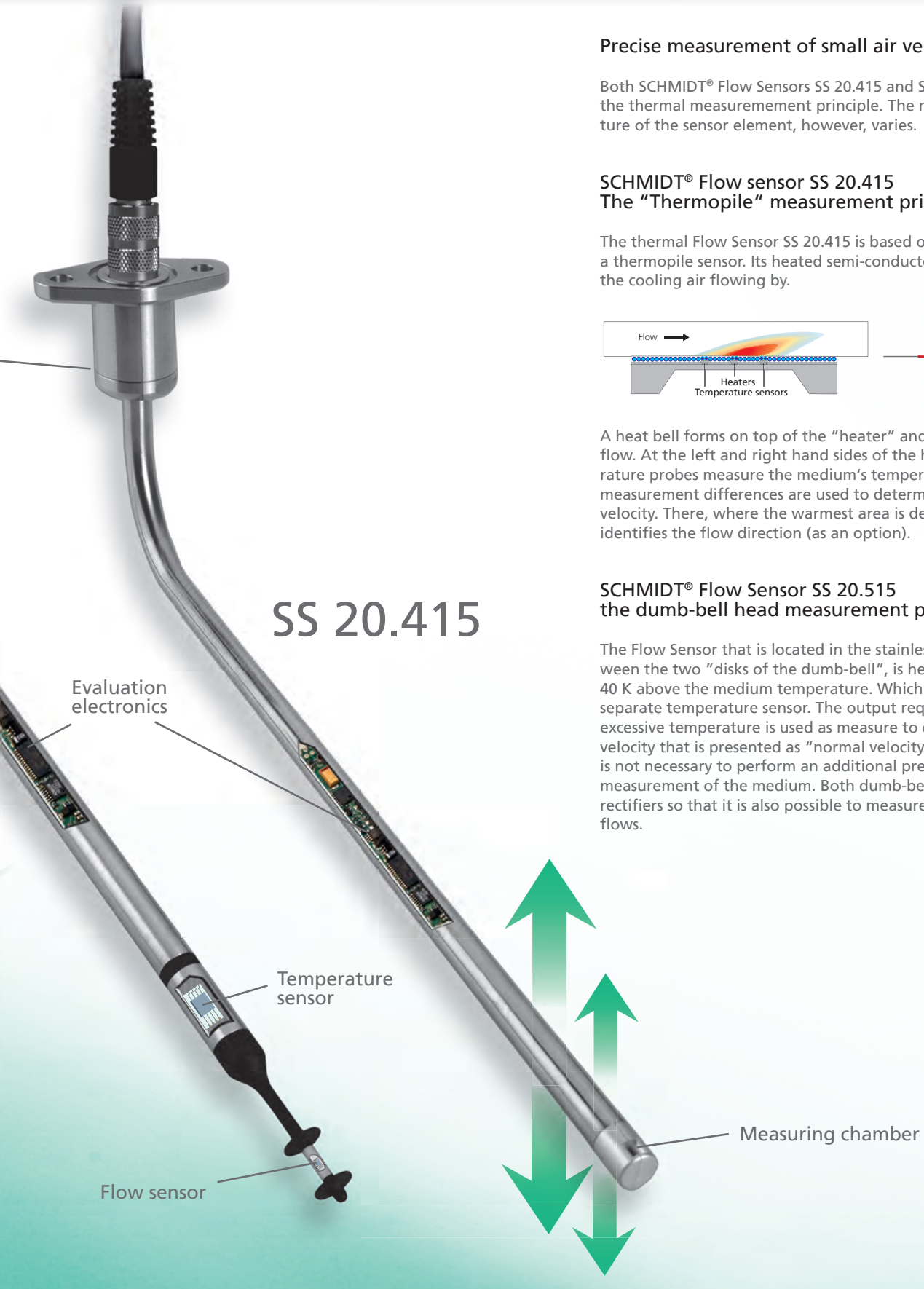
5 mechanical fixing options

SS 20.515

with protecting cover



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



Precise measurement of small air velocities

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

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

The thermal Flow Sensor SS 20.415 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 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.

Always the right choice

Both sensors, the – SS 20.415 and the SS 20.515 – 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 H_2O_2 (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	SS 20.515
Sensor version	Thermopile	Dumb-bell head
Temperature measurement	-	yes
Detection of the direction	yes, bi-directional (as an option)	-
Determination of the degree of turbulence	yes (programming kit)	-
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_2O_2	++	++ (without protective sleeve)
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)	-
Configuration on site	yes (programming kit)	-

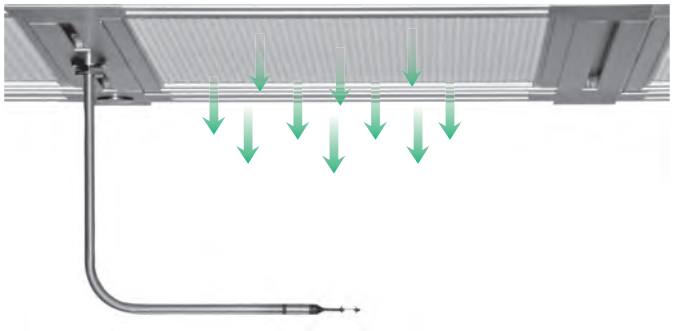
Legend

-	not possible
+	well-suited
++	ideally suited

* with safety bar

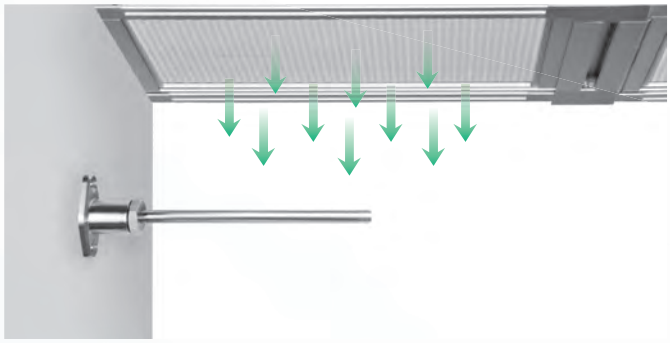
Both sensor types are available both, as 90° angular version for ceilings or straight for an integration into walls

Example 1



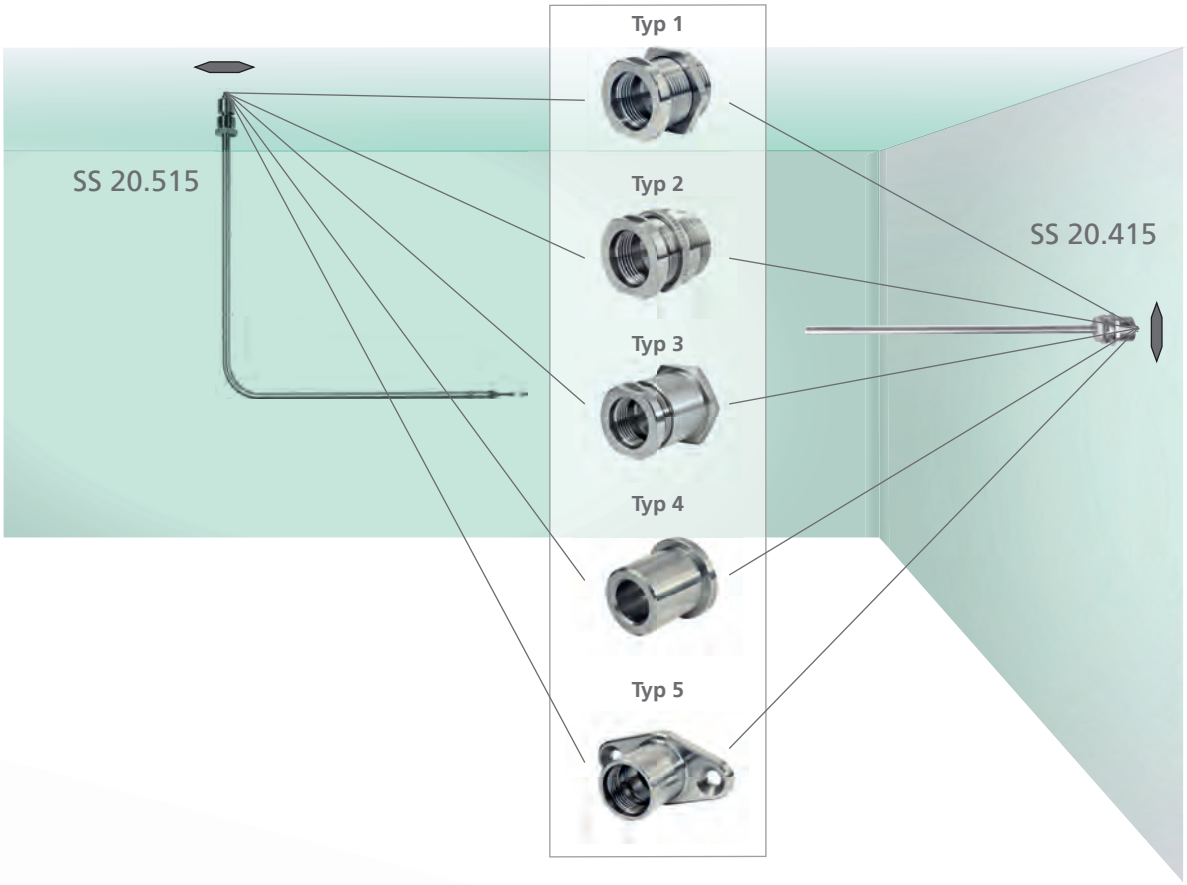
SS 20.515 (angular; 270 mm x 300 mm), installation to the ceiling below a laminar flow unit (with a type 1 fixation)

Example 2

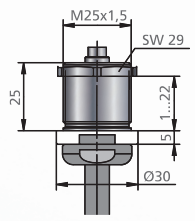


SS 20.415 (straight; ≥ 300 mm), installation to the wall (with a type 5 fixation)

Selection of the mechanical fixing options



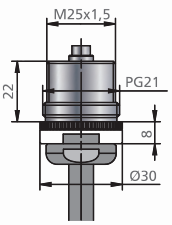
Typ 1



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.

Scope of supply
- Threaded bush M25 (stainless steel 1.4571)
- Counternut

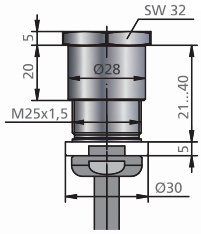
Typ 2



To be installed to an opening with PG21 thread (e. g. sprinkler openings in profiles) in the frame.

- Threaded bushing M25 (stainless steel 1.4571)
- Thread adapter M25 x 1.5 on PG21

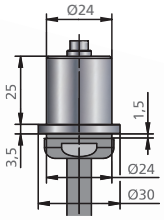
Typ 3



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.

- Threaded bush M25 (stainless steel 1.4571)
- Shank nut

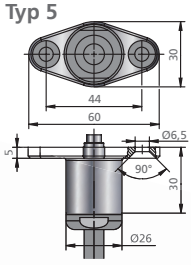
Typ 4



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

- Welding bush (stainless steel 1.4571)

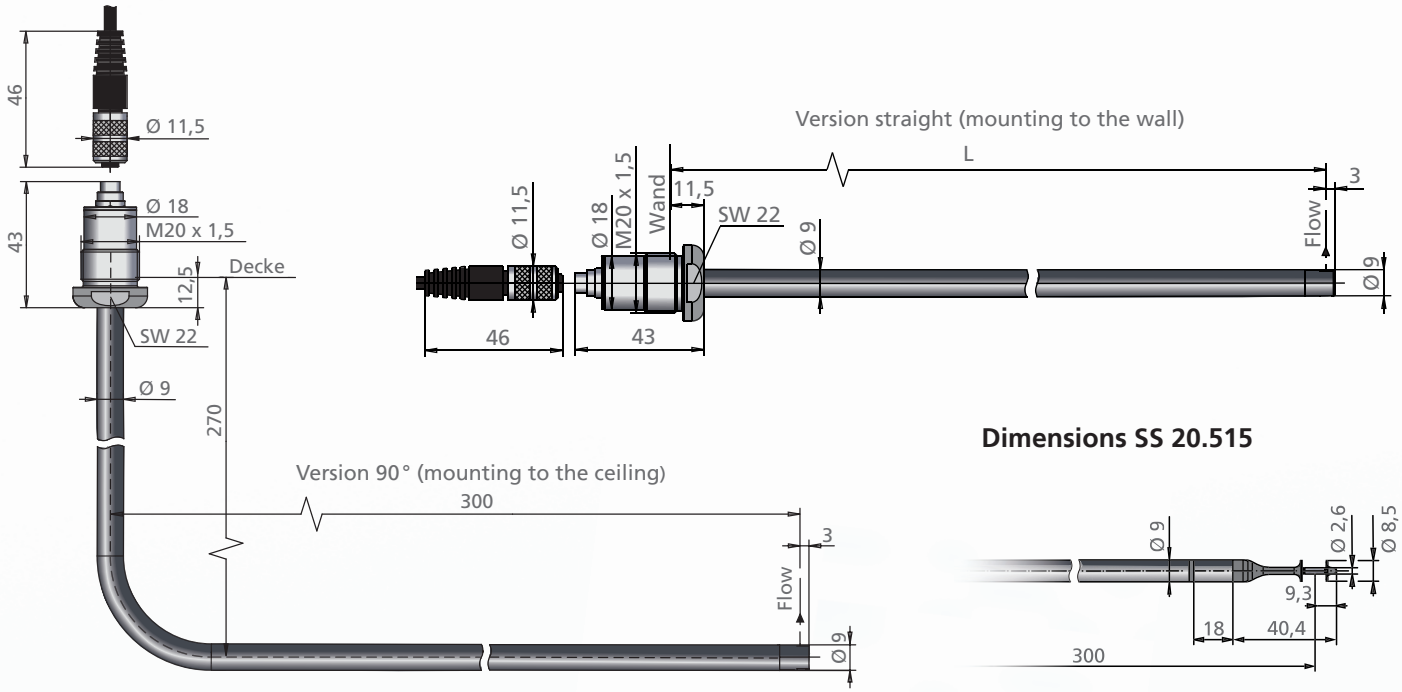
Typ 5



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.

- Flange bush (stainless steel 1.4571)

Dimensions SCHMIDT® Flow Sensor SS 20.415 and SS 20.515 (mm)

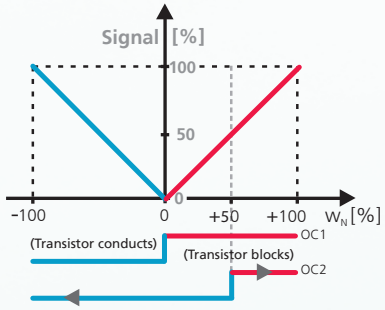


Dimensions SS 20.515

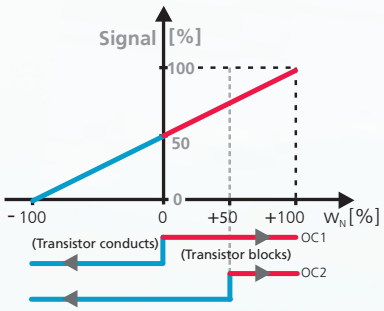
Min. immersion depth: 58 mm

Representation of the analog and digital signals SS 20.415

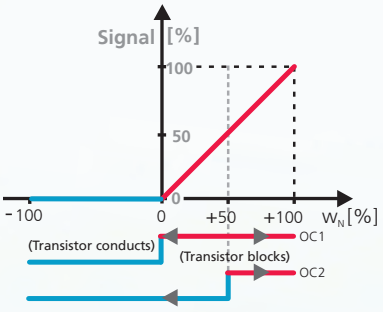
Bidirectional
Representation of the direction: Switching output OC11



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).

Technical Data

Data	SS 20.415	SS 20.515
Measurement size w_N	Normal velocity w_N referred to standard conditions of T_N = 20 °C and p_N = 1,013.25 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	±(3 % of the measured value + 0.05 m/s) [1]	
High precision (option) w_N	±(1 % of the measured value + 0.04 m/s) [1]	
Repeatability w_N	±1,5 % of the measured value	
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		±0.4 K (10 … 30 °C) ±1 K remaining measurement range
Operational temperature		
Operating temperature	0 … +60 °C	-20 … +70 °C
Storage temperature	-20 … +85 °C	-30 … +85 °C
Material		
Sensor head	Aluminum anodized	PBT reinforced by fiber glass, stainless steel 1.4571, protective coating (as an option)
Sensor tube	Stainless steel 1.4571	
Plug connector	Stainless steel 1.4571	
General data		
Medium, environment	non condensating (up to 95 % rh)	
Operating pressure	atmospheric (700 … 1.300 hPa)	
Supply voltage	typ. 24 V DC (12 … 26.4 V DC)	24 V DC ±10 %
Power consumption	typ. 30 mA/max. 160 mA	typ. 80 mA/max. 120 mA
Analog output	0 … 10 V ($R_L \geq$ 10 kΩ) or 4 … 20 mA/max. 21,6 mA ($R_L \leq$ 300 Ω); protected against short-circuit	
Switching outputs	2 open collectors, current-limited and protected against short circuits (≤ 26,4 V DC/65 mA), configurable Channel 1 (OC1): direction or threshold value Channel 2 (OC2): threshold value switching hysteresis 5 % of the threshold value, min. ±0,05 m/s	
Error signal	Only with 4 … 20 mA output: 2 mA (according to NAMUR NE43)	
Connection	Connector M9 screwed, 7-pin	
Maximum line length	Tension signal: 15 m, Power signal: 100 m	
Mounting position	in the vertical flow direction	
Protection type/protection class	IP 65/III	
Sensor length	270 x 300 mm (angular), 300 mm or customer-specific until 1,000 mm (straight)	
Weight	approx. 200 g (angular version)	

[1] under reference conditions

Accessory

Programming kit (only for SS 20.415) item no. 505 960
The programming kit – in combination with a PC (via RS 232) – allows for an on-site configuration of the sensor. In addition, it is possible to display the medium temperature and the degree of turbulence of the flow [1]. The degree of turbulence is a variation from the average value.

The programming kit consists of:
- Programming interface with LED display of the output signals and power supplys for the sensor
- PC software (for Windows 2000 and XP)
- Connection cable for sensor (length 2 m)
- RS 232 cable

Configuration possibilities via the programming kit (alternative: For a customer-specific programming in the factory for each sensor see order data):

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	

[1] The transmission of the measurement values and/or – the evaluation via the programming kit is intended for configuration and test purposes (not suitable for continuous operation).

Shielded connection cables are available in different lengths.

Coupler socket article no. 507 150
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
- Power supply 85 - 250 V AC or 24 V DC
- Power supply of the connected sensor

Safety bar Article 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 (W x H x L) : 53 x 11 x 99 mm

Order information SCHMIDT® Flow Sensor SS 20.415 and SS 20.515

	Description	Article number									
Basic sensor	SCHMIDT® Flow Sensor SS 20.415 Version as thermopile head	531 953 -	A	1	C	D	E	F	G	H	I
	SCHMIDT® Flow Sensor SS 20.515 Version as dumb-bell head	524 515 -	A	B	C	D	1	1	G	H	1
	Options										
Mechanical type	Sensor length 270 x 300 mm		1								
	Sensor length 300 mm (straight)		2								
	Special lengths (only straight: 300 to 1,000 mm) Length: _____mm		9								
Protection type	without protective coating			1							
	with protective coating (only SS 20.515)			2							
Mechanical fixing	Threaded bush M25 with counternut				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					
	Measurement range 0 ... 2,5 m/s					2					
	Measurement range 0 … 10 m/s					3					
Measurement direction	unidirectional						1				
	bidirectional (only SS 20.415)						2				
Representation of the direction	unidirectional							1			
	Switching output OC 1 = direction signal (only SS 20.415, bidirectional)							2			
	Representation of the direction with halved analog signal: 0 m/s = 8 mA or 5 V output signal (only SS 20.415, bidirectional)							3			
Output signals	0 … 10 V								1		
	4 … 20 mA								2		
Setting and calibration	default calibration									1	
	high precision calibration incl. ISO calibration certificate									2	
	high precision calibration incl. ISO calibration certificate, bidirectional (only SS 20.415)									3	
Sensor programming	factory setting										1
	customer-specific programming (only SS 20.415) of switching polarity, threshold value, splitting signal, response time										2

Order information SCHMIDT® Flow Sensor SS 20.415 and SS 20.515

	Describtion	Article number
Accecories	Coupler socket, 7-pin with soldering sleeves for cable Ø 0.14 mm²	507 150
	Connection cable with coupler socket, length: 2 m, open cable ends, material PUR	505 911-1
	Connection cable with coupler socket, 5 m length, open cable ends, material PUR	505 911-2
	Connection cable with coupler socket, length freely definable, open cable ends, material PUR	505 911-4
	Connection cable, 7-pin with angle junction box, 10 m length, open cable ends, material PUR	508 140
	Programming kit with 2 m connection cable between programming kit and sensor (only for SS 20.415)	505 960
	Slip-on safety bar for dumb-bell head against mechanical influences, stainless steel (only for SS 20.515)	531 026
	SCHMIDT® LED display MD 10.010; in the wall housing to visualize the volumetric flow and the flow velocity (or other measures), 85 … 250 V AC and sensor supply	527 320
	SCHMIDT® LED display MD 10.010; as with 527 320 but with 24 V DC voltage supply	528 240
	SCHMIDT® LED display MD 10.015; in the wall housing to visualize the volumetric flow and the flow velocity (or other measures) with additional sum function and second measuring input, 85 … 250 V AC and sensor supply	527 330
	SCHMIDT® LED display MD 10.015; as with 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

Form 1095/12/11/3000/2 · Art. No. 532097.02 · Data subject to change

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