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SCHMIDT® Technology

SCHMIDT® Flow Sensor
SS 20.415 Twin
Instructions for Use

SCHMIDT® Flow Sensor
SS 20.415 Twin

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Imprint:

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Subject to modifications

1 Important information

These instructions for use contain all required information for a fast commissioning and a safe operation of **SCHMIDT®** flow sensors of the model **SS 20.415 Twin**.

- These instructions for use must be read completely and observed carefully, before putting the unit into operation.
- Any claims under the manufacturer's liability for damage resulting from non-observance or non-compliance with these instructions will become void.
- Tampering with the device in any way whatsoever - with the exception of the designated use and the operations described in these instructions for use - will forfeit any warranty and exclude any liability.
- The unit is designed exclusively for the use described below (see chapter *2*). In particular, it is not designed for direct or indirect protection of personal and machinery.
- **SCHMIDT Technology** cannot give any warranty as to its suitability for a certain purpose and cannot be held liable for errors contained in these instructions for use or for accidental or sequential damage in connection with the delivery, performance or use of this unit.

Symbols used in this manual

The symbols used in this manual are explained in the following section.

Danger warnings and safety instructions - please read them!
Non-observance of these instructions may lead to personal injury or malfunction of the device.

General note

All dimensions are given in mm.

2 Application range

The **SCHMIDT® Flow Sensor SS 20.415 Twin** (566950) is designed for stationary use in cleanrooms under atmospheric pressure conditions and clean environmental conditions.

The sensor consists of two independent, spatially closely[1] positioned sensor heads. Both of them are measuring the flow velocity of the measured medium as standard velocity[2] w_N (unit: m/s) relative to standard conditions of 1,013.25 hPa and 20 °C. The respective output signals are linear and independent of pressure and temperature of the medium. The decisive characteristics of the product are listed below:

- Measuring task
  - Redundant measurement of flow velocity at one spot of the laminar flow field.
  - Output of the measured values via two independent analog signals.
- Application examples
  - Simultaneous control and monitoring of laminar flow in cleanrooms.

Special operating notes

Only suitable for the use in clean gases.
The medium to be measured must not contain oils, residue forming substances or abrasive particles.

Correct measurements require a laminar[3] flow with as low turbulence as possible.

When transporting the sensor or when carrying out not approved cleaning measures, always place the protective cap on the sensor.

The **SCHMIDT® Flow Sensor SS 20.415 Twin** is designed for applications inside closed rooms and is not suitable for outdoor use.

Note:

The positions "A" respective "B" are assigned to both probes (see Figure 1) in order to be able to clearly assign their output signals (w_{NA} resp. w_{NB}; see also Figure 2 and Table 2).

[1] Aerodynamic cross influences are eliminated by the common adjustment.
[2] Corresponds to the real velocity under standard conditions.
[3] The term “laminar” means here an air flow low in turbulence (not according to its physical definition saying that the Reynolds number is < 2300).

3 Mounting instructions

The following five mounting options are available for installtion:

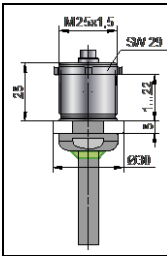
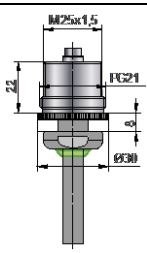
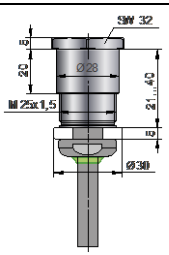
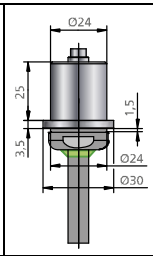
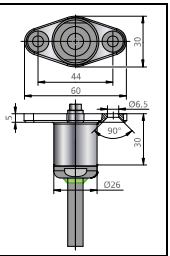
				
Type 1 For mounting in ceilings or frames with wall thickness from 1 … 22 mm. Opening Ø 26 mm necessary (mounting with counter nut) or a thread M25 x 1.5 in ceiling frame.	**Type 2** For mounting in ceiling frames with existing opening with PG21 winding (e.g. sprinkler opening in ceiling frames).	**Type 3** For mounting in ceiling frames with thickness of 21 … 40 mm, especially for ceiling frames out of hollow profiles. Openings required with Ø 26 mm and Ø 28.5 mm.	**Type 4** For welding in stainless steel ceilings.	**Type 5** For mounting under a ceiling or at a wall with two screws M6. Opening of Ø 15 mm for cable necessary and 2 threads M6. Pressure-tight up to 300 mbar.

Table 1

Mounting sequence

If not yet in place, first drill a bore into the wall or ceiling for installing the mounting bush. Then the mounting bush is fastened in the wall or ceiling. Feed connecting cable from cleanroom side through the mounting bush (open cable ends at first) until the cable jack protrudes by about 5 cm out of the receptable. There must be enough room behind the mounting bush, to allow the cable to be pushed backward when screwing in the sensor.

Then connect sensor with connection cable (plug in cable connector and screw on sleeve nut), insert sensor into mounting bush and tighten mounting screw by hand. Now the sensor can still be aligned accurately by hand, if required. Finally, the holding fixture screw must be tightened with a key wrench (wrench size 22) until the sensor is sufficiently secured against twisting (hold sensor, if necessary).

Prior to commissioning the sensor, remove the protective caps.

Mounting beneath a ceiling

The angled sensor has been designed for mounting beneath a ceiling.

After screwing the sensor into the ceiling sleeve, its tip is automatically in the correct position to measure the vertical downdraft flow beneath the filter outlet. Only the torsional angle of the sensor arm (parallel to ceiling) has to be aligned. Then tighten the assembly screw using the key wrench until the sensor is secured against twisting (SW22; hold sensor, if necessary).

Mounting at a wall

The straight sensor has been designed for installation at a wall.

After screwing the sensor into the receptable (tighten by hand), aligned it as follows:

First, the sensor must be positioned in the flow field so that its measuring direction corresponds to the flow direction. For this, the arrow engraved on the housing's surface (see Figure 1) must point approximately in the direction of the air flow. For finer adjustment align the housing line visible on the front of the sensor tip in parallel to the flow direction as precisely as possible (e.g. in case of a vertical downdraft the sensor arrow has to point downward to the floor and the housing line is also vertically).

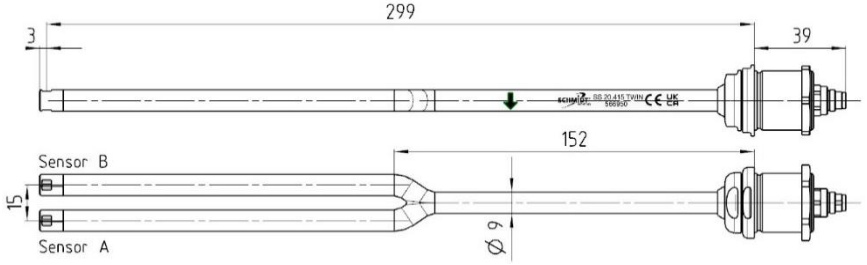


Figure 1

The angular deviation should not be greater than ±3° referenced to the ideal direction of the gaseous flow. Otherwise measurement accuracy may be affected (deviation > 1 %).

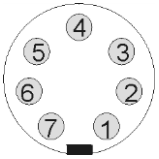
Finally, fully fasten the assembly screw using the fork wrench (SW22; hold sensor, if necessary) to prevent the sensor from unintentional rotating.

4 Electrical connection

Plug-in connector

The **SCHMIDT® Flow Sensor SS 20.415 Twin** is equipped with a plug-in connector which is firmly integrated in the probe. The connector has the following data:

Number of connection pins:	7 (plus shield connection on the metallic enclosure)
Type:	Male
Fixation of connecting cable:	Screw M9 (on cable)
Model:	Binder, series 712
Pin numbering:	



View on plug-in connector of sensor

Figure 2

Pin assignment

The pin assignment of the plug-in connector can be found in Table 2.

Pin	Designation	Function	Wire color
1	Power	Operating voltage : $+U_B$	White
2	RS485 A	Do not connect[4]	Brown
3	RS485 B	Do not connect	Green
4	A_{out} Flow B	Probe B: Velocity signal w_{NB}	Yellow
5	RS_Select	Do not connect	Grey
6	A_{out} Flow A	Probe A: Velocity signal w_{NA}	Pink
7	GND	Operating voltage : Mass	Blue
	Shield	Electromechanical shielding	Shield meshwork

Table 2

All signals use GND as electrical reference potential.

The wire colours mentioned in Table 2 are applicable for the use of a cable delivered by **SCHMIDT®** (article numbers: 505911-4, 535279, 535281, 561972, 561973, 565072).

[4] Manufacturer use only - risk of destruction in case of incorrect connection

Electrical assembly

During electrical installation ensure that no voltage is applied and inadvertent activation is not possible.

The cable shield is electrically connected to the metallic enclosure of the plug-in connector and the sensor which are coupled to GND (VDR[5], in parallel with 100 nF). The shield and / or the enclosure should be connected to an anti-interference potential, e.g. ground (depending on shielding concept).

The appropriate protection class III (SELV) respective PELV (according to EN 50178) has to be considered.

Operating voltage

The **SCHMIDT® Flow Sensor SS 20.415 Twin** is protected against a polarity reversal of its operating voltage.

It has a nominal operating voltage range of U_B = 24 V_{DC} ± 10 %.

Only operate sensor within the defined operating voltage range (21.6 ... 26.4 V_{DC}).
Undervoltage may result in malfunction, overvoltage may lead to irreversible damage to the sensor.

The specifications for the operating voltage are valid for the connection at the sensor. Voltage drops generated due to line resistances must be considered by the customer.

Current consumption of the sensor (incl. both signal outputs) in the configuration with voltage outputs is typically[6] 26 mA and at maximum 32 mA. With current interfaces the sensor requires typically 30 mA and at maximum 45 mA.

[5] Voltage dependent resistor; breakdown voltage 27 V @ 1 mA

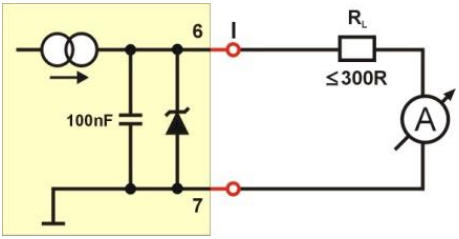
[6] Typical: w_N = 0.45 m/s and $U_B = U_{B,Nenn}$; maximum: w_N = overflow and $U_B = U_{B,min}$

Analog signal outputs

The signal characteristic as current or voltage interface is defined on ordering and applies to both analog outputs commonly (see Table 3):

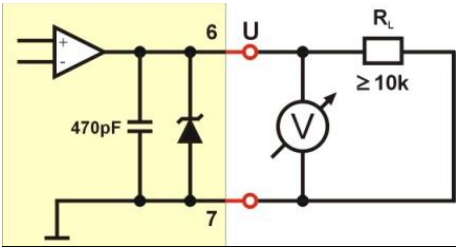
Current interface:

Signal range:	4 ... 20 mA
Type:	High side driver, load resistance against GND
Maximum load resistance R_L:	300 Ω
Maximum load capacity C_L:	100 nF
Maximum cable length:	100 m
Wiring:	



Voltage output:

Signal range:	0 ... 10 V
Type:	High side driver, load resistance against GND
Minimum load resistance R_L:	10 kΩ
Maximum load capacity C_L:	10 nF
Maximum short-circuit current:	35 mA (current limited)
Maximum cable length:	10 m (recommended)
Wiring:	



The voltage drop in the GND wire[7] of the connecting cable (mass offset) may cause a significant distortion of the analog voltage output signal.

[7] The specific resistance of a lead of the nominal cable (0.14 mm²) is 0.138 Ω/m (20 °C); at L = 10 m a current of $I_{B,U,max}$ = 32 mA can cause a voltage drop up to 50 mV.

5 Signalizing

Analog outputs

The following applies to both output variants of the **SS 20.415 Twin**:

- Representation of measuring range:
  The measuring range of flow velocity (0 … $w_{N,max}$) is mapped in a linear way to the signal range of the respective interface type (see Table 3).

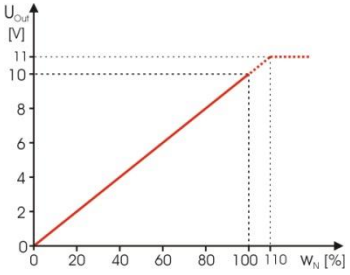
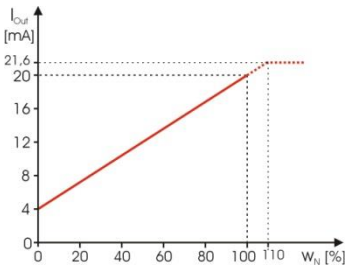
Voltage interface (U)	Current interface (I)
	
$w_N = \frac{w_{N,max}}{10\ V} \cdot U_{Out}$	$w_N = \frac{w_{N,max}}{16\ mA} \cdot (I_{Out} - 4\ mA)$

Table 3

- Overflow:
  Flow speeds exceeding the measuring range are furthermore output in a linear way up to 110 % of the measuring range (11 V or 21.6 mA), to signalize clearly that there is an overflow.
  For higher values of flow the output signal remains constant.
- Error signaling:
  The voltage version (0 … 10 V) is set to 0 V.
  The current interface (4 … 20 mA) signalizes 2 mA.
- Response time (damping of measured values):
  By default the response time of flow measurement is 5 s.

LED light ring

The **SS 20.415 Twin** indicates its current operating state via a light ring in its bracket:

Colour signal	Function / failure
None	Supply voltage: None / reversed / too low
Green pulsing (2 Hz)	Supply voltage: Too high
Green blazing	Sensor operational

Table 4

6 Startup

The **SCHMIDT® Flow Sensor SS 20.415 Twin** is ready within 5 seconds after switch-on.

If the sensor has a temperature different from that of the installation site, this time will be extended until the sensor has become acclimatized.

7 Information concerning operation

Sterilization

The **SS 20.415 Twin** can be sterilized during operation.

Approved disinfectants are alcohol (drying without leaving residues) and hydrogen peroxide. On wetting a sensor element with cleaning liquid, the "soiling detection" can be triggered, causing the associated analog signal to enter error state (0 V or 2 mA). As soon as the sensor element is dried, the sensor automatically returns to its normal function.

Due to its capillarity, the gap of the measurement chamber can be filled completely with cleaning liquid. In this case, it is possible that it will take **more than one hour** until the liquid is evaporated and the sensor works again without problems. To accelerate the drying process, the measuring gap can be cleaned by means of a short and soft blast of compressed air or similar methods.

Cleaning of the system

If it is necessary to clean the system in which the sensor is installed by using another cleaning agent than mentioned above, the sensor heads must be protected by means of the supplied protective caps.

This applies in particular to cleaning agents that do not dry without leaving residues or cleaning processes may flush into the measurement chambers.

In case of problematic cleaning measures (e.g. with inadmissible cleaning agents), the supplied yellow protective caps must be placed on both sensor heads to protect their sensor elements.

See also chapter *8 Service information*, subchapter *Cleaning of sensor head*.

8 Service information

Maintenance

Contaminations in the measuring chamber of a sensor head may result in a distortion of the measured value. Therefore the sensor heads must be checked for soiling at regular intervals.
In case of heavy contamination or wetting of any of the sensor head's measurement chamber, the sensor provides an error signal (0 V or 2 mA) at the respective analog output. In this case, clean sensor as described below.
If the error signal does not disappear after cleaning and drying, the sensor must be sent in to the manufacturer for repair.

Cleaning of sensor head

In case of contamination or wetting of the measuring chamber of a probe it may be carefully blown out using compressed air (avoid strong pressure impulses!).
If this procedure is not successful, the sensor head can be cleaned by immersing and washing it in alcohol or a similar cleaning agent, which dries without leaving residues (e.g. isopropyl alcohol).

- Do not shake or tap the wet sensor!
- Do not try to clean the sensor tip by any type of mechanical methods. Any contact with the sensor element embedded in the measuring chamber leads to irreversible damage to it.
- Do not use strong cleaners, brush or other objects, fluffy cloths etc. to clean the sensor tip!
- Inappropriate cleaning agents may be deposited on the sensor element and therefore lead to incorrect measurements or even damage it permanently.
- If the measuring chamber of a sensor head is completely filled with cleaning agent, accelerate the drying process by blowing it out, if necessary.

As soon as the cleaning agent has been evaporated without residues, the sensor is again ready for operation.

Transport / dispatch of the sensor

When transporting or dispatching the **SS 20.415 Twin**, the supplied protective caps should be placed over the sensor's heads. Avoid soiling of or mechanical impacts on the sensor's heads.

Calibration

If the customer has made no other provisions, we recommend repeating the calibration at a 12-month interval. To do so, the sensor must be sent in to **SCHMIDT Technology**.

Spare parts or repair

No spare parts are available, since a repair is only possible at **SCHMIDT Technology**. In case of defects, the sensors must be sent in to the supplier for repair.

When the sensor is used in systems important for operation, we recommend keeping a replacement sensor in stock.

Test certificates and material certificates

Every newly produced sensor is accompanied by a certificate of compliance according to EN10204-2.1. Material certificates are not available.

Upon request, we shall prepare, at a charge, a factory calibration certificate, traceable to national standards.

9 Technical data

Measuring quantity	Normal velocity w_N of air based on normal conditions of 20 °C and 1013.25 hPa
Medium to be measured	Clean air or nitrogen; more gases on request
Measuring range	0 ... 1 / 2.5 m/s
Lower detection limit	0.05 m/s
Measuring accuracy[8] - Standard - High precision	 ±(3 % of measured value + 0.05 m/s) ±(1 % of measured value + 0.04 m/s)
Response time (t_{90})	5 s
Storage temperature	-20 ... +85 °C
Operating temperature	0 ... +60 °C
Humidity range	Measuring mode: Non-condensing (< 95 % RH)
Operating pressure	Atmospheric (700 ... 1,300 hPa)
Operating voltage	24 V_{DC} ± 10 %
Current consumption[9]	Typical 26 (32) mA; max. 32 (45) mA
Analog outputs - Current - Voltage	Short circuit protected (type by ordering) 2 x 4 ... 20 mA (R_L ≤ 300 Ω; C_L ≤ 100 nF) 2 x 0 ... 10 V (R_L ≥ 10 kΩ; C_L ≤ 10 nF)
Electrical connection	Plug (male), M9, screw, 7-pin (shielded)
Max. line length	100 m / voltage output: 10 m (recom.)
Protection type[10]	IP65
Protection class	III (SELV) or PELV (EN 50178)
Mounting position	±3° relative to flow direction (unidirectional; straigt version)
Dimensions / material: - Sensor head - Sensor tube: Straight (L) Angled (H x L) - Bracket - Screw nut - Light ring	 Ø 9 mm x 10 mm Ø 9 mm 300 mm 150 / 270 mm x 300 mm Ø 18 mm x 17,7 mm Ø 25 mm (SW22) Ø 14 mm	 Stainless steel 1.4404 Stainless steel 1.4404 Stainless steel 1.4404 Edelstahl 1.4404 PC

Table 5

[8] Under reference condition
[9] Values in brackets apply to the variant with current interfaces
[10] Only with correctly attached connecting cable

10 Declarations of conformity

SCHMIDT Technology GmbH herewith declares in its sole responsibility, that the product

SCHMIDT® Flow Sensor SS 20.415 Twin

Part-No. **566 950**

is in compliance with the appropriate

European guidelines and standards

and

UK statutory requirements and designated standards.

The corresponding declarations of conformity can be download from **SCHMIDT®** homepage:

www.schmidt-sensors.com

www.schmidttechnology.de

SCHMIDT Technology GmbH
Feldbergstraße 1
78112 St. Georgen
Germany
Phone +49 (0)7724 / 899-0
Fax +49 (0)7724 / 899-101
Email sensors@schmidttechnology.de
URL www.schmidt-sensors.com
www.schmidttechnology.de