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SCHMIDT® Technology

SCHMIDT® Flow Sensor
SS 20.515
Instructions for Use

SCHMIDT® Flow Sensor

SS 20.515

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Imprint:

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Errors and technical modifications subject to change

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 **SS 20.515** type:

- 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 (refer to *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 certain purpose and cannot be held liable 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 below.

Danger warnings and safety instructions - please read them!

Non-observance of these instructions may lead to personal injury or malfunction of the device.

General information

All dimensions are given in mm.

2 Application Range

The **SCHMIDT® flow sensor SS 20.515** (article number: 524515) is designed for stationary use in clean rooms under atmospheric pressure conditions and clean environmental conditions.

The sensor measures flow velocity of the measuring medium as standard velocity[1] (unit: m/s) relative to standard conditions of 1013.25 hPa and 20 °C. Thus, the resulting output signal is independent of the pressure and temperature of the medium to be measured.

The sensor is designed for the use inside closed rooms and is not suitable for outdoor use.

3 Mounting Instructions

General information on handling

The flow sensor **SS 20.515** is a sensitive measuring instrument. This is why applying mechanical force to the sensor tip should be avoided.

The sensor tip can be damaged irreversibly due to mechanical loads.
Leave the protective cap as long as possible attached during mounting and handle the sensor with care.

For applications with an uncontrollable risk of touch, a special safety strap can be mounted on the sensor (optional accessory: 531026).

Flow characteristics

To avoid false measurement results, appropriate installation conditions must be guaranteed to ensure that the gas flow is supplied to the sensor in a quiet (low in turbulence) state.

Correct measurements requires laminar[2] flow with as low turbulence as possible.

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

Assembly

For the assembly of the **SCHMIDT® flow sensor SS 20.515**, five different assembly versions optimized for use in cleanrooms are available, in order to cover all the different applications (see Table 1).

First, the required holes, depending on the assembly version, must be drilled, and the corresponding fixing socket must be mounted in that hole. Then the connecting cable is introduced with its open into the fixing socket from the cleanroom side until the cable bushing protrudes from the fixture by only about 5 cm. Please note that after assembling the sensor, there must still be room for this protruding cable length in the void behind the assembly bushing. Now connect the sensor to the connecting cable (plug in and screw down spigot nut), insert it into the fixture bushing and tighten the holding fixture 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.

Prior to commissioning the sensor, remove the protective cap.

Assembly beneath a ceiling

The angled sensor is designed for assembly below the ceiling.

After the sensor has been inserted into the fixture bushing and the assembly screw tightened (first only by hand), the sensor head will automatically have an optimum position for the detection of the vertical downdraft flow from the ceiling. Only the torsional angle of the sensor arm in parallel to the ceiling must still be aligned. Then tighten the assembly screw using the fork wrench (hold sensor, if necessary) until the sensor is secured against twisting.

Assembly at a wall

The straight sensor is designed for assembly at a wall.

Insert sensor into the fixture bushing and thoroughly tighten the assembly screw. No alignment to the flow is required, due to the omnidirectional measurement characteristic of the sensor head.

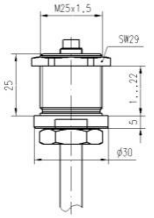
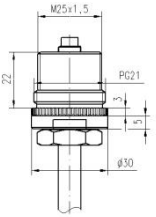
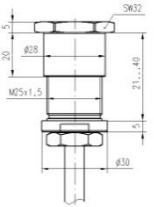
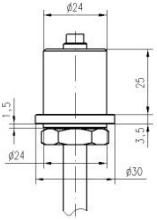
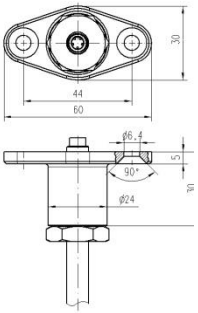
Type / Article No.	Drawing	Assembly
Mounting Type 1		Threaded bush M25 with lock nut: - For installation in ceilings, walls or frames with a thickness from 1 to 22 mm. - Opening with a Ø of 26 mm required for fixing with lock nut. - Or insert a thread M25 x 1.5 into ceiling.
Mounting Type 2		Threaded bush M25 with threaded adapter M25 x 1.5 for PG: - For installation in frames with an existing opening with PG21 thread (e.g. sprinkler openings in profiles).
Mounting Type 3		Threaded bush M25 with shank nut: - For installation in frames with a thickness from 21 to 40 mm, especially for ceiling frames made of hollow profiles. - Openings with a Ø of 26 mm and a Ø of 28.5 mm are necessary.
Mounting Type 4		Welding bush: - For welding to stainless steel ceilings or walls.
Mounting Type 5		Flanged bushing (pressure-tight till 300 mbar): - For mounting under the ceiling or at a wall with two screws M6. - Opening in ceiling / wall required with a Ø of 15 mm for cable and 2 threads M6.

Table 1

4 Electrical Connection

The sensor is equipped with a plug-in connector which is firmly integrated into the enclosure. The plug-in connector has the following data:

Number of connection pins:	7 (plus shield connection of metallic housing)
Type:	male
Locking of connecting cable:	M9 spigot nut (on cable)
Model:	Binder, series 712
Pin numbering:	

View on connector of sensor

Figure 4-1

The pin assignment of the plug-in connector can be seen from the following Table 2.

Pin	Designation	Function	Wire colour
1	Power	Supply voltage: $+U_B$	white
2	A_{out} Temp	Temperature output	brown
3	internal	-	green
4	internal	-	yellow
5	internal	-	grey
6	A_{out} Flow	Velocity signal	pink
7	GND	Supply voltage: Mass	blue
	Shield	Electromechanical shielding	Shield meshwork

Table 2

All signals use GND as electric reference potential.

The wire colour mentioned in Table 2 is applicable when using a **SCHMIDT®** cable (material No. 505911-4, 535279, 535281).

The cable shield is connected to the metallic housings of the connector and the sensor: It is coupled indirectly to GND (VDR[3], in parallel with 100 nF) and should be connected to an anti-interference potential, e.g. GND (depending on the shielding concept).

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

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

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

Operating voltage

The **SS 20.515** is protected against a polarity reversal of the operating voltage.

It requires a DC voltage with a nominal value of 24 V with a permissible tolerance of ± 10 %.

Operate the sensor only within the defined range of operating voltage (24 V DC ± 10 %).

Undervoltage may result in malfunction, overvoltage may lead to irreversible damage.

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

The typical operating current is approx. 60 mA and at most 100 mA.

Analog outputs

The analog outputs of the sensor (flow and temperature) are protected against a short circuit towards both rails.

There are two output versions (selected by ordering):

Current interface:

Signal range[4]:	4 ... 20 mA
Type:	high side driver, load resistance against GND
Maximum load resistance R_L:	300 Ω
Maximum load capacitance C_L:	10 nF
Maximum recommended cable length:	100 m
Wiring:	

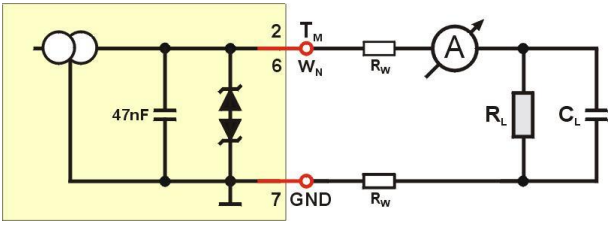


Figure 4-2

[4] Error signaling 2 mA as specified in NAMUR NE 43

Voltage interface:

Signal range:	0 ... 10 V
Type:	high side driver, load resistance against GND
Minimum load resistance R_L:	10 kΩ
Maximum load capacitance C_L:	10 nF
Maximum short-circuit current:	25 mA
Maximum recommended cable length:	10 m
Wiring:	

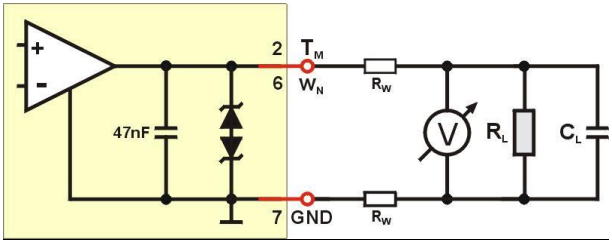


Figure 4-3

Due to the resistance[5] R_W of the connecting cable, the operating current causes a voltage drop in each wire of the operating voltage, which may adopt interfering values especially as so-called "mass offset" in the GND wire.

This is why you have to make sure during installation that the original lead of the sensor is kept as short as possible. Reconnection to cables with wider cross-sections near the sensor is recommended.

The voltage drop in the GND wire of the connecting cable during operation can substantially falsify the analog signal at the voltage output.

5 Signaling

The sensor **SS 20.515** reproduces the respective measuring quantity linearly on the relevant analog output. The representation specification depends both on the measuring quantity and the output characteristics (see figures in the following tables).

- Representation of measuring range

  When measuring flow velocity $w_{N,max}$, the measuring range ranges from zero flow to the selectable end of the measuring range $w_{N,max}$ (= 100 %, see Table 3).

[5] The specific resistance of the lead of the nominal cable (0.14 mm^2) is 0.138 Ω/m (20°C); at L = 10 m a current of $I_{B,max}$ = 100 mA can cause a voltage drop up to 166 mV.

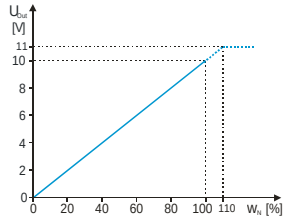
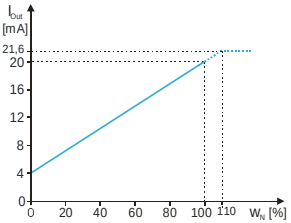
Voltage interface (U) w_N	Current interface (I) w_N
	
$w_N = \frac{w_{N,\max}}{10V} \cdot U_{Out}$	$w_N = \frac{w_{N,\max}}{16mA} \cdot (I_{Out} - 4mA)$

Table 3

The measuring range of the temperature of the medium is fixed between -20 and +70 °C (see Table 4).

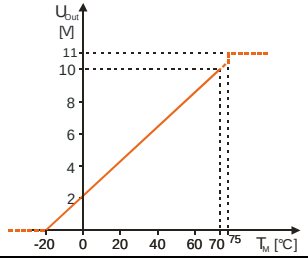
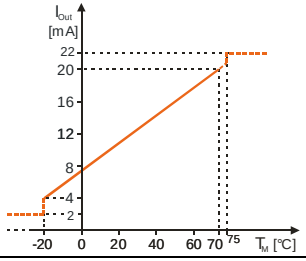
Voltage interface (U) T_M	Current interface (I) T_M
	
$T_M = (\frac{90}{10V} \cdot U_{Out} - 20)°C$	$T_M = [\frac{90}{16mA} \cdot (I_{Out} - 4mA) - 20]°C$

Table 4

Note regarding commissioning:

The temperature output normally provides approx. 5 V or 12 mA because the typically prevailing room temperature of approx. 25 °C corresponds to half the measuring range.

- Overflow:

  Flow speeds which exceed measuring range are furthermore output in a linear way up to 110 % of measuring range (end value + 10 %). For higher values of flow the output signal remains constant.

- Temperature of medium outside of specification range

  Operation outside the specified limits may damage the sensor and is displayed as follows (see also graphics in Table 4):

- Temperature of the medium below -20 °C
  The analog output for T_M switches to error (0 V or 2 mA).
  The analog output for w_N switches to error (0 V or 2 mA).
- Temperature of the medium above +70 °C
  Measuring values above $T_{M,max}$ are output in a linear way up to approx. 75 °C (10.6 V or 21.6 mA).
- Temperature of the medium above +75 °C[6]
  The analog output for w_N signals an error (0 V or 2 mA).
  The analog output T_M switches directly to the maximum output values of 11 V or 22 mA.

- Error signaling:
  The voltage interface is set to 0 V.
  The current interface outputs 2 mA.

6 Startup

The **SS 20.515** is ready within 20 sec after switch-on. If the sensor has a temperature different from that of the place of use, this time will increase until the sensor has reached ambient temperature.

7 Information on Continuous Operation

Ambient condition temperature

The **SCHMIDT® flow sensor SS 20.515** monitors the temperature of both medium and electronics. As soon as one of the measuring values leaves the specified operating range, the sensor switches off the flow measurement and reports the corresponding error. As soon as proper operational conditions are restored, the sensor resumes the measuring mode.

Even leaving the specified operating temperature range for a short period can cause irreversible sensor damage.

Ambient condition medium

The **SCHMIDT® flow sensor SS 20.515** is designed for use in clean to slightly contaminated media.

[6] The switching hysteresis for the threshold is approx. 2 K.

Dirt or other deposits on the sensor cause false measurement results.
Therefore, the sensor must be checked for contamination at regular intervals and cleaned if necessary.

The coated version has particularly high chemical media resistance to organic solvents, acids and bases in liquid or gaseous state, for example:

Acetone, ethyl acetate, methyl ethyl ketone, perchloroethylene, peracetic acid, xylene, alcohols, ammonia, gasoline, motor oil (50 °C), cutting oil (50 °C), sodium hydroxide, acetic acid, hydrochloric acid, sulfuric acid.

The suitability of the above-mentioned or other similar chemicals must be checked for every individual case due to different ambient conditions.

(Condensing) liquid on the sensor results in serious measurement errors.
After being dried, the sensor will work again correctly (if the condensate has not caused any damage, e.g. as a result of corrosion).

Sterilization

Both uncoated and coated sensors can be sterilized during operation.

Alcohols (drying without leaving residues) and hydrogen peroxide (uncoated version only) are approved and certified disinfectants.

Other disinfectants must be checked by the customer if necessary.

8 Service Information

Maintenance

Heavy contamination of the sensor head may lead to false measured values. Therefore, the sensor head must be checked for contamination at regular intervals. If contaminations are visible, the sensor can be cleaned as described below.

Cleaning of the sensor head

The sensor head can be cleaned to remove dust or dirt by moving it carefully in warm water containing a dishwashing liquid or other allowed cleaning liquid (e.g. isopropanol)[7]. Persistent incrustations or deposits can be previously softened by prolonged immersion and then removed

[7] Other cleaning agents upon request.

by means of a soft brush or cloth. Avoid applying force to the sensitive sensor tip.

The sensor head is a sensitive measuring system.
During manual cleaning proceed with great care.

Before putting it again into operation, wait until the sensor head is completely dry.

Transport / Shipment of the sensor

Before transport or dispatch of the **SS 20.515**, the delivered protective cap must be put over the sensor head. Avoid soiling or mechanical stress.

Calibration

If the customer has made no other provisions, we recommend repeating the calibration at a 12-month interval. To this end, the sensor must be sent 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 you to keep a replacement sensor in stock.

Test certificates and material certificates

Every newly produced sensor is accompanied by a certificate of compliance according to EN 10204-2.1. 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 quantities	Standard velocity w_N of air, based on standard conditions of 20 °C and 1,013.25 hPa Temperature of the medium T_M
Medium to be measured	Air or nitrogen, other gases on request
Measuring range w_N	0 ... 1 / 2.5 / 10 m/s
Lower detection limit w_N	0.06 m/s
Measuring accuracy[8] w_N - Standard - Precision (optional)	 ±(3 % of measured value + 0.05 m/s) ±(1 % of measured value + 0.04 m/s)
Reproducibility w_N	±1.5 % of measured value
Response time (t_{90}) w_N	3s (jump from 0 to 5 m/s)
Operating / Measuring range T_M	-20 ... +70 °C
Measuring accuracy T_M (w_N > 1 m/s)	±1 K (10 ... 30 °C) ±2 K (remaining measuring range)
Humidity range	Not condensing (< 95 % rel. humidity)
Operating pressure	Atmospheric (700 ... 1,300 hPa)
Supply voltage	24 V_{DC} ± 10 %
Current consumption	Typical < 60 mA (max. 100 mA[9])
Analog outputs - Current output - Voltage output Maximum load capacitance	2 pcs., short circuit protected (type by ordering) 4 ... 20 mA for $R_L \leq 300\ \Omega$ 0 ... 10 V for $R_L \geq 10\ k\Omega$ 10 nF
Electrical connection	Plug (male), M9, screwed, 7-pin (shielded)
Line length (max.)	Voltage output: 10 m / current output: 100 m
Protection type[10]	IP 65
Protection class	III (SELV) or PELV (EN 50178)
Mounting	Accessories (see chapter 3)
Dimensions / material: - Sensor head - Sensor tube: Straight (L) Angled (H x L) - Screw nut	 Ø 9 mm x 10 mm Stainless steel 1.4404, PBT Ø 9 mm Stainless steel 1.4404 300 / 301 … 1,000 mm 270 mm x 300 / 600 mm Stainless steel 1.4571
Weight	300 g max. (straight, 1000 mm, type 3)

Table 5

[8] Under reference condition; calibration is carried out in downfall wind tunnel
[9] Including all signal output currents
[10] Only with correctly attached connecting cable

10 EC Declaration of Conformity

EG-Konformitätserklärung
Certificate of Conformity
Déclaration de conformité CE

SCHMIDT Technology GmbH erklärt, dass das Produkt
SCHMIDT Technology GmbH herewith declares that the product
SCHMIDT Technology GmbH déclare que le produit

SCHMIDT® Flow-Sensor SS 20.515 Part-No.: **524515**

den wesentlichen Schutzanforderungen entspricht, die in der Richtlinie des Rates zur Angleichung der Rechtsvorschriften der Mitgliedsstaaten über elektromagnetische Verträglichkeit (**2004/108/EG**) festgelegt sind.

is in compliance with the relevant protection requirements in respect of the electromagnetical compatibility (EMC) which are laid down in the guidelines of the council for the harmonization of the regulations of the members within the European community (**2004/108/EG**).

correspond aux prescriptions de protection établies dans la norme du conseil pour l'harmonisation de règles de droit des Etats membre sur la compatibilité électromagnétique (**2004/108/EG**).

Zur Beurteilung hinsichtlich elektromagnetischer Verträglichkeit wurden folgende Normen herangezogen:

The assessment of EMC for industrial applications refers to the following European standards:

Pour le jugement de la compatibilité électromagnétique normes suivantes sont appliquées:

a) Störaussendung (Emission) / Electromagnetic Emission / Interférence
EN 61000-6-3:2007

b) Störfestigkeit / Electromagnetic Immunity / Immunité aux parasites
EN 61000-6-2:2005

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