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SCHMIDT® Technology

SCHMIDT® Volume Flow Sensor

IL 30.0xx

Instructions for Use

SCHMIDT® Volume Flow Sensor IL 30.0xx

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Imprint:

Version: 557006.02E
Subject to modifications

1 Important information

The instructions for use contain all required information for a fast commissioning and safe operation of **SCHMIDT® volume flow sensors**.

- These instructions for use must be read completely and observed carefully, before putting the unit into operation.
- Working on a pressurized system as well as assembly, electrical installation, commissioning and operation of the sensor may only be carried out by trained specialists. Safety and accident prevention regulations must be observed.
- 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 or machinery.
- **SCHMIDT Technology** cannot give any warranty as to its suitability for 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. Read carefully!
Non-observance of these instructions may lead to injury of personal or malfunction of the device.

Note on hazards due to electrostatic discharge (ESD).

General note

All dimensions are given in mm.

2 Application range

The **SCHMIDT® Volume Flow Sensor IL 30.0xx** is designed as inline sensor i.e. the tubular measuring section is already integrated in its basic body.

Four variants with different diameters are offered:

Type	Inner-Ø [mm]	Thread connection	Volume flow [Norm-m³/h]	Article No.
IL 30.005	16.1	DN 15 / G½	76.3	550 250
IL 30.010 MPM	27.3	DN 25 / G1	229	550 251
IL 30.015 MPM	41.9	DN 40 / G1½	417	550 252
IL 30.020 MPM	53.1	DN 50 / G2	712	550 253

Table 1

Connection to the pipe system is carried out by the internal threads on both sides of the base body, suitable extended measuring sections are offered by **SCHMIDT Technology** as optional accessory (see Table 2).

The **IL 30.0xx** measures both volume flow as well as the temperature of pure air and other inert[1] gases which are classified in fluid group 2 according to the **Pressure Equipment Directive 2014/68/EU** (PED), i.e. no chemically aggressive components or abrasive particles are included.

The sensor and the aforementioned measuring sections are designed for a maximum operating pressure[2] of 16 bar and are covered by **article 4, paragraph 3 of the PED**. Accordingly, the devices are designed and manufactured in accordance with the sound engineering practice.

The sensor is based on the measuring principle of a thermal anemometer and measures the standard volume flow of the measuring medium which is output in a linear way as standard (respective: Norm) volume flow $\dot{V}_N$ (unit: m³/h), referred to standard conditions of T_N = 1013.25 hPa and p_N = 20 °C. Thus, the resulting output signal is independent of the pressure and temperature of the measured medium.

The sensor features several special properties, notably due to the unique Multi-Point-Measurement design (MPM) of its sensor elements:

- Best measurement results even in not fully smoothened air flows
- Excellent sensitivity
- High measurement dynamics

When using the sensor outdoors, it must be protected against direct exposure to the weather.

[1] Check suitability in individual cases.
[2] Overpressure

3 Mounting instructions

General information on handling

The **SCHMIDT® Volume Flow Sensor IL 30.0xx** is a precision instrument with high measuring sensitivity, which can be achieved only by a delicate structure of its measuring probes. Therefore, applying mechanical forces to the probe tips inside the housing should be avoided if possible. In case of cleaning by the customer, this should preferably be made contactless (e.g. with a spray) or only with appropriate care.

The sensor probes should not be touched or exposed to any other mechanical effects.

Likewise, a touch can cause electrical damage to the ESD-sensitive sensor elements.

The sensor probes can be damaged by ESD.

To protect the sensitive inside, **SCHMIDT Technology** delivers the sensor with protective caps placed into both ends of its body, which should be removed only before final installation. Vice versa when dismounting the sensor the protective caps should be attached in place immediately. In general, great care is required when handling the sensor.

The enclosure of the sensor is made of anodized aluminium. This ensures a low-friction screw-in of the installation pipes into the enclosure. Due to the softness of the material, however, the thread windings could be irreversibly damaged when tilting the pipes while screwing in.

The threads of the sensor body can take irreversible damage if handled incorrectly, i.e. by tilting pipes when screwing in.

If the sensor is installed without the extended measurement sections, which are offered optionally by **SCHMIDT Technology**, the dimensions and tolerances prescribed by the manufacturer must be observed strictly for the customized installation (see subchapter *Flow characteristics*).

Corresponding dimensional drawings are available as download from

www.schmidt-sensors.com or www.schmidttechnology.de

The mounting position of the sensor is arbitrary.

Systems with overpressure

The **IL 30.0xx** is designed for a maximum working over pressure of 16 bar. As long as the measuring medium is operated with overpressure, make sure that:

- There is no overpressure in the system during installation.
- Only appropriately pressure-tight mounting accessories are used.
- All connections to pressurized systems are checked for pressure tightness from time to time.

Mounting and dismounting of the sensor can be carried out only as long as the system is **in depressurized state**.

The extended measuring sections, which are optionally available from **SCHMIDT Technology** (see subchapter *Accessories*), are delivered with two O-Rings which are intended as pressure seals for easy installation (must be applied by customer). If the customer uses his own pipes, suitable installation and sealing equipment must be used (e.g. sealing tape). In any case take care that the threads are screwed into the housing without tilting, to avoid damaging of the sensor body. Furthermore, before applying pressure, the sensor must be checked for a safe and firm installation. After pressurization check for any leakages and eliminate them immediately if there are some.

Before applying pressure, make sure that all screw connections are firmly seated and cannot be loosened. Unscrewing while the system is under pressure can damage the sensor and can also result in serious harm to your health.

The pressure sealing parts of the installation have to be checked regularly for pressure tightness and safe installation.

Flow characteristics

Local turbulences of the medium can cause distortion of measurement results. The resulting measurement distortions are reduced to a minimum by the special sensor design “MPM” (Multi-Point-Measurement – all variants except **IL 30.005**). In order to get maximum accuracy it’s nevertheless advisable to smooth turbulences of the gas flow before applying it to the sensor.

The best way to achieve this is to ensure that you have sufficient straight lengths upstream (“Run-in distance”) and downstream (“Run-out distance”) of the installed sensor. The absolute length of the respective distances is indicated as a multiple of the inner diameter D of the pipe.

For optimal measurement results it is recommended to provide standard distances of at least 10•D before and 5•D after the sensor. Using sensor

types with MPM these distances can be reduced to at least 3•D before and 3•D after it in case of modest sources of disturbance (e.g. 90° arcs).

If this is not possible, the run-in distance should take up ⅔ of the available measuring length and the run-out distance ⅓ of it.

In particular, care must be taken to ensure that the inner diameters of the attached pipes correspond exactly to that of the sensor. Steps in the pipe cross-section lead to strong deviations of measurement results and require longer inlet distances.

Accessories for installation

For mounting of the **SCHMIDT® Volume Flow Sensor IL 30.0xx**, there are several accessories available (see Table 2).

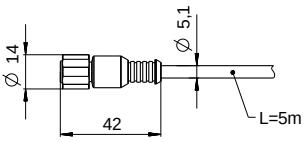
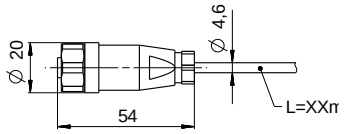
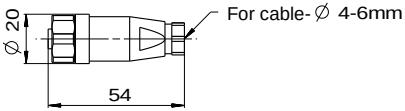
Type / article No.	Drawing	Mounting
Connecting cable fixed length: **5** m 523 565		- Threaded ring, hexagon - Plug injection-moulded - Wires: 5 x 0.34 mm² - Material: Stainless steel PUR, PVC
Connecting cable optional length: **x** m 523 566 **x** = 2 … 100 m (Step: 1 m)		- Threaded ring, hexagon - Wires: 5 x 0.34 mm2 - Material: Stainless steel PA, PUR, PP Free of halogen[3]
Coupler socket Thread locking system (VA) 523 562		- Threaded ring, hexagon - Material: Stainless steel PA, PUR, PP - Connection of leads: Bolted (5 x 0.75 mm²)
Extended measuring sections ½": 556 954 1": 556 955 1½": 556 956 2": 556 957		- Type of thread: G and R - Material: Stainless steel (pipe) NBR 70 (O-rings)

Table 2

[3] According to IEC 60754

4 Electrical connection

The sensor features two connectors:

- Main connector:
  - Connection of voltage supply
  - Output of measuring signals
- Module connector:
  For connection of an
  - **SCHMIDT**® extension module
  - or Modbus

Figure 1

The connector housings (and therefore also the shield of a plugged-in connection cable) are electrically connected to the metallic core of the sensor housing, which is indirectly[4] coupled to GND.

The appropriate protection class III (SELV resp. PELV) has to be considered.

5 Main connector

This connector is designed as a 5-pin plug, type M12 (male, A-coded) with an external thread for the spigot nut of the connection cable (pinassignment see Figure 2 and Table 3).

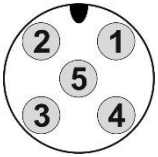


Figure 2:
View on plug of sensor (male)

Pin	Designation	Function	Wire colour
1	Power	$+U_S$ (+24 V)	Brown
2	Analog $\dot{V}_N$	Volume flow	White
3	GND	GND	Blue
4	Analog T_M	Temperature of medium	Black
5	Impulse	Volume	Grey

Table 3 Pin assignment of main connector

The specified lead colours are valid for connecting cables from **SCHMIDT Technology** (see subchapter *Accessories*).

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

[4] Varistor (breakthrough voltage: 30 V @ 1 mA), in parallel with 100 nF

Power supply

For proper operation, the sensor requires direct voltage with a nominal value of 24 V with permitted tolerance of ±10 %.
Deviating values lead to deactivation of measuring of volume flow or even to defects and, therefore, should be avoided. As far as it is functionally possible, the LED indication reports the faulty operational conditions (see chapter *7 Signaling*).

Only operate sensor within the defined range of supply voltage (U_S = 24 V_{DC} ± 10 %).
Undervoltage may result in malfunction; overvoltage can lead to irreversible damage.

Specifications for operating voltage apply to the connection at the sensor. Voltage drops generated due to line resistances must be considered by the customer.
The operating current[5] of the sensor is at minimum 25 (15) mA up to a maximum[6] of 300 (180) mA.

Wiring of analog outputs

Both analog outputs (volume flow and temperature of medium) are designed as short-circuit protected current interfaces (4 … 20 mA) using a highside driver stage.

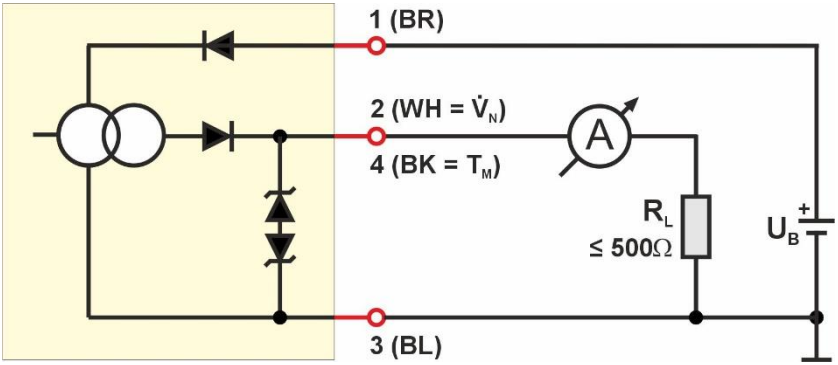


Figure 3

The respective load R_L must be connected to the reference potential (GND) of the sensor (see Figure 3).

Load specification: $R_L \leq 500\ \Omega$; $C_L \leq 10$ nF

A maximum cable length of 100 metres is recommended, whereby only the voltage drops in the cable wires limiting the length.

[5] Current of impulse output not included; operation current of IL 30.005 in brackets.
[6] Both signal outputs emitting 21.6 mA at minimum operating voltage.

Wiring of impulse output

The pulse output is current-limited, short-circuit protected and has the following technical characteristics:

Design:	Highside driver
Minimum high level $U_{S,H,min}$:	U_B – 1 V (with maximum switching current)
Maximum low level $U_{S,L,max}$:	0 V (switching transistor is blocking)
Short-circuit current limitation:	Typ. 50 mA (max. 65 mA)
Maximum leakage current $I_{Off,max}$:	10 µA
Minimum load resistance $R_{L,min}$:	Depending on supply voltage U_B (see below)
Maximum load capacitance C_L:	10 nF
Maximum cable length:	100 m (recommended)
Wiring:	

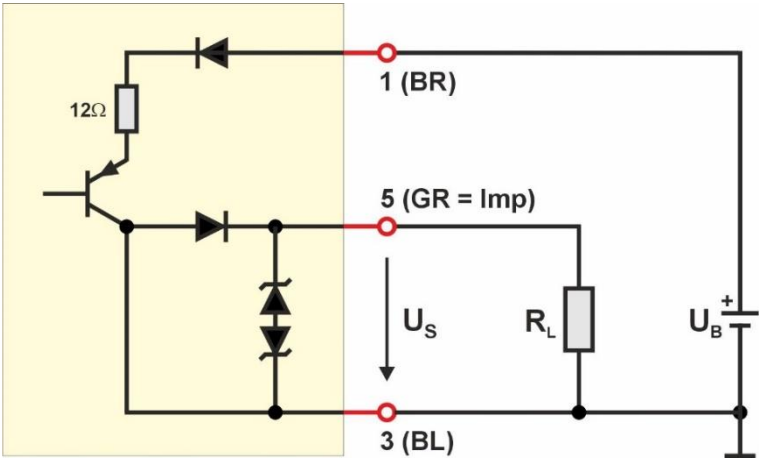


Figure 4

The load R_L has to be connected to the reference potential (GND).

This pulse output can be used as follows:

- Direct driving of relatively low-impedance loads (e.g. optocoupler, coil of relay etc.) with a maximum current consumption of $I_{L,max}$ = 50 mA.
  This allows calculating the minimum permitted (static[7]) load resistance $R_{L,min}$ depending on the supply voltage U_B:

$$R_{L,min} = \frac{U_{S,Grenz}}{I_{L,max}} = \frac{U_B - 1\,V}{I_{L,max}} = \frac{U_B - 1\,V}{0{,}05\,A}$$

  Example:
  In case of the maximum admissible supply voltage of $U_{B,max}$ = 26.4 V the minimal load is $R_{L,min}$ = 508 Ω.
  Here the excessive heating power of the load has to be considered.

[7] Overcurrent peaks are absorbed by the short circuit limiter.

- Providing a digital signal with a signal level close to the sensor's supply voltage.
  It is sufficient to use a relatively high-impedance load resistor R_L, which pulls the pulse output to GND and taps the voltage U_S across R_L as a digital signal.
  Depending on the internal resistance of the signal tap, a resistance value of R_L = 10 ... 100 kΩ represents a good compromise between power loss and EMC robustness.

The pulse output is protected by means of different mechanisms:

- Current limiting (analog):
  The current is limited to typ. 50 mA (max. 65 mA).
  If the burden value is too low, the switching transistor regulates the switching current to the specified current limit by reducing the switching voltage U_S across R_L accordingly (see Figure 4). However, this may lead to a drastic increase of power loss in the switching transistor, depending on load conditions.
  This mechanism is intended as short-term protection in case of faulty wiring during commissioning or installation and should not be permanently active.

  
  Prolonged operation of the pulse output with a load that is too low is not recommended due to the resulting heating of the switching transistor.
- Protection against overvoltage:
  A diode connected in series protects the pulse output against accidental contact with a voltage (e.g. the positive rail of the supply voltage) that is higher than the switching voltage U_S.
  The non-destructive level of the applied overvoltage is limited by a TVS[8] diode, which primarily protects the output against short overvoltage peaks (e.g. ESD or surge) of both polarities.
  Exceeding the described parameters can lead to the destruction of the electronics.

  
  Overvoltage can destroy the pulse output.

[8] Transient Voltage Suppressor Diode; breakdown voltage approx. 31 V @ 1 mA a. 20 °C; pulse load capacity: 4 kW (8/20 µs)

6 Module/Modbus connector

The **SCHMIDT® Volume Flow Sensor IL 30.0xx** comes with an additional connector (M12, female, A-coded, 5-pin), with an internal thread for the counter-thread of the connection cable (for pin assignment, see Figure 5 and Table 4).

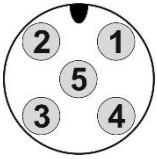


Figure 5:
View of socket of sensor (female)

Pin	Designation	Function	Wire colour
1	Power	$+U_B$ (+24 V)	Brown
2	B	RS485-B	White
3	GND	GND	Blue
4	A	RS485-A	Black
5	I/O	Reserve	Grey

Table 4 Pin assignment of module connector

A hybrid interface with serial communication is provided here, which can be configured for two different modes:

- Proprietary **SCHMIDT®** module interface
- Modbus interface

The interface must be configured to the corresponding mode and can only operate modules/devices that are compatible with said mode.

PC-Programming-Kit

The “PC-Programming-Kit” (Mat. no.: 564710) is the only accessory module from **SCHMIDT®** that is compatible with both interface modes.

When connected to the sensor, it automatically recognizes the currently set operating mode and enables switching to the other mode.

This applies from the update to:

- Software version 4.0.0 of the user interface
- Revision A of the instructions for use:
  - Standard instructions: 564714.01
  - Quick guide: 566066

Older versions of software and instructions for use only allow resp. describe the operation as module interface.

For the advanced functionality with Modbus, only use the updated software. It is available for download at:

www.schmidt-sensors.com or www.schmidttechnology.de

Operation as module interface

This mode uses an arbitrary communication protocol and is therefore only suitable for connecting and operating of **SCHMIDT®** accessory modules, which are listed below:

- BT 10.010 (Bluetooth module)
- DL 10.010 (data logger)
- MD 10.020 (simple measured value display)

These modules also require the operating voltage of 24 V_{DC} provided by the interface.

Inadvertent connection of one of the above modules to an interface configured for Modbus is electrically harmless and will not cause any damage. Only the serial communication does not work, the module then signals a communication error.

Modbus operation

This provides an interface compatible with Modbus RTU:

- Electrical: RS485 (EIA-485), 2-wire, 3.3 V
- Terminating resistor: Not integrated
- Baud rate: 9600
- Telegram: 8 data bits, no parity bit, 1 stop bit

Further information on operating the sensor on Modbus can be found in the accompanying supplementary instructions for use for digital communication (576983.02).

Only the two data lines (A, B) and the GND line are required for Modbus operation. However, it is possible to operate the sensor via the +24 V carried in the Modbus connector. In this scenario, it is not necessary to connect the main connector, in which case the following must be taken into account:

- The signal outputs applied here are not available.
- Ensure a sufficiently low line offset, especially for the ground offset.
  On the one hand, this applies to the operation of the sensor itself (see subsection *Power supply*).
  On the other hand, the permissible common mode input voltage range of the RS485 drivers used is +12/-7 V. Due to the bidirectional communication, the common-mode differential voltage of the digital lines must not exceed 7 V across the entire fieldbus.
- The supply voltage is then also present at the main connector, which can be easily contacted via its pins (male version).
  It is therefore advisable to protect the connector with a cap against contact as well as dirt and moisture ingress.

7 Signaling

Light emitting diodes

The **SCHMIDT® Volume Flow Sensor IL 30.0xx** has four Duo-LEDs (see Figure 6) to indicate its operational status (see Table 5):

- In error-free operation: Volume flow (bar graph mode)
- Problems in operation: Cause of detected error

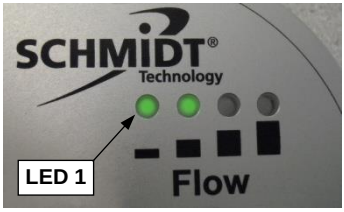


Figure 6

No.	State	LED 1	LED 2	LED 3	LED 4
1	Ready for operation & $\dot{V}_N$ < 5 %[9]	orange	off	off	off
2	Volume flow $\dot{V}_N$ > 5 %	green	off	off	off
3	Volume flow $\dot{V}_N$ > 20 %	green	green	off	off
4	Volume flow $\dot{V}_N$ > 50 %	green	green	green	off
5	Volume flow $\dot{V}_N$ > 80 %	green	green	green	green
6	Volume flow $\dot{V}_N$ > 100 % (overflow)	green	green	green	orange
7	Sensor element defective	red	red	red	red
8	Operating voltage too low	red	red	off	off
9	Operating voltage too high	off	off	red	red
10	Electronic temperature too low	off	red	red	off
11	Electronic temperature too high	red	off	off	red
12	Medium temperature too low	orange	red	red	orange
13	Medium temperature too high	red	orange	orange	red

Table 5

off = LED off; green = LED on: green; orange = LED on: orange; red = LED flashes (1 Hz): red

[9] „%“ of final value of measuring range of volume flow

Analog outputs

- Representation of measuring range
  The measuring range of the corresponding measuring value is mapped in a linear way to the signal range.
  For volume flow measurement, the measuring ranges from zero to the variant-specific end of the measuring range $\dot{V}_{N,max}$ (see Table 6, left).

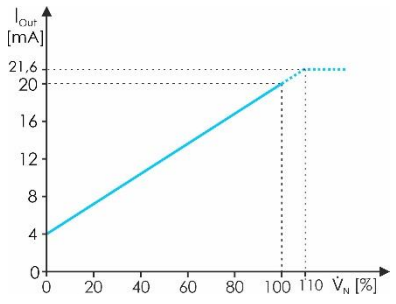
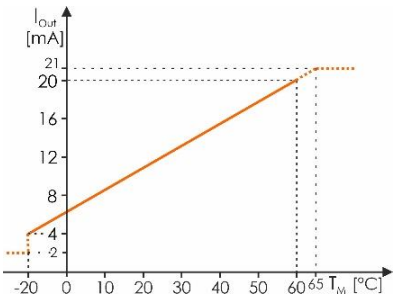
Volume flow	Temperature of medium
	
$\dot{V}_N = \frac{\dot{V}_{N,max}}{16\ mA} \cdot (I_{Out,\dot{V}_N} - 4\ mA)$	$T_M = \frac{80\ °C}{16\ mA} \cdot (I_{Out,T_M} - 4\ mA) - 20\ °C$

Table 6

The measuring range of the medium temperature T_M is specified between -20 °C and +60 °C.

Note regarding commissioning:

Normally the temperature output indicates approx. 12 mA because the typical prevailing room temperature of 20 °C corresponds to about half of the measuring range.

- Error signaling[10]
  The interface outputs 2 mA.
- Exceeding measuring range of volume flow
  Measuring values higher than $\dot{V}_{N,max}$ are output linearly up to 110 % of the signaling range (this corresponds to the maximum output of 21.6 mA, see left image in Table 6). For higher values, the output signal remains constant.
  Error signaling doesn't take place because damage of the sensor is unlikely.

[10] In accordance to NAMUR specification

- Medium temperature beyond specification range
  Operation beyond specified limits[11] can damage the measuring probes and, therefore, is seen as a critical error:
  - o Medium temperature below -20 °C:
    The analog output for T_M switches to error signaling (2 mA).
    The measuring function of volume flow is switched off; its analog output also reports an error (2 mA).
  - o Medium temperature above +60 °C:
    Up to 65 °C the temperature is still output linearly (corresponds to 21 mA), e.g. to enable an overshooting of a heating control. The volume flow is measured and displayed further on.
    Above this critical limit the measurement of volume flow is switched off and its outputs are going to error (2 mA / locked). The output for T_M jumps directly to its maximum value of 22 mA, which differs from standard error signaling.
    In case of excessive temperature, this avoids a harmful feedback of the heating control that might be measuring by means of the medium temperature sensor. The standard error signaling (2 mA) could be identified by the control as a very low temperature of the medium which would lead to further heating.

Impulse output

- Signaling
  One impulse represents a defined volume that has flowed.
  During the pulse signal itself, the output transistor switches through for a fixed time (conducting), otherwise the transistor is locked (high impedance).
  - o Pulse valence:
    IL 30.005; **IL 30.010 MPM**: 0.1 Norm-m^3
    IL 30.015 MPM; **IL 30.020 MPM**: 1.0 Norm-m^3
  - o Pulse duration (fix): 1 s
- Error signaling
  As long as the analog flow volume output signals an error (2 mA), the pulse output is locked (transistor is blocking).

[11] Switching hysteresis for threshold is approx. 2 K.

8 Commissioning

Before applying supply voltage to the **SCHMIDT® Volume Flow Sensor IL 30.0xx** the following checks have to be carried out:

- Mechanical mounting:
  - o All screws are tightened properly.
  - o Suitable pressure protection measures are carried out (e.g. sealing tape in the threads).

For measurements in media with overpressure check if all screws are tightened properly and all mechanical connections are pressure tight.

- Connecting cable:
  - o Proper connection in the field (switch cabinet or similar).
  - o Tight fit of spigot nut of the connector of the connecting cable at sensor enclosure.

If the sensor is in the correct operational state after initialization, it switches into measuring mode. The indication of volume flow (both LEDs and signal outputs) jumps for a short period to maximum and settles after approx. one second at the correct measuring value provided the sensor probe have medium temperature already. Otherwise, the process will prolong until the sensor has reached medium temperature.

9 Information concerning operation

Ambient condition temperature

The **SCHMIDT® Volume Flow Sensor IL 30.0xx** monitors the temperature of both medium and electronics.

As soon as one limit of the specified operation ranges is exceeded, the sensor switches off one or both measuring functions associated with the medium depending on the situation and report the corresponding error. As soon as proper operational conditions are restored, the sensor resumes normal function.

Even short-term exceedance or undershooting of operating temperatures can cause irreversible damage to the sensor.

Ambient condition medium

The **SCHMIDT® Volume Flow Sensor IL 30.0xx** is suitable for clean, non-combustible air and gases that contain neither dust, abrasive particles or vapours nor gaseous oils or chemical aggressive components.

Depending on the consistency and composition, deposits or other contaminants may lead to falsification of the measured value and should be avoided coercively (see chapter *10 Service information*).

Soiling or other deposits on the sensing elements cause false measurement results. Therefore, the sensor should be checked for contaminations regularly and, if necessary, has to be cleaned or send in for maintenance.

When cleaning, use only mild agents (such as isopropanol) and avoid direct contact of the sensor elements as far as possible.

The suitability of the sensor for use in any non-clean media must be checked in individual cases.

Condensing liquid fractions in gases or even immersion into liquids can damage the probe and therefore must be avoided strictly. Also, the significantly higher heating capacity of liquids distorts the measuring results seriously (in this case a much higher volume flow is detected and will be signalled accordingly).

(Condensing) liquid on the measuring probes causes serious measurement distortions and can also damage the sensor irreversibly.

For maximum accuracy in real applications, the **SCHMIDT® Volume Flow Sensor IL 30.0xx MPM** is matched in pressures > 3 bar. In order to avoid additional measurement deviations, the use of it at > 50 % of the measuring range is only recommended at pressures > 3 bar.

When using a **SCHMIDT® Volume Flow Sensor IL 30.0xx MPM** in higher standard volume flows (> 50 % of measuring range), a minimum operating pressure of 3 bar is recommended for optimal measurement results.

10 Service information

Troubleshooting

Possible errors (error images) are listed in Table 7.

Furthermore, several causes and measures to eliminate errors are described.

Causes of any error signaling have to be eliminated imme-diately. Exceeding or falling below the permitted operating parameters can result in permanent damage to the sensor.

Error image	Possible causes	Troubleshooting
○ ○ ○ ○ No LED is shining All signal outputs are at zero	Problems with supply U_S: ➢ No U_S available ➢ Wrong polarity (DC) ➢ U_S < 15 V Sensor is defective	➢ Connector screwed on correctly? ➢ Supply voltage connected correctly? ➢ Supply voltage at sensor plug available (cable break)? ➢ Power supply sufficient? ➢ Send in sensor for repair
Start sequence is repeated continuously (all LEDs flashes simultaneously in red - yellow - green)	U_S unstable: ➢ Power unit cannot supply inrush current ➢ Other consumers over-load power source ➢ Wire resistance too high	➢ Supply voltage at sensor stable? ➢ Power supply sufficient? ➢ Voltage losses over cable negligible?
◐ ◐ ◐ ◐	Sensor element defective	Send in sensor for repair
◐ ◐ ○ ○	Supply voltage U_S < 21.6 V	Increase supply voltage
○ ○ ◐ ◐	Supply voltage U_S > 26.4 V	Decrease supply voltage
○ ◐ ◐ ○	Electronic temperature too low	Increase temperature of environment
◐ ○ ○ ◐	Electronic temperature too high	Decrease temperature of environment
◍ ◐ ◐ ◍	Medium temperature too low	Increase medium temperature
◐ ◍ ◍ ◐	Medium temperature too high	Reduce medium temperature
Signal $\dot{V}_N$ is too large/small	Measuring medium does not correspond to air Sensor elements are soiled Sensor elements are moistened	Gas correction considered? Send in sensor for cleaning / maintaining Dry sensor elements
Signal $\dot{V}_N$ is fluctuating	U_S unstable Installation conditions: ➢ Run-in or run-out distance is too short ➢ Strong fluctuations of pressure or temperature	Check voltage supply Check installation conditions Check operating parameters
Analog signal permanently at maximum	Load resistance of signal output is at +U_S	Connect load resistance to GND

Table 7

○ LED off ◍ LED on: orange

● LED on: green ◐ LED flashes (1 Hz): red

Transport / shipment of the sensor

For transportation or dispatching of the volume flow sensor **IL 30.0xx**, it must be well protected against vibrations and shocks. Ideally, the sensor is shipped with fitted protective caps and in its original packaging.
Soiling, mechanical stress and / or touching the sensor elements should be avoided.

Calibration

If the customer has made no other provisions, we recommend repeating the calibration at a 12-month interval. For this purpose the sensor must be sent in to the manufacturer.
A calibration can be carried out only if the basic sensor, i.e. without mounted extended sections or other pipes, is sent in. Also make sure that there are no damages especially concerning the sensor elements and the inner mounting threads.

Spare parts or repair

No spare parts are available, since a repair is only possible at the manufacturer's facility. In case of defects, the basic sensor must be sent in to the supplier for repair. Any other installed parts like pipes or measurement extensions have to be removed.

- **A completed declaration of decontamination must be attached.**

The appropriate form “Declaration of decontamination” is enclosed with the sensor and can also be downloaded at

www.schmidt-sensors.com

tab "Service & Support for Sensors”, heading “Product Downloads".

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

Test and material certificates

Every new 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.

11 Technical data

Sensor technology	Thermal inline volume flow sensor (with MPM[12])
Measurands	Standard[13] volume flow $\dot{V}_N$ Temperature of medium T_M
Measuring ranges[14] $\dot{V}_N$	½": 0.15 … 76.3 Norm-m³/h 1": 0.50 … 229 Norm-m³/h 1½": 1.00 … 417 Norm-m³/h 2": 2.00 … 712 Norm-m³/h
Measuring accuracy $\dot{V}_N$	±(3 % of measured value + 0.3 % of fmr[15]) With higher volume flows (> 50 % of fmr) an operating pressure > 3 bar is recommended for optimal measuring results.
Response time (t_{90}) $\dot{V}_N$	Approx. 5 s
Measuring accuracy T_M	≤ ±2 K (volume flow > 2 % of fmr)
Measurement direction	Unidirectional
Mounting position	Arbitrary
Medium to be measured	Clean (compressed-) air, nitrogen; other gases on request (fluid group 2 according PED 2014/68/EU)
Compression strength	16 bar (overpressure)
Humidity range	Measuring mode: Non-condensing (< 95 % RH)
Operating temperature	-20 … +60 °C
Installation	Inner threads DN 15 … DN 50 (G½ … G2)
Analog output	Current interface (short circuit protected) Signal range: 4 … 20 mA (2 mA error signal) Load: $R_L \leq 500\ \Omega$ / $C_L \leq 10$ nF
Impulse output	Highside driver (open drain, short circuit protected) Pulse valence: 0.1/1.0 Norm-m³ Pulse duration: 1 s (transistor conducting) Pulse high level: $> U_S - 1$ V (current limiting inactive) Current limit: Typ. 50 mA (max. 65 mA)
Display	4 dual LEDs (bar graph display of $\dot{V}_N$ / sensor status)
Supply Voltage U_S	24 V DC ± 10 %
Current consumption (without impulse output)	IL 30.005: ≤ 180 mA IL 30.0xx MPM: ≤ 300 mA
Electrical Connection	Main connector: M12, male, A-coded, 5-pin Module connector: M12, female, A-coded, 5-pin
Length of connection cable	Main connector: 100 m (rec.); module connector: 1,200 m
Type of protection	IP64 (housing), IP67 (connector, with connection cable)
Class of protection	III (SELV or PELV)
Material of housing	Anodized aluminium

[12] MPM: Multi-Point-Measurement; except IL 30.005 with only one measurement point
[13] Based on standard (Norm) conditions $T_N = 20$ °C and $p_N = 1013.25$ hPa
[14] Minimal value of measuring range = lower detection limit
[15] fmr: final value of measuring range

12 Dimensions

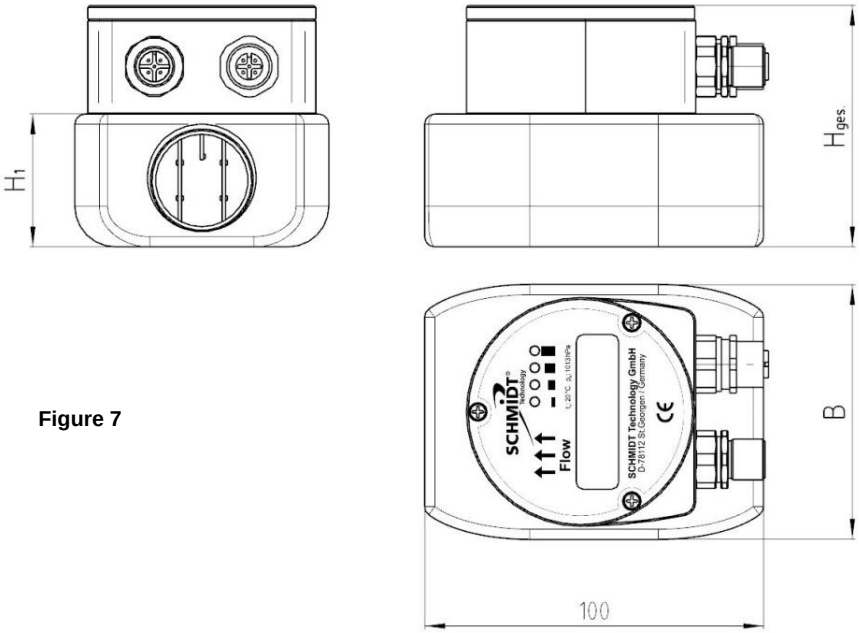


Figure 7

Type	$H_{ges.}$	H_1	B	Article number
IL 30.005	59	27	75	550 250
IL 30.010 MPM	71	39	75	550 251
IL 30.015 MPM	86	54	75	550 252
IL 30.020 MPM	98	66	82	550 253

Table 8

All dimensions in mm

13 Declarations of Conformity

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

SCHMIDT® Volume Flow Sensor IL 30.0xx

Part-Nos. **550 250, 550 251, 550 252, 550 253**

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

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