EN

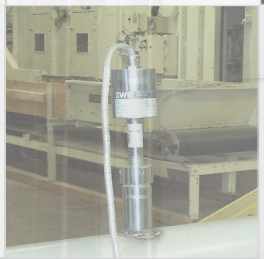
Competence in Solids

GLOBAL TECHNOLOGY SYSTEMS

SWR engineering

SolidFlow

Monitoring of solids



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1. System Overview

Overview of the measuring system:

Sensor

and evaluation unit

2. Function

- SolidFlow is a measuring system especially developed for measuring the flow rate of conveyed solids in metallic ducts.
- The SolidFlow sensor is based on the newest microwave technology. The sensor is usable in metal ducts. Through the coupling of the microwave in the duct it is created a homogenous measured field.
- The microwave energy is being reflected by the solid particles and received by the sensor. These signals are evaluated in frequency and amplitude.
- Because of the selective frequency evaluation only moving particles are measured.
- The measuring signal is independent of pressure and temperature in the duct. A measuring unit consists of one sensor and the evaluation unit.

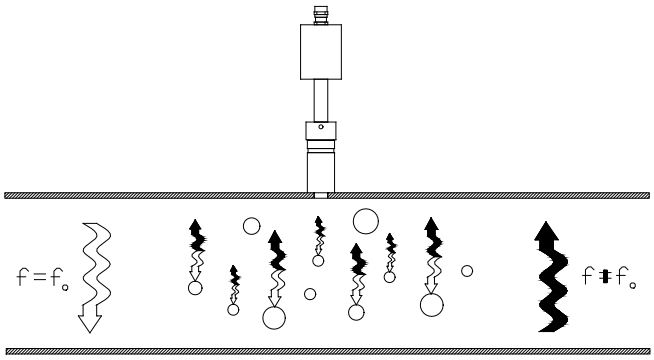


Fig. 3: Coupling and reflection of the microwaves.

3. Safety

The measuring system SolidFlow was designed, built and tested to be safe and was shipped in safe conditions. Nevertheless persons or objects may be endangered by components of the system if these are operated in an inexpert manner. Therefore the operational instructions must be read completely and the safety notes must be followed.
In case of inexpert or irregular use, the manufacturer will refuse any liability or guarantee.

3.1 Regular Use

- The measuring system must be installed for measuring the flow rate in metallic ducts only. Other usage and modifications of the measuring system are not permitted.
- Only original spare parts and accessories of SWR engineering must be used.

3.2 Identification of Dangers

- Possible dangers when using the measuring system are marked by the following symbols in the operating instructions:

Warning!

- This symbol in the operating instructions marks actions, which may represent a danger for life and limb of persons when carried out in an inexpert manner.

Attention!

- All actions which may endanger objects are marked with this symbol in the operating instructions.

3.3 Operational Safety

- The measuring system must be installed by trained and authorised personnel only.
- Switch of the supply voltage for all maintenance, cleaning or inspection works on the tubes or on components of the SolidFlow. Follow the notes of the chapter maintenance.
- Before hot-work the sensor must be removed from the piping.
- The components and electrical connections must be checked for damages regularly. If a damage is found, it is to repaired before further operation of the instruments.

3.4 Technical Progress

- The manufacturer reserves the right to adapt technical data to the technical progress without particular advance notice. If you have any questions, SWR engineering will be pleased to inform you on possible changes and extensions of the operating instructions.

4. Mounting and Installation

4.1 Delivery Range

- Evaluation unit in the housing
- Weld on sensor accommodation
- Sensor (union nut, distance washers, seal-ring for adjustment)
- Operating instructions
- C-Box (optional)

4.2 Auxiliary

- Drill Ø 20 mm for steel
- 32 mm wrench for union nut
- Pliers for circlips (Ø 20 mm) for adjusting the wall thickness at the sensor

4.3 Mounting of the Sensor

The sensor is to be mounted as follows:

- Determine the place of mounting on the duct. On horizontal or inclined ducts the sensor should be mounted from top.
- In case of duct diameters greater than Ø 200 mm or a special application one has to install up to three sensors which are located 120 mm apart from each other and moved by 120° towards each other.
- The distances are valid for the vertical and horizontal installation position.
- Follow the necessary distances of valves, bows, fans or cellular wheel sluices etc. and also other measurement devices like temperature and pressure etc. to the sensor. (see fig. 4)

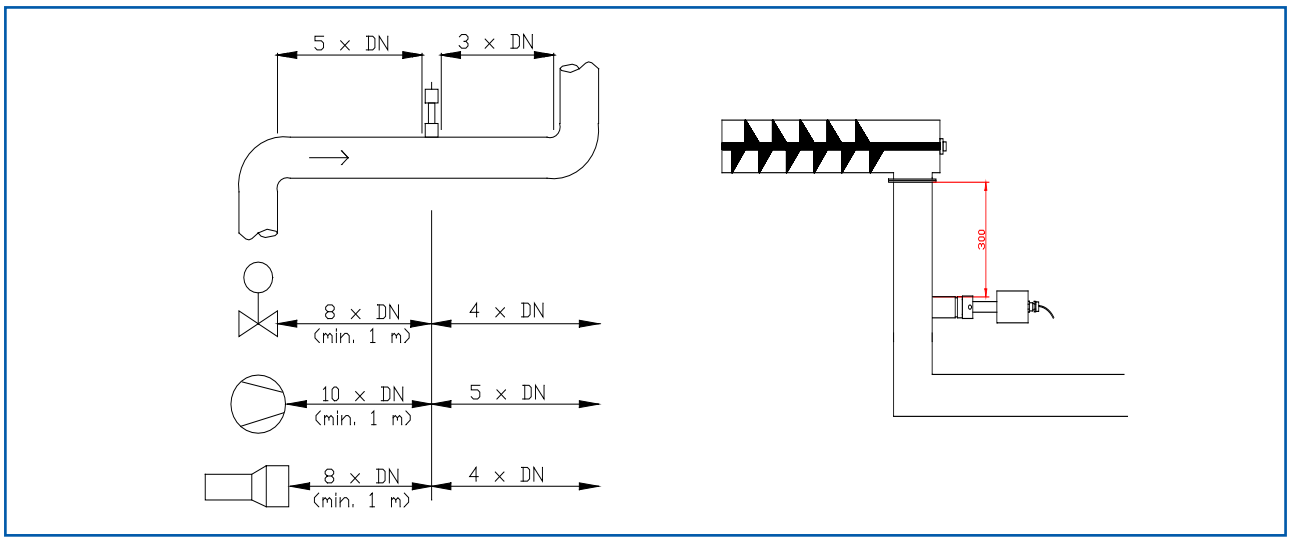


Fig 4: Minimal distances of the sensor to duct bends and baffles.

- With free fall applications (e. g. after screw feeders or rotary valves) a free fall height of at least 300 mm would be perfect.

- Weld the sensor accommodation on to the duct.
- Drill the Ø 20 mm hole into the duct. Please use your own drill as there are different shafts available. Take care that the hole is in line and rectangular to the surface to avoid trouble by inserting the sensor.

Warning!

- After drilling you have to check, if there is a burr resulted at the drilling walls from the drilling. If so, this burr in the duct must be removed with an appropriate tool. If this burr is not removed, a calibration of the sensor is not possible!
- If the sensor is not installed immediately, the dummy plug must be put in until the sensor will be installed (see fig. 5). Use a 32 mm wrench for tightening the union nut.

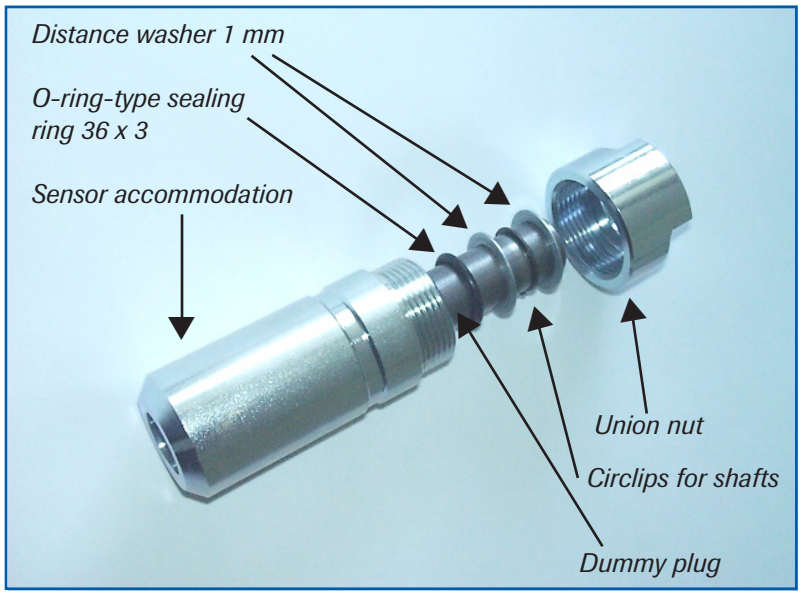


Fig. 5: Installation of the sensor accommodation and the dummy plug.

- Fig. 5: Installation of the sensor accommodation and the dummy plug.
- It's important that the sensor does not intrude into the duct because otherwise the front end of the sensor will be worn by abrasion. If necessary the wall thickness must be checked with a depth gauge. Then position the circlip in the complying slot. The sensor may be submerged into the duct wall by up to 1 mm without creating an error of measurement.

Wall thickness (mm)	Circlip for shafts position	Number of distance washers
3,0	1	2
4,0	1	1
5,5	2	2
6,5	2	1
8,0	3	2
9,0	3	1
10,5	4	2
11,5	4	1
13,0	5	2
14,0	5	1

- Now the sensor is put into the sensor accommodation and screwed with the union nut according to figure 6a.

- Look at the POLARIZATION – label to adjust the sensor along to the duct, fig. 6b.

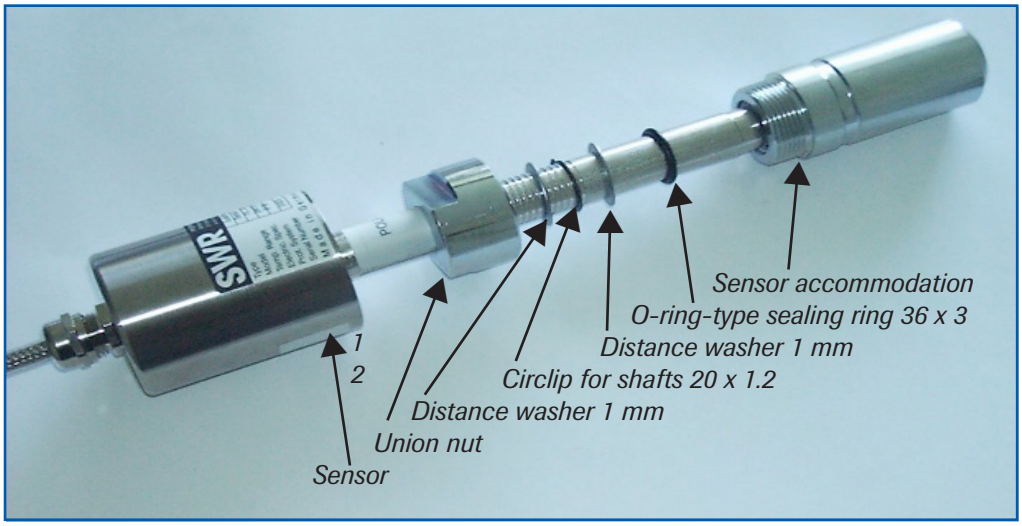
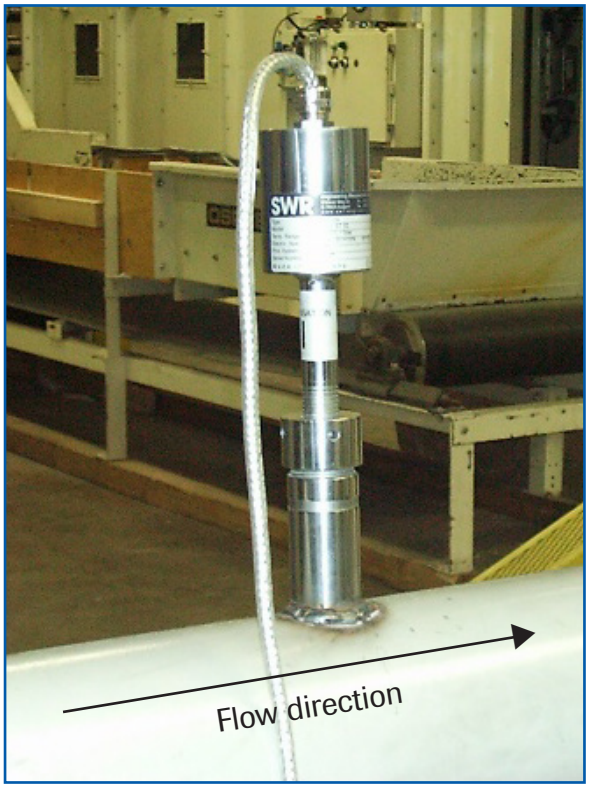


Fig. 6a: Installation of sensor accommodation and sensor.

- Lock the sensor with the union nut dust proof and fix the sensor.

- Make sure you install a drip loop with the cable anywhere it may get wet to prevent water flow from reaching the sensor.



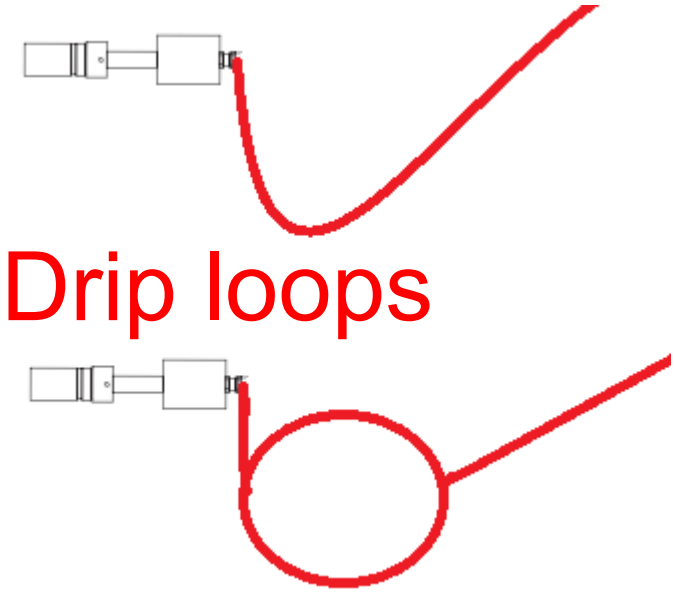


Fig. 6b: Adjustment of the sensor.

4.4 Mounting of the Evaluation Unit

- The whole electronic equipment can be installed at a maximum distance of 300 m from the sensor. The housing is prepared for wall mounting.

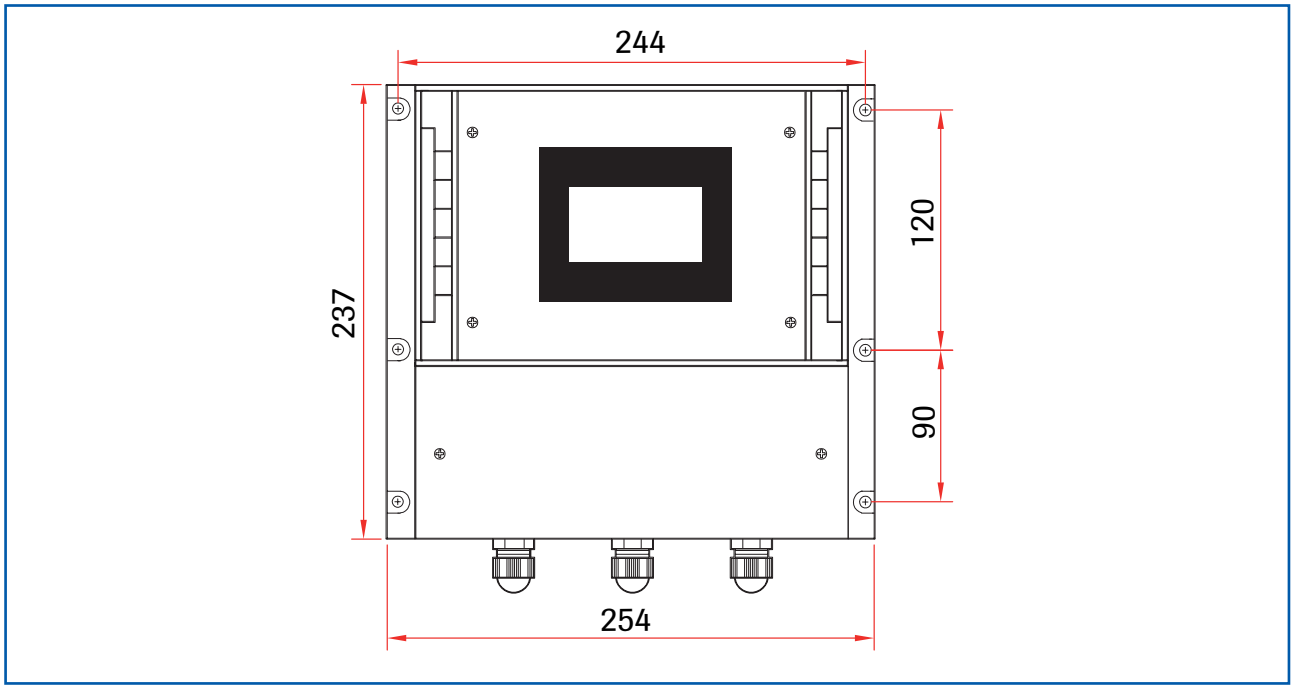


Fig. 7: Field housing evaluation unit.

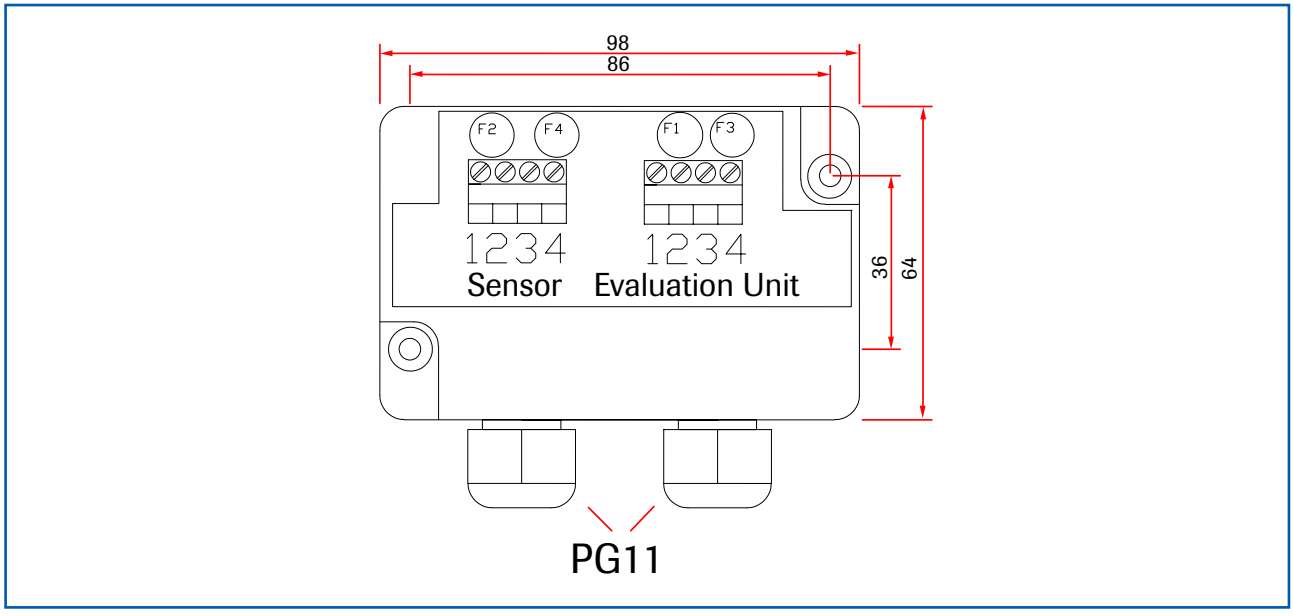
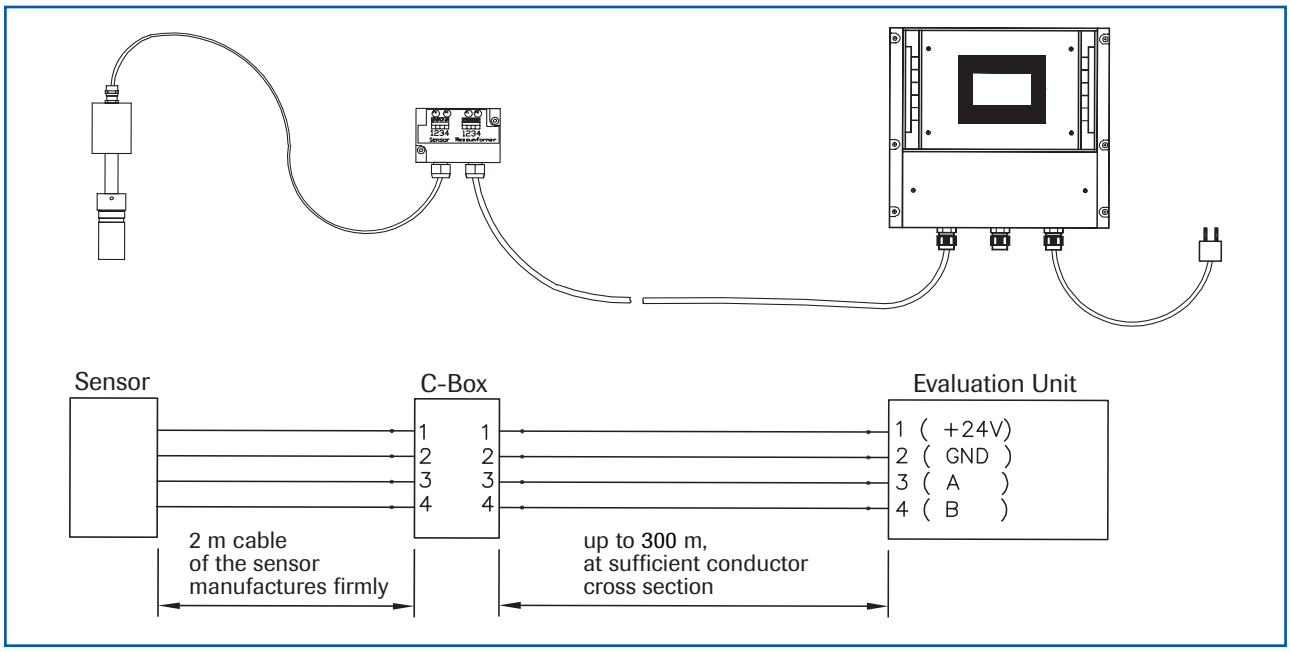


Fig. 8: Field housing C-Box (optional).

4.5 Overview of the Optional Use of the C-Box



The C-Box is an useful optional extension, if the distance between the sensor and the evaluation unit exceeds the given standard length of 2 meters. The C-Box contains additional safety devices and terminal resistors to guarantee the communication over the ModBus between the sensor and the evaluation unit even over longer distances.

4.6 Use in Ex Hazard Array

Marking DustEx: **II 1/2D Ex tD IP 65 T84 °C**

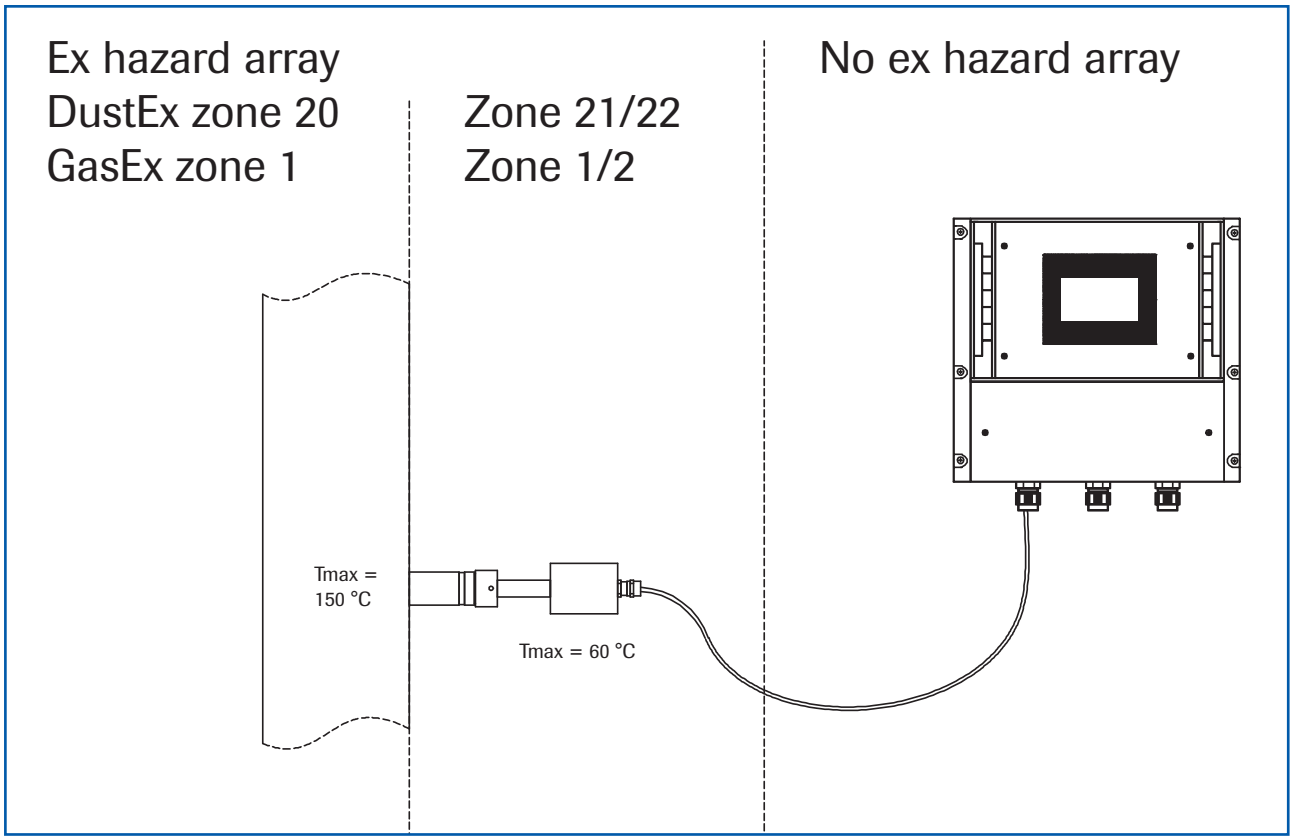
Zone 20: 0 °C ≤ $T_{prozess}$ ≤ 80 °C

Zone 21: -10 °C ≤ T_{amb} ≤ 60 °C

- Group of equipment 2
- Equipment category: 1/2
  Waveguide window zone 20 / Housing zone 21
- For combustible mixtures from air and inflammable type of dust
- IP-Code 65
- Maximum surface temperature 84 °C with Ta = 60 °C

Marking GasEx: **II 1/2D Ex tD A20/21 IP 65 T84 °C**
II 2G Ex d IIC T5/T3

- Group of equipment 2
- Equipment category: 2
- Zone 1
- For combustible mixtures from air and inflammable type of gas
- IP-Code 65
- Allowable process temperature 0 to 150 °C
- Class of temperature T3
- Maximum surface temperature 84 °C with Ta = 60 °C



5. Electrical Connection

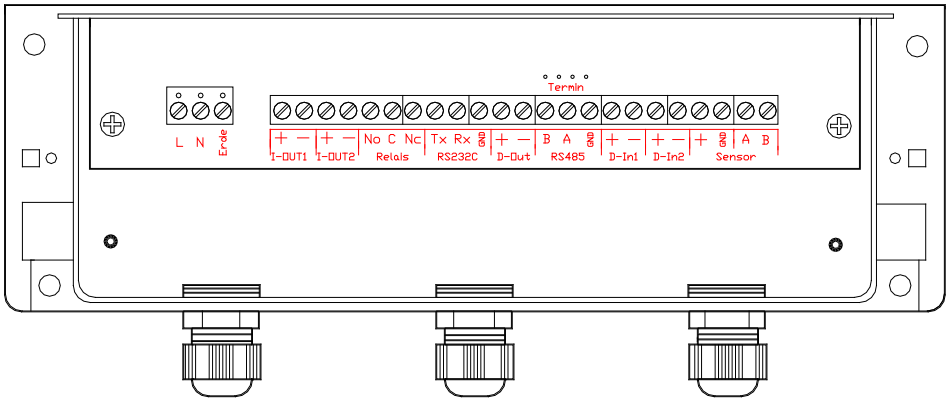


Fig. 9: Electrical connection

Evaluation Unit			
Terminal No.		**Connection**	
Connection of the Supply Voltage			
L / + 24 V		Input Supply Voltage 230 V / 50 Hz, 110 V / 60 Hz (optional 24 V DC)	
N / 0 V		Input Supply Voltage 230 V / 50 Hz, 110 V / 60 Hz (optional 24 V DC)	
PE		Protected Earth	
Sensor Connection			
I-out	+	Analogue Output +	
	-	Analogue Output -	
	NA	not available	
	NA	not available	
Min. / Max.- Relay	NO	Potential-free Relay NO (Close)	
	C	Potential-free Relay COM (Common Conductor)	
	NC	Potential-free Relay NC (Open)	
RS 232	RX	RS 232 Intersection Data	
	TX	RS 232 Intersection Data	
	GND	RS 232 Intersection Ground	
D-out	+	Digital Output +	
	-	Digital Output -	
RS 485	B	RS 485 Intersection Data B	
	A	RS 485 Intersection Data A	
	GND	RS 485 Intersection Ground	
D-in1	+	Digital Intersection 1 (+)	
	-	Digital Intersection 1 (-)	
D-in2	+	Digital Intersection 2 (+)	
	-	Digital Intersection 2 (-)	
Sensor	+	Supply Voltage 24 V (+)	Cable No. 1
	-	Supply Voltage 24 V (-)	Cable No. 2
	A	RS 485 Data A	Cable No. 3
	B	RS 485 Data B	Cable No. 4

6. Commissioning

- For start-up the measurement system it is necessary to adjust the sensor to the local conditions. After switching on the power supply there is at least a warm-up time about 15 minutes required before any adjustment starts.

Please check again:

- The correct cabling between sensor and the evaluation unit.
- The correct adjustment of the wall thickness at the sensor.
- In case that despite these steps a successful measurement is impossible, please contact SWR.

Commissioning of SolidFlow

For start-up the sensor **has to be calibrated and parameterized to each product,** which will be measured. It is necessary to assign the mass flow to the display and initial value. The menu functions are mostly self-explaining. Following a short introduction to the overview:
By leaving the menu level and confirming the memory function in menu 8 all values changed are transferred.

Starting the Menu	**The menu is started by an invisible key in the upper right corner of the touch-screen-panel. Now press approx. 5 seconds until the menu appears.** If the temperature indication is activated, the button for the temperature indication is in the upper right corner, in this case must be changed into the temperature indication first, in order to be able to access the menu.
Basic Function	It is sufficient to carry out a two-point-calibration (normally min and max). Enter the data in menu 4.2.
Min-Point	Set point 1 to 0, with no material flow but system running.
Max-Point	Set point 2 to known maximum flow rate with normal conveying and calibrate as well. (This value can be adjusted later on.) Thus the basic function of the measuring system is given and it is now ready for operation.
Adjustment	See menu 1, point 1 to 3 for the adjustments to the individual local conditions regarding material, measuring units, etc.
Current / Voltage-Output	The initial values are defined in the menu points 1.5 and 1.6. The output value (current / voltage) is assigned to the measuring range here. Standard 0 = 4 mA Max = 20 mA The measuring range filter is used for the adjustment to slower working devices or for a continuous output of the analog output.

Alarms	entered by the user in menu 2.
Analog Output	is modified in menu 3 and can be adjusted to the individual requirements. (e. g. 0 - 20 mA)
Auxiliary Points	The linearisation can be examined by measuring the varying mass throughput. This should be weighed out in each single case for the improvement of the accuracy. If there are deviations the non-linearity can be corrected by a basic table. According to the chosen and fixed points in menu 4.2 (minimum 2 for the first start-up of the commissioning), it is now possible to enter a correction value for the actual mass flow. (This value can be changed afterwards.)
Pulse Output	The pulse output can be parameterized to the value displayed in point 5 of the menu. This is done by declaring the number of pulses per mass unit e. g.: the mass unit is set to 1 t! The pulse output is set on 10.0 impulse / unit. So there will be one pulse every 100 kg. Note: please make sure that the indicated pulses do not exceed 50 pulses per second. After changing the pulse configuration you will have to do a total reset of the evaluation unit by interrupting the power supply a few seconds. Otherwise the changing wouldn't be activated.
Digital Input	All digital inputs may be used for a reset of the totalizer.
System	Adjustment of the ModBus by entering the "baud rate" and address. Correction of the contrast and the delay of the backlight for ergonomics.
Totalizer	With the totalizer function it is possible to monitor the entire flow rate since the last reset of the totalizer. A RESET can be accomplished over an external control line (see digital input) or directly over the display by pressing the R-symbol.
Storage	When leaving the system you will be asked, if adjusted values should be stored or not. By pressing **ok** the adjustment is done, by pressing **n** it will be rejected.
C-Box	Will only be used, if the distance between the sensor and the evaluation unit exceeds 2 meters.

Following the menu parameters in detail:

7. Menu Structure of SolidFlow

1. Measuring Range

1.1	**Tag No**	Adjust Material (10 Digits)
1.2	**Unit**	Adjust Text e. g. kg
1.3	**Time Scale**	Choose: h / min / s
1.4	**Decimal Point**	Choose Position of Dec. Point
1.5	**Beginning of Measuring Range**	Range 0 ... 999
1.6	**End of Measuring Range**	Range 0 ... 999
1.7	**Filter Value**	Range 0.1 ... 999.9 s

2. Alarm

2.1	**Type of Alarm**	Choose: Min / Max
2.2	**Value of Alarm**	-10 to 110 % in phys. Units
2.3	**Alarm Dead Time**	Range 0.1 ... 99.9 s
2.4	**Alarm Hysteresis**	0.1 ... 99.9 %
2.5	**Operation Mode**	Choose: Working- / Static Current Principle
2.6	**Alarm Sensor Malfunction**	Choose: on / off

3. Analog Output

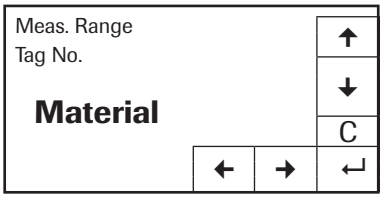
3.1	**Beginning of Measuring Range**	Range: 0 ... 22 mA (Standard: 4 mA)
3.2	**End of Measuring Range**	Range: 0 ... 22 mA (Standard: 20 mA)
3.3	**MIN Point**	Range: 0 ... 22 mA (Standard: 3 mA)
3.4	**MAX Point**	Range: 0 ... 22 mA (Standard: 20 mA)
3.5	**Value of Alarm**	Range: 0 ... 22 mA (Standard: 3 mA)
3.6	**Filter Time**	Range: 0.1 ... 99.9 s (Standard: 1 s)
3.7	**Calibration: 4 mA**	Adjust Current Output (4 mA calibrated)
3.8	**Calibration: 20 mA**	Adjust Current Output (20 mA calibrated)

4.	**Calibration**		
	4.1	**Calibration Factor**	Range 0.01 ... 9.99
	4.2	**Calibration Filter**	Range 0.1 ... 999.9 s
	4.3	**Number of Calibration Points**	Range 2 ... 20 Auxiliary Points
	4.4	**Calibration**	Range 0.1 ... 999.9 s
		4.4.1 Calibration Point 1 Meas. Value	Range of Beginning - End of Measuring Value (in phys. Units)
		4.4.2 Calibration Point 1 Raw Value	Adjust Initial Value
		. . . (depending on the no. of calibration points)	
		4.4.(2*N) Calibration Point N Meas. Value	Range of Beginning - End of Measuring Value (in phys. Units)
		4.4.(2*N+1) Calibration Point N Raw Value	Adjust Initial Value
5.	**Impulse Output**		
	5.1	**Number of Impulses / Mass Unit**	Range 0.01 ... 99.9
6.	**Digital Input**		
	6.1	**Digital Input 1**	
		6.1.1 Function	Choose: None / Totalizer Reset
		6.1.2 Direction of Action	Choose: Current / Without Current
		6.1.3 Filter Time	Range: 0.1 ... 99.9 s
	6.2	**Digital Input 2**	
		6.2.1 Function	Choose: None / Totalizer Reset
		6.2.2 Direction of Action	Choose: Current / Without Current
		6.2.3 Filter Time	Range: 0.1 ... 99.9 s
7.	**System**		
	7.1	**Baudrate**	Choose: 4800 / 9600 / 19200 / 38400
	7.2	**ModBus-Address**	Range: 1 ... 255
	7.3	**Contrast**	Adjust Contrast
	7.4	**Language**	Choose: D / F / E
	7.5	**Backlight**	Backlight Constant = 0 or Delay of Backlight in Minutes Range 1 ... 99 min
	7.6	**Temperature Display**	Temperature Display On / Off
	7.7	**Total Counter**	Total Counter On / Off

8. Menu Parameters:

1. MEASURING RANGE

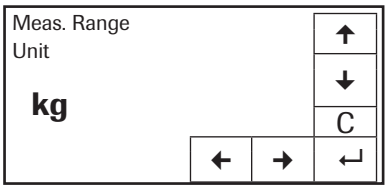
1.1 Tag No.



Freely selectable symbols
of the measuring medium - or place,
max. 10 digits.

With ↑ and ↓ select the letters or symbols
with ← and → select place of the letter
(1 ... 10); with C delete the respective letter and with ↵ transfer the entry and leave the menu level.

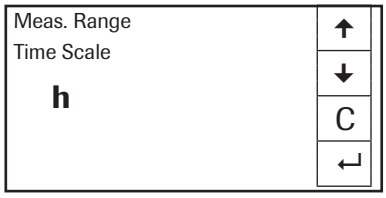
1.2 Unit



Entry of the measuring range
max. 6 digits.

With ↑ and ↓ select the letters or symbols,
with ← and → select the letter (1 ... 6),
with C delete the respective letter and with
↵ transfer the entry and leave the menu level.

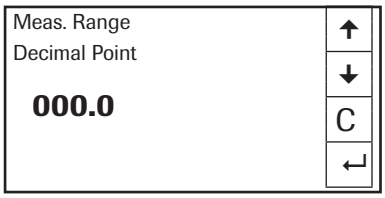
1.3 Time Scale



Choose of the time unit is important for the
Totalizer - Choose h / min / s
/ s per second
/ min per minute
/ h per hour

With ↑ and ↓ select according to the
display, with C leave the menu without any change, with ↵ transfer the entry
and leave the menu level.

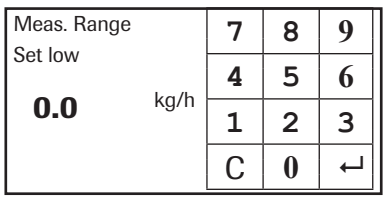
1.4 Decimal Point



Adjust the digit in the display.

With ↑ and ↓ shift the comma.
C is without function here and with ↵
transfer the entry and leave the menu level.

1.5 Beginning of Measuring Range



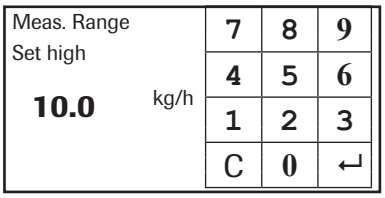
Enter the respective value of the measuring
range you will start with. Usually 0.0.

With C set the value to 0.0 to start enter the
numbers of the measuring range, with ↵
transfer the entry and leave the menu level.

1.6 End of Measuring Range

Enter the respective value of the measuring range end.

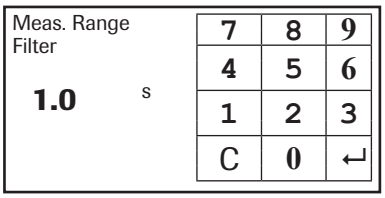
With [C] set the value to 1.0 to start enter the numbers of the measuring range, with [↵] transfer the entry and leave the menu level.



1.7 Filter Value

Adjustable damping for the **display** in seconds.
Range: 0.1 ... 999.9 s

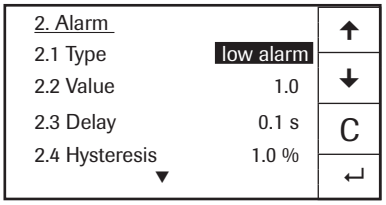
With [C] set the value to 0.0 to start enter the numbers of the measuring range, with [↵] transfer the entry and leave the menu level.



2. ALARM

Effect onto the relay

With [↑] and [↓] select according to your significance, with [C] leave the menu without any change, with [↵] transfer the entry and switch to a deeper menu level.



2.1 Type of Alarm

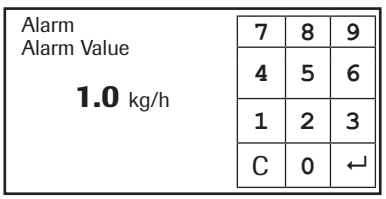
None / min / max.

With [↑] and [↓] select according to your significance, with [C] leave the menu without any change, with [↵] transfer the entry and switch to a deeper menu level.

2.2 Value of Alarm

Threshold value.
Range: -10 ... 110 % of the measuring range in phys. units.

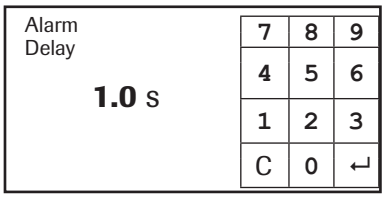
With [C] leave the menu without any change, with [↵] transfer the entry and leave the menu level.



2.3 Alarm Dead Time

Threshold value how long the value must be over or under the limit until the alarm relay reacts. Range: 0.1 ... 99.9 s

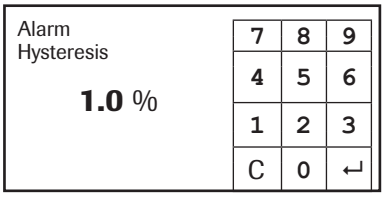
With [C] leave the menu without any change, with [↵] transfer the entry and leave the menu level.



2.4 Alarm Hysteresis

Threshold value of the alarm
Range: 0.1 ... 99.9 % of the measuring range.

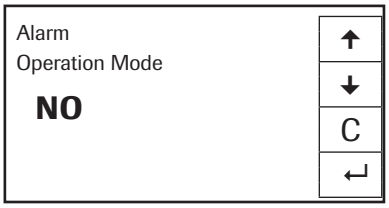
With [C] leave the menu without any change, with [↵] transfer the entry and leave the menu level.



2.5 Operation Mode

Choice of the contact work or interruption.
NO - Working current
NC - Static current

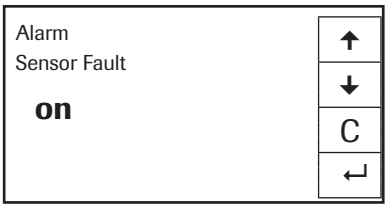
With [↑] and [↓] select according to the display, with [C] leave the menu without any change, with [↵] transfer the entry and leave the menu level.



2.6 Alarm Sensor Error

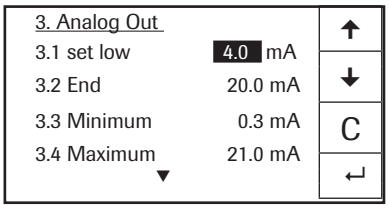
Reaction by sensor error to the alarm and current output. On / Off

With [↑] and [↓] select according to the display, with [C] leave the menu without any change, with [↵] transfer the entry and leave the menu level.



3. ANALOG OUTPUT

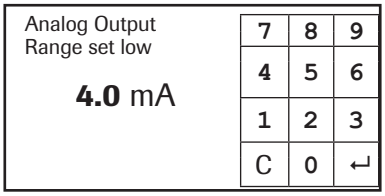
With [↑] and [↓] select according to your significance, with [C] leave the menu without any change, with [↵] transfer the entry and switch to a deeper menu level.



3.1 Starting Range

Value for the output min
(standard 4 mA) - Range 0 ... 22 mA

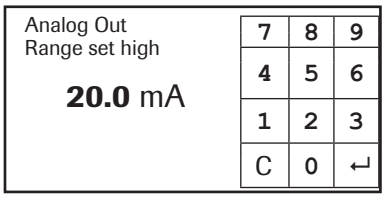
With [C] set the value to 0.0 to start enter the numbers of the measuring range, with [↵] transfer the entry and leave the menu level.



3.2 End of Range

Value for the output max.
(Standard 20 mA)
Range 0 ... 22 mA

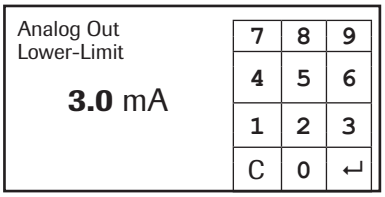
With [C] set the value to 0.0 to start enter the numbers of the measuring range, with [↵] transfer the entry and leave the menu level.



3.3 MIN-Limit

Value for the MIN-Limit
Range 0 ... 22 mA
(Standard 3.0 mA)

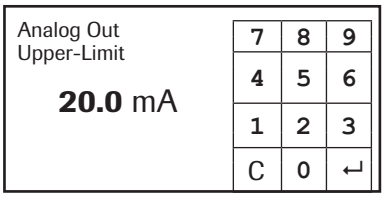
With [C] set the value to 0.0 to start enter the numbers of the measuring range, with [↵] transfer the entry and leave the menu level.



3.4 MAX-Limit

Value for the MAX-Limit
Range 0 ... 22 mA
(Standard 20 mA)

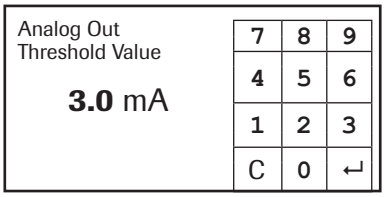
With [C] set the value to 0.0 to start enter the numbers of the measuring range, with [↵] transfer the entry and leave the menu level.



3.5 Threshold Value

Value for alarm (Sensor error or internal alarm) at the same time Rel 3 goes down.
Range 0 ... 22 mA
(Standard 3 mA)

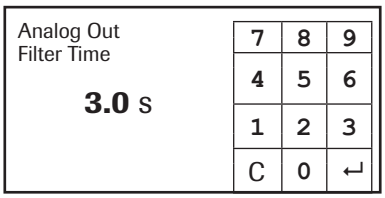
With [C] set the value to 0.0 to start enter the numbers of the measuring range, with [↵] transfer the entry and leave the menu level.



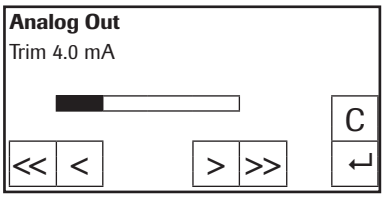
3.6 Filter Time

Adjustable damping for the current output.
Range 0.1 ... 999.9 s
(Standard 1 s)

With [C] set the value to 0.0 to start enter the numbers of the measuring range, with [↵] transfer the entry and leave the menu level.



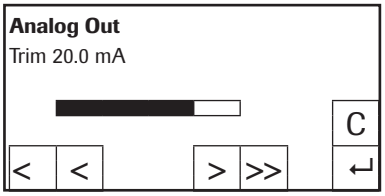
3.7 Trim 4 mA



Value of current min.
Adjust to the external measuring system (if display differs).

With [<<] and [>>] adjust fast, with [>] and [<] adjust slowly the current to 4 mA.
With [↵] transfer the entry and leave the menu level, with [C] leave the menu without any change.

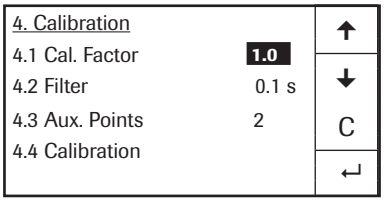
3.8 Trim 20 mA



Value of current max. Adjust to the external measuring system (if display differs).

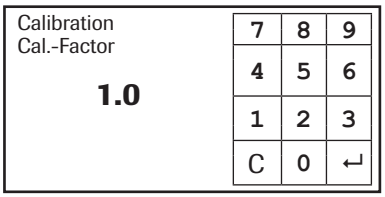
With [<<] and [>>] adjust fast, with [<] and [>] adjust slowly the current to 4 mA.
With [↵] transfer the entry and leave the menu level, with [C] leave the menu without any change.

4. Calibration



With [↑] and [↓] select according to your significance, with [C] leave the menu without any change, with [↵] switch to a deeper menu level.

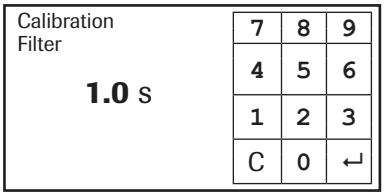
4.1 Calibration Factor



Global calibration factor of the measuring on the display and as well the output range from 0.01 to 9.99 - Setting is 1.0

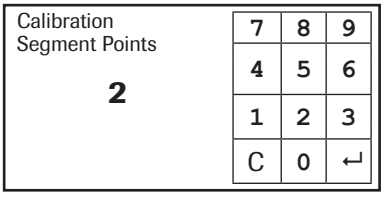
With [C] set the value to 0.0 to start enter the numbers of the measuring range, with [↵] transfer the entry and leave the menu level.

4.2 Calibration Filter



Damping filter for setting unsteady signals during the calibration.
(Has no effect on output and display)
0.1 to 999.9 s
With [C] set the value to 0.0 to start enter the numbers of the measuring range, with [↵] transfer the entry and leave the menu level.

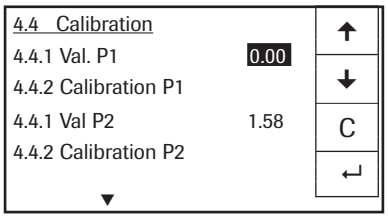
4.3 Number of Calibration Points



Set the number of the auxiliary points:
2 ... 5 points.
With [C] set the value to 0.0 to start enter the numbers of the measuring range, with [↵] transfer the entry and leave the menu level.
.

4.4 Calibration

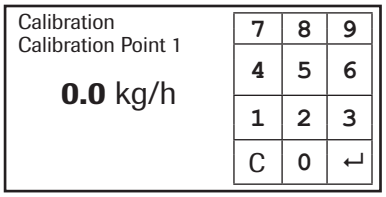
With ↑ and ↓ select according to your significance, with C leave the menu without any change, with ↵ transfer the entry and switch to a deeper menu level.



4.4.1 Calibration Point 1 – Measuring Value

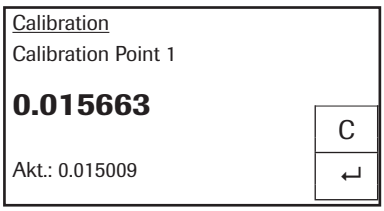
Measuring value in phys. units.
Range: Measuring start - Measuring end

With C set the value to 0.0 to start enter the numbers of the measuring range, with ↵ transfer the entry and leave the menu level.



4.4.2 Calibration Point 1 – Raw Value

Indicate the initial value to the value displayed, if pressed ↵. With C leave the menu without any change.



All other points are calibrated as the first one.

4.4.3 Calibration Point 2 – Measuring Value

Measuring value in phys. units.
Range: Measuring start - Measuring end

4.4.4 Calibration Point 2 – Raw Value

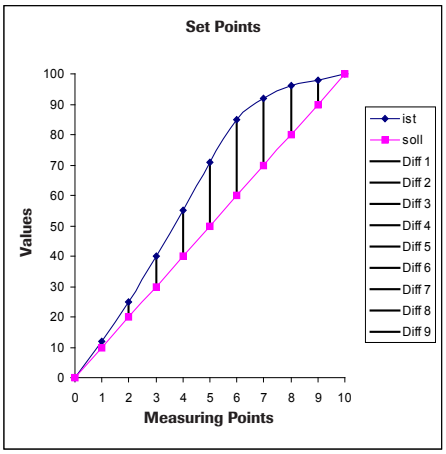
Indicate the initial value to the value displayed.

4.4.5 Calibration Point N – Measuring Value

Only necessary, if you are disturbed by the non-linearity
(see diagram on the right side).

The measuring points of the nominal characteristic curve will be typed in and calibrated to the actual characteristic curve. The customization will be done by the evaluation unit.
The output values are linear.

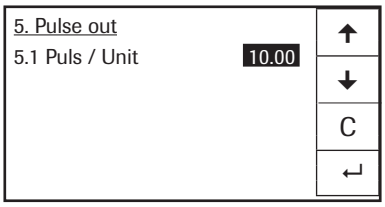
Measuring value in phys. units.
Range:
Measuring start - Measuring end



4.4.6 Calibration Point N – Raw Value

Indicate the initial value to the value displayed.

5. IMPULSE OUTPUT

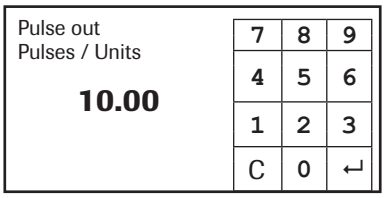


(For connection examples see paragraph 9.2)

Only necessary, if impulse output is required.

With ↑ and ↓ select according to your significance, with C leave the menu without any change, with ↵ transfer the entry and switch to a deeper menu level.

5.1 Number of Impulses / Units



Indicate the number of impulses requested per mass unit. Range: 0.01 ... 99.9

With C set the value to 0.0 to start enter the numbers of the measuring range, with ↵ transfer the entry and leave the menu level.

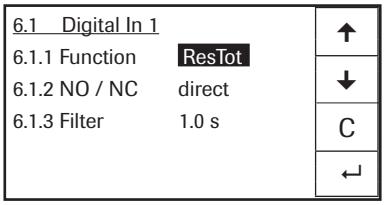
6. DIGITAL INPUT

Only necessary for a reset of the total counter by an external device.
(For connection examples see paragraph 9.1)

With ↑ and ↓ select according to your significance, with C leave the menu without any change, with ↵ transfer the entry and switch to a deeper menu level.

6.1 Digital In 1

(For connection examples see paragraph 9.1)



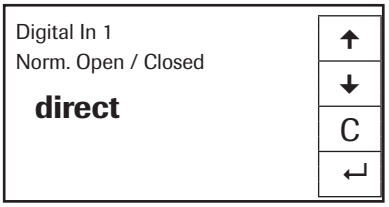
With ↑ and ↓ select according to your significance, with C leave the menu without any change, with ↵ transfer the entry and switch to a deeper menu level.

6.1.1 Function

No function / external reset of totalizer

With ↑ and ↓ select according to the display, with C leave the menu without any change, with ↵ transfer the entry and leave the menu level.

6.1.2 Operating mode



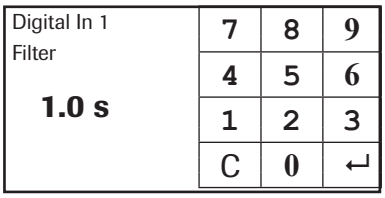
Operation mode
Opened = direct
Closed = invert

With ↑ and ↓ select according to the display, with C leave the menu without any change, with ↵ transfer the entry and leave the menu level.

6.2 Filter

Idle time after activation.
(Anti beat device for mechanical switches.)

With [C] set the value to 0.0 to start enter the numbers of the measuring range, with [↵] transfer the entry and leave the menu level.

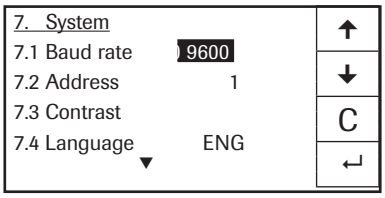


6.3 Digital In 2 like Digital In 1

7. SYSTEM

Adjusting of the ModBus intersection parameter in case of a connection to the system bus.

With [↑] and [↓] select according to your significance, with [C] leave the menu without any change, with [↵] transfer the entry and leave the menu level.



7.1 Baud Rate

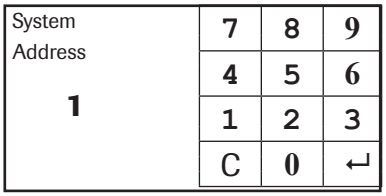
Indicating of the Baud rate
Choose: 4800 / 9600 / 19200 / 38400 Bd

With [↑] and [↓] select according to your significance, with [C] leave the menu without any change, with [↵] transfer the entry and leave the menu level.

7.2 ModBus Address

ModBus address in RTU-Mode (slave)
Selectable address 1 ... 255

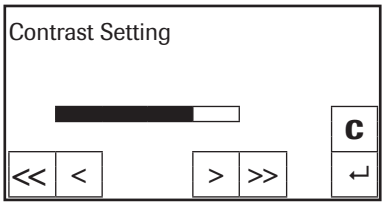
With [C] set the value to 0.0 to start enter the numbers of the measuring range, with [↵] transfer the entry and leave the menu level.



7.3 Contrast

Display contrast for a better legibility.

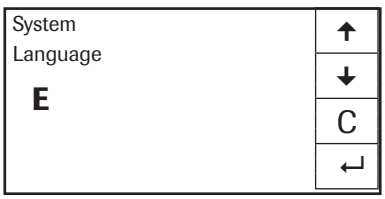
With [<<] and [>>] adjust fast, with [<] and [>] adjust slowly to the contrast required, with [↵] transfer the entry and leave the menu level, with [C] leave the menu without any change.



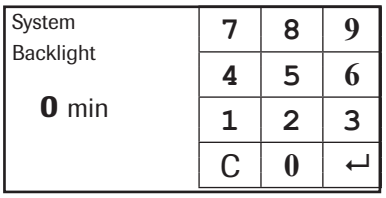
7.4 Language

Indicating of the language - Choose: D / F / E

With [↑] and [↓] select according to your significance, with [C] leave the menu without any change, with [↵] transfer the entry and leave the menu level.



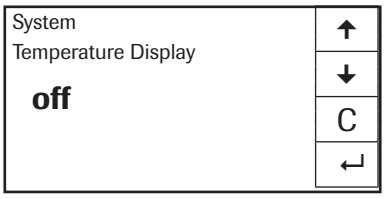
7.5 Backlight



Setting of durable lighting or the luminescence intensity.
Zero switch on to permanent lighting.

With C set the value to 0 (complies in this menu to constant backlight) or enter the numbers of minutes for the delay of the backlight, with ↵ transfer the entry and leave the menu level.

7.6 Temperature Display



Switches display of internal sensor temperature on / off.

The temperature is not available via current output. This value do not represent the temperature of product!

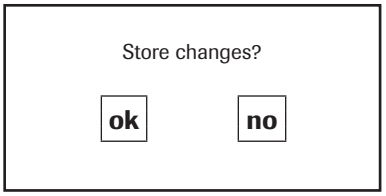
With ↑ and ↓ select according to your significance, with C leave the menu without any change, with ↵ transfer the entry and leave the menu level.

7.7 Total Counter

Switches the totalizer on / off.

With ↑ and ↓ select according to your significance, with C leave the menu without any change, with ↵ transfer the entry and leave the menu level.

8. Storage

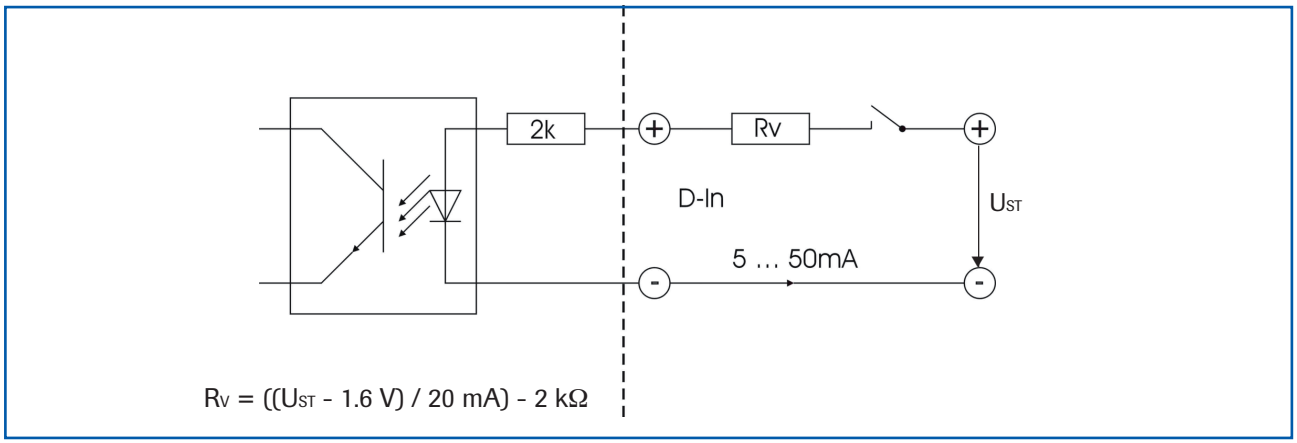


Only with change and leaving the menu level.

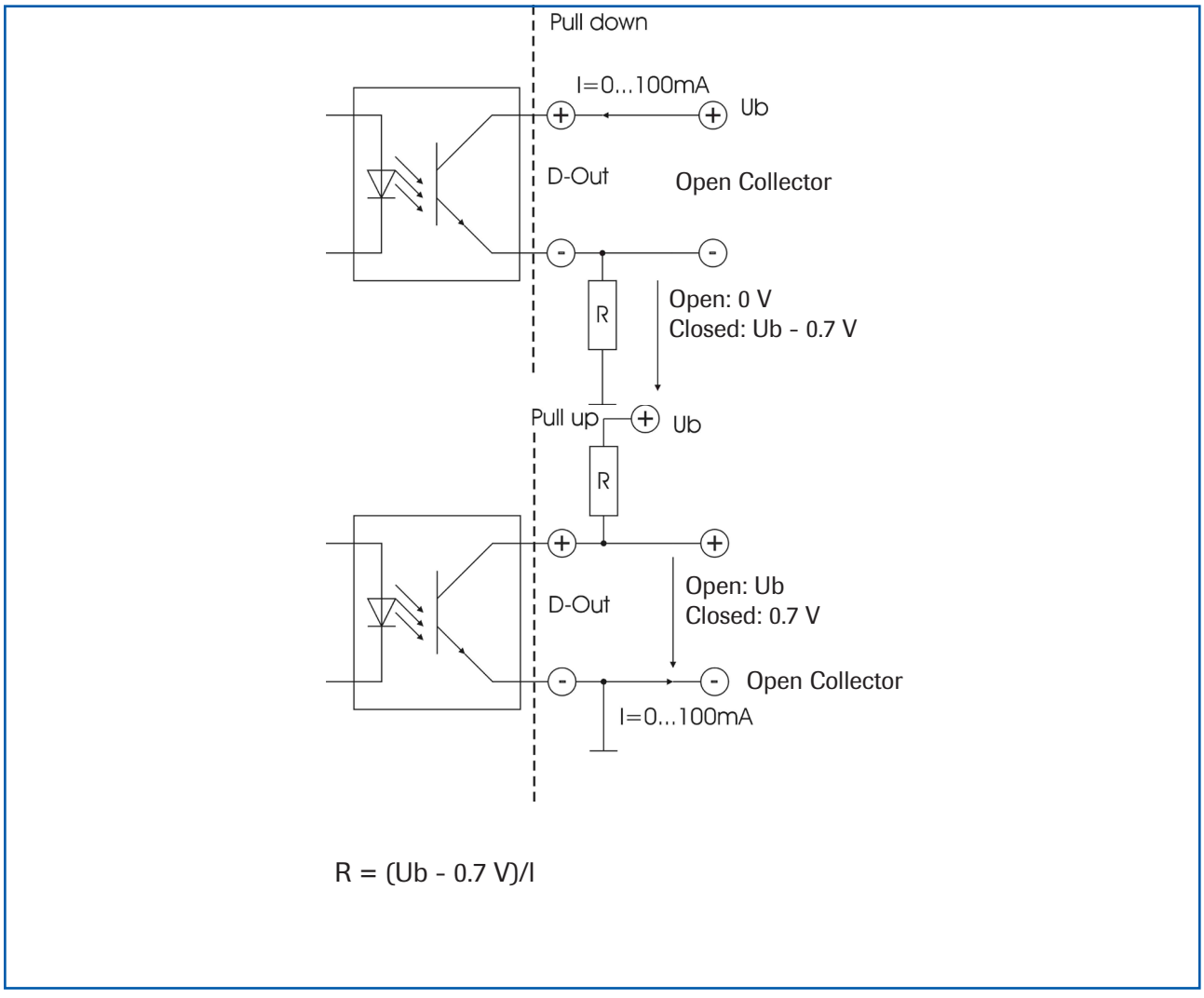
With no leave the menu without any change, with ok transfer the entry and leave the menu level.

9. Connection Examples

9.1 Digital Input

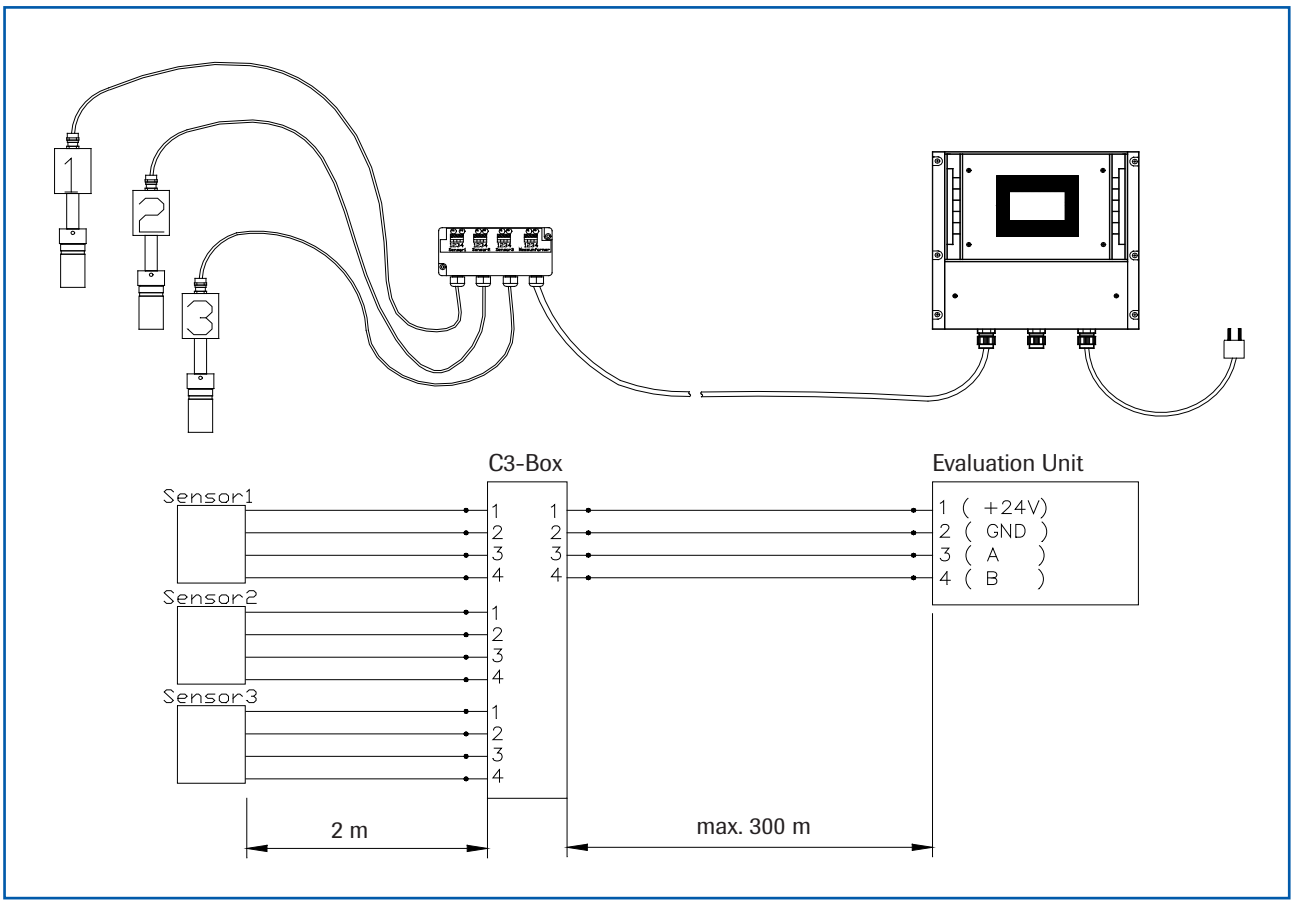


9.2 Impulse Output



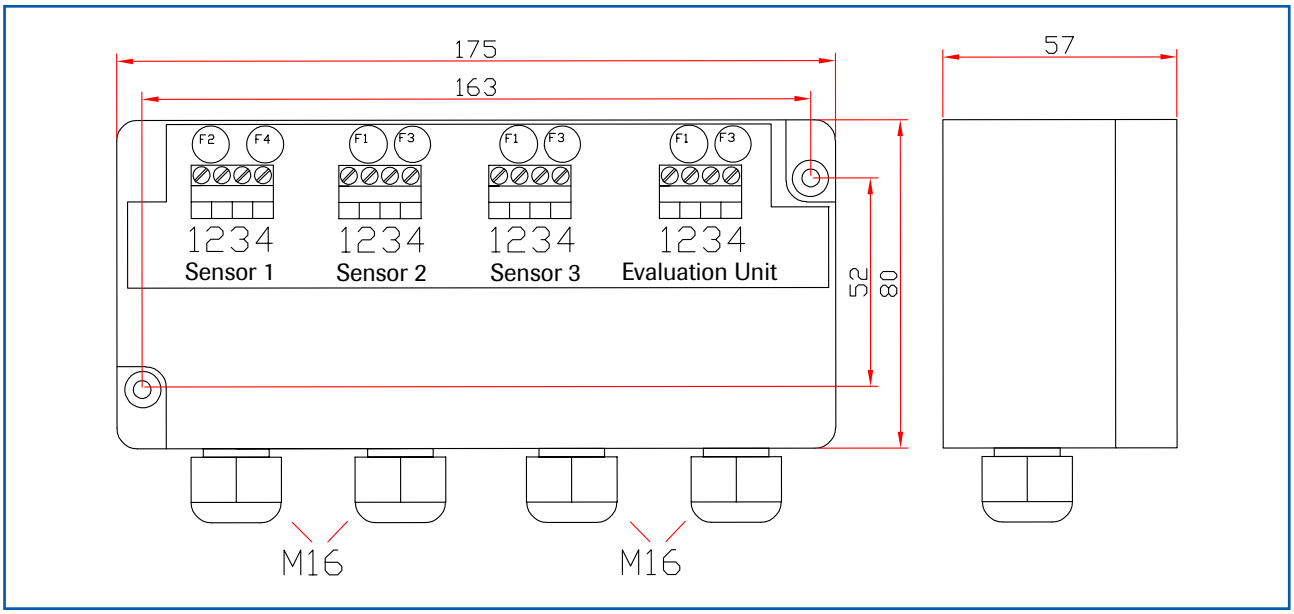
10. Additional Information for the Use of a FME 300 Unit with a C3-Box

Connection



Each sensor is recognized by its own address. The address is signed on the sensor rating plate.

Connecting Diagram for C3-Box



Programming

In addition to the basic SolidFlow Start-up with one sensor it is necessary to switch on the sensors which should be used for the measurement (normally all sensors which are installed). As well every sensor has his own calibration-factor which can be used for adjusting the influence which each sensor gives to the measurement result (normally factor 1.0 for all sensors).

This leads to the following menu-structure for the sensor calibration:

4.4 Calibration Sensor 1

- 4.4.1 Sensor on / Off
- 4.4.2 Calibration Factor Sensor
- 4.4.3 Calibration Point 1 Value
- 4.4.4 Calibration Point 1 Raw Value
- 4.4.5 Calibration Point 2 Value
- 4.4.6 Calibration Point 2 Raw Value

  analogue for all further calibration points

4.5 Calibration Sensor 2
(like sensor 1)

4.6 Calibration Sensor 3
(like sensor 1)

The calibration of each sensor is to be done as it is described for the FME 100.

NOTE: It is important to program the total flow as a pre-set value for each sensor. The FME 300 is calculating the average value of all single measurements automatically and this average value will be given to the analog output.

11. Maintenance

Warning!

- Danger of shock with opened housing!
- Switch off the supply voltage for all maintenance or repair works on the measuring system. The tube must not be in operation during a sensor exchange.
- Repair and maintenance work must be carried out by trained or expert personnel only.
- The system is maintenance-free.

12. Warranty

Warranty is granted for one year starting from delivery date under the condition that the operating instructions have been followed, no interventions on the appliances have been made and the components of the system show no mechanical damage or wear resistance.

In case of a defect during the warranty period, defective components are repaired or are replaced free of charge. Replaced parts turn into the property of SWR. If desired by the costumer that the parts should be repaired or replaced in its factory, then the costumer has to take over the costs for the SWR-service staff.

SWR is not responsible for damage, which did not develop at the delivery article; especially SWR is not responsible for escaped profit or other financial damages of the customer.

13. Trouble Shooting

- **Warning!**
  The electrical installation must only be checked by expert personnel.

Problem	Cause	Measure
Measuring system does not work.	Power supply interrupted.	Check the power supply.
	Break of a cable.	Check the connecting cables for a possible break of a cable.
	Fuse defective.	Exchange the fuse in the field housing.
	Device defective.	Please call SWR for further instructions.
Measuring system outputs wrong values.	Calibration not correct.	Delete input signal correction, new calibration according to section 7.
	Calibration shifted by abrasion on front end of sensor.	Delete input signal correction, new calibration according to section 7.
Sensor error.	Sensor not properly connected.	Check cable.
	Sensor damaged.	Replace sensor.
	No 24 Volt supply on sensor.	Assure power supply.
	Voltage drop on the supply line too highly.	Examine cable lengths on the basis of the table in chapter 4.5 (page 9).
Relay output - Relay flickering.	Hysteresis too small.	Increase hysteresis, check effects caused by external devices.
Do not open, as otherwise the warranty claim expires!		

14. Technical Data

Sensor / Sensor Accommodation	
Housing:	Steel St52, galvanised (stainless steel 1.4541 option)
Protection category:	IP 65, DustEx 20 or GasEx 1 (option)
Operating temperature:	Front end of sensor: -20 ... + 80 °C [-4 ... 176 °F] Optional: -20 ... + 200 °C [-4 ... 392 °F] Sensor electronic: 0 ... + 60 °C [32 ... 140 °F]
Max. working pressure:	1 bar, optional 10 bar
Working frequency:	K-Band 24.125 GHz, ± 100 MHz
Transmitting power:	Max. 5 mW
Weight:	Approx. 1.3 kg
Dimension:	Ø 60, Ø 20, L 290 mm
Accuracy:	+/- 2 ... 5 % in calibrated range
Evaluation Unit	
Supply voltage:	110 / 240 V AC 50/60 Hz (optional 24 V DC)
Power consumption:	20 W / 24 VA
Current consumption:	Max. 1 A @ 24 V
Protection category:	IP 65 to EN 60 529/10.91
Operating temperature:	-10 ... +45 °C [14 ... 113 °F]
Enclosure dimensions:	225 x 237 x 174 (W x H x D)
Weight:	Approx. 2.5 kg
Additional data:	
Cable glands:	3 x M16 (4.5 - 10 mm Ø)
Screw terminals:	0.2 – 2.5 mm² [AWG 24-14]
Current output signal:	4 ... 20 mA (0 ... 20 mA), load < 700 Ω
Measurement value alarm relay output:	Relay with switching contact - Max. 250 V AC, 1 A
Data storage:	Flash
Pulse output:	Open collector - Max. 30 V, 20 mA
RS 232 Interface:	
RS 485 Interface:	Bus interface

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EN

Competence in Solids

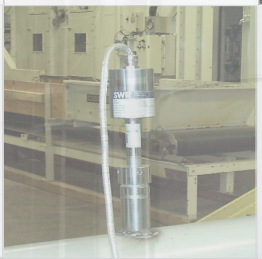
SolidFlow

Monitoring of solids

GLOBAL TECHNOLOGY SYSTEMS

SWR engineering

Quick Start Guide



The menu is started by an invisible key in the bottom left hand **corner of the touch-screen-panel. Now press approx. 5 seconds until the menu appears.** If the temperature indication is activated, the button for the temperature indication is in the upper right corner, in this case must be changed into the temperature indication first, in order to be able to access the menu.

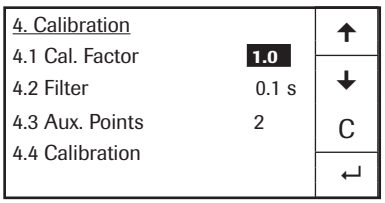
It is sufficient to carry out a two-point-calibration (normally min and max).

Min-Point — Set Calibration Set point 1 to 0 (empty), with no material flow but system running.

Max-Point — Set Calibration Set point 2 to maximum flow rate with normal conveying and operation. (This value can be adjusted later on.)
Thus the basic function of the measuring system is given and it is now ready for operation.

4. Calibration

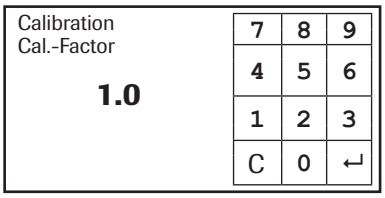
With ↑ and ↓ select according to your significance, with C leave the menu without any change, with ↵ switch to a deeper menu level.



4.1 Calibration Factor

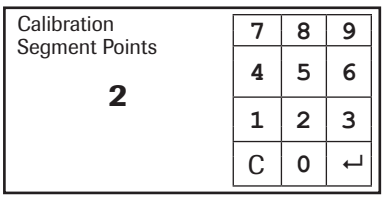
Global calibration factor of the measuring on the display and as well the output range from 0.01 to 9.99 - Setting is 1.0

With C set the value to 0.0 to start enter the numbers of the measuring range, with ↵ transfer the entry and leave the menu level.



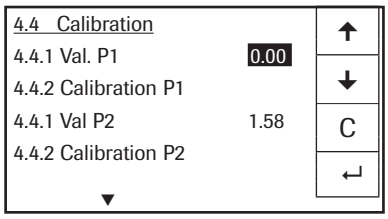
4.3 Number of Calibration Points

Set the number of the auxiliary points:
2 ... 5 points.
With C set the value to 0.0 to start enter the numbers of the measuring range, with ↵ transfer the entry and leave the menu level.



4.4 Calibration

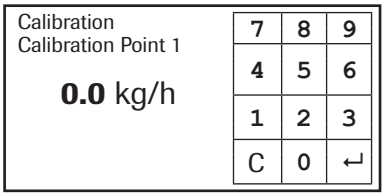
With ↑ and ↓ select according to your significance, with C leave the menu without any change, with ↵ transfer the entry and switch to a deeper menu level.



4.4.1 Calibration Point 1 - Measuring Value

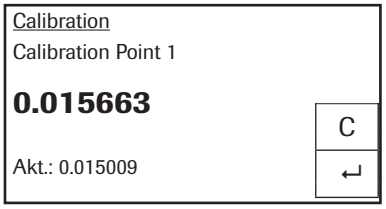
Measuring value in phys. units.
Range: Measuring start - Measuring end

With C set the value to 0.0 to start enter the numbers of the measuring range, with ↵ transfer the entry and leave the menu level.



4.4.2 Calibration Point 1 - Raw Value

Indicate the initial value to the value displayed, if pressed ↵. With C leave the menu without any change.



All other points are calibrated as the first one.

4.4.3 Calibration Point 2 – Measuring Value

Measuring value in phys. units.
Range: Measuring start - Measuring end

4.4.4 Calibration Point 2 – Raw Value

Indicate the initial value to the value displayed.

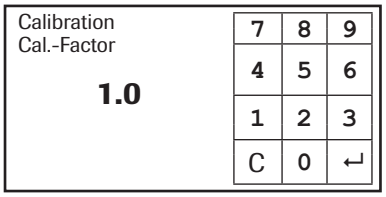
Once you set your calibration points, achieve a two runs of material and note the results. Weigh your material and calculate the difference. Once you know the difference go to back to menu 4.1 and adjust in the difference in a percentage (1=100% and .10=10%).

Example: If your material is 10% over than the controllers reading change the Factor to 1.10. This will boost the reading up 10% to a total of110%. Re-run your materail check the weight again and compare the result. If needed adjust ther Calibration Factor Again.

4.1 Calibration Factor

Global calibration factor of the measuring on the display and as well the output range from 0.01 to 9.99 - Setting is 1.0

With C set the value to 0.0 to start enter the numbers of the measuring range, with ↵ transfer the entry and leave the menu level.



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