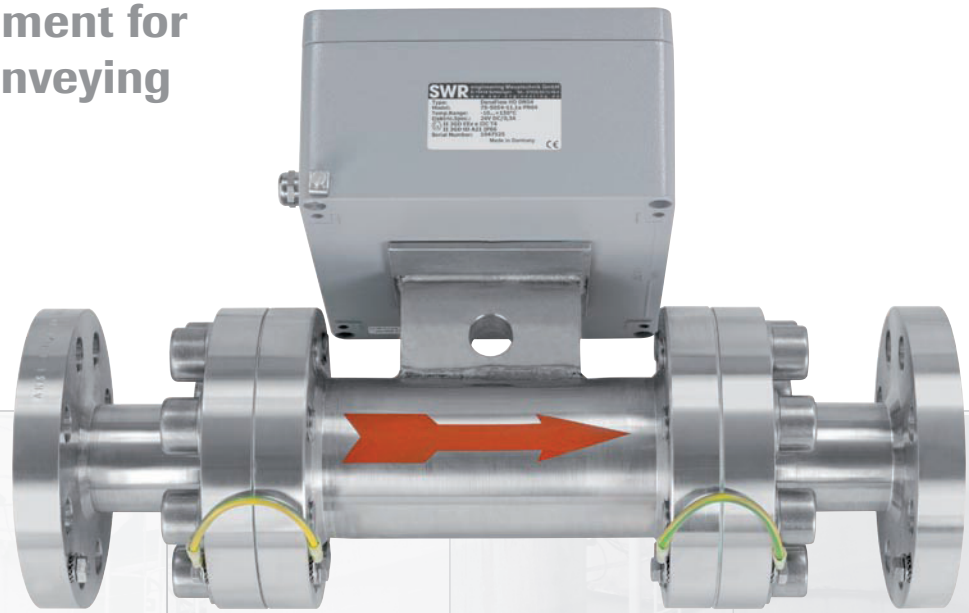
EN

Competence in Solids

SWR engineering

DensFlow D

Flow measurement for densphase conveying



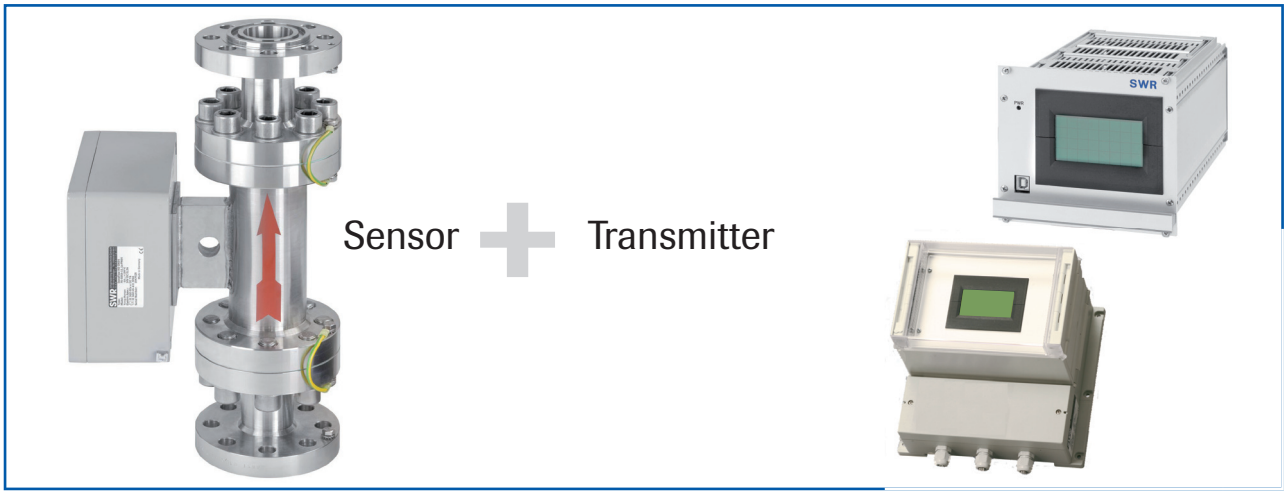
Operating Instructions

SWR engineering Messtechnik GmbH

Contents

1. System Overview

A DensFlow D measuring system consists of the following components:



2. Function

- DensFlow D is a measuring system especially developed for the measurement of high flow rates in densphase conditions.
- DensFlow D is working according to the latest microprocessor technology. By special capacitive linking of an electromagnetic wave a homogeneous measuring field is produced in the pipe.
- The electromagnetic wave brought into the pipe is reciprocally acting with the solid particles. These signals are evaluated in frequency and amplitude.
- The measurement of the solid speed is done by means of correlation. Two sensors are used for the generation of the correlation signals.
- A complete measuring unit consists of the sensor (measuring pipe) and the transmitter.

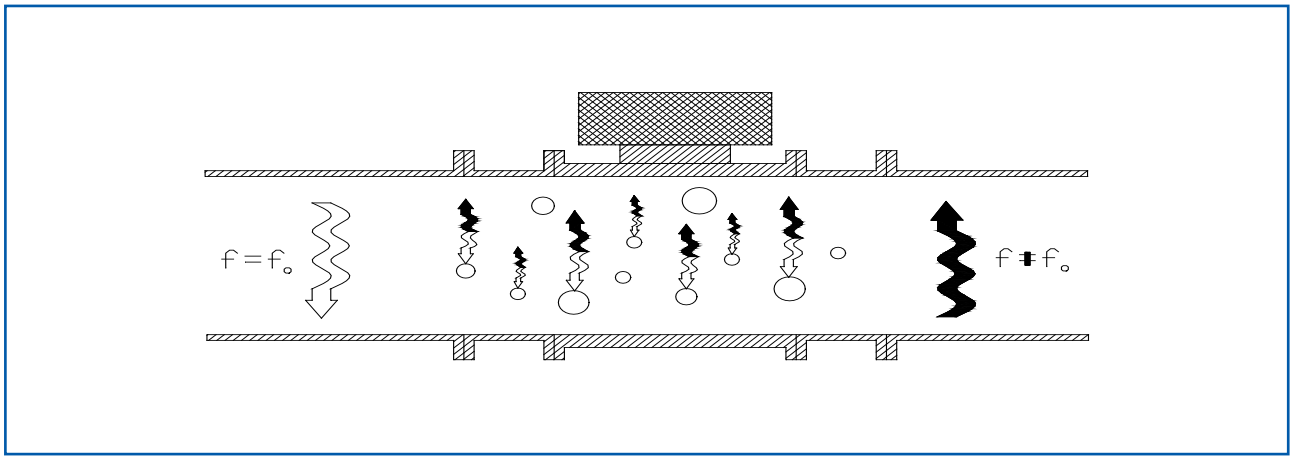


Fig. 2: Coupling of the electromagnetic waves

3. Safety

The measuring system DensFlow D was designed, built and tested to be safe and was shipped in safe condition. 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 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.
- In case of maintenance-work on the pipe or on components of the DensFlow D-sensor, make sure that the piping is in unpressurized condition.
- Switch off the power supply for all maintenance, cleaning or inspection works on the tubes or on components of the DensFlow D. Follow the notes of the chapter maintenance.
- The components and electrical connections must be checked for damages regularly. If a damage is found, it is to be repaired before further operation of the instruments.
- Before hot-work the sensor must be removed from the piping.

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

- Measuring instrument in a field housing or in a 19” rack mounted transmitter
- Sensor for installation into the pipe
- Operating instructions

4.2 Auxiliary

- Appropriate wrench or ring wrench for screwing
- Tools for adjusting the wiring

4.3 Mounting of the Measuring Pipe

The sensor has to be mounted as follows:

- Determine the place of mounting on the pipe. The mounting has to be in a vertical 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. 3).

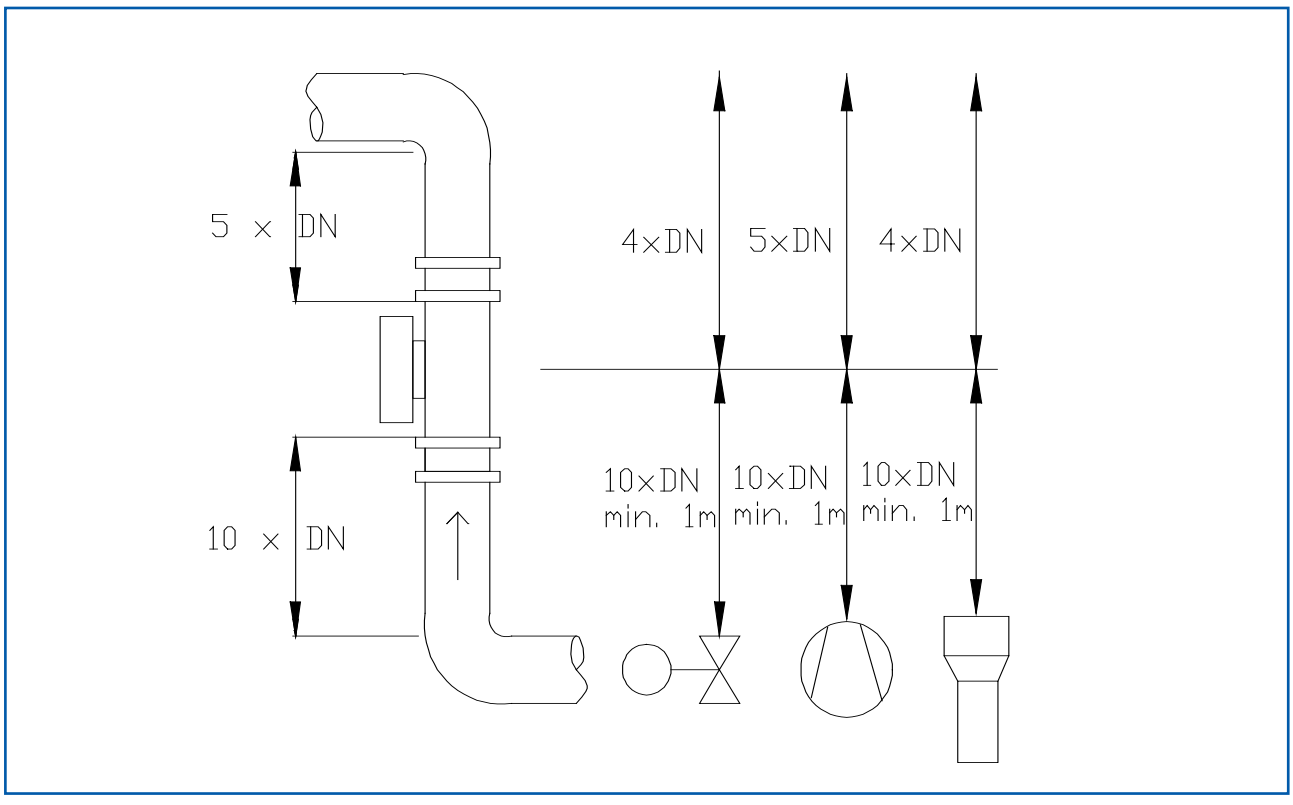


Fig. 3: Minimal distances of the sensor to pipe bends and baffles

Attention!

- Before installation it has to be checked that no fin, mismatch or seals are inside the pipe. It is important to remove any resistors affecting the flow.

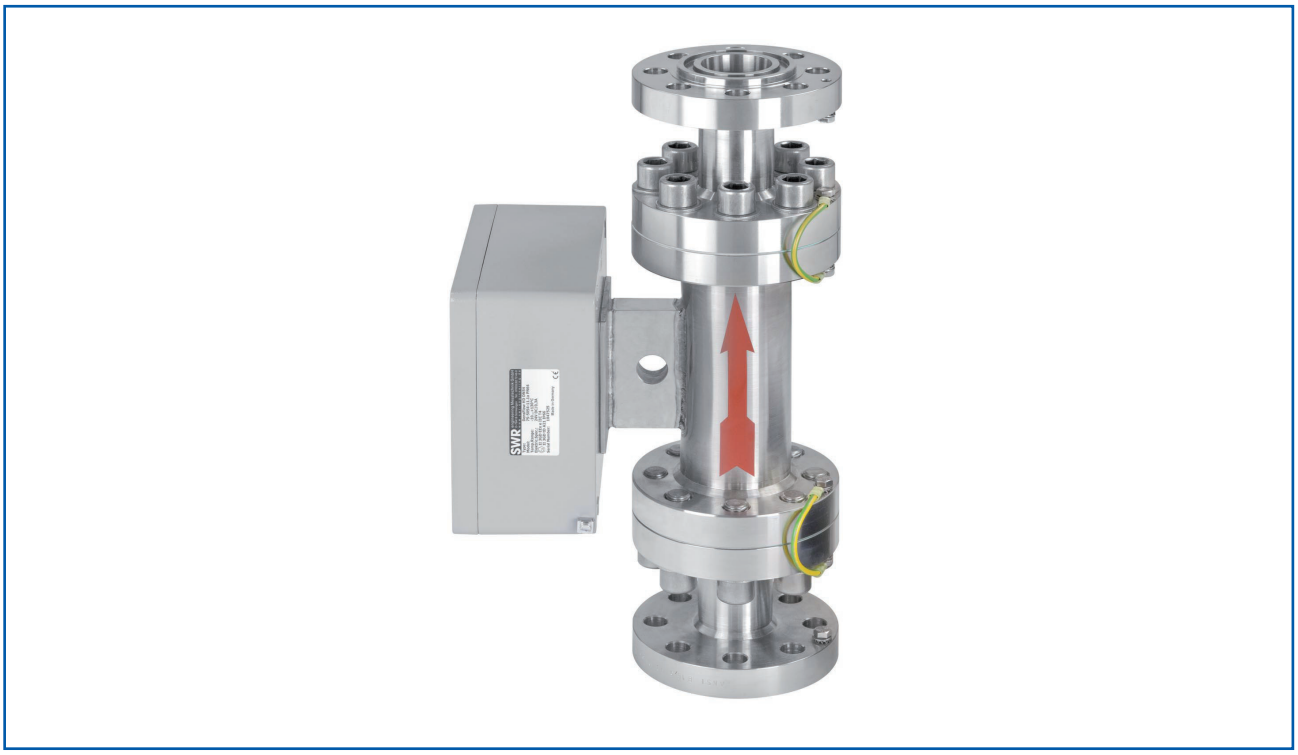


Fig. 4: Build in of sensor

- It is possible to mount the transmitter up to 300 m away from the sensor.

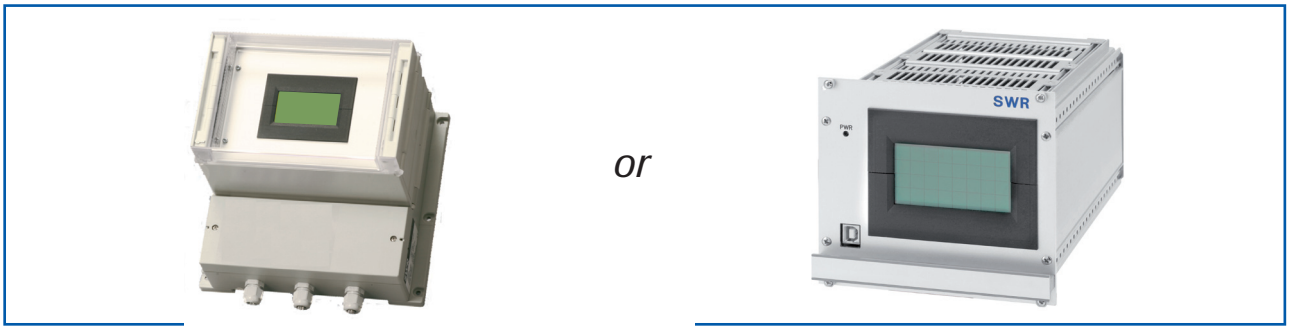


Fig. 5: Transmitter

4.4 Overview of the Connection of the Sensor Pipe and Transmitter

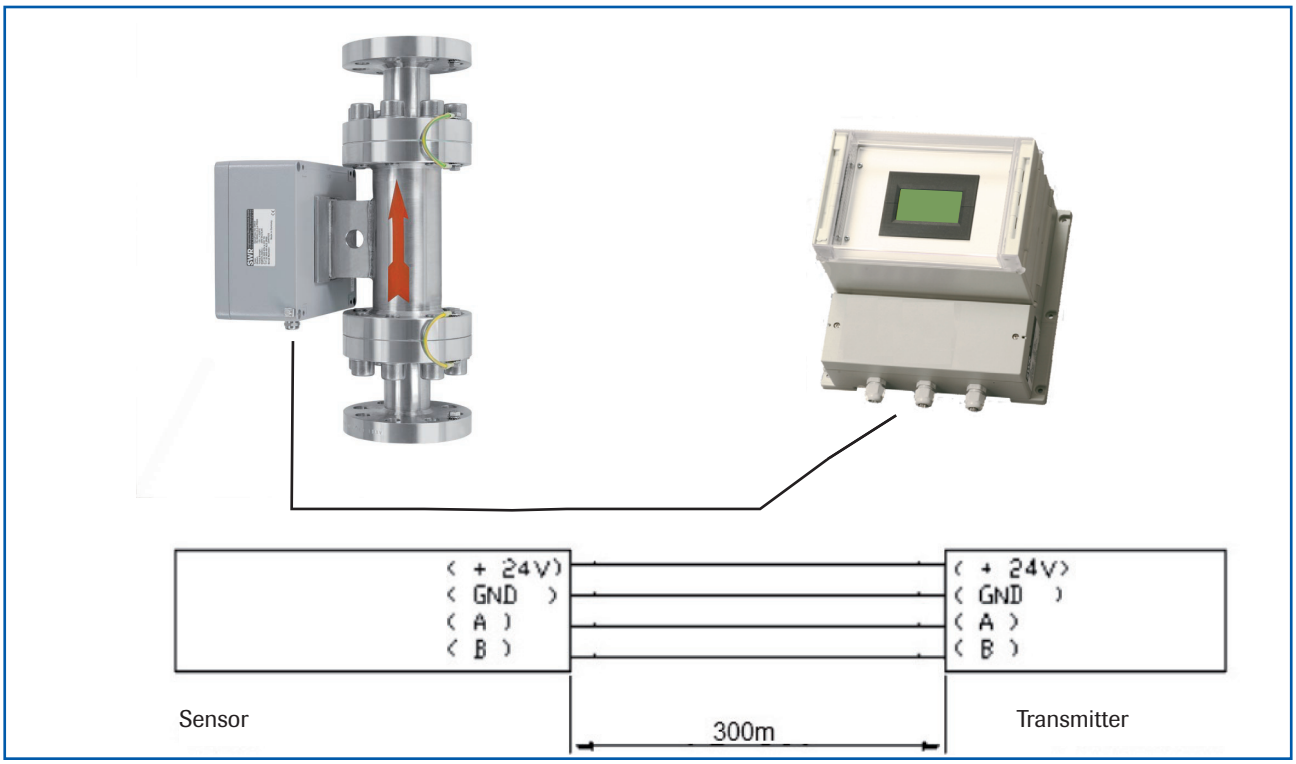


Fig. 6: Wiring of the sensor pipe and transmitter

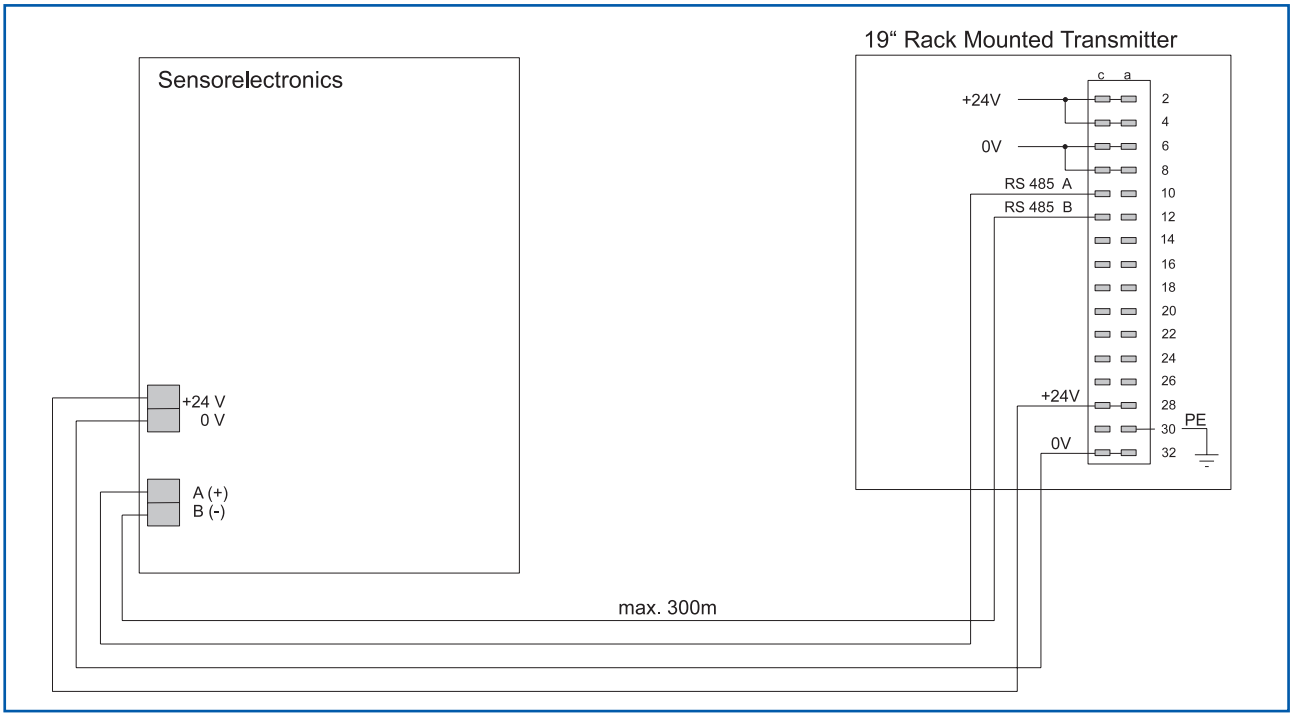


Fig. 7: Wiring of the sensor pipe and transmitter 19” version

A maximum length of 300 m of the sensor cable should not be exceeded.
A 4-wired shielded cable is needed between sensor and transmitter.

5. Electrical Connection

5.1 Version Field Housing

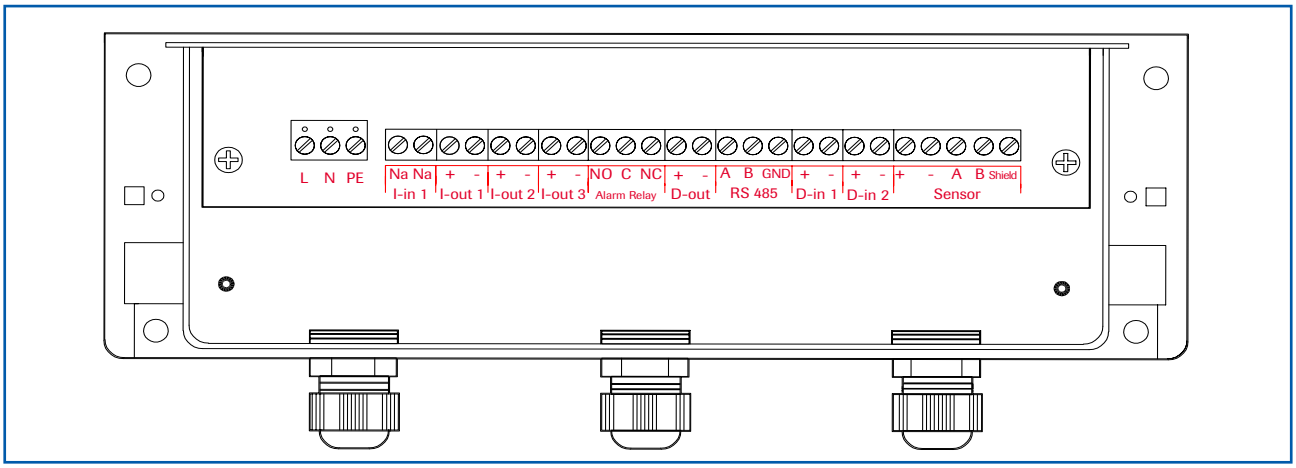


Fig. 8: Electrical Connection

Transmitter			
Terminal No.		**Connection**	
Connection of the Power Supply			
L / +24 V		Input Power Supply 230 V/50 Hz, 110 V/60 Hz (optional 24 V DC)	
N / 0 V		Input Power Supply 230 V/50 Hz, 110 V/60 Hz (optional 24 V DC)	
PE		Protective Earth	
Connections			
I-in 1	Na	not available	
	Na	not available	
I-out 1	+	Current Output 4 ... 20 mA +	Flow
	-	Current Output 4 ... 20 mA - (GND)	
I-out 2	+	Current Output 4 ... 20 mA +	Density
	-	Current Output 4 ... 20 mA - (GND)	
I-out 3	+	Current Output 4 ... 20 mA +	Velocity
	-	Current Output 4 ... 20 mA - (GND)	
Alarm Relay	NO	Isolated Relay Contact NO (make contact)	
	C	Isolated Relay Contact COM (common contact)	
	NC	Isolated Relay Contact NC (break contact)	
D-out	+	Digital Output (+)	
	-	Digital Output (-)	
RS 485	A	RS 485 Interface Data A (+)	
	B	RS 485 Interface Data B (-)	
	GND	RS 485 Interface Ground	
D-in 1	+	Digital Interface 1 (+)	
	-	Digital Interface 1 (-)	
D-in 2	+	Digital Interface 2 (+)	
	-	Digital Interface 2 (-)	
Sensor	+	Power Supply 24 V (+)	Cable No. 1
	-	Power Supply GND	Cable No. 2
	A	RS 485 Data A	Cable No. 3
	B	RS 485 Data B	Cable No. 4
	Shield	Shield	Shield

5.2 Version 19” Rack Mounted Transmitter

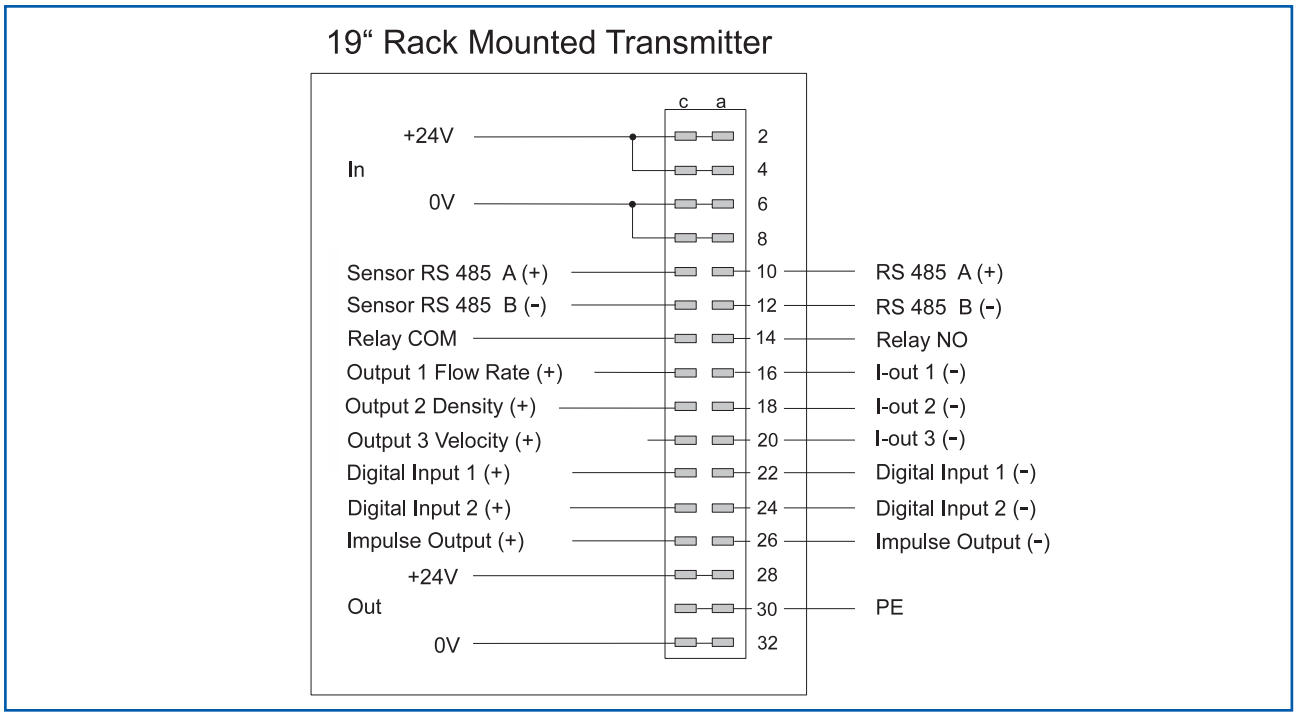


Fig. 9: Electrical Connection

Transmitter		
Terminal		**Function**
Connection of Power Supply		
+ 24 V DC	2 a/c + 4 a/c	Input Power Supply + 24 V DC
0 V GND	6 a/c + 8 a/c	Input Power Supply GND
PE	30 a/c	Protective Earth
Terminals		
RS 485 System / PC	10 a	RS 485 Interface Data A (+)
	12 a	RS 485 Interface Data B (-)
Relay NO	14 a	Relay Contact 1
	14 c	Relay Contact 2
Current Output 1 Flow Rate	16 a	4 ... 20 mA I-out 1 (-)
	16 c	4 ... 20 mA I-out 1 (+)
Current Output 2 Density	18 a	4 ... 20 mA I-out 2 (-)
	18 c	4 ... 20 mA I-out 2 (+)
Current Output 3 Velocity	20 a	4 ... 20 mA I-out 3 (-)
	20 c	4 ... 20 mA I-out 3 (+)
Digital Input 1	22 a	Dig. In 1 (-)
	22 c	Dig. In 1 (+)
Digital Input 2	24 a	Dig. In 2 (-)
	24 c	Dig. In 2 (+)
Impulse Output	26 a	Dig. Out (-)
	26 c	Dig. Out (+)
Sensor Connections	**28 a/c**	**Output Power Supply 24 V DC**
	32 a/c	**Output Power Supply 0 V GND**
	10 c	**Output RS 485 Interface Data A (+)**
	12 c	**Output RS 485 Interface Data B (-)**

6. Commissioning

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

  Please check again:
- the correct cabling between sensor and the transmitter.
- the correct adjustment of the sensor pipe.

Commissioning DensFlow D

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 all values changed are transferred.

Basic Function	At least a two-point-calibration (normally zero and max) are sufficient for measuring the density function. The velocity measurement is firmly defined as an absolute measurement by the distance of the sensor plates and does not have to be calibrated.
Zero-Point	Start zero-point calibration in no-flow condition with **empty** pipe.
Velocity	It is necessary and important to have a stable velocity output for operating point calibration. So if no stable velocity output is possible you have to switch fixed velocity on. This fixed velocity value depends to the falling height parameter which has to be set in menu point 1.7.
Operating-Point	Start operating-point calibration during flow condition with known flow value. It is possible to edit this value later.
Analog Output 1	Current output flow rate The measuring range is adjusted in menu point 3.1.1. 0 = 4 mA Max = 20 mA
Analog Output 2	Current output density. The measuring range is adjusted in menu point 3.2.1. 0 = 4 mA Max = 20 mA
Analog Output 3	Current output velocity The measuring range is adjusted in menu point 3.3.1. 0 = 4 mA Max = 20 mA
Damping	The measuring range filter is used for the adjustment to slower working devices or for a continuous output of the analog output.

To enable DensFlow D for calculation a flow rate the following suppositions have to be given:

- Stable working velocity measurement resp. fixed velocity if a stable velocity measurement is not possible due to bad conveying conditions.

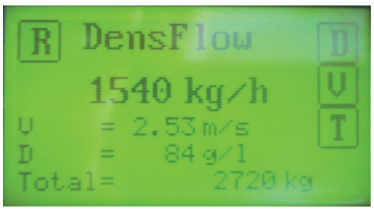
- Density measurement

As the operating-point calibration needs a stable velocity measurement too, within the first commissioning you have to take care for this. Therefore some hints:

- During flow the RMS values of the velocity signals have to be obvious higher than the noise level (NST, no signal threshold). There is no exact defined range, but, experienced values are about 1000 to 3000. If NST is now 500 or smaller a safe operating condition should be possible.

- If velocity still fails, caused of bad conveying conditions, fixed velocity has to be activated. Therefore the parameter “falling height” has to be set, the system will calculate with this value an averaged velocity of fall. Also important in this context is the NST level (see standard display / V - velocity / S - speed adjustment / point 1. threshold). This level will now work like switch, RMS values above NST level will switch velocity on, values below will switch velocity to zero.

7. Standard Display of DensFlow D



The standard display shows the actual flow rate as well as measuring values of density, velocity and the totaliser value.

With four switch pads you are able to further information and configuration windows:

R Reset totaliser, choose OK or NO

D Density, further informations about density measurement, back with **M** (mass flow)

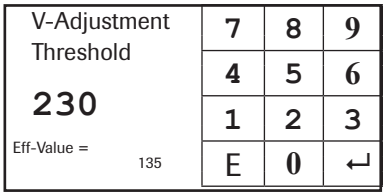
V Velocity, further information about speed measurement, back with **M** or press **S** (speed) for velocity configuration.

S V-Adjustment, various settings for speed measurement.

1. Threshold

   It defines the noise level of the RMS values (root mean square values) of the velocity signals.
   All values below will be ignored for speed measurement resp. with activated fix-velocity the output will switch to 0 m/s.

   Possible values 1 - 65535, cancel with **E** (ESC)

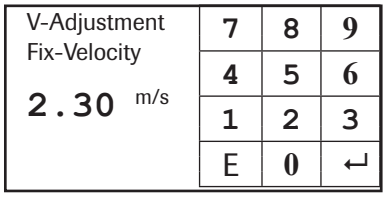


2. Display of the actual RMS value of velocity signals

3. Fix-velocity

   Setting of fix-velocity value, this will replace automatically the parameter falling height.

   Possible values 1 - 99.99, cancel with **E** (ESC)

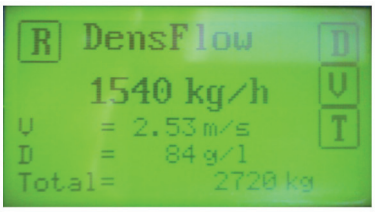


4. Vfix

   Fix-Velocity **On / Off**

T Displays the electronics temperature

8. Structure Main Menu DensFlow D



Switch to main menu: Press any pad of the touchscreen for about 5 s until the menu appears.

1. Measurement

1.1 Tag	Name (10 characters)
1.2 Unit	Select: g / kg / t
1.3 Time Unit	Select: h / min / s
1.4 Dec. Point	Position of dec. point
1.5 Density	Range 1 --- 3000 g/l
1.6 Aperture	Range 10 --- 300 mm
1.7 Drop Height	Range 10 --- 9999 mm

2. Calibration

2.1 Sensor Calibration	Adjusting the measured value to material and mounting situation.
2.1.1 Zero Point	… for the empty sensor
2.1.2 Operating Point	… with material flowing
2.1.3 Full Calibration	… with filled sensor
2.2 Factor	Correction factor density, Range 0.01 --- 9.99
2.3 Interpolation Points	Amount of interpolation points for linearization (max. 3)
2.4 Interpolation Table	Linearization characteristic
2.5 Min. Load	Suppression of conveying breaks during auto acquisition
2.6 Interpolation Point 1	
2.6.1 Raw Value	Non-linearized flow rate
2.6.2 Calibrated Value	Linearized flow rate
2.6.3 Auto Acquisition	Automatic calibration with a weighed mass
2.7 Interpolation Point 2	Same as interpolation point 1

3.	**Outputs**		
	3.1	**Flow Rate**	
		3.1.1 at 20 mA	End of measuring range
		3.1.2 Filter	Range: 0.1 --- 99.9 s (Standard: 1 s)
		3.1.3 Calibration 4 mA output	Precalibrated in the factory, no intervention required
		3.1.4 Calibration 20 mA output	Precalibrated in the factory, no intervention required
	3.2	**Density**	Select: density or velocity
		3.2.1 at 20 mA	End of measuring range
		3.2.2 Filter	Range: 0.1 --- 99.9 s (Standard: 1 s)
		3.2.3 Calibration 4 mA output	Precalibrated in the factory, no intervention required
		3.2.4 Calibration 20 mA output	Precalibrated in the factory, no intervention required
	3.3	**Velocity**	Select: density or velocity
		3.3.1 at 20 mA	End of measuring range
		3.3.2 Filter	Range: 0.1 --- 99.9 s (Standard: 1 s)
		3.3.3 Calibration 4 mA output	Precalibrated in the factory, no intervention required
		3.3.4 Calibration 20 mA output	Precalibrated in the factory, no intervention required
	3.4	**Alarm**	
		3.4.1 Type	Select: Minimum or maximum alarm
		3.4.2 Value	Flow value alarm
		3.4.3 Delay	Range: 0.1 --- 99.9 s
		3.4.4 Hysteresis	Threshold for resetting the alarm
		3.4.5 Output	Select alarm: Alarm signalling or signalling active calibration
		3.4.6 Mode	Select: NO / NC
		3.4.7 Sensor alarm	Select: ON / OFF
	3.5	**Impuls Output**	
		3.5.1 Pulse / Mass	Desired number of pulses counted per unit mass
4.	**Digitale Inputs**		
	4.1	**Digital Input 1**	
		4.1.1 Function	Select of function no / zero adjustment / full adjustment
		4.1.2 Direction	Select: direct / inverted
		4.1.3 Filter	Range: 0.1 --- 99.9 s
	4.2	**Digital Input 2**	
		4.2.1 Function	Select of function no / zero adjustment / full adjustment
		4.2.2 Direction	Select: direct / inverted
		4.2.3 Filter	Range: 0.1 --- 99.9 s
5.	**System**		
	5.1	**Baud Rate**	Select: 4800 / 9600 / 19200 / 38400
	5.2	**Address**	Range: 1 --- 250
	5.3	**Contrast**	Contrast adjustment
	5.4	**Language**	Select: D / F / E

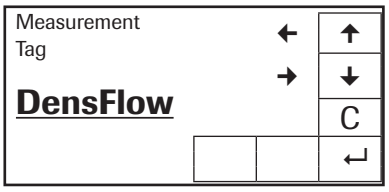
9. System Adjustments in Detail

1. MEASUREMENT

1.1 Tag

Freely selectable notation, max. 10 characters.

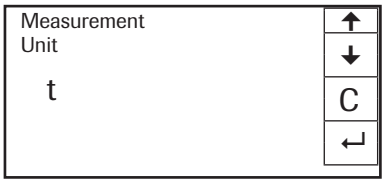
With ↑ and ↓ select the letters or symbols, with ← and → select place of the letter (1...10); with C delete the respective letter and with ↵ transfer the entry and leave the menu level.



1.2 Unit

Selection of the mass unit: g / kg / t

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

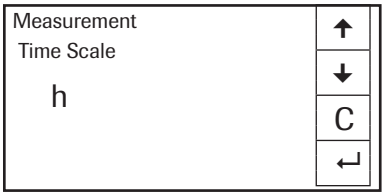


1.3 Time Unit

Choice of the time unit - Choose: h / min / s

/ s per second
/ min per minute
/ h per hour

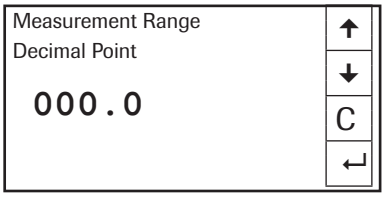
With ↑ and ↓ select according to the display, with C leave the menu without any change, with ↵ transfer the entry and leave the menu level.



1.4 Decimal Point

Adjust the digit in the display.

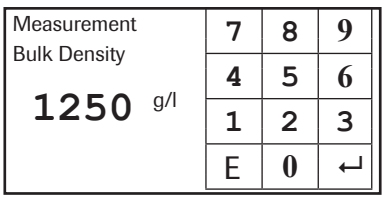
With ↑ and ↓ select according to the display, with C leave the menu without any change, with ↵ transfer the entry and leave the menu level.



1.5 Density

Set bulk density in g/l (= kg/m³), possible range 1 to 3000 g/l.

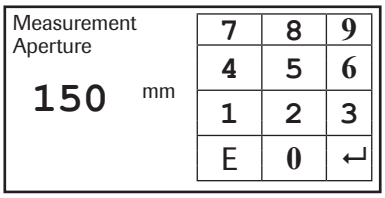
Enter the value, with E leave the without changes, with ↵ transfer the entry and leave the menu level.



1.6 Aperture

Set value of inner pipe diameter.

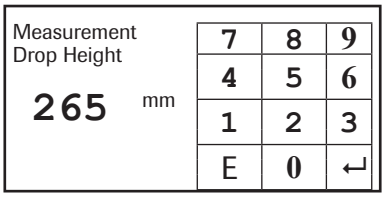
Enter the value, with [E] leave without changes, with [↵] transfer the entry and leave the menu level.



1.7 Drop Height

Enter drop height, this will calculate fixed-velocity value automatically.

Enter the value, with [E] leave without changes, with [↵] transfer the entry and leave the menu level.

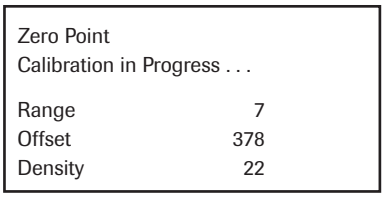


2. CALIBRATION

2.1 Sensor Calibration

2.1.1 Zero Point

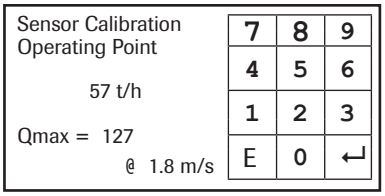
Start zero adjustment with empty pipe with [OK] . Cancel with [NO] .



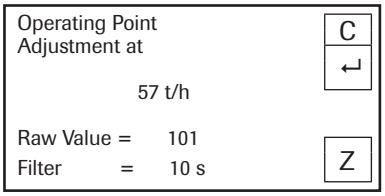
2.1.2 Operating Point

Enter known flow rate.

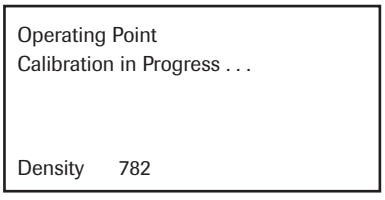
Enter the value, with [E] leave without changes, with [↵] transfer the entry and go to the next window.



Change filter value with [Z] , adopt adjustment values with [↵] .



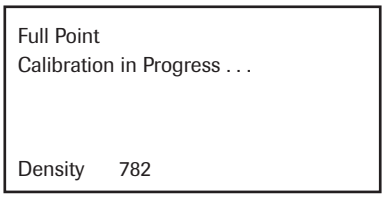
Display during calibration procedure.



2.1.3 Full Calibration

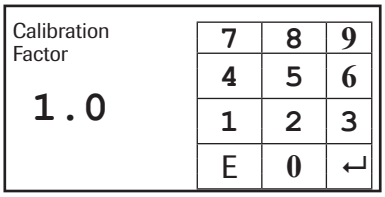
Calibration with 100 % filled pipe in no-flow condition.

Set full calibration with [OK].
Cancel with [NO] .



2.2 Factor

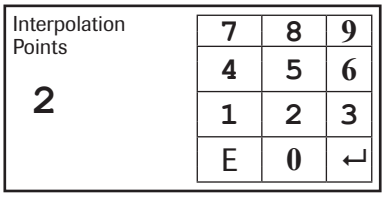
Correction factor affects directly the density measurement.
0.01 to 9.99
Default 1.0
Enter the value, with [E] leave without changes, with [↵] transfer the entry and leave the menu level.



2.3 Interpolation Points

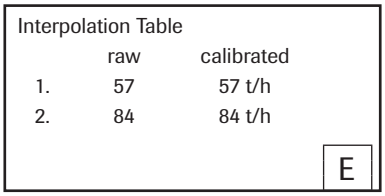
Set amount of required interpolation points; maximum 3 points are possible.

Enter the value, with [E] leave without changes, with [↵] transfer the entry and leave the menu level.



2.4 Interpolation Table

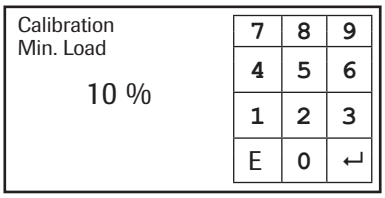
Display of the calibrated points.
Back with [E] .



2.5 Min. Load

Suppresses conveying breaks during Auto Acquisition.

Enter the value, with [E] leave without changes, with [↵] transfer the entry and leave the menu level.

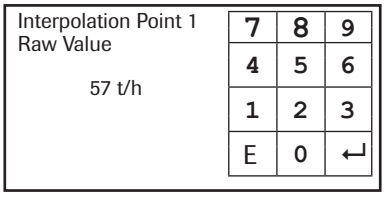


2.6 Interpolation Point 1

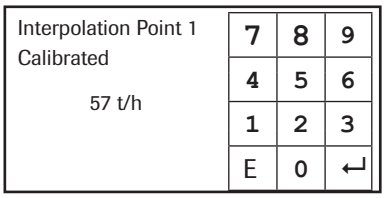
2.6.1 Raw Value

Manual interpolation.
This is the non-linearized flow value.

Enter the value, with [E] leave without changes, with [↵] transfer the entry and leave the menu level.



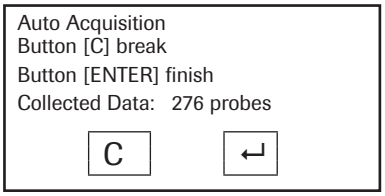
2.6.2 Calibrated



Manual interpolation.
Linearized flow value.

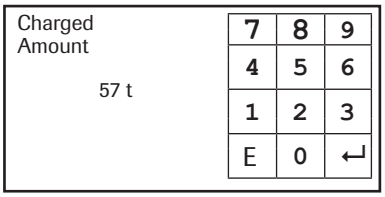
Enter the value, with [E] leave without changes, with [↵] transfer the entry and leave the menu level.

2.6.3 Auto Acquisition



Enables a calibration by means of a weighed mass. The collection of data starts with entering this menu point, but only flow rates above the min. load value will be counted.

Finish with [↵], enter the conveyed mass and confirm with [↵]. Press [E] to leave menu point without any changes.

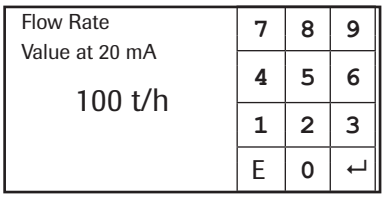


2.7. / 2.8 Interpolation point 2 / 3 same as point 1

3. OUTPUTS

3.1 Flow Rate

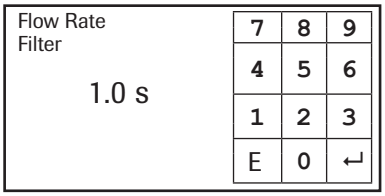
3.1.1 at 20 mA



Enter end of measuring range, this will comply to 20 mA.

Enter the value, with [E] leave without changes, with [↵] transfer the entry and leave the menu level.

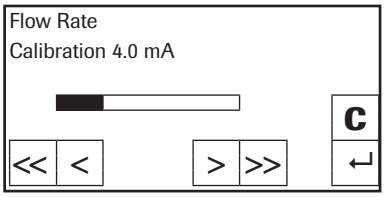
3.1.2 Filter



Adjustable damping for the flow rate.
Range: 0.1 . . . 99.9 s (Standard 1 s)

Enter the value, with [E] leave without changes, with [↵] transfer the entry and leave the menu level.

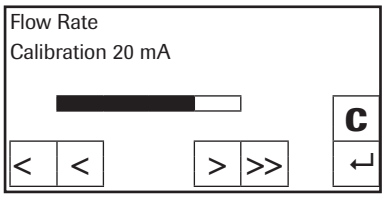
3.1.3 Calibration 4 mA



All current outputs are calibrated at the factory.
If necessary recalibration with multimeter is possible.

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.

3.1.4 Calibration 20 mA

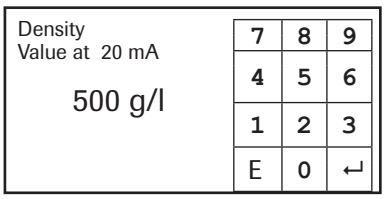


All current outputs are calibrated at the factory.
If necessary recalibration with multimeter is possible.

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.

3.2. Output 2

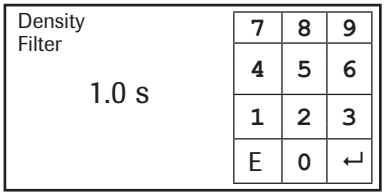
3.2.1 at 20 mA



Enter end of measuring range, this will comply to 20 mA.

Enter the value, with [E] leave without changes, with [↵] transfer the entry and leave the menu level.

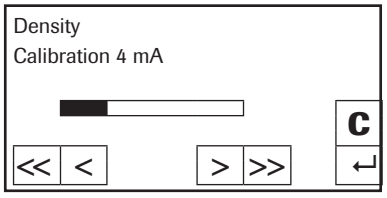
3.2.2 Filter



Adjustable damping for the density.
Range: 0.1 . . . 99.9 s (Standard 1 s)

Enter the value, with [E] leave without changes, with [↵] transfer the entry and leave the menu level.

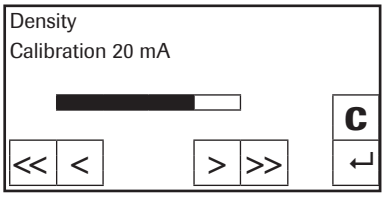
3.2.3 Calibration 4 mA



All current outputs are calibrated at the factory.
If necessary recalibration with multimeter is possible.

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.

3.2.4 Calibration 20 mA



All current outputs are calibrated at the factory.
If necessary recalibration with multimeter is possible.

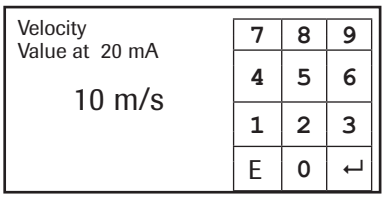
With [<<] and [>>] adjust fast, with [<] and [>] adjust slowly the current to 4 mA. With [↵] transfer the entry and leave the menu level, with [C] leave the menu without any change.

3.3 VELOCITY

3.2.1 at 20 mA

Enter end of measuring range, this will comply to 20 mA.

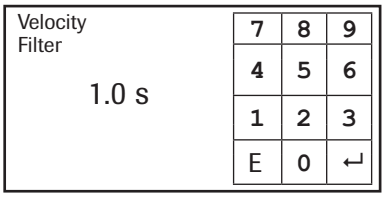
Enter the value, with [E] leave without changes, with [↵] transfer the entry and leave the menu level.



3.2.2 Filter

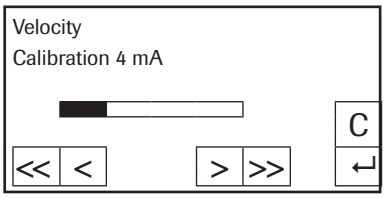
Adjustable damping for the velocity.
Range: 0.1 . . . 99.9 s (Standard 1 s)

Enter the value, with [E] leave without changes, with [↵] transfer the entry and leave the menu level.



3.2.3 Calibration 4 mA

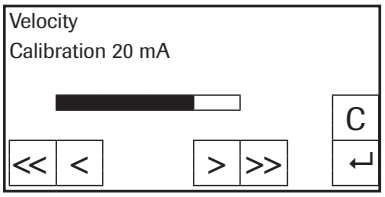
All current outputs are calibrated at the factory.
If necessary recalibration with multimeter is possible.



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.

3.2.4 Calibration 20 mA

All current outputs are calibrated at the factory.
If necessary recalibration with multimeter is possible.



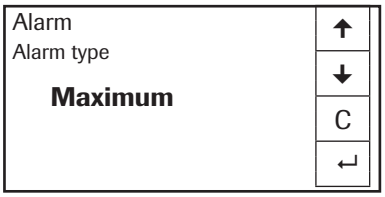
With [<<] and [>>] adjust fast, with [<] and [>] adjust slowly the current to 4 mA. With [↵] transfer the entry and leave the menu level, with [C] leave the menu without any change.

3.4 ALARM

3.4.1 Type

Upper and lower limit value. Affects relays.

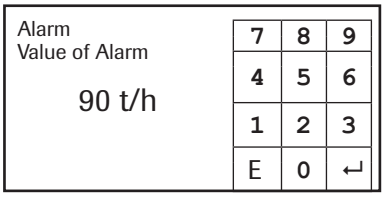
With ↑ and ↓ select according to your significance, with C leave the menu without any change, with ↵ transfer the entry and switch to a deeper menu level.



3.4.2 Value of Alarm

Flow value for the alarm.

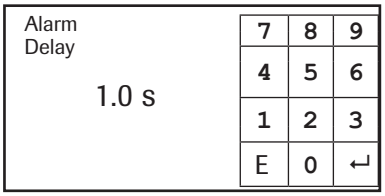
With E leave the menu without any change, with ↵ transfer the entry and leave the menu level.



3.4.3 Delay

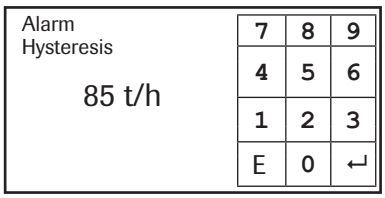
Threshold value how long the value must be over or under the limit until the alarm relay reacts.
Range: 0.1 ... 99.9 s

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



3.4.4 Hysteresis

Threshold for resetting the alarm.
Range: 0 ... 500 t/h
With E leave the menu without any change, with ↵ transfer the entry and leave the menu level.



3.4.5 Output

Alarm / calibration active

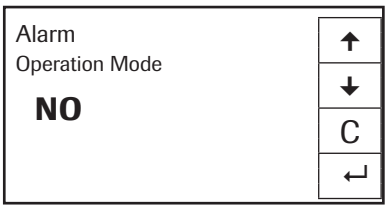
Selection of signalisation mode using the relay either as “alarm signal” or “status signal” for auto calibration unit.

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

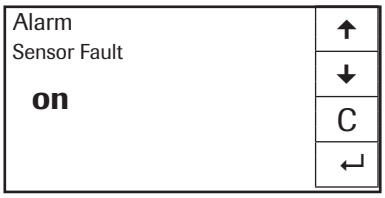
3.4.6 Mode

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.



3.4.7 Sensor Fault

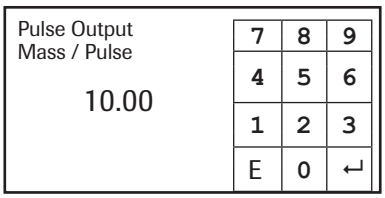


On / Off
Affects to alarm relay.

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

3.5 Pulse Output

The pulse output is potential free (optocoupler), wiring see page 24.



3.5.1 Amount of Pulses / Mass Unit

Type desired number of pulses per mass unit. This should not exceed 50 Hz.

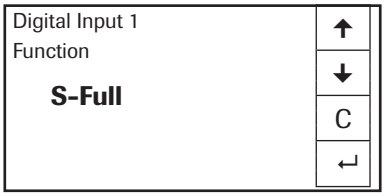
Input with the count keyboard. With E leave the menu without any change, with ↵ transfer the entry and leave the menu level.

4. DIGITAL INPUTS

The digital inputs are potential free (optocoupler), wiring see page 24.

4.1 Digital Input 1

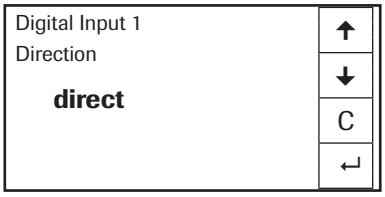
4.1.1 Function



Digital input for trigger signal to start zero or full calibration.
Select input function.
Not one / S-Zero / S-Full

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

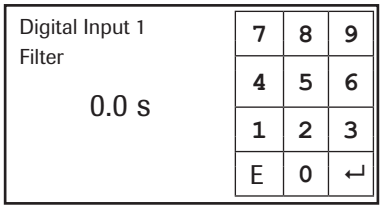
4.1.2 Direction



Direct / Inverted

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

4.1.3 Filter



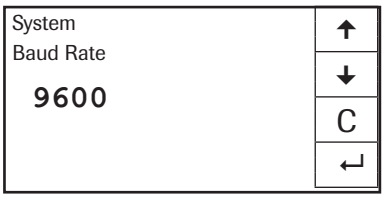
Idle time after activation. (Anti beat device for mechanical switches.)

With E leave the menu without any change, with ↵ transfer the entry and leave the menu level.

4.2 Digital Input 2 — Same as Digital Input 1

5. SYSTEM

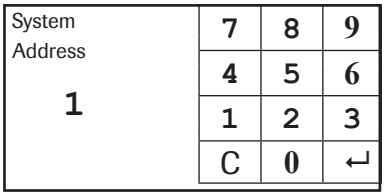
5.1 Baud Rate



Indicating of the Baud Rate
Choose: 4800 / 9600 / 19200 / 38400

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

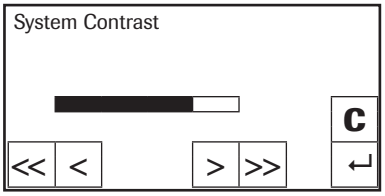
5.2 ModBus-Address



Set 1 . . . 250

With E leave the menu without any change, with ↵ transfer the entry and leave the menu level.

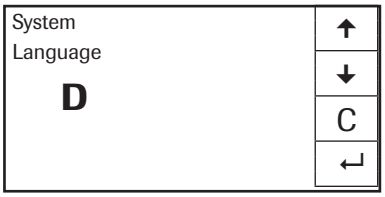
5.3 Contrast



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.

5.4 Language

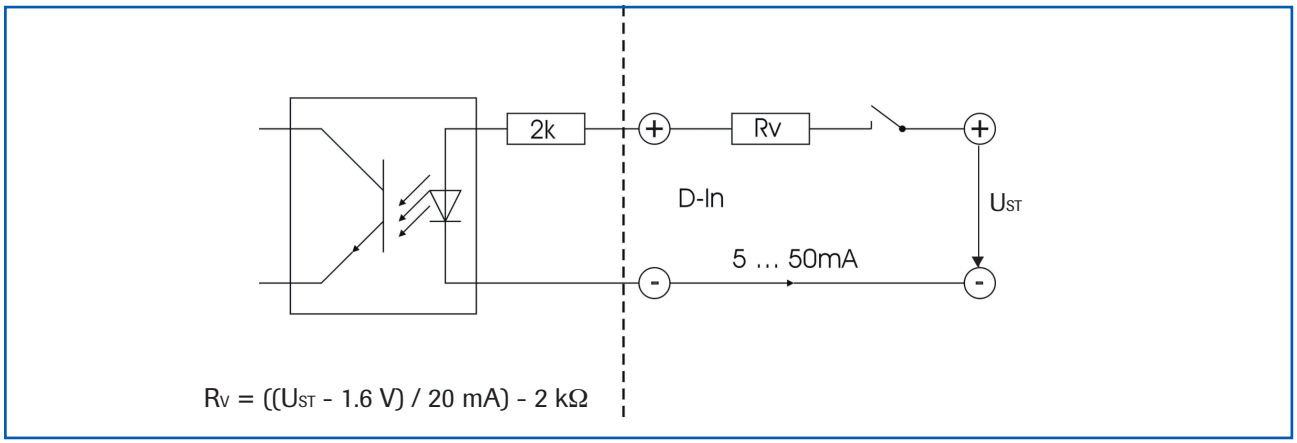


Select of the Language.
Choose: D / F / E

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

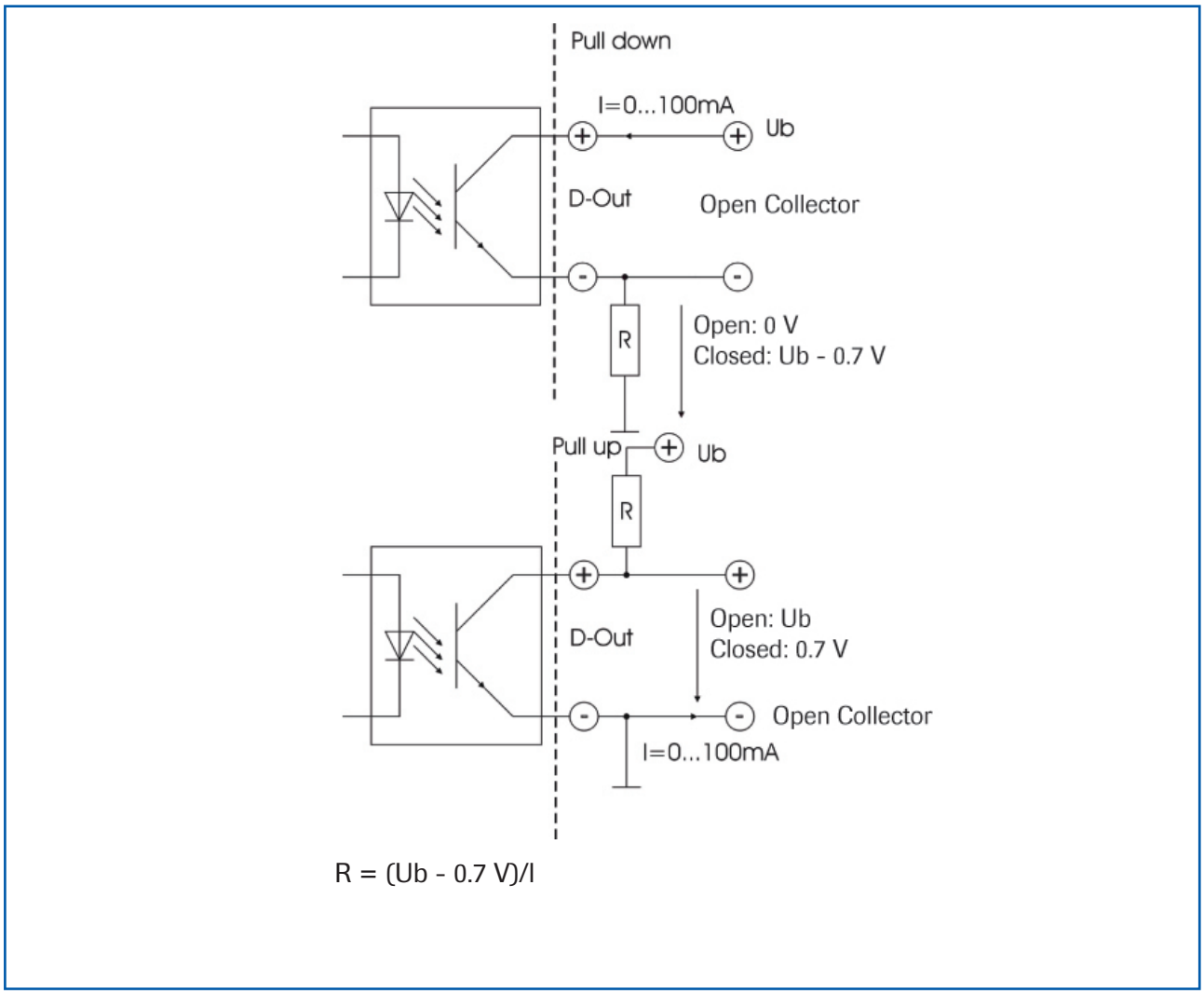
10. Connection Examples

10.1 Digital Input



$R_V = ((U_{ST} - 1.6\ V) / 20\ mA) - 2\ k\Omega$

10.2 Impulse Output



R = (Ub - 0.7 V)/I

- **Warning!**
  Danger of shock with open housing!
- Switch off the power supply for all maintenance or repair works on the measuring system. The pipe must not be in operation during a sensor exchange.
- Repair and maintenance work must be carried out by trained or expert personnel only.
- Before hot-work the sensor must be removed from the piping.

11. 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.

12. Trouble Shooting

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

Problem	**Cause**	**Measure**
Measuring system does not work.	Power supply interrupted. Break of cable. Device defective.	Check the power supply. Check the connection cables for a possible break of a cable. Please call SWR for further instructions.
Measuring system outputs wrong values.	Calibration not correct. Calibration changed by abrasion on front end of sensor	Correction factor place on 1, new calibration according to section 6. Correction factor place on 1, new calibration according to section 6.
Sensor error	Wrong connection of the sensor. Sensor out of order.	Check the wiring. Exchange sensor.
Do not open, as otherwise the warranty claim expires!		

13. Technical Data

Sensor	
Housing	Stainless Steel 1.4571 NW 10 ... 125, flange EN 1092-1
Inner pipe	Ceramic (Al_2O_3)
Protection category	IP 65 according EN 60 529/10.91
Environment temperature	Sensor pipe: -20 ... + 120 °C Sensor electronic: 0 ... + 60 °C
Max. working pressure	16 bar, optional 25 bar
Working frequency	88 kHz
Transmitting power	Max. 2 mW
Weight	Depending to model
Dimensions	NW + 150 mm, L 500 mm
Accuracy	+/- 2 ... 5 % in calibrated measuring range
Transmitter (version field housing)	
Power supply	110 / 240 V AC 50 Hz (optional 24 V DC)
Power consumption	20 W / 24 VA
Protection category	IP 65 according EN 60 529/10.91
Dimensions	258 x 237 x 174 (W x H x D)
Weight	Ca. 2.5 kg
Terminal clamp wire size	0.2 - 2.5 mm^2 [AWG 24-14]
Cable Glands	3 x M16 (4.5 - 10 mm Ø)
Alarm output Error output	Relay with toggle switch - max. 250 V AC, 1 A Relay NC - max. 250 V AC, 1 A
Transmitter (version 19" rack system)	
Power supply	24 V DC
Power consumption	12.5 W
Protection category	IP 30 according EN 60 529/10.91
Dimensions	19" rack system, 3HE, 28TE, L = 227 mm
Weight	ca. 1 kg
Connection	Connector (DIN 41612), Typ B, 32-pol., connector
Alarm output	Relay NC - max. 250 V AC, 1 A
Additional Data	
Environment temperature	-10 ... +45 °C
Current outputs	3 x 4 ... 20 mA (0 ... 20 mA), load < 500 Ω
Digital inputs	2 x Ri 2 kΩ, 5 - 50 mA
Data storage	Flash Memory
Impulse output	Open Collector - Max. 30 V, 20 mA
USB interface	2.0
RS 485 interface	ModBus-Protocol

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