

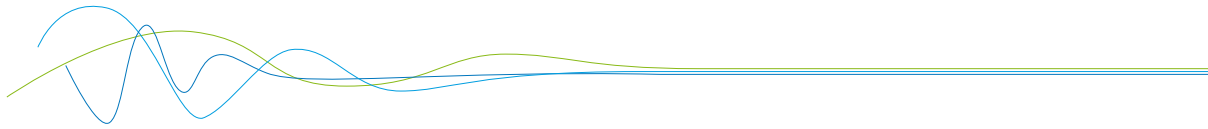


OPERATING INSTRUCTIONS

# MaxxFlow HTC

MEASUREMENT OF HIGH MASS FLOW RATES FOR BULK SOLIDS

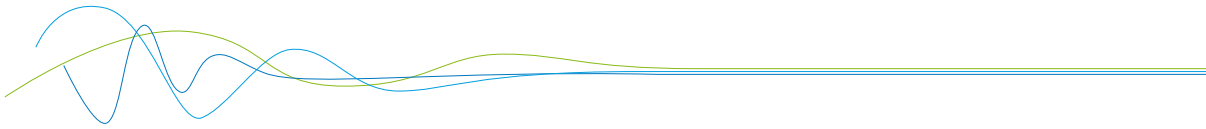




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# 1. System overview

**A measuring point consists of the following components:**

- Transmitter in the DIN Rail housing or field housing
- Sensor for installation in the pipeline
- Installation instructions
- C1-Box (optional)

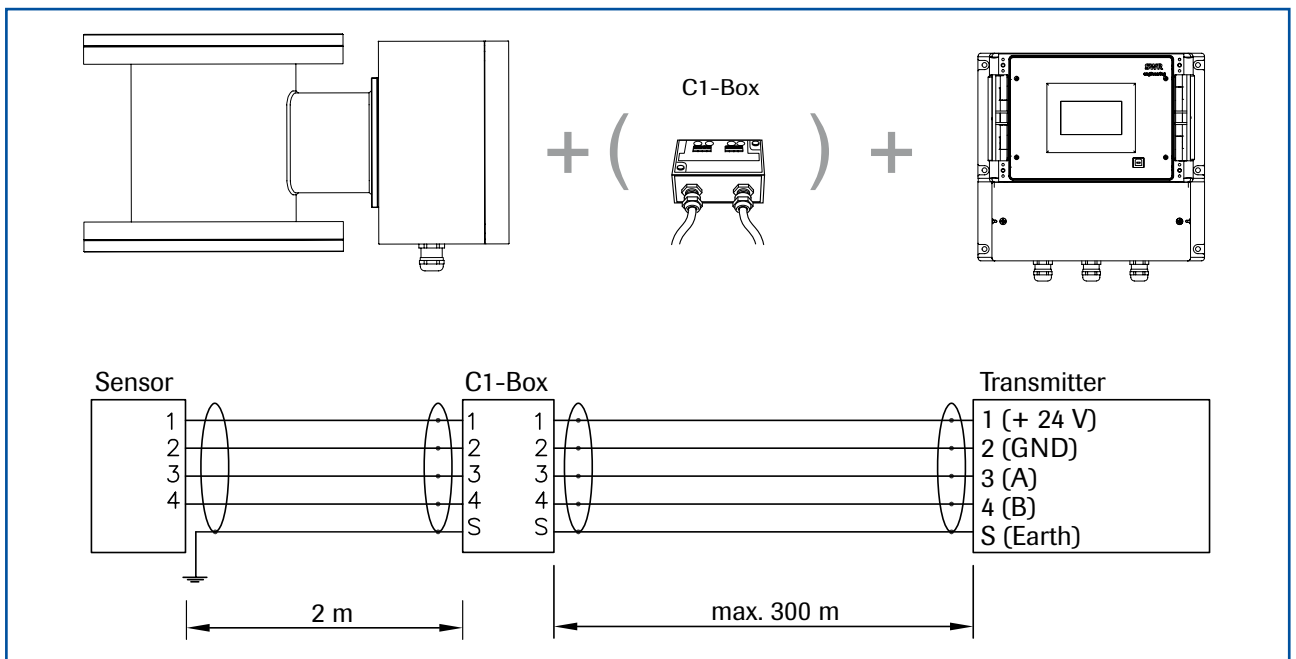


Fig. 1: Overview with C1-Box and field housing transmitter

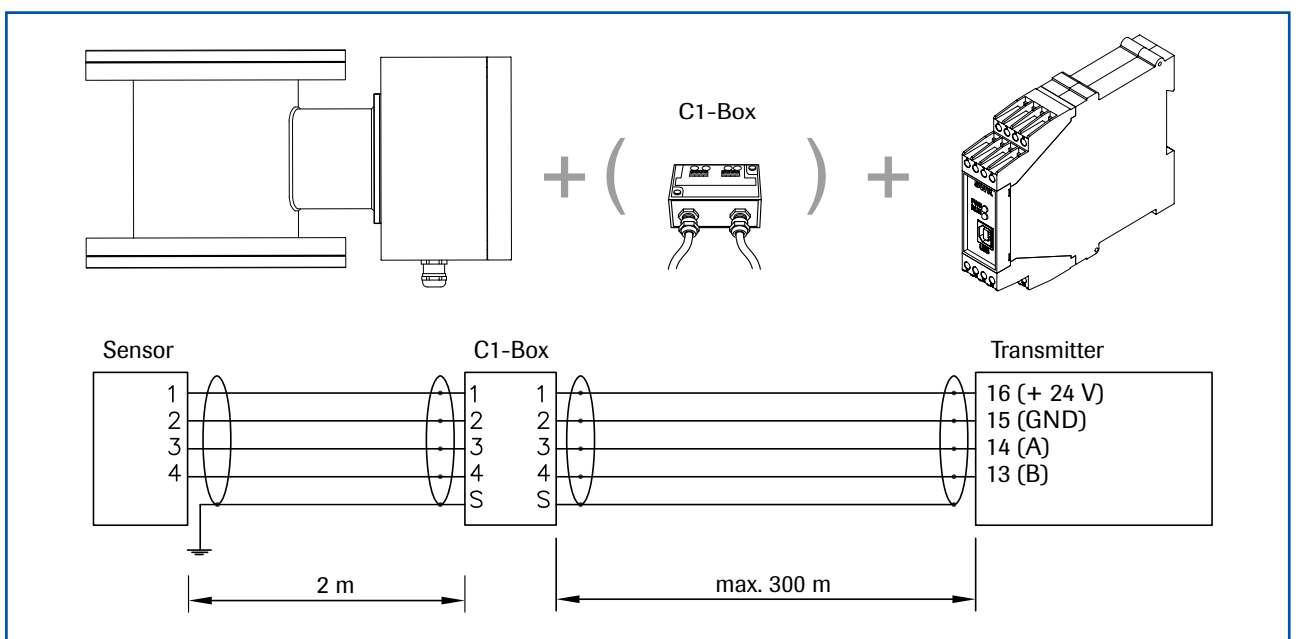


Fig. 2: Overview with C1-Box and DIN Rail transmitter

## 2. Function

- MaxxFlow HTC is a measuring system especially developed for the measurement of high mass flow rates in free fall applications.
- MaxxFlow HTC works with the latest microprocessor technology. By special capacitive coupling of an electromagnetic wave, a homogeneous measuring field is created inside the sensor.
- The electromagnetic wave inside the sensor interacts with the solid particles. The signals are evaluated regarding frequency and amplitude.
- The speed measurement is implemented by correlation. Two sensors are capturing the correlation signals.
- The measuring unit consists of the sensor (measuring pipe) and the transmitter.
- The sensor has an artificial intelligence and independently determines which data are used for the measurement, based on the quality of the measuring signals.
- In version DN 80, the connection flanges can be freely selected and thus adapted directly to the application requirements.

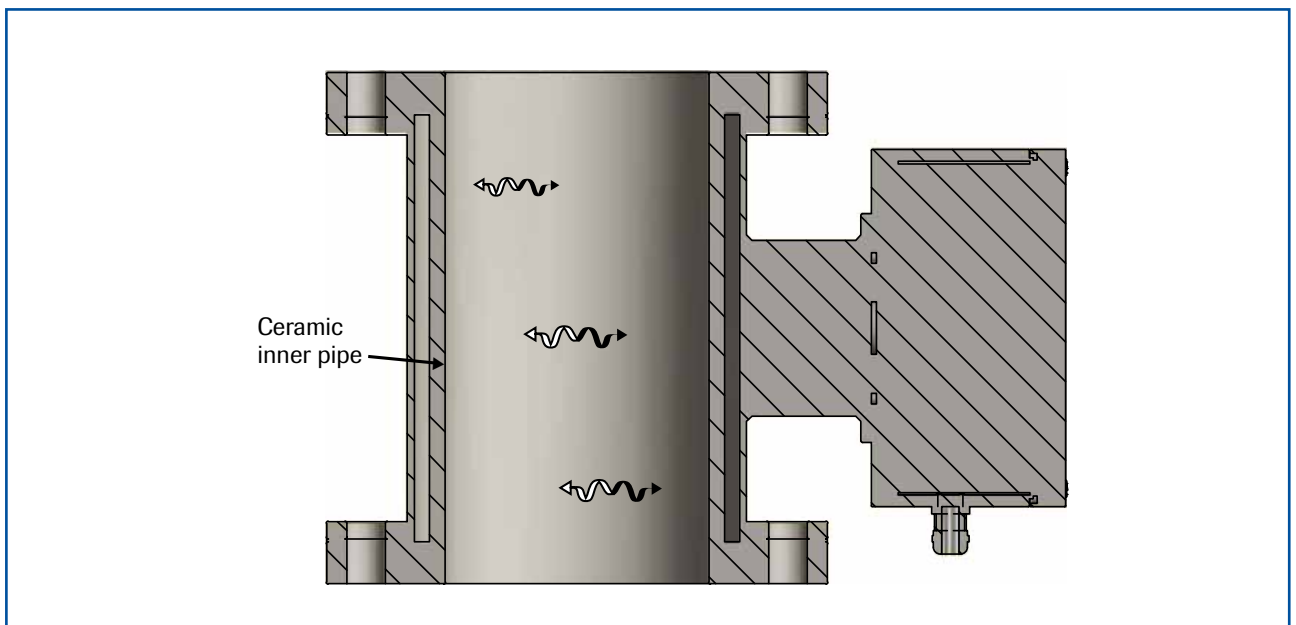


Fig. 3: Coupling of the electromagnetic waves

### 3. Safety

The MaxxFlow HTC was designed, built and tested for safety and is shipped in this condition. Components within the supplied system could be hazardous if not unpacked, installed, connected and commissioned by authorised and qualified persons. All operating instructions must be read and understood before handling the system. Failure to do so will cause the warranty to be revoked.

#### 3.1 Normal use

- The measuring system must be installed for measuring mass flow rate only. Other usage or modifications of the measuring system are not permitted.
- Only original spare parts and accessories of ENVEA Process must be used.

#### 3.2 Identification of hazards

- Possible hazards when using the measuring system are marked by the following symbols:



##### **Warning!**

- This symbolises a situation where personal safety is at risk if used in an improper manner.



##### **Attention!**

- This symbolises the possible damage to the system, if used in an improper manner.

#### 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 MaxxFlow HTC, make sure that the piping is in unpressurised condition.
- Switch off the power supply for all maintenance, cleaning or inspection works on the sensor or on components within the MaxxFlow HTC. 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.
- Make sure the sensor is properly grounded.

#### 3.4 Technical statement

- The manufacturer reserves the right to change any technical data without prior notice. If any queries arise ENVEA Process will be happy to inform customers of any possible changes made.

## 4. Mounting and installation

### 4.1 Supplied equipment

- Transmitter in the DIN Rail housing or field housing
- Sensor
- Operating Instructions
- C1-Box (optional)

### 4.2 Required tools

- Appropriately sized spanner or ring spanner
- Tools for electrical connections

### 4.3 Mounting of the sensor

The sensor has to be mounted as follows:

- Select a location on the pipe, vertical or inclined locations.
- For diagonal pipelines, the terminal box should be oriented upwards.
- The cabling should always be done from below
- Ensure that the correct distance is selected from control devices, e. g. rotary valves, etc. As this will determine velocity criteria, (see fig. 4).
- Depending on the flow rates, the inlet sections may deviate from Fig. 4. A detailed layout design is done by ENVEA Process.

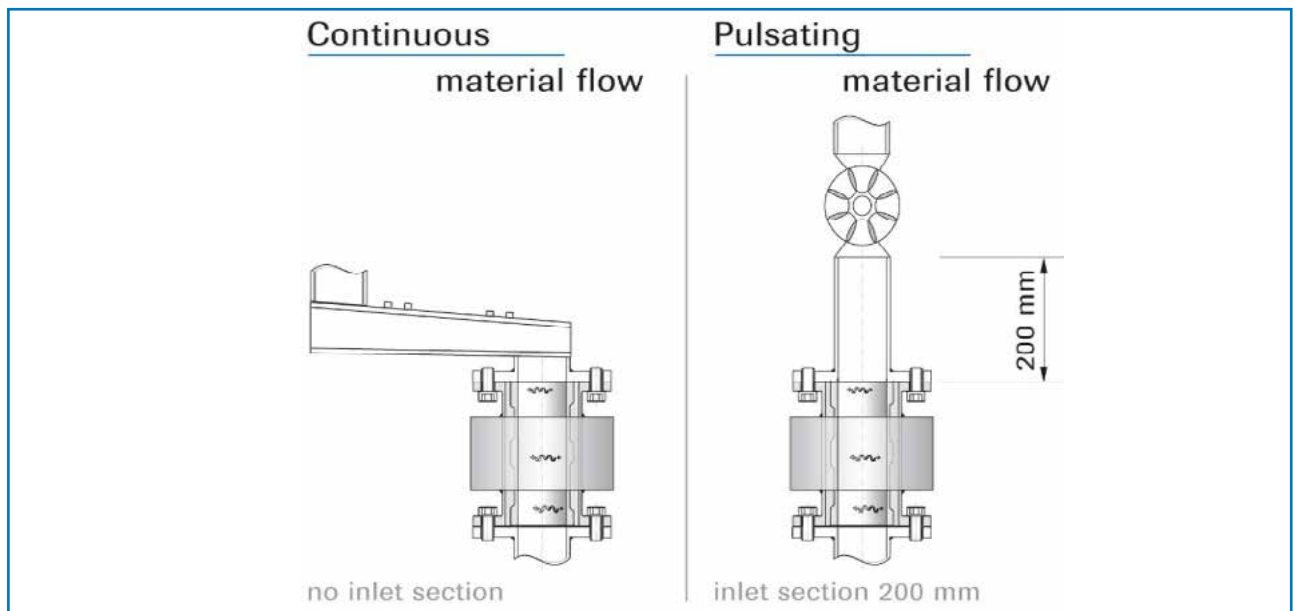


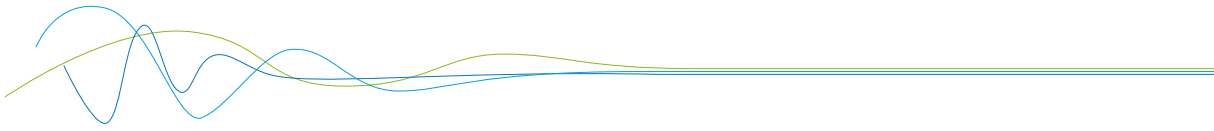
Fig. 4: Minimal distances of the sensor to control devices

Installations in angular pipes are as well possible. If you are unsure contact ENVEA Process staff.



#### Attention!

- Before installation it is necessary to check that the flange alignment is correct and there is no residual debris within the sensor. Always ensure that the material reaches the measuring tube stepless. Make sure the sensor is properly grounded.



#### 4.4 Mounting the transmitter

The transmitter can be installed at a maximum distance of 300 m from the sensor. A cable of type “Öflex Classic 110 CY” is recommended. The cable should be four wired, twisted and shielded. A minimum cable cross-section of 0.75 mm<sup>2</sup> should be observed. For distances more than 150 m the cable cross-section should be adjusted.

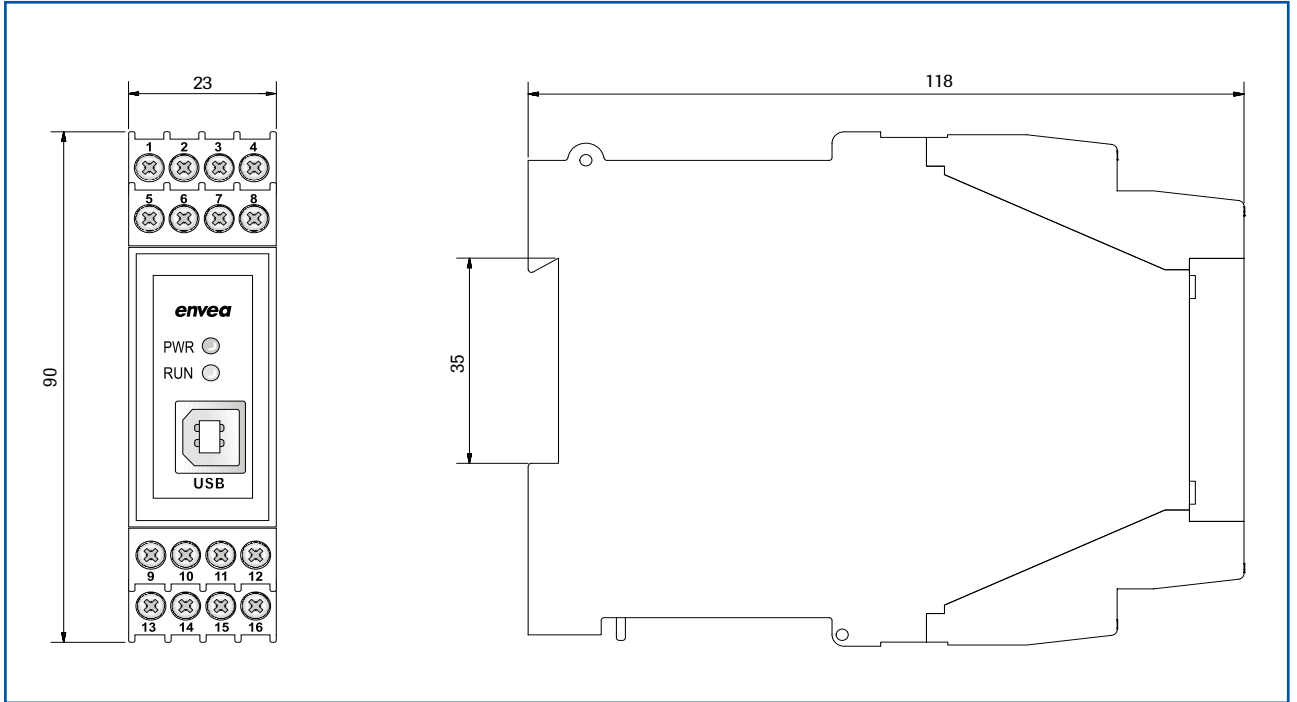


Fig. 5: Dimension of transmitter in DIN Rail housing

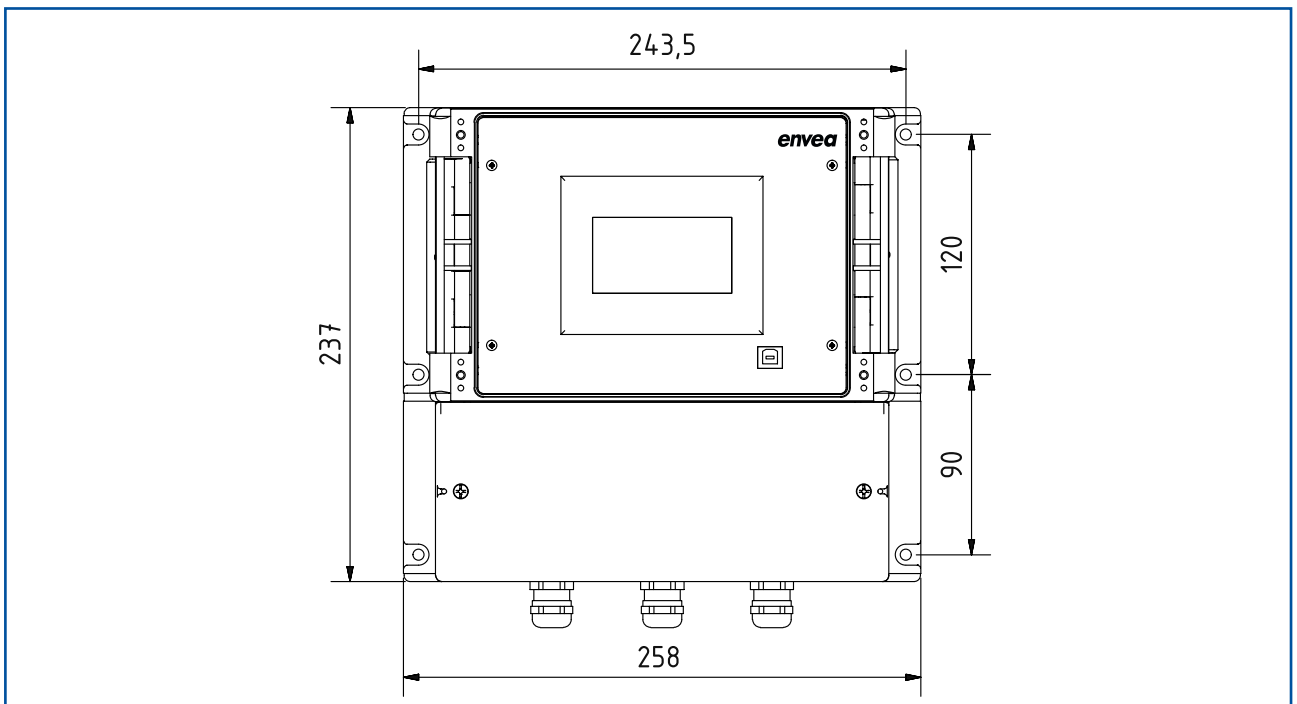


Fig. 6: Dimension of transmitter in field housing (front view)

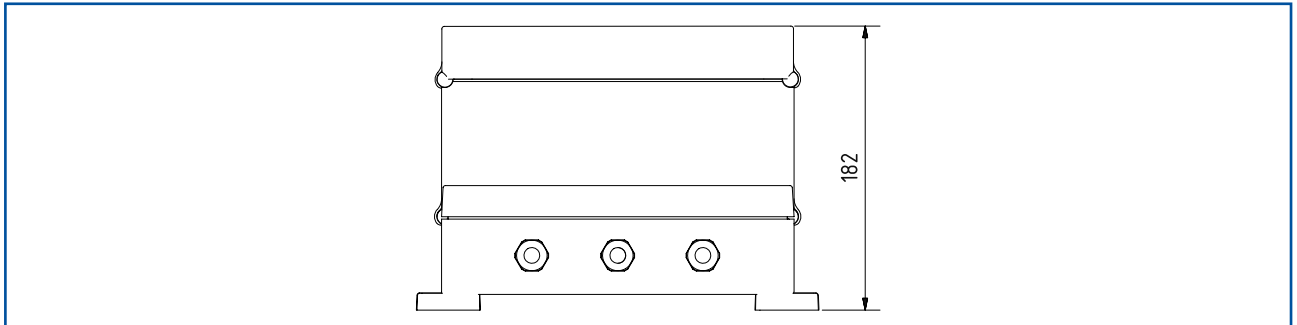
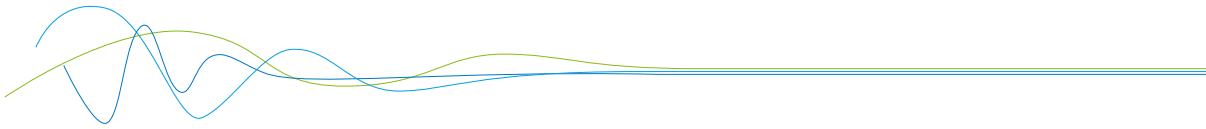


Fig. 7: Dimension of transmitter in field housing (side view)

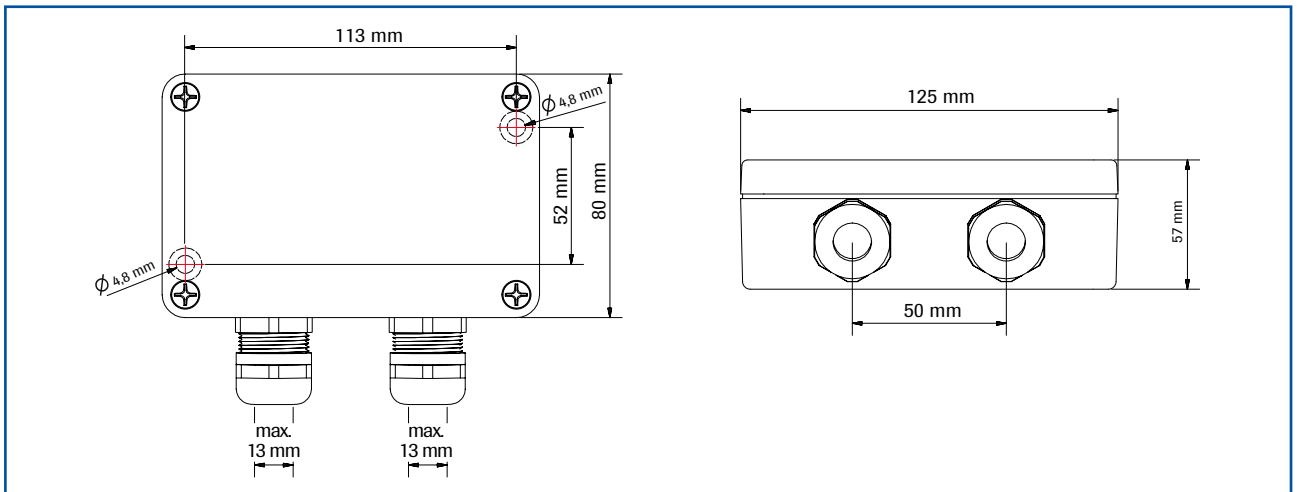


Fig. 8: Dimension of C1-Box

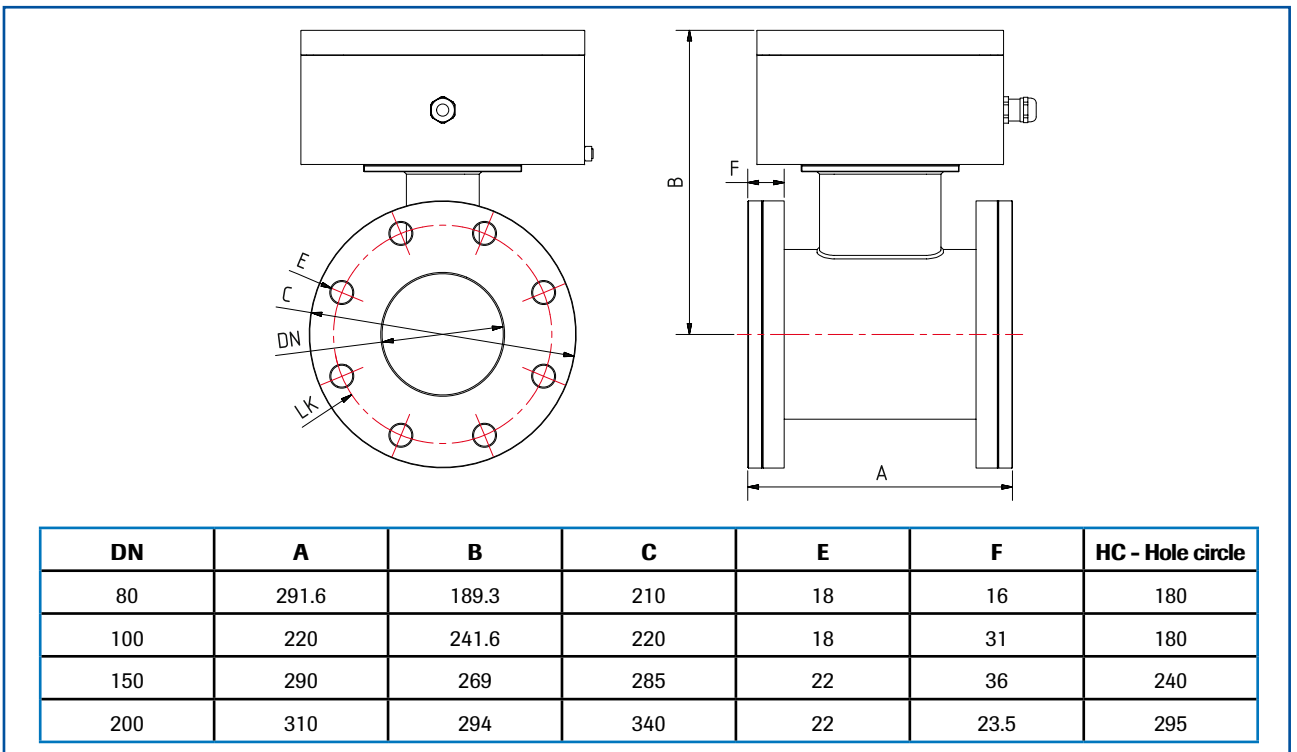



Fig. 9: Dimension of MaxxFlo HTC sensors



#### 4.5 Use in Ex hazardous areas

##### Marking DustEx:

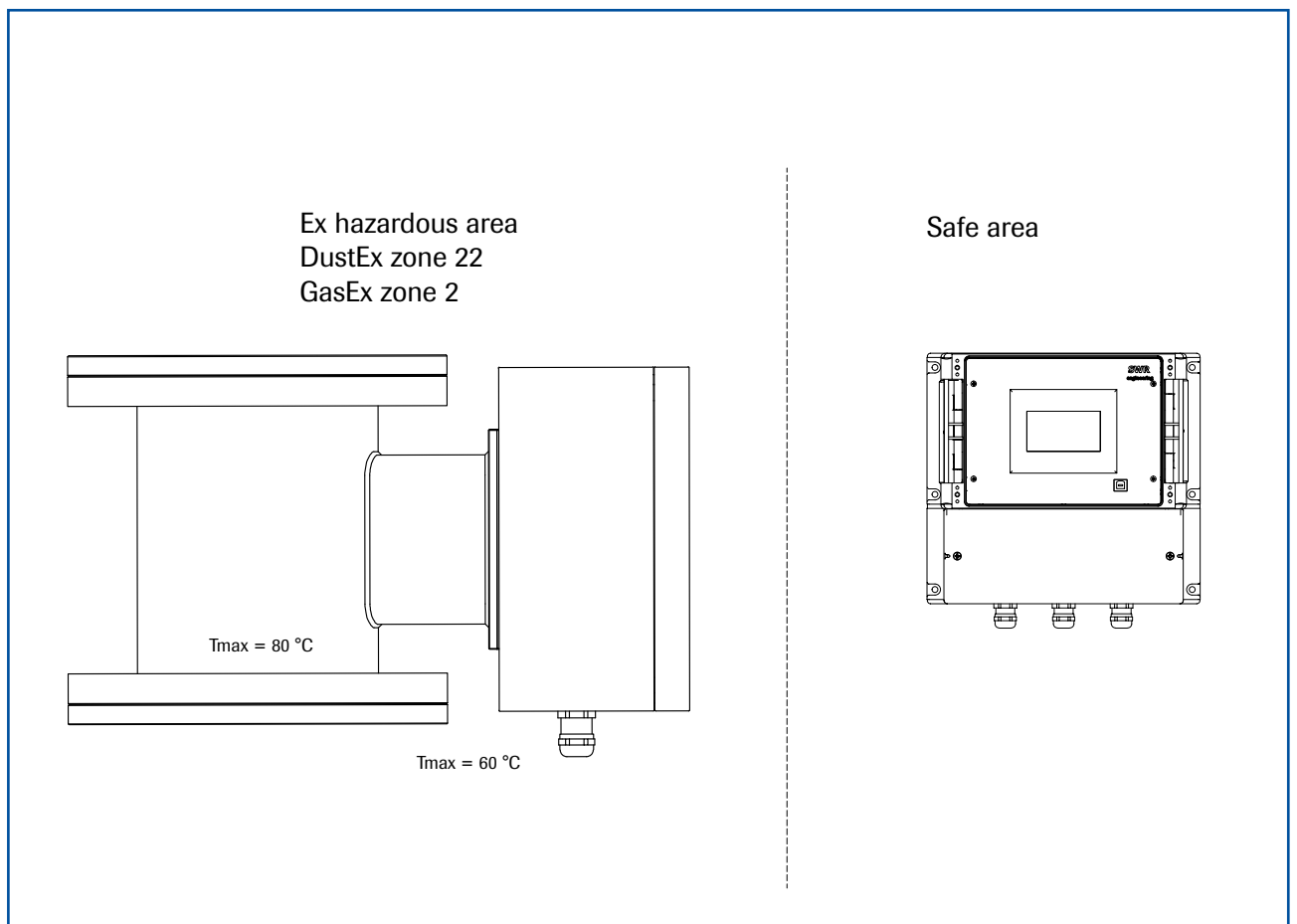
 **II 3D Ex tD A21**  
**Zone 22:  $0\text{ °C} \leq T_{\text{prozess}} \leq 80\text{ °C}$**

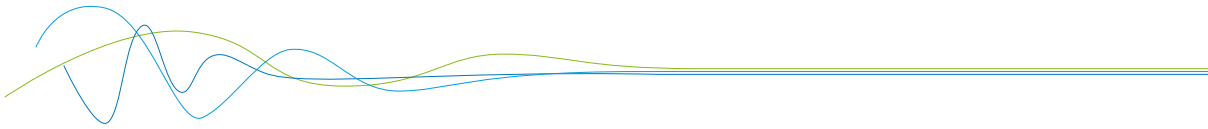
- Equipment group: 2
- Equipment category: 3
- For combustible mixtures of air and dust
- IP 65
- Maximum surface temperature 84 °C with  $T_a = 60\text{ °C}$

##### Marking GasEx:

 **II 3G Ex e IIC T4**

- Equipment group: 2
- Equipment category: 3
- Zone 2
- For combustible mixtures of air and gas
- Allowable process temperature 0 to 80 °C
- Temperature class, T4
- Maximum surface temperature 84 °C with  $T_a = 60\text{ °C}$





## 5. Electrical connection

### 5.1 Version field housing

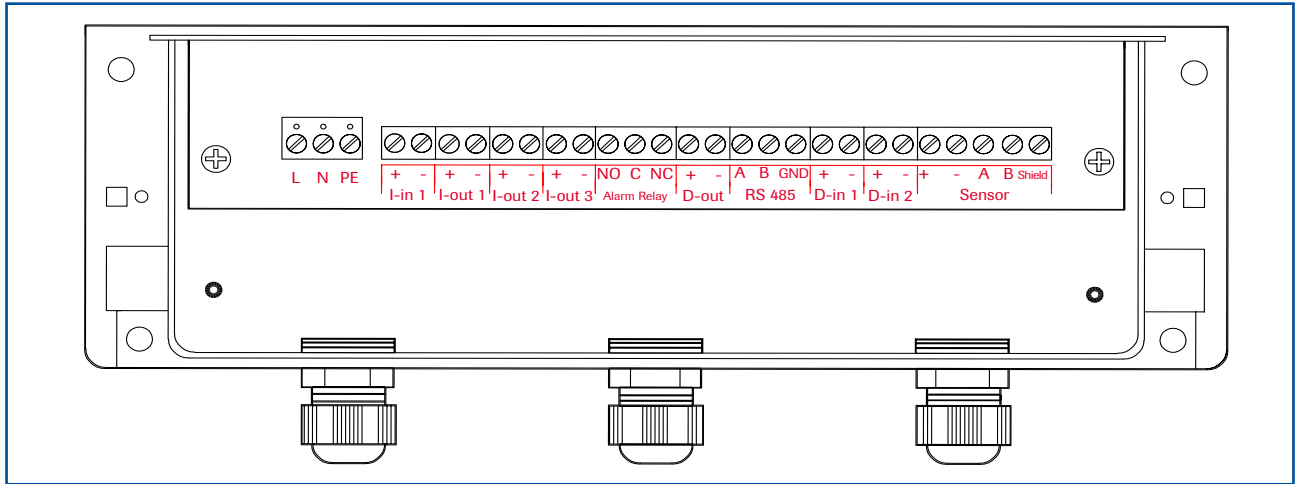
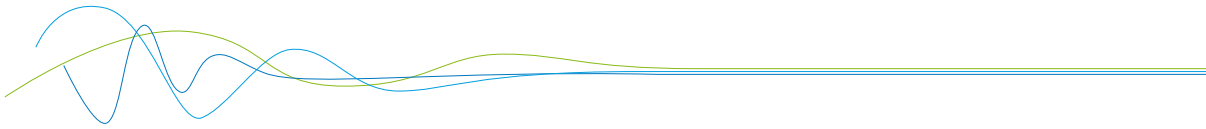


Fig. 11: Electrical connection

<b>Transmitter</b>			
<b>Terminal No.</b>	<b>Connection</b>		
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		
<b>Connections</b>			
I-in 1	+	Current Input (+)	
	-	Current Input (-)	
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	+	NA	
	-	NA	
D-in 2	+	NA	
	-	NA	
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 DIN Rail terminal layout

<b>1</b> Current output - 4 ... 20 mA	<b>2</b> Current output + 4 ... 20 mA	<b>3</b> Input Power supply 0 V DC	<b>4</b> Input Power supply + 24 V DC
<b>5</b> Not used	<b>6</b> Alarm relay NC (break contact)	<b>7</b> Alarm relay C	<b>8</b> Alarm relay NO (make contact)

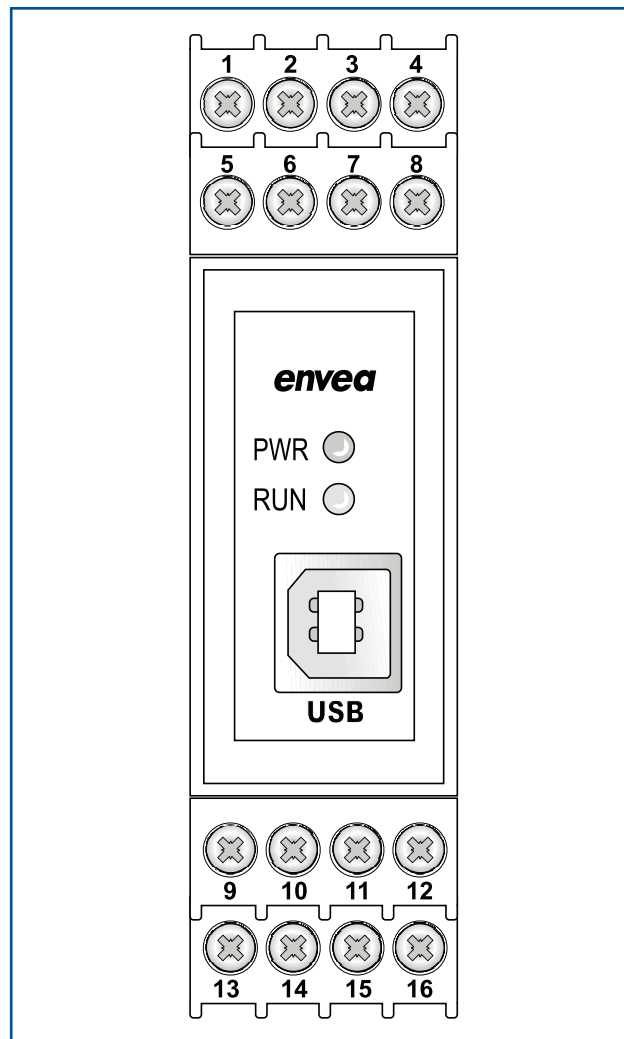
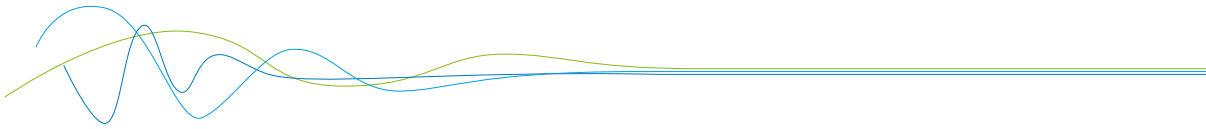


Fig. 12: Electrical connection of the transmitter

<b>9</b> Digital pulse output (-)	<b>10</b> Digital pulse output (+)	<b>11</b> RS 485 Interface Data B	<b>12</b> RS 485 Interface Data A
<b>13</b> Sensor connection Cable 4 RS 485 Data B	<b>14</b> Sensor connection Cable 3 RS 485 Data A	<b>15</b> <b>Sensor connection</b> <b>Cable 2</b> <b>Power</b> <b>supply 0 V</b>	<b>16</b> <b>Sensor connection</b> <b>Cable 1</b> <b>Power</b> <b>supply + 24 V</b>



### 5.3 Electrical connection C1-Box

#### Sensor 1

- PIN 1:** + 24 V DC
- PIN 2:** 0 V DC
- PIN 3:** RS 485, Data A
- PIN 4:** RS 485, Data B
- PIN S:** Shield

#### Evaluation unit

- PIN 1:** + 24 V DC
- PIN 2:** 0 V DC
- PIN 3:** RS 485, Data A
- PIN 4:** RS 485, Data B
- PIN S:** Shield

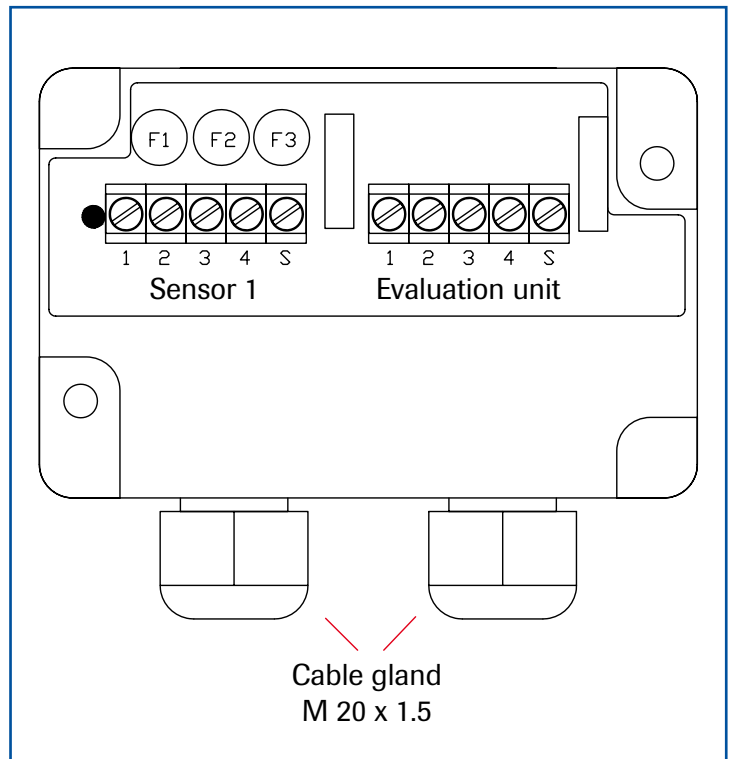


Abb. 13: Electrical connection C1-Box

### 5.4 Electrical connection sensor

- Pin 1:** +24 V DC
- Pin 2:** GND
- Pin 3:** ModBus A
- Pin 4:** ModBus B

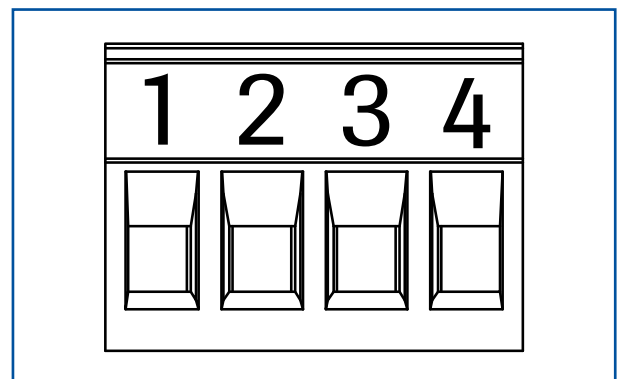
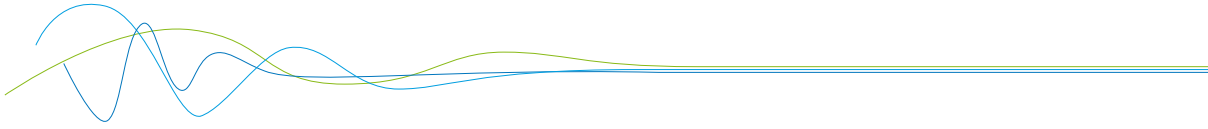


Fig. 14: Electrical connection of the plug connector



## 6. Operator interface

The transmitter is a multi-sensor transmitter. It is therefore strongly recommended to check before commissioning whether the correct sensor is selected in menu **System**.

The operator interface differs depending on the system design:

- DIN Rail housing without touchscreen, operation via PC software
- Field housing with display, alternative operation via PC software

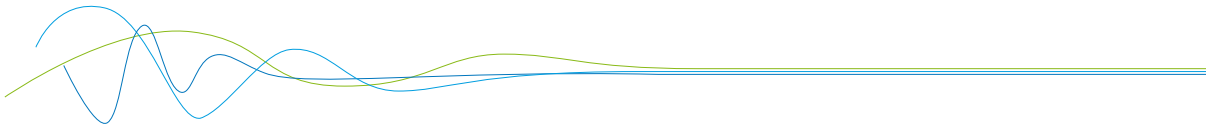
### 6.1 Differences between the DIN Rail and field housing transmitter

The transmitter in the DIN Rail housing is only a part of the functions available in the field housing. The following overview clarifies the differences between the two versions.

Function	Field housing	DIN Rail
Menu system		
• via PC software	yes	yes
• via display	yes	no
Measurement value display current output	yes	yes
Pulse output for the control of solenoid valves or for totaliser output	yes	yes
Alarm system relay output	yes	yes
Remote control digital input	yes	no
Autocorrect analogue input	yes	no
Totaliser display		
• via PC software	yes	yes
• via display	yes	no
Error output		
• on current output	yes	yes
• at relay	yes	yes
• via PC software	yes	yes
• via display	yes	no
• on status LED	no	yes

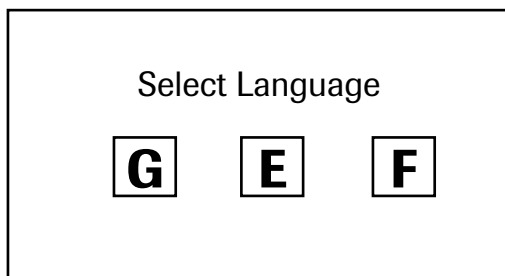
The transmitter in the DIN Rail is configured exclusively via a USB connection and a PC program. For the transmitter in the field housing, all functions can be configured via the touch-sensitive display. The PC configuration is also possible with the transmitter in the field housing.

**The menu items on the display and in the PC software are numbered in a uniform manner so that they can be referred to later on.**



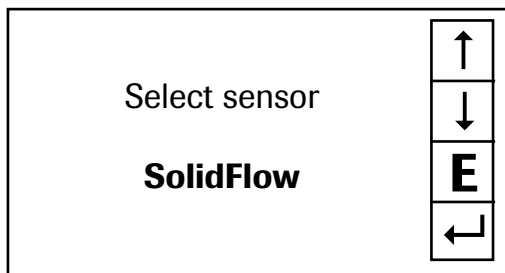
## 6.2 Display

The display is touch-sensitive. Available keys are displayed directly in context. When the measuring system is first started, a query is initiated to select the language and sensor. If no selection is made, the initialization disappears and the German language with a SolidFlow 2.0 sensor is selected.



Initialization screen when the transmitter in the field housing started first time.  
Selection of the menu language:

**G**erman, **E**nglish, **F**rançais

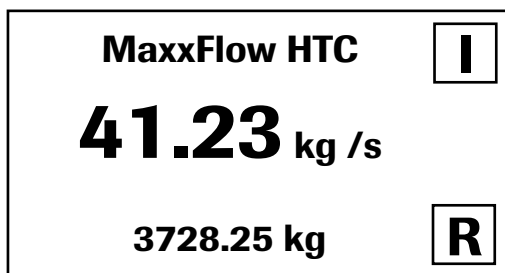


If a language has been selected, the sensor to be used must be selected.

To be available:

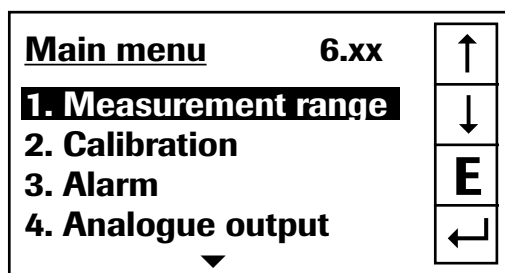
SolidFlow 2.0, PADDY, PicoFlow, MaxxFlo HTC, DensFlow, SpeedFlow 2.0, SlideControl, ProSens, M-Sens 2, M-Sens 2 FD, M-Sens WR, M-Sens WR2.

Afterwards the start page appears.



The start page display the following values:

- Tag No "MaxxFlo HTC", freely selectable text which describes the material or the measuring point
- Measurement, here in [kg/s]
- Totaliser value since the last totaliser reset, here in [kg]
- [ I ] key for info
- [ R ] key for totaliser reset

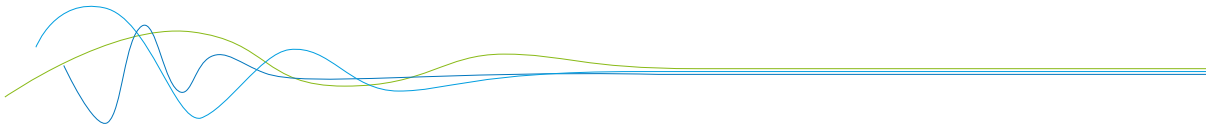


To access the menus, press and hold any area of the display for several seconds.

The sub-menu selection will be displayed:

In the menus and input fields, the displayed keys can be used to browse, select, edit or reject:

- [ Arrow ]: Scroll down the page, select an option, select a position in the input text
- [ E ] for ESC: Interrupt the function without making any changes
- [↵]: Select the function or confirm the input
- [ C ] for Clear: Delete a symbol or number.



<b>Sensor status</b>		
	<b>Value</b>	<b>Qx</b>
<b>D:</b>	<b>82892</b>	<b>100</b>
<b>Q:</b>	<b>216787</b>	<b>99</b>
<b>V:</b>	<b>2.61</b>	<b>99</b>
<b>lout:</b>	<b>4.0/ 4.0/</b>	<b>4.0</b>
	<b>340 kg</b>	

With the key [ I ] you can choose between different information windows. The first window shows the raw values, temperature and the status of the sensor.

The second window displays the error memory.

Recent error codes always come first. If an error code is repeated, it will appear first, but will not be listed multiple times.

<b>Save changes?</b>	
<input type="checkbox"/> <b>Y</b>	<input type="checkbox"/> <b>N</b>

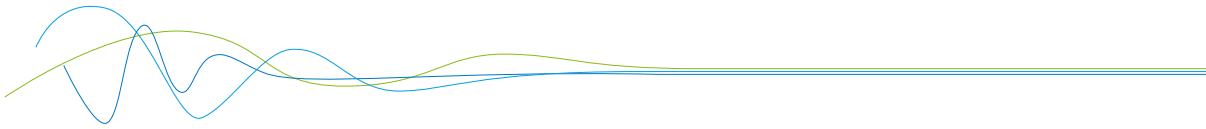
If any data has been changed, the change will only be taken into account when you exit the complete menu structure and answer [ Yes ] when asked if you wish to save the changes.

**For reasons of simplicity, a further display menu screen has been dispensed with. The display screens are directly derived from the menu structure in section 6.5.**

**Protection against unauthorised use:**

If a password has been entered in menu **7. System** in **7.6 Password**, which is different to the “0000” default setting, you will be asked to enter a password when attempting to access the menus.

After the password has been successfully entered, the menus will be unlocked for approx. 5 minutes (from the last menu entry).



### 6.3 PC interface

Communication with a laptop or PC is carried out on the DIN rail as in the field housing version optionally on the terminals via an RS 485 or on the front side via a USB interface.

- ✓ The **RS 485 connection** is attached to the transmitter in the field housing at the ModBus A (+) and ModBus B (-) terminals.

RS 485 is a bus connection; the ModBus address and the baud rate can be set on the device. Upon delivery, the communication parameters are set to:

- ModBus address 1
- Baud rate 9600, 8, E,1
- Parity: even

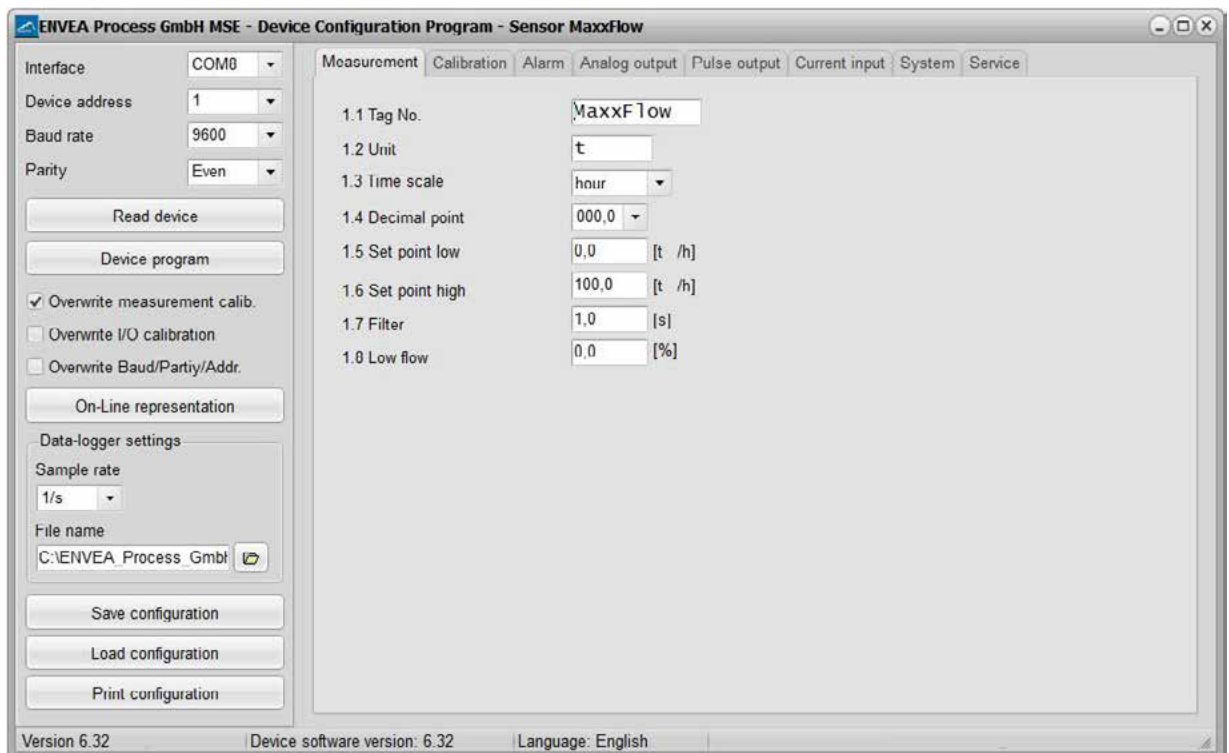
An RS 485 to USB adapter can be purchased from ENVEA Process.

- ✓ For the USB connection to the DIN rail version is a standard USB-A-B cable included. The USB connection is a point-to-point connection that is not BUS-capable. The ModBus address and the baud rate for the front-side connections cannot be changed and are always:

- ModBus address 1 (or the device answers to all addresses)
- Baud rate 9600, 8, E,1
- Parity: even (parity can not be changed on the USB connection)

When connected to the PC for the first time, any interface drivers enclosed with the transmitter must be installed.

After starting the software, the communication parameters must first be entered accordingly. These can be found in the top left of the program window. The COM port to be set is displayed in the device manager.



Communication is established by clicking on “Read device”. The acknowledgement message “Parameter read in” is displayed. If an error message is displayed instead, check the communication parameters and cable connections between the PC and the transmitter.



The edited data is transmitted to the transmitter via “Device program”.

Critical data concerning the ModBus communication and the calibration must be confirmed before the parameters are transmitted to the transmitter:

- ✓ If, when saving the parameters in the transmitter, the system calibration data is changed, this action must be confirmed by checking “Overwrite calibration”.
- ✓ If, when saving the the parameters in the transmitter, the system interface parameter are changed, this must be confirmed by checking the selection “Overwrite Baud/Addr.”.

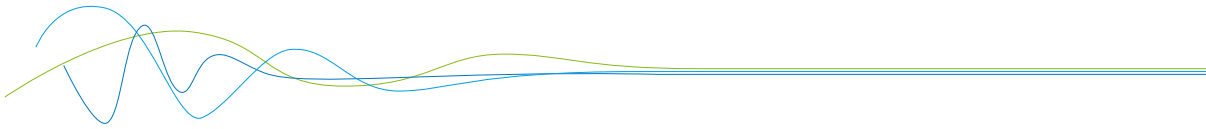
In addition, with the PC software,

- the transmitter parameters can be saved in a file (Save configuration)
- the transmitter parameters can be loaded from a file (Load configuration)
- the transmitter parameter can be printed via the windows standard printer (Print configuration)
- the measured values can be logged in a data logger file (enter the file name and storage rate, and activate the data logger on the online display)

The software language can be set by right-clicking the “Sprache/Language/Langue” field in the bottom program line on “German/English/Français”.

**Protection against unauthorised use:**

The PC interface does not have a password prompt as it is assumed that only authorised personnel will have access to the PC and the software. However, the password to operate the display can be read and changed in menu **7. System** in **7.6 Password**.

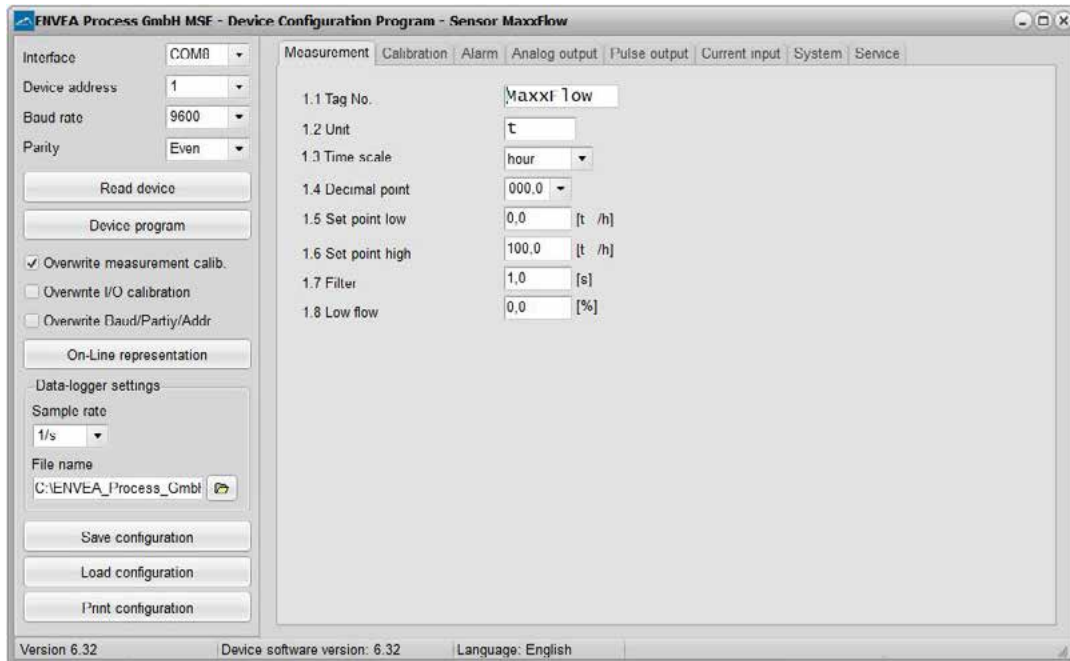


## 6.4 Menu structure

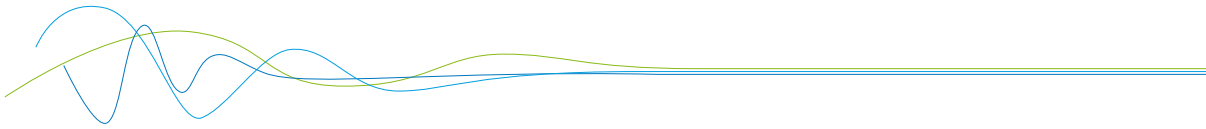
The menu structure supports the user when adjusting the measuring range, the calibration, the measurement values and the choice of additional functions. In this connection, the numbering both on the display and in the PC interface is identical:

### 1. Measurement

Set all relevant measuring range settings



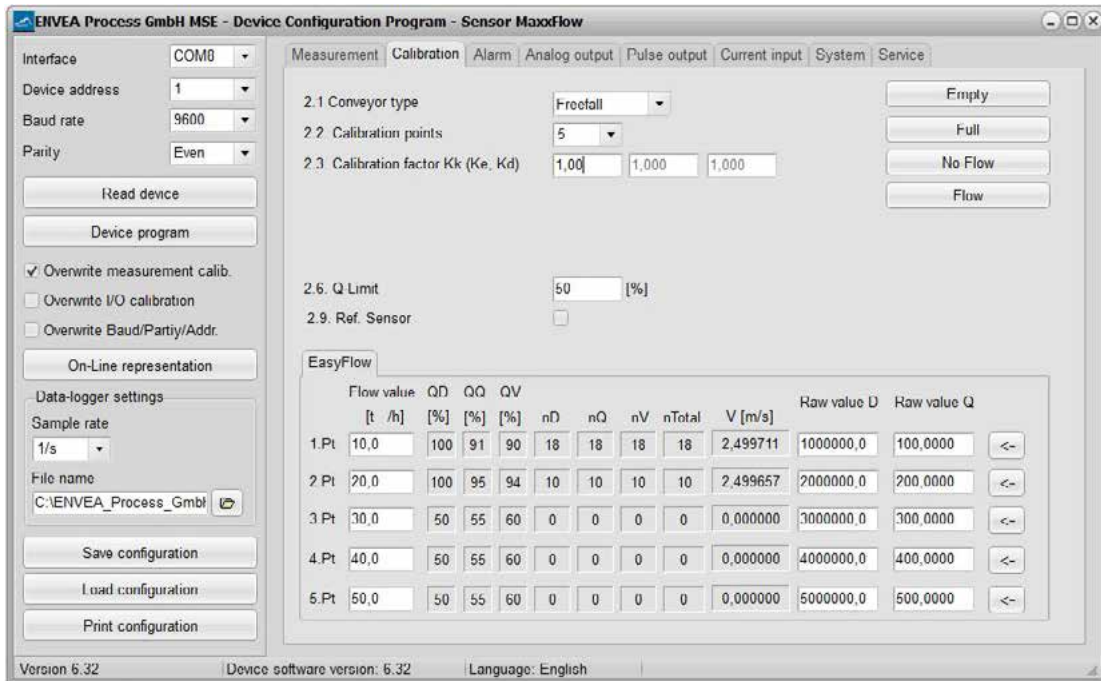
1.1 Tag No.	<b>Input:</b> Free text (10 characters)	Name of the measurement point or product.
1.2 Unit	<b>Input:</b> Unit text, e. g. kg	Required mass flow unit.
1.3 Time scale	<b>Selection:</b> hour / minute / second	time base for the integration by the totaliser and the pulse output.
1.4 Decimal point	<b>Selection:</b> 0000, 0.000, 00.00, 000.0	Number representation and decimal point-accuracy in the measurement menu.
1.5 Set point low	<b>Input:</b> 0 ... 9999	Throughput rates under this value will not be displayed at the current output. This does not concern the display indicator, totaliser or pulse output.
1.6 Set point high	<b>Input:</b> 0 ... 9999	Throughput rates above this value will not be displayed at the current output. This does not concern the display indicator, totaliser or pulse output.
1.7 Filter	<b>Input:</b> 0.0 s ... 999.9 s	Filtering of measurement for the indicator and the output values.
1.8 Low flow	<b>Input:</b> 0.0 % ... 99.9 %	Throughput below this threshold are displayed as zero and are NOT totalised. Indication as % to measuring range end.



## 2. Calibration

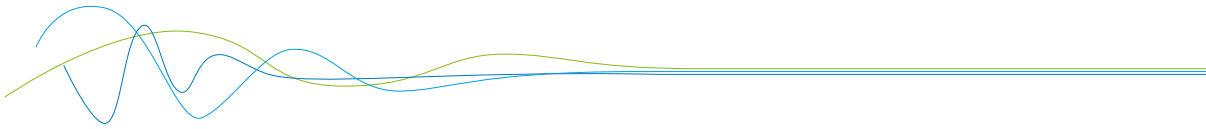
Deposit a calibration curve.

Depending on the selection under **7.2.1 Calibration**, the parameters to be entered are changing.

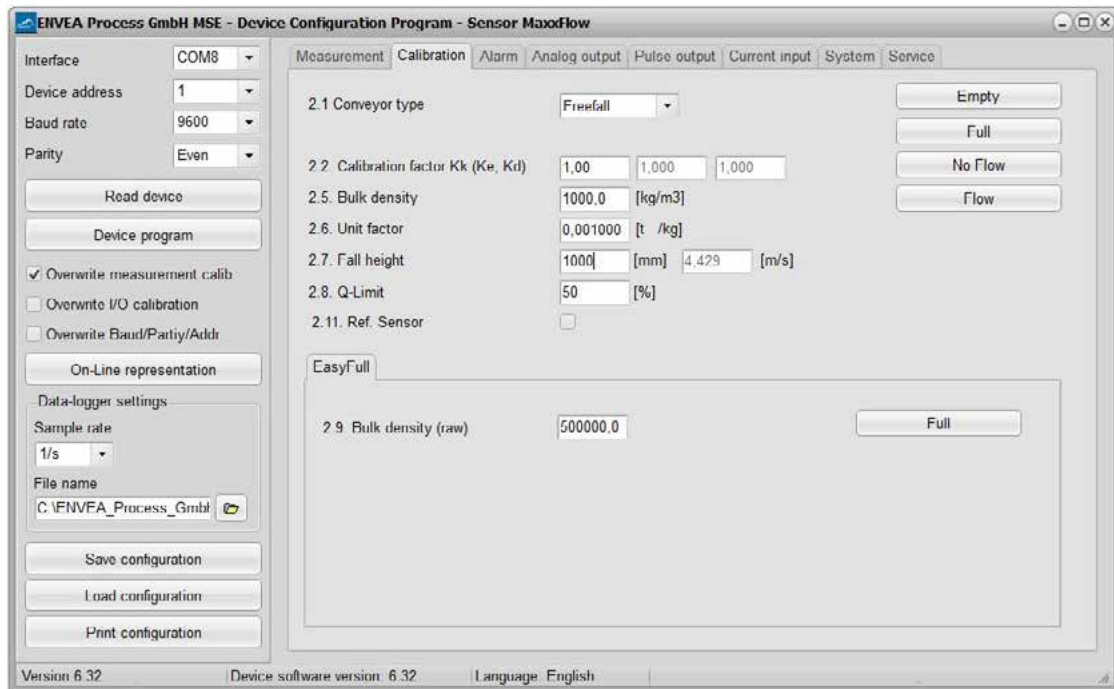
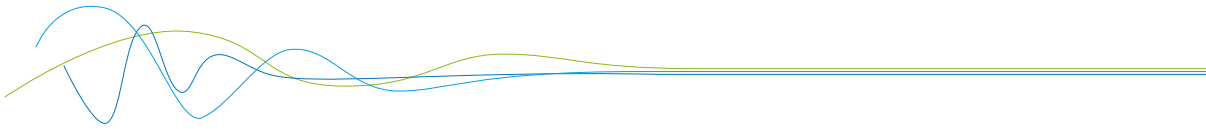


### EasyFlow calibration

2.1	Conveyor type	<b>Selection:</b> Freefall / slide	Selection of conveying type.
2.2	Calibration points	<b>Selection:</b> 1 ... 5	Number of supported points for a linearisation.
2.3	Calibration factor [KK]	<b>Input:</b> 0.01 ... 9.99	Factor for the subsequent adjustment of the actual measurement. All measurements are measured with this factor.
2.4	Factor Kc	<b>Display</b>	Automatically entered correction value for the electrical behaviour of the material, supplied by a correction sensor installed in the process.
2.5	Factor Kd	<b>Display</b>	Automatically entered correction value for the density behaviour of the material, supplied by a correction sensor.
2.6	Q-Limit	<b>Input:</b> 0 ... 100 %	Limit for the quality threshold, for sensor signals to be used for calibration and measurement. 0 ... 99 % = active speed measurement 100 % = speed measurement deactivated

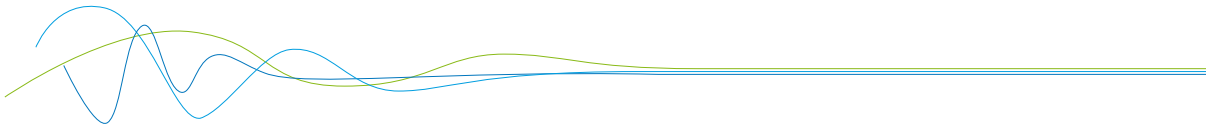


2.7	Calibration	<b>Submenu</b>	
2.7.1	Value P1	<b>Input:</b> Measurement value	Output measurement in the selected mass/time unit.
2.7.2	P1 - actual	<b>Display</b>	Display actually raw values for this calibration point.
2.7.3	P1-Cal.	<b>Input:</b> Raw values	Transfer of the current raw value (filtered) from the mass flow with the key [←]. The raw values of density, throughput and velocity are checked for quality and only values above the <b>2.6 Q limit</b> are used.
2.7.n	... (depending on the number of calibration points)		For additional support points (depending on <b>[2.2]</b> ), additional value pairs can be set.
2.8	Sensor measuring	<b>Submenu</b>	
2.8.1	Empty	<b>Input:</b> Raw value	Customer empty adjustment
2.8.2	Full	<b>Input:</b> Raw value	Customer full adjustment
2.8.3	No Flow	<b>Input:</b> Raw value	Customer adjustment: No Flow
2.8.4	Flow	<b>Input:</b> Raw value	Customer adjustment: Flow

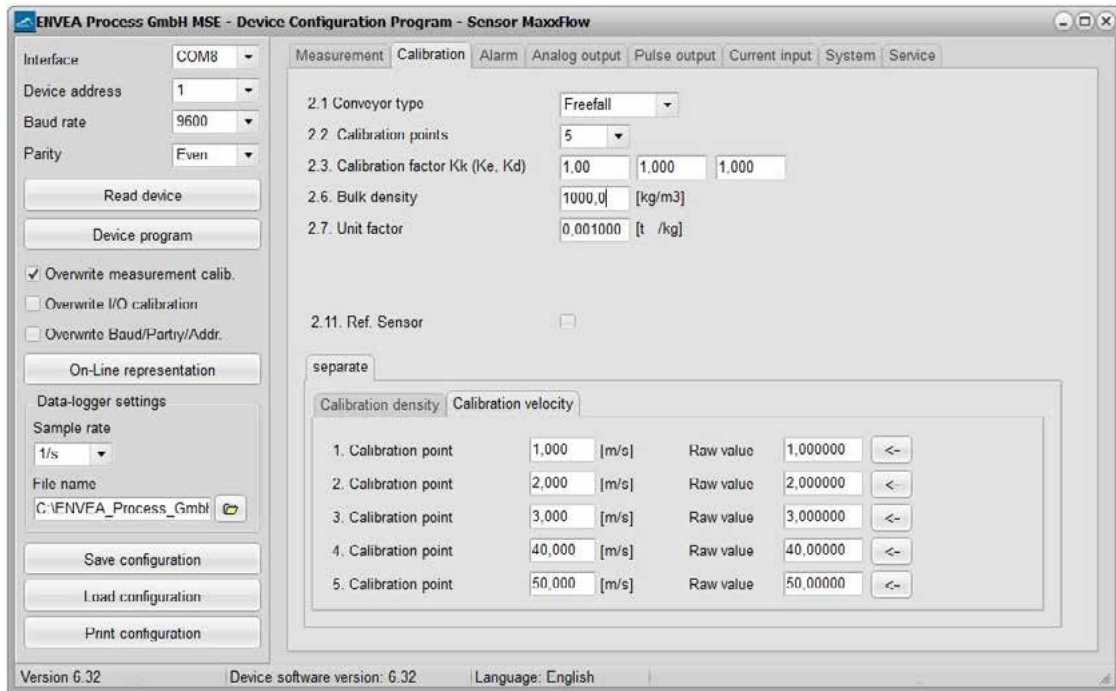


### EasyFull calibration

2.1	Conveyor type	<b>Selection:</b> Freefall / slide	Selection of conveying type.
2.2	Calibration factor [KK]	<b>Input:</b> 0.01 ... 9.99	Factor for the subsequent adjustment of the actual measurement. All measurements are measured with this factor.
2.3	Factor Kc	<b>Display</b>	Automatically entered correction value for the electrical behaviour of the material, supplied by a correction sensor installed in the process.
2.4	Factor Kd	<b>Display</b>	Automatically entered correction value for the density behaviour of the material, supplied by a correction sensor.
2.5	Bulk density	<b>Input:</b> 0.1 ... 9999.9	Density of the material in kg/m <sup>3</sup> .
2.6	Unit factor	<b>Input:</b> 0 ... 9999.9	Conversion factor between entered <b>1.2 Unit</b> to kg.
2.7	Fall height	<b>Input:</b> 1 ... 20.000 mm	Drop height above the sensor in millimeter.
2.8	Q-Limit	<b>Input:</b> 0 ... 100 %	Limit for the quality threshold, for sensor signals to be used for calibration and measurement. 0 ... 99 % = active speed measurement 100 % = speed measurement deactivated
2.9	Bulk density (raw)	<b>Input:</b> RAW-value	RAW-value at 100 % filled sensor

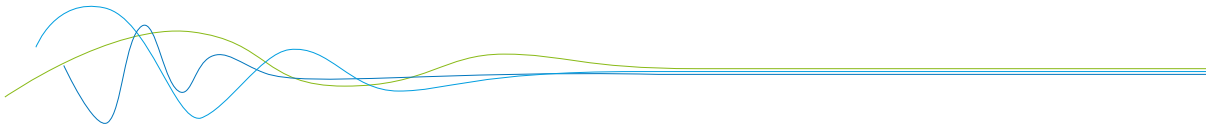


2.10	Sensor measuring	Submenu	
2.10.1	Empty	<b>Input:</b> RAW-Value	Customer empty adjustment
2.10.2	Full	<b>Input:</b> RAW-Value	Customer full adjustment
2.10.3	No Flow	<b>Input:</b> RAW-Value	Customer adjustment: No Flow
2.10.4	Flow	<b>Input:</b> RAW-Value	Customer adjustment: Flow



### Separate calibration

If the single calibration is selected, it is possible to set a linearisation on the bulk density and on the speed. This calibration option should only be performed by ENVEA Process trained personnel.

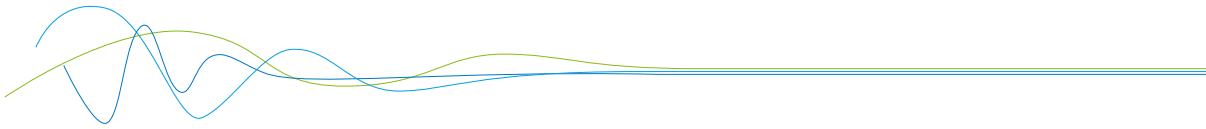


### 3. Alarm

#### Settings for relay contacts

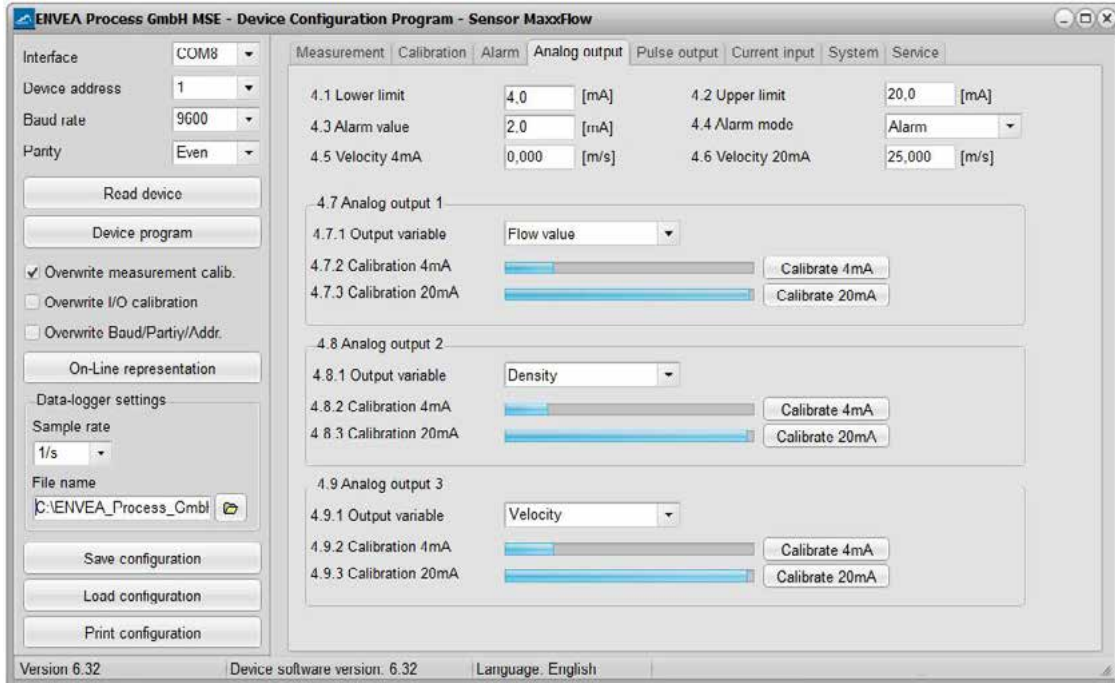


3.1	Alarm type	<b>Selection:</b> none / MIN / MAX / FLOW	<b>none:</b> no alarm output on relay output <b>MIN:</b> min. alarm on relay output <b>MAX:</b> max. alarm on relay output <b>FLOW:</b> flow detection on relay output
3.2	Alarm value	<b>Input:</b> 0 ... 999.9	Threshold for monitoring on selected alarm type: MIN, MAX, FLOW.
3.3	Delay	<b>Input:</b> 0.1 ... 99.9 s	The value must permanently exceed or fall below the set limit during this time.
3.4	Hysteresis	<b>Input:</b> 0,1 ... 99.9 %	The alarm continues for as long as the measurement is not smaller or larger than the limit value plus or minus hysteresis.
3.5	Operation mode	<b>Selection:</b> NC / NO	<b>NC:</b> the relay is closed while there is no alarm. <b>NO:</b> the relay is closed, if there is an alarm.
3.6	Sensor alarm	<b>Selection:</b> OFF / ERR / PROC	<b>OFF:</b> sensor or process errors will not activate the relay. <b>ERR:</b> serious sensor errors lead to an alarm on the relay. <b>PROC:</b> fatal sensor errors and process indicators lead to an alarm on the relay. More information about the ERR and PROC signals, will be found in section error flags.



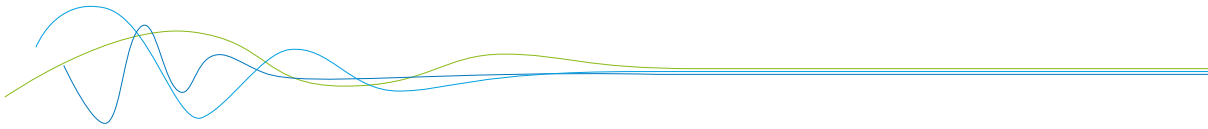
#### 4. Analog output

Settings and calibration of analog output



4.1	MIN limit	<b>Input:</b> 0 ... 22 mA	Default settings: 3.2 mA
4.2	MAX limit	<b>Input:</b> 0 ... 22 mA	Default settings: 21 mA
4.3	Alarm value	<b>Input:</b> 0 ... 22 mA	Output value for sensor alarm. Default settings: 2 mA
4.4	Alarm mode	<b>Selection:</b> Alarm / freeze	<b>Alarm:</b> alarm value at output, during alarm measuring value is 0. <b>Freeze:</b> last measurement value would be freeze on Analogue output, till the error is fixed.
4.5	V-Min 4 mA	<b>Input:</b> 0 ... 99.99 m/s	Velocity at 4 mA
4.6	V-Max 20 mA	<b>Input:</b> 0 ... 99.99 m/s	Velocity at 20 mA
4.7	Analog output 1	<b>Submenu</b>	
4.7.1	Output variable	<b>Selection:</b> Q / V / D	<b>Q:</b> throughput output at the analog output <b>V:</b> speed output at the analog output <b>D:</b> density output at the analog output
4.7.2	Calibration 4 mA	<b>Selection:</b> Set output current	The current output can be set via key functions and adjusted at the receiving end.
4.7.3	Calibration 20 mA	<b>Selection:</b> Set output current	The current output can be set via key functions and adjusted at the receiving end.



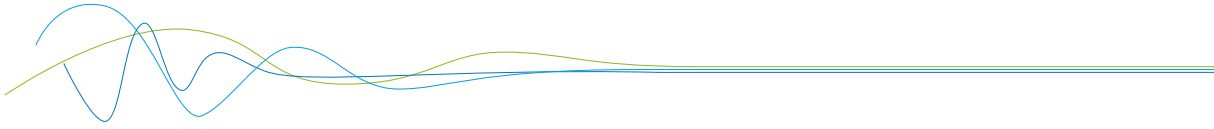


4.8	Analog output 2	<b>Submenu</b>	
4.8.1	Output variable	<b>Selection:</b> Q / V / D	<b>Q:</b> Throughput output at the analog output <b>V:</b> Speed output at the analog output <b>D:</b> Density output at the analog output
4.8.2	Calibration 4 mA	<b>Selection:</b> Set output current	The current output can be set via key functions and adjusted at the receiving end.
4.8.3	Calibration 20 mA	<b>Selection:</b> Set output current	The current output can be set via key functions and adjusted at the receiving end.
4.9	Analog output 3	<b>Submenu</b>	
4.9.1	Output variable	<b>Selection:</b> Q / V / D	<b>Q:</b> Throughput output at the analog output <b>V:</b> Speed output at the analog output <b>D:</b> Density output at the analog output
4.9.2	Calibration 4 mA	<b>Selection:</b> Set output current	The current output can be set via key functions and adjusted at the receiving end.
4.9.3	Calibration 20 mA	<b>Selection:</b> Set output current	The current output can be set via key functions and adjusted at the receiving end.

The current output can be calibrated that the zero point (output of 4 mA) is applied to the background noise of the measuring point. If the noise level decreases due to process changes, material caking or other aging effects, less than 4 mA can be output at the analog output. In this way, a zero offset can be detected (zero point drift).

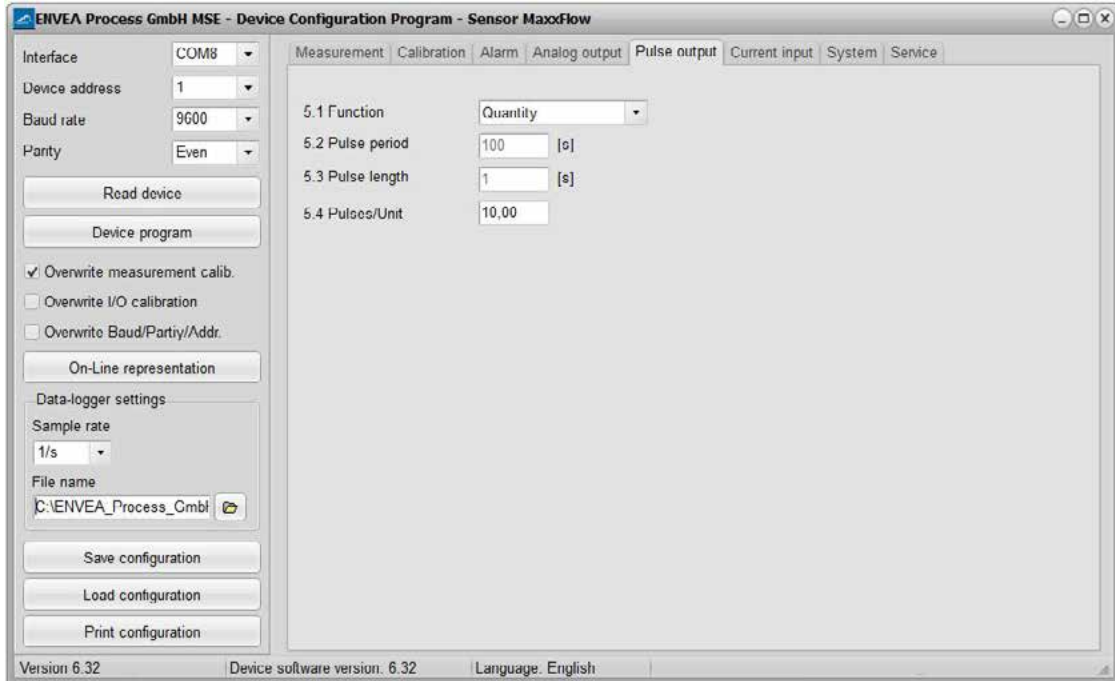
If this function is not required for process-technical reasons, the zero point must be set during calibration on a raw value of zero and / or the **4.1 MIN limit** must be set to 4 mA.

If the settings of the 4 mA or 20 mA signals are changed, the checkbox **Overwrite I/O calibration** must be set.



## 5. Pulse output

Passive signal for pulse cleaning or output of a totaliser.



### 5.1 Function

**Selection:** None / cleaning / quantity

**None:** no pulse output

**Cleaning:** possibility to control a solenoid valve for compressed air-fluid.

**5.4 Pulses / Unit** without function.

**Quantity:** the quantity is send as an impulse sequence to the output; Unit is like **1.2 Unit**.

**5.2 pulse period** and **5.3 pulse length** without function.

### 5.2 Pulse period

**Input:** 1 s ... 600 s

Time between two impulses

### 5.3 Pulse length

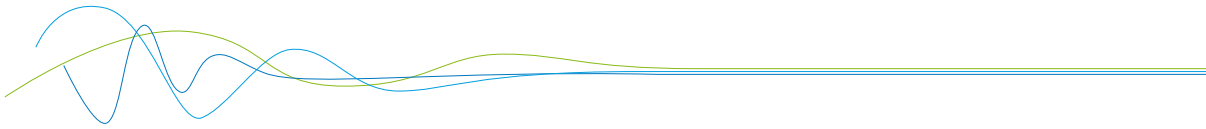
**Input:** 1 s ... 60 s

Length of impulse

### 5.4 Pulses/unit

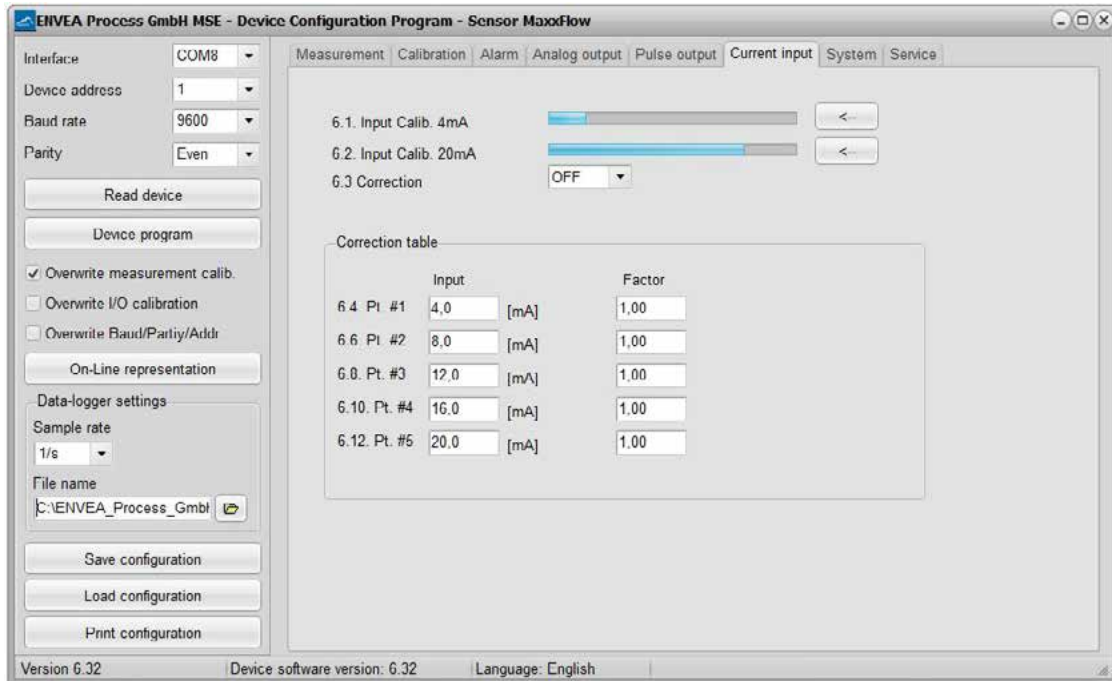
**Input:** 0.01 ... 99.9

Number of pulses per unit



## 6. Analog input

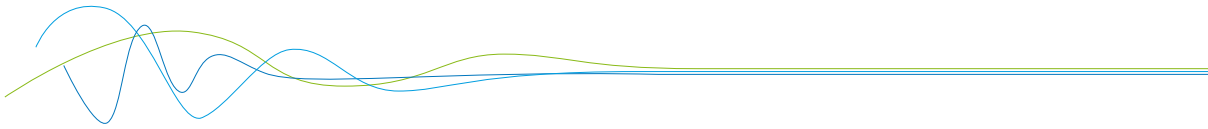
Possibility of autocorrection via external current signal.



### The connection of the current input is not galvanically isolated.

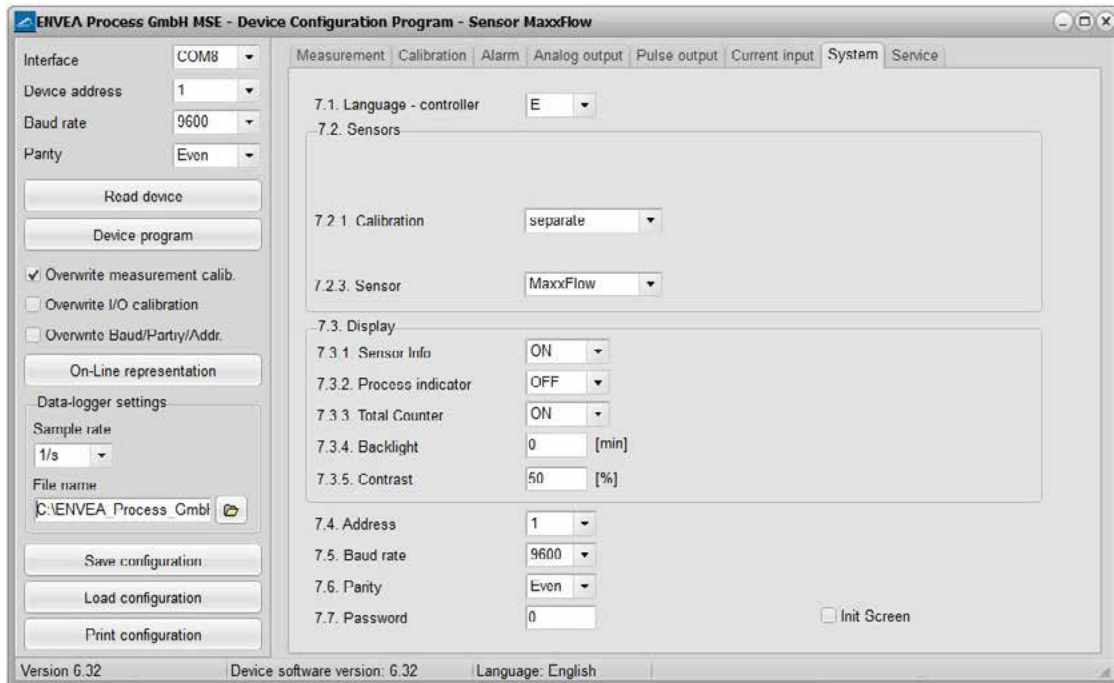
If the connection is incorrect, the CPU of the transmitter can be destroyed. An external galvanic isolation, by current disconnecter or similar shall be provided.

- |     |                         |  |  |
|-----|-------------------------|--|--|
| 6.1 | Input calibration 4 mA  | <b>Selection:</b><br>Calibrate 4 mA input  | The 4 mA signal must be read in via key function.                          |
| 6.2 | Input calibration 20 mA | <b>Selection:</b><br>Calibrate 20 mA input | The 20 mA signal must be read in via key function.                         |
| 6.3 | Correction              | <b>Selection:</b> ON / OFF                 | <b>ON:</b> correction is activated.<br><b>OFF:</b> correction is disabled. |
| 6.4 | P1-input                | <b>Input:</b> 4 mA ... 20 mA               | Enter the current strength to be used for correction.                      |
| 6.5 | P1-factor               | <b>Input:</b> 0.01 ... 10                  | Factor for adjustment of the actual measured value.                        |
| 6.n | Pn-input                | <b>Input:</b> 4 m A ... 20 mA              | Possibility of further current values and correction factor.               |
| 6.n | Pn-factor               | <b>Input:</b> 0.01 ... 10                  |  |

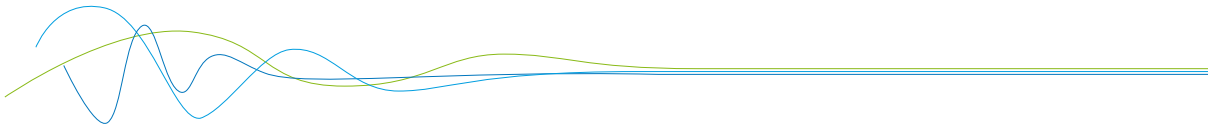


## 7. System

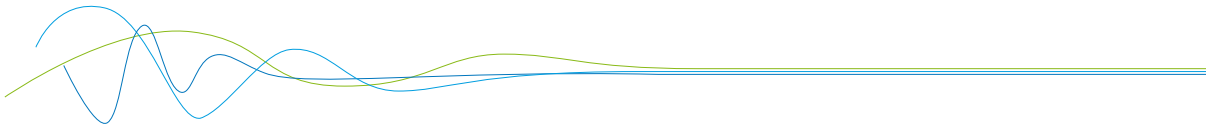
Basic adjustment of the system and transmitter.



7.1	Language	<b>Selection:</b> D / E / F	Language on the transmitter
7.2	Sensors	<b>Submenu</b>	
7.2.1	Calibration	<b>Selection:</b> EasyFlow / EasyFull / separate	<b>EasyFlow:</b> calibration via known throughput <b>EasyFull:</b> calibration via empty- and full-calibration <b>Separate:</b> calibration for ENVEA Process-trained personnel
7.2.2	Sensor	<b>Selection:</b> SolidFlow 2.0 / PicoFlow / ProSens / SpeedFlow 2.0 / Paddy / MaxxFlow HTC / DensFlow / SlideControl / M-Sens 2 / M-Sens 2 FD / M-Sens WR	The transmitter verifies the availability of registered sensors in the selected type, calculate the measurement values on this basis and signals if necessary corresponding errors. Incorrect sensor selection leads to a refusal to communicate.
7.3	Display	<b>Submenu</b>	
7.3.1	Sensor info	<b>Selection:</b> ON / OFF	<b>ON:</b> show info key on display <b>OFF:</b> hide info key
7.3.2	Process indicator	<b>Selection:</b> ON / OFF	<b>ON:</b> process indicators will be shown on display and via double blink on the DIN Rail. <b>OFF:</b> process indicators will not be shown.
7.3.3	Totalisator	<b>Selection:</b> ON / OFF	<b>ON:</b> totalisator will be shown on display. <b>OFF:</b> totalisator will be hide.

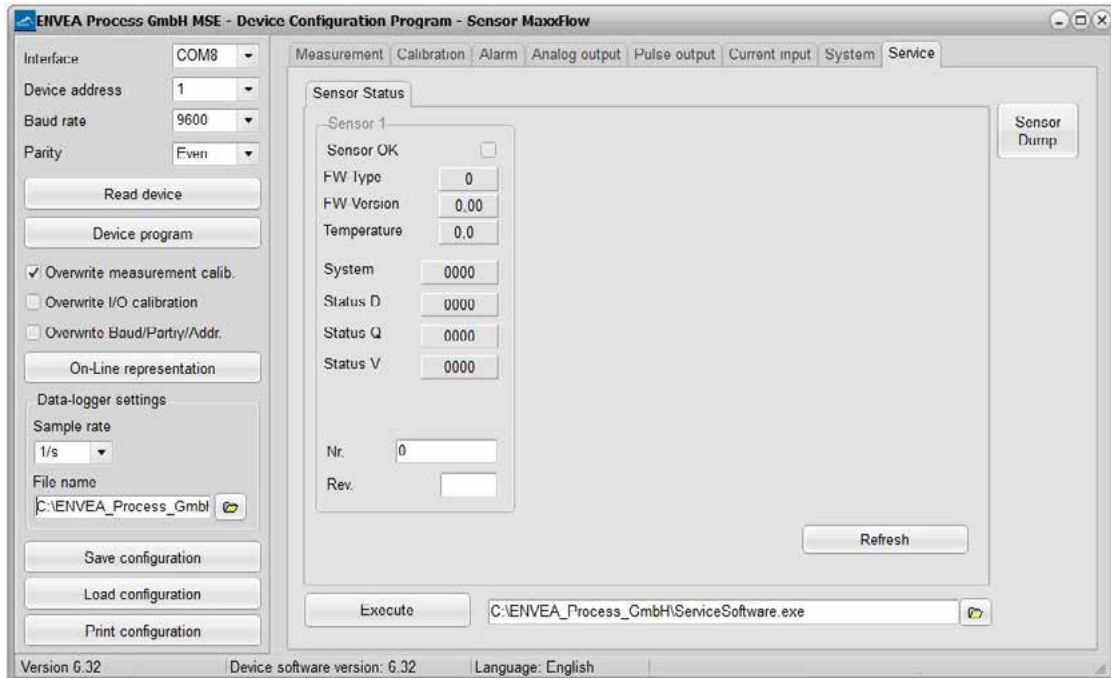


7.3.4	Backlight	<b>Input:</b> 0 ... 99 min	Lighting of the Display in minutes 0 = permanent lighting 99 = time selection for lighting
7.3.5	Contrast	<b>Input:</b> 0 ... 100 %	In the case of display exchange, the contrast can be changed via the PC software, if necessary.
7.4	Address	<b>Input:</b> 1 ... 255	ModBus address of transmitter, if operated on a PLC or PC as a slave.
7.5	Baud rate	<b>Selection:</b> 4800/9600/19200/ 38400 baud	Communication speed of the transmitter when this is operated as a ModBus slave on a PLC or a PC.
7.6	Parity	<b>Selection:</b> Even/Odd/None	The parity is set to <i>even</i> by default. The parity is important for further communication. A change of the parity is only valid after a restart of the power supply.
7.7	Password	<b>Input:</b> 0 ... 9999	0000 = no password XXXX = Four-digit password, which is queried when the menu is called up on the display. Automatic lock five minutes after the last display input.
7.8	Init Screen	<b>Selection:</b>	If Init Screen is selected, the Evaluation unit is reset to factory settings after the next voltage reset.



## 8. Service

Display on the sensor status



The status of each connected sensor is displayed in menu **8. Service**. FW type, FW version, temperature, serial number and possible hardware errors are automatically read and displayed.

### Only according to instructions from personnel of ENVEA Process:

If a detailed error analysis is necessary, a copy of all ModBus registers can be stored as a text file in the installation folder of the software by clicking on the **sensor dump**. This is only possible with the PC software. In addition, a software with deeper access to the sensors can be started via the PC software.

On the touchscreen only the information of the individual sensor will be shown.

## 7. Start-up procedure

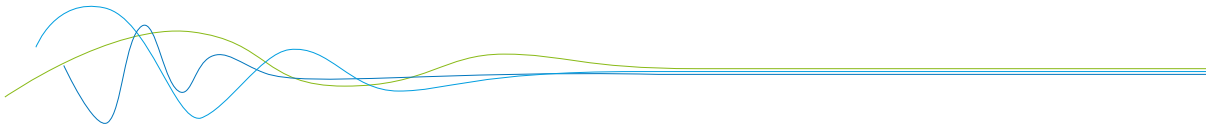
Upon delivery, the sensor is not calibrated to the product to be measured and must be parameterised when started up. During the process, the mass flows measured by the sensor are assigned the display values and output quantities required by the user.

The following points must first be checked:

- the correct connection between the sensor and the transmitter
- the correct build in situation (stepless materialflow)
- proper grounding of the sensor

First, it must be checked whether the correct sensor is selected under **System**. After this the measuring range as well as the physical units are entered under **1. Measurement**. The calibration of the system is then carried out under **2. Calibration**.

Under **7.2.1 Calibration** can be selected between different calibration variants. Depending on the possibility of sensor calibration, the sensor can be calibrated via a known throughput, an empty and a full calibration, or in single mode.



## 7.1 EasyFlow calibration

The EasyFlow calibration calibrates the sensor to a known throughput. First, the conveyor type must be selected under **2.1 Conveyor Type**, this ensures that the correct algorithms is in use.

Every calibration point should be use at different mass flow, so the sensor can calculate a linearisation between this points. If there is no opportunity for two different calibration points, the system use a virtual zero point.

For calibration under normal conditions with minimum two different calibration points, a stable mass flow must be set. The known mass flow is entered under **2.7.n P1-Value**. The RAW-values for this calibration point can be calibrate by directly reading the values under **2.7.n P1 Calibration**, out of the process.

If nonlinearities occur at different delivery rates, up to 5 additional support points can be selected under **2.2 Number of calibration points**.

The sensor also determines the quality of the measured values and decides independently whether the determined raw values are used for calibration and measurement. Based on the **2.6 Q-Limit**, the sensor decides which raw values are used for the calibration and which raw values are neglected. If **2.6 Q-Limit** is set to 100 %, the measured values are calculated over a fixed velocity and the active velocity measurement is deactivated.

**This gives the basic function of the device and the measured values are displayed.**

## 7.2 EasyFull calibration

For the EasyFull calibration it is necessary to proceed a zero calibration. The zero point should be calibrate with running process, but no material flow. Under this condition the zero point will be calibrate under **2.10.1 Empty**. After calibration the zero point, a full point must be calibrated. For the Full point the sensor has to fill up with the material to be measured and proceed a full calibration under **2.10.2 Full**. Assumed the **2.7 Fall height**, **2.5 Bulk density** and **2.6 Unit factor** has been set correctly, this should result a real flow indication now. The **2.6 Unit factor** must be used if the **1.2 Unit** isn't kg. The sensor calculate with kg/m<sup>3</sup>, so it must set a factor from the output unit to kg (example: 1 t → 1000 kg = factor 0.001).

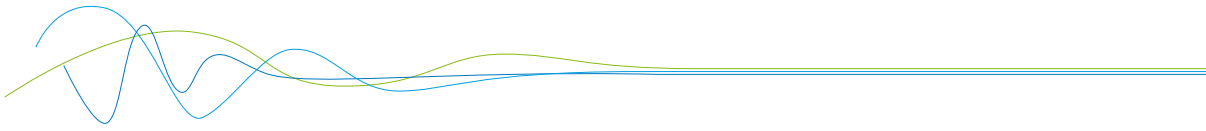
If there is still some deviation adjust the flow value from now on with the **2.2 Calibration factor [Kk]**. The calibration factor could be calculate as follow:

$$\frac{\text{Reference value}}{\text{MaxxFlow HTC indication}} \times \text{actual calibration factor} = \text{new calibration factor}$$

## 7.3 Separate calibration

For single calibration, density and velocity must be assigned a raw value. First, the real **2.6 Bulk density** in kg/m<sup>3</sup> must be specified. If the **1.2 Unit** deviates from kg, a conversion factor between the units must be deposited in **2.7 Unit factor**. The unit factor is calculated as follows:

$$1.2 \text{ Unit} = \text{t} = 1000 \text{ kg} = \text{Unit factor } 0.001$$



For the calibration of density and speed up to five calibration points can be set. Under **2.8.n Calibration point**, the loading of the sensor in % is now specified and assigned to the appropriate raw value in **2.8.n Raw value**.

Subsequently, the same procedure is performed with the speed calibration. Under **2.9.n Calibration point**, the current velocity is given in m/s and assigned to the raw value in **2.9.n Raw value**.

The calibration points must be entered manually. The raw values for density and velocity can be read in directly or determined in the software using the data logger function and then entered manually.

**This gives the basic function of the device and the measured values are displayed.**

If there is still some deviation adjust the flow value from now on with the **2.2 Calibration factor** [Kk]. The calibration factor could be calculate as follow:

$$\frac{\text{Reference value}}{\text{MaxxFlow HTC indication}} \times \text{actual calibration factor} = \text{actual calibration factor}$$



#### **Attention!**

Once the calibration procedure has been carried out, the calibration parameters must be confirmed before transfer. On the transmitter in the field housing, this is done by a security query when leaving the menu structure. In the software it is mandatory to set the checkmark **Overwrite calibration**. If the checkbox is set, the parameters can be transferred to the transmitter by clicking on **Program device**.

### **7.4 Datalogger function in the software**

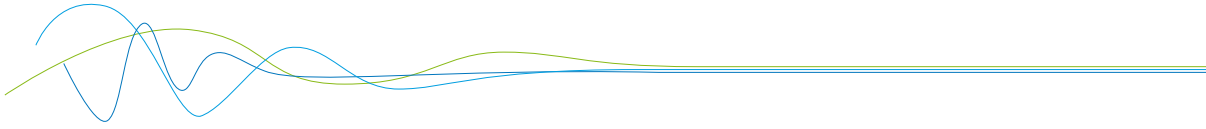
To determine the raw values via the Datalogger function of the PC software, a file path first must be stored. The file path and file name can be selected by clicking on the folder icon next to File name. If the file path is stored, the sample rate could still be changed, this is recommended for long recordings. For determining the raw values for a calibration point, the default setting of 1 (raw value) / second is recommended.

To start the datalogger, the **On-line representation** must be started. As soon as the checkbox on **Datalogger activated** is set in the on-line display, the recording starts and the log file is created in the background.

The data logger is only activated as long as the on-line representation is open. If the window of the on-line display or the entire software is closed, the data recording is aborted. If the data logger is activated, a message window also appears before the on-line representation is closed.

For an evaluation of the recorded log file, it must be opened with Excel or a similar program. In order to determine the appropriate raw value for a calibration point, the mean value must be determined from the period of the reference extraction. The mean value can be calculated by Excel with the function =AVERAGE ( ). The calculated mean value of the raw value will be entered in the box next to the raw value in the configuration software. In order to transmit the determined parameters to the Evaluation unit, the check mark **Overwrite calibration** must be set.

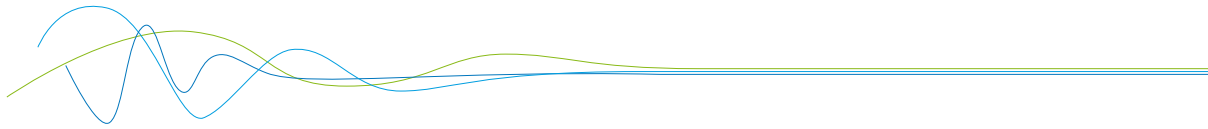




## 7.5 Adjusting the measurement values

The system's additional functions can be set in the following menus:

Alarms	Values for flow rate lower or upper limits can be set in <b>3. Alarm</b> . A sensor monitoring alarm can also be activated here.
Analogue output	The assignment of the analogue output values takes place in <b>4. analogue output</b> . Upper and lower limit of the permitted current and the fault current are set here. The analogue output is an active signal. In the field housing version, analogue outputs 2 + 3 are provided for the MaxxFlow HTC. All other sensors provide their 4 ... 20 mA signal to analogue output 1.
Pulse output	Under <b>5. Pulse</b> output there is the possibility of using different impulses. A cleaning pulse can be used for a pneumatic cleaning on the sensor. For an external totaliser output there are impulses, which correspond to a specific conveyed mass. The pulse duration is 50 Hz, a faster query cannot be guaranteed. An internal totaliser function integrates the mass flow over time. The pulse output is an open collector and need an active power supply for pulsing.
Current input	Various input currents can be stored under <b>6. Current input</b> . When the current is applied, the corresponding correction factor is applied to the measured value. The input current also must be adjusted here.
System	In <b>7. System</b> , functions such as selection of the menu language, the number of connected sensors, the display screen or ModBus addressing and speed are summarized.
Totaliser	The entire flow volume since the last totaliser reset can be read with the totaliser function. A reset can be performed directly via the display by pressing the [R] symbol.
Empty calibration	If a zero shift occurs, it is not advisable to set a new zero point directly. If a new zero point is set again and again, this could lead to deviations in the measuring signal. A zero offset is in most cases a process problem, for example caking in the measuring tube. For processes with caking materials, there is the possibility of a cleaning flange. Please get in contact with ENVEA Process for more information.



## 8. Error signalling

For monitoring the availability a wide range of functions for self-diagnostics were integrated, in order to signal various errors:

### 1. Fatal Error (ERR):

Fatal Errors (ERR) always set the current output to the set alarm value. Technical problems or problems with the complete system are displayed on the touchscreen. An ERR require every time a replacement or repair of a component:

- Failure of the communication to a sensor (sensor failure)
- Failure of a subcomponent of a sensor (temperature monitoring, heating control, memory, data consistency etc. on the sensor)
- Inconsistency of signal paths in the sensor (the amplifier stages, DC offsets)

### 2. Process indicators (PROC):

Process indicators (PROC) are merely a violation of the set parameters and are to be understood as information to improve the measuring process. Process indicators are not output at the current output, but can be displayed on the display as well as optionally on the relay:

- Temperature instability in the sensor due to thermal stress from outside (over-temperature, low temperature)
- Overload of the sensor caused by material flow (too much, too little)

**Process indicators** show if necessary temporary appearing oddities in the process, which can be avoided with a better adjustment of sensor parameters or conveying parameters. They thus deliver more an indication of potential for optimization at the measuring point.

Type of fault	Display (field housing)	Run-LED (DIN Rail)	Relay (optional)	Current output
<b>No fault</b>	Sensor status OK on the information display (Button [I])	Single flash every second	Normal state	4 ... 20 mA
<b>PROC (process indicators)</b>	Display with indicator code in the bottom display line; advanced information on key [I]	Double flash every second	Activated, when Relais-Alarm-Option PROC is chosen	4 ... 20 mA
<b>ERR (fatal errors)</b>	Display with error code in the bottom display line; advanced information on key [I]	Triple flash every second	Activated, when Relais-Alarm-Option PROC <b>or</b> ERR is chosen	2 mA (or for the current output adjusted, chosen alarm value)

**Error codes:** Error and indicator codes are composed of the letter E (ERR = error), P (PROC = process indicator) and a three-digit hexadecimal value from “000” to “FFF”. From the displayed code the cause can be investigated.

**Time-out error:** In order not to complicate the start up of a process plant by process- or heating status errors, nonfatal errors will be signalled only after a period of about 5 minutes after a reset of the measuring system at the outputs. The time-out period is visible in a small “t” in the left upper corner of the display (field housing only).

## 9. Maintenance



### Warning!

- Switch the power supply off before performing any maintenance or repair work on the measuring system. The transport pipe must not be operational when replacing the sensor.
- Repair and maintenance work may only be carried out by electricians.
- The system requires no maintenance.

## 10. Warranty

On condition that the operating conditions are maintained and no intervention has been made on the device and the components of the system are not damaged or worn, the manufacturer provides a warranty of 1 year from the date of delivery.

In the event of a defect during the warranty period, defective components will be replaced or repaired at ENVEA Process plant free of charge as considered appropriate. Replaced parts will become ENVEA Process property. If the parts are repaired or replaced at the customer's site at its request, the customer must pay the travel expenses for ENVEA Process service personnel.

ENVEA Process cannot accept any liability for damage not suffered by the goods themselves and in particular ENVEA Process cannot accept liability for loss of profit or other financial damages suffered by the customer.

## 11. Troubleshooting

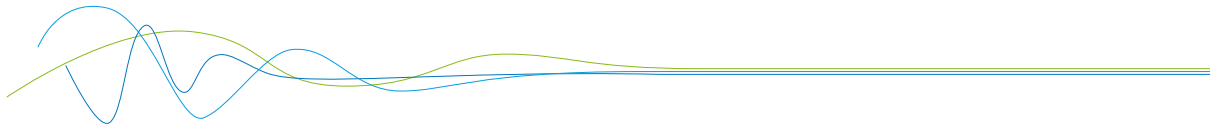


### Warning!

The electrical installation must be carried out by qualified, authorised persons.

Problem	Cause	Solution
System does not operate.	No power. Cable break. Defective device.	Check power supply. Check for connection and cable break. Contact ENVEA Process.
Outputs are the wrong values.	Incorrect calibration.	Recalibrate the sensor.
Sensor error.	Sensor connection incorrect. Sensor failure.	Check wiring connections. Replace sensor.

**Do not open sensor electronics. To do so will make the warranty void!**

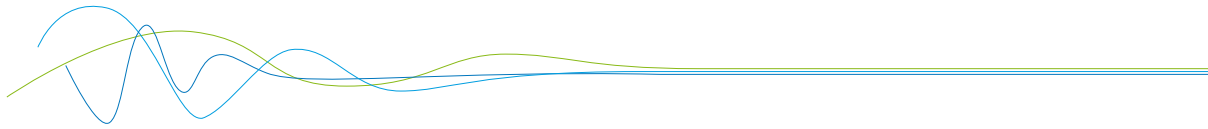


## 11.1 Error codes system

Typ	CODE	Transmitter flashing	Current output	Cause	Action
ERR	S:E0002	3	2 mA	Defective data bus	Turn power off / on. If not helpfully sensor exchange.
ERR	S:E0004	3	2 mA	Defective data bus	Turn power off / on. If not helpfully sensor exchange.
ERR	S:E0010	3	2 mA	Loading measuring is not plausible	Turn power off / on. If not helpfully sensor exchange.
ERR	S:E0020	3	2 mA	Defective memory	Turn power off / on. If not helpfully sensor exchange.
ERR	S:E0040	3	2 mA	Defective temperature measurement	Turn power off / on. If not helpfully sensor exchange.
ERR	S:E0080	3	2 mA	Defective parameter memory	Turn power off / on. If not helpfully sensor exchange.
ERR	S:E0100	3	2 mA	Parameter table not readable	Turn power off / on. If not helpfully sensor exchange.
ERR	S:E0200	3	2 mA	Parameter table not written	Turn power off / on. If not helpfully sensor exchange.
ERR	S:E0400	3	2 mA	Reset request not execute	Turn power off / on. If not helpfully sensor exchange.
PROC	S:P0800	2	4...20 mA	Measuring value below Q-Limit	Adjust Q-Limit, recalibrate sensor, proof process
PROC	S:P8000	2	4...20 mA	No temperature compensation	New temperature compensation from ENVEA Process needed

## 11.2 Error codes density

Typ	CODE	Transmitter flashing	Current output	Cause	Action
PROC	D:P0001	2	4...20 mA	Measuring value high limit	Adjust alarm value
ERR	D:E0002	3	2 mA	Defective receiver	Turn power off / on. If not helpfully sensor exchange.
PROC	D:P0004	2	4...20 mA	Overrange	Check sensor parameter, check process
ERR	D:E0008	3	2 mA	Static signals	Turn power off / on. If not helpfully sensor exchange.
ERR	D:E0010	3	2 mA	Defective receiver	Turn power off / on. If not helpfully sensor exchange.
PROC	D:P0020	2	4...20 mA	Measuring range underflow	Check sensor parameter, check process
PROC	D:P0040	2	4...20 mA	Measuring range overflow	Check sensor parameter, check process
ERR	D:E0080	3	2 mA	Defective transmitter	Turn power off / on. If not helpfully sensor exchange.
PROC	D:P0100	2	4...20 mA	Low temperature, Warning: unreliable output measuring value	Proof heater, wait for heating time, insulate cold sources
PROC	D:P0200	2	4...20 mA	High temperature, Warning: unreliable output measuring value	Insulate hot sources
PROC	D:P0400	2	4...20 mA	No movement in the material	Check for caking, check zero point
PROC	D:P0800	2	4...20 mA	Very dynamic measuring value	Check process
PROC	D:P1000	2	4...20 mA	Negative measured value (zero drift)	Check process, check zero point, check for caking



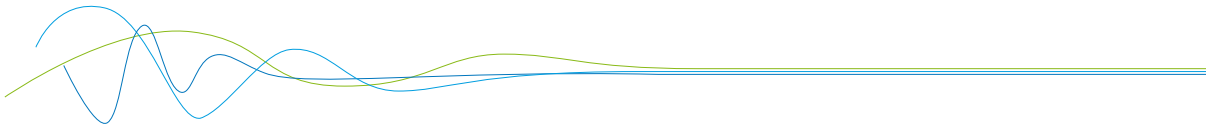
### 11.3 Error codes velocity

Typ	CODE	Transmitter flashing	Current output	Cause	Action
ERR	V:E0001	3	2 mA	Defective internal amplifier (DC Offset)	Turn power off / on. If not helpfully sensor exchange.
PROC	V:P0002	2	4...20 mA	Low signal	Check sensor parameter, check process
ERR	V:E0004	3	2 mA	Defective velocity electrode	Turn power off / on. If not helpfully sensor exchange.
ERR	V:E0008	3	2 mA	Defective velocity electrode	Turn power off / on. If not helpfully sensor exchange.
ERR	V:E0010	3	2 mA	Asymmetric velocity signal	Check parameter, turn off velocity measuring, exchange sensor
PROC	V:P0020	2	4...20 mA	Inverted input signal on one channel	Check parameter, turn off velocity measuring, exchange sensor
PROC	V:P0040	2	4...20 mA	Overrange	Check parameter, check process
PROC	V:P0080	2	4...20 mA	Overrange	Check parameter, check process
PROC	V:P0100	2	4...20 mA	Bad result single measurement	Check parameter, turn off velocity measuring, check process
PROC	V:P0200	2	4...20 mA	Periodic speed signal	Check parameter, turn off velocity measuring, check process
PROC	V:P0400	2	4...20 mA	Too high speed, not measurable signal	Check parameter, turn off velocity measuring, check process
PROC	V:P1000	2	4...20 mA	Negative speed measurement	Check parameter, turn off velocity measuring, check process
PROC	V:P2000	2	4...20 mA	Empty buffer	Wait for some minutes otherwise turn power off / on

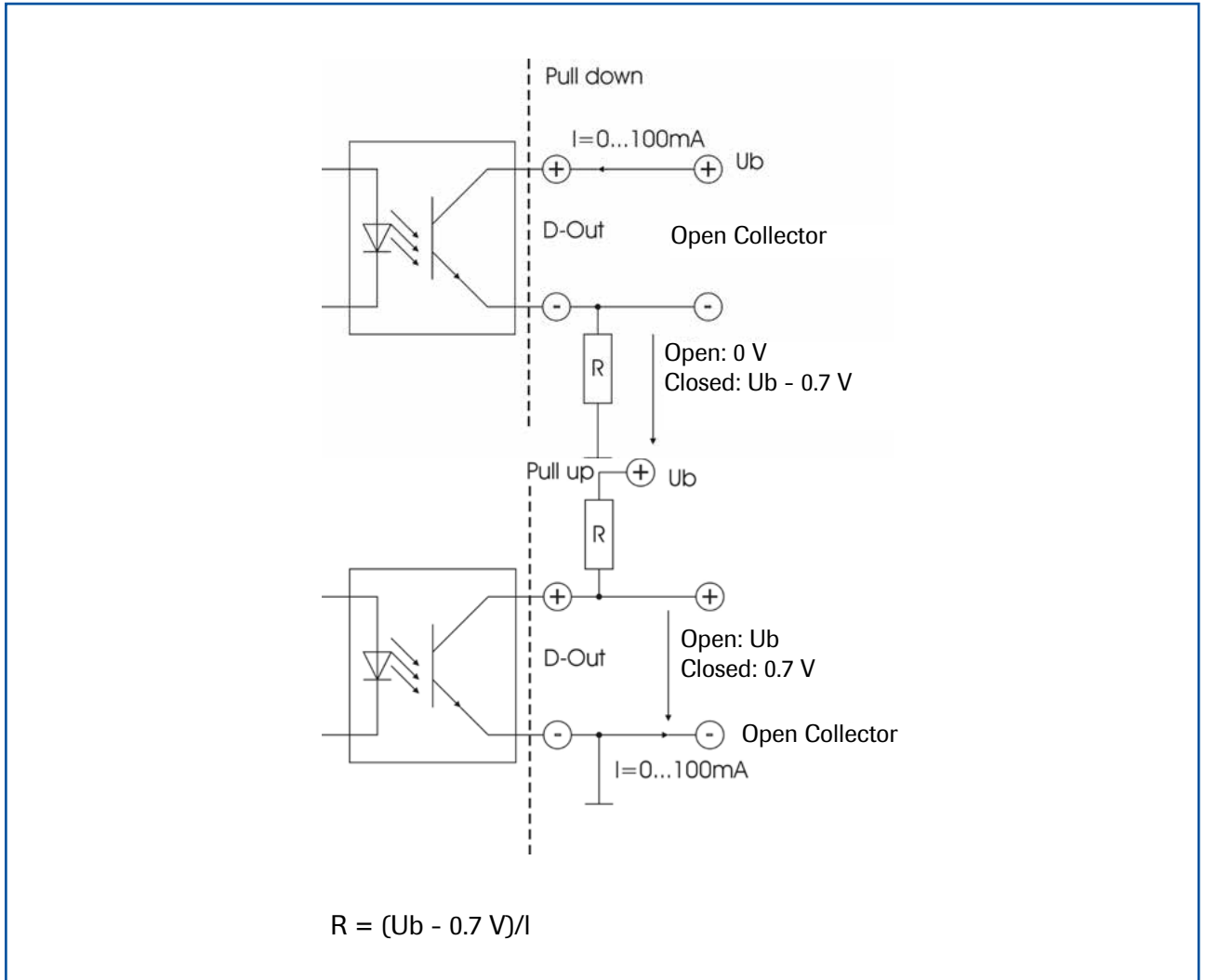
### 11.4 Error codes flow

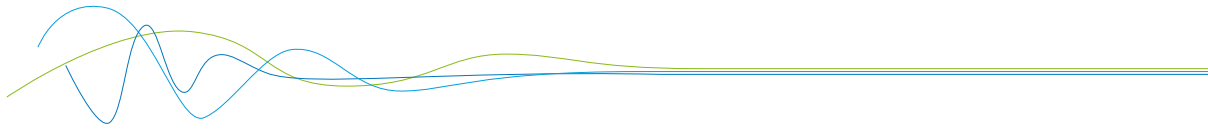
Typ	CODE	Transmitter flashing	Current output	Cause	Action
ERR	Q:E0080	3	2 mA	Unsynchronous measurement signal	Turn power off / on. If not helpfully sensor exchange.
ERR	Q:E0100	3	2 mA	No material movement available	Check parameter, check process
ERR	Q:E0200	3	2 mA	No loading measurement	Check loading parameter
PROC	Q:P0400	2	4...20 mA	No measured velocity	Check velocity parameter
PROC	Q:P1000	2	4...20 mA	Loading and speed show different status of motion detection	Check loading and velocity parameter
PROC	Q:P2000	2	4...20 mA	Empty buffer	Wait for some minutes otherwise turn power off / on

**A detailed error description and following troubleshooting can be carried out by trained ENVEA Process technicians.**



## 12. Connection example digital output





### 13. Technical data

<b>Sensor</b>	
Housing material	St52, powder coated (optional stainless steel 1.4571) NW 80 / 100 / 150 / 200, flange according EN 1092-1 / PN 10
Inner pipe	Ceramic (Al <sub>2</sub> O <sub>3</sub> )
Protection category	IP65, ATEX: Cat. 3D
Operating temperature	Sensor pipe: -20 ... + 120 °C - Sensor electronic: 0 ... + 60 °C
Max. working pressure	1 bar (optional 10 bar)
Working frequency	88 kHz
Transmitter power	Max. 2 mW
Weight	Depending to model
Accuracy	+/- 1 ... 3 % (based on end of measuring range and calibrated material)
<b>Field housing transmitter</b>	
Power supply	110/230 V, 50 Hz (optional 24 V DC)
Power consumption	20 W / 24 VA
Protection category	IP65 to EN 60 529/10.91
Ambient operating temperature	-10 ... +45 °C
Dimensions	258 x 237 x 174 (W x H x D)
Weight	Approx. 2.5 kg
Interface	RS 485 (ModBus RTU) / USB
Cable glands	3 x M20 (4.5 - 13 mm Ø)
Connection terminals cable cross-section	0.2 - 2.5 mm <sup>2</sup> [AWG 24-14]
Current output	3 x 4 ... 20 mA (0 ... 20 mA), load < 500 Ω (Active)
Relay contact	Max. rated load: 250 V AC Max. peak current: 6 A Max. rated load 230 V AC: 250 VA Max. breaking capacity DC1: 3/110/220 V: 3/0.35/0.2 A Min. switching load: 500 mW (10 V/5 mA)
Data backup	Flash memory
Pulse output	Open Collector - max. 30 V, 20 mA
<b>DIN Rail transmitter</b>	
Power supply	24 V DC ± 10 %
Power consumption	20 W / 24 VA
Protection type	IP40 to EN 60 529
Ambient operating temperature	-10 ... +45 °C
Dimensions	23 x 90 x 118 (W x H x D)
Weight	Approx. 172 g
Interface	RS 485 (ModBus RTU) / USB
DIN Rail fastening	DIN 60715 TH35
Connection terminals cable cross-section	0.2 - 2.5 mm <sup>2</sup> [AWG 24-14]
Current output	1 x 4 ... 20 mA (0 ... 20 mA), load < 500 Ω (Active)
Relay contact	Max. rated load: 250 V AC Max. peak current: 6 A Max. rated load 230 V AC: 250 VA Max. breaking capacity DC1: 3/110/220 V: 3/0.35/0.2 A Min. switching load: 500 mW (10 V/5 mA)
Data backup	Flash memory
Pulse output	Open Collector - max. 30 V, 20 mA



**ENVEA Process GmbH**

Gutedelstraße 31 · 79418 Schliengen (Germany)

Fon +49 7635 827248-0 · Fax +49 7635 827248-48 · www.envea.global

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