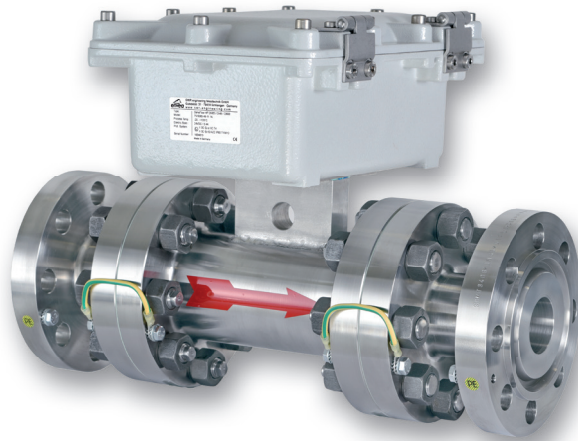




OPERATING INSTRUCTIONS

DensFlow

FLOW MEASUREMENT FOR HIGH PRESSURE DENSE PHASE CONVEYING



For the 1st use of the sensor, correct sensor type should be selected via the screen or the software. Software must be installed if needed.

1. SOFTWARE INSTALLATION

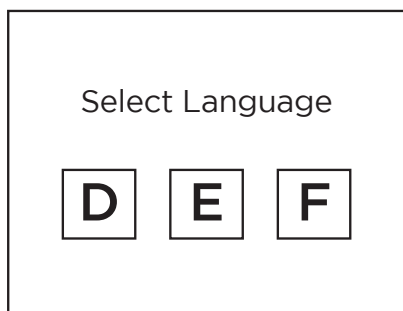
If you want to communicate with our sensor using our dedicated software, you need to download the latest version on our website and install it.

→ <https://www.envea.global/solutions/process-optimization/dahs-software/>

It might also be necessary to install drivers, also available on our website.

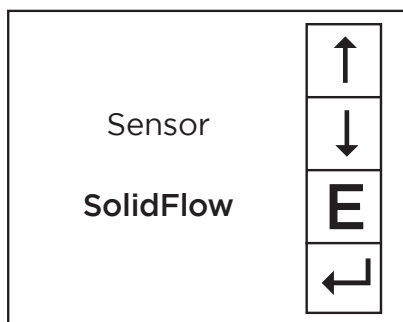
2. MSE 300-FH (WITH SCREEN)

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.



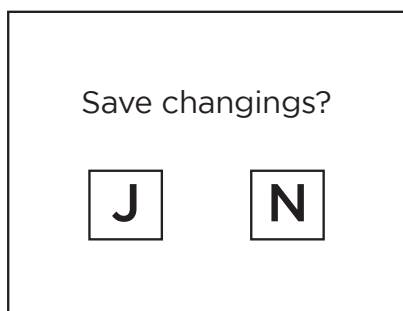
Initialization screen when the Evaluation unit in the field housing started first time.

Selection of the menu language: Deutsch, English, Français.



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

SolidFlow 2.0, Paddy, PicoFlow, MaxxFlow HTC, DensFlow, SpeedFlow 2.0, SlideControl 2.0, ProSens, M-Sens 2, M-Sens 3, M-Sens WR, M-Sens WR2.

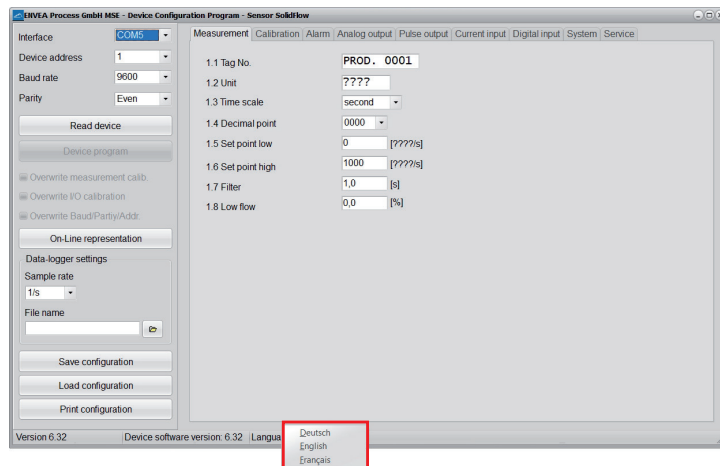


If any data has been changed, the change will only be taken into account when you exit the complete menu structure and answer [Yes] when asked if you wish to save the changes. Afterwards the start page appears.

3. MSE 300-DR / -DR2 (NO SCREEN)

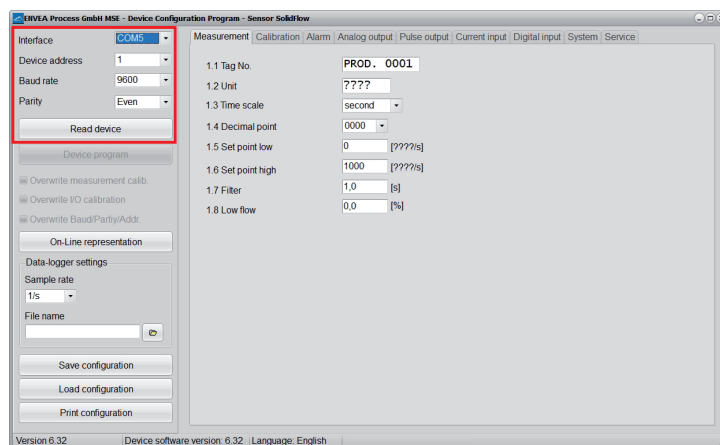
Our dedicated software must be used to connect to the sensor evaluation unit.

Select software language



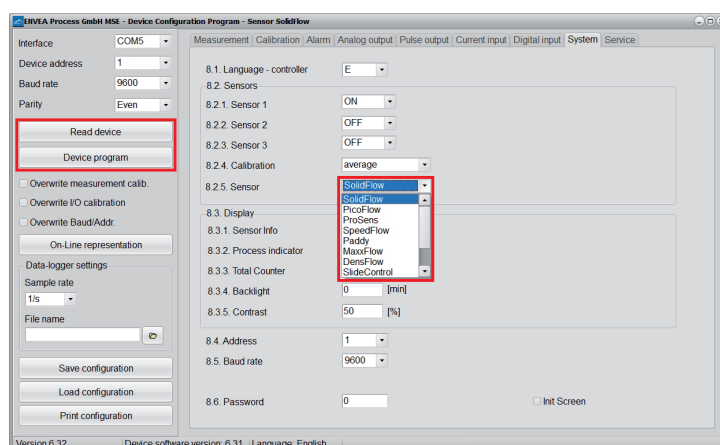
Right click on „Sprache/Language/ Languge“ and select desired language.

Connect to sensor



Select the correct COM port and connect to the device using the „read device“ button.

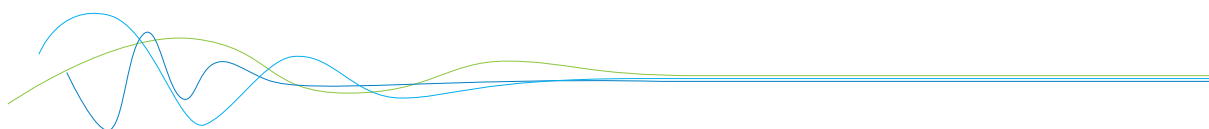
Select correct sensor



In the menu „System“, under „Sensor“, the correct sensor must be selected.

After selecting the sensor, check the box „Overwrite measurement calib.“ and confirm with the button „Device program“.

For more informations and details, please refer to the user manual of the sensor.



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1. System overview

The DensFlow system is available in different variants:

- DensFlow (up to 40 bar)
- DensFlow HP (up to 85 bar)

The variants of the sensor are just different in housing, cause of different pressure specification. The handling of the sensor will be the same. All variants will be also available for Ex-Zones.

A measuring point (max. Ex3GD) consists of the following components:

- MSE 300 in the DIN Rail housing or field housing
- Sensor for installation in the pipeline
- C1-Box (**optional**)

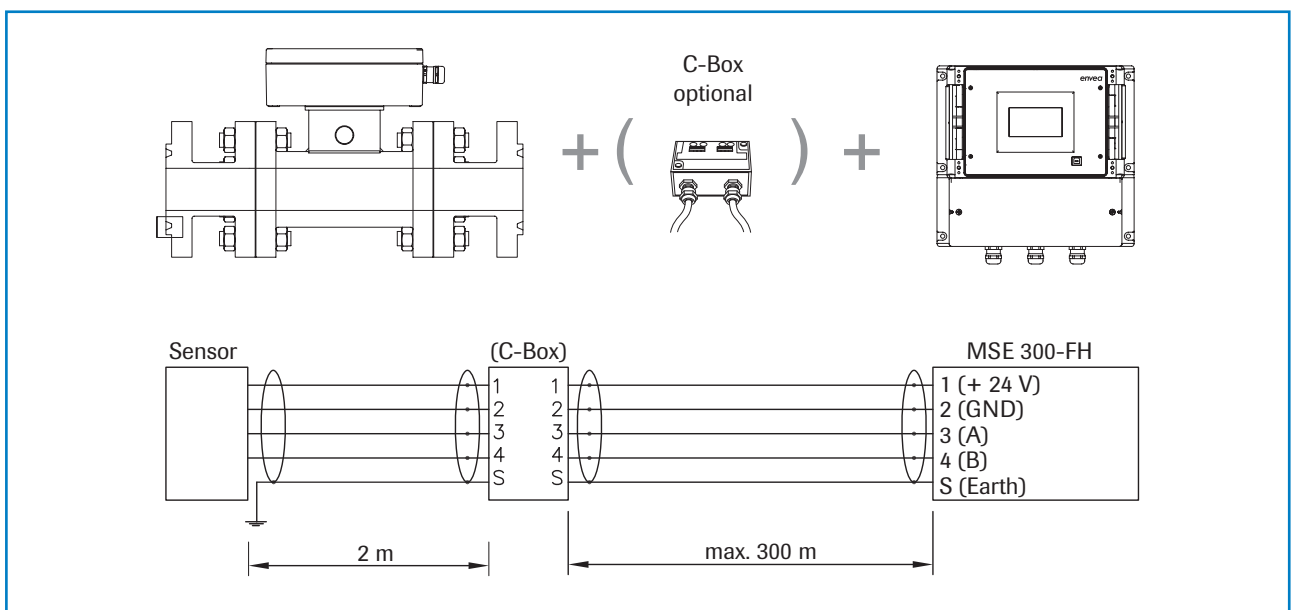


Fig. 1: Overview with C1-Box and MSE 300-FH

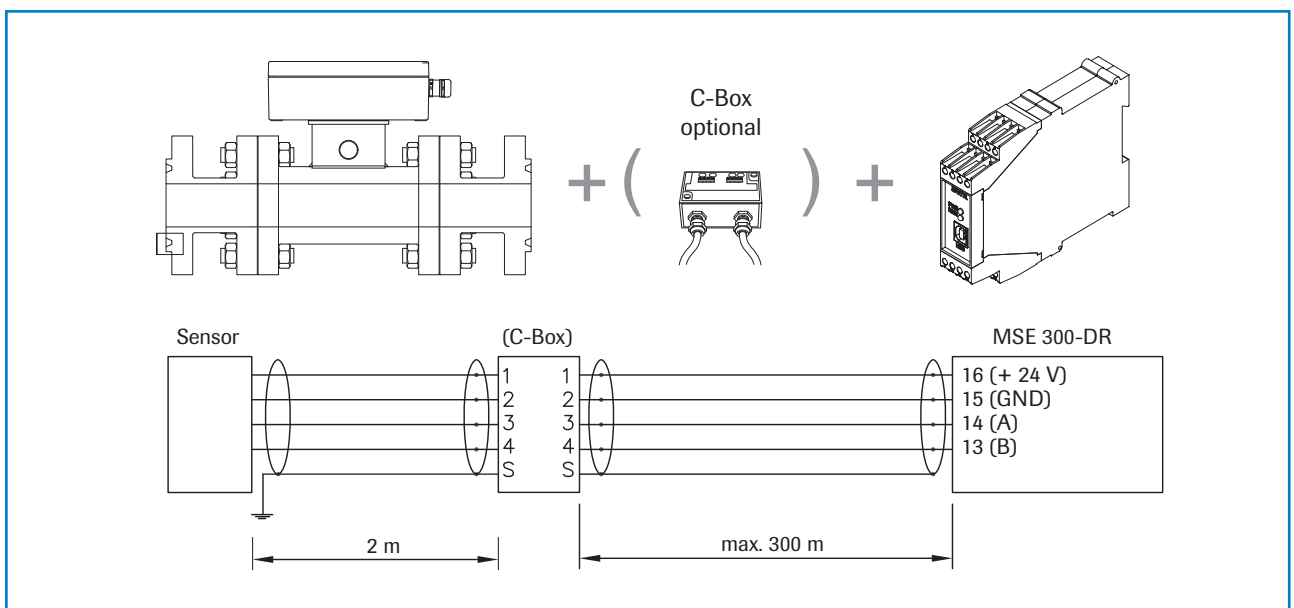


Fig. 2: Overview with C1-Box and MSE 300-DR

An IECEx measuring point consists of the following components:

- Evaluation Unit (MSE 300) in the DIN Rail housing or in the field housing
- Barrier for Ex-Zone separation
- Sensor for installation in the pipeline

Description for cable length

In gas group IIB, the IPB20 isolator can be installed up to 600 m from the sensor.

In gas group IIC, the IPB20 isolator can be installed up to 150 m from the sensor.

Therefore it is recommended to use a cable according to DIN EN 6007914.

Anyway the connection parameter must reach:

Um: 250 V	Po: 2.35 W
Uo: 16.8 V	for IIB / IIC: Lo: 453 μ H, Co: 2.29 μ F
Io: 560 mA	for IIC: Lo: 113 μ H, Co: 390 nF

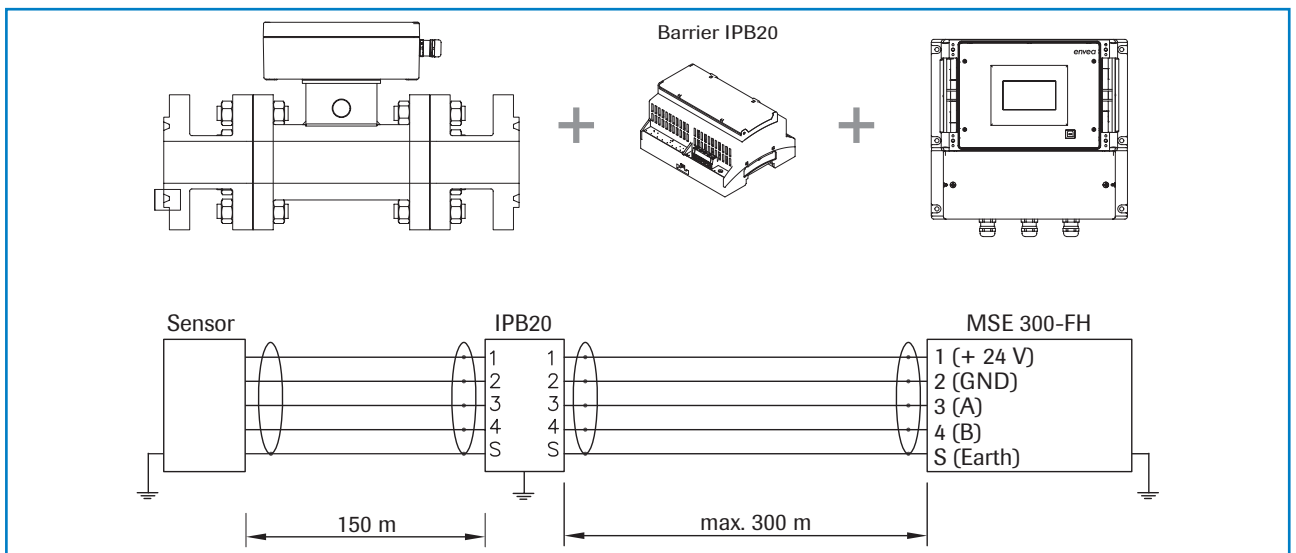


Fig. 3: Overview with barrier and MSE 300-FH

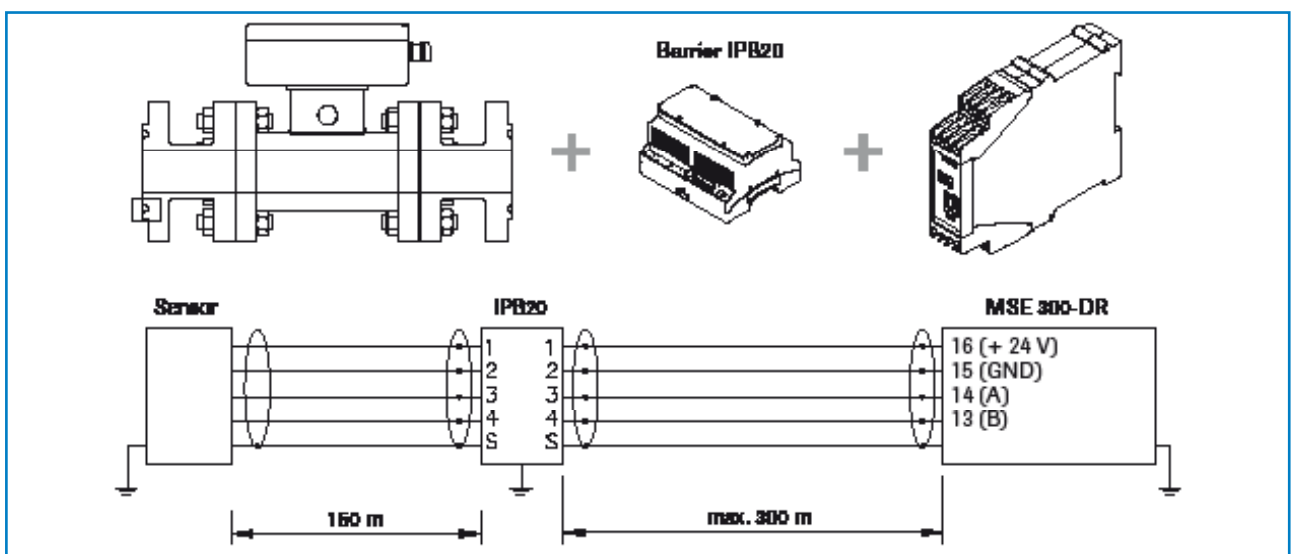


Fig. 4: Overview with barrier and MSE 300-DR

2. Function

- The DensFlow and his variants has been specially developed for the volume measurement of solids conveyed in dense flow under high pressure, especially for use in coal gasification plants.
- DensFlow and his variants are 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 velocity is done by correlation. Two capacitive / triboelectric sensors are used to generate the correlation signals.
- A complete measuring point for Ex-Zones consists of the sensor (measuring pipe), a barrier (IPB20) and an Evaluation unit.
- The measuring tube and the mounting flanges must not be dismantled under any circumstances

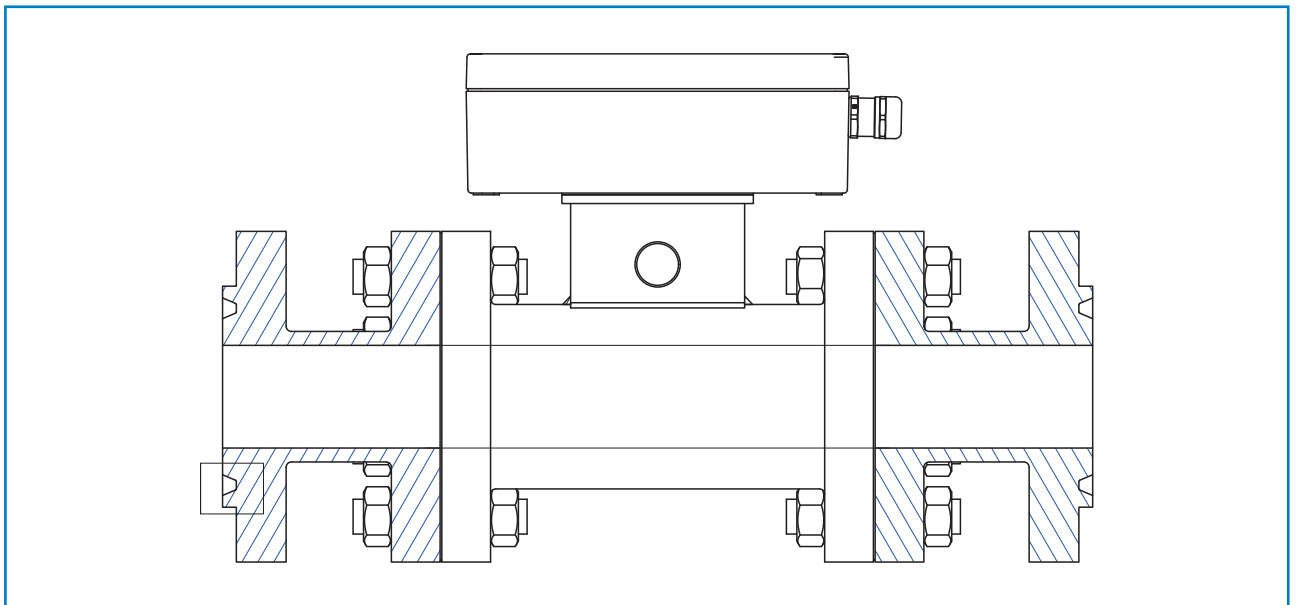


Fig. 5: Cross section sensor

3. Safety

The barrier (IPB20) and the DensFlow measuring system has a state of the art, reliable design. It was tested and found to be in a perfectly safe condition when leaving the factory. Nevertheless, the system components may present dangers to personnel and items if they are not operated correctly.

Therefore, the operating manual must be read in full and the safety instructions followed to the letter.

If the device is not used correctly for its intended purpose the manufacturer's liability and warranty will be void.

3.1 Normal use

- The measuring system may only be installed in metallic pipes to measure the medium passing through them. It is not suitable for any other use or measuring system modifications.
- Only genuine spare parts and accessories from ENVEA Process may be used.

3.2 Identification of hazards

- Possible dangers when using the measuring system are highlighted in the operating instructions with the following symbols:



Warning!

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

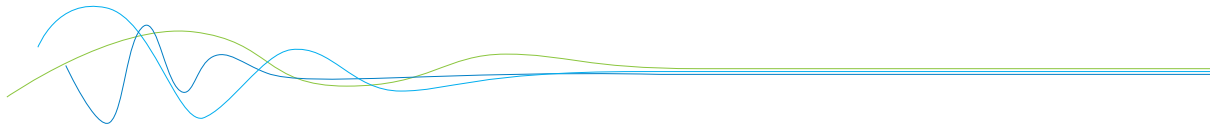


Attention!

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

3.3 Occupational and operational safety

- ① • The measuring system must be installed by trained and authorised personnel only.
- ⚠ • Protective equipment must be worn to avoid injuries caused by possible sharp edges on the measuring device.
- ① • When using a cable with more than 4 cores, unused, open cores may cause sparking. Failure to comply with the specified connection parameters of the cable will result in loss of intrinsic safety. To prevent this, it is mandatory to use a 4-core shielded cable. Always ensure that the connection parameters of the cable are within the specification (Li, Ci). The shield of the cable must not be connected to the housing under any circumstances.
- ⚠ • When installed in an Ex zone, there is an increased risk of explosion, so it should always be ensured that there is no Ex zone when carrying out installation work.
- ⚠ • Improper installation work leads to an increased risk of explosion. The device must always be installed using the process-related seals and observing the torques. Mechanical stresses are to be avoided, for example through supported installation.
- ⚠ • In case of improper assembly, there is an increased risk of explosion due to escaping dusts.
- ⚠ • When installing the measuring device, there is a risk of injury due to crushing. To avoid this, installation work must always be carried out by two people.
- ① • Improper mechanical stress (e.g. torsion) can cause damage to the device. To avoid this, the device should always be installed in accordance with all the instructions in the operating manual. The measuring device should also not be exposed to any vibrations if possible.



- ⚠ • If the device is operated under high pressured conditions, there is a risk of explosion. When cleaning or blowing out the pipe and when transporting material, always ensure that the permissible pressure according to the DGRL is not exceeded.
- ⚠ • Due to the process, hot components on the device can cause burns. It is strongly recommended to wear the appropriate protective equipment and to let the device cool down before working on it.
- ⓘ • Improper use of the device will result in a high risk to system safety, therefore the device must only be used as specified in the associated documentation.
- ⚠ • Make sure that the system is in a depressurised state during all maintenance, cleaning and inspection work on the pipelines or on the components of the device.
- ⚠ • Switch off the power supply for all maintenance, cleaning or inspection works on the sensor or on components. Follow the notes of the chapter maintenance.
- ⓘ • Caution, if welding is required on the pipe, remove sensor.
- ⓘ • 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.

⚠ **Risk of explosion because of installation in Ex zone**

The IPB20 device is associated intrinsically safe equipment and may only be installed and operated outside of the Ex zone.

- Make sure that the device is installed and operated in an explosion-free environment.
- For use in Ex zone 1/21 or 2/22 it is required to use the variant with flameproof encapsulation.

⚠ **Risk of explosion, electric shock or damage due to incorrect or non-existent earthing**

Incorrectly connected equipotential bonding can result in charges that can lead to explosions in an explosive atmosphere, electric shock or device damage.

- Connect equipotential bonding at all points provided on the device components.
- For all work on the device described in these operating instructions, ensure that the equipotential bonding is connected.
- Ensure that there is an earth connection via the power supply.
- Carry out regular checks of the earthing connections for correctness.

⚠ **Risk of explosion from electrostatic charge when cleaning or blowing out**

- No dangerous electrostatic charges may occur during cleaning and blowing out.

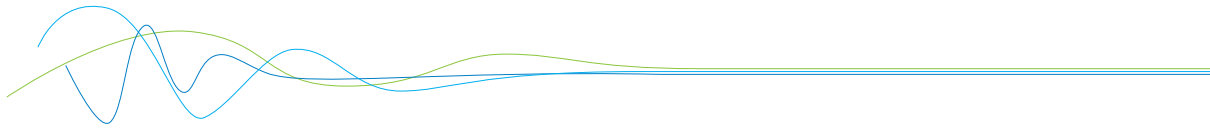
ⓘ **Standardization**

- The provisions of IEC / EN 60079-17 must be observed during commissioning, installation and maintenance.

⚠ **Risk of explosion or electric shock due to improper installation work**

Improper assessment of the installation site and all other installation work in the hazardous area can cause serious damage to people and the company.

- Installation, commissioning, maintenance and testing may only be carried out by qualified personnel who have knowledge of the rules and regulations for potentially explosive areas, in particular:
 - types of protection
 - installation rules
 - zoning
 - applicable standards (for IPP20 especially EN60079-14)
 - local work safety regulations



⚠ Risk of electric shock when opening the evaluation unit

- Only open the housing if the system has previously been disconnected from the power supply.

❗ Damage to the device due to improper mechanical stress

Improper handling (all mechanical stresses, e.g. torsion) can no longer guarantee pressure tightness.

- Tighten screw connections only with the torques specified in the operational instructions.

⚠ Risk of crushing with risk of injury when opening the lid

- Make sure to wear suitable protective equipment (e.g. gloves).

⚠ Risk of injury from sharp edges or splinters

- Make sure to wear suitable protective equipment (e.g. helmet, glasses, gloves, work shoes).

3.4 Maintenance

- ⚠** • For maintenance purposes, it is imperative that the device is de-energised and cooled down, otherwise there is an increased risk of explosion.
- ⚠** • Before working on the device or its components, it is essential to ensure that they are de-energised. Otherwise there is a risk of electric shock.
- ⚠** • The correct tool must be used to open the device, otherwise there is a risk of injury and crushing.
- ⚠** • Before opening the device or its components, it is imperative to ensure that there is no EX zone.
- ⚠** • During cleaning work on the device or in the process, there is an increased risk of explosion due to electrostatic discharges and excessive pressures.

3.5 Technical statement

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

3.6 Reliability

For any additional information concerning product reliability, please contact ENVEA Process GmbH.

3.7 Storage conditions

Observe the following instructions during storage:

- To ensure shock resistance, store in original packaging.
- Do not remove protective discs or caps mounted on process connections. They prevent mechanical damage and contamination to the sealing surfaces.
- Protect from sunlight to avoid impermissibly high surface temperatures.
- Store in a dry and dust-free place.
- Do not store outside.

4. Mounting and installation

4.1 Supplied equipment for DensFlow

- MSE 300 in the DIN Rail or field housing
- Sensor
- Operating Instructions
- C1-Box **(optional)**

4.2 Supplied equipment for DensFlow IECEx

- MSE 300 in the DIN Rail or field housing
- Sensor
- Barrier (IPB20)
- Operating Instructions

4.3 Required tools

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

4.4 Mounting of the sensor

The sensor has to be mounted as follows:

- It is strongly recommended to install in a vertical position.
- Mounting in horizontal position is also possible. In this case, considerable measuring deviations may occur due to material deposits in the measuring system.
- 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. 6).

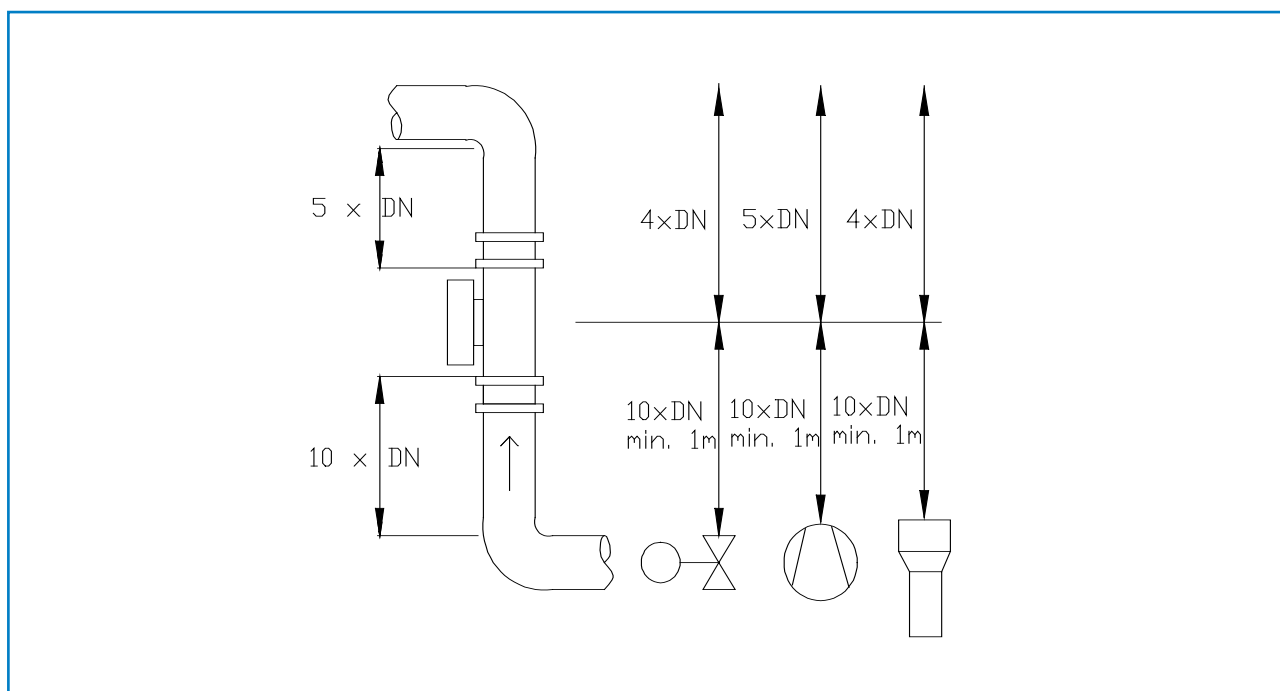


Fig. 6: Minimal distances of the sensor to pipe bends and baffles



Attention!

- Before installing the sensor, it is essential to check whether in the transition range from pipe and measuring pipe a burr, offset or seal extends into the free area. Possibly any protrusions in the pipe must be removed before mounting the sensor. It is always to ensure that the material enters the measuring tube continuously. It must be ensured that the sensor is properly grounded.
- The screw connections between the sensor body (middle part) and the two mounting sockets must not be tightened or loosened any further. All screw connections are supplied ex works with a defined torque and guarantee the pressure resistance of the sensor.
- The sensor must not be subjected to any bending moment or excessive vibration must be exposed to the air (max. 2 x g). When installing, therefore, care must be taken to ensure appropriate interception.

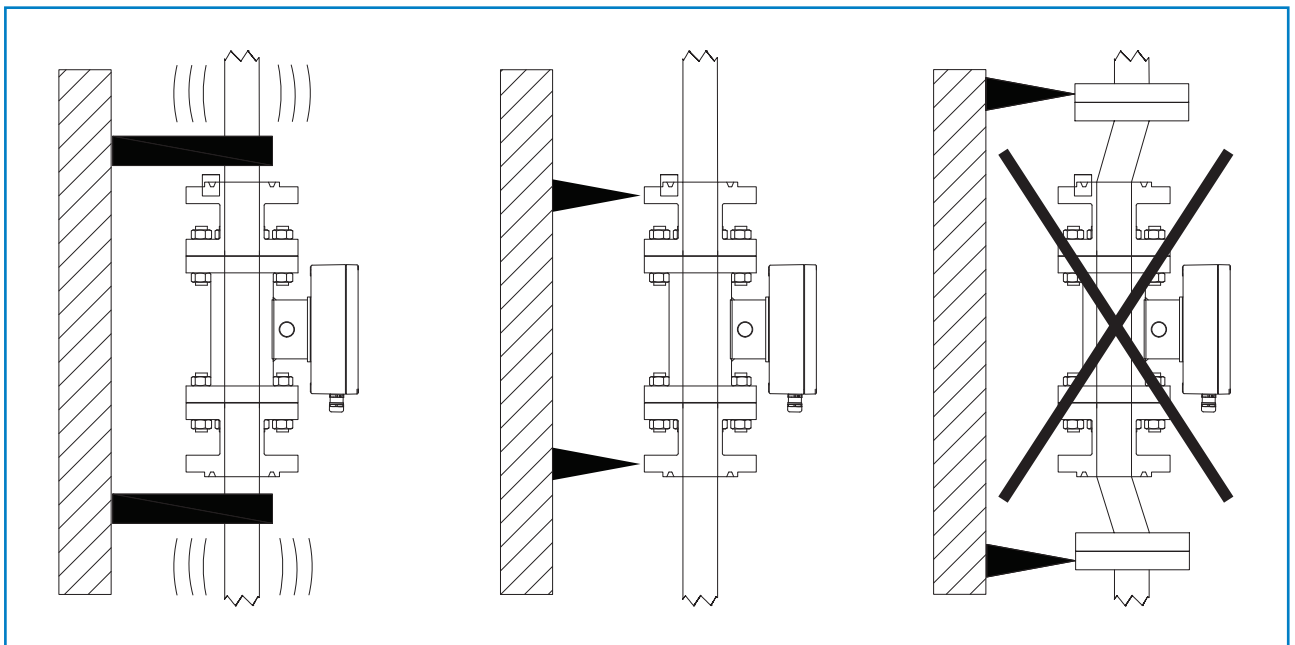


Fig. 7: Sensor installation

- If explosions occur within the pipeline, pressures higher than the design pressure of the sensor will be generated. If there is a risk of explosion, the sensor should be mounted with a bursting disc flange to protect it.
- The pipe should be supported at least within two metres before and after the sensor.
- Do not open the measuring pipe under any circumstances.

4.5 Mounting of the barrier IPB20

The barrier IPB20 could be mounted in a cabinet on a standard DIN Rail (NonEx area).
It also could be installed in an Ex area, therefore a pressure-resistant encapsulation enclosure must be used.

In gas group IIB, the IPB20 isolator can be installed up to 600 m from the sensor.

In gas group IIC, the IPB20 isolator can be installed up to 150 m from the sensor.

Therefore it is recommended to use a cable according to DIN EN 6007914.

Anyway the connection parameter must reach:

Um: 250 V

Uo: 16.8 V

Io: 560 mA

Po: 2.35 W

for IIB / IIIC: Lo: 453 μ H, Co: 2.29 μ F

for IIC: Lo: 113 μ H, Co: 390 nF

**The barrier IPB20 must be used
if a DensFlow IECEx variant is in use!**

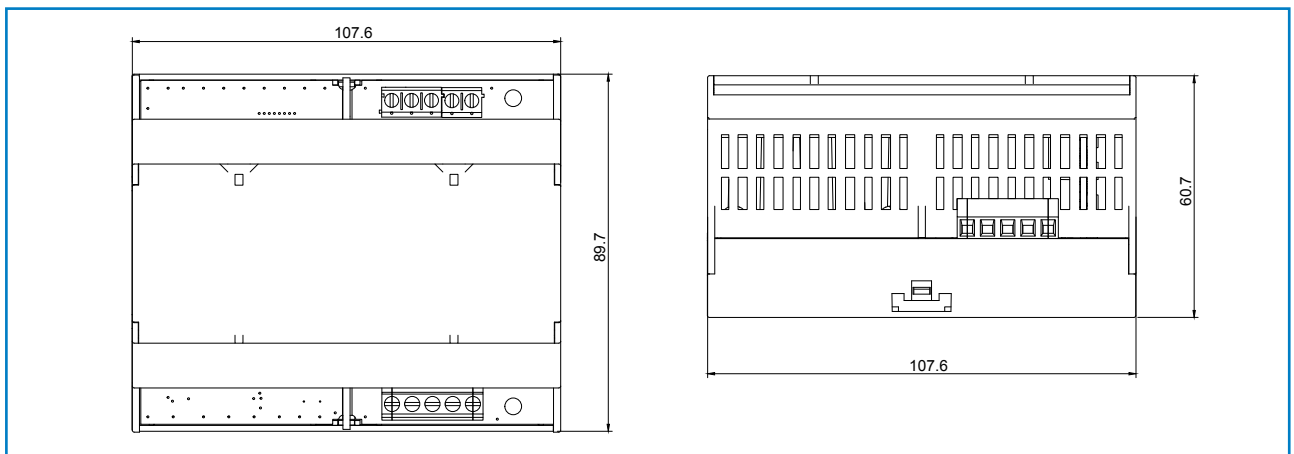


Fig. 8: Dimension of the barrier IPB20

4.6 Mounting of the C1-Box

It is not needed to install a C1-Box, the system also run without C1-Box. The C1-Box could be installed in-between sensor and Evaluation unit. The C1-Box could be used to secure the sensor and Evaluation unit in case of electric error.

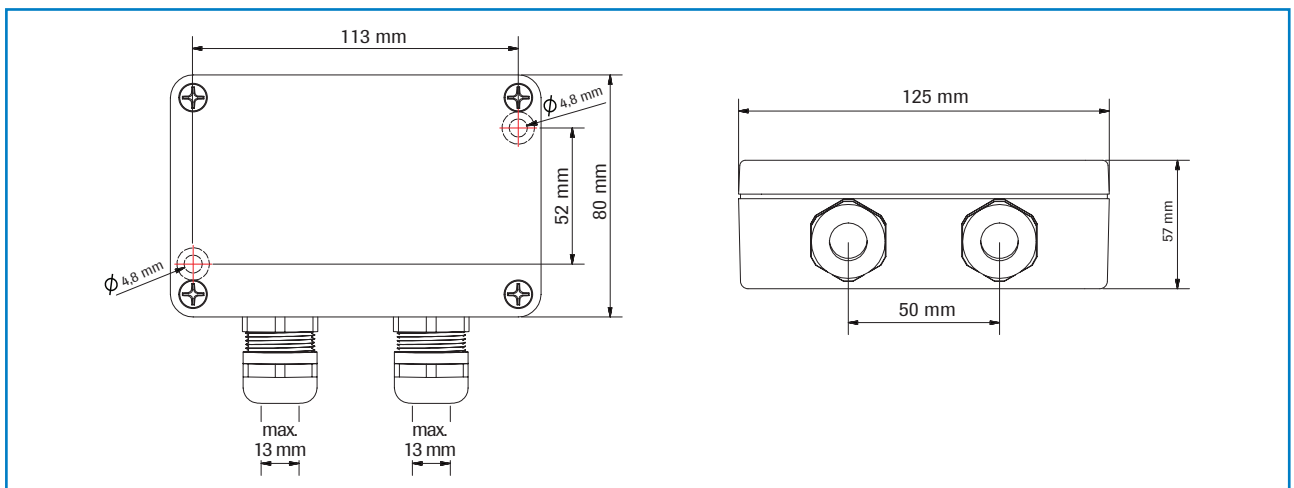


Fig. 9: Dimension of C1-Box

4.7 Mounting of the Evaluation unit

The Evaluation unit can be installed at a maximum distance of 300 m from the sensor. A cable of type “Ölflex Classic 110 CY” is recommended. The cable should be four wired, twisted and shielded. A minimum cable cross-section of 0.75 mm² should be observed. For distances more than 150 m the cable cross-section should be adjusted.

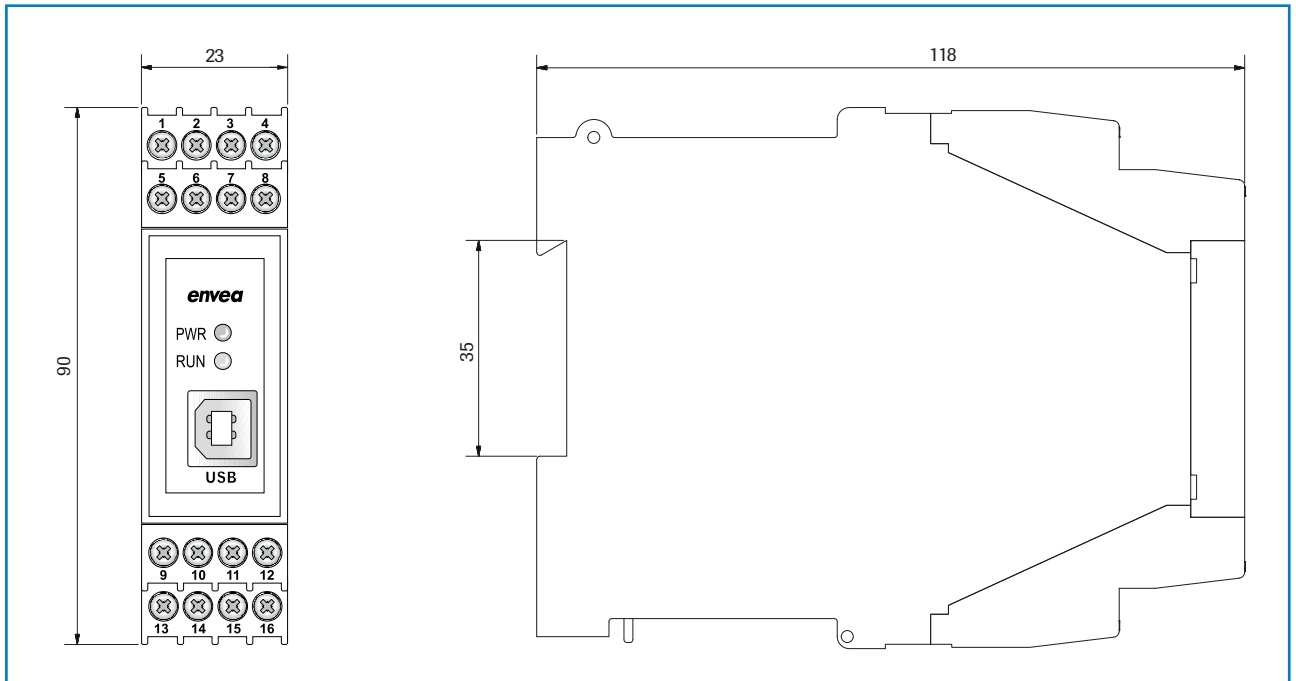


Fig. 10: Dimension of the MSE 300-DR

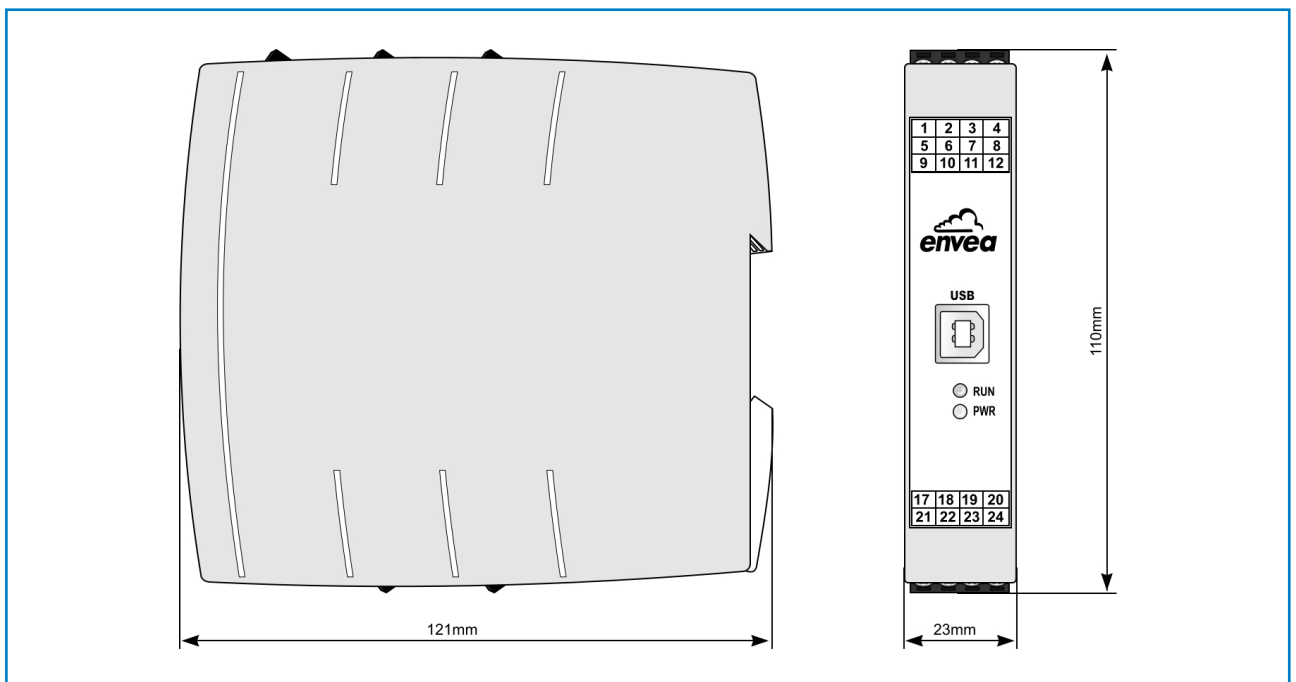


Fig. 11: Dimension of the MSE 300-DR2

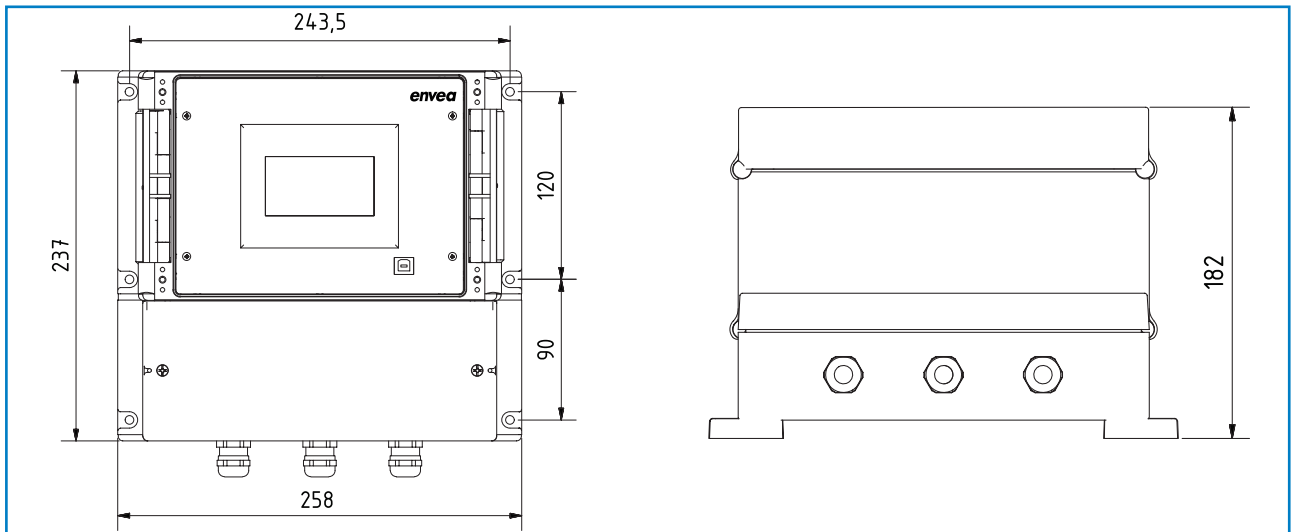


Fig. 12: Dimension of the MSE 300-FH

5. Use in Ex hazardous areas

5.1 Sensor DensFlow HP Ex

Marking ATEX

Gas-Ex $\text{Ex II 2G Ex ib IIC T4 Gb}$

Dust-Ex $\text{Ex II 2D Ex ib IIIC T135°C Db}$

ATEX Cert. Number: CSANe 21 ATEX 2140 X

Marking IECEx

Gas-Ex Ex ib IIC T4 Gb

Dust-Ex $\text{Ex ib IIC T135°C Db}$

IECEx Cert. Number: IECEx CSA 21.00

To be used with intrinsically safe barrier IPB20.

Ambient temperature range: $-20\text{ °C} \leq T_a \leq +60\text{ °C}$

Process temperature range: $-20\text{ °C} \leq T_p \leq +130\text{ °C}$

5.1.1 Connection parameters

Ui: 16.8 V

Ii: 560 mA (linear characteristics)

Pi: 2.35 W

Li: 0 mH

Ci: 100 nF

5.1.2 Related standards

IECEx (Cert.: IECEx CSA 21.0026X)

IEC 60079-0:2017, Edition 7.0, IEC 60079-11:2011, Edition 6.0

ATEX (Cert.: CSANe 21 ATEX 2140 X)

EN IEC 60079-0: 2018, EN 60079-11: 2012

5.2 Barrier IPB20

Marking DustEx:  II (1)D [Ex ia Da] IIIC

To be used with intrinsically safe equipment up to zone 20.

Marking GasEx:  II (1)G [Ex ia Ga] IIC

To be used with intrinsically safe equipment up to zone 0.

Ambient temperature range: $-20\text{ °C} \leq T_a \leq +60\text{ °C}$

5.2.1 Connection parameters

Um: 250 V

Uo: 16.8 V

Io: 560 mA

Po: 2.35 W

for IIB / IIIC: Lo: 453 μH , Co: 2.29 μF

for IIC: Lo: 113 μH , Co: 390 nF

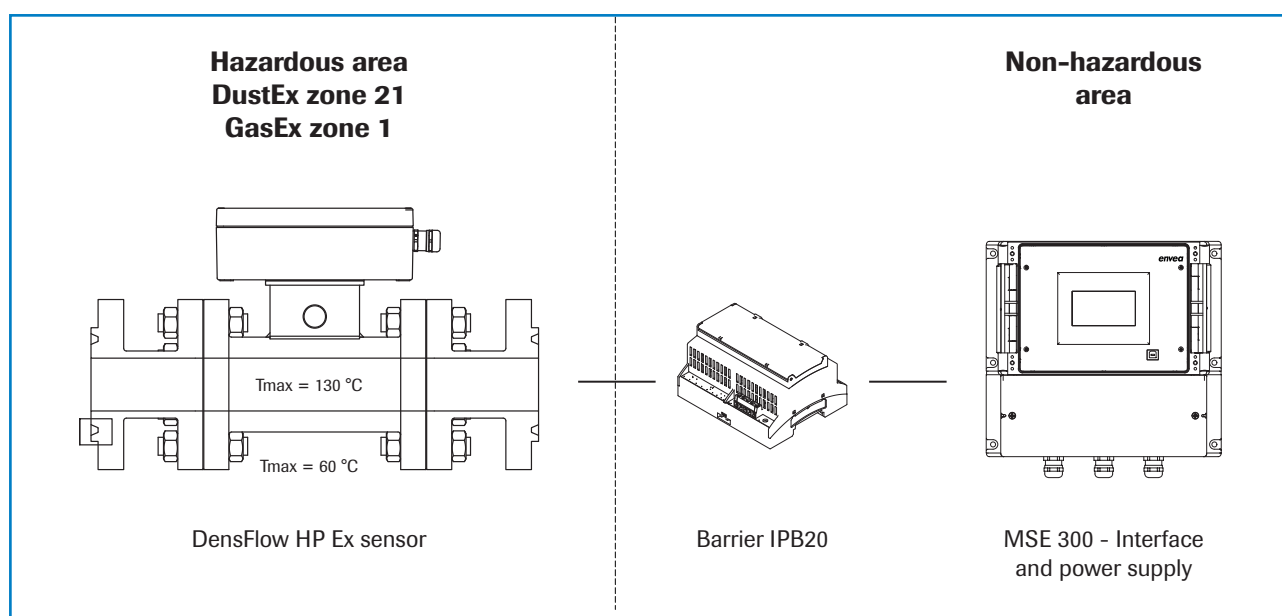
5.2.2 Related standards

IECEX (IECEX CSA 21.0016):

IEC 60079-0:2017, Edition 7.0, IEC 60079-11:2011, Edition 6.0

ATEX (CSANe 21 ATEX 2088):

EN IEC 60079-0: 2018, EN 60079-11: 2012



6. Electrical connection

6.1 Terminal layout MSE 300-FH

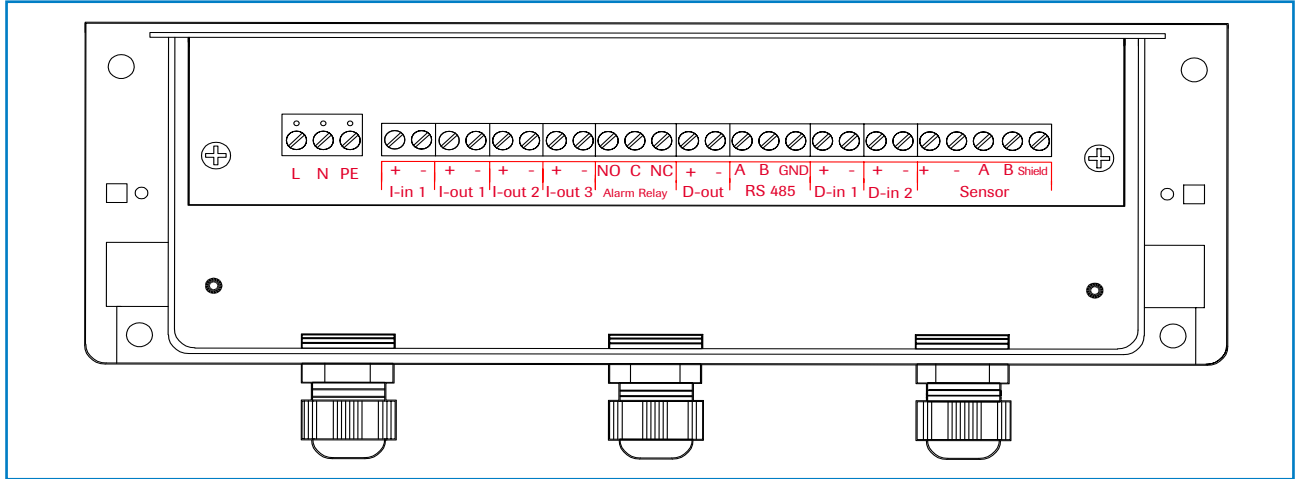


Fig. 13: Electrical connection of the MSE 300-FH

Evaluation unit			
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	+	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

6.2 Terminal layout MSE 300-DR

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

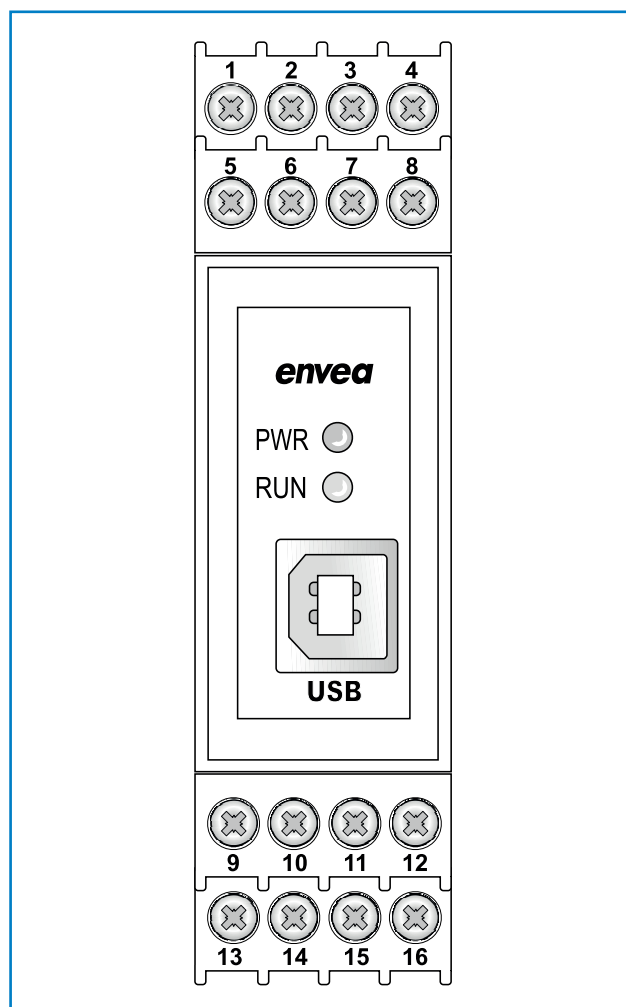


Fig. 14: Electrical connection of the MSE 300-DR

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

6.3 Terminal layout MSE 300-DR2

1 Alarm relay NO (make contact)	2 Alarm relay C	3 Alarm relay NC (break contact)	4 Not used
5 1. Digital pulse output (+)	6 1. Digital pulse output (-)	7 2. Digital pulse output (+)	8 2. Digital pulse output (-)
9 1. Current output + 4 ... 20 mA	10 1. Current output - 4 ... 20 mA	11 2. Current output + 4 ... 20 mA	12 2. Current output - 4 ... 20 mA

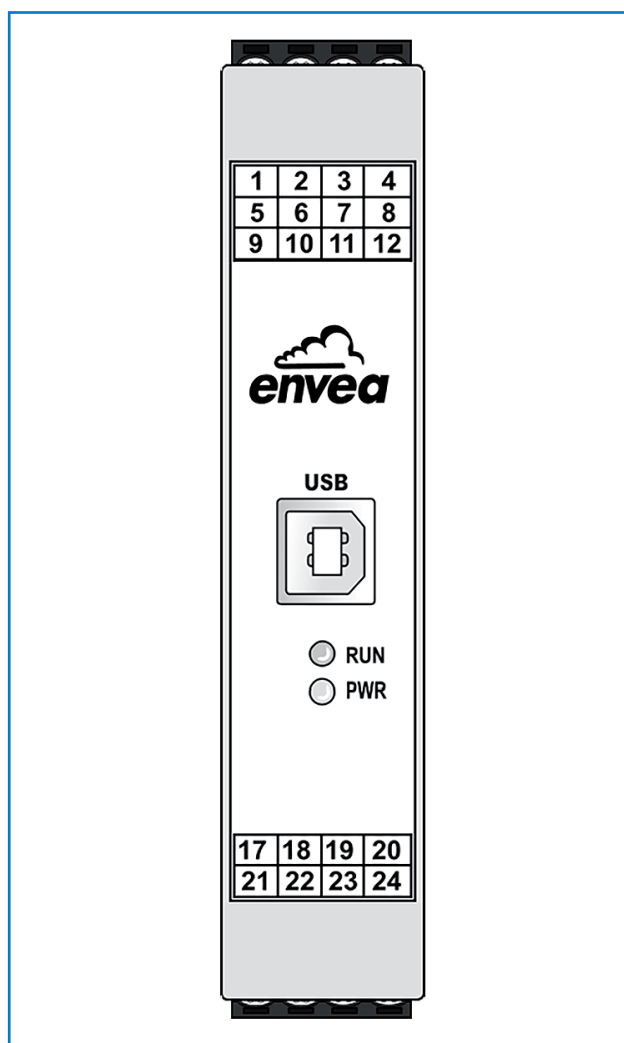


Fig. 15: Terminal layout MSE 300-DR2

17 Sensor connection Cable 1 Power supply +24 V	18 Sensor connection Cable 2 Power supply 0 V	19 Sensor connection Cable 3 RS 485 Data A	20 Sensor connection Cable 4 RS 485 Data B
21 Input Power supply + 24 V DC	22 Input Power supply 0 V DC	23 RS 485 Interface Data A	24 RS 485 Interface Data B

6.4 Terminal layout C1-Box

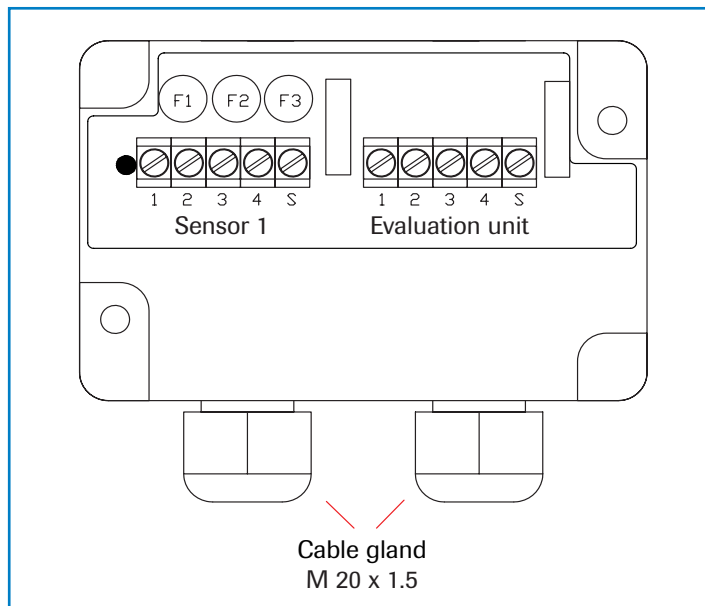


Fig. 16: Electrical connection C1-Box

Sensor 1

- 1 **Power supply + 24 V**
- 2 **Power supply 0 V**
- 3 RS 485, Data A
- 4 RS 485, Data B
- S Shield

Evaluation unit

- 1 **Power supply + 24 V**
- 2 **Power supply 0 V**
- 3 RS 485, Data A
- 4 RS 485, Data B
- S Shield

6.5 Terminal layout IPB20

Safe Area

- PIN 1:** + 24 V DC
- PIN 2:** GND (0 V)
- PIN 3:** Modbus A
- PIN 4:** Modbus B
- PIN 5:** Shield

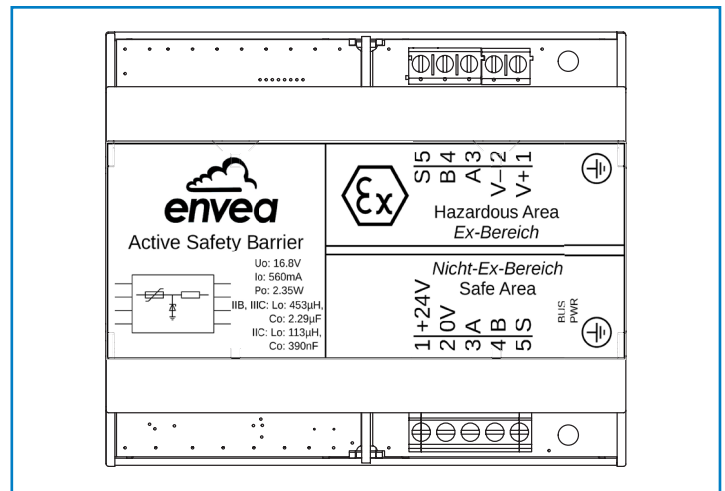


Fig. 17: Electrical connection barrier

Hazardous Area

For using an Ex-device please make sure that the connection parameter are not violated:

- for IIB / IIIC: Lo: 453 μ H, Co: 2.29 μ F
- for IIC: Lo: 113 μ H, Co: 390 nF

- PIN 1:** Power Supply to the sensor +
- PIN 2:** Power Supply to the sensor -
- PIN 3:** Modbus A
- PIN 4:** Modbus B
- PIN 5:** Shield

6.6 Electrical connection sensor

- PIN 1:** Power supply +
- PIN 2:** Power supply -
- PIN 3:** Modbus A
- PIN 4:** Modbus B

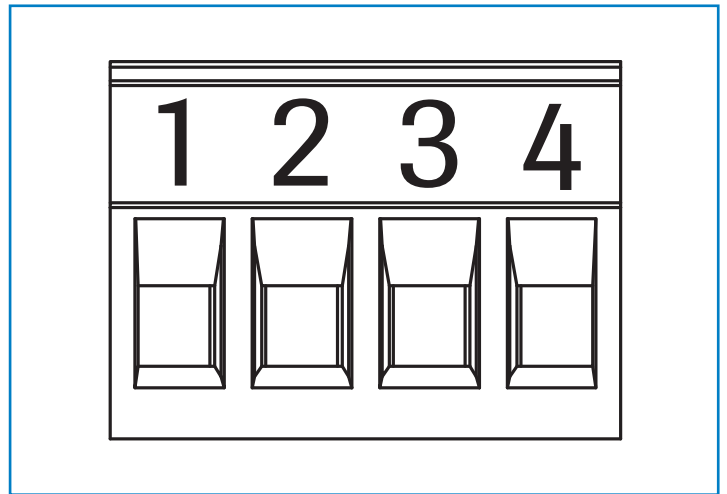


Fig. 18: Electrical connection plug connector

7. Operator interface

The MSE 300 is a multi-sensor Evaluation unit. 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 touchscreen, alternative operation via PC software

7.1 Differences between the DIN Rail and field housing Evaluation unit

The Evaluation unit 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	MSE 300-FH	MSE 300-DR	MSE 300-DR2
Menu system			
• via PC software	yes	yes	yes
• via display	yes	no	yes
Multiple current outputs for density, velocity and throughput	yes	no	yes
Pulse output for the control of solenoid valves or for measured value output	yes	yes	yes
Alarm system relay output	yes	yes	yes
Remote control digital input	yes	no	yes
Autocorrect analogue input	yes	no	yes
Totaliser display			
• via PC software	yes	yes	yes
• via display	yes	no	yes
Error output			
• on current output	yes	yes	yes
• at relay	yes	yes	yes
• via PC software	yes	yes	yes
• via display	yes	no	yes
• on status LED	no	yes	no

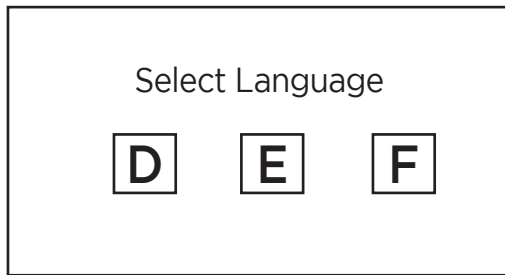
The Evaluation unit in the DIN Rail is configured exclusively via a USB connection and a PC program. For the Evaluation units MSE 300-FH and MSE 300-DR2, all functions can be configured via the touch-sensitive display.

The PC configuration is also possible with the display of the Evaluation unit.

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.

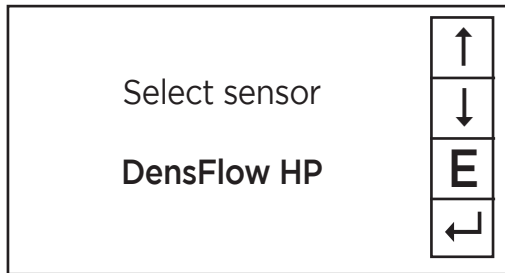
7.2 Display

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 DensFlow HP sensor is selected.



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

Deutsch, English, Français

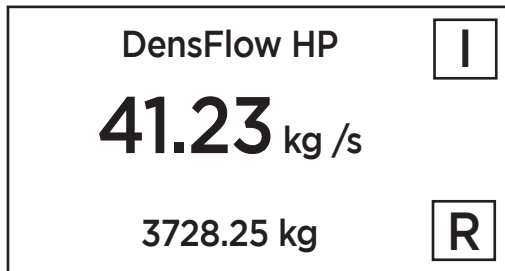


If a language has been selected, the sensor to be used must be selected.

To be available:

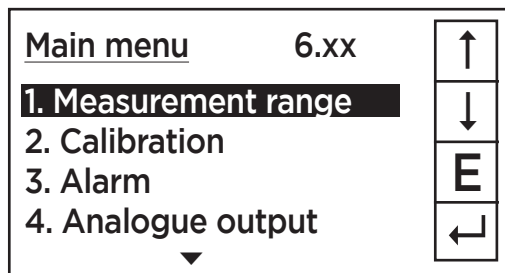
SolidFlow 2.0, Paddy, PicoFlow, MaxxFlow HTC, DensFlow, SpeedFlow 2.0, SlideControl 2.0, ProSens, M-Sens 2, M-Sens 3, M-Sens WR2, AirFlow P.

Afterwards the start page appears.



The start page display the following values:

- Tag No "DensFlow HP", 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.

Sensor status		
	Value	Qx
D:	82892	100
Q:	216787 99	
V:	2.61	99
Iout:	4.0/ 4.0/ 340 kg	4.0

With the key [I] you can choose between different information windows. In the first window the raw values for density [D] and flow rate [Q], the velocity [m/s], the current outputs [mA] and the quality [%] are displayed. 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. In the other windows, the stored sensor parameters are displayed in an overview.

Save changes?

Y

N

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 6.4.

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).

7.3 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 Evaluation unit 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

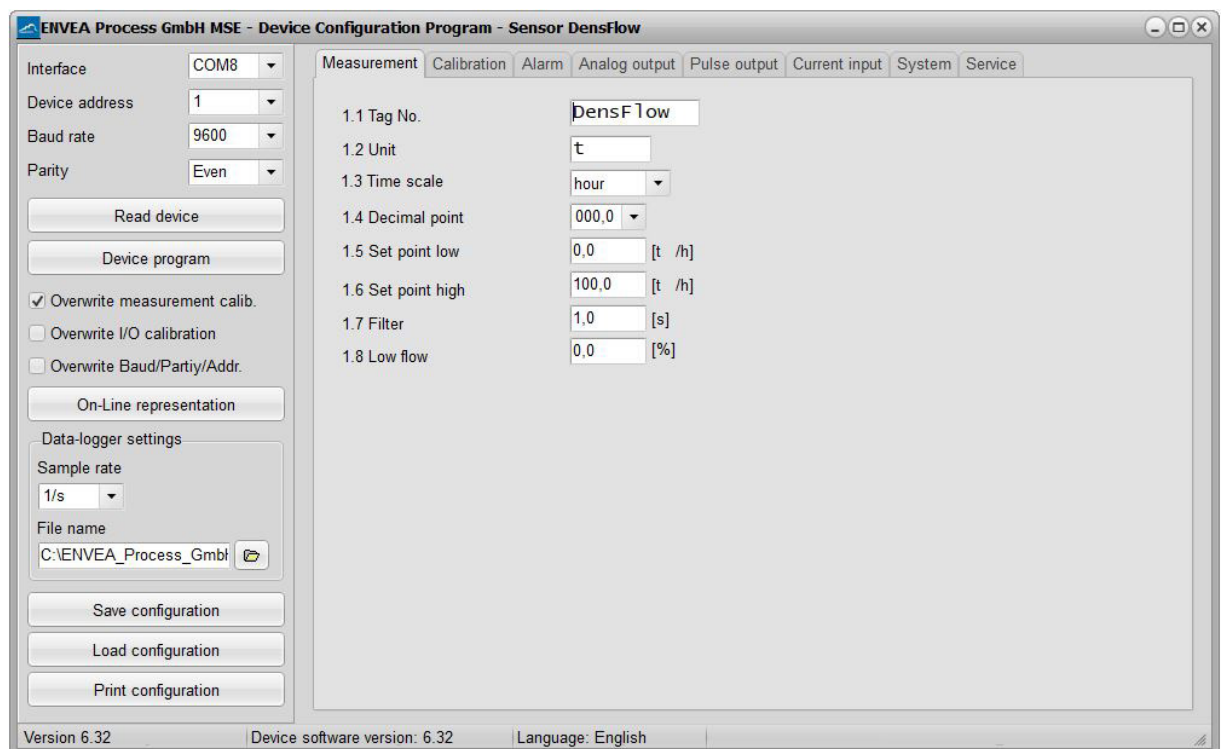
An RS 485 to USB adapter can be purchased from ENVEA Process.

- ✓ 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 Evaluation unit 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 Evaluation unit.

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

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

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

In addition, with the PC software,

- the Evaluation unit parameters can be saved in a file (Save configuration)
- the Evaluation unit parameters can be loaded from a file (Load configuration)
- the Evaluation unit 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:

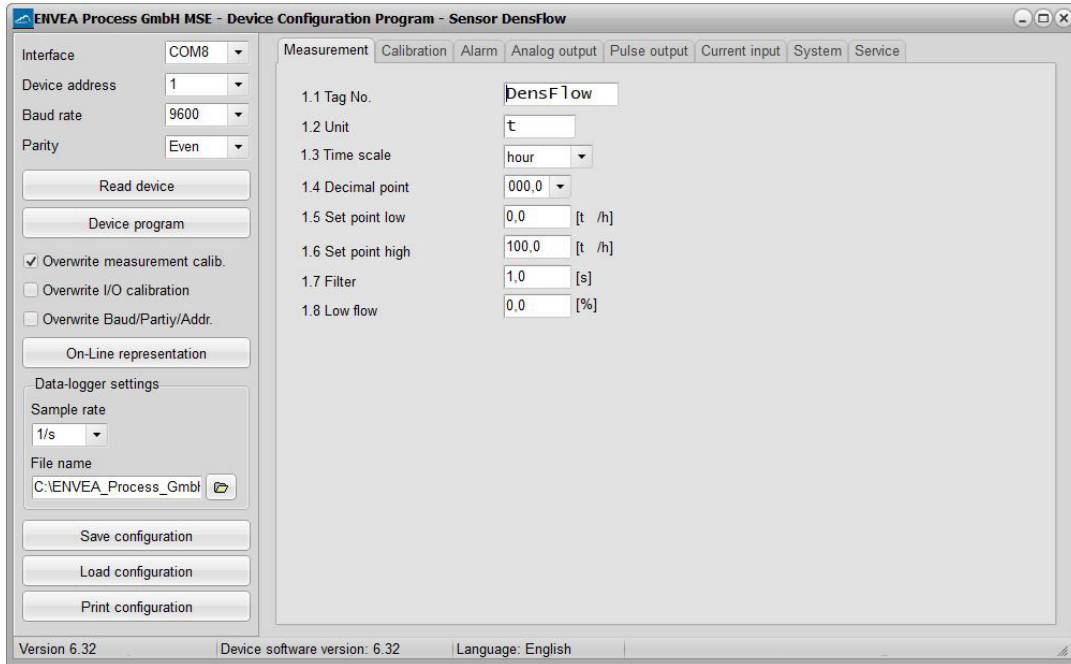
The PC interface does not have a password prompt as it is assumed that only authorised personnel will have access to the PC and the software. However, the password to operate the display can be read and changed in menu **7. System** in **7.6 Password**.

7.4 Menu structure

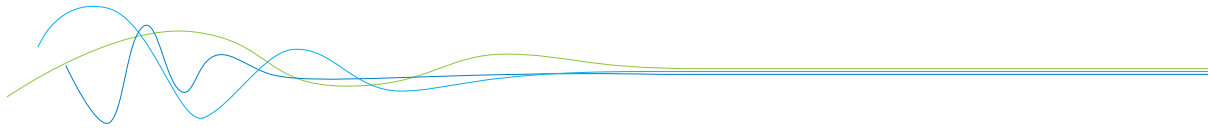
The menu structure supports the user when adjusting the measuring range, the calibration, the measurement values and the choice of additional functions. In this connection, the numbering both on the display and in the PC interface is identical:

1. Measurement

Set all relevant measuring range settings



1.1 Tag No.	Input: Free text (10 characters)	Name of the measurement point or product.
1.2 Unit	Input: Unit text, e. g. kg	Required mass flow unit.
1.3 Time scale	Selection: hour / minute / second	Time base for the integration by the totaliser and the pulse output.
1.4 Decimal point	Selection: 0000, 0.000, 00.00, 000.0	Number representation and decimal point-accuracy in the measurement menu.
1.5 Set point low	Input: 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	Input: 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	Input: 0.0 s ... 999.9 s	Filtering of measurement for the indicator and the output values.
1.8 Low flow	Input: 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.

EIVEA Process GmbH MSE - Device Configuration Program - Sensor DensFlow

Interface: COM8
 Device address: 1
 Baud rate: 9600
 Parity: Even

Read device
 Device program

☒ Overwrite measurement calib.
☐ Overwrite I/O calibration
☐ Overwrite Baud/Parity/Addr.

On-Line representation

Data-logger settings
 Sample rate: 1/s
 File name: C:\ENVEA_Process_Gmbh

Save configuration
 Load configuration
 Print configuration

Measurement | **Calibration** | Alarm | Analog output | Pulse output | Current input | System | Service

2.1 Conveyor type: Pneumatic
 2.2 Calibration points: 5
 2.3 Calibration factor Kk (Ke, Kd): 1,00 | 1,000 | 1,000

2.5 Q-Limit: 50 [%]
 2.9 Ref. Sensor: ☐

EasyFlow

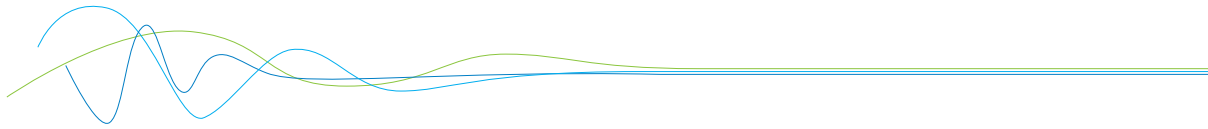
	Flow value [t /h]	QD [%]	QQ [%]	QV [%]	nD	nQ	nV	nTotal	V [m/s]	Raw value D	Raw value Q	
1.Pt	10,0	100	91	90	18	18	18	18	2,499711	1000000,0	100,0000	<-
2.Pt	20,0	100	95	94	10	10	10	10	2,499657	2000000,0	200,0000	<-
3.Pt	30,0	50	55	60	0	0	0	0	0,000000	3000000,0	300,0000	<-
4.Pt	40,0	50	55	60	0	0	0	0	0,000000	4000000,0	400,0000	<-
5.Pt	50,0	50	55	60	0	0	0	0	0,000000	5000000,0	500,0000	<-

Version 6.32 Device software version: 6.32 Language: English

EasyFlow calibration

- | | | | |
|-----|-------------------------|--------------------------------|---|
| 2.1 | Conveyor type | Selection:
pneumatic | The DensFlow HP is only suitable for use in pneumatic lines. |
| 2.2 | Calibration points | Selection: 1 ... 5 | Number of support points for a linearisation above the operating range. |
| 2.3 | Calibration factor [KK] | Input: 0.01 ... 9.99 | Factor for the subsequent adjustment of the actual measurement. All measurements are measured with this factor. |
| 2.4 | Factor Kc | Display | Automatically entered correction value for the electrical behaviour of the material, supplied by a correction sensor installed in the process. |
| 2.5 | Factor Kd | Display | Automatically entered correction value for the density behaviour of the material, supplied by a correction sensor. |
| 2.6 | Q-Limit | Input: 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 |

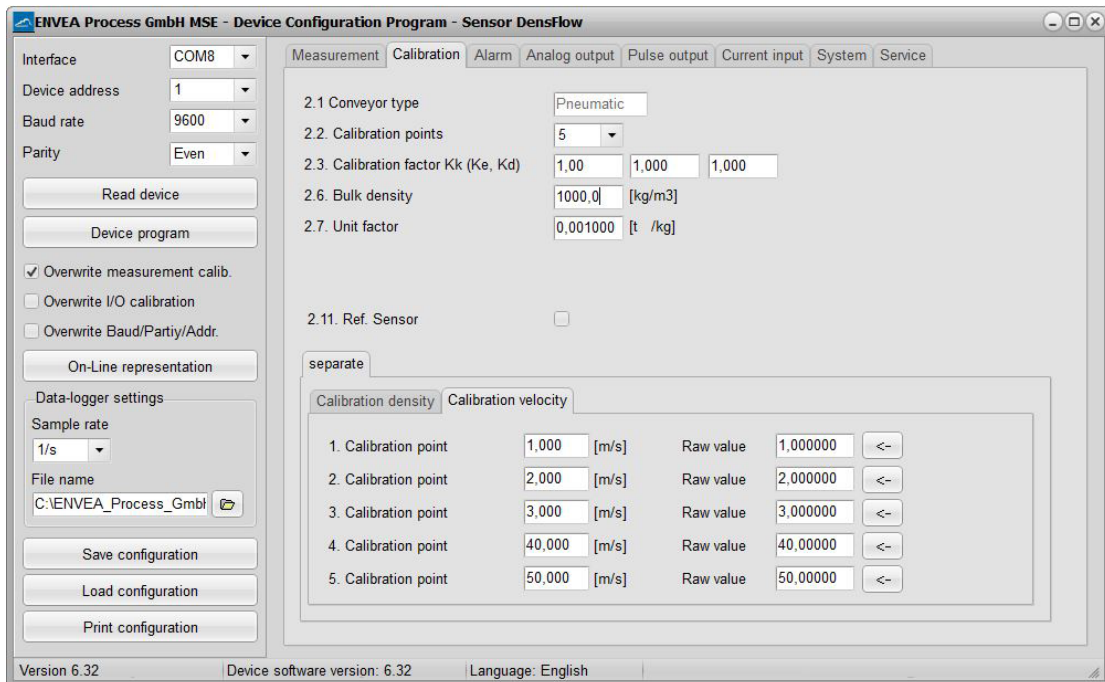
2.7	Calibration	Submenu	
2.7.1	Value P1	Input: Measurement value	Output measurement in the selected mass/time unit.
2.7.2	P1 - actual	Display	Display actually raw values for this calibration point.
2.7.3	P1-Cal.	Input: Raw values	Transfer of the current raw value (filtered) from the mass flow with the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



EasyFull calibration

2.1	Conveyor type	Selection: pneumatic	The DensFlow HP is only suitable for use in pneumatic lines.
2.2	Calibration factor KK	Input: 0.01 ... 9.99	Factor for the subsequent adjustment of the actual measurement. All measurements are measured with this factor.
2.3	Factor Kc	Display	Automatically entered correction value for the electrical behaviour of the material, supplied by a correction sensor installed in the process.
2.4	Factor Kd	Display	Automatically entered correction value for different density behaviour with constant material - supplied by a correction sensor.
2.5	Bulk density	Input: 0.1 ... 9999.9	Density of the material in kg/m ³ .
2.6	Unit factor	Input: 0 ... 9999.9	Conversion factor between entered 1.2 Unit to kg.
2.7	Fall height	Input: 1 ... 20.000 mm	Drop height above the sensor in millimeter.
2.8	Q-Limit	Input: 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)	Input: Raw value	Raw value at 100 % filled sensor
2.10	Sensor measuring	Submenu	
2.10.1	Empty	Input: Raw value	Customer empty adjustment
2.10.2	Full	Input: Raw value	Customer full adjustment
2.10.3	No Flow	Input: Raw value	Customer adjustment: No Flow
2.10.4	Flow	Input: Raw value	Customer adjustment: Flow



ENVEA Process GmbH MSE - Device Configuration Program - Sensor DensFlow

Interface: COM8
 Device address: 1
 Baud rate: 9600
 Parity: Even

Read device
 Device program

☒ Overwrite measurement calib.
☐ Overwrite I/O calibration
☐ Overwrite Baud/Parity/Addr.

On-Line representation

Data-logger settings
 Sample rate: 1/s
 File name: C:\ENVEA_Process_GmbH

Save configuration
 Load configuration
 Print configuration

Version 6.32 Device software version: 6.32 Language: English

Calibration

2.1 Conveyor type: Pneumatic
 2.2 Calibration points: 5
 2.3 Calibration factor Kk (Ke, Kd): 1,00 1,000 1,000
 2.6 Bulk density: 1000,0 [kg/m3]
 2.7 Unit factor: 0,001000 [t /kg]

2.11. Ref. Sensor: ☐

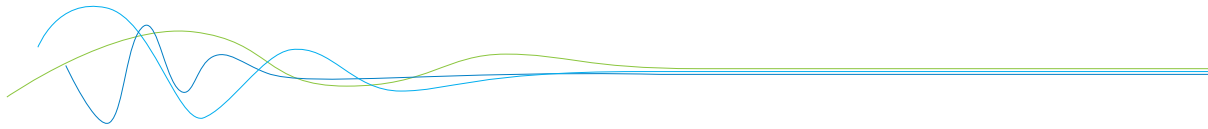
separate

Calibration density Calibration velocity

Calibration point	Raw value
1. Calibration point: 1,000 [m/s]	Raw value: 1,000000 <-
2. Calibration point: 2,000 [m/s]	Raw value: 2,000000 <-
3. Calibration point: 3,000 [m/s]	Raw value: 3,000000 <-
4. Calibration point: 40,000 [m/s]	Raw value: 40,000000 <-
5. Calibration point: 50,000 [m/s]	Raw value: 50,000000 <-

Separate calibration

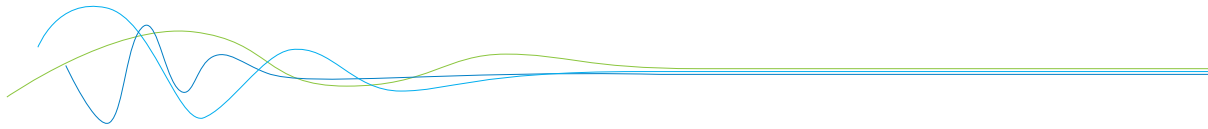
If the single calibration is selected, it is possible to set a linearisation on the bulk density and on the speed. This calibration option should only be performed by ENVEA Process trained personnel.



3. Alarm

Settings for relay contacts

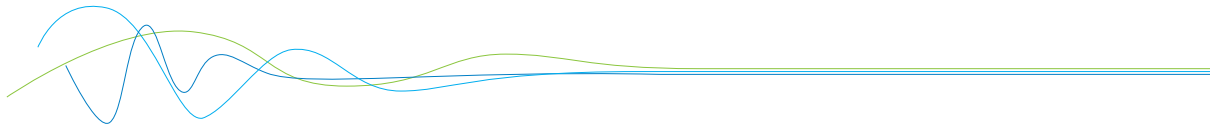
3.1	Alarm type	Selection: none / MIN / MAX / FLOW	none: no alarm output on relay output MIN: min. alarm on relay output MAX: max. alarm on relay output FLOW: flow detection on relay output
3.2	Alarm value	Input: 0 ... 999.9	Threshold for monitoring on selected alarm type: MIN, MAX, FLOW.
3.3	Delay	Input: 0.1 ... 99.9 s	The value must permanently exceed or fall below the set limit during this time.
3.4	Hysteresis	Input: 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	Selection: NC / NO	NC: the relay is closed while there is no alarm. NO: the relay is closed, if there is an alarm.
3.6	Sensor alarm	Selection: OFF / ERR / PROC	OFF: sensor or process errors will not activate the relay. ERR: serious sensor errors lead to an alarm on the relay. PROC: 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	Input: 0 ... 22 mA	Default settings: 3.2 mA
4.2	MAX limit	Input: 0 ... 22 mA	Default settings: 21 mA
4.3	Alarm value	Input: 0 ... 22 mA	Output value for sensor alarm. Default settings: 2 mA
4.4	Alarm mode	Selection: Alarm / Freese	Alarm: alarm value at output, during alarm measuring value is 0. Freeze: last measurement value would be freeze on Analogue output, till the error is fixed.
4.5	V-Min 4 mA	Input: 0 ... 99.99 m/s	Velocity at 4 mA
4.6	V-Max 20 mA	Input: 0 ... 99.99 m/s	Velocity at 20 mA
4.7	Analog output 1	Submenu	
4.7.1	Output variable	Selection: Q / V / D	Q: throughput output at the analog output V: speed output at the analog output D: density output at the analog output
4.7.2	Calibration 4 mA	Selection: Set output current	The current output can be set via key functions and adjusted at the receiving end.
4.7.3	Calibration 20 mA	Selection: Set output current	The current output can be set via key functions and adjusted at the receiving end.



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

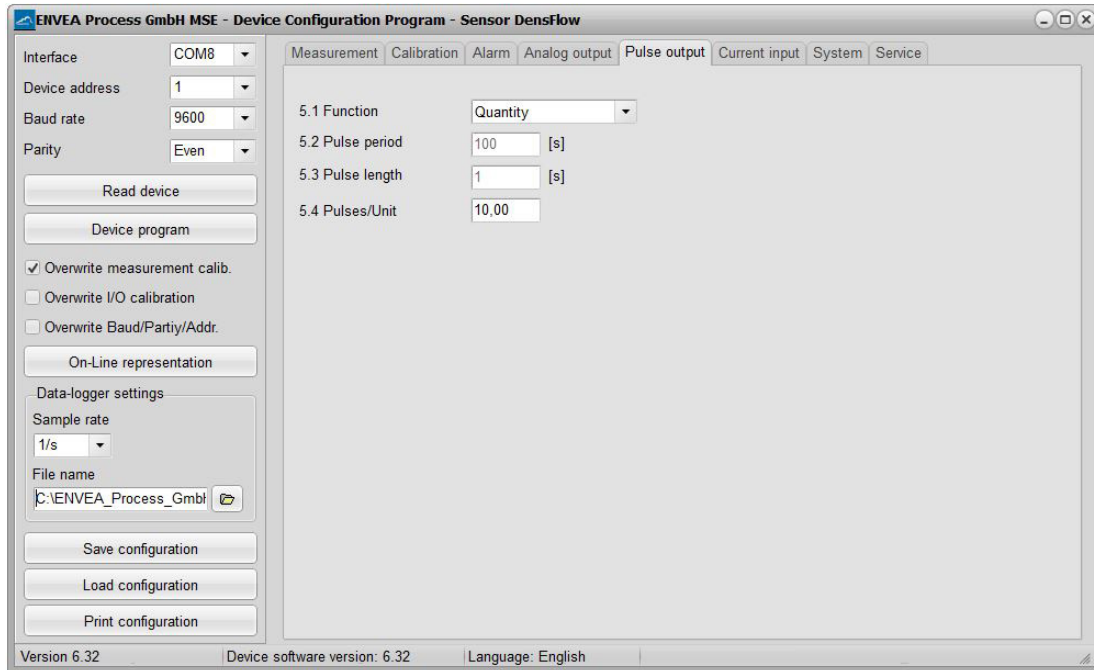
The current output can be calibrated that the zero point (output of 4 mA) is applied to the background noise of the measuring point. If the noise level decreases due to process changes, material caking or other aging effects, less than 4 mA can be output at the analog output. In this way, a zero offset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

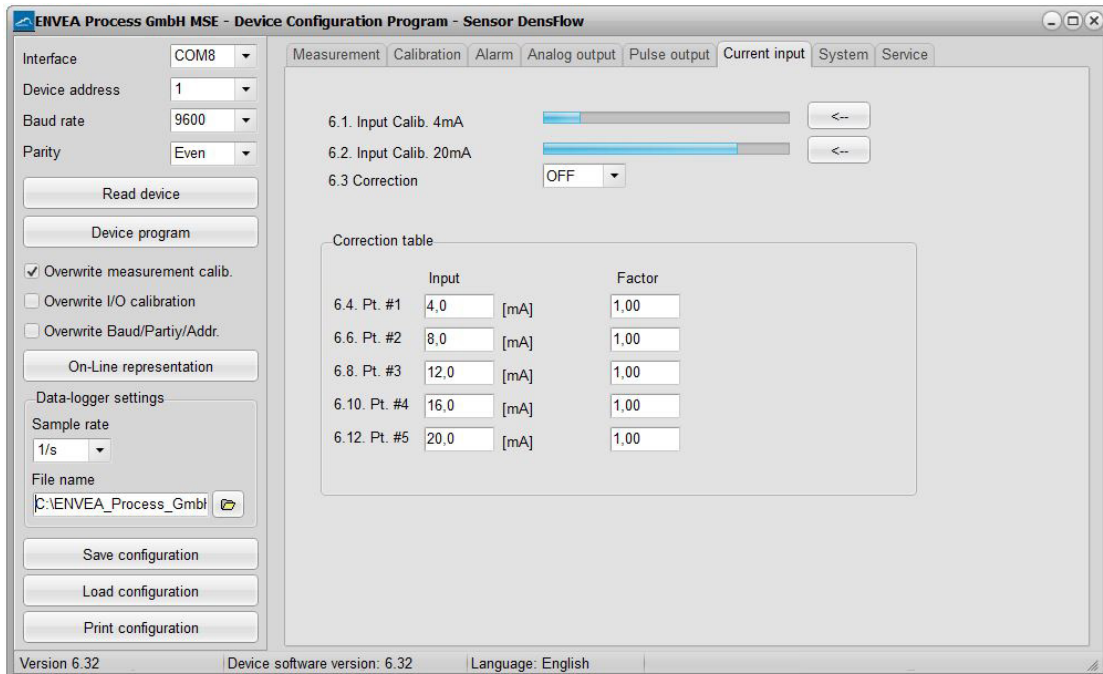
5.4 Pulses/unit

Input: 0.01 ... 99.9

Number of pulses per unit

6. Analog input

Possibility of autocorrection via external current signal.



ENVEA Process GmbH MSE - Device Configuration Program - Sensor DensFlow

Interface: COM8
 Device address: 1
 Baud rate: 9600
 Parity: Even

Read device
 Device program

☒ Overwrite measurement calib.
☐ Overwrite I/O calibration
☐ Overwrite Baud/Parity/Addr.

On-Line representation

Data-logger settings
 Sample rate: 1/s
 File name: C:\ENVEA_Process_GmbH

Save configuration
 Load configuration
 Print configuration

Version 6.32 | Device software version: 6.32 | Language: English

Current input

6.1. Input Calib. 4mA
 6.2. Input Calib. 20mA
 6.3 Correction: OFF

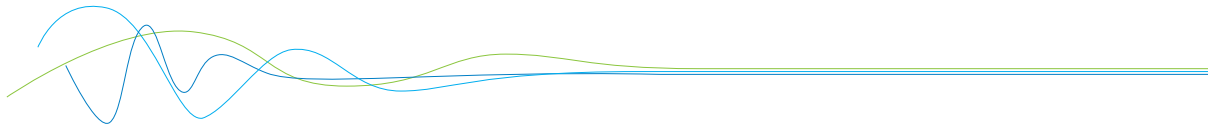
Correction table

	Input	Factor
6.4. Pt. #1	4,0 [mA]	1,00
6.6. Pt. #2	8,0 [mA]	1,00
6.8. Pt. #3	12,0 [mA]	1,00
6.10. Pt. #4	16,0 [mA]	1,00
6.12. Pt. #5	20,0 [mA]	1,00

The connection of the current input is not galvanically isolated.

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

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

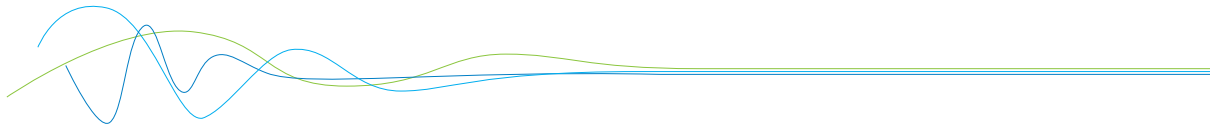


7. System

Basic adjustment of the system and Evaluation unit.

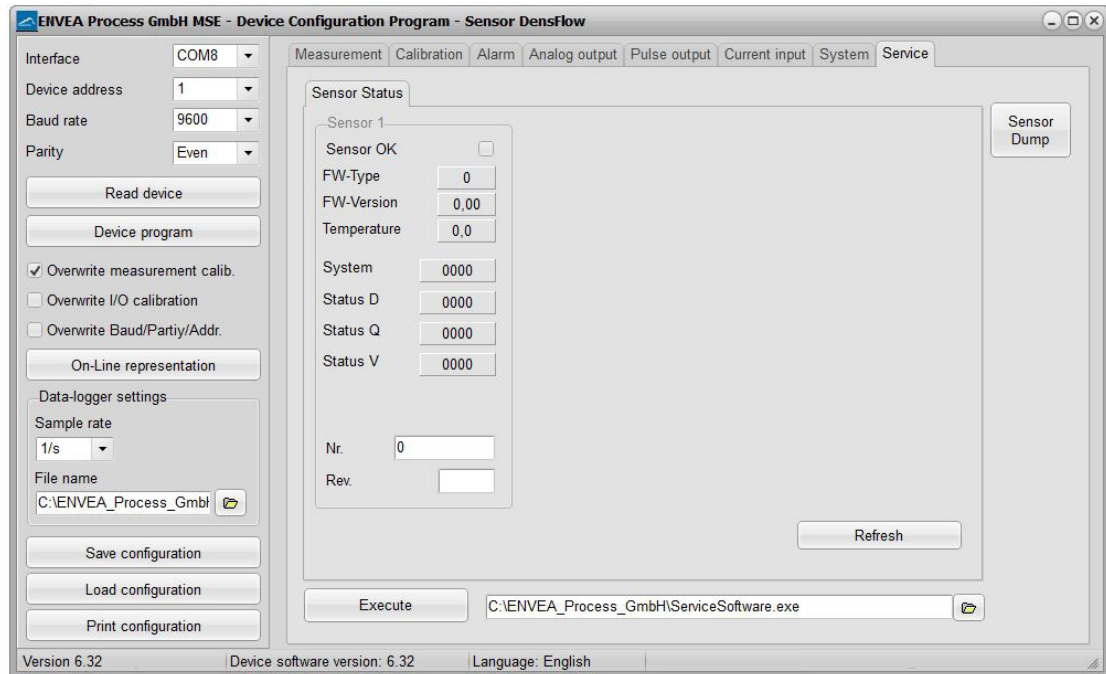
7.1	Language	Selection: D / E / F	Language on the Evaluation unit
7.2	Sensors	Submenu	
7.2.1	Calibration	Selection: EasyFlow / EasyFull / separate	EasyFlow: calibration via known throughput EasyFull: calibration via empty- and full-calibration Separate: calibration for ENVEA Process trained personnel
7.2.2	Sensor	Selection: SolidFlow 2.0 / Paddy / PicoFlow / MaxxFlow HTC / DensFlow / SpeedFlow 2.0 / SlideControl 2.0 / ProSens / M-Sens 2 / M-Sens 3 / M-Sens WR2	The Evaluation unit 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	Submenu	
7.3.1	Sensor info	Selection: ON / OFF	ON: show info key on display OFF: hide info key
7.3.2	Process indicator	Selection: ON / OFF	ON: process indicators will be shown on display and via double blink on the DIN Rail. OFF: process indicators will not be shown.
7.3.3	Totalisator	Selection: ON / OFF	ON: totalisator will be shown on display. OFF: totalisator will be hide.
7.3.4	Backlight	Input: 0 ... 99 min	Lighting of the Display in minutes 0 = permanent lighting 99 = time selection for lighting

7.3.5	Contrast	Input: 0 ... 100 %	In the case of display exchange, the contrast can be changed via the PC software, if necessary.
7.4	Address	Input: 1... 255	ModBus address of Evaluation unit, if operated on a PLC or PC as a slave.
7.5	Baud rate	Selection: 4800/9600/19200/ 38400 baud	Communication speed of the Evaluation unit when this is operated as a ModBus slave on a PLC or a PC.
7.6	Parity	Selection: Even/Odd/None	The parity is set to even 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	Input: 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	Selection:	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.

8. 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 installation of the sensor (vertical and stepfree installation)
- The correct connection between the sensor and the Evaluation unit
- The 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 **1.2 Unit** is a free text, there are 10 characters available.

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.

8.1 EasyFlow calibration

The EasyFlow calibration calibrates the sensor to a known throughput.

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.

8.2 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/m³, 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:

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

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

8.3 Separate calibration

For single calibration, density and velocity must be assigned a raw value. First, the real **2.6 Bulk density** in kg/m³ 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:

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



Attention!

Once the calibration procedure has been carried out, the calibration parameters must be confirmed before transfer. On the Evaluation unit 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 Evaluation unit by clicking on **Program device**.

8.4 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.

8.5 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 3. Alarm . A sensor monitoring alarm can also be activated here.
Analogue output	The assignment of the analogue output values takes place in 4. Analogue output . 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 5. Pulse 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 6. Current input . 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 7. System , 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.

9. 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
No fault	Sensor status OK on the information display (Button [I])	Single flash every second	Normal state	4 ... 20 mA
PROC (process indicators)	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
ERR (fatal errors)	Display with error code in the bottom display line; advanced information on key [I]	Triple flash every second	Activated, when Relais-Alarm-Option PROC or 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).

10. Maintenance



- **Warning!**
Danger of shock with open housing!
- 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.

11. 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.

12. Troubleshooting



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

Problem	Cause	Solution
Systm does not operate.	No power.	Check power supply.
	Cable break.	Check for connection and cable break.
	Defective device.	Contact ENVEA Process.
Outputs are the wrong values.	Incorrect calibration.	Recalibrate the sensor.
Sensor error.	Sensor connection incorrect.	Check wiring connections.
	Sensor failure.	Replace sensor.
Do not open sensor electronics. To do so will make the warranty void!		

12.1 Error codes system

Typ	CODE	DIN Rail 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 SWR needed

12.2 Error codes density

Typ	CODE	DIN Rail 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 Evaluation unit	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

12.3 Error codes velocity

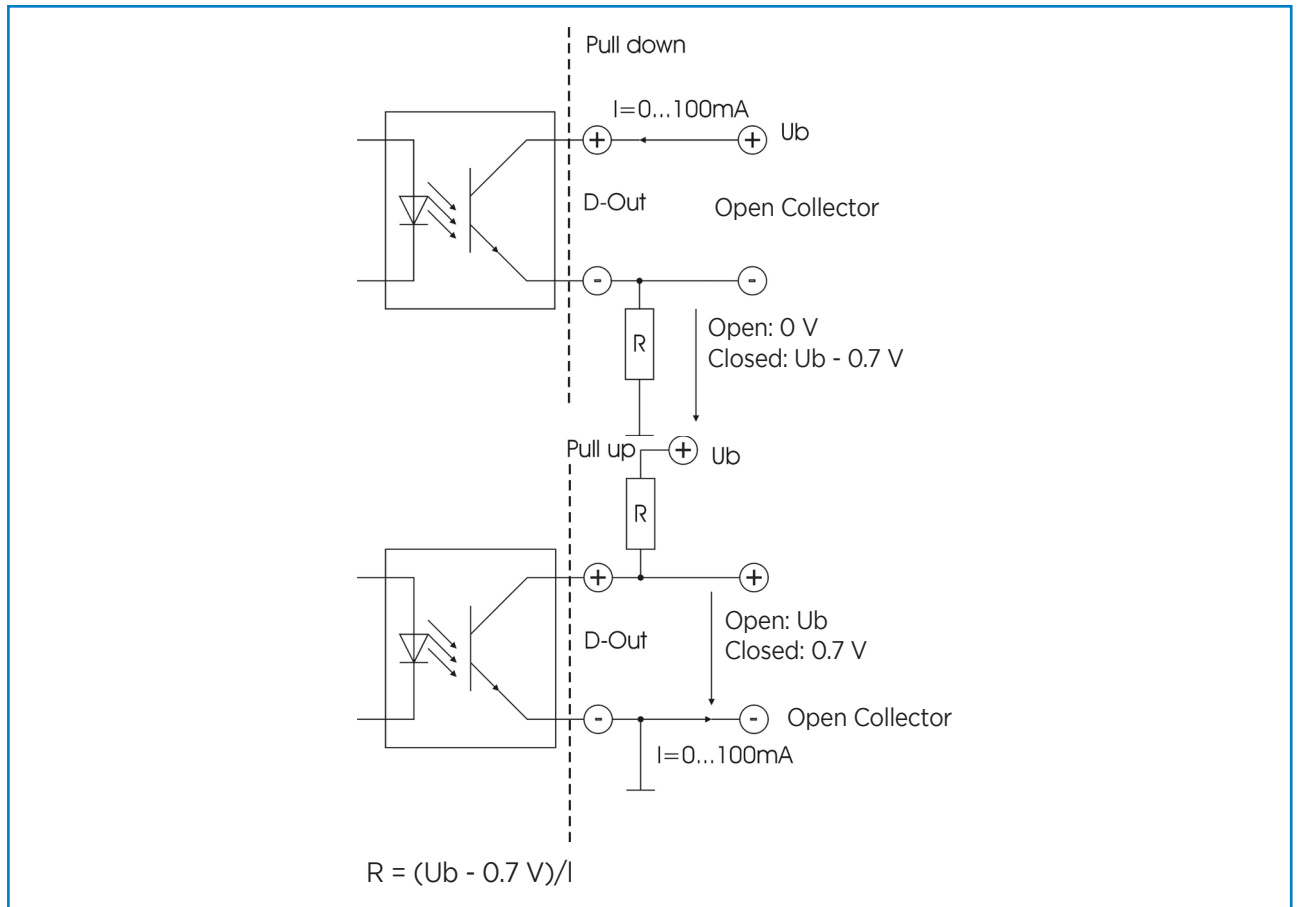
Typ	CODE	DIN Rail flashing	Current output	Cause	Action
ERR	V:E0001	3	2 mA	Defective internal amplifier (DC Offset)	Turn power off / on. If not helpfully sensor exchange.
PROC	V:P0002	2	4...20 mA	Low signal	Check sensor parameter, check process
ERR	V:E0004	3	2 mA	Defective velocity electrode	Turn power 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	Asymetric 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

12.4 Error codes flow


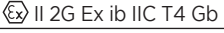

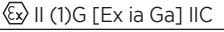
Typ	CODE	DIN Rail flashing	Current output	Cause	Action
ERR	Q:E0080	3	2 mA	Unsynchronous measurement signal	Turn power off / on. If not helpfully sensor exchange.
ERR	Q:E0100	3	2 mA	No material movement available	Check parameter, check process
ERR	Q:E0200	3	2 mA	No loading measurement	Check loading parameter
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

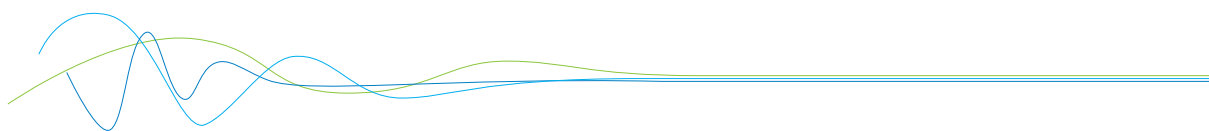
A detailed error description and following troubleshooting can be carried out by trained ENVEA Process technicians.

13. Connection example digital output



14. Technical data

Sensor	
Housing	Stainless steel 1.4571 - NW 10 ... 100 mm, flange according EN 1092-1
Inner pipe	Ceramic (Al_2O_3)
Protection category	IP65 according EN 60 529/10.91 Marking DustEx:  Marking GasEx: 
Environment temperature	Sensor pipe: $-20 \dots +130 \text{ °C}$ - Sensor electronic: $0 \dots +60 \text{ °C}$
Max. working pressure	85 bar
Transmission power	Max. 2 mW
Weight	Depending on the diameter
Dimensions	H: depending on diameter, L = 500 mm
Accuracy	$\pm 2 \dots 5 \%$ in the calibrated measuring range
Barrier IPB20	
Power supply	From MSE 300
Protection category	IP20 Marking DustEx:  Marking GasEx: 
Environment temperature	$0 \dots +60 \text{ °C}$
Weight	Approx. 500 g
Dimensions	107.6 x 89.7 x 60.7 (W x H x D)



14. Technical data

Evaluation unit MSE 300-FH	
Power supply	110/230 V, 50Hz - 60Hz (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 mm² [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 DCI: 3/110/220 V: 3/0.35/0.2 A Min. swithing load: 500 mW (10 V/5 mA)
Data backup	Flash memory
Pulse output	Open Collector - max. 30 V, 20 mA
Evaluation unit MSE 300-DR	
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 mm² [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 DCI: 3/110/220 V: 3/0.35/0.2 A Min. swithing load: 500 mW (10 V/5 mA)
Data backup	Flash memory
Pulse output	Open Collector - max. 30 V, 20 mA
Evaluation unit MSE 300-DR2	
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 110 x 121 (W x H x D)
Weight	Approx. 190 g
Interface	RS 485 (ModBus RTU) / USB
DIN Rail fastening	DIN 60715 TH35
Connection terminals cable cross-section	0.2 - 2.5 mm² [AWG 24-14]
Current output	2 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 DCI: 3/110/220 V: 3/0.35/0.2 A Min. swithing load: 500 mW (10 V/5 mA)
Data backup	Flash memory
Pulse output	Open Collector - max. 30 V, 20 mA

