

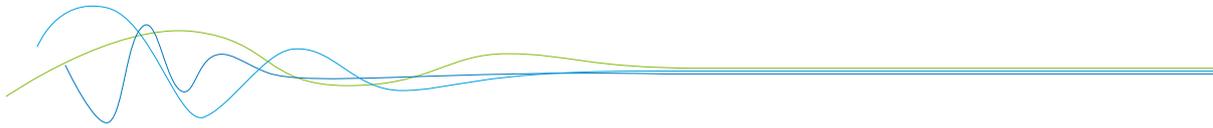


OPERATING INSTRUCTIONS

FlowJam T

BULK FLOW DETECTION FOR THIN PIPELINES





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1. Safety

The measuring system has been designed, built and tested in accordance with the latest state of the art and has left the factory in perfect condition. Nevertheless, system components may pose a risk to persons and property if they are operated improperly.

The operating instructions must therefore be read in full and the safety instructions observed. In case of improper and intended use, any liability and warranty by the manufacturer is rejected.

1.1 Normal use

The measuring system may only be installed for material flow monitoring in non-conductive lines. Other uses and modifications of the measuring system are not permitted. Only original spare parts and accessories from ENVEA Process GmbH may be used.

1.2 Indication of hazards

The following symbols are used in the operating instructions to indicate possible dangers when using the measuring system:



Warning!

- This symbol indicates actions in the operating instructions which, if not carried out correctly, may pose a risk to life and limb.



Attention!

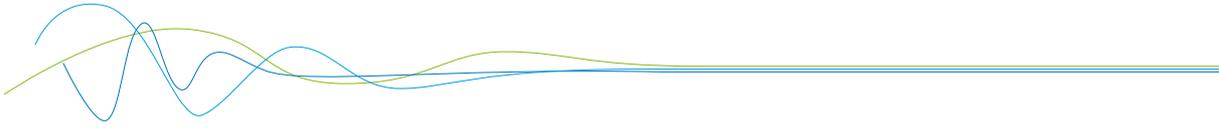
- This symbol is used in the operating instructions to indicate all actions that may cause possible danger to property.

1.3 Occupational and operational safety

- ① ▪ The measuring system may only be fitted and installed by trained and authorised personnel.
- ⚠ ▪ To avoid injuries caused by possible sharp edges on the measuring device, it is mandatory to wear protective equipment.
- ① ▪ Improper mechanical stress can cause damage to the device. To avoid this, the sensor should always be installed and used in accordance with all the information in the operating instructions. Likewise, the measuring device should not be exposed to vibrations.
- ① ▪ The components and electrical connections must be checked for damage at regular intervals. If there is any damage, it must be repaired before further operation of the units.
- ① ▪ Improper use of the sensor leads to a high risk to system safety, therefore the device may only be used as specified in the associated documentation.
- ① ▪ Switch off the supply voltage during all maintenance work, cleaning work and inspections on the pipelines or on the components of the meter.

1.4 Maintenance

- ⚠ ▪ Before working on the measuring device or its components, it is essential to ensure that they are de-energised, otherwise there is a risk of electric shock.
- ⚠ ▪ When working on the meter, use the correct tool, otherwise there is a risk of injury and the device could be damaged.



1.5 Technical statement

The manufacturer reserves the right to adapt technical data to technical development progress without special notice. ENVEA Process GmbH will be happy to provide information about the up-to-dateness and possible changes and extensions of the operating instructions.

1.6 Reliability

For more information about the reliability of the product, please contact ENVEA Process GmbH.

2. Evaluation unit

The measuring device is a compact device and does **not** require an evaluation unit. The sensor is parameterised via direct connection of a USB-RS485-Converter and the appropriate software.

If an external evaluation is explicitly desired, a converter in a DIN Rail housing can be used (art.no.: 55-0050).

3. Sensor

3.1 Product description

The FlowJam T was specially developed for monitoring the flow of solids conveyed through hose lines. The sensor can be used for hose lines made of electrically non-conductive material, such as plastic or rubber, with outer diameters between 4 and 25 mm. For the measurement, the sensor is mounted around the hose line.

The measuring device detects solid streams of all kinds moving through the detection area. The detection is carried out by the triboelectric discharges of the particles, independent of the direction of movement.

The material movement in non-metallic pipelines is displayed as a trend at the analogue output and as a switching state at the relay. Via the trend output, whether more or less material is conveyed through the tube, for example, can be displayed. The material flow can also be monitored for uniform distribution. In addition, the relay contact output provides additional Flow/NoFlow information.

The FlowJam T is a compact device and is connected via an 8-pin plug. If an external evaluation is explicitly desired, a converter can be installed subsequently. A USB-RS485-Converter and software could be supplied for parameterisation of the sensor.

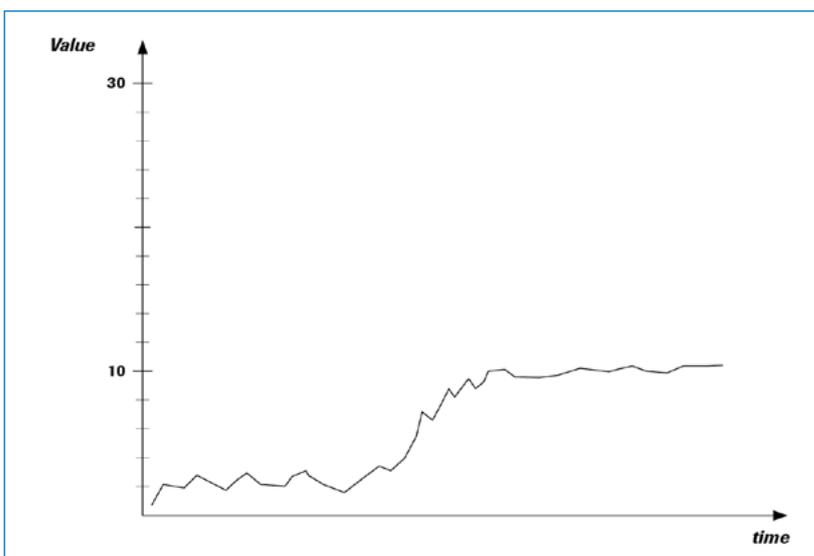
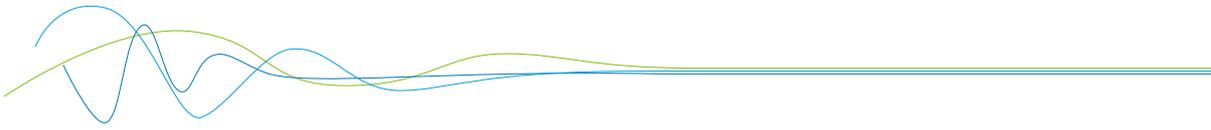


Fig. 1: Sensor signal with increasing mass flow rate



3.2 Mounting and installation

The sensor is delivered pre-assembled. The required outer diameter (of the hose to be monitored) is carried out via two retaining plates; it is mandatory to specify this when ordering.

The retaining plates are produced to the required outer diameter and can be exchanged for other sizes if necessary. The plates can be adapted for diameters from 4 to 25 mm. If necessary, the retaining plates can be replaced independently. Alternatively, the sensor can be sent to ENVEA Process GmbH for the exchange of the retaining plates.

The entire measurement technology of the sensor is located in the sensor body. The sensor can be installed independently of the flow direction.

An inlet distance of at least 10 cm should be maintained so that the material can be homogeneously distributed in the pipe.

If the sensor is used in wet applications (e.g. waterjet cutting systems), it is mandatory to use some sealing compound. The sealing compound must be applied to the measuring and base plate in the areas in front of the measuring electrode. The sealing compound should prevent water deposits from settling directly on the measuring electrode. A moist measuring electrode disturbs the measuring signal, but does not lead to a defect of the sensor.

The sensor consists of the following components:

- Body including measuring electronics (1)
- Measuring plate (2)
- Base plate (3)
- Mounting screws (4)
- Connection plug (5)

The sensor is delivered pre-assembled. In order to mount the sensor around the hose line, the screws (4) and the base plate (3) must be loosened from the body (1). The hose is inserted into the recess provided for this purpose, then the sensor body (1), together with the measuring plate (2), is mounted on the base plate (3) and fixed to an earthed base using suitable screws via the prefabricated holes.

As soon as the individual parts around the hose to be monitored are firmly connected to each other, the hose line is fixed in front of the measuring electrode and the sensor is ready for use.

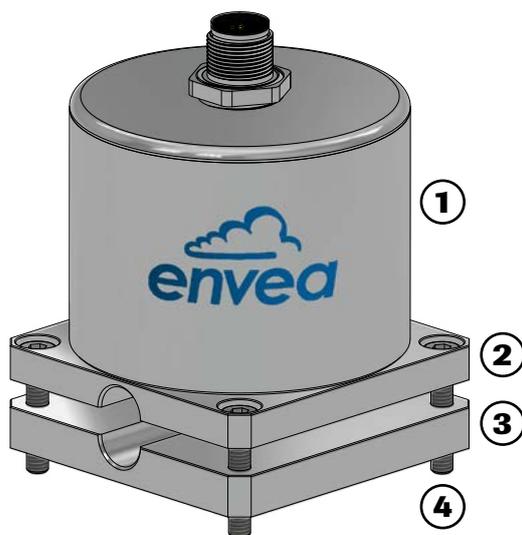
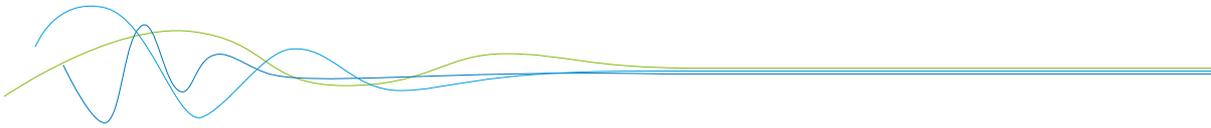


Fig. 2: Sensor



Fig. 3: Installation example



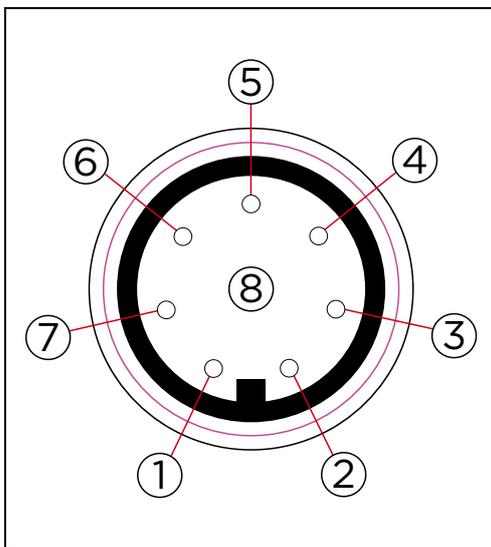
3.3 Electrical connection

The sensor is supplied with a suitable connector plug. An 8-wire, shielded cable needs to be connected to this connector.

For a communication in-between computer and sensor a USB-RS485-Converter is needed. This kind of converter could be also ordered by ENVEA Process GmbH. With this converter the sensor can be connected to a computer to change the sensor parameters. To use the converter correctly, it may be necessary to install the appropriate drivers. These are provided on the ENVEA website.

3.3.1 Sensor

The plug supplied is connected according to the following connection diagram. The analogue output provides an active signal.

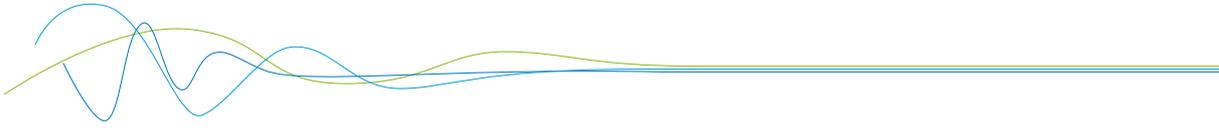


PIN no.	Signal
1	+ 24 V DC
2	0 V DC
3	Modbus A
4	Modbus B
5	Relay NO
6	Relay COM
7	Current output + (4 ... 20 mA)
8	Current output - (4 ... 20 mA)

Fig. 4: M12-connector: sensor

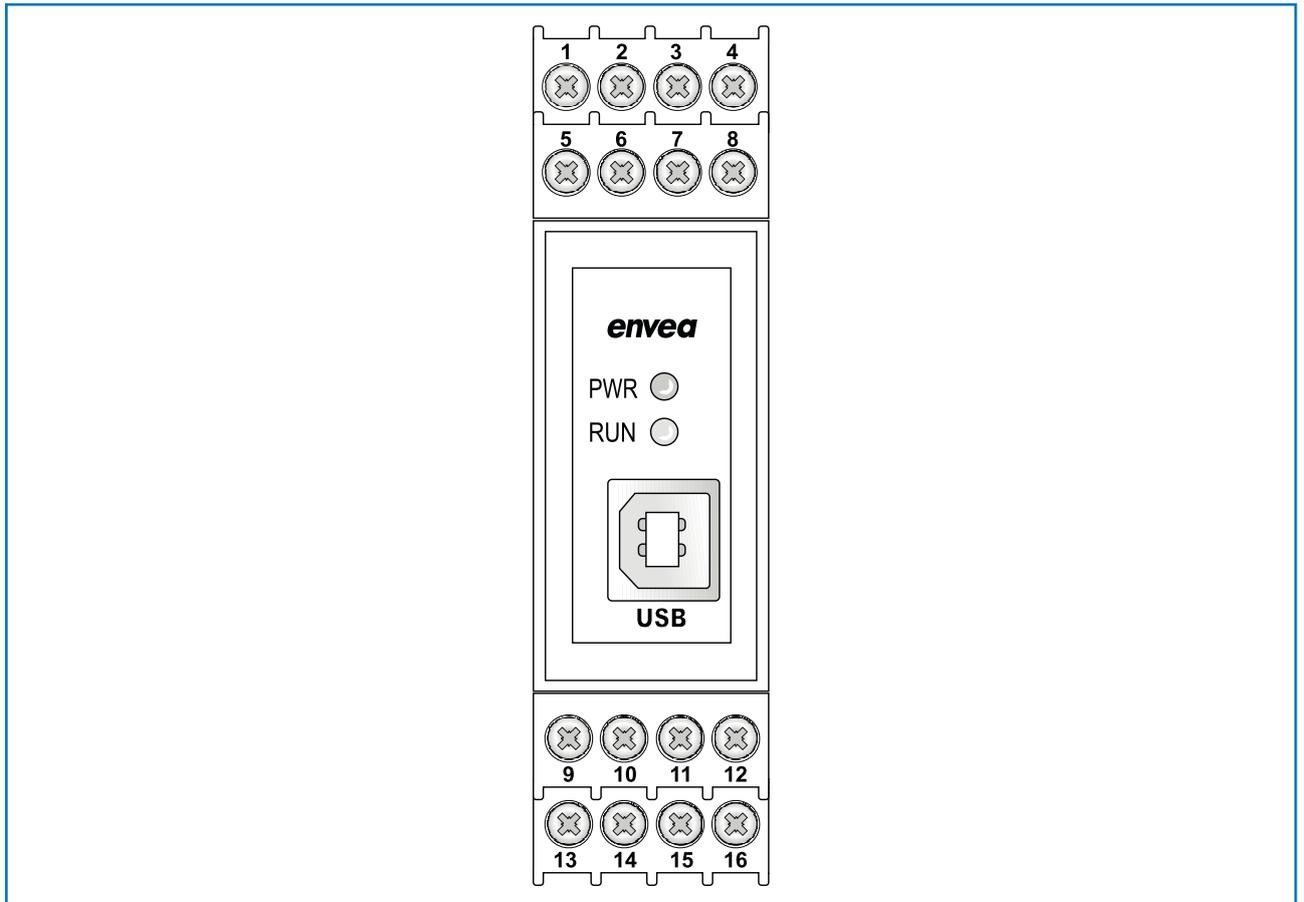
3.3.2 USB-RS485-Converter

Converter connection	Meaning
D +	Modbus A (sensor)
D -	Modbus B (sensor)
USB A	USB (computer)



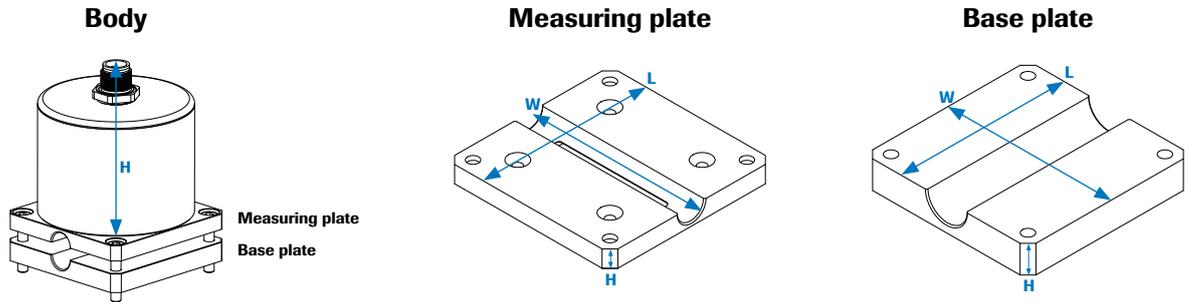
3.3.3 DIN Rail converter (optional)

1 Current output - 4 ... 20 mA	2 Current output + 4 ... 20 mA	3 Input Supply voltage 0 V DC	4 Input Supply voltage + 24 V DC
5 not used	6 Alarm relay NC (normally closed contact)	7 Alarm relay COM	8 Alarm relay NO (normally open contact)



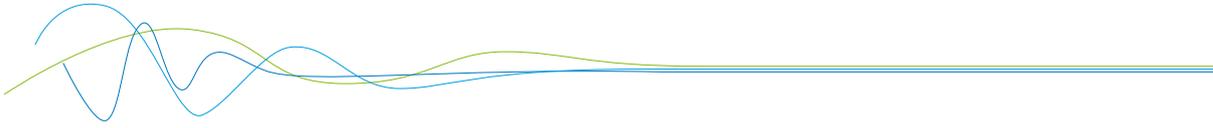
9 not used	10 not used	11 RS 485- Interface Data B	12 RS 485- Interface Data A
13 Sensor connection RS 485 Data B	14 Sensor connection RS 485 Data A	15 Sensor connection Voltage supply 0 V	16 Sensor connection Voltage supply + 24 V

3.4 Dimensions



Height	Ø
62.35 mm	62 mm

Hose outer diameter	Height measuring plate	Height base plate	Height total sensor	Wide	Length
4 mm	3.6 mm	5.0 mm	70.95 mm	62 mm	62 mm
5 mm	4.1 mm	5.5 mm	71.95 mm		
6 mm	4.6 mm	6.0 mm	72.95 mm		
7 mm	5.1 mm	6.5 mm	73.95 mm		
8 mm	5.6 mm	7.0 mm	74.95 mm		
9 mm	6.1 mm	7.5 mm	75.95 mm		
10 mm	6.6 mm	8.0 mm	76.95 mm		
11 mm	7.1 mm	8.5 mm	77.95 mm		
12 mm	7.6 mm	9.0 mm	78.95 mm		
13 mm	8.1 mm	9.5 mm	79.95 mm		
14 mm	8.6 mm	10.0 mm	80.95 mm		
15 mm	9.1 mm	10.5 mm	81.95 mm		
16 mm	9.6 mm	11.0 mm	82.95 mm		
17 mm	10.1 mm	11.5 mm	83.95 mm		
18 mm	10.6 mm	12.0 mm	84.95 mm		
19 mm	11.1 mm	12.5 mm	85.95 mm		
20 mm	11.6 mm	13.0 mm	86.95 mm		
21 mm	12.1 mm	13.5 mm	87.95 mm		
22 mm	12.6 mm	14.0 mm	88.95 mm		
23 mm	13.1 mm	14.5 mm	89.95 mm		
24 mm	13.6 mm	15.0 mm	90.95 mm		
25 mm	14.1 mm	15.5 mm	91.95 mm		



4. PC software

Communication between the sensor and the computer is via Modbus. The parameters of the FlowJam T are adjusted by default with the Dust Base software. A USB-RS485-Converter could be provided by ENVEA Process GmbH.

This converter allows the sensor to be connected to a computer and the sensor parameters to be changed. To use the converter correctly, it may be necessary to install the appropriate drivers.

A total of three software variants are available:

- **Dust Base:** For normal use and parameterisation of the sensor.
- **Dust Professional:** For the display, recording and analysis of sensor data from up to 10 sensors.
- **Dust Service:** Exclusively for ENVEA service technicians, for in-depth sensor analysis.

We are happy to offer the Dust Professional software for a fee as a separate item.

4.1 Establishing a connection between sensor and software

1. Install sensor according to specifications and connect electrically.
2. Switch on the power supply.
3. Run the software installation routine - Dust Base Vx (Link: [Product Software](#)).
4. Connect the sensor to a computer using an USB-RS485 converter.
 - a) From Windows 7 onwards, the required driver should be installed automatically. If the required driver is not installed automatically, it can be downloaded from the ENVEA homepage (Link: [Drivers](#)).
 - b) After a successful driver installation appears under: Windows Control Panel\Device Manager under „COM & LTP“ a „USB485 Isolated 2 wire port“.
 - c) The COM number must be between 1 and 10 so that communication can be established between the software and the sensor. The numbering can be adjusted manually by clicking on the COM port with the right mouse button:
Properties → Connection Settings → Advanced Settings
5. Start Dust Base software and select the appropriate COM port under the System tab. The sensor address is by default: 2.
6. In the upper left selection window, select the option direct or auto.
7. By confirming the checkbox ON, the communication to the sensor is started. If communication is correct, the query counter is highlighted in green.

4.2 PC interface

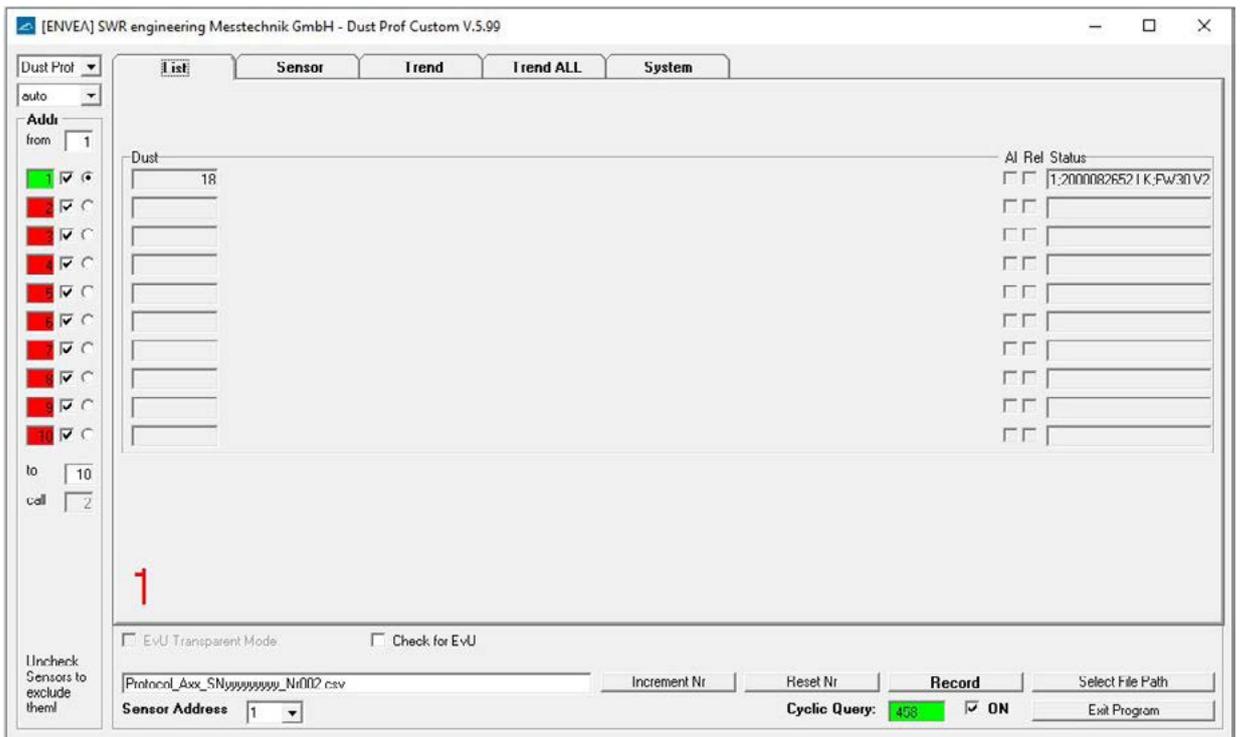
4.2.1 List tab (only in Dust Professional version)

All connected sensors (max. 10) are listed and displayed in the List tab.

Connected sensors provide the current dust value here, as well as information about the alarm (AI) and relay (Rel) status. Information on the Modbus address, serial number, firmware and error words are also displayed for each active sensor.

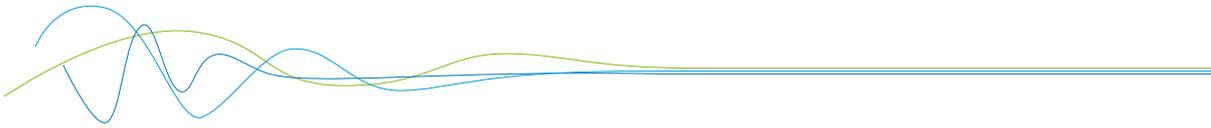
It is possible to remove individual sensors from the query. In order for a sensor to no longer be queried, only the respective tick must be removed.

The dot next to the tick serves as orientation which sensor is being processed in the other tabs.



The screenshot shows the 'List' tab of the 'Dust Prof Custom V.5.99' software. The interface is divided into several sections:

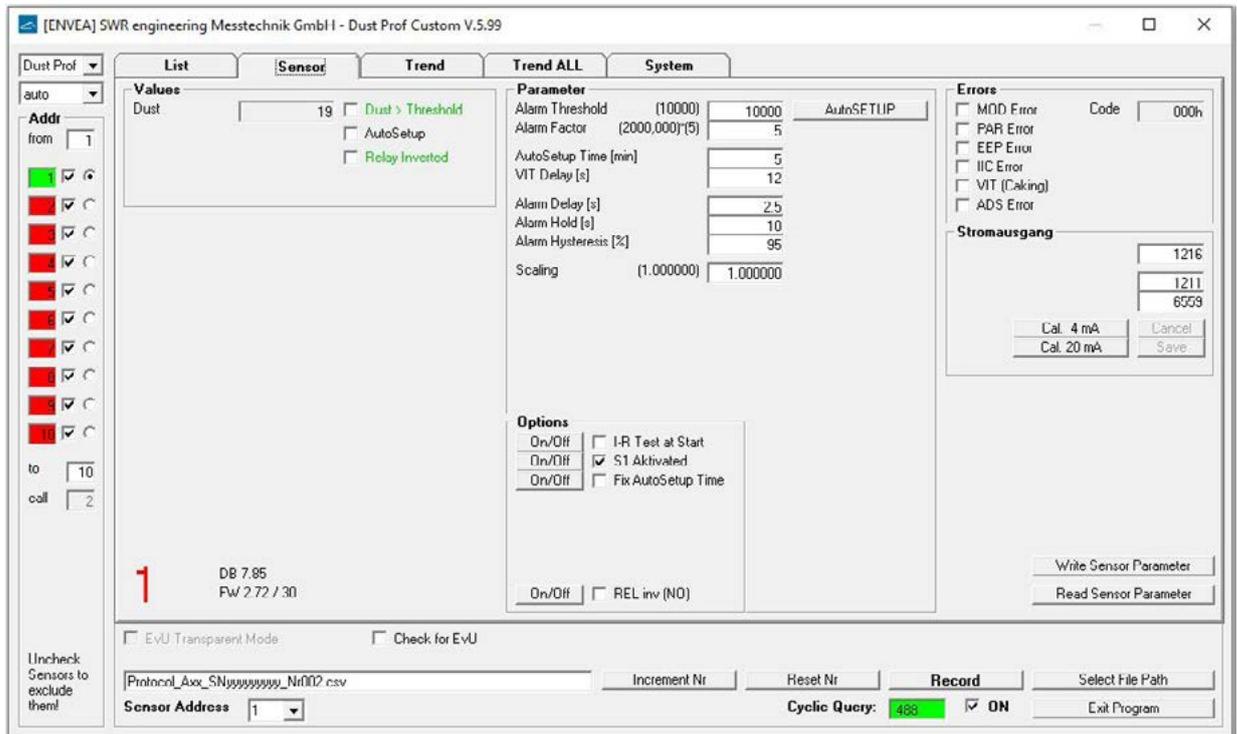
- Top Bar:** Contains tabs for 'List', 'Sensor', 'Trend', 'Trend ALL', and 'System'. The 'List' tab is currently selected.
- Left Sidebar:** Includes a 'Dust Plot' dropdown set to 'auto', an 'Add' section with a 'from' field set to '1', a list of 10 sensors (each with a colored status indicator and a checked tick), and a 'to' field set to '10'. Below this is a 'call' field set to '2' and a checkbox for 'Uncheck Sensors to exclude them!'.
- Main Table:** A table with columns for 'Dust', 'AI', 'Rel', and 'Status'. The first row shows a dust value of '18' and a status of '1:20000826521 K;Fw30 V2'. There are 10 rows in total, with the first row having a red dot next to its tick.
- Bottom Panel:** Contains checkboxes for 'EvU Transparent Mode' and 'Check for EvU'. Below these are several buttons: 'Increment Nr', 'Heset Nr', 'Record', 'Select File Path', and 'Exit Program'. A 'Sensor Address' dropdown is set to '1'. A 'Cyclic Query' indicator shows '458' in a green box and is checked 'ON'.



4.2.2 Sensor tab

Individual settings for the sensor can be made in the Sensor tab.

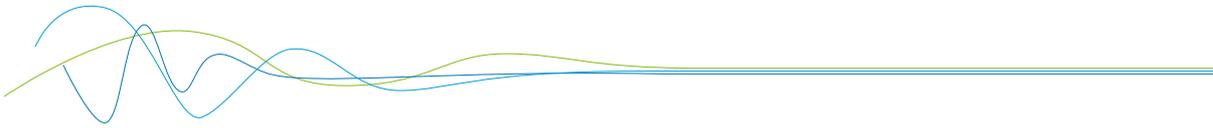
Here the measured values of the sensor (**Values**) can be observed and the basic parameters (**Parameter**) of the sensor can be set.



Measurement data of the sensor

- Dust: Measured value for dust loading
- ✓ Dust > Threshold: Alarm threshold exceeded
- ✓ Relay inverted: Switch REL inv to ON, so that alarm output (flag and relay of the sensor) is inverted
- ✓ AutoSetup: an AutoSetup is being executed

Parameter	Default value	Meaning
Alarm threshold	10000	Threshold value for the relay contact and 12 mA signal at the analogue output.
Alarm factor	5	Factor for calculating the alarm threshold when using AutoSetup.
AutoSetup time	5 min	Duration of the AutoSetup
VIT delay [s]	12 s	Time a deposit must be present to create an alarm (not necessary for the FlowJam T).
Alarm delay [s]	2.5	Time for which the alarm value must be exceeded/fallen short of in order to switch on the alarm.
Alarm hold time [s]	10	Minimum time for which the alarm remains switched on, even if the alarm threshold has been exceeded/fallen below again in the meantime.
Alarm hysteresis [%]	95	Threshold for resetting the alarm.



AutoSetup

AutoSetup starts a search for the alarm value:

The sensor goes in search of the signal level, which represents the current dust load.

Option		
I-R test	On/Off	Self-test of the sensor outputs
S1 activated	On/Off	Activate/deactivate the push button switch on the electronics
Fixed AutoSetup time	On/Off	AutoSetup time can no longer be adjusted.
REL INV (NO)	On/Off	Software inversion of the relay

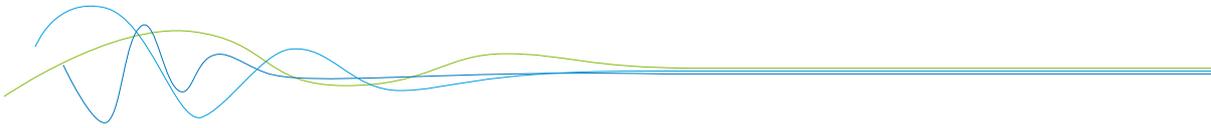
Error

The indicators show the results of functional tests that run permanently at runtime of the system.

- ✓ MOD error: Modbus connection is defective
- ✓ PAR error: EPRM cannot be read/written
- ✓ EEP error: EEPROM provides inconsistent data
- ✓ IIC error: IIC bus defective
- ✓ VIT (caking): Limited measuring range due to build-up of deposits (conductive)
- ✓ ADS error: Incorrect internal timing

Current output

First line	Momentary analogue value (digital)
Second line	Analogue value at 4 mA (digital)
Third line	Analogue value at 20 mA (digital)
Kal. 4 mA	The 4 mA signal can be simulated and calibrated via the functions.
Kal. 20 mA	The 20 mA signal can be simulated and calibrated via the functions.



4.2.3 Trend tab

In the Trend tab, the measured and calculated values of the individual sensors can be viewed.

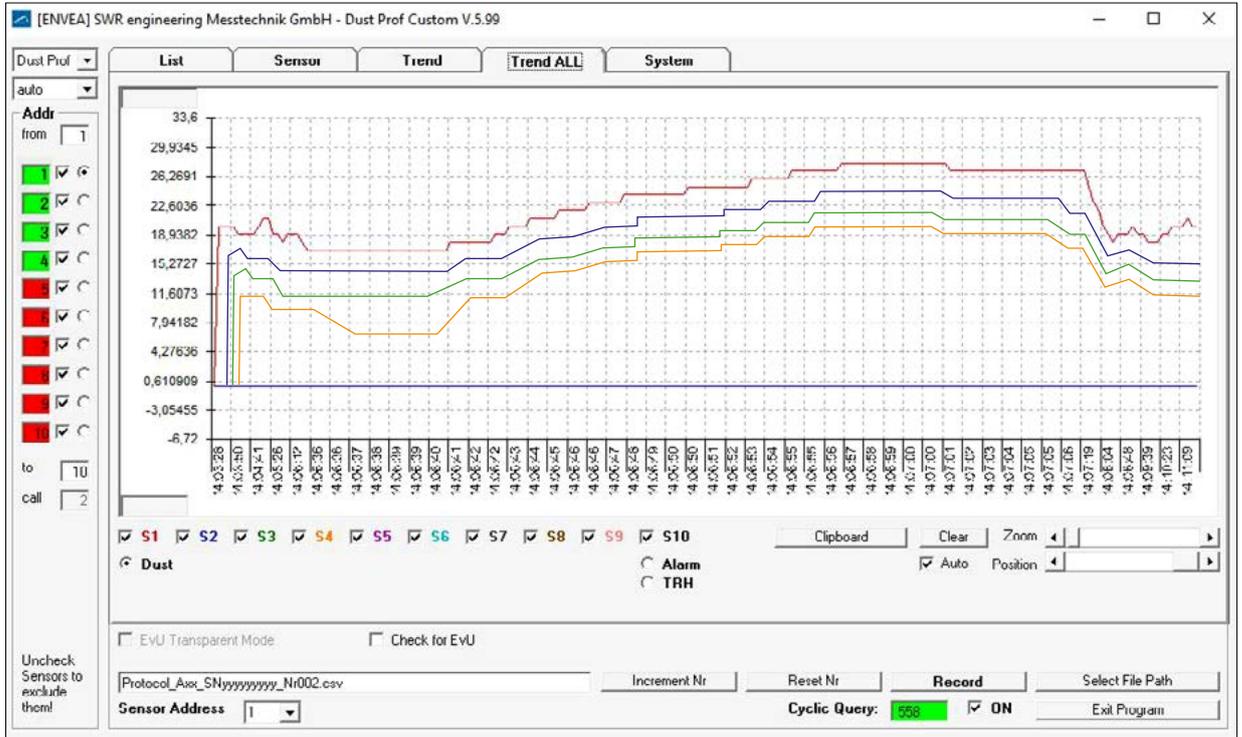


All values can be displayed either on the left or on the right scale. To display a value on the right scale, right-click on the value name. Values that are displayed on the right scale are formatted in *italics*.

Button	Function
Clipboard	A screenshot of the displayed trend is saved to the clipboard and can be further processed as desired.
Save to file	All sensor data displayed in the trend can be saved in Excel format. Maximum storage time is 60 min.
Clear	The trend window is cleared.
Zoom	The slider can be used to zoom in and out of the data.
Position	The position of the trend display can be varied via the slider.
Auto	If Auto is ticked, the trend window always runs with the current values.

4.2.4 Trend all tab (only in Dust Professional version)

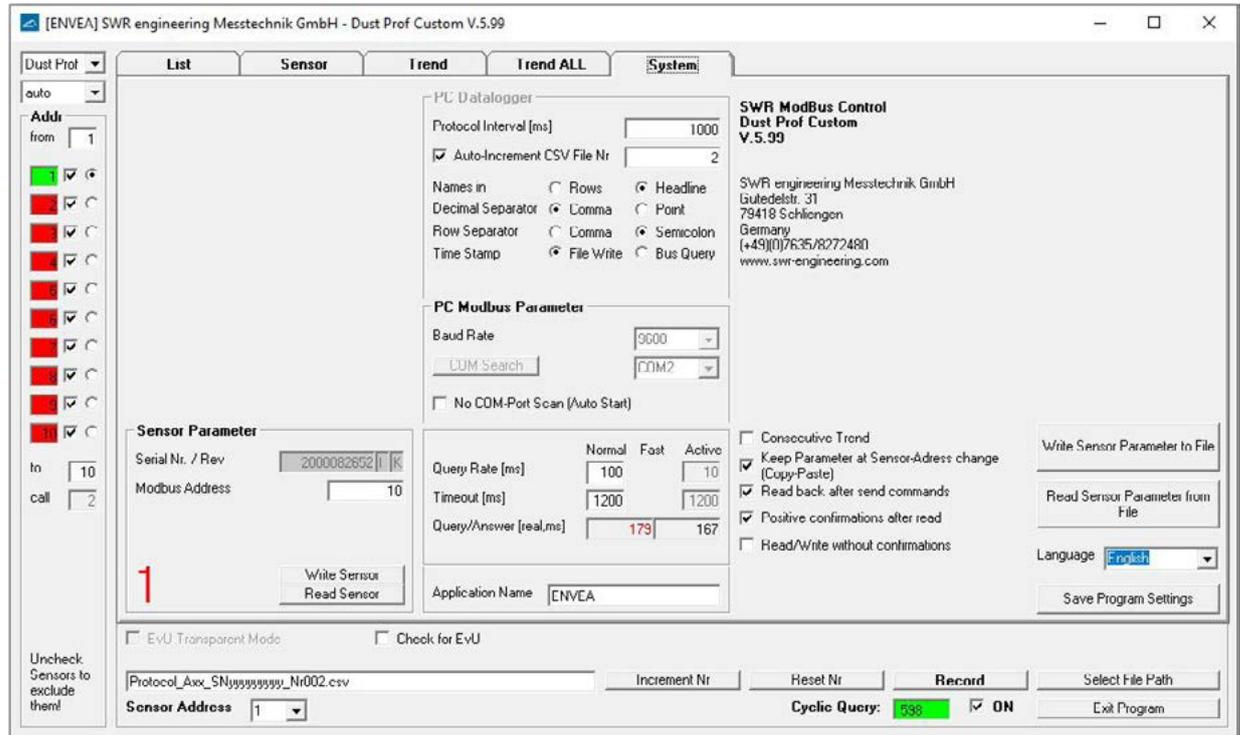
In the Trend all tab, all activated individual sensors can be displayed simultaneously.





4.2.5 System tab

In the System tab, the basic settings for communication are made and displayed.



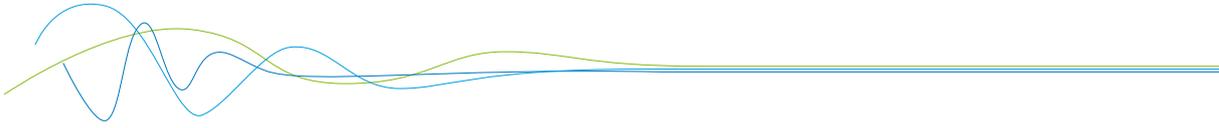
The serial number and the Modbus address can be read out under **Sensor Parameter**. To do this, press the button *Read sensor*.

The baud rate (Std. 9600), the COM port and the query rate and timeout time are set under **PC Modbus Parameter**. The *COM search* button can be used to search for a COM port that is not listed. This function is only available when communication is switched off. An application name can also be assigned, which is named in the software and in the protocol notes. If desired, the set parameters can be saved on the computer by clicking on the button *Write sensor parameter to File* or loaded from the computer by clicking on the button *Read sensor parameters from File*.

Under **Language**, you can choose between English and German software language. The button *Save Program Settings* is for saving the set parameters (application name, language, query rate, timeout) of the software.

In addition, the behaviour of the software can be adapted to the user via some checkboxes:

Checkbox	Meaning
Consecutive trend	The trend continues even with communication breakdowns.
Keep parameters at sensor-address change	If activated, all parameters are retained when the address is changed.
Read back after send commands	If activated, all parameters are read out again after sending.
Positive confirmations after read	When activated, there is a reaction from the software for each action.
Read/write without confirmations	If activated, parameters are sent or read without the software asking again.



PC Data Logger (Dust Professional version only)

Additional settings for logging the sensor data can be made here.

- Protocol interval in milliseconds
- Auto Increment CSV File No.
If this option is checked, a new CSV file is created every 24 hours.
This file is numbered in ascending order.
The numbering can also be entered freely here.

Depending on the settings of the computer used, it may be necessary to change the formatting of the log file.

The following options are available for this:

- Names (value description) in columns or header
- Decimal separator as point or comma
- Column separator as comma or semicolon
- Time stamp as protocol (system time) or as bus query

Creating a log file

The sensor signals can be recorded via the integrated data logger.

To start a recording, proceed as follows:

First, the storage location on the computer is specified via the button *Select file path*. Then the recording can be started via the *Record* button. As long as the software is creating a recording, the *Record* button is highlighted in red. To record data, the cyclical query must be switched on.

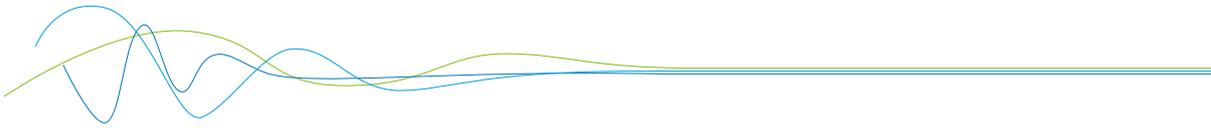
Each protocol file is named according to a specific structure:

Protocol_Axx_SNyxxxxxxxxx_Nr001.csv

Protocol	non-modifiable part
Axx	Modbus address of the recorded sensor
SNxxxxxxxxxx	Serial number of the recorded sensor
Nr.	Sequential numbering of the protocol files

The Modbus address and the serial number are automatically added to the protocol name.

The numbering at the end of the name can be increased using the *Increment Nr.* button or, using the *Reset Nr.*, be set back to 001.

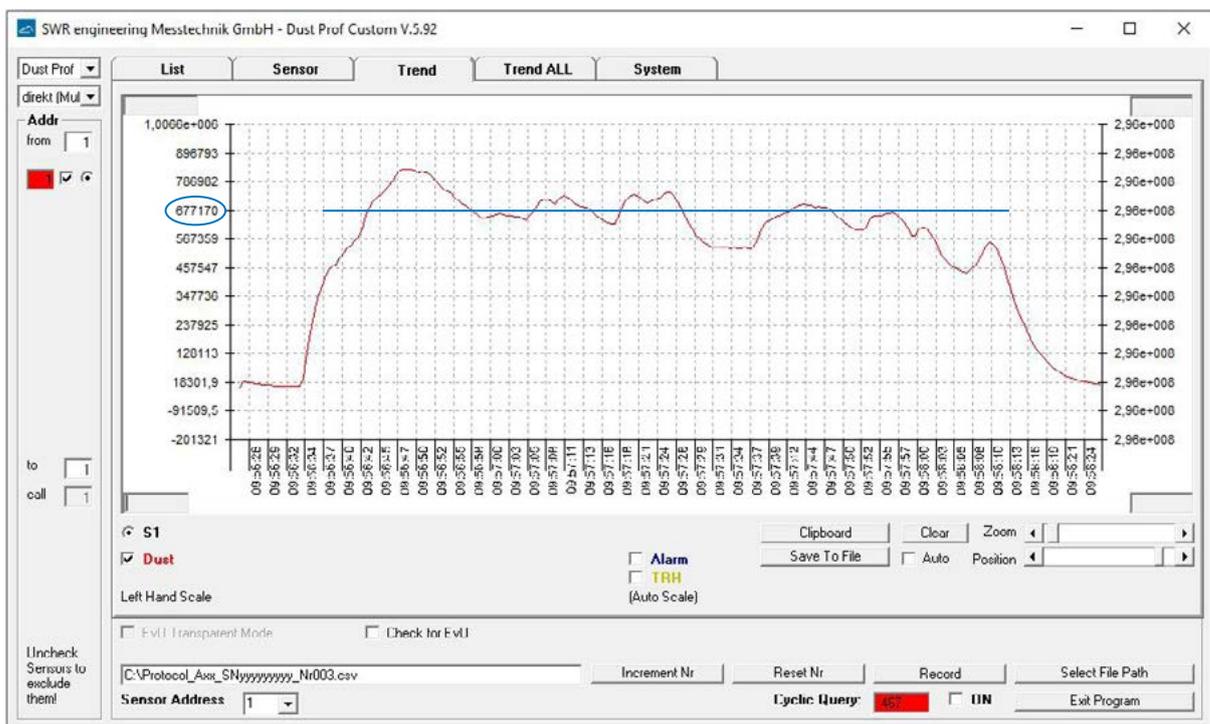


5. Commissioning

The sensor must be mounted and electrically connected as described in chapter 3.2 and chapter 3.3. Then a USB-RS485-Converter is connected to the corresponding cable ends (pin 3 + pin 4). In order to adjust the FlowJam T to the existing material flow, Dust software is mandatory. The parameters can now be adjusted via the Dust software.

No calibration table can be created on the sensor for the sensor signals, only the 12 mA signal can be assigned to a process state. To adjust the analogue signal, the alarm threshold must be set to the process. The set alarm threshold later corresponds to a 12 mA signal.

A constant material flow should be established for setting the alarm threshold. The signal curve can be viewed in the Trend tab. If the material flow is constant over a period of approx. 3-5 minutes, the alarm threshold can be set close to this point.



This example shows a relatively constant flow. The mean value is the limit shown, so the alarm threshold can be set to 677170 points.

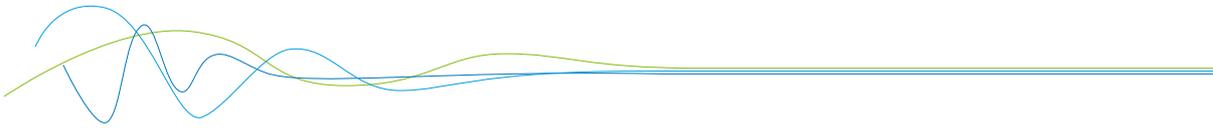
The data can also be analysed externally, e.g. via Excel. To do this, click on the *Save to File* button in the Trend tab. After a storage location has been specified, the process need to be recorded. During recording the process values, a .csv-file will be created. Using the date and time from the recorded protocol, the dust values can also be assigned to the process retrospectively. Using the dust values, an exact average value can now be calculated and used as an alarm threshold.

Attention!

In this way, only up to 60 minutes can be logged with the Dust Base version. If a longer period or the recording of up to 10 sensors is desired, the Dust Professional version must be used.

The calculated value (677170) is now entered in the Sensor tab in the *Alarm/Threshold* column. In order to transfer this parameter to the sensor, the button *Write sensor parameters* must then be clicked. It is recommended to read in the parameters again via the button *Read sensor parameters* in order to check that all parameters have been transferred correctly.

If an alarm threshold has been set, this value corresponds to the 12 mA signal at the analogue output. Process states that generate a lower or higher flow are now indicated linearly at the analogue output.



6. Technical data

Sensor	
Power supply	24 V DC
Connection	M12 plug
Current output	4 ... 20 mA, load < 500 Ω (Aktiv)
Relay output	NO (normally open contact) max. 250 V AC / 0.5 A; 30 V DC / 1 A
Interface	RS 485 (Modbus RTU)
Housing material	Aluminium
Protection class	IP64
Process temperature	-20 ... +60 °C
Ambient temperature	-20 ... +60 °C
Available diameters	4 ... 25 mm
Weight	Approx. 365 g (depending on diameter)
Dimensions	Width: 62 mm Depth: 62 mm Height: depending on diameter Ø (with Ø 8 mm the height is 75 mm)

