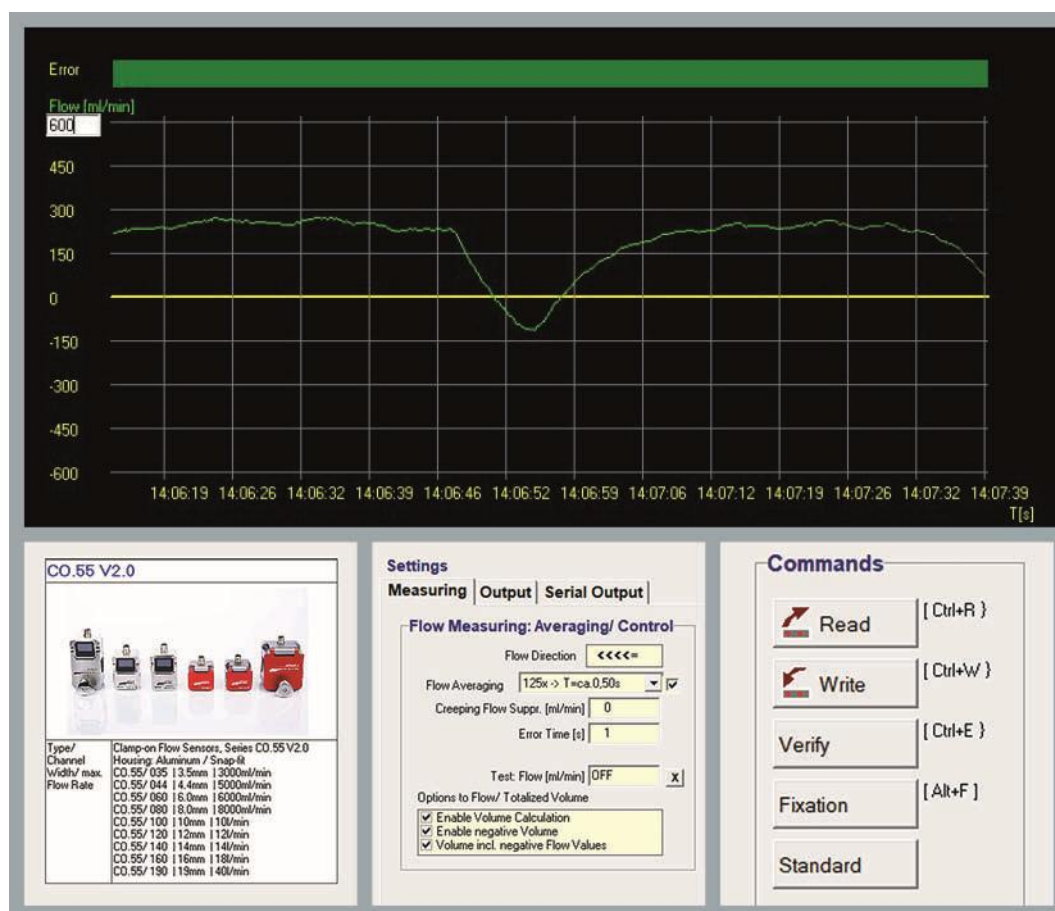




## Operating Manual

### Flow Monitor

V02.60.04.00

Software for SONOFLOW and SEMIFLOW Sensors

Original

Revision: 1.1 | 2026-02-17



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# 1 Introduction

The following section explains the function, structure and relevant information types of this documentation. This is intended to make it easier to find information.

## 1.1 Notes on this documentation

### Purpose of the following information

The following information is an integral part of the product. It contains important and necessary instructions for safe operation. Before any application, each user must read and understand the contents. All rules and regulations must be strictly followed. In addition, you will find information and guidance necessary for proper and efficient use.

❗ Even if commissioning and usage seem to be largely self-explanatory - not all functions are perfectly transparent at first glance. In addition, some action steps require deeper knowledge of the scope of functions. Read all details carefully to take advantage of all supported features and use them optimally for your application.

### Scope of the documentation

The following information is part of the 'User Documentation' of SONOTEC sensors and associated accessories, e.g. software for parameterization. Components of this 'User Documentation' are (depending on sensor type, the scope of order and application):

- 'Operating Manual' (instructions for safety, trouble-free installation and operation)
- 'Technical Data Sheet' (lists technical specifications of the sensors standard version)
- 'Customer Specification' (optional: deviations from the SONOTEC standard)
- 'Sensor Interface Description'
- Manual for 'Communication Interface' (e.g. data converters)
- 'User Documentation' of software for sensor configuration
- 'Notes to settings' (explanations of typical or recommended parameter settings)
- Certificates proving special product properties

Contact us if you find inaccuracies in these documentations and if parts or content are missing.

### Accessibility

All staff working with the equipment must have constant access to this information to prevent handling errors and guarantee trouble-free operation. Ensure that all required information – especially the safety instructions – is available to all persons working with it.

User groups can be depending on the application:

- Device and system developers planning the adaption and integration of sensors
- Operators responsible for the monitoring of flow

## Up-to-dateness

This documentation describes the software in Version V02.60.02.00.

Every effort has been made to ensure that the information contained in this documentation is complete and correct at the time of release. The following information describes all units and functions known at the current point of time.

The information is subject to change without notice in the course of continuous product development. The information is not subject to an automatic change service.

## Standard version and customer-specific adaptations

This software documentation lists standard sensor types

- with measurement parameters for typical applications and
- different interface settings for sensor integration.

The parameter sets are approved for numerous applications.

In case the standard settings do not work for the application, they can be adapted by SONOTEC or partly by the customer. Deviations of the standard settings are listed in the 'Customer Specification'. Please contact our service for details.

## 1.2 Labeling of safety-relevant information

Information and instructions on hazards are specially labelled depending on the risk to the user. The hazard level is indicated by different signal words and colors.

| Signal word                                                                                        | Color  | Meaning – Level of risk                                                                                                                                                 |
|----------------------------------------------------------------------------------------------------|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  <b>DANGER</b>  | Red    | Warns of immediate danger, which, if ignored, may lead to death or serious injury.                                                                                      |
|  <b>WARNING</b> | Orange | Warns of possible immediate danger, which, if ignored, may lead to lasting damage to health and/or property – including financial losses due to operational impairment. |
|  <b>CAUTION</b> | Yellow | Warns of dangers, which, if ignored, may lead to injury or damage to property – including damage to property due to operational interruptions.                          |
| <b>ATTENTION</b>                                                                                   | Yellow | Warns of dangers, which, if ignored, may lead to damage to property – including damage to property due to operational interruptions.                                    |

General structure of warning messages:

**▲ SIGNAL WORD**

**Potential hazard, and if appropriate, their causes.** This is followed by an explanation of the probable consequences and instructions on how to avoid such hazards.

---

The safety alert symbol **▲** in combination with the listed signal words indicates hazards that can occur during individual work steps.

## 1.3 Representations in this documentation

### Illustrations and sample data

The illustrations used do not always include all details or special cases (e.g. in the case of deviating specifications of a product series or different software releases). To explain the basic design or functionality, only the relevant information is shown in some cases.

Due to the many possible different applications, not every individual case can be described. Examples (e.g. parameters or measurement data) should enable a better understanding of functions and applications.

### Tips

Tips are marked as follows:

① Tips describe specific information or particular features that might not be evident, even for experienced users. The neglect of a tip poses no direct safety risk. However, it can lead to workflow disruptions.

### General icons

The following general icons are used for visual emphasis:

| Icon                                                                                | Function                                  |
|-------------------------------------------------------------------------------------|-------------------------------------------|
|  | Indicates a hyperlink to external content |

---

## 2 Safety instructions

The reliable and safe operation of the software and all accessories depend on the careful handling and execution of all operational tasks as well as the observation of all safety regulations.

### 2.1 Basic hazards

The software and its accessories comply with the current state of the art and applicable safety regulations. All components are tested thoroughly before they leave the factory and are delivered in a condition for safe operation.

However, residual risks can never be completely eliminated by the manufacturer because

- not all details of the application or the installation site are known,
- the circumvention of integrated protective measures cannot be ruled out by the design of the equipment and
- operating errors can occur due to carelessness even after instruction of the user and with safety-conscious, intended use.

**⚠** Observe all safety instructions and warning information in all parts of this user documentation as well as related codes of practice.

Failure to comply with safety instructions can, in the worst case, lead to serious injury with lasting health consequences for personnel as well as malfunctions, damage or destruction of sensors or components. Depending on the application, this may have unforeseeable consequences. Serious financial consequences due to business interruptions can also not be ruled out in this case.

### 2.2 General safety instructions

#### **⚠ DANGER**

#### **Modification of sensor parameters can massively impair safety.**

Some of the SONOFLOW sensors can be configured by SONOTEC to be used in medical applications. Observe, that parameter changes can have strong impact on medical safety! Parameter changes or modifications to sensors for use in medical applications without consulting SONOTEC are strictly prohibited.

The plant operator is responsible for correct documentation of any parameter changes.

---

In addition, the following basic safety instructions apply:

- Only commission the necessary accessories and only change sensor settings if you have the required qualification, sufficient knowledge and experience.
- Valid technical standards, applicable installation regulations and specifications in the 'Technical Data Sheet' must be observed.
- Never use the software accessories in potentially explosive atmospheres.
- Never change the sensor settings before you have saved all parameters with the software.
- Electronic accessories, connectors and flash drive must never be immersed. They must be protected against moisture.
- Do never use any accessories if they show visible damage. Take them out of operation immediately in the rare event that functional errors occur.
- Accessory equipment must never be opened. They do not contain any user-serviceable parts.

Further safety instructions that must be observed can be found before the corresponding steps, if applicable. They are specially marked. For more details, see the introductory section.

## 2.3 Requirements for personnel and necessary qualifications

All tasks involved in the adaptation of the sensors to the planned measuring task (parameterization or calibration) must only be performed by personnel qualified for the special task. All groups must have read and understood the entire 'User documentation'. Authorized persons must be instructed for the relevant work steps. All necessary information from the manufacturer must be made available.

## 2.4 Prohibition of modifications and alterations

Modifications to the software are prohibited. The software or individual parts of it must never be disassembled, decrypted or decompiled. The accessories must never be opened or disassembled. The equipment does not contain any components to be cleaned, maintained or repaired by the operator. Repairs must always be carried out by the manufacturer. Modifications are prohibited as well. In these cases, safe operation can no longer be guaranteed. SONOTEC is not liable for any resulting damage or consequences.

## 2.5 Notes on data security

Based on analysis of vulnerabilities according to IEC 62443-4-1 and IEC 62443-4-2, no cyber security measures are necessary. However, a direct cyber-attack or tampering with the application environment cannot be completely ruled out.

Thus, we strongly recommend to implement safety measures (e.g. anti-virus programs, firewalls, access restrictions) against potential cyber-attacks within the application environment.

## 3 Flow Monitor description

In the following section you will find information about the intended use of the software. You will also find details about the design and explanations about the operating principle.

### 3.1 Intended use and functional description

The Flow Monitor in conjunction with the USB Data Converter is used to communicate via serial interface to the SONOFLOW and SEMIFLOW sensors, as well as the Remote Display using a computer. It is intended to support the operator in testing parameter settings to adjust sensors for a specific application and to provide assistance when investigating problems.

The following functions are available:

- Monitoring of flow and volume over time
- Recording data: flow and volume with time stamp and sensor state (up to 16 parameters more)
- Loading default settings of each sensor type
- Restoring delivery state
- Reading, writing and storing sensor settings
- Adapting measurement and interface settings
- Calibrating sensors (optional)
- Configuring sensor interface
- Changing software settings

Any other than the designated use is prohibited and can result in personal injury or damage to property. SONOTEC GmbH accepts no liability for damage, including to third parties, caused by improper handling of the FLOW Monitor and its components.

### 3.2 Supported sensor types

Firmware V2.71 and higher:

- SONOFLOW CO.55 (SD) V2.0 / SEMIFLOW CO.55 V2.0
- SEMIFLOW CO.65 PI V2.0
- SEMIFLOW CO.66 Ex1 (only with Barrier Box ST Ex1)
- SONOFLOW IL.52 V2.0

Firmware V1.05 and higher:

- SONOFLOW CO.55 V3.0

Firmware V4.01 and higher:

- SONOFLOW CO.56 (Pro)

Firmware V1.00 and higher:

- SONOFLOW Remote Display RD.10

→ Sensor short forms: CO.55 / CO.56 / CO.56 Pro / CO.65 / CO.66 / IL.52 / RD.10

The chapters relevant for parameterization are provided with a list of sensor short forms (see above). The abbreviation 'CO.55' stands for all three types. In case of deviations they are labeled with the relevant version (Vx.x). Chapters without label refer to all sensor types.

Older sensor versions (e.g. firmware V2.42 or V2.70) are still supported by the software. The description is not part of this manual (see description Flow Monitor V1.0; please contact our service).

### 3.3 System requirements

The software is optimized for the following systems:

| System            | Requirements                      |
|-------------------|-----------------------------------|
| Operating system  | (64-bit) Windows 7, 8.1, 10 or 11 |
| Screen resolution | OpenGL 4.3 / 1024 x 640 or higher |
| Interface         | Minimum 1 USB port                |
| Processor         | i5 (2.4 GHz) or higher            |
| RAM               | 4 GB or higher                    |
| Software Size     | Approx. 20 MB                     |
| Software          | Excel (only for reporting)        |

### 3.4 Components of the Flow Monitor (Hardware)

The Flow Monitor generally consists of the following:

- USB Data Converter (different types, see next page)
- USB flash drive or download of Flow Monitor software (Flow Monitor and driver for USB Data Converter)
- Sensor cable, except for sensors with fixed cable (see next page)
- USB cable, type A-B, length 2 m (if necessary, depending on version of USB Data Converter)
- Plug-in power supply +24 V (if necessary, depending on version of USB Data Converter)

### 3.5 USB Data Converter design

| Sensor                                                                                      | USB Data Converter | Sensor cable                                                                  |
|---------------------------------------------------------------------------------------------|--------------------|-------------------------------------------------------------------------------|
| SONOFLOW IL.52 V2.0<br>SONOFLOW CO.55 V2.0<br>SONOFLOW CO.55 V3.0<br>SONOFLOW Display RD.10 | Type 023           | USB V2.0, 8 pole, length 2 m<br>Sensor: M12-plug<br>USB Data Converter: fixed |

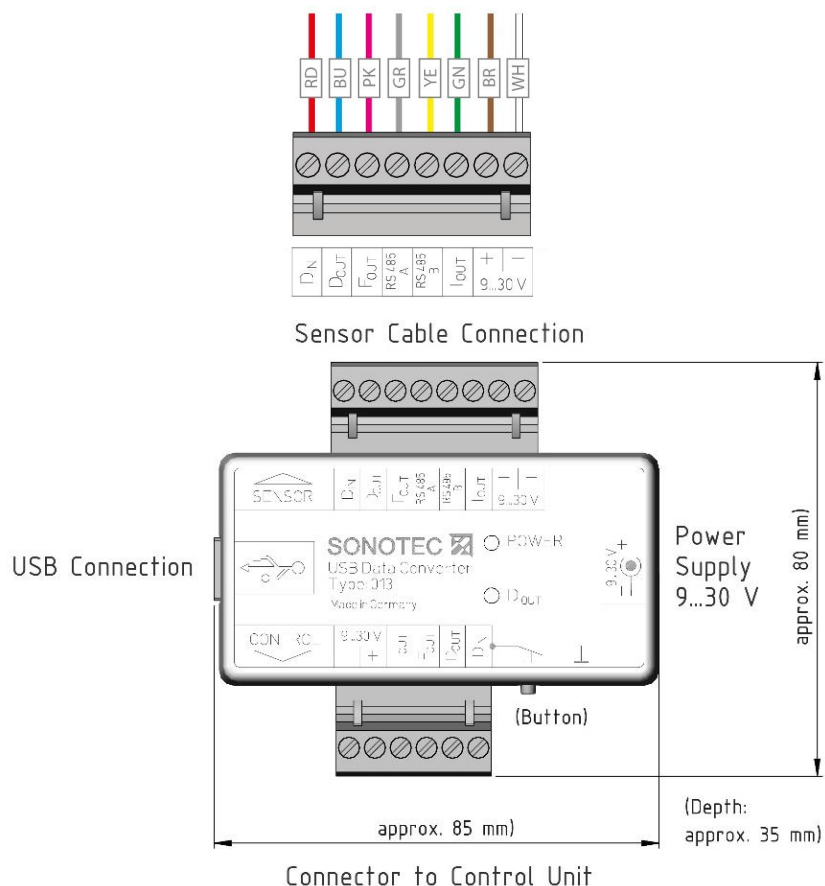
**With additional adapter:**

SEMIFLOW CO.55 V2.0

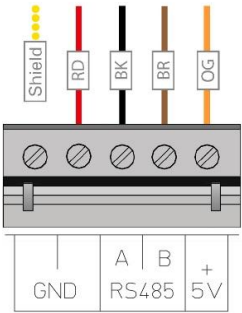
SEMIFLOW CO.65 PI V2.0



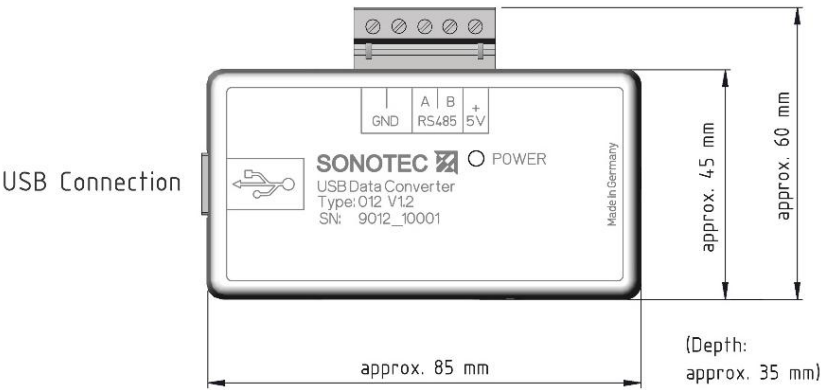
Type 013      USB V2.0, 8 pole, length 2 m  
Sensor: M12-plug  
USB Data Converter: WECO terminal block



| Sensor                                             | USB Data Converter | Sensor cable                                                                     |
|----------------------------------------------------|--------------------|----------------------------------------------------------------------------------|
| <b>SONOFLOW CO.56</b><br><b>SONOFLOW CO.56 Pro</b> | Type 012           | 5 pole, length 2.5 m<br>Sensor: fixed<br>USB Data Converter: WECO terminal block |



Sensor Cable Connection



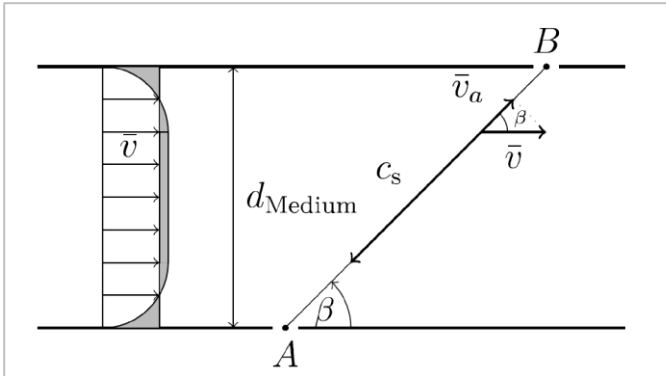
## 4 General: Sensor functionality and parameterization

The following chapter describes the general functionality of SONOFLOW and SEMIFLOW sensors including the explanation of several parameters that can be adapted via software.

### 4.1 Ultrasonic flow measurement in clamp-on sensors

→ Sensor types: CO.55 / CO.56 / CO.65 / CO.66

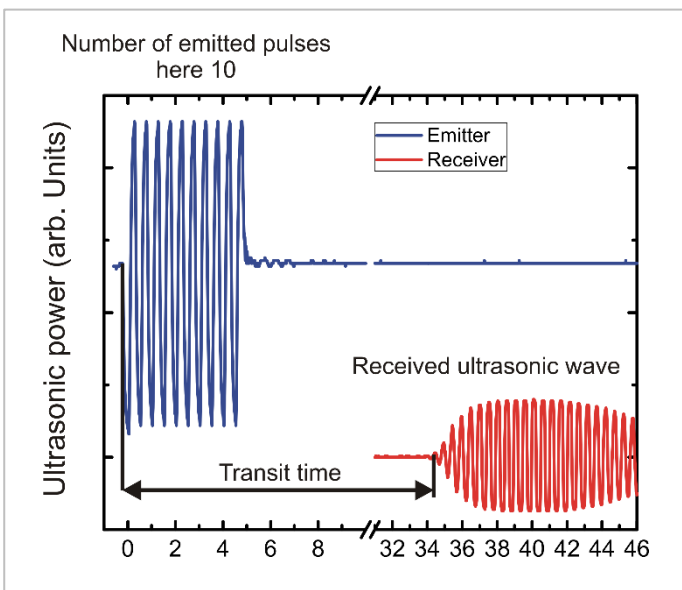
The concept of the ultrasonic flow measurement is shown in the following figure:



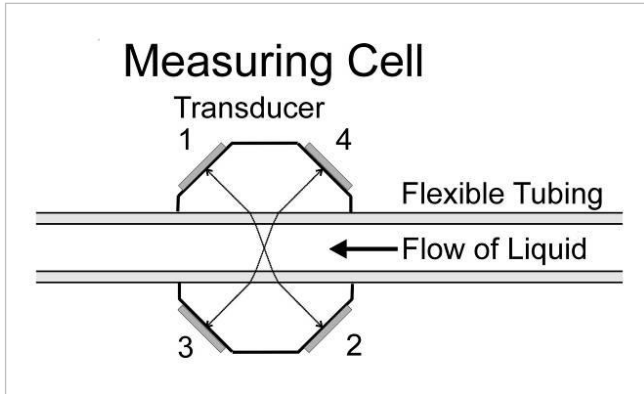
The ultrasonic wave is emitted by transducer A and is received by transducer B. The actual transit time is measured. Afterwards, transducer B is the emitter and transducer A the receiver. The transit time is measured again. The time difference between both transit times is a quantity for the velocity of the streaming liquid.

The volume flow is calculated by multiplying the velocity with the tube's cross-sectional area.

The following figure shows the functional principle of the flow sensor part. The emitted ultrasonic signal with 10 bursts is shown in blue, the received signal is shown in red:

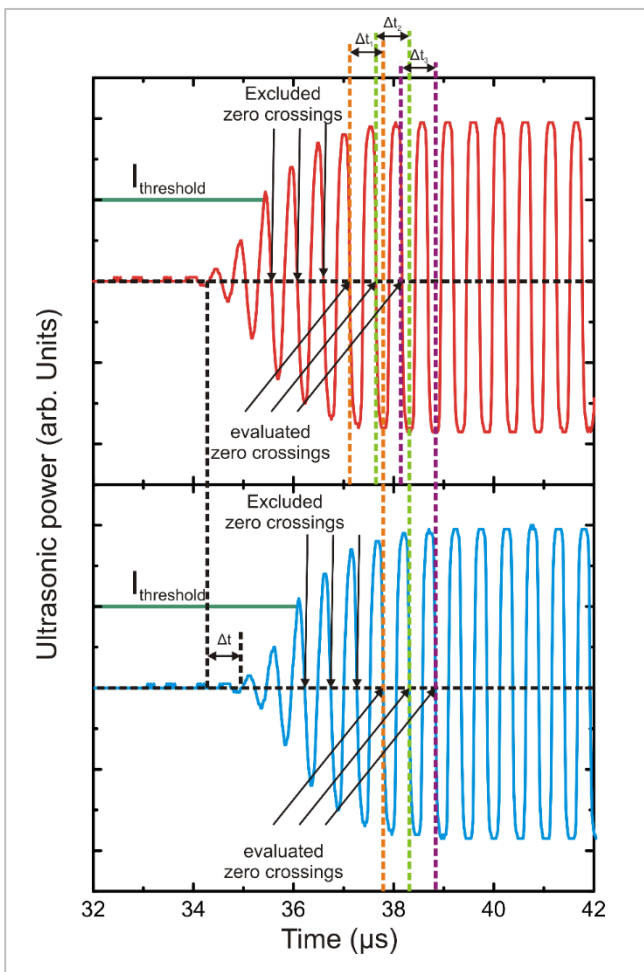


The sensor emits an ultrasonic wave. The number of emitted bursts can be set via the Flow Monitor. The ultrasonic wave is travelling through the tube material including the liquid and is finally received by the receiver after a transit time. The sensor does support two separate measurement channels built-in in one measurement cell as shown in the following figure.



One measurement channel consists of transducer 1 and 2 and the second one uses channel transducer 3 and 4. Each channel performs its measurement independently. After calculating each flow value, these results are evaluated and compared to each other.

As shown in the following figure, the sensor recognizes the received signal as soon as the threshold intensity is exceeded.



Afterwards, the sensor records the zero crossings of the ultrasonic wave. The sensor is able to evaluate up to three consecutive zero crossings.

The red curve shows the measurement with the flow direction of the streaming liquid and the blue curve shows the measurement against the streaming liquid.

The transit time difference is marked by the black dotted curve. The transit-time difference  $\Delta t$  is determined by measuring  $\Delta t_1$ ,  $\Delta t_2$  and  $\Delta t_3$  and averaging these values afterwards.

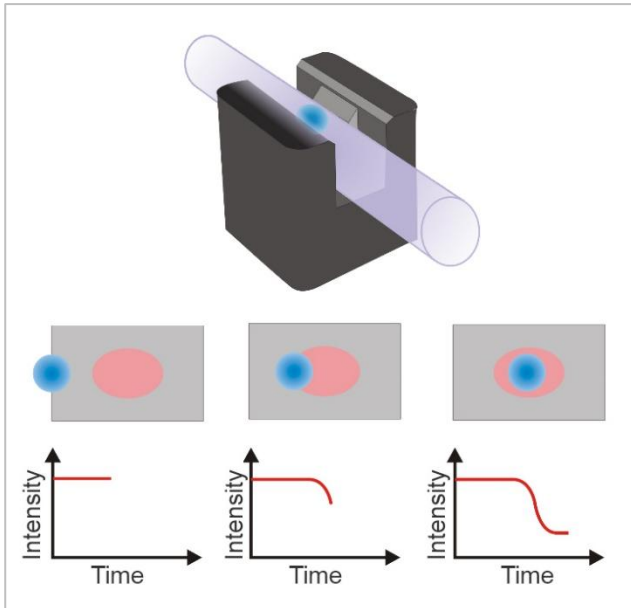
The sensor starts recognizing the signal when the ultrasonic power exceeds the threshold value (green).

The sensor measures the transit-time of the identical zero crossings with and against the flow direction (see orange dotted line, green dotted line and purple dotted line in Figure 4) and calculates  $\Delta t_1$ ,  $\Delta t_2$  and  $\Delta t_3$ . The sensor finally determines the transit-time difference as an average of the three measured time differences.

$$\Delta t = \frac{(\Delta t_1 + \Delta t_2 + \Delta t_3)}{3}$$

## 4.2 Ultrasonic air bubble detection – CO.56 / CO.56 Pro / CO.55 V3.0

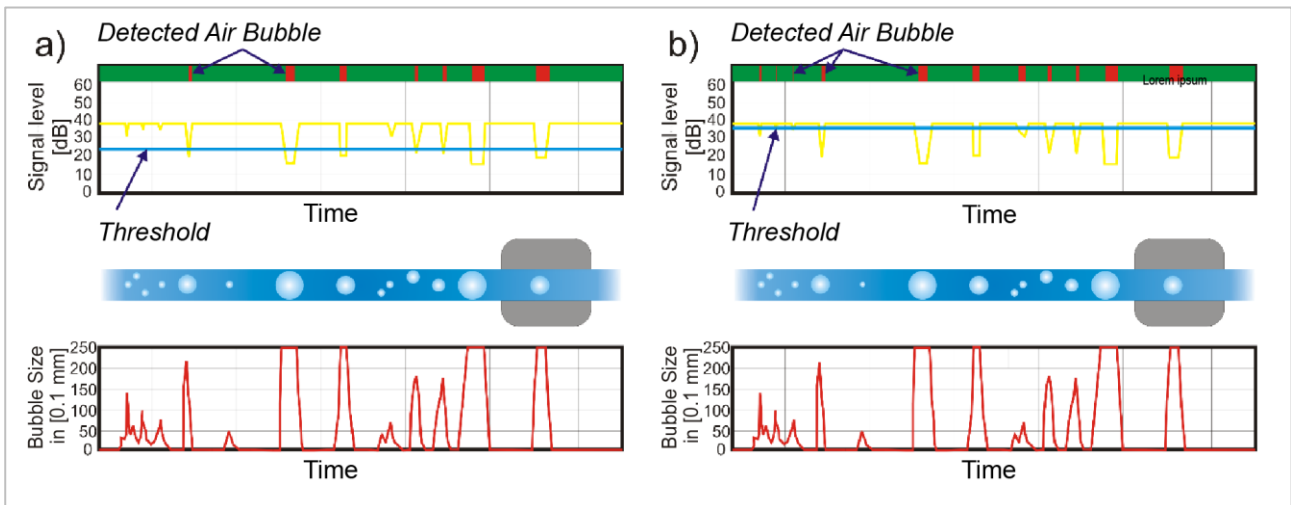
The working principle of the air bubble detection is shown in the following figure:



The signal intensity is measured permanently. When an air bubble is passing the sensor channel, it leads to a decrease of the signal intensity comparable to a solar eclipse.

The ultrasonic wave is reflected and the signal intensity is reduced depending on the actual size of the air bubble. The amount of the signal intensity drop is a measure to determine the approximate air bubble size within the tolerances of the sensor. In case of a large air bubble filling nearly the entire inner tube diameter, it is not possible to differentiate anymore between several sizes due to the intensity change does not differ anymore.

The following figure shows the air bubble detection routine within the sensor.



Behavior of sensors when detecting different air bubble sizes depending on the set threshold:

- (a) When setting a high threshold, only larger air bubbles are recognized (shown in red within the green bar).
- (b) When setting a low threshold, also small air bubbles are detected and transmitted (shown in red within the green bar).

Each air bubble travelling within the sensor reduces the signal intensity as indicated by the yellow line. Depending on the applied threshold level being adjusted via the Flow Monitor, the decreased signal intensity is interpreted as an air bubble. A drop of signal intensity below the threshold is ignored. To set the threshold allows to define the sensor's sensitivity for detecting air bubbles.

**NOTE**

Adjustable threshold settings are available for SONOFLOW CO.56 and CO.56 pro sensors only. In the SONOFLOW CO.55 V3.0 series, the bubble detection threshold is fixed and not adjustable in standard user mode. Adjustments may be possible upon request; please contact our service.

Depending on the actual signal reduction, the sensor calculates the size of the air bubble. In case of a full signal drop, the bubble size signal remains constant on maximum value (see the red curve).

## 5 Preparations

The following section contains instructions on necessary preparatory activities.

### 5.1 Installation of USB Data Converter driver

#### ❗ IMPORTANT

Ensure, that you have administrator rights on your computer!  
Before connecting the USB Data Converter, the driver for the associated USB Data Converter must be installed.

To install the driver, start the file SONOTEC-Driver-Setup.exe and follow the instructions.

### 5.2 Connecting sensor via USB Data Converter

#### ATTENTION

**Incorrect installation may damage the USB Data Converter or the sensor.**

The sensor and the USB Data Converter must be connected correctly.

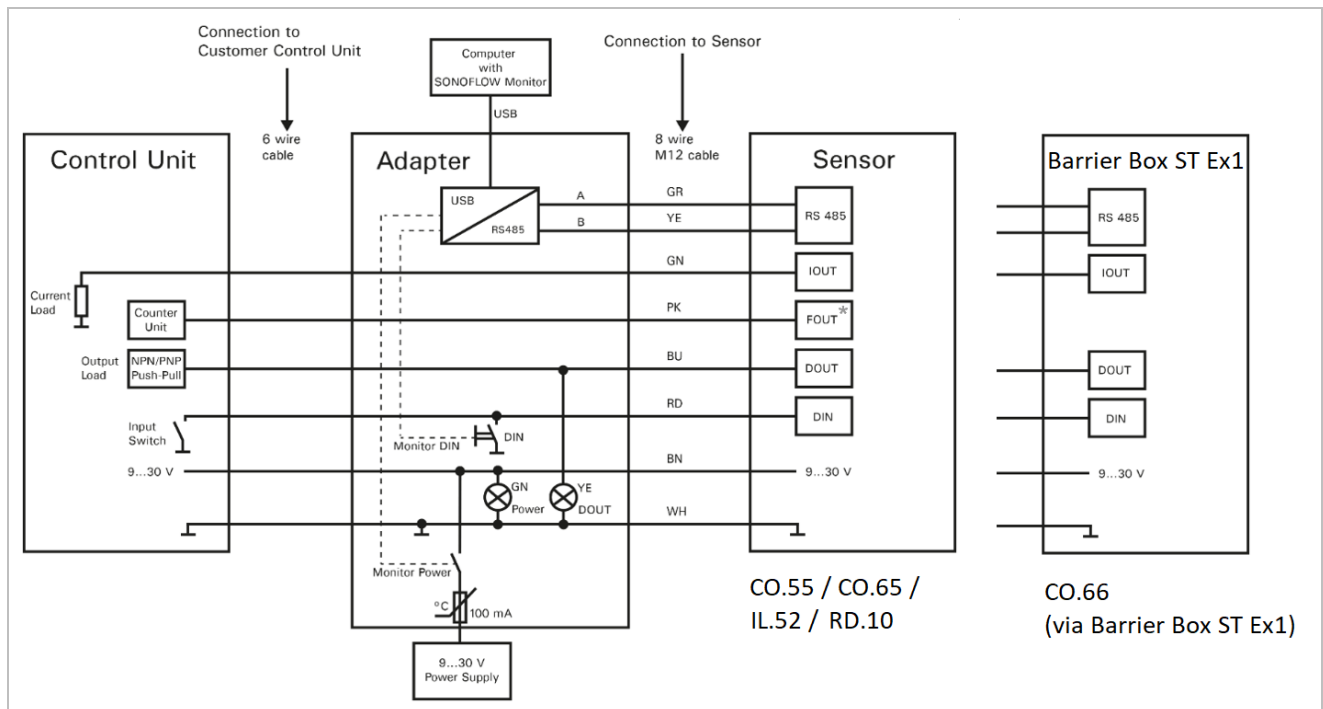
Before connecting the sensor or the display, the power supply to the USB data converter must be disconnected.

Never connect the plug for serial data transmission using the mains connection or the current output.

---

The USB Data Converter is required to connect the sensors via USB interface to a computer. See chapter 3.5 for information on the USB Data Converter types.

CO.55, CO.65, CO.66, IL.52 and RD.10 can be connected via **USB Data Converter Type 013** to a customer control unit (e.g. PLC) using a 6-wire cable according to drawing below:



\* For sensors of the CO.55 V3.0 series not assigned

### 5.3 Copying software

ⓘ The Flow Monitor will not make any changes to your operating system. Registry and any \*.ini files will not be changed.

No setup program is needed to install Flow Monitor. You can start the program directly from the USB flash drive. If you want to store the program on your computer, follow the next steps:

1. Delete any previous versions of Flow Monitor and all associated files.
2. If it does not yet exist, create a folder on your computer's hard disk.  
Example: C:\Program Files\SONOTEC\FS02M\
3. Copy the entire content of the software folder on the flash drive into the new folder created.  
→ The software can be started by double-clicking on the file FS02M.exe.

If you want a shortcut on the desktop, please create this manually.

### 5.4 Uninstalling Flow Monitor

If you have copied files onto your computer, you only have to delete these files. You do not need to uninstall, as the software was not registered on your computer. You can uninstall the driver for the relevant USB data converter at any time using the Device Manager.

## 6 General software settings

Details and explanations regarding settings and parameter changes are given in the following section.

### 6.1 Start software and exit

1. Start the software via clicking  'FS02M.exe'.  
ⓘ Measurement data and changed settings in the Flow Monitor are not saved automatically.
2. Press F10 to exit, use in tab 'Monitor' the button 'Close' or select menu item 'File' → 'End of program'.

### 6.2 Change language

Two languages can be selected: English | German.

1. Select menu item 'Options' → 'Language' to change the setting or use the icons in the menu bar  DE |  EN to change the language.

### 6.3 Change mode

In delivery state the Flow Monitor supports general used functions to monitor flow behavior. Furthermore, parameters can be changed to optimize sensor performance for special applications. With extended functionality the software supports e.g. calibration and features more detailed parameterization.

#### ATTENTION

**The sensor can be irreparably destroyed if special parameters are changed.**

To change parameters in 'Expert mode' extended knowledge of sensor functionality and meaning of parameters is required. Please note, that we offer the permission only after consultation of our support.

To use extended functionality of Flow Monitor or to restrict the functionality:

1. Select menu item 'Options' → 'Change Access Mode'.
2. Enter the code you received from SONOTEC in the window and confirm with 'OK'.  
→ The mode will be changed and parameter selection will be adapted (extended / restricted).

### 6.4 Software help files

1. Select menu item 'Help' → 'Documents' to load description of serial interface and driver installation. If you have questions contact our service. If you have problems please find the chapter 16 Troubleshooting).

## 7 Communicate via Flow Monitor with sensor

The following chapter describes the general communication of software with the sensor. For monitoring and recording flow see chapters 9 and 10, for reading and changing parameters see chapters 11 and the following.

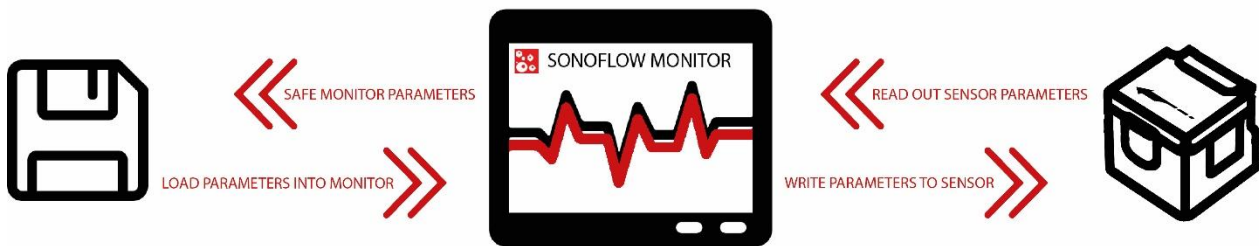
### 7.1 General handling of settings and measurement data

ⓘ NEVER CHANGE SETTINGS of the sensor before you have saved all parameters.

To save sensor parameters, they must be read out from the sensor first.

Working with the Flow Monitor you can change parameters either in the window of the Flow Monitor or the sensor. Any changes to parameters in the software are not instantaneously applied to sensor's operation and are not saved automatically. Modifications must be written into the sensor or must be saved to a computer to be loaded again.

ⓘ There are different options to load and save data. Please read the manual carefully.



### 7.2 Changing / Reconnecting interface or reset USB

If the SONOTEC driver is installed, USB Data Converter and SONOFLOW Sensor are installed properly and connected to USB Port, the interface will be detected automatically if the software is started.

To change or reconnect interface:

1. Select menu item 'Interface'.
2. Click 'Select Interface' to choose the interface from list.

To reset USB:

1. Select menu item 'Interface'.
2. Click 'Reset USB' or press F4.

### 7.3 Restart sensor

To restart the sensor:

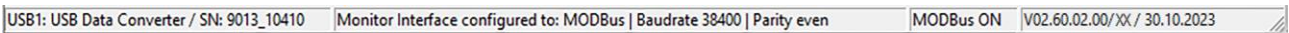
1. Select menu item 'Measuring'.
2. Click 'Restart Sensor' or press 'Alt' + 'R' or use the button 'Reset' in the Monitor tab.

## 7.4 'Messages' window and status bar

Right with the start of Flow Monitor all steps of software operation are shown in the window 'Messages' (can be enlarged). Error messages are shown to support troubleshooting. To show the window see chapter 9.5 Display messages.



Further information is given via status bar:



(not shown in the following pictures of Flow Monitor)

- Connection: Type of USB Data Converter
- Operation / Error messages
- Information on Modbus settings
- Software version

## 8 Monitor settings (Protocol / Dialog mode)

### 8.1 Functions in the 'Monitor Settings' tab

**Flow Monitor for Sensor - CO55/035 V2.0**

File Measuring View Interface Version Options Help EN

Ident Monitor Table Settings **Monitor Settings** MODBUS Tools

**Serial Data Request**

**Dialog Mode**

Interval: 100 ms

Protocol: Dialog Type 11

Volume Auto Reset ☐

Flow Min Reset ☐

Flow Max Reset ☐

Bubble Counter Reset ☐

Sensor Address: #01

**Auto Mode**

**Selection of Protocol**

Transfer to Settings <--

Get from Settings -->

**Selection:**

| ID   | Name                | Unit    | Type  | Abbr        |
|------|---------------------|---------|-------|-------------|
| \$00 | ---                 | ---     | int   | ---         |
| \$81 | Flow                | µl/s    | float | flow_f_uls  |
| \$85 | Flow Offset         | µl/s    | float | flow_zero_f |
| \$88 | Volume              | µl      | float | vol_f       |
| \$8C | Volume Diff         | µl      | float | voldiff_f   |
| \$88 | Temperature         | °C      | float | temp_f      |
| \$1A | Time Std. Deviation | ps      | int   | tdev        |
| \$21 | Gain                | DAC     | int   | gain        |
| \$1C | Current Out 1       | 0.01mA  | int   | cur1        |
| \$1D | Frequency Out       | 0.01kHz | int   | frq         |
| \$42 | Device Error        |         | int   | error       |
| \$43 | Measuring Error     |         | int   | terror      |
| \$45 | Warning             |         | int   | warning     |

**List of requested Variables 1 .. x**

| Var | ID   | Name   | Show Dia | Min | Max     | Unit         |
|-----|------|--------|----------|-----|---------|--------------|
| 1   | \$81 | Flow   | 1        | X   | -600.0  | 600.0 ml/min |
| 2   | \$88 | Volume |          | 0.0 | 10.0    | ml           |
| 3   | \$00 | ---    |          | 0.0 | 10000.0 |              |
| 4   | \$00 | ---    |          | 0.0 | 10000.0 |              |
| 5   | \$00 | ---    |          | 0.0 | 10000.0 |              |
| 6   | \$00 | ---    |          | 0.0 | 10000.0 |              |
| 7   | \$00 | ---    |          | 0.0 | 10000.0 |              |

**Log File**

Log File: Time Stamp ☒

**System**

Decimal Separator: Default by Window System

**Other Monitor Options**

- ☒ Warning just before writing settings
- ☒ Highlighted variable settings
- ☒ Warning to Volume Options
- ☒ Excel Import/ Export enabled
- ☐ Report Data of Serial Frames
- ☒ Enable Red Marking by Change of Setting
- ☒ Warning, if file with selected parameters
- ☒ High Time Resolution (ms)
- ☒ Format Zero Command = Float (instead of integer)
- ☐ Volume Reset just after Auto Zero
- ☒ Virtual COM Ports

**Storage of Monitor Settings**

Write Read

ⓘ With 'mouse over' function you can display notes or details to parameters.

| Input mask                                   | Function                                                                                                                                                                                       |
|----------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Interval</b>                              | Selects the interval for every internal request                                                                                                                                                |
| <b>Protocol</b>                              | Indicates the type of protocol of serial communication (only Type 11 allowed)                                                                                                                  |
| <b>Reset</b>                                 | Volume Auto Reset   Flow Min / Max Reset   Bubble Counter Reset:<br>Resets the value with every request<br>For resetting values manually: see menu item 'Measuring'                            |
| <b>Sensor Address</b>                        | Changes the current sensor address (see also tab 'Ident' → 'RS485 Address')                                                                                                                    |
| <b>Auto Mode</b>                             | Sets variables for 'Auto Mode' if 'Auto Mode' is required<br>Selection of Protocol: Via <--   --> the variables can be synchronized with the variable list in tab 'Settings' → 'Serial Output' |
| <b>Selection</b><br>(depends on sensor type) | Adds variables to the measurement data, if one variable is activated in the list of required variables (for details see the following chapters)                                                |

(Continue on next page)

| Input mask                                 | Function                                                                                                                                                                                                                                                   |
|--------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>List of requested Variables 1 ... x</b> | Selected Variables 1 to x (depending on sensor type) for Serial Data Request<br>Arrows ▲▼: move an activated (blue highlighted) variable up or down in the list<br>Button 'Stand.' (Standard): Resets the selection to the default configuration of sensor |
| <b>Log File</b>                            | Record sets of measuring data in text file (*.txt)<br>Input field to name the log file   Checkbox 'Time Stamp' dates the log file<br>❗ Data sets are not limited.                                                                                          |
| <b>System</b>                              | Defines the decimal separator for data                                                                                                                                                                                                                     |
| <b>Save of Monitor Settings</b>            | 'Write' settings into file (MONITOR.INI)   'Read' settings from MONITOR.INI                                                                                                                                                                                |
| <b>Other Monitor Options</b>               | To specify additional options (description next to the checkbox)                                                                                                                                                                                           |

## 8.2 'Auto Mode' and 'Dialog Mode'

**'Dialog' mode:** Control unit requests – the sensor responds

When sensor operation is set to 'Dialog Mode' the sensor transmits data only on request. The Flow Monitor sends a request command to the sensor and the sensor responds to the Flow Monitor again. The request command rate and the protocol variables are defined through the Flow Monitor.

❗ With every data request the register 'G.state' is transmitted. It contains all relevant sensor status information in one byte, e.g. Bubble Alarm, Device Fault ...

These are Monitor settings.

**'Auto Type 11' transmission mode** (optional, not recommended): Sensor transmits automatically data with defined time interval.

When operating the sensor in Auto Mode all measured data are transmitted cyclically through the serial interface. The data transmission rate and the protocol variables can be selected.

❗ No bus operation possible!

These are sensor settings.

To select dialog type: See also chapter 13.3 Parameters Description – Serial Output.

## 8.3 Select measurement values – Records in the tab ‘Table’

1. Select the tab ‘Monitor Settings’.
2. Click in the right table ‘List of requested Variables 1 ... x’ to activate the variable you plan to change.  
→ One field in the line will be highlighted by a gray frame.

**Serial Data Request**

**Dialog Mode**

Interval: 100 ms

Protocol: Dialog Type 11

Volume Auto Reset ☐

Flow Min Reset ☐

Flow Max Reset ☐

Bubble Counter Reset ☐

Sensor Address: #01

**Auto Mode**

Selection of Protocol

Transfer to Settings <—

Get from Settings —>

**Selection:**

| ID   | Name                | Unit | Type  | Abbr        |
|------|---------------------|------|-------|-------------|
| \$00 | ---                 |      | int   |             |
| \$81 | Flow                | µl/s | float | flow_f_uls  |
| \$85 | Flow Offset         | µl/s | float | flow_zero_f |
| \$88 | Volume              | µl   | float | vol_f       |
| \$8C | Volume Diff         | µl   | float | voldiff_f   |
| \$88 | Temperature         | °C   | float | temp_f      |
| \$1A | Time Std. Deviation | ps   | int   | tdev        |
| \$21 | Gain                | DAC  | int   | gain        |
| \$95 | Analog Input        | ADC  | float | ana_in      |
| \$96 | Output              | DAC  | float | output      |
| \$42 | Device Error        |      | int   | geerror     |
| \$43 | Measuring Error     |      | int   | feerror     |
| \$45 | Warning             |      | int   | warning     |

**List of requested Variables 1 .. x**

| Var | ID   | Name        | Show | Dia | Min    | Max    | I      |
|-----|------|-------------|------|-----|--------|--------|--------|
| 1   | \$81 | Flow        | 1    | X   | -600.0 | 600.0  | ml/min |
| 2   | \$88 | Volume      |      |     | 0.0    | 1.0    | ml     |
| 3   | \$88 | Temperature |      |     | 0.0    | 1000.0 | °C     |
| 4   | \$00 | ---         |      |     | 0.0    | 1000.0 |        |
| 5   | \$00 | ---         |      |     | 0.0    | 1000.0 |        |
| 6   | \$00 | ---         |      |     | 0.0    | 1000.0 |        |
| 7   | \$00 | ---         |      |     | 0.0    | 1000.0 |        |
| 8   | \$00 | ---         |      |     | 0.0    | 1000.0 |        |
| 9   | \$00 | ---         |      |     | 0.0    | 1000.0 |        |
| 10  | \$00 | ---         |      |     | 0.0    | 1000.0 |        |
| 11  | \$00 | ---         |      |     | 0.0    | 1000.0 |        |
| 12  | \$00 | ---         |      |     | 0.0    | 1000.0 |        |
| 13  | \$00 | ---         |      |     | 0.0    | 1000.0 |        |
| 14  | \$00 | ---         |      |     | 0.0    | 1000.0 |        |
| 15  | \$00 | ---         |      |     | 0.0    | 1000.0 |        |
| 16  | \$00 | ---         |      |     | 0.0    | 1000.0 |        |

Stand.

List of selected variables for serial data request  
Select row for inserting the selection!

(The scope of both lists depends on sensor version)

3. Double-click on a value in the left table ‘Selection’ to transfer the value to the selected variable in the right table.  
→ The value will be added to the variable.  
→ The following variable is activated (marked blue) to be defined.

**Serial Data Request**

**Dialog Mode**

Interval: 100 ms

Protocol: Dialog Type 11

Volume Auto Reset ☐

Flow Min Reset ☐

Flow Max Reset ☐

Bubble Counter Reset ☐

Sensor Address: #01

**Auto Mode**

Selection of Protocol

Transfer to Settings <—

Get from Settings —>

**Selection:**

| ID   | Name                | Unit | Type  | Abbr        |
|------|---------------------|------|-------|-------------|
| \$00 | ---                 |      | int   |             |
| \$81 | Flow                | µl/s | float | flow_f_uls  |
| \$85 | Flow Offset         | µl/s | float | flow_zero_f |
| \$88 | Volume              | µl   | float | vol_f       |
| \$8C | Volume Diff         | µl   | float | voldiff_f   |
| \$88 | Temperature         | °C   | float | temp_f      |
| \$1A | Time Std. Deviation | ps   | int   | tdev        |
| \$21 | Gain                | DAC  | int   | gain        |
| \$95 | Analog Input        | ADC  | float | ana_in      |
| \$96 | Output              | DAC  | float | output      |
| \$42 | Device Error        |      | int   | geerror     |
| \$43 | Measuring Error     |      | int   | feerror     |
| \$45 | Warning             |      | int   | warning     |

**List of requested Variables 1 .. x**

| Var | ID   | Name            | Show | Dia | Min    | Max    | I      |
|-----|------|-----------------|------|-----|--------|--------|--------|
| 1   | \$81 | Flow            | 1    | X   | -600.0 | 600.0  | ml/min |
| 2   | \$88 | Volume          |      |     | 0.0    | 1.0    | ml     |
| 3   | \$88 | Temperature     |      |     | 0.0    | 1000.0 | °C     |
| 4   | \$43 | Measuring Error |      |     | 0.0    | 1000.0 |        |
| 5   | \$00 | ---             |      |     | 0.0    | 1000.0 |        |
| 6   | \$00 | ---             |      |     | 0.0    | 1000.0 |        |
| 7   | \$00 | ---             |      |     | 0.0    | 1000.0 |        |
| 8   | \$00 | ---             |      |     | 0.0    | 1000.0 |        |
| 9   | \$00 | ---             |      |     | 0.0    | 1000.0 |        |
| 10  | \$00 | ---             |      |     | 0.0    | 1000.0 |        |
| 11  | \$00 | ---             |      |     | 0.0    | 1000.0 |        |
| 12  | \$00 | ---             |      |     | 0.0    | 1000.0 |        |
| 13  | \$00 | ---             |      |     | 0.0    | 1000.0 |        |
| 14  | \$00 | ---             |      |     | 0.0    | 1000.0 |        |
| 15  | \$00 | ---             |      |     | 0.0    | 1000.0 |        |
| 16  | \$00 | ---             |      |     | 0.0    | 1000.0 |        |

Stand.

Select row in table, then double click to transfer the variable into the selection list (right)

4. Use the arrows ▲ | ▼ to change the position of activated variables in the table.
5. Click the button ‘Standard’ to reload the default software settings.

Example for records in the tab ‘Table’ (for recommended values see next section):

| date       | time     | state | frame seq | flow f_uls | temp f | vol f    | io flags | curr1 | frq | flow f_uls |  |  |  |  |
|------------|----------|-------|-----------|------------|--------|----------|----------|-------|-----|------------|--|--|--|--|
| 03.08.2022 | 14:07:37 | 00    | 33        | 5341,3     | 37,17  | 183832,2 | 00       | 419   | 24  | 5341,3     |  |  |  |  |
| 03.08.2022 | 14:07:37 | 00    | 34        | 5293,0     | 37,17  | 184508,2 | 00       | 419   | 24  | 5293,0     |  |  |  |  |
| 03.08.2022 | 14:07:37 | 00    | 35        | 5299,2     | 37,17  | 185136,2 | 00       | 419   | 24  | 5299,2     |  |  |  |  |

## 8.4 List of recommended variables – CO.55 / CO.65 / CO.66 / IL.52 / CO.56 / CO.56 Pro

The following table lists recommended variables, both general for all sensor variants and specific for individual sensor versions. Additional variables are also available, some of which require a higher user level (see 6.3 Change mode). For further options or assistance, please contact our service.

| ID                                                                        | Name                                                    | Unit     | Type  | Abbr.       |
|---------------------------------------------------------------------------|---------------------------------------------------------|----------|-------|-------------|
| <b>\$81</b>                                                               | Flow:<br>the measured flow value                        | µl/s     | float | flow_f_uls  |
| <b>\$85</b>                                                               | Flow Offset:<br>adjusted value via Zero Point Adjusting | µl/s     | float | flow_zero_f |
| <b>\$8B</b>                                                               | Volume:<br>totalized volume                             | µl       | float | vol_f       |
| ① For sensor version CO.55 V3.0                                           |                                                         |          |       |             |
| <b>\$3E</b>                                                               | Error Counter                                           |          | int   | error_ct    |
| <b>\$44</b>                                                               | ABD Error                                               |          | int   | abd_error   |
| ① For sensor versions V2.0 (CO.55 / CO.65 / CO.66 / IL.52) and CO.55 V3.0 |                                                         |          |       |             |
| <b>\$1C</b>                                                               | Current Out 1: Value of current output                  | 0.01 mA  | int   | curr1       |
| ① For sensor versions V2.0 (CO.55 / CO.65 / IL.52)                        |                                                         |          |       |             |
| <b>\$1D</b>                                                               | Frequency Out: Value of frequency output                | 0.01 kHz | int   | frq         |
| ① For sensor version CO.56 / CO.56 Pro                                    |                                                         |          |       |             |
| <b>\$2A</b>                                                               | Bubble Size                                             | 0.1 mm   | int   | bubble_size |

## 9 Measuring / Monitoring flow – Overview settings

The following chapters describe how you configure the Flow Monitor to your individual needs. For recording flow (start and stop measurements) and management of data records see the following chapter.



① With 'mouse over' function in the diagram you can read out the value for 'Flow' at a certain point of time (displayed below the diagram).

To select measurement values to be recorded (in the Tab 'Table'): see chapter 8.3 Select measurement values – Records in the tab 'Table' and the following.

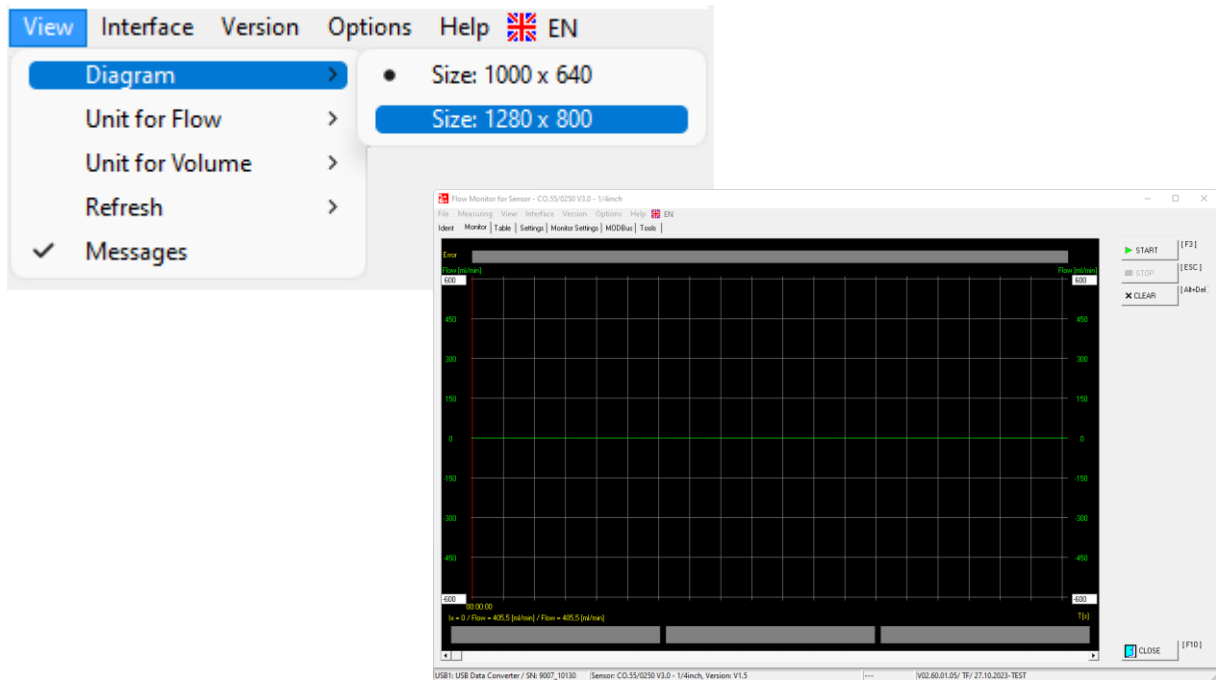
### 9.1 Change the scaling of flow range in diagram

(or other displayed values; depending on the selected ones)

1. Enter a new value for the upper range (example value: 600 ml/min, see screenshot) to change the scaling of axis.

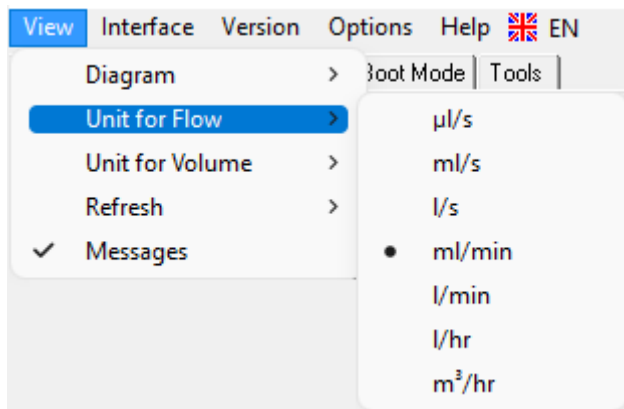
## 9.2 Display detailed flow – Zoom diagram size

- Select menu item 'View' → 'Diagram' to enlarge the size of window:  
**1000 × 640 px** (default) | **1280 × 800 px**.



## 9.3 Change 'Unit for Flow' / 'Volume'

- Select menu item 'View' → 'Unit for Flow' → unit 'µl/s' | 'ml/s' | 'l/s' | 'ml/min' (default) | 'l/min' | 'l/hr' | 'm³/hr' | 'UK gal/s' | 'US gal/s' | 'UK gal/min' | 'US gal/min' | 'UK gal/h' | 'US gal/h' to change the unit of 'Flow' in the diagram.



- Select menu item 'View' → 'Unit for Volume' → unit 'µl' | 'ml' | 'l' | 'm³' | 'UK gal' | 'US gal' to change the unit of 'Volume' in the diagram.

## 9.4 Define the number of cycles for 'Refresh'

1. Select menu item **'View' → 'Refresh'** → Define the number of cycles  
'1 cycle' (default) | '2 cycles' | ... | '200 cycles'.

## 9.5 Display messages

For details see: 7.4 'Messages' window and status bar. If the message window is not displayed:

1. Select menu item **'View' → 'Messages'** to display the window.

## 10 Measuring / Monitoring flow – Record and manage data

### ❗ IMPORTANT

Observe the safety instructions. Never change settings of the sensor before you have saved all parameters. Follow the steps in chapter '12.2 Load and save parameters'.

### 10.1 General functions via 'Table' tab (measurement data)

If the measurement is started, the table lists all measured values with the corresponding time stamp. The scope of data depends on the variables selected; see chapter 8.3 Select measurement values – Records in the tab 'Table'.

1. Click on the button '**Help ON**', to get a list with the explanation of all values (shown in the yellow window):

The screenshot shows the 'Flow Monitor for Sensor - CO.55/0250 V3.0 - 1/4inch' application. The 'Table' tab is selected, displaying a table of measurement data. A yellow window titled 'Notes to Data: (some data are available in special protocols only)' is open, listing various parameters and their units. The window also includes a 'Help OFF' button and a 'MONITOR' button.

| date       | time     | state | frame seq | flow f uls | temp f | vol f    | io flags | curr1 | frq | flow f uls |
|------------|----------|-------|-----------|------------|--------|----------|----------|-------|-----|------------|
| 03.08.2022 | 14:07:37 | 00    | 33        | 5341.3     | 37.17  | 183832.2 | 00       | 419   | 24  | 5341.3     |
| 03.08.2022 | 14:07:37 | 00    | 34        | 5293.0     | 37.17  | 184508.2 | 00       | 419   | 24  | 5293.0     |
| 03.08.2022 | 14:07:37 | 00    | 35        | 5299.2     | 37.17  | 185136.7 | 00       | 419   | 24  | 5299.2     |

Notes to Data: (some data are available in special protocols only)

- date/ time date and time of recording
- state Summary of flags/ error bits, 0 = no errors
- frame\_seq Sequence counter of frames
- flow.. Flow or Flow Zero in [µl/s] or several other units, f=float format
- flow\_zero.. Flow Zero Adjust in [µl/s], f=float format
- flow\_dpy.. Shown value of flow in Display in [µl/s]
- time\_b/\_f.. Time of flight f=forwards/ b=backwards in [ps], all or one of multi-hit
- time\_avg Time of flight averaged of both directions in [ps], all hits included
- tdiff resulting difference of time of flight, in [ps], all hits included
- time\_v\_1..8 Time of flight, several measuring pathes in [ps], all hits included
- fdev Standard deviation of time measuring in [ps]
- vol measured volume in [µl], f=float format
- voltdiff measured volume increment since last volume request in [µl]
- vol\_tdiff measured time since last volume request in [clock]
- bubble.. various bubble measuring values (Reference/ Amplitude/ Test/.., [0.01dB])
- bubble\_size approximated bubble size, [0.1mm]
- temp.. Temperature in [°C], float format, 255.75 = Error during measuring
- gerror Serious device error/ 0 = no errors
- ferro Error during measuring of flow/ 0 = no errors
- bubble\_error Error during bubble detection/ 0 = no errors
- fwarning Warnings/ 0 = no warnings
- trig/ gain x internal values of DAC A =Trigger and DAC B =Gain, [0 .. 4095]
- curr../ frq internal values of DAC C =Current output [0.01mA] and DAC D =Frq. output [0.01kHz]
- io\_flags state of switching output/ input
- ana\_in Analog Input [ADC]
- mode Measuring mode, 0x10 .. 0x14: normal mode / 0x01 .. 0x04: searching of signal
- mtime internal watch in [clock]
- speed.. Speed of Sound in [m/s]
- speed\_fac.. Compensation Factor Speed of Sound
- visc.. Viscosity in [mm²/s]
- visc\_fac.. Compensation Factor Viscosity
- adc\_seq.. internal ADC array, for diagnosis only
- CRC.. calculated CRC of various memory ranges

Help OFF [F8] MONITOR

2. Click on the button '**Help OFF**', to hide the list.
3. Click on '**MONITOR**', to switch to the corresponding tab.

## 10.2 General functions via ‘Monitor’ tab (diagram)



| Button              | Function                                                                                                                                              |
|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>START / STOP</b> | Controls recording of measurement data in the ‘Monitor’ (and the ‘Table’ tab)                                                                         |
| <b>CLEAR</b>        | Deletes all recorded measuring values in the ‘Monitor’ tab (and the ‘Table’ tab)<br>ⓘ Data is not saved automatically! To save data: see chapter 10.4 |
| <b>Zero Point</b>   | Changes the ‘Zero Point’. ⓘ Overwrites sensor parameters!                                                                                             |
| <b>AUTO</b>         | Sets the ‘Zero Point’ automatically. ⓘ Ensure, that there is no flow!                                                                                 |
| <b>READ</b>         | Reads the actual set ‘Zero Point’ out of sensor                                                                                                       |
| <b>ABS</b>          | Sets the ‘Zero Point’ to an <b>absolute</b> value                                                                                                     |
| <b>REL</b>          | Moves the ‘Zero Point’ <b>relative</b> to the current value                                                                                           |
| <b>RESET</b>        | Resets sensor (restart), see as well 7.3 Restart sensor                                                                                               |

(Continue on next page)

| Button | Function                                    |
|--------|---------------------------------------------|
| TABLE  | Shows measurement data table (tab 'Table')  |
| POWER  | Switches power supply for sensor on / off   |
| CLOSE  | Closes the window (software will be closed) |

Colors of the 'Error bar' (at the top of the graph):

- Grey bar: Measurement not started yet
- Green bar: Signal is OK
- Red bar: Measurement error
- Blue bar: Incorrect parameters
- Yellow bar: Warning

### 10.3 Start or stop recording measurement data in the 'Monitor' tab

#### NOTE

Ensure, that the monitor is adapted to your needs (see chapter 9) and that you defined the parameters to be recorded (see chapter 8.3).

**All data must be saved manually.** Measurements in the 'Monitor' or the 'Table' tab are not saved automatically.

For exact measurements and parameterization the **selection of the correct sensor type** and version is very important (for details see chapter 11.3).

1. Click the button '**START**' in the 'Monitor' tab to initiate the recording of measurement data in the diagram and the tab 'Table'.
2. Click the button '**STOP**' in the 'Monitor' tab to interrupt the measurement recording.

### 10.4 Save recorded data in file and reload saved records

The recorded measurement data can be saved as text file (.txt) or as Excel file (.xls).

#### NOTE

For reasons of compatibility of older Excel versions max. 32000 data can be managed. If you want to store higher volume, please use the data logger function.

To export measurement data:

1. Select menu item '**File**' → '**Export Data**' to store measurement data. (Choose a format of data (Excel, CSV, Text, HTM, HTML) and a file name that can identify your data later, e.g. name the serial number).  
→ The data is saved and can be reloaded (see next page for examples).

To load measurement data:

2. Select menu item **'File' → 'Import Data'** to load saved measurements (Choose a file according to the format of data (Excel, CSV, Text, HTM, HTML). Navigate in diagram via scroll bar; mouse over displays flow value at a certain point.

Examples for exported data with different variables and metadata  
(Date, Time, Sensor and Firmware version ...):

|    | A                                                                                                      | B           | C            | D                | E                 | F            | G | H |
|----|--------------------------------------------------------------------------------------------------------|-------------|--------------|------------------|-------------------|--------------|---|---|
| 1  | <b>REPORT</b>                                                                                          |             |              |                  |                   |              |   |   |
| 2  | Filename: C:\USERS\USER.NAME\DOCUMENTS\SONOFLOW\MONITOR\MEASUREMENT_CO.55_10014_MONITOR_2019-05-07.XLS |             |              |                  |                   |              |   |   |
| 3  | recorded on: 07.05.2019 / Time: 09:21:36                                                               |             |              |                  |                   |              |   |   |
| 4  | Flow Monitor, Version: V2.52                                                                           |             |              |                  |                   |              |   |   |
| 5  |                                                                                                        |             |              |                  |                   |              |   |   |
| 6  | <b>Identification</b>                                                                                  |             |              |                  |                   |              |   |   |
| 7  | Sensor: CO.55 V2.0 / 044                                                                               |             |              |                  |                   |              |   |   |
| 8  | Firmware: V2.70                                                                                        |             |              |                  |                   |              |   |   |
| 9  |                                                                                                        |             |              |                  |                   |              |   |   |
| 10 | <b>Measuring Data</b>                                                                                  |             |              |                  |                   |              |   |   |
| 11 | <b>date</b>                                                                                            | <b>time</b> | <b>state</b> | <b>frame_seq</b> | <b>flow_f_uls</b> | <b>vol_f</b> |   |   |
| 12 | 07.05.2019                                                                                             | 13:48:11    | 00           | 8                | 603,5             | 9836812,0    |   |   |
| 13 | 07.05.2019                                                                                             | 13:48:11    | 00           | 9                | 611,7             | 9836872,0    |   |   |
| 14 | 07.05.2019                                                                                             | 13:48:11    | 00           | 10               | 615,3             | 9836935,0    |   |   |
| 15 | 07.05.2019                                                                                             | 13:48:11    | 00           | 11               | 625,7             | 9836998,0    |   |   |
| 16 | 07.05.2019                                                                                             | 13:48:11    | 00           | 12               | 621,0             | 9837061,0    |   |   |
| 17 | 07.05.2019                                                                                             | 13:48:11    | 00           | 13               | 618,9             | 9837124,0    |   |   |
| 18 | 07.05.2019                                                                                             | 13:48:11    | 00           | 14               | 610,6             | 9837187,0    |   |   |
| 19 | 07.05.2019                                                                                             | 13:48:11    | 00           | 15               | 607,9             | 9837250,0    |   |   |
| 20 | 07.05.2019                                                                                             | 13:48:11    | 00           | 16               | 626,1             | 9837313,0    |   |   |
| 21 | 07.05.2019                                                                                             | 13:48:12    | 00           | 17               | 596,1             | 9837376,0    |   |   |
| 22 | 07.05.2019                                                                                             | 13:48:12    | 00           | 18               | 583,0             | 9837438,0    |   |   |

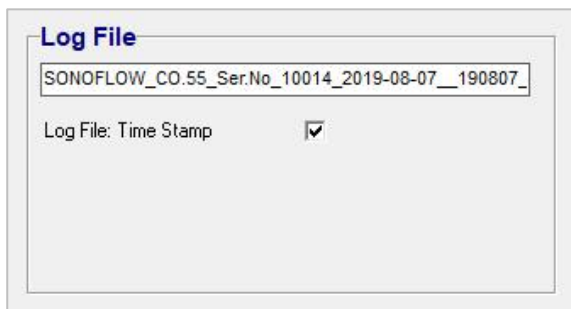
|                                                                                                |          |       |           |            |            |            |              |             |  |
|------------------------------------------------------------------------------------------------|----------|-------|-----------|------------|------------|------------|--------------|-------------|--|
| REPORT                                                                                         |          |       |           |            |            |            |              |             |  |
| =====                                                                                          |          |       |           |            |            |            |              |             |  |
| Filename: C:\Users\User.Name\Documents\SONOFLOW\Monitor\Measurement_CO.55_10014_2019-06-28.txt |          |       |           |            |            |            |              |             |  |
| recorded on: 28.06.2019 / Time: 10:08:10                                                       |          |       |           |            |            |            |              |             |  |
| Flow Monitor, Version: V2.52                                                                   |          |       |           |            |            |            |              |             |  |
| Sensor: CO.55 V2.0 / 044                                                                       |          |       |           |            |            |            |              |             |  |
| Firmware: V2.70                                                                                |          |       |           |            |            |            |              |             |  |
| date                                                                                           | time     | state | frame_seq | flow_f_uls | flow_mlmin | flow_f_uls | flow_f_mlmin | flow1_f_uls |  |
| 28.06.2019                                                                                     | 10:07:07 | 02    | 17        | 311,5      | 19         | 311,5      | 18,691       | -781,2      |  |
| 28.06.2019                                                                                     | 10:07:07 | 02    | 18        | 322,7      | 19         | 322,7      | 19,360       | -806,0      |  |
| 28.06.2019                                                                                     | 10:07:07 | 02    | 19        | 316,1      | 19         | 316,1      | 18,967       | 458,8       |  |
| 28.06.2019                                                                                     | 10:07:07 | 02    | 20        | 333,0      | 20         | 333,0      | 19,978       | -1426,0     |  |
| 28.06.2019                                                                                     | 10:07:08 | 02    | 21        | 358,5      | 22         | 358,5      | 21,508       | 86,8        |  |
| 28.06.2019                                                                                     | 10:07:08 | 02    | 22        | 306,1      | 18         | 306,1      | 18,367       | -86,8       |  |
| 28.06.2019                                                                                     | 10:07:08 | 02    | 23        | 317,2      | 19         | 317,2      | 19,034       | 1215,2      |  |
| 28.06.2019                                                                                     | 10:07:08 | 02    | 24        | 317,7      | 19         | 317,7      | 19,061       | -855,6      |  |
| 28.06.2019                                                                                     | 10:07:08 | 02    | 25        | 299,2      | 18         | 299,2      | 17,951       | -1066,4     |  |
| 28.06.2019                                                                                     | 10:07:08 | 02    | 26        | 309,6      | 19         | 309,6      | 18,575       | -1450,8     |  |
| 28.06.2019                                                                                     | 10:07:08 | 02    | 27        | 331,1      | 20         | 331,1      | 19,864       | -558,0      |  |
| 28.06.2019                                                                                     | 10:07:08 | 02    | 28        | 358,2      | 21         | 358,2      | 21,495       | -570,4      |  |
| 28.06.2019                                                                                     | 10:07:08 | 02    | 29        | 346,4      | 21         | 346,4      | 20,786       | -12,4       |  |
| 28.06.2019                                                                                     | 10:07:09 | 02    | 30        | 353,5      | 21         | 353,5      | 21,208       | -1190,4     |  |
| 28.06.2019                                                                                     | 10:07:09 | 02    | 31        | 355,5      | 21         | 355,5      | 21,329       | -744,0      |  |
| 28.06.2019                                                                                     | 10:07:09 | 02    | 32        | 359,7      | 22         | 359,7      | 21,585       | -806,0      |  |
| 28.06.2019                                                                                     | 10:07:09 | 02    | 33        | 351,2      | 21         | 351,2      | 21,071       | -434,0      |  |
| 28.06.2019                                                                                     | 10:07:09 | 02    | 34        | 371,8      | 22         | 371,8      | 22,310       | 694,4       |  |
| 28.06.2019                                                                                     | 10:07:09 | 02    | 35        | 388,8      | 23         | 388,8      | 23,325       | 421,6       |  |
| 28.06.2019                                                                                     | 10:07:09 | 02    | 36        | 382,6      | 23         | 382,6      | 22,954       | -868,0      |  |
| 28.06.2019                                                                                     | 10:07:09 | 02    | 37        | 407,9      | 24         | 407,9      | 24,475       | 905,2       |  |
| 28.06.2019                                                                                     | 10:07:09 | 02    | 38        | 387,5      | 23         | 387,5      | 23,249       | -706,8      |  |
| 28.06.2019                                                                                     | 10:07:10 | 02    | 39        | 340,4      | 20         | 340,4      | 20,421       | -1066,4     |  |
| 28.06.2019                                                                                     | 10:07:10 | 02    | 40        | 352,5      | 21         | 352,5      | 21,150       | -37,2       |  |
| 28.06.2019                                                                                     | 10:07:10 | 02    | 41        | 319,3      | 19         | 319,3      | 19,157       | -471,2      |  |

## 10.5 Data logging of measuring data

With logging function measuring data can be saved into \*.txt file without any limitation.

1. Select '**File**' in the main menu and click '**Log File**'.
2. Define a name and determine, where you want to save the data and click on '**Save**' (\*.txt). Option: '**Log File: Time Stamp**'.
3. From this point forward, all data will be appended to the defined text file.
4. To quit recording click '**File**' → '**Log File**' again.

The name of the text file can be defined in '**Monitor Settings**' tab.



If the option 'Log File: Time Stamp' is enabled, the date and time is added to the file name automatically.

## 11 Sensor identification and address

### ❗ IMPORTANT

Observe all safety instructions: Parameter changes may have **impact on medical safety**. Never change settings of the sensor before you have saved all parameters. For exact measurements and parameterization ensure, that the correct sensor type and version are selected.

To save sensor identification and parameters, they must be read out from the sensor first (for details see chapter 7.1 General handling of settings and measurement data).

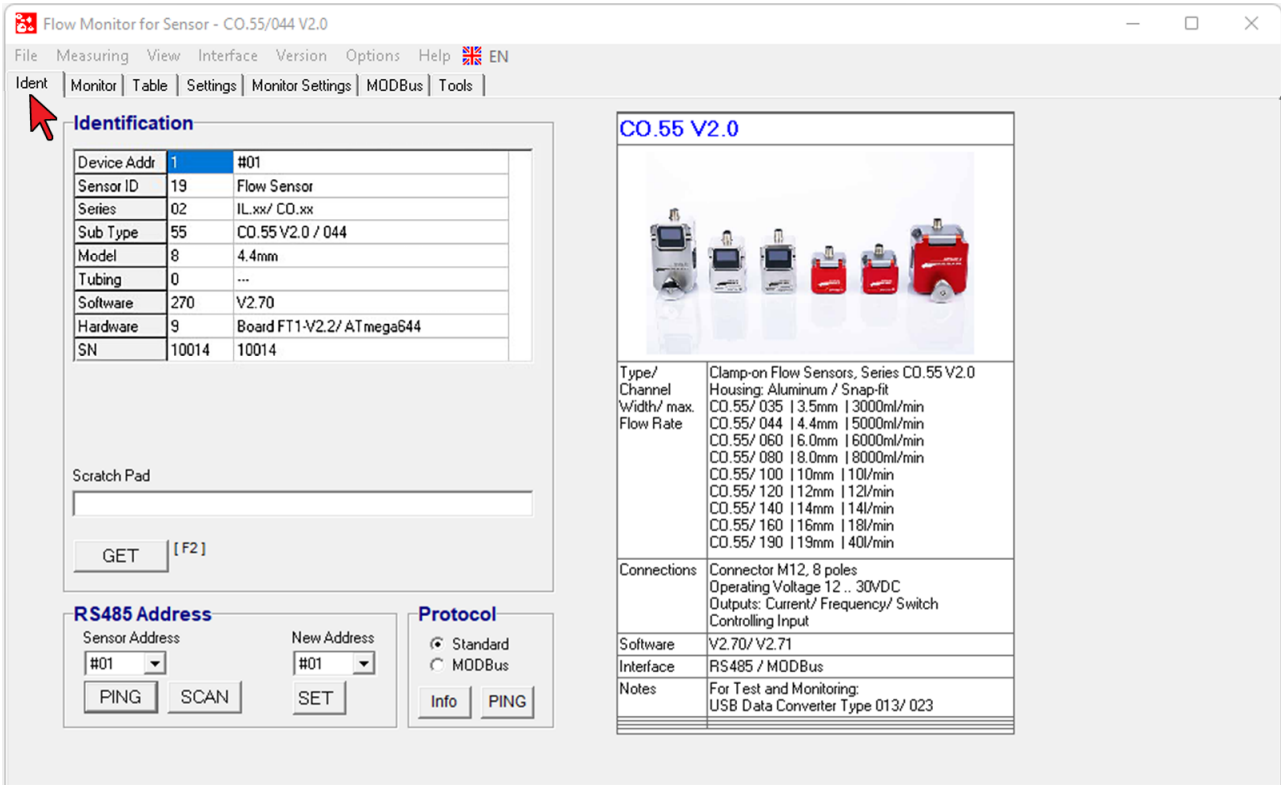
1. Ensure, that the interface is connected to communicate with the sensor.
2. Select the tab '**Interface**' and click on '**Reset USB**' after connecting the sensor (see also chapter 7.2 Changing / Reconnecting interface).

If the sensor is bus-capable and if the identification has been loaded, the sensor's address can be changed (see 11.2 General functions and sensor information in the 'Ident' tab).

### 11.1 Options to read and write sensor identification ('Ident' tab)

| Button      | Function                                                                                                                                                                                          | Status                                                                                               |
|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|
| <b>Get</b>  | Reads out sensor identification (sensor type and version, software type and version)<br>❗ The 'Get' button is deactivated if the recording of measurement data in the 'Monitor' tab is activated. | ❗ Overwrites parameters in the software<br>Temporarily<br>Changes are gone after restart of monitor. |
| <b>Scan</b> | Reads device address (RS-485)                                                                                                                                                                     | Temporarily<br>Changes are gone after restart of monitor.                                            |
| <b>Set</b>  | Sets device address (RS-485)                                                                                                                                                                      | ❗ Permanent<br>Changes sensor's factory settings.                                                    |
| <b>Ping</b> | Test of serial communication                                                                                                                                                                      | Instantaneous<br>Feedback displayed in the status bar and 'Messages' window.                         |

## 11.2 General functions and sensor information in the 'Ident' tab



| Button / mask                | Function                                                                                                                                                                                           |
|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Sensor identification</b> | List of sensor attributes: Serial number<br>(please keep the data available in case of problems)                                                                                                   |
| <b>GET</b>                   | Reads out sensor identification.<br>⌚ Overwrites attributes in the 'Identification' table and all 'Settings' in the corresponding software tabs with sensor data (for details see chapters before) |
| <b>Scratch Pad</b>           | Detailed software version (if read out from sensor)                                                                                                                                                |
| <b>RS485 Address</b>         | Reads out and change sensor address                                                                                                                                                                |
| <b>SCAN</b>                  | Reads out sensor address (if sensor is bus capable)                                                                                                                                                |
| <b>SET</b>                   | Writes new address to sensor.<br>⌚ Overwrites sensor parameters permanently.<br>Never use sensors with the same address on one bus!                                                                |
| <b>Protocol</b>              | Selects Flow Monitor interface: Standard   Modbus                                                                                                                                                  |

(Continue on next page)

| Button / mask                  | Function                                                                                                                |
|--------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| Info                           | Reads out sensor interface (monitor window 'Messages')                                                                  |
| PING                           | Test of serial connection (monitor window 'Messages')                                                                   |
| General sensor details (right) | Picture (if available), list of available sensor specifications, available connections and interfaces, software version |

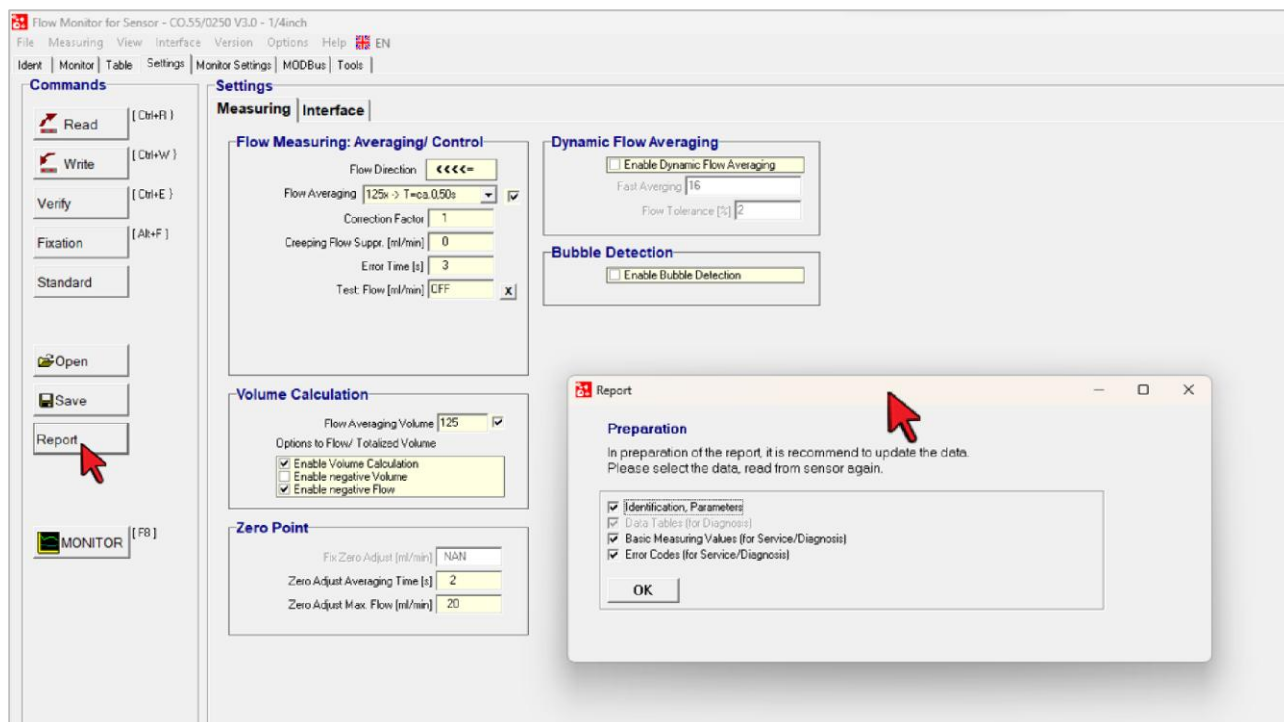
## 11.3 Read out and save / Report sensor identification (and settings)

Load sensor identification:

1. Select the tab '**Ident**' and click on '**Get**' to load sensor identification and parameters to Flow Monitor.
2. Switch to the tab '**Settings**' and click '**Save**' to store sensor's \*.hex file containing the sensor identification and factory settings!  
→ The data can be reloaded to Flow Monitor via '**Open**' and can be written to the sensor to overwrite sensor settings.

To save sensor identification and parameters in Excel file:

3. Switch to the tab '**Settings**' and click '**Report**' to store sensor identification and factory settings. A new window will open, allowing you to select which data should be read from the sensor and included in the report (example for exported data on the next page).



|    | A                                                                                     | B                         | C              | D                  | E              | F             |
|----|---------------------------------------------------------------------------------------|---------------------------|----------------|--------------------|----------------|---------------|
| 1  | <b>REPORT TO IDENTIFICATION AND SETTINGS OF SENSOR</b>                                |                           |                |                    |                |               |
| 2  | Filename: C:\USERS\USER.NAME\DOCUMENTS\SONOFLOW\MONITOR\REPORT_IDENT_AND_SETTINGS.XLS |                           |                |                    |                |               |
| 3  | recorded on: 05.08.2019 / Time: 13:40:44                                              |                           |                |                    |                |               |
| 4  | Flow Monitor, Version: V2.52                                                          |                           |                |                    |                |               |
| 5  |                                                                                       |                           |                |                    |                |               |
| 6  |                                                                                       |                           |                |                    |                |               |
| 7  |                                                                                       |                           |                |                    |                |               |
| 8  |                                                                                       |                           |                |                    |                |               |
| 9  |                                                                                       |                           |                |                    |                |               |
| 10 | <b>Name</b>                                                                           | <b>Value</b>              | <b>Comment</b> | <b>Parameter</b>   | <b>Address</b> | <b>Format</b> |
| 11 | <b>Identification</b>                                                                 |                           |                |                    |                |               |
| 12 | Device Addr                                                                           | #01                       |                | EE_Id_DevAddr      | 0000           | U8            |
| 13 | Sensor ID                                                                             | Flow Sensor               |                | EE_Id_Device       | 0001           | U8            |
| 14 | Series                                                                                | IL.xx/ CO.xx              |                | EE_Id_Type         | 0002           | U8            |
| 15 | Sub Type                                                                              | CO.55 V2.0 / 044          |                | EE_Id_SubType      | 0003           | U8            |
| 16 | Model                                                                                 | 4.4mm                     |                | EE_Id_Spec         | 0004           | U8            |
| 17 | Tubing                                                                                | ---                       |                | EE_Id_Tubing       | 0005           | U8            |
| 18 | Software                                                                              | V2.70                     |                | EE_Id_Id_Firmware  | 000C           | U16           |
| 19 | Hardware                                                                              | Board FT1-V2.2/ ATmega644 |                | EE_Id_Hardware     | 0006           | U16           |
| 20 | SN                                                                                    | 10014                     |                | EE_Id_SerialNumber | 0008           | U32           |
| 21 |                                                                                       | Address: 0x0000           |                | EE_Id_ApplAddr     | 000E           | U32           |
| 22 |                                                                                       | Address: 0xF000           |                | EE_Id_ParamAddr    | 0012           | U32           |
| 23 |                                                                                       | Size 1024                 |                | EE_Id_ParamSize    | 0016           | U16           |
| 24 |                                                                                       | Address: 0x0846           |                | EE_Id_VarAddr      | 0018           | U32           |
| 25 |                                                                                       | Address: 0x063E           |                | EE_Id_M0Tab1Addr   | 001C           | U32           |
| 26 |                                                                                       | Address: 0x0742           |                | EE_Id_M0Tab2Addr   | 0020           | U32           |
| 27 |                                                                                       | Address: 0xFC00           |                | EE_Id_Id_BootAddr  | 0024           | U32           |
| 28 |                                                                                       | Version: 4                |                | EE_Id_BootVersion  | 0028           | U16           |
| 29 |                                                                                       | Type: 6                   |                | EE_Id_BootType     | 002C           | U8            |
| 30 |                                                                                       | ATmega 644                |                | EE_Id_Id_MCUType   | 002A           | U16           |
| 31 | Scratch Pad                                                                           | V02.70.00.00              |                | EE_Id_ScratchPad   | 0030           | Char32        |
| 32 | <b>Settings</b>                                                                       |                           |                |                    |                |               |
| 33 | <b>Page: Output</b>                                                                   |                           |                |                    |                |               |
| 34 | <b>Current Output</b>                                                                 |                           |                |                    |                |               |
| 35 | Configuration                                                                         | Flow                      |                | C1_Config          | F002           | U8            |
| 36 | Range                                                                                 | 4-20mA                    |                | C1_Config.4        |                | U1            |
| 37 | Limit                                                                                 | > 20mA                    |                | C1_Config.5        |                | U1            |
| 38 | Flow min. [ml/min]                                                                    | 0                         |                | C1_FlowMin         | F004           | F32           |
| 39 | Flow max. [ml/min]                                                                    | 5000                      |                | C1_FlowMax         | F008           | F32           |

## 11.4 RS-485 address (tab 'Ident')

For all sensors (if bus-capable and after selecting the correct sensor type and version) it is possible to change the sensor's address. If supported by sensor the protocol type can be selected as well.

The screenshot shows a software interface for configuring an RS-485 sensor. It is divided into two main sections: 'RS485 Address' and 'Protocol'.  
The 'RS485 Address' section contains two dropdown menus, both currently set to '#01'. The first is labeled 'Sensor Address' and the second is labeled 'New Address'. Below these are three buttons: 'PING' (under Sensor Address), 'SCAN' (between the two dropdowns), and 'SET' (under New Address).  
The 'Protocol' section contains two radio buttons: 'Standard' (which is selected) and 'MODBus'. Below these are two buttons: 'Info' and 'PING'.

You can connect up to 12 sensors within one RS-485 bus. Each sensor needs to be set to a unique address:

### ❗ IMPORTANT

Sensors connected by a bus system must all have unique addresses.  
Never assign same address to more than one sensor on a bus! Change the sensor address only if just one sensor is connected to the bus.

1. Click on '**PING**' to check communication for the selected address.
2. Click on '**SCAN**' to search for the address of the connected sensor, starting with address #01. The first sensor identified is the selected sensor.
3. Click on '**SET**' to change the current sensor address to the 'New Address'.

## 12 Parameterization: Change sensor settings (basic options)

### ❗ IMPORTANT

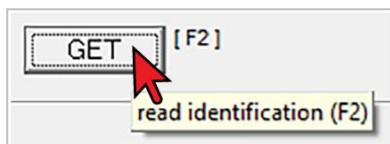
Observe all safety instructions: Parameter changes may have **impact on medical safety**. Never change settings of the sensor before you have saved all parameters. For exact measurements and parameterization ensure, that the correct sensor type and version are selected.

Ensure, that the interface is connected to communicate with the sensor:

1. Select the menu item '**Interface**'.
2. Click on '**Reset USB**' after connecting the sensor (see also chapter 7.2 Changing / Reconnecting interface).

The parameters vary depending on the activated device type. The following chapters introduce general functions and options.

With 'mouse over' function you can display notes or details to parameters in the input masks.



### 12.1 Change parameters

Changed parameters in the input mask that differ from the parameter written in the sensor are marked red. When loading a parameter set from a \*.hex file, all parameters that differ from the previous state are marked red.

**Current Output**

Configuration: Flow

Range: 4-20mA

Limit: > 20mA

Flow min. [ml/min]: 0

Flow max. [ml/min]: 5000

Measuring Error [mA]: 2,00

Device Fault [mA]: 0,00

Test [mA]: 0,00

**Current Output**

Configuration: Flow

Range: 4-20mA

Limit: > 20mA

Flow min. [ml/min]: 0

Flow max. [ml/min]: 6000

Measuring Error [mA]: 2,00

Device Fault [mA]: 0,00

Test [mA]: 0,00

The red marking can be removed by using the 'Reset Red Marking' function via right mouse click. In this case, note that the parameter has not been written in the sensor yet.

Flow min. [ml/min]: 0

Flow max. [ml/min]: 6000

Measuring Error [mA]: 2,00

Device Fault [mA]: 0,00

Test [mA]: 0,00

tmp Set

tmp Get

Reset Red Marking

## 12.2 Load and safe parameters

1. Select the tab '**Ident**'.
2. Click on '**Get**' to read out sensor identification and parameters.  
→ The following message is shown: "Type of sensor or version of firmware different from current settings of Monitor! Apply correct version?"
3. Click '**OK**'. (Click 'Cancel' to stop overwriting monitor parameters.)  
→ Message is shown: "Settings will be read out from sensor now. Continue?"
4. Click again on '**OK**'. (Click 'Cancel' to stop overwriting monitor parameters.)
5. Select the tab '**Settings**' and click '**Save**' to store sensor's \*.hex file containing the sensor identification and factory settings or click '**Report**' to save settings in Excel file (see example in chapter 11.3 Read out and save / Report sensor identification).

## 12.3 Restoring of 'delivery state'

1. Select the tab '**Tools**' → sub tab '**Delivery State**'
2. Select a file.

### WARNING

**Incorrect sensor parameters can permanently damage sensors.**

The sensor type of the settings file must be corresponding!

---

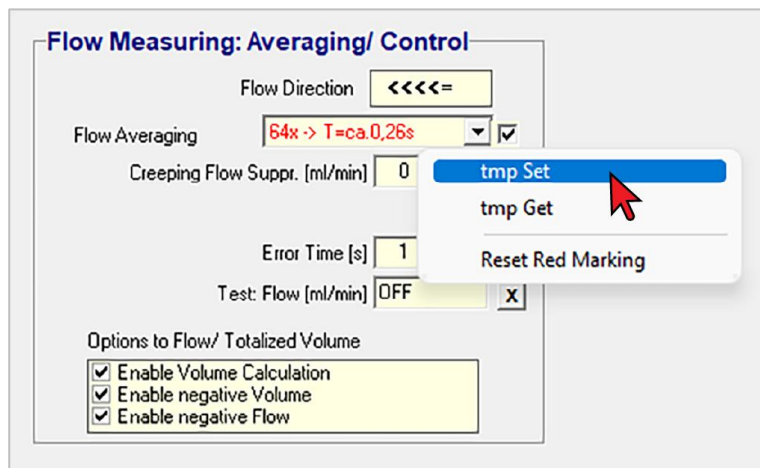
Click the button '**Open**' to load all data from a file (\*.hex).

Change sensor settings:

3. Click the button '**Write**' to transfer all data into sensor.

## 12.4 Options to read and write sensor parameters (testing sensor parameters)

| Button                    | Function                                                                               | Status                                                                                               |
|---------------------------|----------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|
| <b>Read</b>               | Reads out sensor parameters to monitor.<br>Changed parameters are marked red           | ⓘ Overwrites parameters in the software<br>Temporarily<br>Changes are gone after restart of monitor. |
| <b>tmp Get</b>            | Reads out one special sensor parameter (see picture below)                             | Temporarily<br>Changes are gone after restart of monitor.                                            |
| <b>tmp Set</b>            | Applies immediately one chosen parameter to the sensor's operation (see picture below) | Temporarily<br>Changes are gone after restart of sensor.                                             |
| <b>Fixation</b>           | Sets all temporarily set parameters (tmp Set) permanently                              | ⓘ Permanent<br>Changes sensor's factory settings.                                                    |
| <b>Write<br/>[Ctrl+W]</b> | Overwrites all parameters from the sensor with the current software settings           |                                                                                                      |

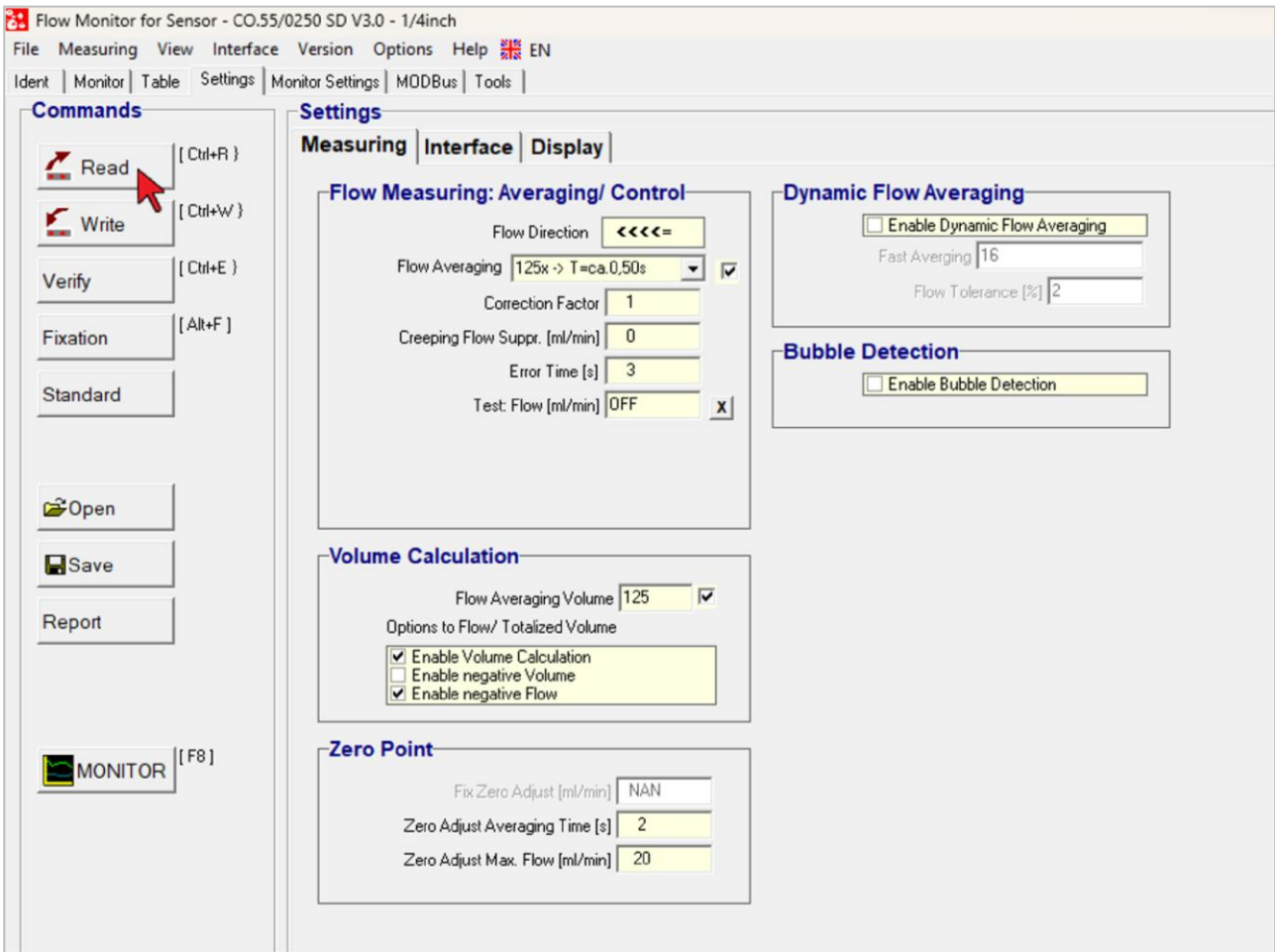


Use the **tmp Set / tmp Get** function via right mouse click within the yellow colored parameter fields.

The settings are instantaneously active and change the sensor settings until the sensor is switched off; the state is documented in the status bar. Changed parameters are marked red in the input mask.

Use '**Fixation**' to write the changed settings permanently to sensor.

## 12.5 Commands in the ‘Settings’ tab



| Button   | Function                                                                                                                                                              |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Read     | Reads out settings of sensor                                                                                                                                          |
| Write    | Writes settings into sensor. ⓘ Overwrites sensor parameters permanently!                                                                                              |
| Verify   | Compares settings between sensor and Flow Monitor (result in status bar)                                                                                              |
| Fixation | Sets all temporarily set parameters (via 'tmp Set') permanently<br>ⓘ Overwrites sensor parameters permanently! The temporary changed values will be secured in flash. |
| Standard | Loads the default settings to Flow Monitor (depending on sensor type)                                                                                                 |
| Open     | Opens a file and imports settings into Flow Monitor                                                                                                                   |
| Save     | Saves settings and sensor identification from Flow Monitor to a file (.hex) to be reloaded later                                                                      |

(Continue on next page)

| Button  | Function                                                                 |
|---------|--------------------------------------------------------------------------|
| Report  | Saves settings and sensor identification from Flow Monitor to Excel file |
| Monitor | Switches to tab 'Monitor' (details see chapter 10.2)                     |

## 13 Change settings – CO.55 / CO.65 / CO.66 / IL.52

### ❗ IMPORTANT

Observe all safety instructions: Parameter changes may have **impact on medical safety**. Never change settings of the sensor before you have saved all parameters. For exact measurements and parameterization ensure, that the correct sensor type and version are selected.

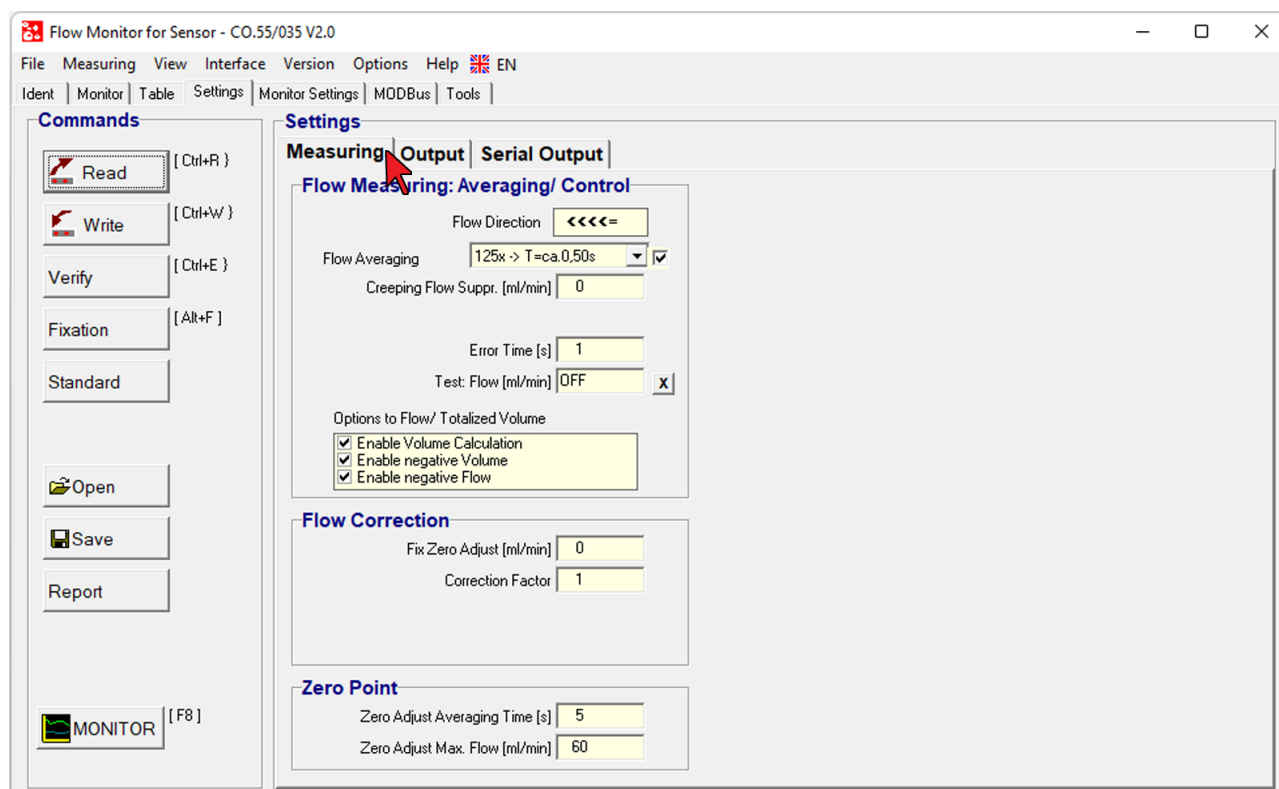
The 'Default' sensor settings apply to most applications and sensor types. Please note that in rare cases the settings may differ from those mentioned in the following chapters (e.g. if individual outputs have been deactivated).

The chapter '16.1 Influences on sensor performance regarding parameterization (Troubleshooting)' might be helpful in case of problems.

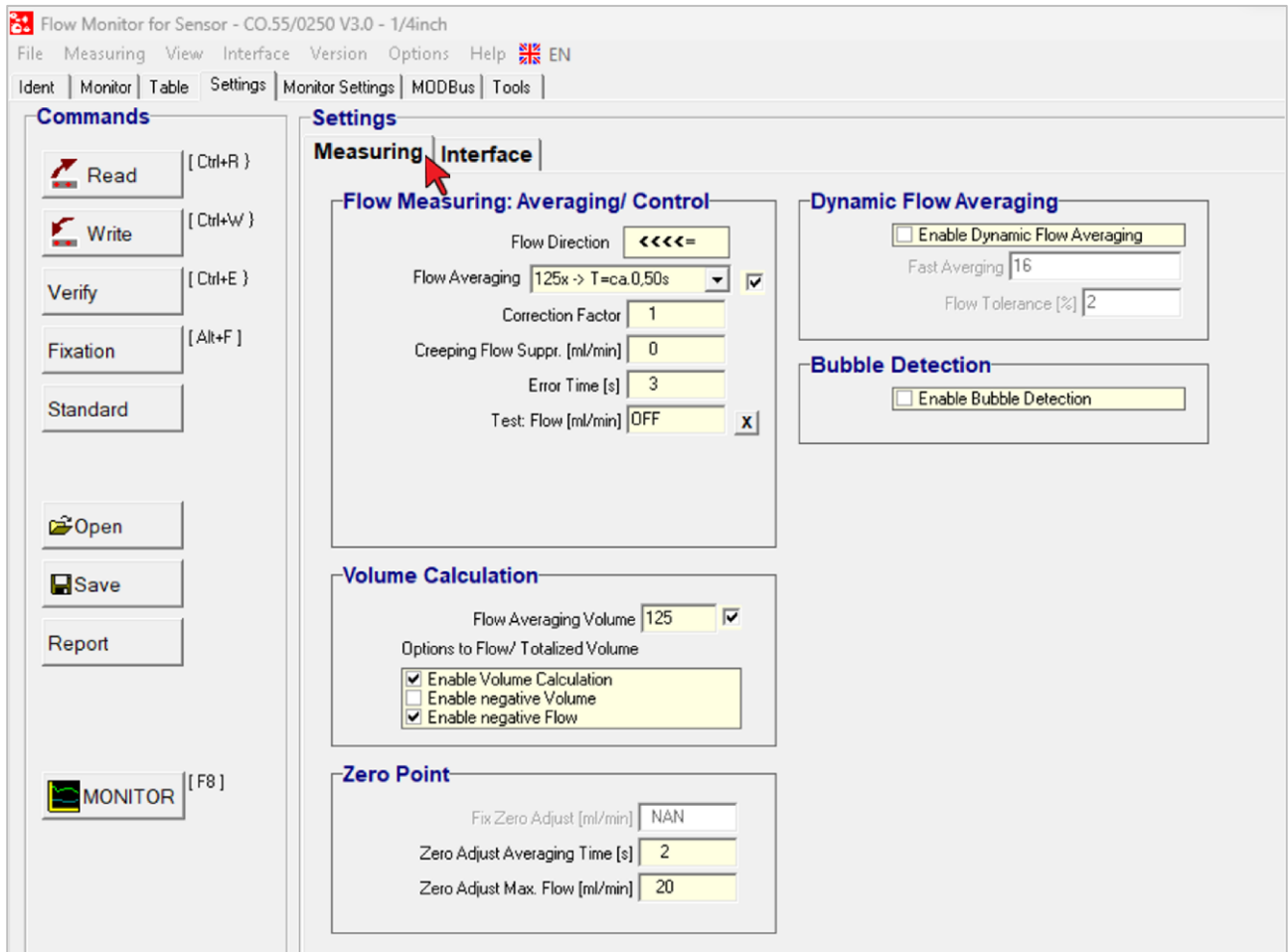
More details for parameterization of SONOFLOW CO.55 V3.0 sensors are given in the documentation: 'Notes to Settings SONOFLOW CO.55 V3.0'



### 13.1 Parameters in the 'Settings' tab – Measuring



Parameters for sensors V2.0 – 'Measuring' sub tab



Parameters for sensors SONOFLOW CO.55 V3.0 – 'Measuring' sub tab

| Input mask                       | Function / Meaning                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Flow Direction</b>            | Defines the 'Flow Direction', depending on sensor type - please compare with arrow of labelling on hinged lid                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Flow Averaging</b>            | <p>Chooses the count of values used in averaging of flow signal; the higher the smoother but lazier the signal; method of averaging selectable via checkbox</p> <p><input checked="" type="checkbox"/> Activated (default): moving (or floating) averaging over count of measuring values; output value is refreshed with each measuring but smoothed exponentially</p> <p><input type="checkbox"/> Deactivated: arithmetic averaging, count of measuring values per interval<br/>Example: 32 values = averaging about a period of ca. 150 ms<br/>After this time the output value is refreshed.</p> <p>Example: 64 values = floating averaging with an exponential factor<br/><math>\tau</math> = ca. 300 ms; after a jump from high flow to zero: it lasts a time of <math>3 \times \tau</math>, then the value is reduced by 95 %</p> |
| <b>Creeping Flow Suppression</b> | Avoids fluctuating signals near zero; all values (positive/negative in ml/min) below this limit will be suppressed to 0; default = 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Error Time</b>                | Failure tolerance time (1 s = default for all V2.0 sensors   3 s = default for SONOFLOW CO.55 V3.0 sensors): in case of disturbed measurements the actual flow value is hold over the defined time period. If the error persists, the sensor sets a measuring alarm (outputs are set to the defined error status).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Test Flow</b>                 | <p>Simulates Flow (e.g. to test the control unit)</p> <p>ⓘ Test flow must be deactivated after completion of test (set to 'Off').</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Flow Averaging Volume</b>     | <p>ⓘ Depending on sensor type. Not applicable for V2.0 sensors.</p> <p>Count of values for internal volume calculation;<br/>method of averaging selectable via checkbox (for details see 'Flow Averaging')</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Further Options to Flow</b>   | <p>Enable / disable: <input checked="" type="checkbox"/> Volume calculation / <input checked="" type="checkbox"/> Negative volume / <input checked="" type="checkbox"/> Negative flow</p> <p>Calculation of totalized volume: depending on configuration;<br/>Volume dosing / Pulses: volume calculation must be enabled<br/>Pulses: Volume / Flow shall be restricted to positive values only</p>                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Flow Correction</b>           | Sets correction factor and zero adjust (Might be needed to compensate the real measured flow values, can be done by scaling, shifting or cutting)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Fix Zero Adjust</b>           | <p>ⓘ Depending on sensor type. Not applicable for CO.55 V3.0.</p> <p>All flow values will be shifted by value of zero adjust (0 ml/min = default)<br/>Example: A systematic zero offset of 12 ml/min is detected, independent of putting in / out the tubing. This offset can be compensated by setting the value to -12 ml/min</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

(Continue on next page)

| Input mask                        | Function / Meaning                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Correction Factor</b>          | All flow values are to be multiplied by this factor (1 = default).<br>Example: A tube with a thinner wall thickness is used. The cross-sectional area is enlarged by 10 %. With the same speed of fluid, the flow rate is higher. So, the flow values can be compensated by factor = 1.1                                                                                                                                                                                |
| <b>Zero Adjust Averaging Time</b> | Defines the averaging time in s for zero adjust procedure                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Zero Adjust Max. Flow</b>      | Sets the max. allowed flow of zero point in ml/min; if the flow exceeds the value a warning is raised                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Dynamic Flow Averaging</b>     | <div>ⓘ Depending on sensor type. Not available for V2.0 sensors in standard user mode. Please contact our service.</div> <p>Type of averaging, applicable on 'floating averaging' (refer to last page: parameter 'Flow Averaging').<br/>Combines high noise suppression with a fast reaction to sudden flow changes.<br/>Further options: Number of samples: Count of values used for averaging; Flow tolerance: Threshold for the activation of Dynamic Averaging.</p> |
| <b>Bubble Detection</b>           | <div>ⓘ Depending on sensor type. Not applicable for V2.0 sensors.</div> <p>Enables detection of air bubbles in the medium. Bubble detection is based on a fixed internal threshold stored in the sensor.<br/><input checked="" type="checkbox"/> For detailed specifications, refer to the data sheet and technical documentation.</p>                                                                                                                                  |

## 13.2 Parameters in the ‘Settings’ tab – Output/Interface

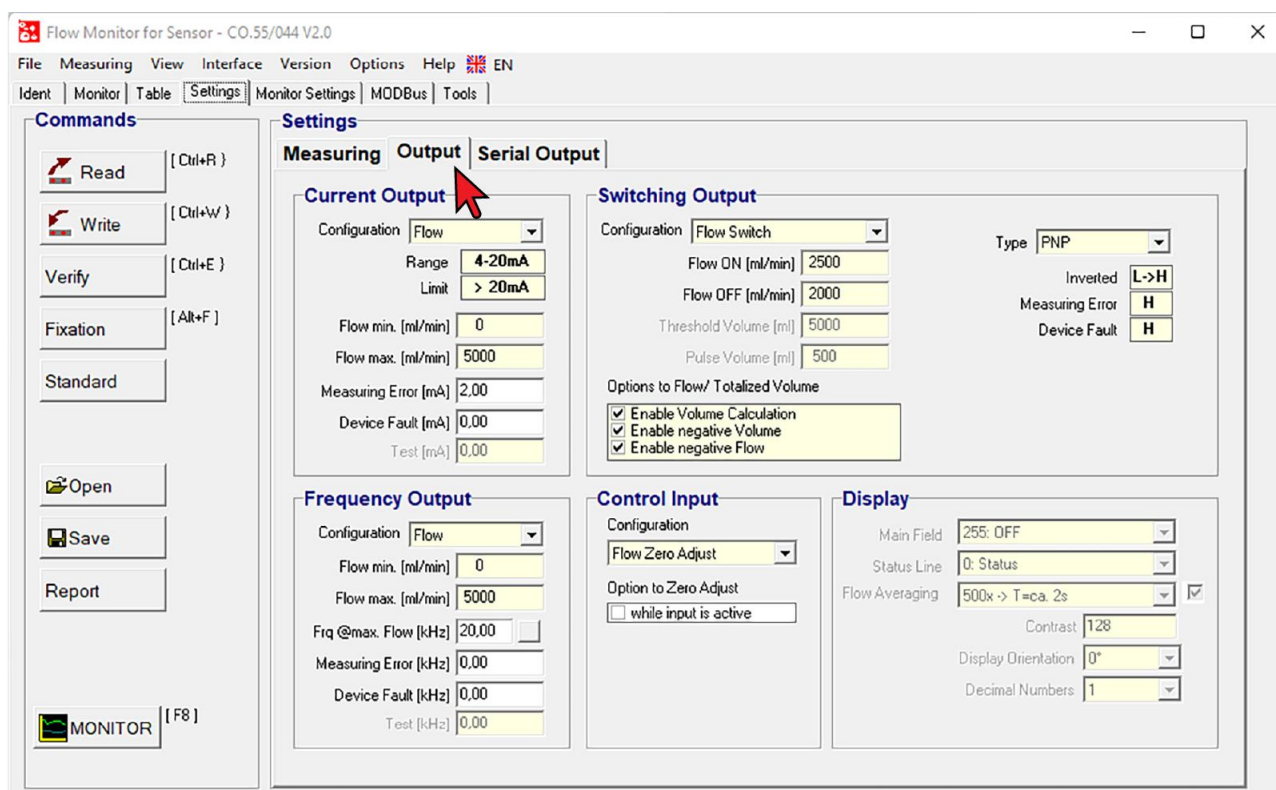
### ❗ Note:

The tab structure for interface settings differs between V2.0 sensors and SONOFLOW CO.55 V3.0 sensors.

For V2.0 sensors, interface parameters can be configured under the “Output” tab, with “Serial Output” provided as a separate tab. For CO.55 V3.0 sensors, these functions are consolidated under the “Interface” tab (for “Serial Output” settings please see section 13.3 “Parameters Description – Serial Output”).

For CO.55 V2.0 SD(H) sensors with display, display-related parameters are located in the “Output” tab and are only configurable when a corresponding sensor is connected and selected. (see 13.2.5.1 “Sensor Display Settings – SONOFLOW CO.55 V2.0 SD (H)”)

For CO.55 V3.0 SD (H) sensors, display parameters are not part of the “Interface” tab. When such a sensor is connected and selected, a separate “Display” tab is added in addition to “Measuring” tab and “Interface” tab, providing access to display-specific settings. (see section see 13.2.5.2 “Sensor Display Settings – SONOFLOW CO.55 V3.0 SD(H)”)



Parameters for V2.0 sensors – ‘Output’ sub tab

Flow Monitor for Sensor - CO.55/0250 V3.0 - 1/4inch

File Measuring View Interface Version Options Help EN

Ident Monitor Table Settings Monitor Settings MODBUS Tools

**Commands**

Read [Ctrl+R]

Write [Ctrl+W]

Verify [Ctrl+E]

Fixation [Alt+F]

Standard

Open

Save

Report

MONITOR [F8]

**Settings**

**Measuring Interface**

**Current Output**

Configuration Flow

Range 4-20mA

Limit > 20mA

Averaging 125x -> T=ca.0.50s

Flow min. [ml/min] 0

Flow max. [ml/min] 1000

Device Fault [mA] 0.00

Measuring Error [mA] 2.00

Test [mA] 5.000

**Switching Output**

**Configuration**

Configuration Pulse Volume

Type Off

Inverted L->H

Measuring Error L

Device Fault L

**Flow Switch**

Flow ON [ml/min] 500

Flow OFF [ml/min] 400

Hold Time [ms] 2.291E007

Flow Averaging 10

**Bubble Switch**

Pulse Width [ms] 40

**Volume/ Dosing/ Pulse**

Threshold Volume [ml] 100

Pulse Volume [ml] 10

Pulse Vol Max [ml] 100

Pulse Width [ms] 40

Options to Flow/ Totalized Volume

☒ Enable Volume Calculation

☐ Enable negative Volume

☒ Enable negative Flow

**PWM Output**

Flow min. [ml/min] 0

Flow max. [ml/min] 1000

PWM Range 5..95%

PWM Period [ms] 10

PWM Measuring Error [%] 3

PWM Device Fault [%] 1

PWM Test [%] 50

Flow Averaging 10

**Frequency Output**

Flow min. [ml/min] 0

Flow max. [ml/min] 1000

Freq @max. Flow [kHz] 20

Measuring Error [kHz] 0

Device Fault [kHz] 0

Test [kHz] 2

Flow Averaging 10

**Control Input**

Configuration Flow Zero Adjust

Min Interval [ms] 20

Option to Zero Adjust

☐ while input is active

**Serial Output**

Protocol Auto Type 11

Interval Auto [ms] 20.0

Variables 1 .. x

| Var | ID   | Abbr     |
|-----|------|----------|
| 1   | \$01 | flow_uls |
| 2   | \$00 |          |
| 3   | \$00 |          |
| 4   | \$00 |          |
| 5   | \$00 |          |
| 6   | \$00 |          |
| 7   | \$00 |          |
| 8   | \$00 |          |

Stop Auto

Auto Protocol Selection

**Options**

MODBUS Flow Unit [ul/s]

Selection of Channel 1

Parameters for CO.55 V3.0 sensors – 'Interface' sub tab

### 13.2.1 Settings for Current Output

| Settings for Current Output | Function / Meaning / Settings                                                                                                                                                 |
|-----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Configuration</b>        | Defines the settings of the Current Output:<br>Flow (default)   Off   Test current                                                                                            |
| <b>Range</b>                | 4 ... 20 mA   0 ... 20 mA                                                                                                                                                     |
| <b>Limit</b>                | > 20 mA   ≤ 20 mA                                                                                                                                                             |
| <b>Averaging</b>            | <div>ⓘ Depending on sensor type. Not applicable for V2.0 sensors.</div><br>125 x T = approx. 0.5 s   Configurable<br>Floating Averaging enabled   Floating Averaging disabled |
| <b>Flow Min.</b>            | 0 ml/min (4 mA)   Customized value                                                                                                                                            |
| <b>Flow Max.</b>            | Value [ml/min] depends on sensor type; see 'Technical Data Sheet' (20 mA)   Customized value (limited by tubing capacity)                                                     |
| <b>Measuring Error</b>      | Current in case of measuring error: 2 mA   Customized value 0 ... 22 mA                                                                                                       |
| <b>Device Fault</b>         | Current in case of sensor fault: 0 mA   Customized value 0 ... 22 mA                                                                                                          |
| <b>Test</b>                 | Test current (must be activated in field 'Configuration'): 0 ... 22 mA                                                                                                        |

### 13.2.2 Settings for Frequency Output

ⓘ Depending on sensor type. Not applicable for CO.66 Ex1 and CO.55 V3.0 sensors.  
For CO.55 V3.0 sensors, the switching output can optionally be configured as a frequency output (see section 'Settings for Switching Output').

| Settings for Frequency Output | Function / Meaning / Settings                                                                                              |
|-------------------------------|----------------------------------------------------------------------------------------------------------------------------|
| <b>Configuration</b>          | Defines the settings of the Frequency Output.: Flow (default)   Off   Test Frequency                                       |
| <b>Flow min.</b>              | 0 ml/min (0 kHz)   Customized value                                                                                        |
| <b>Flow max.</b>              | Value [ml/min] depends on sensor type; see 'Technical Data Sheet' (20 kHz)   Customized value (limited by tubing capacity) |
| <b>Frq@max Flow</b>           | Frequency in case of Flow max:20 kHz   Customized value 0 ... 20 kHz                                                       |
| <b>Measuring Error</b>        | Frequency in case of measuring error: 0 mA   Customized value 0 ... 20 kHz                                                 |
| <b>Device Fault</b>           | Frequency in case of sensor fault: 0 mA   Customized value 0 ... 20 kHz                                                    |
| <b>Test</b>                   | Test frequency must be activated in field 'Configuration': 0 ... 20 kHz                                                    |

### 13.2.3 Settings for Switching Output

| Settings for Switching Output | Function / Meaning / Settings                                                                                                                                                                                                                                                                                                                            |
|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Configuration</b>          | <p>Defines the settings of the Switching Output.:<br/>Flow Switch   Fix L (0 V)   Fix H (24 V)   Volume Dosing<br/>(Threshold volume in ml)   Pulse Volume (Pulse volume in ml)</p> <p>Further options, only applicable for CO.55 V3.0 sensors:</p> <p>Bubble Alarm   Zero Adjust Status   Flow PWM   Test PWM   Flow Frequency  <br/>Test Frequency</p> |
| <b>Type</b>                   | Defines the type of switch: PNP   NPN   Push pull   Off                                                                                                                                                                                                                                                                                                  |
| <b>Type Settings</b>          | Inverted: L → H   L → H; Measuring error: H   L; Device fault: H   L<br>(Double-click to select)                                                                                                                                                                                                                                                         |
| <b>Flow ON / OFF</b>          | <p>Defines the threshold of flow to switch: Flow on (ml/min) / Flow off ml/min<br/>(in case of config. 'Flow switch')</p> <p>Further options, only applicable for CO.55 V3.0 sensors</p> <p>Flow Averaging   Floating Averaging enabled/disabled</p>                                                                                                     |
| <b>Threshold Volume</b>       | Threshold of volume in ml (in case of config. 'Volume Dosing')                                                                                                                                                                                                                                                                                           |
| <b>Pulse Volume</b>           | Volume of each pulse in ml (in case of config. 'Pulse Volume')                                                                                                                                                                                                                                                                                           |
| <b>Pulse Vol Max</b>          | <div>ⓘ Not available for V2.0 sensors in standard user mode. Please contact our Service.</div> <p>Defines the maximum volume overrun allowed for real-time pulse output<br/>before a warning is issued in ml<br/>(in case of config. 'Pulse Volume')</p>                                                                                                 |
| <b>Pulse Width</b>            | <div>ⓘ Not available for V2.0 sensors in standard user mode. Please contact our Service.</div> <p>Defines width of pulses in ms<br/>(in case of config. 'Pulse Volume')</p>                                                                                                                                                                              |

(Continue on next page)

| Settings for Switching Output   | Function / Meaning / Settings                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Further Options for Flow</b> | Enable or disable: Volume Calculation / negative Volume / negative Flow<br>Calculation of totalized volume: depending on configuration;<br>Volume dosing / Pulses: volume calculation must be enabled<br>Pulses: Volume / Flow shall be restricted to positive values only                                                                                                                                                                                                                                                                                                          |
| <b>PWM Output</b>               | <div>ⓘ Depending on sensor type. Not applicable for V2.0 sensors.</div> <p>Sets the flow output using a PWM signal<br/>(in case of config. 'Flow PWM')</p> <p>PWM Output Settings:<br/>Flow min. in ml/min   Flow max. in ml/min   PWM Range in %   PWM Period in ms   PWM Measuring Error in %   PWM Device Fault in %   PWM Test in %   Flow Averaging / Floating Averaging enabled/disabled</p>                                                                                                                                                                                  |
| <b>Frequency Output</b>         | <div>ⓘ Depending on sensor type. Only applicable for CO.55 V3.0 sensors. For V2.0 Sensors (not applicable for CO.66 Ex1 sensors) there is a separate Frequency Output available. (Please refer to section "Settings for Frequency Output".)</div> <p>Sets the flow output using a frequency signal<br/>(in case of config. 'Flow Frequency')</p> <p><b>Frequency Output settings:</b><br/>Flow min. in ml/min   Flow max. in ml/min   Frq @max. Flow in kHz   Measuring Error in kHz   Device Fault in kHz   Test in kHz   Flow Averaging   Floating Averaging enabled/disabled</p> |
| <b>Bubble Switch</b>            | <div>ⓘ Depending on sensor type. Only applicable for CO.55 V3.0 sensors.</div> <p>Defines the minimum activation time: Pulse Width in ms (in case of config. 'Bubble Alarm')</p>                                                                                                                                                                                                                                                                                                                                                                                                    |

13.2.4 Settings for Control Input

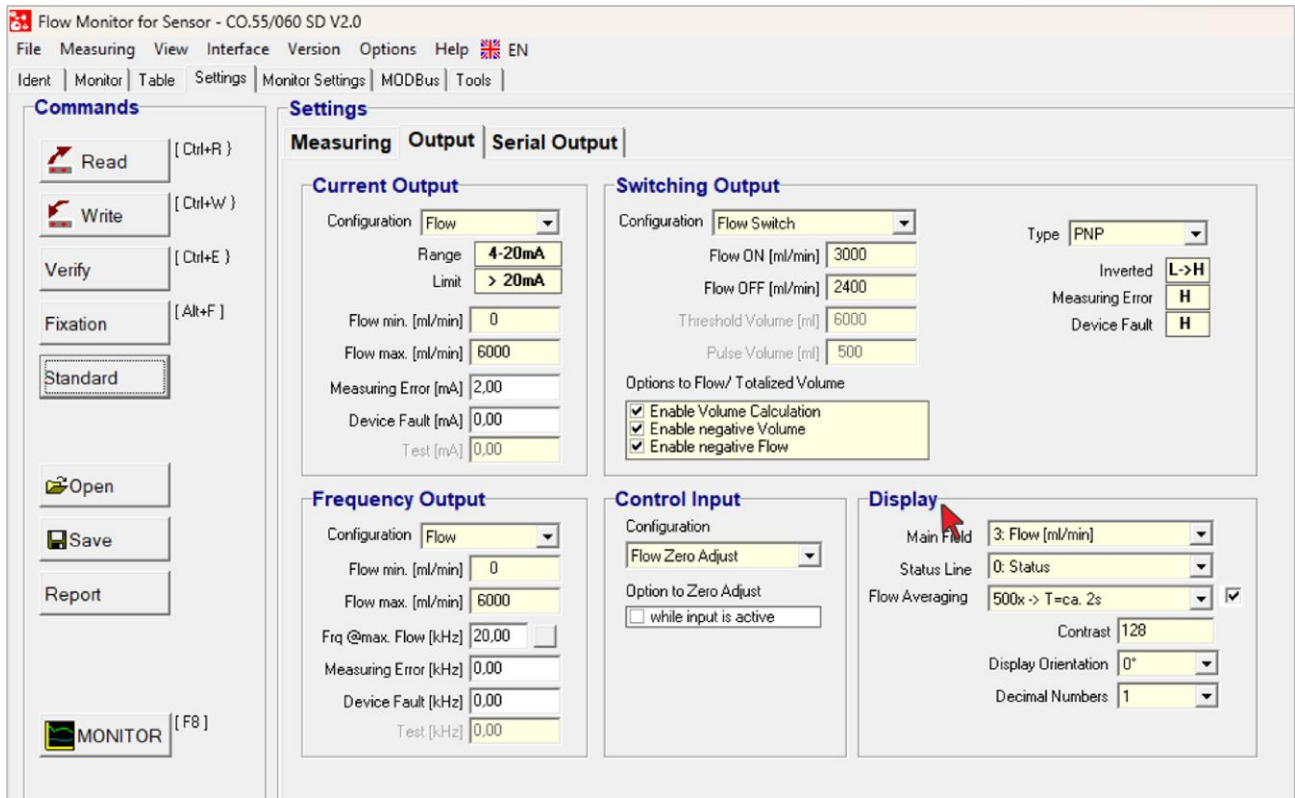
| Settings for Control Input | Function / Meaning / Settings                                                                                                                                                                          |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Configuration              | Defines the settings of the Control Input:<br>Flow Zero Adjust   OFF   Reset Volume   Flow Zero + Reset Volume   Restart                                                                               |
| Min Interval               | <div>ⓘ Depending on sensor type. Not available for V2.0 sensors in standard user mode. Please contact our Service.</div><br>Minimum interval from external input to release the defined function in ms |
| Option to Zero Adjust      | The Zero Adjust is controlled by time interval (see tab 'Measuring')<br>The Zero Adjust is performed while the input is active                                                                         |

13.2.5 Sensor Display Settings

|                                                                                                                                                                                  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <div>ⓘ Depending on sensor type. Only applicable for sensor types with integrated display.<br/>For settings RD.10 see chapter 14 Change settings – SONOFLOW Display RD.10.</div> |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

13.2.5.1 Sensor Display Settings – SONOFLOW CO.55 V2.0 SD(H)

|                                                                                                                                                                                 |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <div>ⓘ Display-related parameters for V2.0 SD(H) sensors are located in the "Output" tab and are only configurable when a corresponding sensor is connected and selected.</div> |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

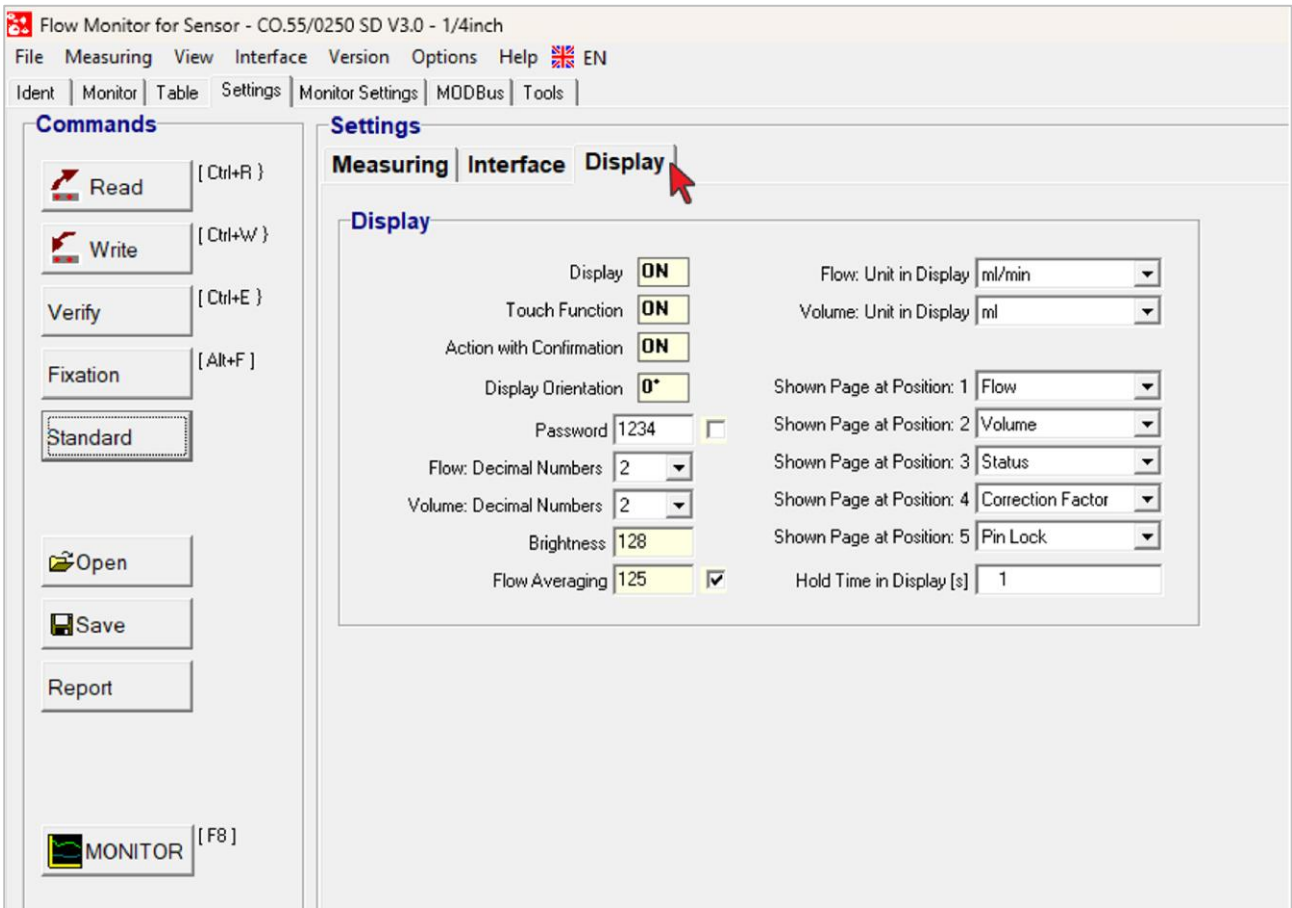


Sensor Display Settings – SONOFLOW CO.55 V2.0 SD(H)

| Settings for Display   | Function / Meaning / Settings                                                                                                                                                                                                                                                       |
|------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Main Field</b>      | Defines value and unit of 'Main Filed'<br>(for possible values compare screenshot page 65)<br>Select option for display functionality: Pixel test   Demo   Off                                                                                                                      |
| <b>Status Line</b>     | Sets value and unit of 'Status Line'                                                                                                                                                                                                                                                |
| <b>Flow Averaging</b>  | Averaged flow signal for displaying (independent from flow for outputs)<br>Choose with the option the method of averaging:<br>Deactivated: arithmetic averaging, count of measuring values per interval<br>Activated: moving (or floating) averaging over count of measuring values |
| <b>Contrast</b>        | Sets the contrast of LCD: 0 ... 255, default: 128                                                                                                                                                                                                                                   |
| <b>Orientation</b>     | Rotates the display 180° (default = 0°), if the sensor is mounted upside down                                                                                                                                                                                                       |
| <b>Decimal Numbers</b> | Selects the number of decimals: none to max. 3 numbers, default = 1                                                                                                                                                                                                                 |

13.2.5.2 Sensor Display Settings – SONOFLOW CO.55 V3.0 SD(H)

① When a CO.55 V3.0 SD(H) sensor is connected and selected, a separate “Display” tab is added in addition to “Measuring” tab and “Interface” tab, providing access to display-specific settings.



Sensor Display Settings – SONOFLOW CO.55 V3.0

| Settings for Display     | Function / Meaning / Settings                                                                                                                                                         |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Display                  | Activate or deactivate the display: ON (default   OFF<br>(Double-click to select)                                                                                                     |
| Touch Function           | Activate or deactivate the touch function: ON (default)   OFF<br>(Double-click on field)                                                                                              |
| Action with Confirmation | Defines if change via touch display require information:<br>ON (default): Changes must be confirmed or cancelled  <br>OFF: Changes are applied immediately<br>(Double-click on field) |

(Continue on next page)

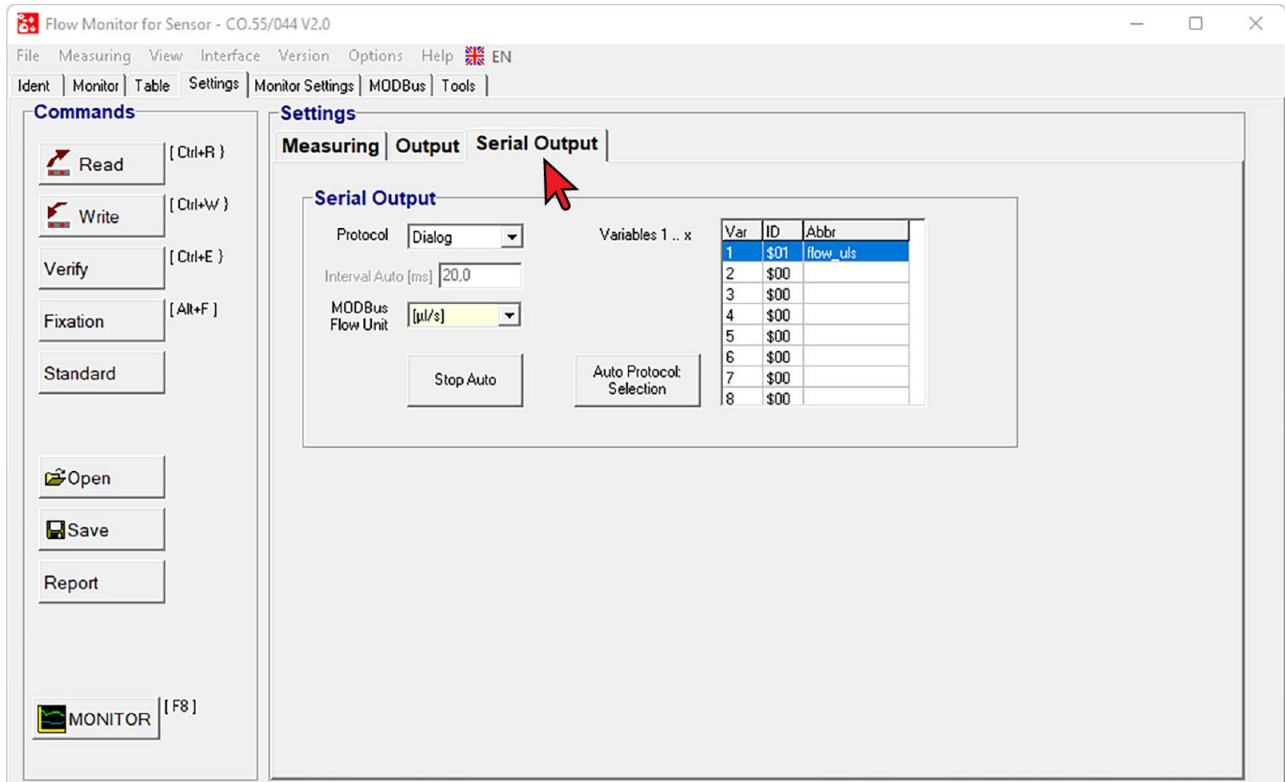
| Settings for Display               | Function / Meaning / Settings                                                                                                                                                                                                                                                             |
|------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Display Orientation</b>         | Rotates the display 180° (default = 0°), if the sensor is mounted upside down                                                                                                                                                                                                             |
| <b>Password</b>                    | <p>Change the password for optional screen lock:<br/>1234 (default)   0000...9999</p> <p>Please note: Screen lock is deactivated by default and requires additional activation via touch display.</p>                                                                                     |
| <b>Flow: Decimal Numbers</b>       | Sets decimal places for the flow values on the display:<br>0   1   2 (default)   3                                                                                                                                                                                                        |
| <b>Volume: Decimal Numbers</b>     | Sets decimal places for the volume values on the display:<br>0   1   2 (default)   3                                                                                                                                                                                                      |
| <b>Brightness</b>                  | Sets display contrast: 0 ... 255   128 (default)                                                                                                                                                                                                                                          |
| <b>Flow Averaging</b>              | <p>Averaged flow signal for displaying (independent from flow for outputs)<br/>Choose with option the method of averaging:<br/>Deactivated: arithmetic averaging, count of measuring values per interval<br/>Activated: moving (or floating) averaging over count of measuring values</p> |
| <b>Flow: Unit in Display</b>       | <p>Defines the unit for the flow rate values on the display:</p> <p>µl/s   ml/s   l/s   ml/min (default)   l/min   l/hr   m³/hr   US gallons/s   UK gallons/s   US gallons/min   UK gallons/min   US gallons/h   UK gallons/h</p>                                                         |
| <b>Volume: Unit in Display</b>     | <p>Defines the unit for the volume values shown on the display:</p> <p>µl   ml (default)   l   m³   US gallons   UK gallons</p>                                                                                                                                                           |
| <b>Shown Page at Position: 1-5</b> | <p>Defines displayed parameters for up to five configurable pages:</p> <p>Off   Flow   Volume   Status   Correction factor   PIN lock</p>                                                                                                                                                 |
| <b>Hold Time in Display</b>        | <p>Defines how long the bubble symbol remains visible after a bubble alarm:</p> <p>1 s (default)   Configurable</p>                                                                                                                                                                       |

## 13.3 Parameters Description – Serial Output

**Note:**

For V2.0 sensors, serial output parameters can be configured under “Settings” → “Serial Output”.

For SONOFLOW CO.55 V3.0 sensors, the settings can be found under “Settings” → “Interfaces”.



Serial Output settings – V2.0 sensors

Flow Monitor for Sensor - CO.55/0250 V3.0 - 1/4inch

File Measuring View Interface Version Options Help EN

Ident Monitor Table Settings Monitor Settings MODBus Tools

**Commands**

Read [Ctrl+R]

Write [Ctrl+W]

Verify [Ctrl+E]

Fixation [Alt+F]

Standard

Open

Save

Report

MONITOR [F8]

**Settings**

**Measuring Interface**

**Current Output**

Configuration: Flow

Range: 4-20mA

Limit: > 20mA

Averaging: 125x -> T=ca.0,50s

Flow min. [ml/min]: 0

Flow max. [ml/min]: 1000

Device Fault [mA]: 0,00

Measuring Error [mA]: 2,00

Test [mA]: 5,000

**Switching Output**

**Configuration**

Configuration: Pulse Volume

Type: Off

Inverted: L->H

Measuring Error: L

Device Fault: L

**Flow Switch**

Flow ON [ml/min]: 500

Flow OFF [ml/min]: 400

Hold Time [ms]: 2,291E.007

Flow Averaging: 10

**Bubble Switch**

Pulse Width [ms]: 40

**Volume/ Dosing/ Pulse**

Threshold Volume [ml]: 100

Pulse Volume [ml]: 10

Pulse Vol Max [ml]: 100

Pulse Width [ms]: 40

Options to Flow/ Totalized Volume

☒ Enable Volume Calculation

☐ Enable negative Volume

☒ Enable negative Flow

**PWM Output**

Flow min. [ml/min]: 0

Flow max. [ml/min]: 1000

PWM Range: 5..95%

PWM Period [ms]: 10

PWM Measuring Error [%]: 3

PWM Device Fault [%]: 1

PWM Test [%]: 50

Flow Averaging: 10

**Frequency Output**

Flow min. [ml/min]: 0

Flow max. [ml/min]: 1000

Freq @max. Flow [kHz]: 20

Measuring Error [kHz]: 0

Device Fault [kHz]: 0

Test [kHz]: 2

Flow Averaging: 10

**Control Input**

Configuration: Flow Zero Adjust

Min Interval [ms]: 20

Option to Zero Adjust

☐ while input is active

**Serial Output**

Protocol: Auto Type 11

Interval Auto [ms]: 20,0

Stop Auto

Auto Protocol Selection

| Var | ID   | Abbr     |
|-----|------|----------|
| 1   | \$01 | Flow_uls |
| 2   | \$00 |          |
| 3   | \$00 |          |
| 4   | \$00 |          |
| 5   | \$00 |          |
| 6   | \$00 |          |
| 7   | \$00 |          |
| 8   | \$00 |          |

**Options**

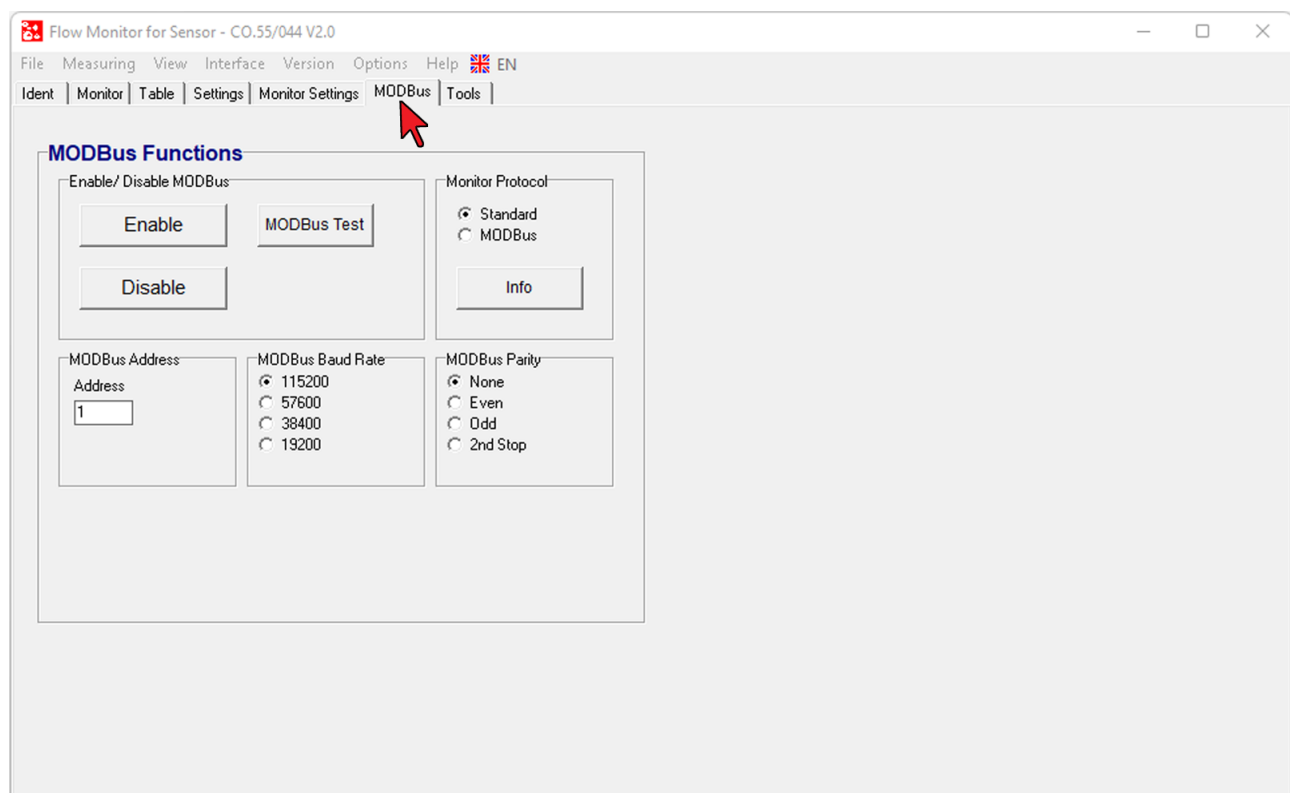
MODBus Flow Unit: [µl/s]

Selection of Channel: 1

Serial Output Settings – SONOFLOW CO.55 V3.0 sensors

| Setting                  | Function / Meaning                                                                                                                                                                                                                                                                                                            |
|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Protocol</b>          | <p>'Dialog' mode (default): the control unit requests, the sensor responds</p> <p>'Auto Type 11' transmission mode (optional, not recommended): the sensor transmits automatically data with defined time interval (no bus operation possible)</p> <p>For details see chapter 8 Monitor settings (Protocol / Dialog mode)</p> |
| <b>Interval Auto</b>     | Time interval for 'Auto' transmission mode in ms                                                                                                                                                                                                                                                                              |
| <b>Variables 1 ... x</b> | <p>List of measuring data, to be sent cyclically in 'Auto' transmission mode</p> <p>For selection, press button 'Auto Protocol Selection'.</p> <p>→ The values in 'Monitor Settings' tab are used.</p>                                                                                                                        |
| <b>Modbus Flow Unit</b>  | <p>Selects the flow in Modbus standard message (for details see specification of Modbus Interface)</p> <p>ⓘ Not applicable for sensors series SONOFLOW CO.56 (Pro)</p>                                                                                                                                                        |

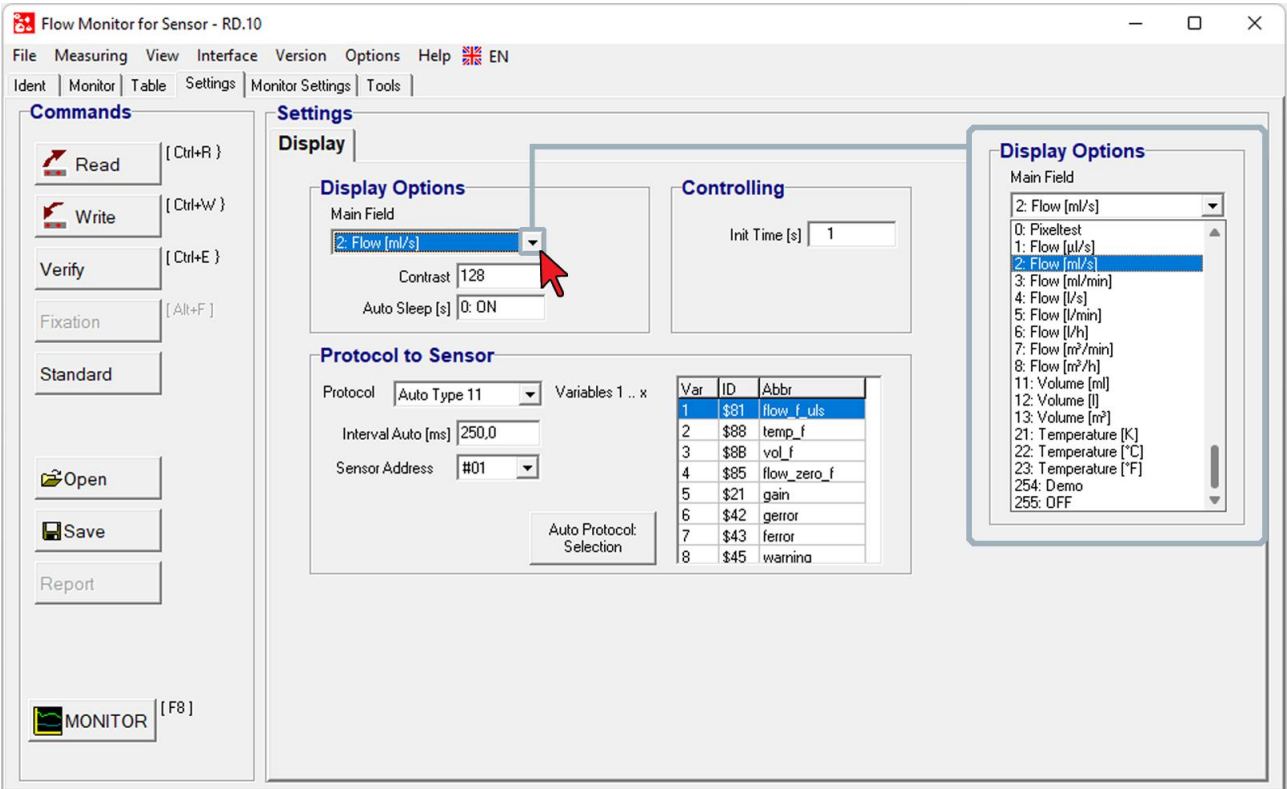
## 13.4 Parameters in the 'Modbus' tab (if supported)



| Setting                                                      | Function / Meaning                                                                                                                                                                                                                                                                |
|--------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Enable / Disable Modbus</b>                               | <p>Enable: Switch to Modbus protocol, according to the chosen configuration</p> <p>Disable: Switch back to standard protocol (SONOTEC protocol); default setting for most sensors, see corresponding 'Operating Manual'</p> <p>Modbus Test: Check of Modbus connection</p>        |
| <b>Set Modbus Address</b>                                    | <p>Sets Modbus address for commands #0 ... #247</p> <p>① The sensors support bus operation with max. 12 subscribers.</p>                                                                                                                                                          |
| <b>MODbus Baud Rate and Parity</b>                           | <p>Modbus protocol (default): 38.400 baud / parity = even</p> <p>SONOTEC protocol (default): 115.200 baud / no parity</p>                                                                                                                                                         |
| <b>Monitor Protocol</b>                                      | <p>Adjusts the monitor interface to Modbus resp. SONOTEC Protocol</p> <p>Info: Reads sensors interface config. and adjusts monitor interface</p> <p>① Function is only available, if the sensor is connected via USB Data Converter and no other sensor is connected with bus</p> |
| <b>Temporary disabling of Modbus -&gt; Standard Protocol</b> | <p>Option to disable Modbus temporarily, without changing the configuration</p> <p>① Only applicable for sensors CO.55 V3.0 (without picture).</p>                                                                                                                                |

For more details see specification of Modbus interface (contact our service).

## 14 Change settings – SONOFLOW Display RD.10



| Setting    | Function / Meaning                                                                                                                                                                                                                     |
|------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Main Field | Selects the value to be displayed (see drop down list in the screenshot).<br>Values can also be set via buttons on SONOFLOW Display RD.10.<br>Default: Flow [ml/s]<br>Select option for display functionality: Pixel test   Demo   Off |
| Contrast   | Sets the contrast of LCD: 0 ... 255, default: 128                                                                                                                                                                                      |
| Auto Sleep | Defines time interval in s for automatic switch off:<br>0 (default) ... 25.5 s (= always on)                                                                                                                                           |
| Init Time  | Defines interval (1 s = default) the display remains in start mode<br>for service after restart or power on. Automatic transmitting is suppressed,<br>means the machine is able to control sensor without danger of bus collision.     |

(Continue on next page)

|                           |                                                                                                                                                                                                                                                                                                                        |
|---------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Protocol to Sensor</b> | 'Dialog' mode (default): the control unit requests, the display responds<br>'Auto Type 11' transmission mode (optional, not recommended):<br>The sensor transmits automatically data with defined time interval<br>(no bus operation possible).<br>For details see chapter 8 Monitor settings (Protocol / Dialog mode) |
| <b>Interval Auto</b>      | Time interval for 'Auto' transmission mode in ms                                                                                                                                                                                                                                                                       |
| <b>Sensor Address</b>     | RS-485 address of sensor: #1 ... #12                                                                                                                                                                                                                                                                                   |
| <b>Variables 1 ... x</b>  | List of measuring data, to be sent cyclically in 'Auto' transmission mode<br>For selection, press button 'Auto Protocol Selection'.<br>→ The values in 'Monitor Settings' tab will be used.                                                                                                                            |

## 15 Change settings – CO.56

### DANGER

**Modification of sensor parameters can massively impair safety.**

Observe, that parameter changes can have strong impact on medical safety!

Parameter changes or modifications without consulting SONOTEC are strictly prohibited.

The plant operator is responsible for correct documentation of any parameter changes.

---

The standard sensor is configured in the factory for easy testing only. So, some routines of self-test are disabled for practical reason. For preparing the using in medical applications there is need of:

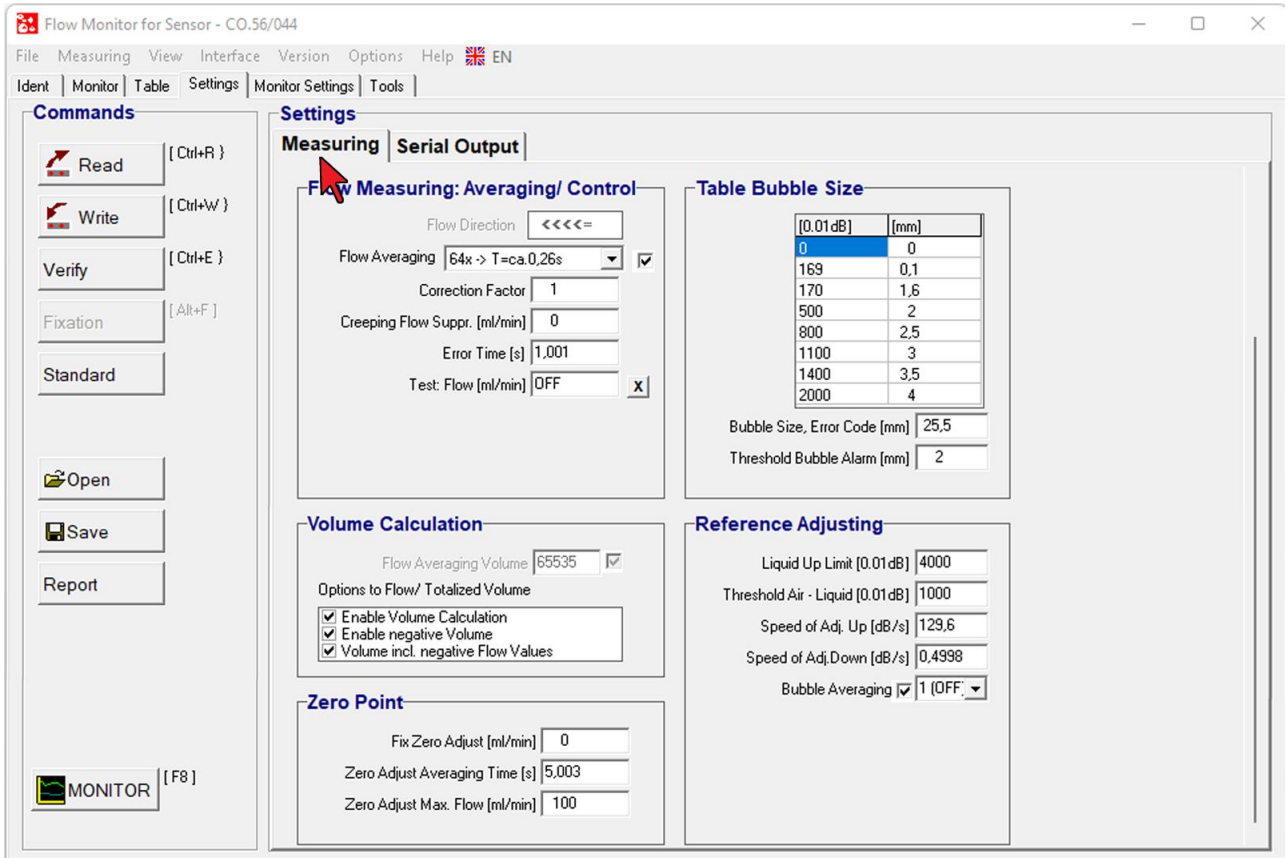
- Calibration of flow measurement to intended tubing, medium and temperature
- Calibration of bubble detection to intended tubing, mounting orientation, requirements of bubble sensitivity
- Configuration and enabling of safety routines of self-testing
- Verification and release of settings

 Contact our service for qualifying the sensor before using it in any medical applications!

The introduction into sensor functionality and corresponding parameters you find in chapter 4 General: Sensor functionality and parameterization.

The chapter 16.1 Influences on sensor performance regarding parameterization (Troubleshooting) might be helpful in case of problems.

## 15.1 Parameters in the 'Settings' tab – Measuring



### Settings for 'Flow'

| Input mask     | Function / Meaning                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Flow Direction | Indication of flow direction                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Flow Averaging | <p>Sets Flow Averaging parameters: Choose the count of values used in averaging of flow signal, the higher the smoother but lazier the signal.</p> <p>Method of averaging via checkbox:</p> <p><input checked="" type="checkbox"/> Activated (default) = moving (or floating) averaging over count of values<br/>Output value is refreshed with each measuring but smoothed exponentially<br/>Example: 64 values = floating averaging with an exponential factor<br/><math>\tau = \text{ca. } 300 \text{ ms}</math><br/>After a jump from high flow to zero: it lasts a time of <math>3 \times \tau</math> than the value is reduced by 95 %</p> <p><input type="checkbox"/> Deactivated = arithmetic averaging, count of measuring values per interval<br/>Example: 32 values (default) = averaging about a period of ca. 150 ms<br/>After this time the output value is refreshed.</p> |

|                                                      |                                                                                                                                                                                                                                                                                          |
|------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Correction Factor</b>                             | All flow values are to be multiplied by this factor (1 = default).<br>Example: A tube with a thinner wall thickness is used. The cross-sectional area is enlarged by 10 %. With the same speed of fluid, the flow rate is higher. So, the flow values can be compensated by factor = 1.1 |
| <b>Creeping Flow Suppression</b>                     | Avoids fluctuating signals near zero. All values (positive/negative in ml/min) below this limit will be suppressed to 0; default = 0                                                                                                                                                     |
| <b>Error Time</b>                                    | Failure tolerance time (1 s = default): In case of disturbed measurements the actual flow value is hold over the defined time period. If the error persists, the sensor sets a measuring alarm (outputs are set to the defined error status).                                            |
| <b>Test Flow</b>                                     | Simulates flow (e.g. to test the control unit)<br>ⓘ Test flow must be deactivated after completion of test (☒ set to 'Off').                                                                                                                                                             |
| <b>Volume Calculation (Further Options for Flow)</b> | Enable / disable: ☑ Volume calculation / ☑ Negative volume / ☑ Negative flow<br>Calculation of totalized volume: depending on configuration;<br>Volume dosing / Pulses: volume calculation must be enabled<br>Pulses: Volume / Flow shall be restricted to positive values only          |
| <b>Fix Zero Adjust</b>                               | All flow values will be shifted by value of zero adjust (0 ml/min = default)<br>Example: A systematic zero offset of 12 ml/min is detected, independent of putting in / out the tubing. This offset can be compensated by setting the value to -12 ml/min                                |
| <b>Zero Adjust Averaging Time</b>                    | Defines the averaging time in s for zero adjust procedure                                                                                                                                                                                                                                |
| <b>Zero Adjust Max. Flow</b>                         | Sets the max. allowed flow of zero point in ml/min. If the flow exceeds the value a warning is raised.                                                                                                                                                                                   |

## Settings for Bubble Sensitivity

| Input mask                     | Function / Meaning                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |          |      |   |   |    |   |     |    |     |    |     |    |     |    |      |    |      |     |          |      |   |   |     |   |     |    |     |    |     |    |      |    |      |    |      |    |
|--------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|------|---|---|----|---|-----|----|-----|----|-----|----|-----|----|------|----|------|-----|----------|------|---|---|-----|---|-----|----|-----|----|-----|----|------|----|------|----|------|----|
| <b>Table Bubble Size</b>       | <p>Relation of acoustic signal deviation [0.01 dB; internally calculated difference between reference signal and real measured signal] to the estimated air bubble size [0.1 mm].</p> <p>The table allows to set-up the sensor according to the actual application.</p> <p>The assignment needs to be evaluated by experimentation. Air bubble detection depends e.g. on sensor's mounting orientation, type of tubing...</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |          |      |   |   |    |   |     |    |     |    |     |    |     |    |      |    |      |     |          |      |   |   |     |   |     |    |     |    |     |    |      |    |      |    |      |    |
|                                | <div> <div> <p>Example:</p> <table border="1"> <thead> <tr> <th>[0.01dB]</th><th>[mm]</th></tr> </thead> <tbody> <tr><td>0</td><td>0</td></tr> <tr><td>99</td><td>1</td></tr> <tr><td>100</td><td>60</td></tr> <tr><td>200</td><td>65</td></tr> <tr><td>380</td><td>70</td></tr> <tr><td>800</td><td>80</td></tr> <tr><td>1400</td><td>90</td></tr> <tr><td>2000</td><td>100</td></tr> </tbody> </table> </div> <div> <p>Example:</p> <table border="1"> <thead> <tr> <th>[0.01dB]</th><th>[mm]</th></tr> </thead> <tbody> <tr><td>0</td><td>0</td></tr> <tr><td>149</td><td>1</td></tr> <tr><td>150</td><td>12</td></tr> <tr><td>250</td><td>16</td></tr> <tr><td>500</td><td>20</td></tr> <tr><td>1000</td><td>25</td></tr> <tr><td>1500</td><td>30</td></tr> <tr><td>2500</td><td>40</td></tr> </tbody> </table> </div> </div> <p>Sample settings when using a sensor with a wider measurement cell to accommodate wider tube dimensions. Air bubbles with a diameter of 6 to 10 mm are classified. All smaller bubbles than 6.0 mm are not detected.</p> <p>Sample settings when using a sensor with a smaller measurement cell to accommodate small tube dimensions. High air bubble detection sensitivity. Bubbles with a diameter of 1 to 4 mm are classified. All smaller air bubbles than 1.0 mm are not detected.</p> | [0.01dB] | [mm] | 0 | 0 | 99 | 1 | 100 | 60 | 200 | 65 | 380 | 70 | 800 | 80 | 1400 | 90 | 2000 | 100 | [0.01dB] | [mm] | 0 | 0 | 149 | 1 | 150 | 12 | 250 | 16 | 500 | 20 | 1000 | 25 | 1500 | 30 | 2500 | 40 |
| [0.01dB]                       | [mm]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |          |      |   |   |    |   |     |    |     |    |     |    |     |    |      |    |      |     |          |      |   |   |     |   |     |    |     |    |     |    |      |    |      |    |      |    |
| 0                              | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |          |      |   |   |    |   |     |    |     |    |     |    |     |    |      |    |      |     |          |      |   |   |     |   |     |    |     |    |     |    |      |    |      |    |      |    |
| 99                             | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |          |      |   |   |    |   |     |    |     |    |     |    |     |    |      |    |      |     |          |      |   |   |     |   |     |    |     |    |     |    |      |    |      |    |      |    |
| 100                            | 60                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |          |      |   |   |    |   |     |    |     |    |     |    |     |    |      |    |      |     |          |      |   |   |     |   |     |    |     |    |     |    |      |    |      |    |      |    |
| 200                            | 65                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |          |      |   |   |    |   |     |    |     |    |     |    |     |    |      |    |      |     |          |      |   |   |     |   |     |    |     |    |     |    |      |    |      |    |      |    |
| 380                            | 70                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |          |      |   |   |    |   |     |    |     |    |     |    |     |    |      |    |      |     |          |      |   |   |     |   |     |    |     |    |     |    |      |    |      |    |      |    |
| 800                            | 80                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |          |      |   |   |    |   |     |    |     |    |     |    |     |    |      |    |      |     |          |      |   |   |     |   |     |    |     |    |     |    |      |    |      |    |      |    |
| 1400                           | 90                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |          |      |   |   |    |   |     |    |     |    |     |    |     |    |      |    |      |     |          |      |   |   |     |   |     |    |     |    |     |    |      |    |      |    |      |    |
| 2000                           | 100                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |          |      |   |   |    |   |     |    |     |    |     |    |     |    |      |    |      |     |          |      |   |   |     |   |     |    |     |    |     |    |      |    |      |    |      |    |
| [0.01dB]                       | [mm]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |          |      |   |   |    |   |     |    |     |    |     |    |     |    |      |    |      |     |          |      |   |   |     |   |     |    |     |    |     |    |      |    |      |    |      |    |
| 0                              | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |          |      |   |   |    |   |     |    |     |    |     |    |     |    |      |    |      |     |          |      |   |   |     |   |     |    |     |    |     |    |      |    |      |    |      |    |
| 149                            | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |          |      |   |   |    |   |     |    |     |    |     |    |     |    |      |    |      |     |          |      |   |   |     |   |     |    |     |    |     |    |      |    |      |    |      |    |
| 150                            | 12                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |          |      |   |   |    |   |     |    |     |    |     |    |     |    |      |    |      |     |          |      |   |   |     |   |     |    |     |    |     |    |      |    |      |    |      |    |
| 250                            | 16                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |          |      |   |   |    |   |     |    |     |    |     |    |     |    |      |    |      |     |          |      |   |   |     |   |     |    |     |    |     |    |      |    |      |    |      |    |
| 500                            | 20                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |          |      |   |   |    |   |     |    |     |    |     |    |     |    |      |    |      |     |          |      |   |   |     |   |     |    |     |    |     |    |      |    |      |    |      |    |
| 1000                           | 25                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |          |      |   |   |    |   |     |    |     |    |     |    |     |    |      |    |      |     |          |      |   |   |     |   |     |    |     |    |     |    |      |    |      |    |      |    |
| 1500                           | 30                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |          |      |   |   |    |   |     |    |     |    |     |    |     |    |      |    |      |     |          |      |   |   |     |   |     |    |     |    |     |    |      |    |      |    |      |    |
| 2500                           | 40                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |          |      |   |   |    |   |     |    |     |    |     |    |     |    |      |    |      |     |          |      |   |   |     |   |     |    |     |    |     |    |      |    |      |    |      |    |
| <b>Bubble Size, Error Code</b> | <p>In case of an air bubble detection, the defined code is transmitted. Normally the diameter of a recognized air bubble is transferred into the protocol variable 'Bubble Size'. In case of fault, the defined code is transmitted.</p> <p>Example: Error Code = 255 (default), means the unit reads an air bubble size = 25.5 mm in case of error. It should be large enough to signalize alarm.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |          |      |   |   |    |   |     |    |     |    |     |    |     |    |      |    |      |     |          |      |   |   |     |   |     |    |     |    |     |    |      |    |      |    |      |    |
| <b>Threshold Bubble Alarm</b>  | <p>When detecting air bubble diameters larger than the defined threshold in mm an air bubble signal ('Bubble Alarm') is triggered. The 'Bubble Alarm' flag can be read from the 'G.state' status register.</p> <p>Example: Threshold for air bubble alarm = 50. When a bubble occurs with a sphere diameter larger than 5.0 mm, the air bubble flag status = 0 is set.</p> <p>For more details please refer to the serial interface specification.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |          |      |   |   |    |   |     |    |     |    |     |    |     |    |      |    |      |     |          |      |   |   |     |   |     |    |     |    |     |    |      |    |      |    |      |    |

|                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Reference Adjusting</b>    | To ensure a high safety level during air bubble detection, the limits of the dynamic for air bubble detection must be set.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Liquid up Limit</b>        | Upper Limit (default = 40 dB): If the signal exceeds the set limit (measured signal [0.01 dB] with fully water filled tube), the sensor is assuming misuse, e.g. bridged channel → air bubble error is triggered                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Threshold Air-Liquid</b>   | Lower Limit (default = 14 dB): If the signal falls below the set limit (signal intensity with fully air-filled tube), the sensor is assuming a non-acoustic coupling, e.g. mechanical lid is not closed, empty tubing, or no tubing → air bubble error is triggered                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Speed of Adj Up / Down</b> | <p>Adjusts the stability of air bubble sensitivity (e.g. compensate impact of peristaltic pump to avoid wrong alarms):</p> <p>ⓘ Value for 'Up' should be much higher than the value for 'Down'.</p> <p>Example: Speed of Adjusting Up = 216 000 = 130 dB/s (default)<br/>Speed of Adjusting Down = 2000 = 1.2 dB/s (default)</p> <p>When inserting a tube filled with liquid into the sensor's channel it immediately finds its best working point due to its fast signal adjustment. If e.g. the tube's elasticity is getting weaker over a long period of time, the working point is adjusted automatically.</p> <p>ⓘ When using a peristaltic pump generating high pressure pulses in the tubing, it might be necessary to increase 'Speed of Adjusting Down'.</p> |
| <b>Bubble Averaging</b>       | Option to average over several bubble events; define number of events (1 = Off   2 ... 16 000)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

## 15.2 Parameters in the 'Settings' tab – Serial output

Settings in the tab 'Serial Output' correspond to the settings of V2.0 sensors series CO.55 / CO.65 / CO.66 / IL.52.

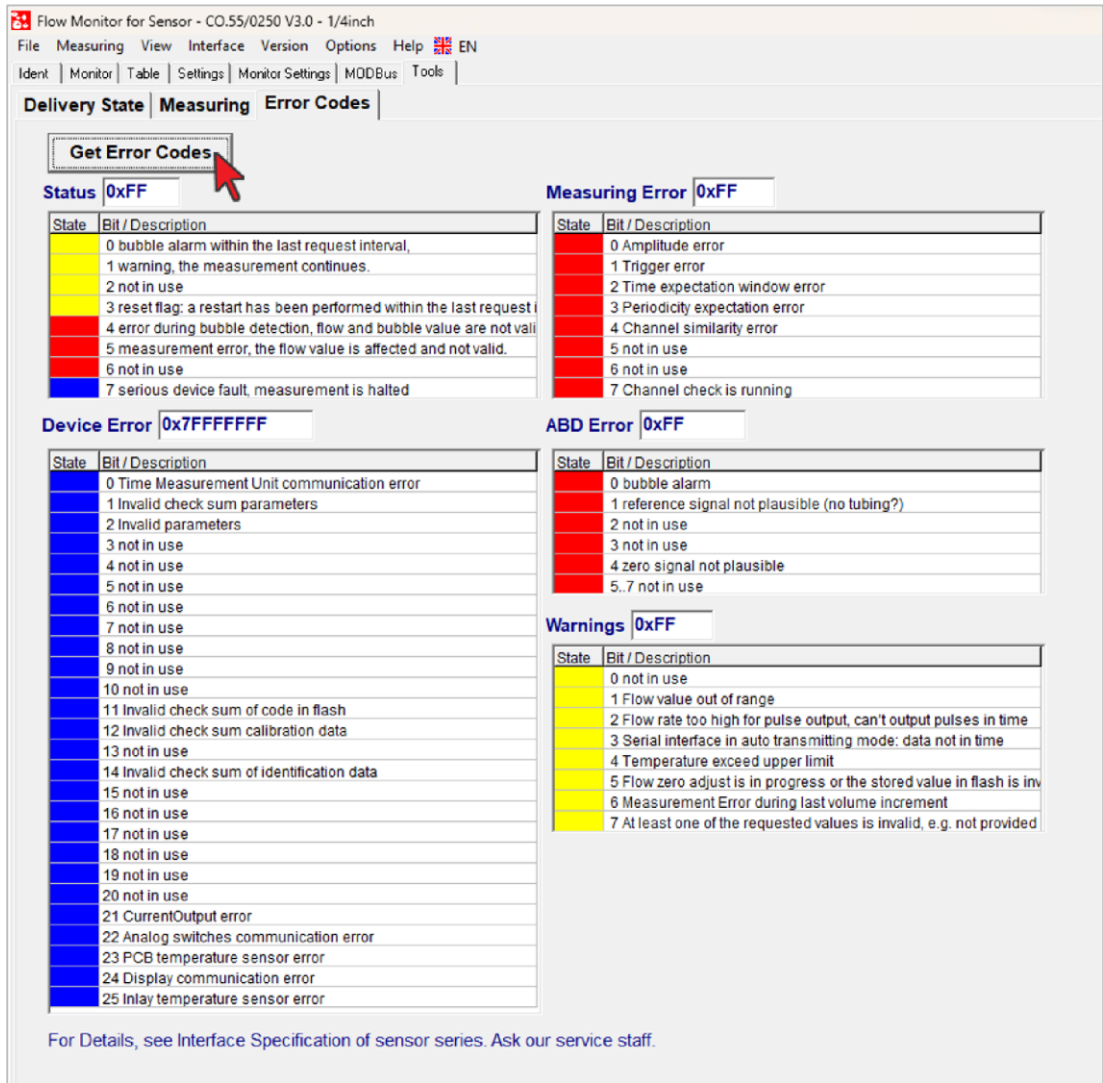
See chapter 13.3 Parameters Description – Serial Output.

# 16 Troubleshooting

In case of problems – please observe the messages in the corresponding window  
(To show the window see 7.4 'Messages' window and status bar).



For identifying errors open the 'Tools' → 'Error Codes' tab and click the button 'Get Error Codes' to retrieve the active error codes.



① For troubleshooting or service purposes, the sensor status and settings can be saved using the Report function (see Section 11.3 Read out and save / Report sensor identification (and settings)).

## 16.1 Influences on sensor performance regarding parameterization

In case of problems, sources of influence shall be checked, as follows:

How fast does the sensor find a signal?

1. Press 'ALT' + 'R' to reset the sensor and check the time difference until the sensor starts a new measurement.

How stable is the zero position over time?

2. Observe the zero position over a period of about 30 minutes.  
Check if jumps or drift occur?

How reproducible is the flow measurement at a fixed flow value?

How is the reproducibility when reinserting the tube into the sensor?

3. Check the actual flow value being measured at a fixed flow value (e.g. 3 l/min) after putting in the tube several times in the sensor: Set 3 l/min and remove the tube. Reinsert the tube and check the flow value. Stop the flow and check the zero position.

Repeat this procedure several times if applicable.

## 16.2 Evaluation of signal quality

The most important aspect is the application itself. For some applications, a fast reaction of the sensor is very important. In this case, noise or a slightly higher standard deviation might be acceptable.

Some applications may require a faster signal search or a measurement of a non-optimal signal. For such requirements a further optimization (reduction of noise, minimization of standard deviation) would not be the best choice.

Applications requiring high accuracy must be set to measure only under optimal conditions and to exclude any bad signal.

① Note, that some parameters are 'sensitive' regarding sensor safety and could not be offered for free parameterization. With extended functionality in 'Expert mode' the sensor can be further optimized. Contact our service.

## 16.3 List of potential problems and possible solutions

| Description of problem                                                                                 | Problem cause                                                                  | Possible solution                                                                        |
|--------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
| Sensor not recognized<br><br>Unable to set 'USB1' under 'Interface' → 'Select interface'               | Sensor driver not installed on computer                                        | Install sensor driver on computer                                                        |
| No reading displayed on graph in Monitor tab; red bar shown on top of graph (Error)                    | Tube is not seated properly in sensor channel                                  | Seat tube properly in sensor channel and keep bends and kinks in tubing clear of sensor  |
| Sensor, USB Data Converter and power supply are all properly connected but there is no power to sensor | The sensor has been switched off in the Flow Monitor under 'Monitor' tab       | Turn sensor on in the Flow Monitor under 'Monitor' tab                                   |
| Readings from graph in Monitor tab are too small to read                                               | Flow rate scale is too large (i.e. 600 ml/s)                                   | Adjust flow rate scale to a smaller size (i.e. 6 ml/s)                                   |
| No sensor reading despite all connections being correct                                                | Flow rate scale is too small (i.e. 6ml/s)                                      | Adjust flow rate scale to a larger size (i.e. 600 ml/s)                                  |
| Warning message on sensor readout (select models only): 'Warning: 0x80'                                | Flow rate is off the scale register                                            | Adjust flow rate scale to a larger size                                                  |
|                                                                                                        | Flow rate changes from positive (+) to negative (-)                            | Denote if necessary                                                                      |
| Warning message displayed during flow measurement: 'Zero Adjust: Flow is too high'                     | Flow is too high                                                               | Adjust flow rate                                                                         |
| Status bar not visible at bottom of Monitor window                                                     | Monitor window dimensions are not properly adjusted                            | Adjust monitor window dimensions so the status bar can be seen                           |
| Sensor version is not among choices under 'Version' → ...                                              | Sensor is powered with USB Data Converter and not directly from another source | Update Flow Monitor version and Press F2                                                 |
| 'Get' button is inactive                                                                               | Record Flow is started                                                         | Stop the recording in the 'Monitor' tab to activate the 'Get' button                     |
| 'GET' button produces an image reference error                                                         | Software is outdated for the type of sensor used                               | Uninstall outdated software and install updated software (from download or data carrier) |

|                                                                                                            |                                                                                                                               |                                                                                                                                                                                                                                                                                                                            |
|------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sensor is recognized by Flow Monitor, but no data is transmitted                                           | The CRC parameter (Security / Self-Test) is deactivated                                                                       | Reactivate the CRC parameter (Security / Self-Test)                                                                                                                                                                                                                                                                        |
| Sensor flow rate reading that seems excessively high at zero flow.                                         | There is a maximum zero reading that should be seen on a new sensor at zero flow and it is related to the size of the sensor. | The zero offset does depend on the sensor size: A defined time difference is multiplied by the geometry factor. By increasing the sensor size, the geometry factor increases and thereby the absolute value of the defined time difference.                                                                                |
| Zero Point value is too high                                                                               | The Zero Point is shifted by the Zero Flow entry value.                                                                       | This must be performed before every new calibration with '0' ABS on zero. Because this value is not a component of the default parameter, this is NOT AUTOMATICALLY reset to zero when experimenting with the default parameter! If the Zero Point is not set to zero, this leads to a false zero value while calibrating. |
| Incorrect time stamp: data recording begins at the end of time period and the start data is in the middle. | Data is not stored in a free range.<br>Default setting:<br>'Measuring' → 'Data overflow' → 'Roll over'                        | Change to: 'Measuring' → 'Data overflow' → 'Stop Measuring' – or –<br>'Measuring' → Data overflow → Restart Measuring                                                                                                                                                                                                      |
| Blue error bar appears at the top of Monitor grid screen during Fixation function                          | Sensor needs to be reset                                                                                                      | Reset sensor so it is re-initialized:<br>Monitor tab → R RESET button (or Alt + R)                                                                                                                                                                                                                                         |
| Maximize Window does not zoom the contents                                                                 | The contents of the Monitor window cannot be zoomed                                                                           | Adjust computer monitor resolution to fit your application                                                                                                                                                                                                                                                                 |

| FAQ                                                                                                         | Explanations and instructions                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| How do I change the volume dose during a process run without disconnecting the sensor using the PNP output? | <p>Software V2.71 allows changes to volume settings using the Dosing Volume:</p> <ul style="list-style-type: none"> <li>• Temporarily change setting by PLC or Monitor via RS485 and serial command (Write/Read Register)</li> <li>• Temporarily change setting by PLC or Monitor via RS485 and Modbus command (Write/Read Register)</li> </ul>                                                                                                                                                    |
| Can I use the Interval setting for flow on my serial output?                                                | <p>The time interval to request data on is not a sensor parameter: only the user defines the cycles.</p> <p>If the Monitor is used for requests, then the interval can be adjusted with:<br/>Monitor Settings &gt; Serial Data Request &gt; Dialog Mode &gt; Interval<br/>Set cycle time in the Interval window of no faster than 25 ms.</p> <p>To change settings, shut off the sensor. In the first second after powering back on, you can read or write various parameters into the sensor.</p> |
| Is there a serial command to change the volume dose output amount via serial communication?                 | <p>Use the Flow Monitor software</p> <p>READ settings from sensor → CHANGE dosing volume<br/>→ WRITE settings into sensor</p> <p>- or -</p> <p>READ settings from sensor → CHANGE dosing volume<br/>→ EXPORT settings into file</p> <p>then</p> <p>IMPORT settings from file → WRITE settings into sensor</p>                                                                                                                                                                                      |

In case of 'Device Fault' please contact our support. If possible, please ensure to have the following information available:

- Sensor type and version (designation and serial number)
- Sensor hardware version  
(see chapter 11.2 General functions and sensor information in the 'Ident' tab)
- Monitor version
- Screenshots / content from the window 'Messages'

❗ For troubleshooting or service purposes, the sensor status and settings can be saved using the Report function (see Section 11.3 Read out and save / Report sensor identification (and settings)).

## 16.4 Service and support

Please find the contact details of the manufacturer in the last section of this documentation.

Further information can be found on our web pages:

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|                          |                                                      |
|--------------------------|------------------------------------------------------|
| <b>SONOTEC worldwide</b> | <a href="http://www.sonotec.eu">✉ www.sonotec.eu</a> |
|--------------------------|------------------------------------------------------|

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|                    |                                                              |
|--------------------|--------------------------------------------------------------|
| <b>SONOTEC USA</b> | <a href="http://www.sonotecusa.com">✉ www.sonotecusa.com</a> |
|--------------------|--------------------------------------------------------------|

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→ Products → Non-Invasive Fluid Monitoring → Service: Calibration Service & Repair

- Calibration and recalibration
- Inspection and repair
- Technical support

Feel free to contact us! We will be happy to help you.

## 17 Disposal

### Data protection when decommissioning

#### ATTENTION

##### Data misuse possible.

Before passing on or disposing data carriers, delete all company-related information (e.g. photos of measuring data) and personal data (e.g. names).

### Recycling and taking back of used equipment

Electrical and electronic devices may pose a risk to health and the environment if disposed of incorrectly. Therefore, they cannot be disposed of as domestic waste according to WEEE Directive 2012/19/EU (Waste Electrical and Electronic Equipment Directive). Instead, they must be taken to designated collecting points or returned to the manufacturer.

The following symbol indicates the legal duty to dispose of electronic devices as stipulated.



They must undergo specified recycling processes (e.g., with respect to batteries or circuit boards) which enable safe, environmentally compatible re-use or separate disposal of different device elements.

The return of used equipment is regulated differently in the individual countries and regions. Find out about the return conditions for commercially used electrical appliances at the local authorities and other responsible public bodies.

Data carriers and packaging materials contain no toxic substances requiring separate identification for disposal such as mercury (Hg), cadmium (Cd), lead (Pb) or chrome 6 (e. g., in plated parts or circuit boards).

## 18 Manufacturer information

### Copyright

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### Certifications and registrations

- Quality management according to EN ISO 13485:2016  
(Registration No.: SX 1625253-1)
- Quality management according to ISO 9001:2015  
(Certificate Registration No.: 091006014)
- Acceptance notification of quality assurance production process according to ATEX Directive 2014/34/EU (No.: IBExU20ATEXQ021)
- Registration according to ElektroG at the "stiftung elektro-altgeräte register" (ear):  
WEEE Reg. No. DE 22125904

### Contact

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