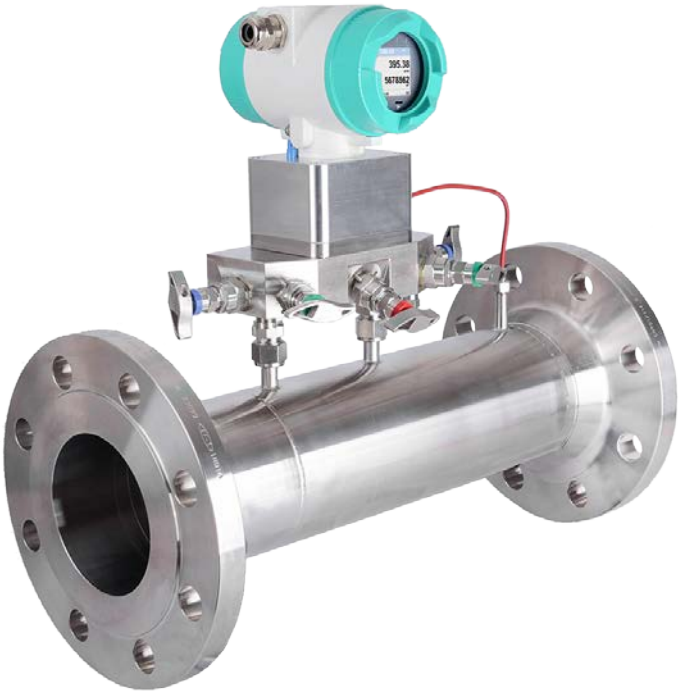
CS INSTRUMENTS GmbH & Co. KG

EN

# Operating instructions
# Flow sensor CMM500

## Compressor Master Meter

(for wet compressed air)



# I. Foreword

Read these operating instructions carefully and completely before carrying out installation, commissioning and maintenance work. Follow the instructions to ensure safe operation and perfect functioning.

The operating instructions must always be available at the place of use. It is not permitted to provide only individual pages.

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**Imprint**

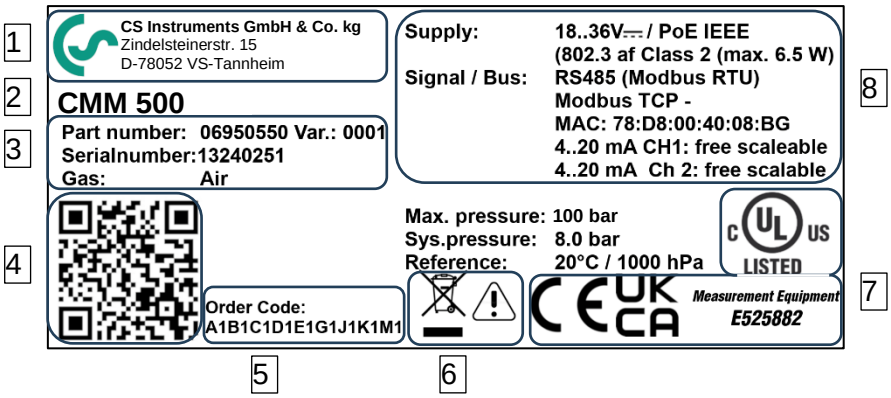
Translation of the original German manual CMM 500 | DE | V1.00.

# II. Table of contents

# 1 Scope of delivery

- CMM 500 flow sensor with venturi tube
- Calibration certificate
- These operating instructions

# 2 Type plate




1 - Manufacturer info

2 - Sensor name

3 - Order number, serial number, date

4 - 2D QR code

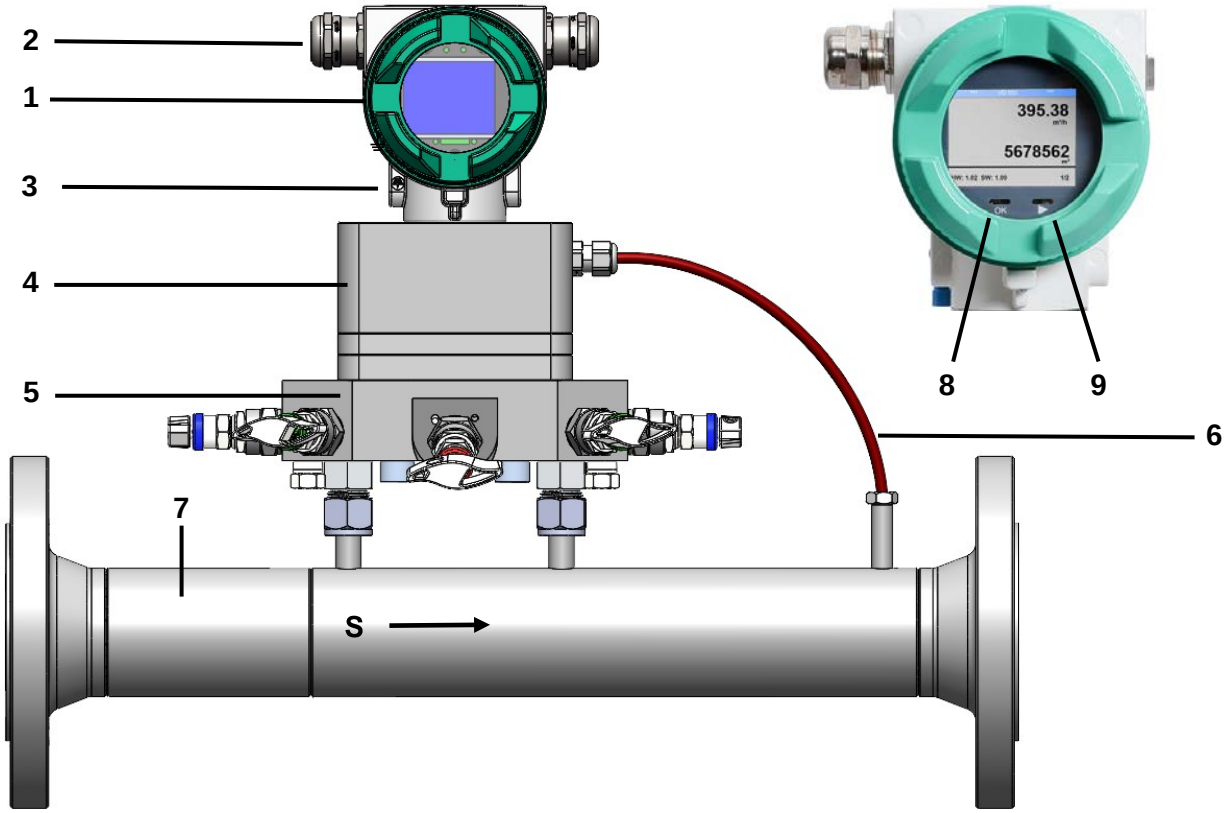
5 - Order code

6 - Warning "Operating instructions must be observed

7 - Conformity/certification marking

8. Electrical connection data: e.g. available inputs and outputs, supply voltage

# 3 Device overview




1. Sensor housing with display
2. Cable bushing (sensor cable inputs)
3. Symbol PE / PE connection
4. Housing with pressure measuring head
5. Valve block with service and maintenance functions
6. Temperature Sensor
7. Measuring section / Venturi tube
8. Button for selection menu item (>)
9. ENTER/OK button

S -- Flow direction

# 4 Pictograms and symbols

## 4.1 Warning symbols


General danger symbol (danger, warning, caution)


General note


Installation- and Instruction manual to consider (on Nameplate)


Installation- and Instruction manual to consider

## 4.2 Electrical symbols

| Icon | Meaning |
|---|---|
|  | Direct current |
|  | Alternating current |
|  | Direct and alternating current |
|  | **Earth connection**<br>An earthed terminal that is earthed from the user's point of view via an earthing system. |
|  | **Potential equalization connection (PE: Protective earth)**<br>Earthing terminals that must be earthed before other connections can be made. |

# 5 Signal words according to ISO 3864 and ANSI Z 535

| | |
|---|---|
| Danger! | Imminent danger |
| | As a consequence of incorrect handling: serious personal injury or death |
| Warning! | Possible harzard |
| | As a consequence of incorrect handling: possible serious injury or death |
| Caution! | Imminent hazard |
| | As a consequence of incorrect handling: possible personal injury or damage |
| Please | Possible harzard |
| note! | As a consequence of incorrect handling: possible personal injury or damage |
| Important! | Additional notes, information, tips |
| | As a consequence of incorrect handling: Disadvantages in operation and maintenance, no danger |

# 6 Intended use

The CMM 500 (Compressor Master Meter) is a new type of reference flow meter that has been specially developed for high precision measurement of the delivery volume of compressors and for the billing of compressed air.

Areas of application: Directly after the compressor (wet side), at high temperatures (up to 100 °C) and/or fast processes (approx. 100 ms), for example for measuring the delivery volume of compressors, compressed air audits or for measuring the efficiency of compressed air systems.

It is also suitable for use both indoors and outdoors.

Improper or incorrect use the operational reliability will be canceled. The manufacturer is not liable for any damage resulting by improper or incorrect use.

**Operation is only permitted in the following cases:**

- The sensor must be protected from direct sunlight, rain, splashing water or excessive dust.
- Installation only downstream of a functioning water separator.
- In horizontal pipes (recommended) or in risers
- With an undisturbed flow pattern in compliance with the required calming distances upstream and downstream of the sensor.
- With correctly performed zero point adjustment and specification of the flow medium.
- Up to the maximum permissible differential pressure (500 mBar).
- In accordance with the technical data and approved ambient conditions.

# 7 Inappropriate use

**Misuse when used as a climbing aid!**

The flow sensor can be damaged. Risk of slipping. Select the installation location so that the flow sensor cannot be used as a climbing aid. Never use the flow sensor as a step or climbing aid.

**Incorrect measurement results if installed in an incorrect position.**

**The flow sensor is not suitable for measuring leakage quantities.**

# 8 Safety provisions

## 8.1 General safety instructions

### Important notes for installation and maintenance personnel

The flow sensor may only be installed by trained specialists with knowledge and experience in compressed air and electrical engineering.

Electrical connection, commissioning and maintenance may only be carried out by qualified electricians in accordance with the electrotechnical regulations (DIN EN 50110-1, DIN EN 60204-1 and so on). Prerequisite: Technical training and knowledge of technical standards, EU directives and EU regulations.

Observe applicable national accident prevention regulations and ordinances. Observe measures of general occupational health and safety, such as through the wearing of suitable and prescribed personal protective equipment (PPE).

Only the manufacturer is permitted to perform repairs and adjustments.

### Obligations of the installer and system operator

The flow sensor must be checked and maintained regularly by a trained and qualified individual.

Cleaning (the measuring obstacle if required) and maintenance intervals are to be determined by the system operator in accordance with DIN-ISO certification – frequency depending on ambient conditions and anticipated considerations.

Calibration: As part of the DIN ISO certification, have the flow sensor calibrated at regular intervals. The calibration cycles should be based on your internal specifications.

Remove the flow sensor for calibration and send to CS Instruments GmbH & Co.KG.

Keep an identical replacement sensor ready for use in systems that are essential for operation.

**NOTE**

▶ Without the consultation and approval of CS Instruments GmbH & Co.KG, the warranty claim is void in case of conversion work which is not listed in these operating instructions. This symbol is located at points in the operating instructions where special attention must be paid to ensure that the guidelines, regulations, instructions and the correct procedure for the work are observed and that damage and destruction are prevented.

**Obligations of the installer of the system:** The installer of the system is responsible for the safety of the system in which the VD 570 is installed. Pay particular attention to the technical data and ambient conditions (chapter 8) and the information on the electrical connection and prescribed connection cables (chapter 11).

Only use flow sensor VD 570 according to its intended purpose.

**Risk of injury and accidents when operating outside the permissible ambient/operating conditions or operating temperatures due to overpressure or faulty installation.** The pipeline pressure may be **up to 100 bar / 1450 psig** depending on the application. Ensure that the flow sensor is only operated within the permissible limit values (→ type plate, specified max. PS pressure) and that the measuring range full scales are taken into account (→ table chapter measuring range)

**Risk of injury due to unauthorised unit modifications, incorrect installation or damaged components.** The operating licence expires in these cases. **Operation is only permitted with original components.** Only operate the flow sensor when it is completely assembled. Do not operate a damaged sensor, and prevent further use of the sensor until it is repaired. The sensor must be checked and maintained regularly by trained and qualified individuals. Device modifications are not permitted and release the manufacturer from any warranty and liability.

**Dirt particles in the compressed air will cause measurement errors.** Dirt particles and liquids can contaminate the measuring tips of the sensor and lead to malfunction or failure. The system operator must ensure the prescribed purity of the fluids approved for the application as well as appropriate cleaning and maintenance intervals. The manufacturer provides no warranty and accepts no liability of any kind with regard to misuse.

**Explosion hazard in potentially Ex-protective zones due to ignition of explosives when sparks are generated.**

In Ex-protective zones please use the Sensor CMM 500 Ex.

**Ensure clean compressed air without harmful components.** Harmful components include explosive or chemically unstable gases and vapours, acid or base-forming substances such as ammonia, chlorine or hydrogen sulphide and condensates or oils and oil vapours.

**Password protection for settings menu:** Password protection is provided to protect against unauthorised entries/settings of the system parameters.
For setting the password → chapter 13.3.5.1.

**Danger of burns from hot sensor shaft. Hot air/gas/gas mixtures in the pipe can warm up or heat the sensor shaft of the flow sensor.** Only touch the sensor shaft when it has cooled down. If applicable, use protective gloves.

**Danger to life from escaping compressed air if it is directed at people, especially at high pressure.** Shut off the compressed air line and check that it is depressurized. Ensure proper installation..

**Danger if the applicable regulations for electrical installations are not observed.** For electrical installation, observe the applicable regulations, e.g. DIN EN 50110-1. In Germany observe in particular VDE 0100 in the relevant parts. Observe local regulations. Before working on the electrical installation, switch off all supply circuits, switch off the mains fuse and secure against being switched on again. Ensure voltage-free status. Operate the flow sensor only with permissible connection cables for the mains supply and bus connection → technical data. Establish the electrical connection according to the wiring diagram (→ chapter 11).

**Exercise due care when handling packaging materials.** Comply with applicable safety and accident prevention regulations. Keep packaging material out of reach of children (choking hazard if small parts are swallowed).

**Seals/sealants:** As a suitable sealant for the screw connections of the ball valve or flow sensor, sealing rings made of copper or aluminium, elastomer sealing rings with metal backing, sealing tape/sealing cord or other equivalent sealants that meet the demands of the required, necessary compressed air quality can be used. For operating pressures >16 bar, generally use elastomer sealing rings with metal backing.

## 8.2 Environmental protection

The flow sensor and also the packaging contain recyclable materials that must not be disposed of in the residual waste. At the end of use, dispose of the packaging materials and flow sensor in an environmentally friendly manner in accordance with the regulations in your country.

The operating materials and auxiliary materials consumed and any parts that are replaced during operation of the flow sensor must be disposed of in accordance with environmental protection regulations.

Germany: Disposal code according to the Waste Catalogue Ordinance **(AVV) 16 02 14,** electrical and electronic devices and their components

# 9 Product information

## 9.1 Product features

The CMM 500 flow sensor is a consumption meter for gaseous fluids (air, nitrogen, etc.).

**Advantages**

- Integrated display with indication of flow rate, consumption, speed, temperature and pressure
- Units freely selectable: m³/h, m³/min, l/min, l/s, kg/h, kg/min, kg/s, cfm, bar, psi, °C or °F
- 2 buttons Input on the display (optical)
- Modbus RTU interface (RS-485)
- **Optional:** Ethernet interface (Modbus TCP) / PoE (Power over Ethernet)
- 1x analog output 4 ... 20 mA, adjustable for the measured variables flow rate, pressure, temperature or speed
- Switching/alarm output, galvanically isolated

## 9.2 Function

This flow sensor for compressed air measures the flow rate directly after the compressor, at high temperatures (up to 80 °C) and/or fast processes (100 ms).

The sensor control unit uses the mass flow rate to calculate the consumption data (based on the differential pressure in the Venturi pipe and the pipe diameter). The consumption data can be read out directly at the control unit, output at the analog output or transmitted to a control center via a bus system.

Important for a precise measurement result is an undisturbed flow pattern in compliance with the required calming distances in the measuring range→ Chapter 11.

# 10 Technical data

## 10.1 Technical data and ambient conditions

| | |
|---|---|
| Parameters | Flow rate, total consumption, pressure, temperature, speed |
| Sensor principle | Differential pressure |
| Measuring span | > 1: |
| Measuring range | 0.04 ... 500 mBar Differential pressure for gases |
| Accuracy<br><br><br>typical Accuracy when installing CS inlet/outlet sections | ± 1% for Qmin to 0.2 Qmax<br>± 0.5% for 0.2 Qmax to Qmax<br><br>± 0.75% for Qmin to 0.2<br>± 0.3% for 0.2 Qmax to Qmax |
| Response time | T 99: < 1 second |
| Temperature of the medium | -20 ... 100 °C / -4… 212°F (Standard)<br>-20 ... 85 °C / -4… 185 °F (Ex-Version) |
| Ambient temperature | -30 ... 70 °C / -22... 158 °F |
| Storage temperature | -40 ... 80 °C / -40 ... 176 °F |
| Pollution level | 2 |
| Relative humidity<br>(transportation, storage, operation) | 0% to 90% (non condensing) |
| Operating height, storage height | 0...4000m (0...13123 ft). |
| Operating pressure | Max. 100 bar (1450 psig) at media temperature <=100 °C |
| Compressed air requirements min. | ISO 8573-1 (particle moisture oil) 5-6-4 |
| Pressure accuracy | 0.5 % f. s. .** (at 20 °C / 68 °F) |
| Power supply | 18 to 36 VDC via SELV supply,<br>5 W or Power over Ethernet in accordance with IEEE 802.3af, class 2 (3.84 ... 6.49 W).<br>Fuse protection in supply unit T2.5L 125V<br>If used at an altitude of over 2000 m, the power supply unit must also be approved for this altitude. |
| Power consumption | Max. 6.5W |
| Signal output | Modbus RTU (RS-485)<br>1x AO 4...20 mA (flow rate, pressure, temperature **or** speed)<br>Optional:<br>Modbus-TCP Ethernet / Etrhernet PoE<br><br>2x 4..20mA gal. isolated |
| Measured values via Modbus TCP | Volume flow (m³/min, m³/h, cfm, ...)<br>Meter reading (m³, cf, ...)<br>Temperature (°C, °F) |

| | |
|---|---|
| | Pressure (bar, MPa, mbar, psi, ...)<br>Air velocity (m/s, fpm) |
| Electrical connection | Via cable entry to internal |
| Protection class | IP 67 |

* based on ISO 1217 with 1000 mbar / 14.50 psi at 20 °C / 68 °F

** m.v. = from measured value | f. s. = from full scale

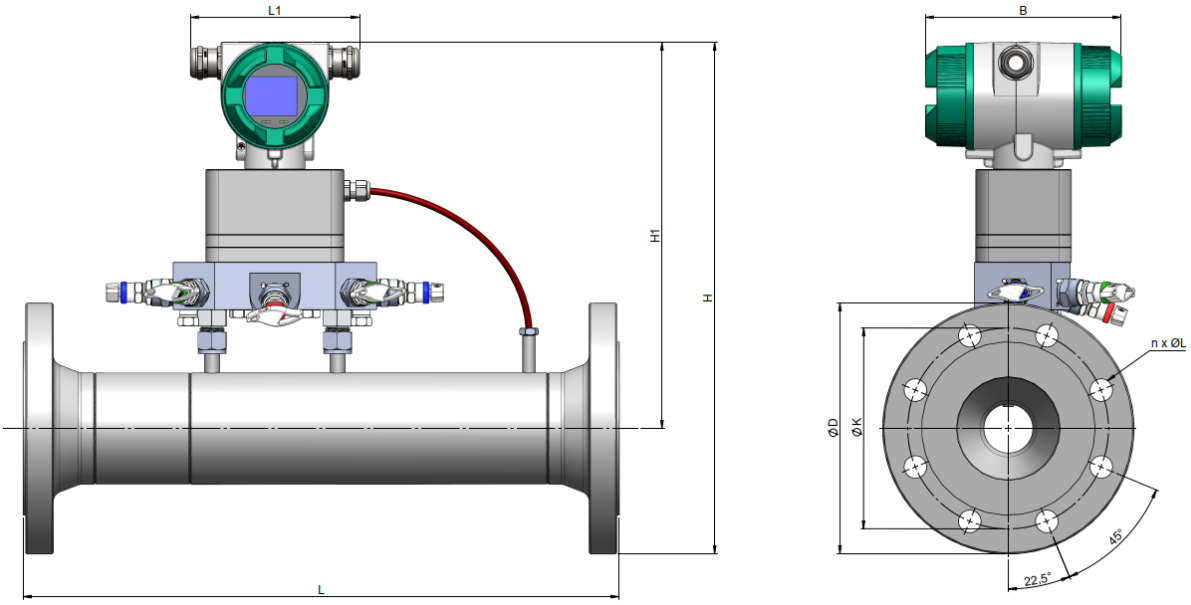
## 10.2 Measuring ranges

**Restrictions:**

Not suitable for measuring leakage rates

| **Measuring ranges Flow rate CMM 500 for compressed air (ISO 1217:1000 mbar, 20 °C)** | | | | | | |
|---|---|---|---|---|---|---|
| | | | **Operating conditions 7 bar(g), 20 °C** | | **Operating conditions 11 bar(g), 20 °C** | |
| | Pipe inner diameter | | Measuring range start and/or end values | | Measuring range start and/or end values | |
| Customs | mm | DN | m³/h | cfm | m³/h | cfm |
| 2″ | 54,5 | DN 50 | 17...1800 | 11...1050 | 21...2240 | 12...1315 |
| 3″ | 82,5 | DN 80 | 33...3475 | 20...2045 | 40...4300 | 23...2530 |
| 4″ | 107,1 | DN 100 | 120...12800 | 70...7530 | 147...15900 | 86...9355 |
| 5" | 135 | DN 125 | 190...19950 | 111...11740 | 228...24750 | 134...14560 |
| 6" | 159 | DN 150 | 259...27700 | 152...16300 | 315...34350 | 185...20210 |
| 8" | 200 | DN 200 | 405...43560 | 238...25638 | 500...54050 | 294...31810 |

## 10.3 Dimensions




| CMM 500 | | | | | Flange DIN EN 1092-1 Type11 B1 PN 40 | | | |
|---|---|---|---|---|---|---|---|---|
| **Pipe size** | **L (mm)** | **L1 (mm)** | **H (mm)** | **H1 (mm)** | **B (mm)** | **Ø D (mm)** | **Ø K (mm)** | **n x ØL (mm)** |
| DN 50 | 475 | 135 | 375,8 | 293,4 | 156 | 165 | 125 | 4 x 18 |
| DN 80 | 475 | 135 | 407,6 | 307,7 | 156 | 200 | 160 | 8 x 18 |
| DN 100 | 475 | 135 | 437,7 | 320,4 | 156 | 235 | 190 | 8 x 22 |

# 11 Installation preparations

## 11.1 Placement of the flow sensor, pipelines

- To ensure precise measurement results, the CMM500 must be installed correctly in the pipe.
- Only use correctly dimensioned seals that are suitable for the flow medium.
- Avoid diameter jumps in the pipe (inlet section) at the joints (max. 1 mm). For further information→ ISO 14511:2019-01
- Observe the specified direction of flow→ See the marking on the measuring section for the direction of flow.
- After the installation work, ensure that the piping is clean.
- Condensation or water droplets on the sensor element lead to incorrect measurement results. Therefore, do not install the flow sensor with the measuring tips pointing upwards or in downpipes.

## 11.2 Necessary inlet and outlet sections

**NOTE**

▶ The principle of differential pressure measurement used here is very sensitive to flow disturbances or turbulence.
In order to maintain the accuracies specified in the data sheets, the sensor must be installed centrally in a straight piece of pipe at a point with an undisturbed flow path.
An undisturbed flow pattern is achieved if a sufficiently long section is provided upstream of the sensor (inlet section) and downstream of the sensor (outlet section) that is absolutely straight and without any disturbance points such as edges, seams, bends, etc.
When positioning the sensor, observe the necessary inlet and outlet distances. This is the only way to achieve precise measurement results.

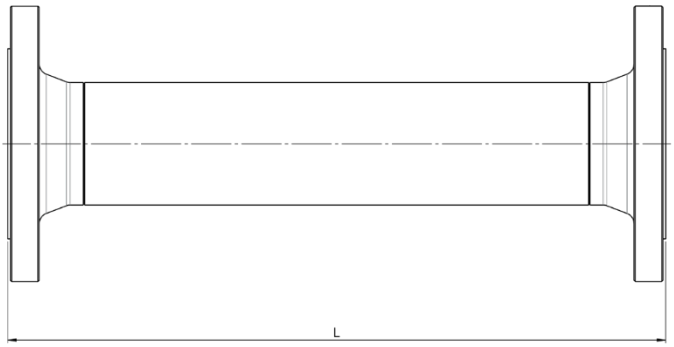
**NOTE**

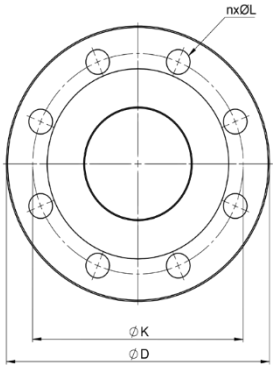
▶ The following figures show the minimum required lengths of the calming sections. If the distances are shortened, increased deviations in the measurement results must be expected→ Avoid shortened distances.

### Required inlet and outlet sections in the measuring pipe range

- Inlet and outlet sections ensure calm flow conditions and highly accurate measurements
- When installing the CS inlet and outlet sections, it is ensured that there is no turbulence due to different internal diameters, edges of the CMM 500 and inlet and outlet sections
- In the event of extreme pre-interference and turbulence, e.g. due to non-return flaps, valves, and partially closed ball valves, it is recommended to install a perforated plate rectifier upstream of the inlet section

### CS Instruments inlet and outlet sections



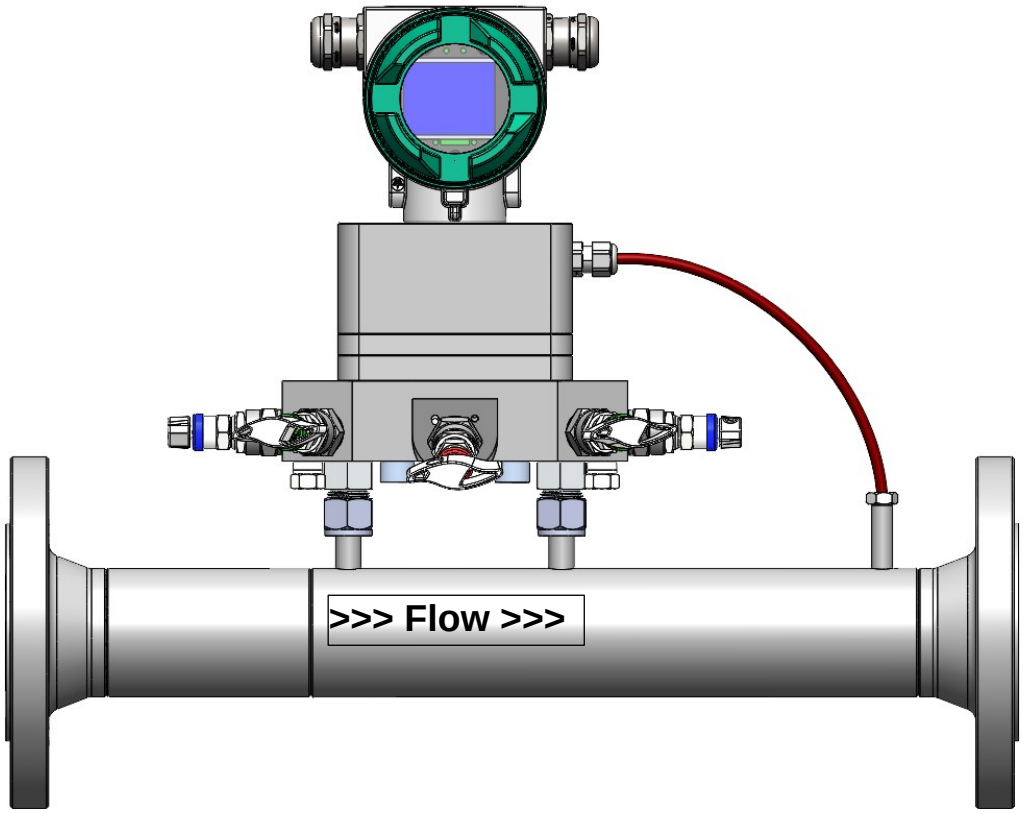




| **Inlet/ outlet sections CMM 500** | | | **Flange DIN EN 1092-1 Typ11 B1 PN40** | | |
|---|---|---|---|---|---|
| Pipe diameter | Inlet section L - mm | Outlet section L - mm | ØD (mm) | ØK (mm) | n x ØL (mm) |
| DN 50 | 500 | 500 | 165 | 125 | 4 x 18 |
| DN 80 | 800 | 500 | 200 | 160 | 8 x 18 |
| DN 100 | 1000 | 500 | 235 | 190 | 8 x 22 |

# 12 Installation CMM 500

**The CMM 500 sensor is supplied pre-assembled together with the measuring section.**

- Installation by the customer is only permitted when the system is depressurized
- Ensure that the flow direction is correct.
- The tightness of the connections must be checked and ensured.



# 13 Electrical connection

**Work on the electrical system may only be carried out by qualified electricians or authorized persons. For electrical installations, observe the applicable regulations, e.g. DIN EN 50110-1, in Germany in particular**
**VDE 0100 with the corresponding parts or other national regulations accordingly.**

## 13.1 Cable gland, permissible cable diameter

To ensure tightness and strain relief, connecting cables with the following cable diameters must be used

| | |
|---|---|
| CMM 500 Standard permissible cable diameters : | Ø 5- 9mm |
| CMM 500 Ex Permissible cable diameters: | Ø5-10mm |

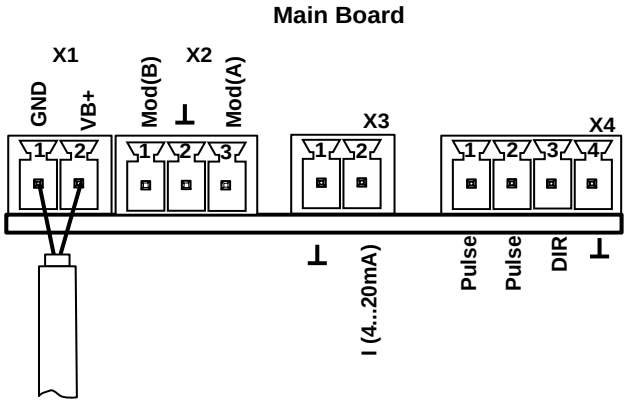
Tightening torque for the cap nut of the cable gland: 9 Nm

## 13.2 Wiring

### 13.2.1 In general:

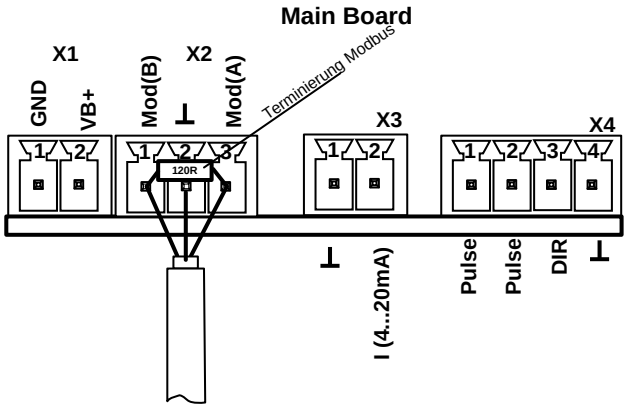
- Only carry out wiring in a de-energized state.
- Minimize the length of the stripping
- Unused cable entries must be sealed with end caps
- Use of shielded connection cables
- Use of cables with cross-sections of >= 0.25mm²

### 13.2.2 Power supply



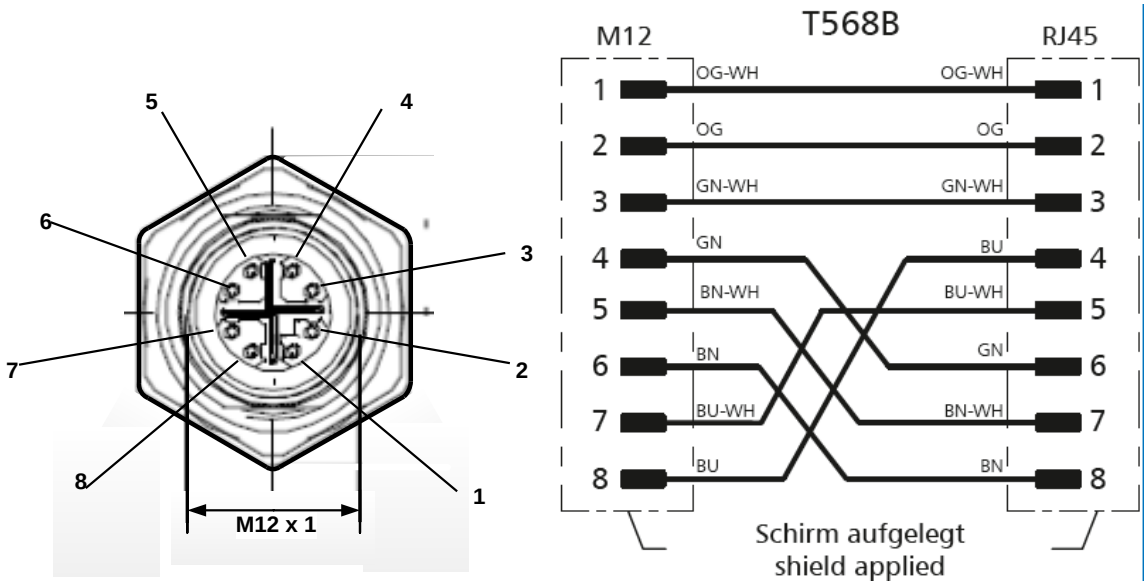
### 13.2.3 Modbus RTU

If the sensor is used at the end of the Modbus system, a termination is required. To do this, please connect the enclosed 120R resistor to the connections, pin 1 and pin 3 of connector "X2".



### 13.2.4 Modbus TCP (Ethernet) Optional PoE*

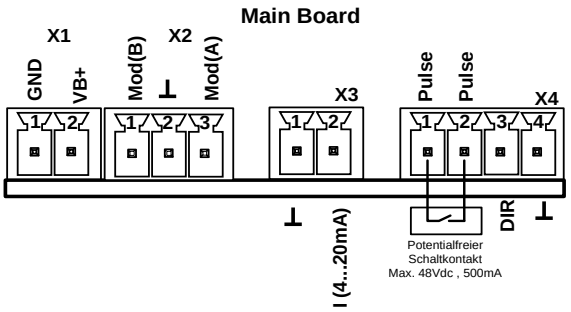
M12 x-coded
Data lines: 1,2 and 3,4
PoE lines: 5.6 and 7.8



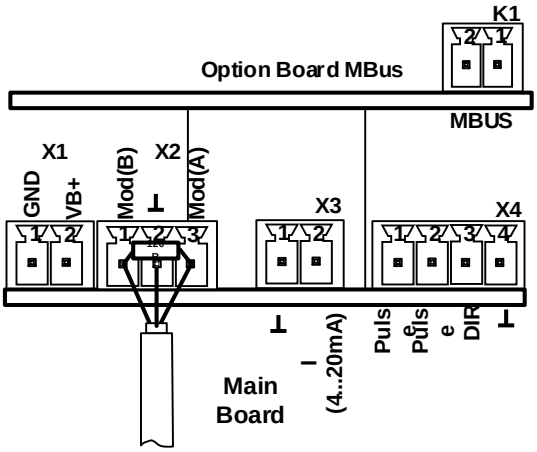

**Connection cable:** Cat 6.

*PoE: Power over Ethernet

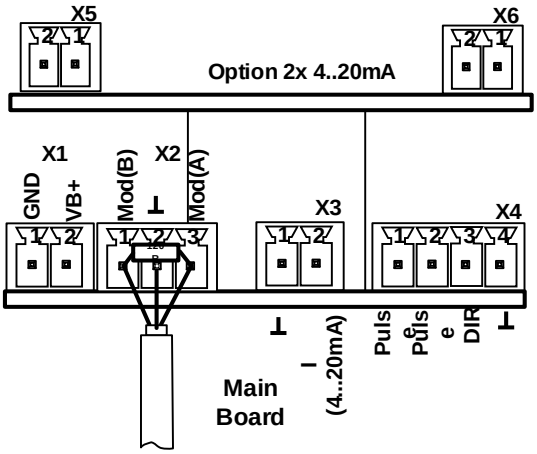
### 13.2.5 Pulse output



### 13.2.6 MBus option




### 13.2.7 Option 2x 4...20mA (galvanically isolated)



| Plug | Pin | Description |
|---|---|---|
| **X1** Supply voltage | 1 | VB - (negative supply voltage GND) |
| | 2 | VB+ (positive supply voltage) |
| **X2** Modbus | 1 | Modbus (B) |
| | 2 | cable shield |
| | 3 | Modbus (A) |
| **X3** Current output | 1 | I- Active |
| | 2 | I+ Active |
| **X4** Direction / impulse | 1 | Pulse / Alarm * |
| | 2 | Pulse / Alarm * |
| | 3 | Directional input |
| | 4 | GND |
| **X5** Current output 1 | 1 | I- Active** |
| | 2 | I+ Active** |
| **X6** Current output 2 | 1 | I- Active** |
| | 2 | I+ Active** |
| **K1** MBus | 1 | MBus |
| | 2 | MBus |

* All analog outputs are galvanically isolated.

** The analog current outputs X5 and X6 are optional (available as active and passive outputs).

# 14 Commissioning

**WARNING**
**Danger from pressurized components.**
▶ Ensure sufficient and safe compressed air quality with a pressure maintenance system. If the operating pressures are too low over a longer period of time, the flow velocity in the pipe increases significantly. This can lead to massive impairments in the compressed air treatment. Install a pressure maintenance system to avoid this.
▶ During initial commissioning, ensure that the operating pressure is matched to the consumer network.

## 14.1 Switch on sensor

1. Ensure that the flow sensor is connected correctly.
2. After the power supply is applied (initial start or after a reset), the reset), the CMM 500 flow sensor switches on and initializes the device for approx.
   initializes the device for approx. 2...3 seconds.

## 14.2 Zero point adjustment

The CMM 500 flow sensor measures the flow velocity (differential pressure principle) in the Venturi tube.

In order to achieve the required measuring accuracy, the sensor must first be zeroed at the start of the measurement.

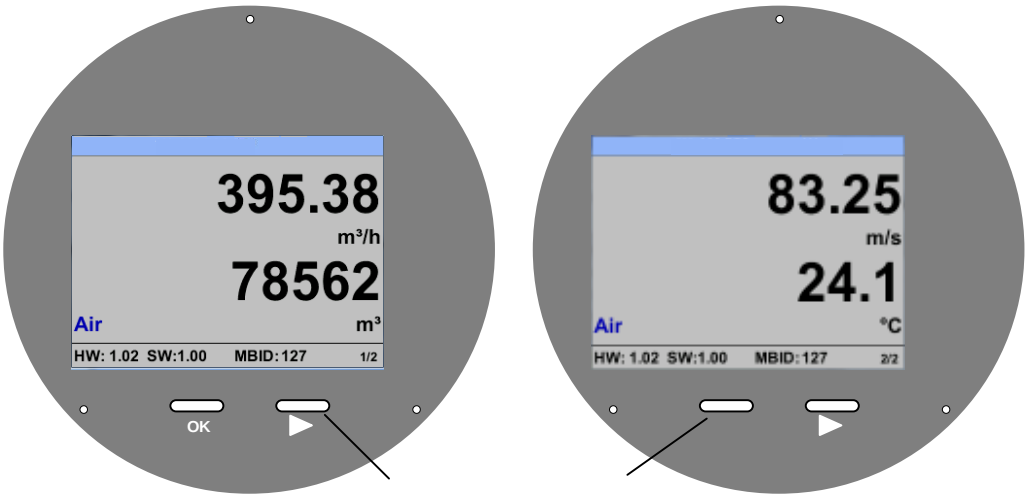
1. Apply system pressure to the sensor
2. Ensure that there is no flow.
3. Then start the zero point calibration on the sensor.→ Chapter 13 "Operation".
4. The system can then be put into operation.

**RECOMMENDATION**
▶ Carry out zero point adjustment regularly (180 Tg) to ensure precise measurement results.

# 15 Operation CMM 500

**Note:** Only for version with display

The CMM 500 is operated using 2 optical buttons, which are operated directly via / through the glass cover. This means that the CMM 500 can be operated from the outside without opening the cover.




The individual menu items are selected using the ">" button and confirmed by pressing the **"OK"** button

Information or changes can be made in all fields with a white background; the selection for input is indicated by a yellow background color.

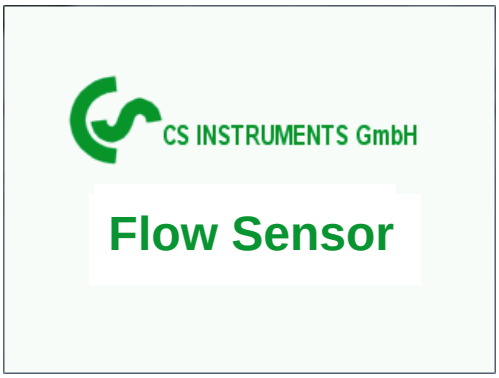
Words in *green* mainly refer to the figure(s) in the chapter section. But also important menu paths or menu items that are related to it are
marked in *green letters*.

The menu navigation is generally in *green font*!

The table of contents and the chapter references in blue font contain links to the respective chapter headings.

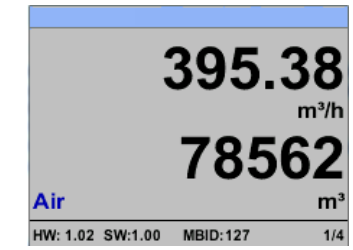
## 15.1 Main menu (Home)

### 15.1.1 Intialization

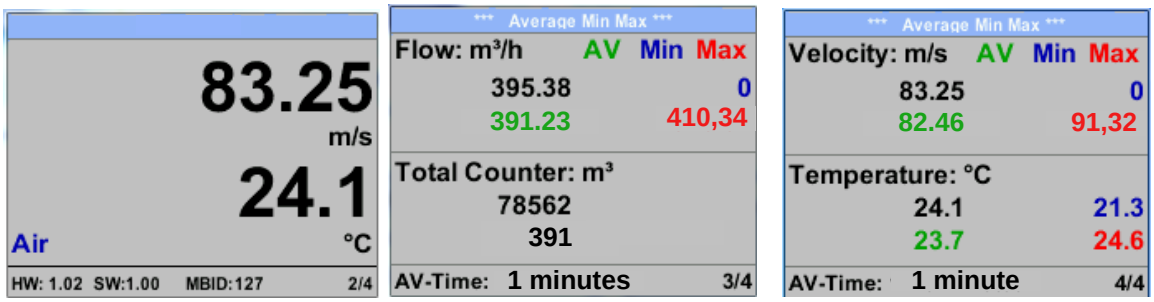



After switching on the VD 570, the initialized screen is displayed followed by the main menu.

## 15.2 Main menu



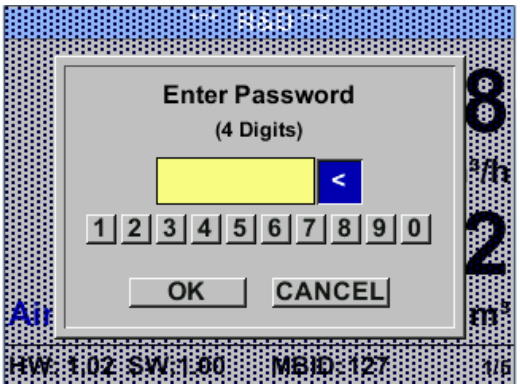

Switching to pages 2-4 or back by pressing key „>“




AV-Time ( Period for average value calculation) could be changed under *Sensor Setup.-Advanced– AV-Time*

## 15.3 Settings

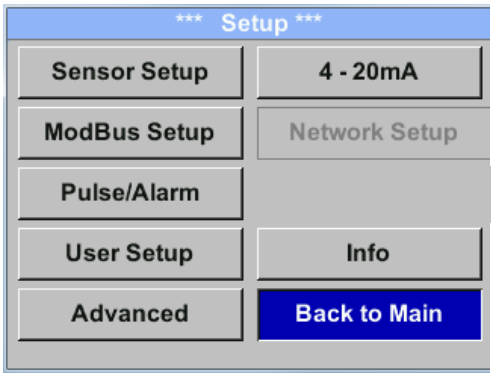
The settings menu could accessed by pressing the key **„OK“**.
But the access to the *settings menu* is password protected.




Factory settings for password at the time of delivery: 0000 (4 times zero).

If required the password could be changed at *Setup–User setup-Password*.

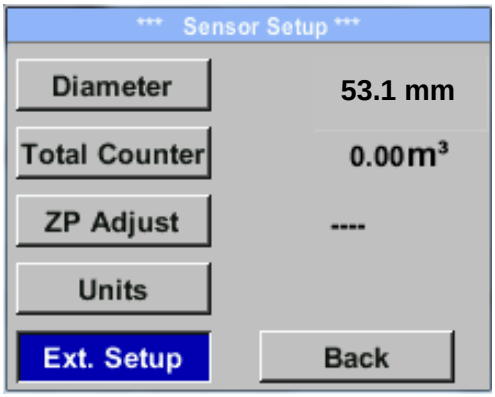
.




Selection of a menu item or to change a value is done with the key **„>“**, a final move to the chosen menu item or takeover of the value change needs the confirmation by pressing the key ***„OK“***

### 15.3.1 Sensor Setup

***Setup → Sensor Setup***



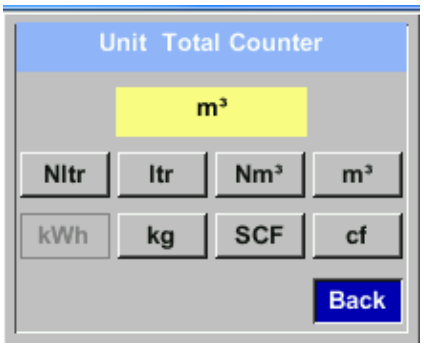

For changes, first select the menu item with key ***„>“*** **and** then confirm it with ***“OK“.***

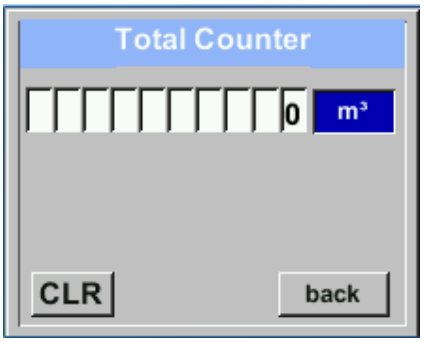
#### 15.3.1.1 Input / change tube diameter

For CMM 500 not adjustable (suspended) as voted on included measuring section with corresponding pipe diameter.

### 15.3.1.2 Input / change consumption counter

***Setup → Sensor Setup→ Total Counter → Unit button***




In order to change, e.g. the unit, first select by pressing key ***„>“*** the button ***“Unit”*** and then key “***OK”***.

Select with the key ***„>“*** the correct unit and then confirm selection by pressing 2x ***„OK“***.

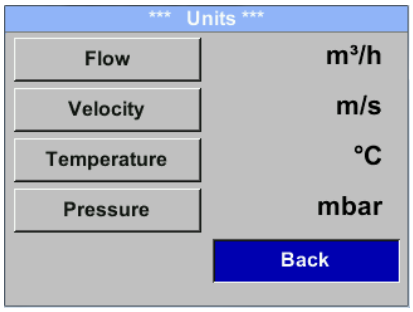
Entering / changing the consumption counter
via button ***„>“***, select the respective position and activate the position with the

**Important!**

**When the counter reach 100000000 m³ the counter will be reset to zero.**

### 15.3.1.3 Definition of the units for flow, velocity, temperature and pressure

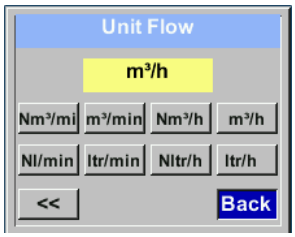
***Setup → Sensor Setup→ Units***

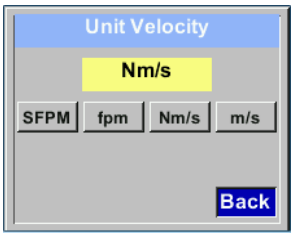


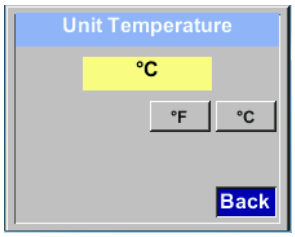

To make changes to the unit for the respective measurement value, first select by pressing ***„>“*** the field of the „measurement value“ and activate „it with ***„OK“*** .

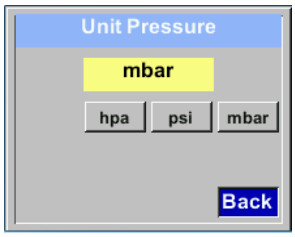
Selection of the new unit with ***„>“***

In case the quantity of units selectable are



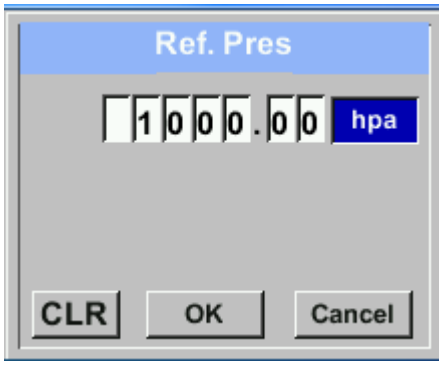



#### 15.3.1.4 Definition of the reference conditions

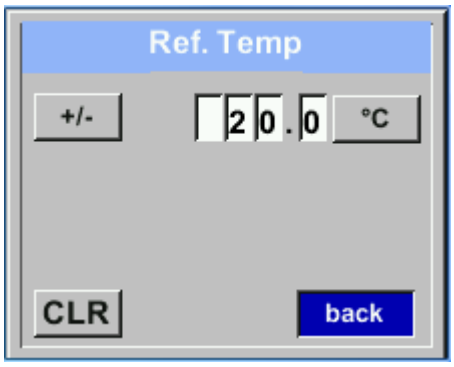
Here can be defined the desired measured media reference conditions for pressure and temperature
and times for the filter and averaging.

- Factory pre-setting for reference temperature and reference pressure are 20 °C, 1000 hPa
- All volume flow values (m³/h) and consumption values indicated in the display are related to 20 °C and 1000 hPa (according to ISO 1217 intake condition)
- Alternatively 0 °C and 1013 hPa (=standard cubic meter) can also be entered as a reference.
- **Do not enter the operation pressure or the operation temperature under reference conditions!**

***Setup → Sensor Setup → Advanced → Ref.Pref***




***Setup → Sensor Setup→ Advanced → Ref.Temp***




In order to change, e.g. the unit, first select by pressing key ***„>“*** the field ***“Units”*** and then key “***OK”***.

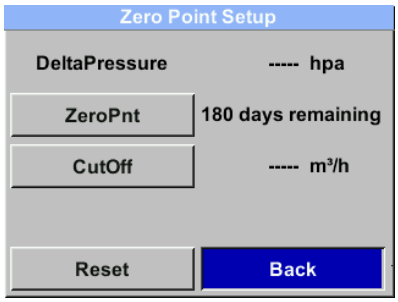
Select with the key ***„>“*** the correct unit and then confirm selection by pressing 2x ***„OK“***.

Input / change of the value by selecting the respective position with button ***„>“***and entering by pressing button ***„OK“.***

By pressing ***„>“*** the position value is incremented by 1. Complete with ***"OK"*** and activate next number position.

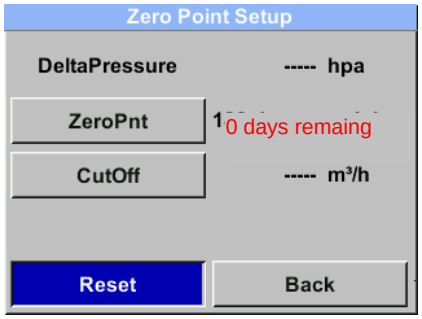
### 15.3.1.5 Setting of Zeropoint and Low-flow cut off

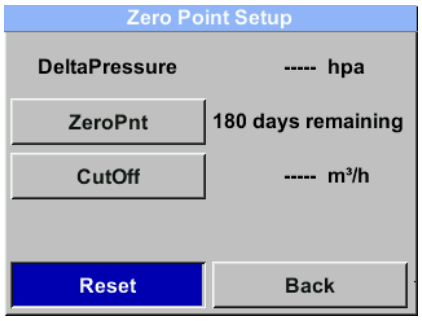
***Setup → Sensor Setup→ ZP Adjust →***




To make changes, first select a menu with button ***„>“*** and confirm selection by pressing ***„OK“*** .

***Setup → Sensor Setup → ZP Adjust → ZeroPnt***

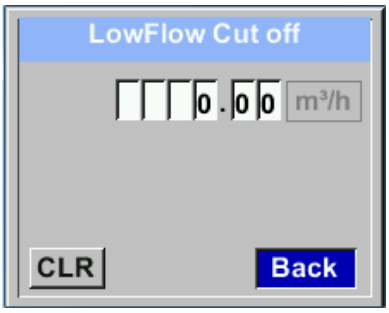



If the sensor shows the message ***CalZeroPnt"*** " on the display, a zero point calibration should be carried out, see also chapter 12.2 "Zero point calibration".

The zero point calibration must be carried out under system pressure and without flow

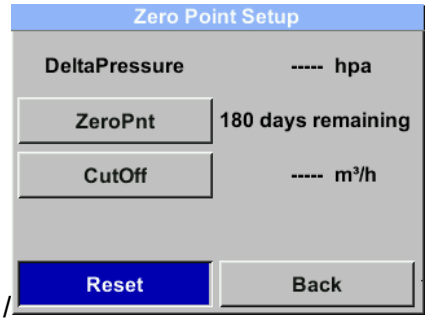
### *Setup → Sensor Setup → ZP Adjust → CutOff*




With the low-flow cut off activated, the flow below the defined "LowFlow Cut off" value will be displayed as 0 m³/h and not added to the consumption counter.

For an input / change of the value select with the button ***„>“*** the respective number position and activate it with ***„OK“***.

### *Setup → Sensor Setup → ZP Adjust t → Reset*




/

By selection of ***„Reset“*** all settings for ***„ZeroPnt“*** and. ***„CutOff“*** are reset.

Menu item to be select with button ***„>“*** and confirm the reset with ***„OK“*** .

### 15.3.2 Modbus RTU

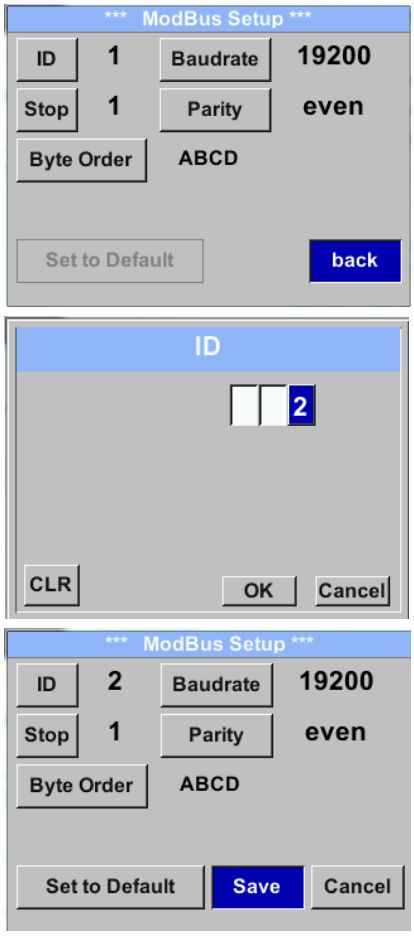
#### 15.3.2.1 Setup

The Flow sensors VD 570 comes with a Modbus RTU Interface.
Before commissioning the sensor the communication parameters

- Modbus ID, Baudrate, Parity und Stop bit

must be set in order to ensure the communication with the Modbus master.

***Settings → Modbus Setup***




For changes, e.g. the sensor ID, select with key „△“ the field ***“ID”*** and then pressing “***OK”***.

Select the desired position by pressing the ***">"*** and select with ***"OK***" button.

Change values by pressing the „△“ values takeover by pressing ***"OK".***

Inputs for baudrate, stopbit and parity is done analogue.

By means of the button "Byte Order" it

**Default values out of factory:**

| | |
|---|---|
| Modbus ID: | 1 |
| Baud rate: | 19200 |
| Stopbit: | 1 |
| Parity: | even |
| Byte Order: | ABCD |

**Remark**: If the sensor placed at the end of the Modbus system a termination is required. Therefore the enclosed 120R resistor is to be connected at Pin 1 and Pin 3 of connector „X2“

### 15.3.3 Modbus TCP (Optional)

#### 15.3.3.1 Setup

The Flow sensors VD 570 comes optional with a Modbus TCP Interface (HW Interface:M12 x 1 X-coded connector).

Device supports with this option the Modbus TCP protocol for communication with SCADA systems. TCP port is set to 502 by default. Port can be changed at the sensor or using PC Service Software

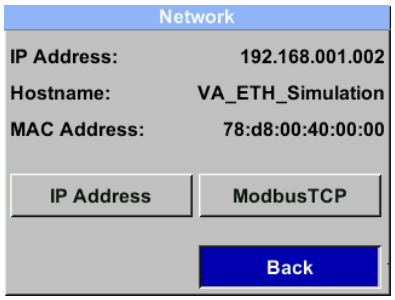
Modbus device address (Unit Identifier) can be set in the range of 1- 247.
Specification and description of the Modbus protocol is free to download on: www.modbus.org.

Supported Modbus commands (functions):

| Command | Code | Description |
|---|---|---|
| Function Code | 3 | (Read holding register) |
| Function code | 16 | (Write multiple registers) |

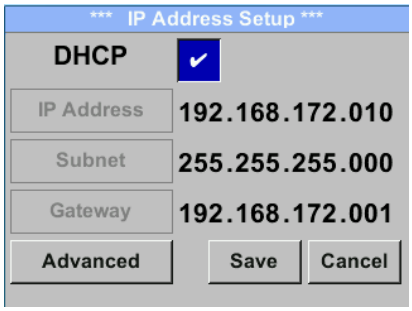
For more details, please see **VA 5xx Modbus RTU_TCP Installation in the actual version**

***Settings → Network Setup***




#### *15.3.3.1.1 Network Setup DHCP*

***Settings → Network Setup Settings → IP Address***




Here you can set up and made a connection, with or without *DHCP*, to a computer.

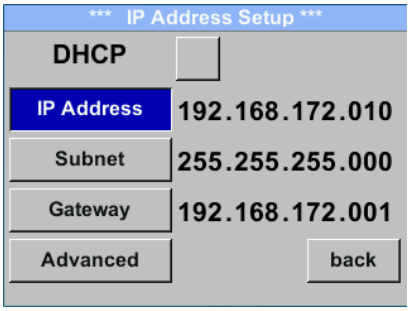
**Remark:**

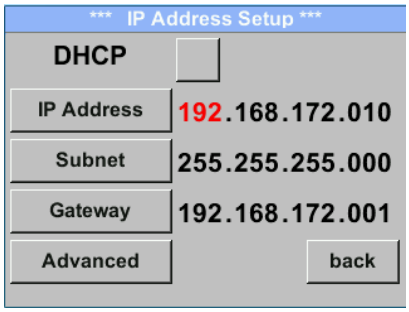
With activated DHCP the automatic integration of the sensor in an existing network is possible, without a manual configuration.

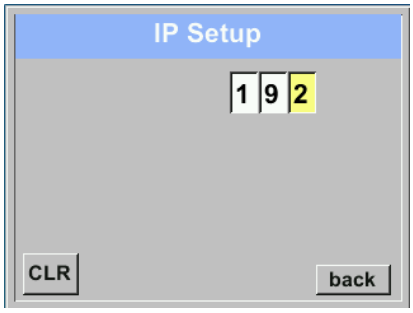
Storing of settings by pressing ***"Save"***

### *15.3.3.1.2 Network Settings static IP*

***Settings → Network Setup Settings → IP Address → IP Address***
***Settings → Network Setup Settings → IP Address → Subnet***
***Settings → Network Setup Settings → IP Address → Gateway***



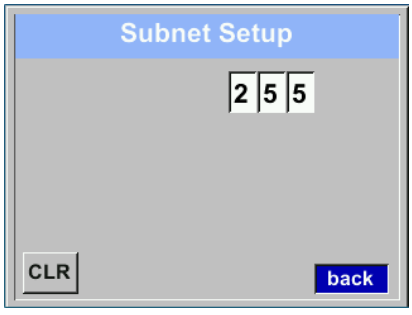



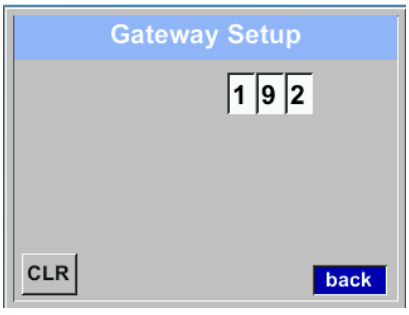

For manual (static) IP, the ***"IP Address", "Subnet"*** and ***"Gateway"*** selection keys must be selected and activated with ***"OK".***

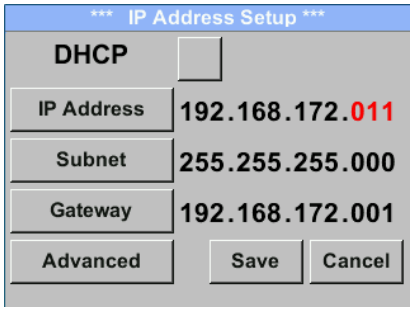
The first data field of the selection, in this case the IP address, is then marked (red).

Confirm with ***"OK"*** the corresponding input menu is opened.

By means of ***">"***, the next data field is changed.



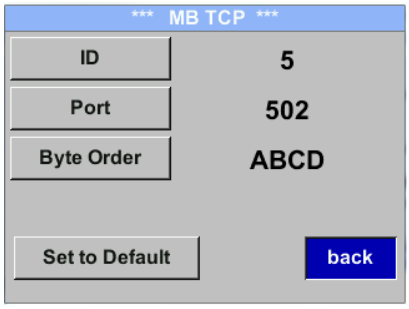



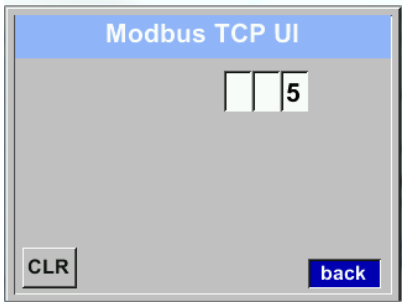

Store the settings by ***„Save“***

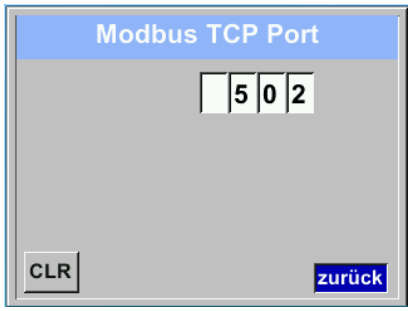
#### *15.3.3.1.3 Modbus TCP Settings*

***Settings → Network Setup Settings → IP Address → MB TCP***




***Settings → Network Setup Settings → IP Address → ID***
***Settings → Network Setup Settings → IP Address → Port***




For changes, e.g. the sensor ID, select with key ***„>“*** the field ***“ID”*** and then pressing “***OK”***.

Select the desired position by pressing the ***">"*** and select it with ***"OK***" button.

Change values by pressing the ***„>“*** values takeover by pressing ***"OK".***

Input for the port is done analogue.

By means of the button ***"Byte Format"*** it is possible to change the data format (Word Order). Possible formats are ***"ABCD"*** (Little Endian) and ***"CDAB"*** (Middle Endian)

Saving the changes by pressing ***"Save",*** therefore select it with key ***„>“*** and then confirm it with ***"OK".***
Reset to the default settings by activating ***"Set to Default"-***

#### 15.3.3.2 Modbus Settings (2001…2005)

| Modbus Register | Register Address | No.of Byte | Data Type | Description | Default Setting | Read Write | Unit /Comment |
|---|---|---|---|---|---|---|---|
| 2001 | 2000 | 2 | UInt16 | Modbus ID | 1 | R/W | Modbus ID 1…247 |
| 2002 | 2001 | 2 | UInt16 | Baudrate | 4 | R/W | 0= 1200<br>1 = 2400<br>2 = 4800<br>3 = 9600<br>4 = 19200<br>5 = 38400<br>6 = 57600<br>7 = 115200 |
| 2003 | 2002 | 2 | UInt16 | Parity | 1 | R/W | 0 = none<br>1 = even<br>2 = odd |
| 2004 | 2003 | 2 | UInt16 | Number of Stopbits | | R/W | 0 = 1 Stop Bit<br>1 = 2 Stop Bit |
| 2005 | 2004 | 2 | UInt16 | Word Order | 0xABCD | R/W | 0xABCD = Big Endian<br>0xCDAB = Middle Endian |

**.3 Values Register (1001 …1500)**

| Modbus Register | Register Address | No.of Byte | Data Type | Description | Default | Read Write | Unit /Comment |
|---|---|---|---|---|---|---|---|
| 1101 | 1100 | 4 | Float | Flow in m³/h | | R | |
| 1109 | 1108 | 4 | Float | Flow in Nm³/h | | R | |
| 1117 | 1116 | 4 | Float | Flow in m³/min | | R | |
| 1125 | 1124 | 4 | Float | Flow in Nm³/min | | R | |
| 1133 | 1132 | 4 | Float | Flow in ltr/h | | R | |
| 1141 | 1140 | 4 | Float | Flow in Nltr/h | | R | |
| 1149 | 1148 | 4 | Float | Flow in ltr/min | | R | |
| 1157 | 1156 | 4 | Float | Flow in Nltr/min | | R | |
| 1165 | 1164 | 4 | Float | Flow in ltr/s | | R | |
| 1173 | 1172 | 4 | Float | Flow in Nltr/s | | R | |
| 1181 | 1180 | 4 | Float | Flow in cfm | | R | |
| 1189 | 1188 | 4 | Float | Flow in Ncfm | | R | |
| 1197 | 1196 | 4 | Float | Flow in kg/h | | R | |
| 1205 | 1204 | 4 | Float | Flow in kg/min | | R | |
| 1213 | 1212 | 4 | Float | Flow in kg/s | | R | |
| 1221 | 1220 | 4 | Float | Flow in kW | | R | |

| Modbus Register | Register Address | No.of Byte | Data Type | Description | Default | Read Write | Unit /Comment |
|---|---|---|---|---|---|---|---|
| 1269 | 1268 | 4 | UInt32 | Consumption m³ before comma | x | R | |
| 1275 | 1274 | 4 | UInt32 | Consumption Nm³ before comma | x | R | |
| 1281 | 1280 | 4 | UInt32 | Consumption ltr before comma | x | R | |
| 1287 | 1286 | 4 | UInt32 | Consumption Nltr before comma | x | R | |
| 1293 | 1292 | 4 | UInt32 | Consumption cf before comma | x | R | |
| 1299 | 1298 | 4 | UInt32 | Consumption Ncf before comma | x | R | |
| 1305 | 1304 | 4 | UInt32 | Consumption kg before comma | x | R | |
| 1311 | 1310 | 4 | UInt32 | Consumption kWh before comma | x | R | |
| 1347 | 1346 | 4 | Float | Velocity m/s | | | |
| 1355 | 1354 | 4 | Float | Velocity Nm/s | | | |
| 1363 | 1362 | 4 | Float | Velocity Ft/min | | | |
| 1371 | 1370 | 4 | Float | Velocity NFt/min | | | |
| 1419 | 1418 | 4 | Float | GasTemp °C | | | |
| 1427 | 1426 | 4 | Float | GasTemp °F | | | |

**Remark:**

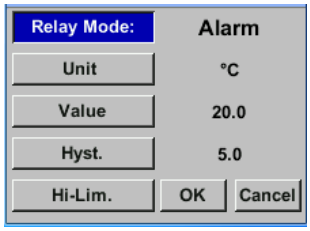
For DS400 / DS 500 / Handheld devices - Modbus Sensor Datatype

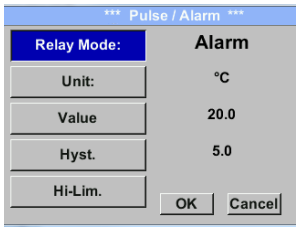
„Data Type R4-32“ match with „Data Type Float“

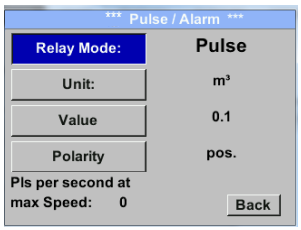
For more additional Modbus values please refer to VA5xx_Modbus_RTU_TCP_Installation_in the actual version.

### 15.3.4 Pulse /Alarm

***Setup → Sensor Setup→ Pulse/ Alarm***




The galvanically isolated output can be defined as pulse- or alarm output.
Selection of field ***„Relay Mode"*** with key ***„>"*** and change modus by pressing key ***„OK".***

For alarm output following units could be chosen: kg/min, cfm, ltr/s, m³/h, m/s, °F, °C and kg/s.
***„Value"*** defines the Alarm value, ***„Hyst."*** defines the desired hysteresis and with ***„Hi-Lim"*** or ***„Lo-Lim"*** the alarm settings when the alarm is activated
Hi-Lim: Value over limit
Lo-Lim: Value under limit

#### 15.3.4.1 Pulse output

The maximum frequency for pulse output is 50 pulses per second (50Hz).
The Pulse output is delayed by 1 second.

| Pulse value | [m³ /h] | [m³ /min] | [l/min] |
|---|---|---|---|
| 0.1 ltr / Pulse | 18 | 0,3 | 300 |
| 1ltr / Pulse | 180 | 3 | 3000 |
| 0.1m³ / Pulse | 18000 | 300 | 300000 |
| 1 m³ / Pulse | 180000 | 3000 | 3000000 |

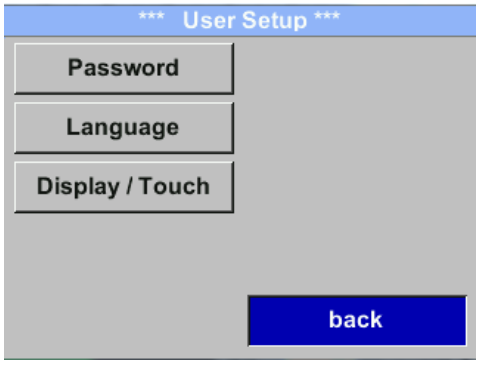
**Table 1 Maximum flow for pulse output**

Entering pulse values that are not allow a presentation to the full scale value, are not allowed. Entries are discarded and error message displayed.

### 15.3.5 User Setup

#### 15.3.5.1 Password

***Settings → UserSetup → Password***





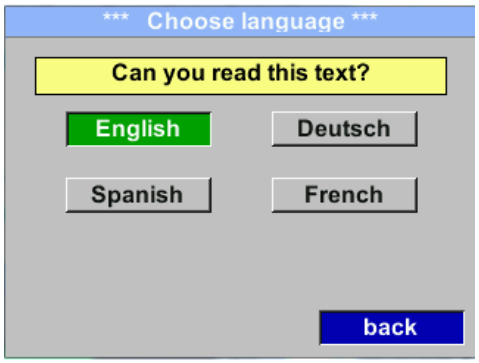
To make changes, first select a menu with button „>“ and confirm selection by pressing ***„OK“*** .

It is possible to define a password. The required password length is 4 digits. Please select with button „>“ a figure and confirm it with ***„OK“*** .Repeat this 4 times.

With ***„<“*** the last figure could be deleted. Password input have to be inserted twice.

#### 15.3.5.2 Language

***Settings → UserSetup → Language***

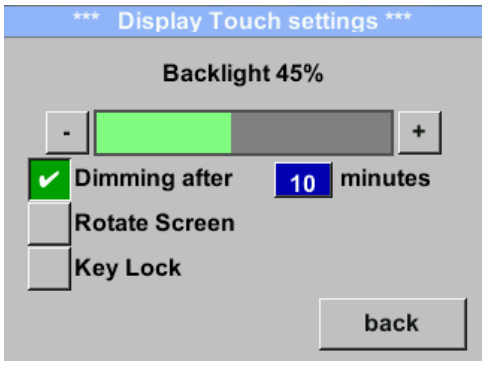


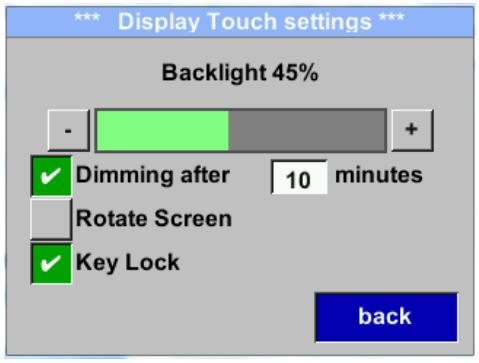

Currently 4 languages have been implemented and could be selected with button „>“.

Change of language by confirming with ***“OK***”.

#### 15.3.5.3 Display / Touch

***Settings → UserSetup → Display / Touch***




With the button ***„-“*** and with button ***„+“*** it is possible to adjust the backlight / display brightness. The actual / adjusted backlight brightness is showed in the graph ***„Backlight.“***

By activation ***“Dimming after”*** and entering a time a display dimming could be set.

With ***„Rotate Screen“*** the display information could be rotated by 180°.

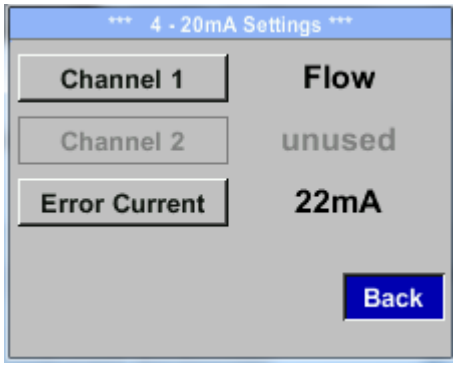
### 15.3.6 Advanced

***Settings → Advanced***


By pressing ***„Factory Reset“*** the sensor is set back to the factory settings.

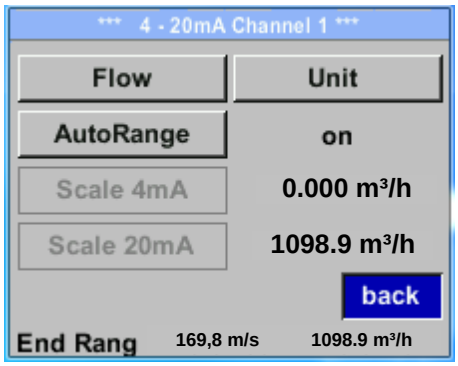
### 15.3.7 4 -20mA

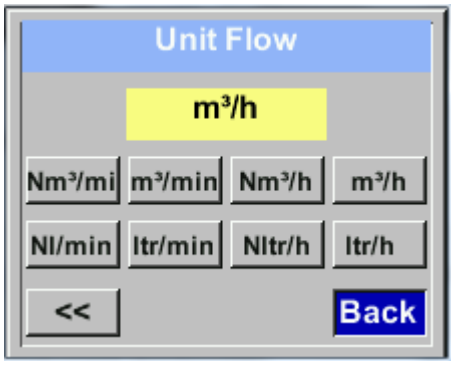
***Settings → 4-20mA***

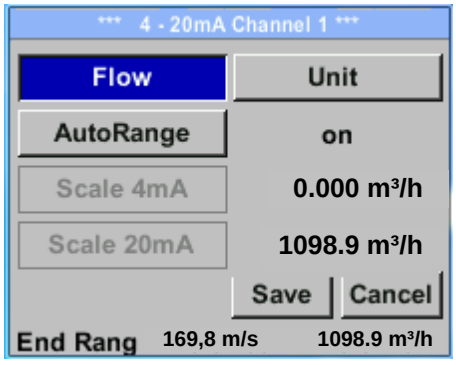



To make changes, first select a menu with button ***„>“*** and confirm selection by pressing ***„OK“*** .

***Settings → 4-20mA → Channel 1***




The 4-20 mA Analogue output of the Sensor VD 570 can be individually adjusted.

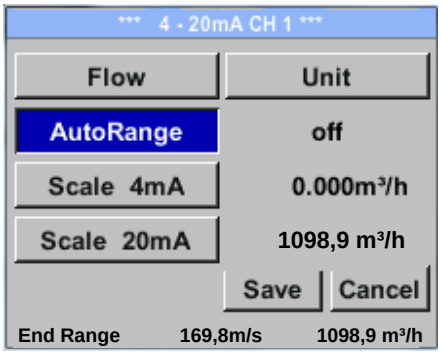
It is possible to assign following values ***„Temperature“***, ***„Velocity“*** und ***„Flow“*** to the channel CH 1.

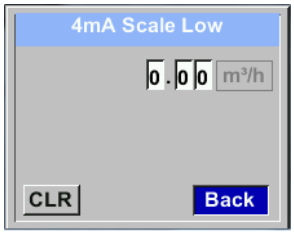
To make changes, first select the value item with button ***„>“*** and confirm.
Moving between the different measurements values or to deactivate the 4-20mA with setting to ***„unused“*** by pressing ***„OK“***.

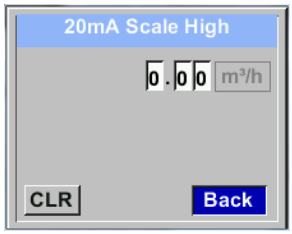
To the selected measurement value a corresponding / appropriate unit needs to be defined. Select ***„Unit“*** with ***„>“*** and open menu with ***„OK“.***
Select required unit with ***„>“*** and take over by pressing ***„OK“.***

Here e.g. for the measurement value Flow, procedure for the other measurements values is

***Settings → 4-20mA → Channel 1 → AutoRange***




The scaling of the 4-20mA channel can be done automatically "Auto Range = on" or manual "AutoRange = off" .

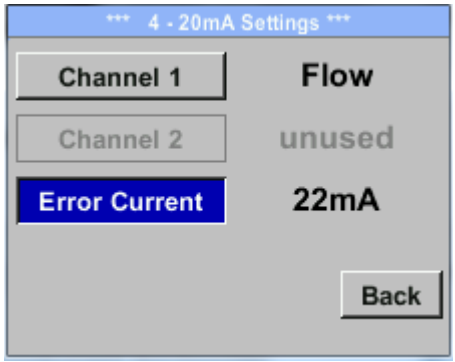
With button ***„>“*** select the menu item „AutoRange“ select with ***„OK“*** the desired scaling method. (Automatically or manually)

In case of ***AutoRange = off*** with ***„Scale 4mA“*** und ***„Scale 20mA“*** the scale ranges needs to be defined.

Select with button ***„>“*** the item „Scale 4mA“ or „Scale 20mA“ and confirm with ***„OK“*** .

Input of the scaling values will be analogous as described before for value settings.

***Settings → 4-20mA → Error Current***




This determines what is output in case of an error at the analog output.

- 2 mA Sensor error / System error
- 22 mA Sensor error / System error
- None Output according Namur (3.8mA – 20.5 mA)

< 4mA to 3.8 mA Measuring range under range

>20mA to 20.5 mA Measuring range exceeding

To make changes first select a menu item "Current Error" with button ***„>“*** and then select by pressing the ***„OK“*** the desired mode

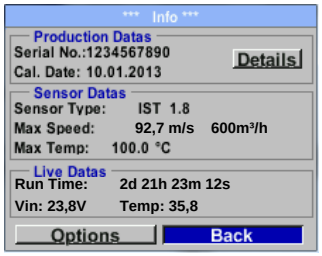
**Remark:**

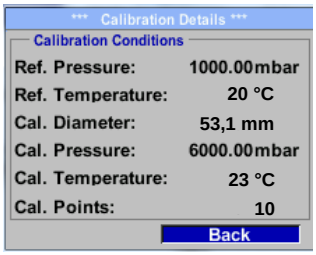
| | |
|---|---|
| Default setting VD 570 for analogue output is | Channel 1:0…max. flow [m³/h] |
| Default settings for VD 570 with option board analogue output | Channel 1:0…max. flow [m³/h]<br>Channel 2: -20°C … 100°C] |

For max. flow see label on Sensor.

### 15.3.8 VD 570 Info

***Setup → Sensor Setup → Info***




Here you get a brief description of the sensor data incl. the calibration data.

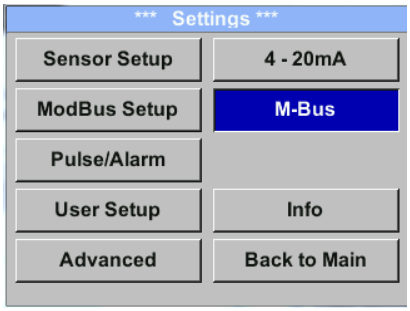
Under ***Details,*** you are able to see in addition the calibration conditions.

## 15.4 MBus

### 15.4.1 Change of communication settings

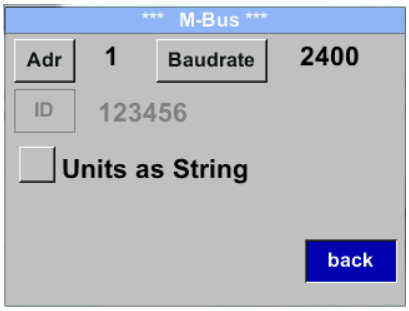
The communication settings Primary-address and baud rate could be changed directly at the sensor, in case sensor has a display, or with the PC Service software (Order-No. 0554 2007).

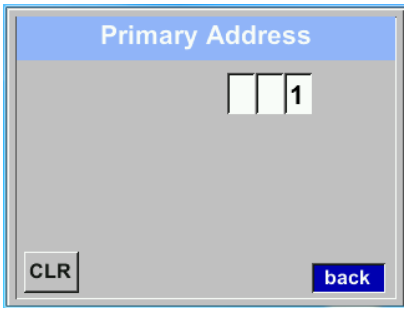
***Settings → M-Bus***




***Settings → M-Bus → Adr***

Possible inputs are values from1-255 (Default setting = 1)




With *„>“* select the button „Adr“ and confirm it with ***„OK***.
Select the desired position by pressing the button *„△“* and select it with ***"OK***" button.

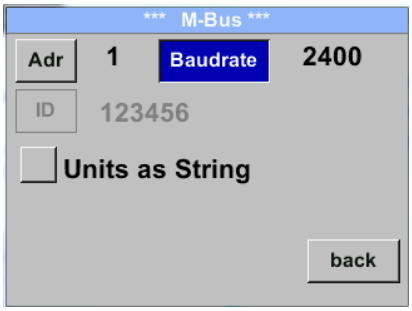
Change values by pressing *„>“* with step of 1, taking the value by confirming with ***"OK".***
Move to next position with *„>“*

Using ***„CLR“*** clears up the complete settings at once.

For saving the changes done press button ***„Save“*** to discard the changes press button

***Settings → M-Bus →Baudrate***

Possible values are 2400, 4800 and 9600 Baud (Default setting = 2400).

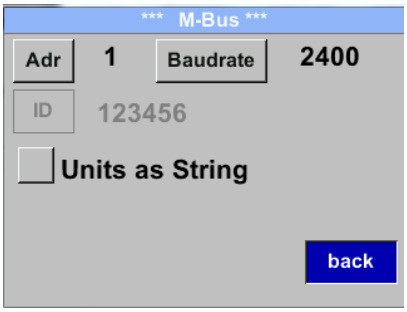


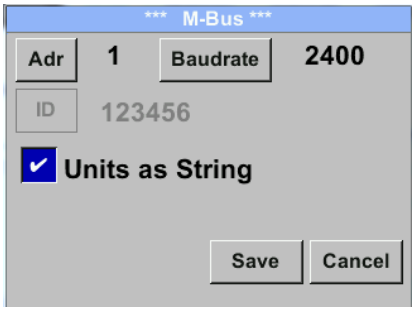

Baudrate change by pressing the button ***„OK“***

For saving the changes done press button ***„Save“*** to discard the changes press button ***“Cancel”.***

Leaving the menu with ***„Back***“.

### 15.4.2 Coding VIF (Value Information Field)




The Sensor offers two possibilities for coding the Value Information Field (VIF).

- Primary VIF (The units and multiplier correspond to MBus specification 4.8 chapter 8.4.3
- Plain Text VIF ((units are transmitted as ASCCII characters. So units that are not included in MBus specification chapter 8.4.3 are possible

Download:
https://m-bus.com/downloads

### 15.4.3 Default Settings communication

| | |
|---|---|
| Primary Address*: | 1 |
| ID: | Serial number of Sensor |
| Baud rate*: | 2400 |
| Medium*: | depending on medium (Gas or Compressed Air) |
| Manufacturer ID: | CSI |
| VIF coding: | Primary VIF |

Both addresses, Primary address and ID, could be searched in the M-Bus system automatically.

### 15.4.4 Default values transmitted

| | |
|---|---|
| Value 1 with [Unit]*: | Consumption [m³] |
| Value 2 with [Unit]*: | Flow [m³/h] |
| Value 3 with [Unit]*: | Gas temperature [°C] |

*All Values could be changed / preset in production or with CS Service software (Order-No. 0554 2007)

# 16 Error messages

## 16.1 Errors messages

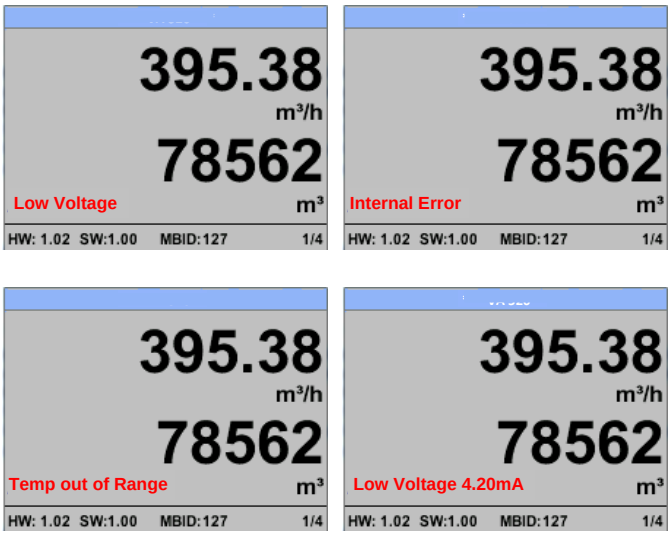
- **Low Voltage**
  Bei einer Versorgungsspannung kleiner 18V wird die Warnmeldung „**Low Voltage“** angezeigt.Dies bedeutet der Sensor kann nicht mehr ordnungsgemäß arbeiten / messen und somit stehen keine Messwerte für Duchfluss, Verbrauch sowie Geschwindigkeit zur Verfügung.

- **Internal Error**
  In the case of this **"Internal Error**" message, the sensor has detected an internal read error on e.g. EEProm , AD converter etc..

- **Temp out of Range**
  If the media temperature is outside the specified temperature range, the status message status message **"Temp out of Range".** This leads to incorrect measured values (outside the sensor specification)

- **Low Voltage 4-20mA**
  For sensors with a galvanically isolated 4-20mA output, a minimum supply voltage of 17.5V is required. If the voltage falls below this, the error message **"Low Voltage 4-20mA"** is displayed

**Error messages:**




# 17 Supplementary Documentation

- Supplementary Documentation for Ex-Version:

Flow / Consumption  Sensor CMM 500 Ex-Documentation

## 18 DECLARATION OF CONFORMITY

# KONFORMITÄTSERKLÄRUNG

DECLARATION OF CONFORMITY

Wir / We — CS Instruments GmbH & Co. KG
Zindelsteinerstr. 15, 78052 VS-Tannheim

Erklären in alleiniger Verantwortung, dass das Produkt
Declare under our sole responsibility that the product

Verbrauchs-/ Durchflusssensor CMM 500
Flow Sensor CMM 500

den Anforderungen folgender Richtlinien entsprechen:
We hereby declare that above mentioned components comply with requirements of the following EU directives:

| | |
|---|---|
| Elektromagnetische Verträglichkeit<br>Electromagntic compatibility | 2014/30/EU<br>2014/30/EC |
| RoHS (Restriction of certain Hazardous Substances) | 2011/65/EC & 2015/863/EC |

Angewandte harmonisierte Normen:
Harmonised standards applied:

| | |
|---|---|
| EMV-Anforderungen<br>EMC requirements | **EN 55011:2016 + A2:2021-04**<br>**EN 61326-1: 2013-07** |
| RoHS (Restriction of certain Hazardous Substances) | **EN IEC 63000:2018** |

Das Produkt ist mit dem abgebildeten Zeichen gekennzeichnet.
The product is labelled with the indicated mark.

CE

Harrislee, den 22.04.2024

Wolfgang Blessing Geschäftsführer