EN

Operating instructions Flow sensor IVD 520

IVD 520 EN V1.00

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I. Foreword

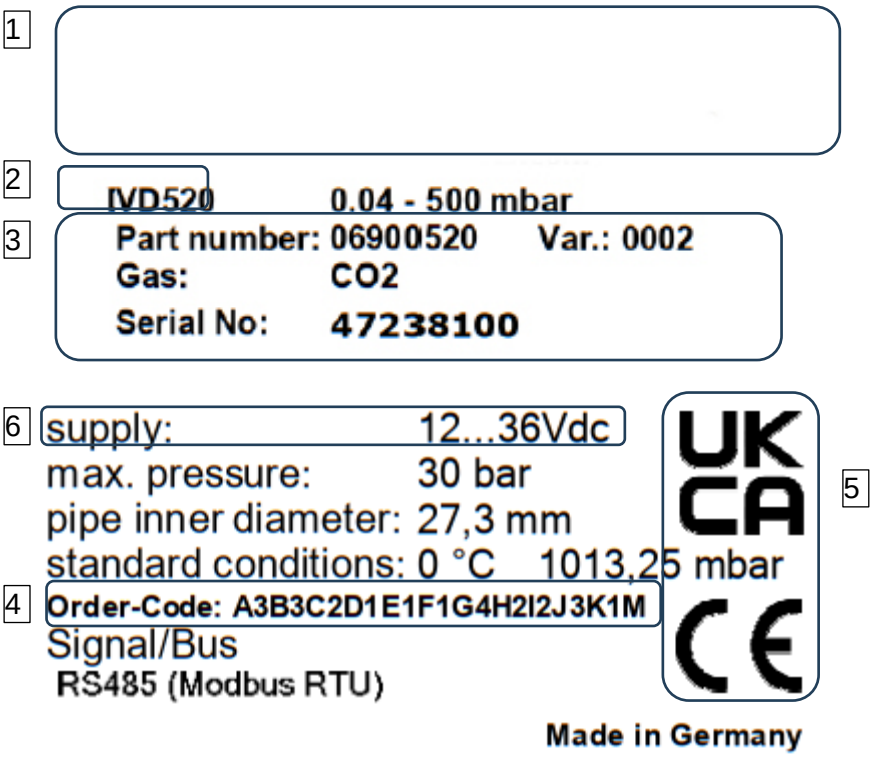
Read these operating instructions carefully and completely before carrying out installation, commissioning and maintenance work. Follow the instructions to ensure safe operation and perfect functioning.
The operating instructions must always be available at the place of use. It is not permitted to provide only individual pages.

II. Table of contents

1 Scope of delivery

- IVD 520 flow sensor with integrated measuring section
- Calibration certificate
- These operating instructions

2 Type plate



1 - Manufacturer info

2 - Sensor name

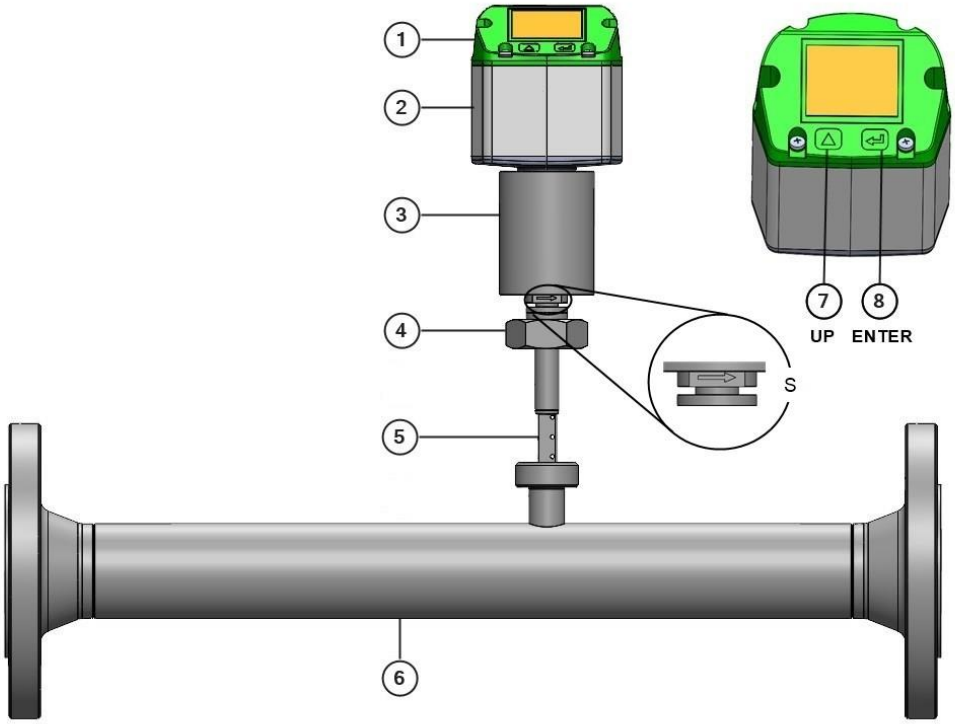
3 - Order number, serial number, production date

4 - Order code

5 - Conformity/certification marking

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

3 Device overview



1 Lid with display (180° rotatable)
2 Housing with:
- M12 panel connector A, 5-pin, A-coded:
  24VDC, Modbus RTU, 4...20 mA
- M12 panel connector A, 5-pin, A-coded:
  Switching output (pulse or alarm)
  Optional: Modbus TCP / PoE: D-coded or M-BUS

3 Pressure measuring head
4 Locking nut
5 Measuring tip
6 Measuring section
7 Selection button (UP)
8 ENTER/OK button
S Flow direction

4 Intended use

The IVD 520 flow sensor is a measuring probe for measuring the flow and consumption of gaseous fluids (air, nitrogen, etc.) in pipelines (dynamic pressure/differential pressure measurement).

Areas of application: Directly after the compressor (wet side), at high temperatures (up to 180 °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.

Operation is only permitted in the following cases:

- Only use the sensor indoors

  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 flow velocity (224 m/s / 600 m/s).
- In accordance with the technical data and approved ambient conditions.

5 Inappropriate use

Misuse when used as a climbing aid! 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. No condensation permitted on the sensor measuring tips. Condensation or water droplets on the sensor element lead to incorrect measurement results. Do not install the flow sensor with the measuring tips pointing upwards or in downpipes.

The flow sensor is not suitable for measuring leakage quantities. Measuring range start values only begin from 2 m/s.

6 Safety regulations

6.1 Warning and information symbols

 This symbol is used for all work safety instructions in these operating instructions where there is a risk to life and limb. Observance of these instructions and careful behavior are particularly important in these cases. All safety instructions must also be passed on to other users. In addition to the instructions in this operating manual, the general safety and accident prevention regulations must also be observed.

Achtung This symbol is located at those points in the operating instructions that require special attention to ensure that the guidelines, regulations, instructions and correct work procedures are observed and to prevent damage and destruction.

 This symbol indicates important information or measures for environmental protection.

 This symbol indicates particularly important information for the operator.

6.2 Warnings

Warnings are categorized according to the hazard levels **DANGER, WARNING** and **CAUTION**. Meaning of the warnings:

DANGER
Immediate danger!
▶ Failure to observe this warning may result in serious injury or death.

WARNING
Potentially dangerous situation!
▶ Failure to comply could result in serious injury or death.

CAUTION
Potentially dangerous situation!
▶ Non-compliance may result in moderate to minor injuries.

NOTE
Potentially dangerous situation!
▶ Failure to observe may result in damage to property.

6.3 General safety instructions

Important information 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 electrical engineering regulations (DIN EN 50110-1, DIN EN 60204-1 etc.). Prerequisite: Specialist training and knowledge of the technical standards, EU directives and EU regulations.

Observe applicable national accident prevention regulations and ordinances. Observe general occupational health and safety measures, e.g. wear suitable and prescribed personal protective equipment (PPE).

Repairs and adjustments may only be carried out by the manufacturer.

Obligations of the installer and system operator

The flow sensor must be checked and maintained regularly by an instructed and qualified person.

Cleaning and maintenance intervals must be determined by the system operator in accordance with DIN-ISO certification - frequency depends on ambient conditions and expected impairments.

Calibration: Calibrate the flow sensor at regular intervals as part of DIN ISO certification. The calibration cycles should be based on your internal specifications. Remove the flow sensor for calibration and send it to us.

Keep an identical replacement sensor ready for use in critical systems.

NOTE
▶ Without consultation with and approval any conversion work not listed in these operating instructions will invalidate the warranty. This symbol is placed at the points in the operating instructions where special attention must be paid to ensure that the guidelines, regulations, instructions and the correct sequence of work are observed, and that damage and destruction are prevented.

Duties of the system installer: The system installer is responsible for the safety of the system in which the IVD 520 is installed. Pay particular attention to the technical data and ambient conditions (chapter 8) as well as the information on the electrical connection and prescribed connection cables (chapter 11).

Only use the IVD 520 flow sensor as intended.

Risk of injury and accidents if operated outside the permissible ambient/operating conditions or operating temperatures due to overpressure or incorrect installation. The pipe pressure can be **up to 100 bar / 1450 psig** depending on the application. Ensure that the flow sensor is only operated within the permissible limit values (→ nameplate, specified max. PS pressure) and that the upper measuring range values are observed (→ table in chapter Upper measuring range values).

Risk of injury due to unauthorized device modifications, incorrect installation or damaged components. In such cases, the operating permit will be invalidated. **Operation is only permitted with original components.** Only operate the flow sensor fully assembled. Do not put a damaged sensor into operation and prevent further use until it has been repaired. The sensor must be checked and maintained regularly by instructed and qualified persons. Device modifications are not permitted and release the manufacturer from any warranty and liability.

Measuring errors due to dirt particles in the compressed air. Dirt particles and liquids can contaminate the measuring tips of the sensor and lead to a malfunction or fault. 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 accepts no warranty or liability for incorrect use.

Explosion hazard in explosion-protected areas due to ignition of explosives when sparks are generated.

Please use the IVD 570 Ex sensor in explosion-protected areas

Ensure clean compressed air without harmful components. Harmful components are, for example, explosive or chemically unstable gases and vapors, acid or base-forming substances such as ammonia, chlorine or hydrogen sulfide as well as condensates or oils or oil vapors.

Password protection settings menu: Password protection is available to protect against unauthorized entries/settings of the system parameters.
To set the password→ Chapter 13.3.5.1

Risk of burns due to hot sensor shaft. Hot air/gas/gas mixtures in the pipe can heat or warm up the sensor shaft of the flow sensor. Only touch the sensor shaft when it has cooled down. Use protective gloves if necessary.

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

Dangers if the applicable regulations for electrical installations are not observed. Observe the applicable regulations for the electrical installation, e.g. DIN
EN 50110-1, in Germany in particular VDE 0100 with the corresponding 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 that there is no voltage. Only operate the flow sensor with permissible connection cables for the mains supply and bus connection→ technical data. Make the electrical connection according to the wiring diagram (→ chapter 11).

Take care when handling packaging materials. Observe the applicable safety and accident prevention regulations. Keep packaging material out of the reach of children (risk of choking if small parts are swallowed).

Seals/sealant: Sealing rings made of copper or aluminum, elastomer sealing rings with metal backing, sealing tape/sealing cord or other equivalent sealing materials that meet the requirements of the necessary compressed air quality can be used as suitable sealants for the screw connections of the flow sensor.

6.4 Environmental protection

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

The used operating and auxiliary materials and replacement parts produced during operation of the flow sensor
and auxiliary materials as well as replacement parts produced during the operation of the flow sensor must be disposed of in accordance with environmental protection regulations.

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

7 Product information

7.1 Product features

The IVD 520 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: m^3/h, m^3/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) or M-BUS
- 1x analog output 4 ... 20 mA, adjustable for the measured variables flow rate, pressure, temperature or speed
- Switching/alarm output, galvanically isolated

7.2 Function

This flow sensor for compressed air measures the flow velocity in the middle of the pipe 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/back pressure at the sensor tip and the set 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 course in compliance with the required calming distances in the measuring range → Chapter 9.

8 Technical data

8.1 Technical data and ambient conditions

Measured variables	Flow rate, total consumption, pressure, temperature, speed
Sensor principle	Differential pressure
Measuring span	1:100 (1..300)
Measuring range	Up to 600 m/s* Compressed air 0.04 ... 500 mBar Differential pressure for gases
Accuracy	±1.5 % of the average **.
Response time	T 99: < 1 second
Media temperature	-30 ... 80 °C / -22...176°F
Ambient temperature	-20 ... 70 °C / -4 ... 158 °F
Storage temperature	-40 ... 80 °C / -40 ...176 °F
Relative humidity	< 99 % RH
Operating height, storage height	0...4000m (0...13123 ft).
Operating pressure	-1...30 bar(g) (435 psig).
Compressed air requirements min.	ISO 8573-1 (particle moisture oil) 5-6-4
Pressure accuracy	0.5 % v. E. .** (at 20 °C / 68 °F)
Power supply	18 to 36 VDC Optional: PoE according to IEEE 802.3af, PD Class 2 (max. 6.5W), voltage from 36V to 57V DC
Power consumption	max. 6.5W
Signal output	Modbus RTU (RS-485) 1x 4...20 mA (flow rate, pressure, temperature **or** speed) Optional: Modbus-TCP Ethernet / Ethernet PoE M-Bus
Measured values via Modbus TCP	Volume flow (m³/min, m³/h, cfm, ...) Meter reading (m³, cf, ...) Temperature (°C, °F) Pressure (bar, MPa, mbar, psi, ...) Air velocity (m/s, fpm)
Electrical connection	M12
Protection class	IP 65

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

** v. M. = from measured value | v. E. = from final value

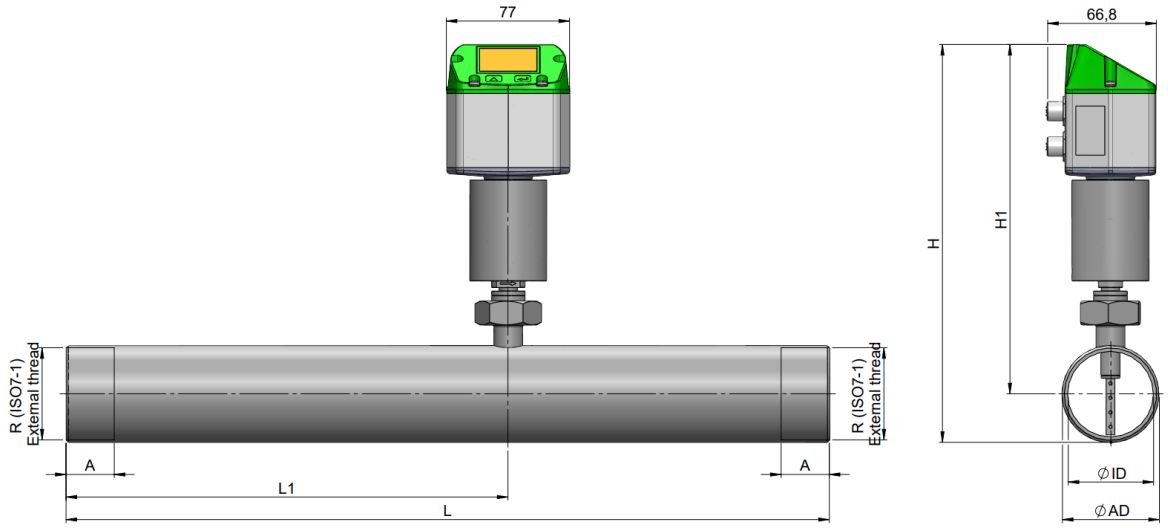
8.2 Measuring range values

Measuring ranges IVD 520 flow sensor for compressed air at (ISO 1217:1000 mbar, 20 °C)

Pipe inner diameter			2...224 m/s Measuring range start/end values	
Customs	mm	DN	m³/h	(cfm)
¾"	21,7	DN 20	2...215	1,2...127
1"	27,3	DN 25	3,2...357	1,9...210
1 ¼"	36,0	DN 32	5,7...644	3,4...379
1 ½"	41,9	DN 40	8...886	4,7...522
2"	53,1	DN 50	13...1450	8...853
2 ½"	68,9	DN 65	23...2484	13...1462
3"	80,9	DN 80	31...3440	18...2025

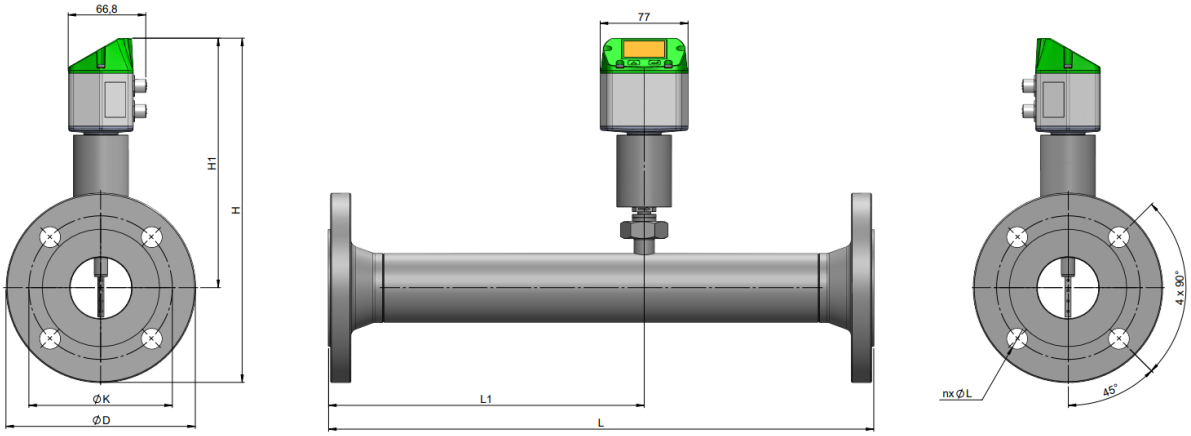
8.3 Dimensions

8.4 Measuring section with connection thread



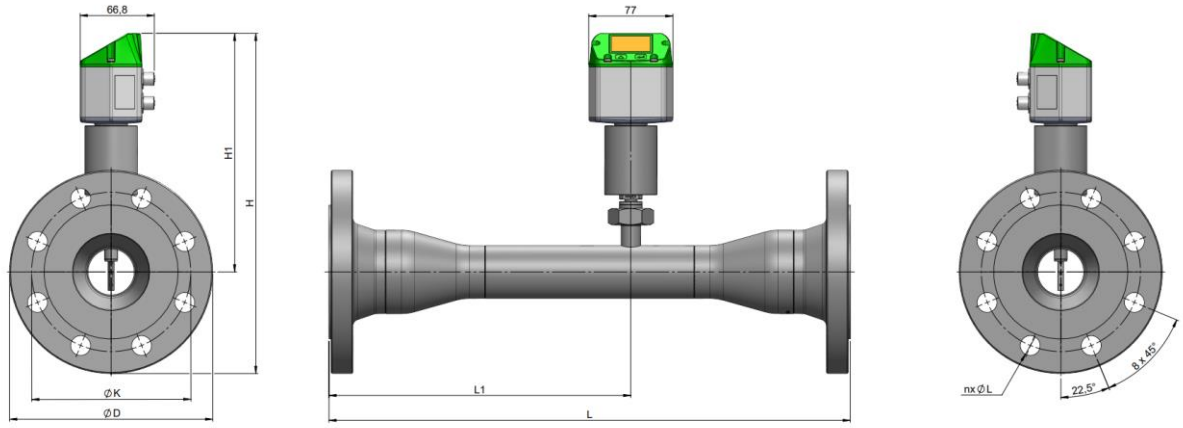
Pipe size	AD / ID (mm)	L (mm)	L1 (mm)	H (mm)	H1 (mm)	R	A (mm)
DN 15	21,3 / 16,1	300	210	227,9	217,2	R 1/2"	20
DN 20	26,9 / 21,7	475	275	230,7	217,2	R 3/4"	20
DN 25	33,7 / 27,3	475	275	234,1	217,2	R 1"	25
DN 32	42,4 / 36,0	475	275	238,4	217,2	R 1 1/4"	25
DN 40	48,3 / 41,9	475	275	241,4	217,2	R 1 1/2"	25
DN 50	60,3 / 53,1	475	275	247,4	217,2	R 2"	30
DN 65	76,1 / 68,9	475	275	255,3	217,2	R 2 1/2"	30
DN 80	88,9 / 80,9	475	275	261,6	217,2	R 3"	30

8.5 Measuring section with welding neck flanges (material stainless steel 1.4404):



						Flange DIN EN 1092-1		
Process connection	**AD/ID (mm)**	**L (mm)**	**L1 (mm)**	**H (mm)**	**H1 (mm)**	**Ø D in mm**	**Ø K in mm**	**nxØL in mm**
DN 15	21,3 / 16,1	300	210	264,7	217,2	95	65	4 x 14
DN 20	26,9 / 21,7	475	275	269,7	217,2	105	75	4 x 14
DN 25	33,7 / 27,3	475	275	274,7	217,2	115	85	4 x 14
DN 32	42,4 / 36,0	475	275	287,2	217,2	140	100	4 x 18
DN 40	48,3 / 41,9	475	275	292,2	217,2	150	110	4 x 18
DN 50	60,3 / 53,1	475	275	299,7	217,2	165	125	4 x 18
DN 65	76,1 / 68,9	475	275	319,7	227,2	185	145	8 x 18
DN 80	88,9 / 80,9	475	275	327,2	227,2	200	160	8 x 18

8.6 Reduced measuring section with welding neck flanges (material stainless steel 1.4404):



							Flange DIN EN 1092-1		
Process connection	**Reduction**	**AD/ID (mm)**	**L (mm)**	**L1 (mm)**	**H (mm)**	**H1 (mm)**	**Ø D in mm**	**Ø K in mm**	**nxØL in mm**
DN 25	DN25 - DN15	21,3 / 16,1	475	275	274,7	217,2	115	85	4 x 14
DN 32	DN32 - DN20	26,9 / 21,7	475	275	287,2	217,2	140	100	4 x 18
DN 40	DN40 - DN25	33,7 / 27,3	475	275	292,2	217,2	150	110	4 x 18
DN 50	DN50 - DN32	42,4 / 36,0	475	275	299,7	217,2	165	125	4 x 18
DN 65	DN65 - DN40	48,3 / 41,9	475	275	309,7	217,2	185	145	8 x 18
DN 80	DN80 - DN50	60,3 / 53,1	475	275	317,2	217,2	200	160	8 x 18
DN 100	DN100-DN65	76,1 / 68,9	475	275	344,7	227,2	235	190	8 x 22

9 Installation preparations

9.1 Positioning the flow sensor

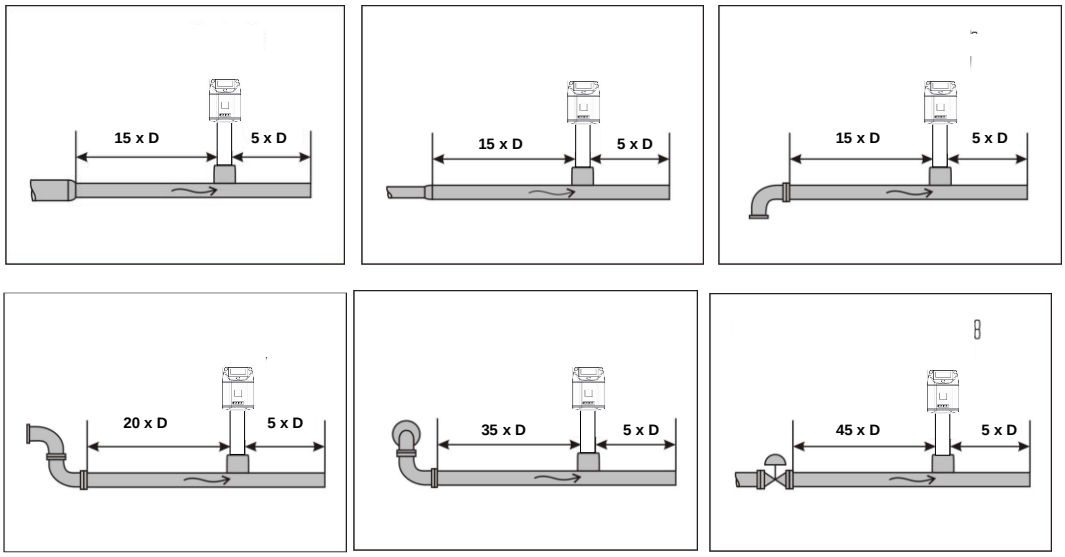
- To ensure precise measurement results, the IVD 520 must be installed correctly in the pipe.
- Only use correctly dimensioned seals that are suitable for the flow medium.
- Avoid diameter jumps in the pipe (inlet section) at the joints (max. 1 mm). For further information → ISO 14511:2019-01
- Observe 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.

9.2 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 calming sections in the measuring pipe area
Inlet and outlet sections: D = inner pipe diameter

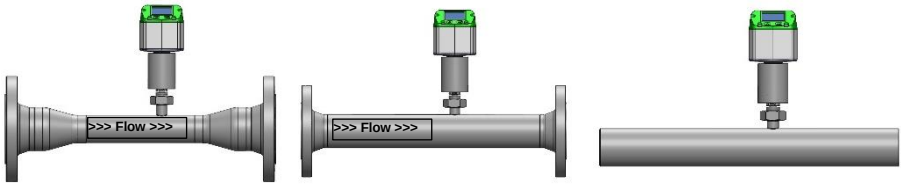


Flow obstacle in front of the measuring section	Minimum length Inlet section (L1)	Minimum length Outlet section (L2)
Low curvature (arc < 90°)	12 x D	5 x D
Reduction (pipe narrows towards the measuring section)	15 x D	5 x D
Extension (pipe extends to the measuring section)	15 x D	5 x D
90° bend or T-piece	15 x D	5 x D
2 bends á 90° in one plane	20 x D	5 x D
2 bends á 90° 3-dimensional change of direction	35 x D	5 x D
Shut-off valve	45 x D	5 x D

10 Installation IVD 520

The IVD 520 sensor is supplied pre-assembled together with the measuring section.

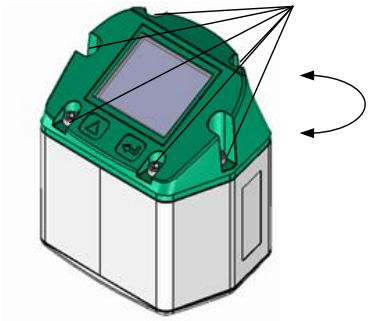
- Installation by the customer is only permitted when the system is depressurized
- Check whether the IVD 520 is correctly installed in the measuring section, the flow direction arrow must point in the correct direction.



- The connection nut must be tightened to a torque of 25 - 30 Nm.
- The tightness of the connections must be checked and ensured.

10.1 Rotate control unit

Fastening screws



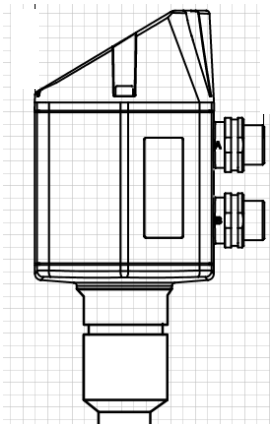
The position of the display head can be rotated by 180°, e.g. in the case of reverse flow direction.
To do this, loosen the 6 fixing screws and turn the head through 180°.

Caution: Functional impairment
It must be ensured that the connection lines are still plugged in and the seal is correctly installed.

11 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.

11.1 Modbus, 4..20mA, pulse or M-Bus



- Connector plug A

- Connector plug B

Caution: Unused connections (NC) must not be connected to potential and/or earth. Cut and insulate the cables.

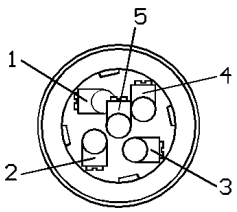
	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5
Connector plug A	+VB	RS 485 (A)	-VB	RS 485 (B)	I+ (4..20 mA)
Connector plug B Pulse output (standard)	NC	GND	DIR	Pulse galvanically isolated	Impulse galvanically insulated
Connector plug B M-Bus option	NC	GND	DIR	M-Bus	M-Bus
Colors pulse lines 0553.0106 (5 m) 0553.0107 (10 m)	brown	white	blue	black	gray

Legend:

-VB	Negative supply voltage 0 V
+VB	Positive supply voltage 12...36 VDC smoothed
I +	Current signal 4..20 mA - selected measurement signal
RS 485 (A) RS 485 (B)	Modbus RTU A Modbus RTU B

Impulse	Impulse for consumption
NC	Not connected. Must not be connected to potential and/or earth. Please cut and insulate the cables.
M-Bus	M-Bus connection (M-Bus is reverse polarity protected)

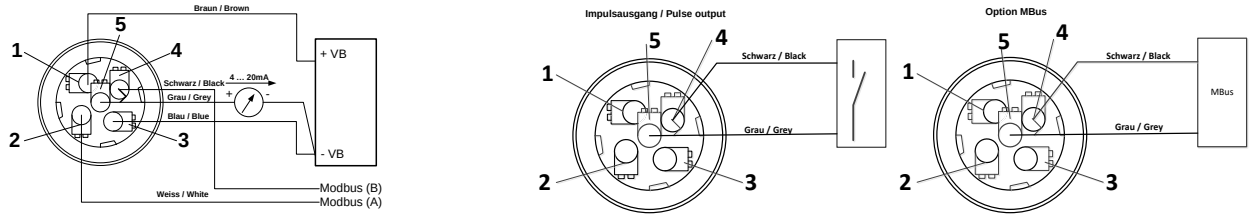
If no connecting cable/pulse cable has been ordered, the sensor sor is supplied with M12 connectors. The user can connect the signals as shown in the connection diagram.



M 12 connector plug

Rear view
(terminal side)

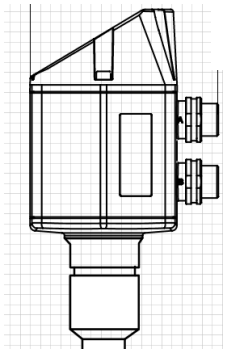
Connector plug A (M12 A coding) Connector plug B (M12 A coding)



Attention: If the sensor is used at the end of the Modbus system, termination is required. The sensors have an internally switchable termination. To do this, please loosen the 6 screws on the housing cover and set the internal DIP switch to "On" . When assembling, ensure that the housing seal is correctly seated.

Alternatively, a 120R resistor can be installed in the connector between pin 2 and pin 4

11.2 Ethernet (optional PoE)



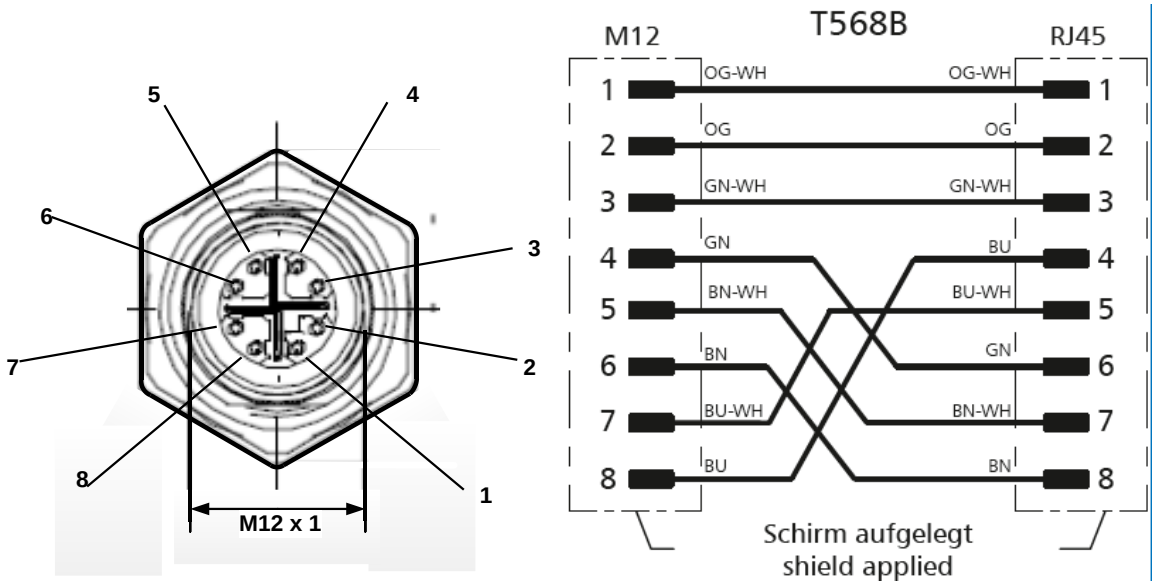
- Connector plug A

- Connector B (M12 X-coded 8-pin)

Connector plug B
M12 X-coded 8-pin

Data lines: 1,2 and 3,4
PoE lines: 5.6 and 7.8

Connection cable
M12 X-coded to RJ45



Connection cable: Cat 6.

*PoE: Power over Ethernet

12 Commissioning

WARNING
Danger from pressurized components.
▶ Ensure sufficient and safe compressed air quality with a pressurization 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.

12.1 Switch on sensor

1. Ensure that the flow sensor is connected correctly.
2. After connecting the power supply (initial start or after a reset) reset), the IVD 520 flow sensor switches on and performs a device initialization for
   approx. 2...3 seconds.

12.2 Zero point adjustment

The IVD 520 flow sensor measures the flow velocity (differential pressure principle) in the middle of the pipe.

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

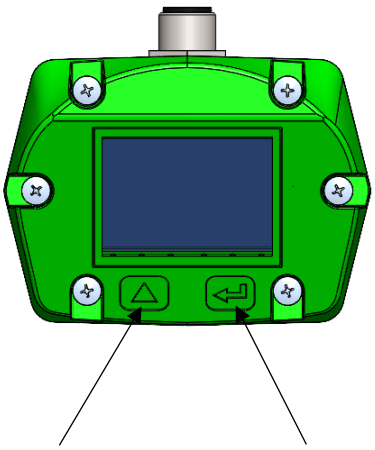
1. Apply system pressure to the sensor
2. Ensure that there is no flow.
3. Then start the zero point calibration on the sensor.→ Chapter 13 "Operation".
4. The system can then be put into operation.

RECOMMENDATION

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

13 Operation IVD 520

Note: Only for version with display



"Up" (△) "OK" (↵)

The VA 500 is operated using the two capacitive buttons Up ↘□) and Enter (□).

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.

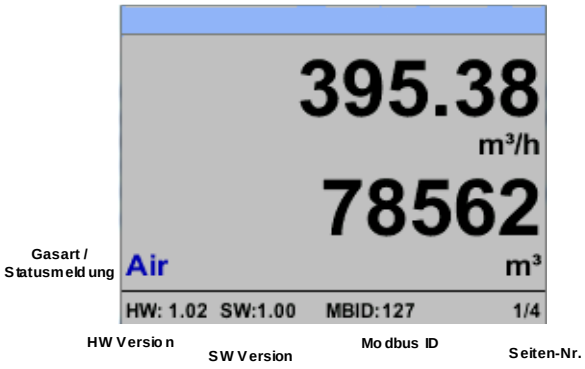
13.1 Main menu (Home)

13.1.1 Initialization

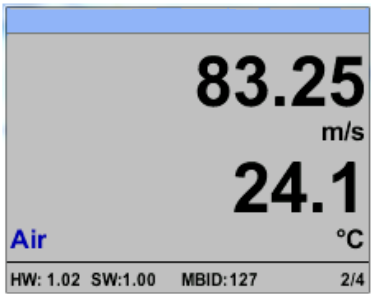
Flow sensor

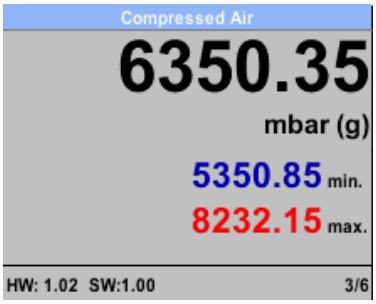
After switching on the IVD 520, initialization takes place, see right, followed by the main menu.

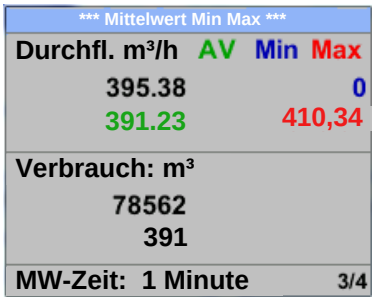
13.2 Main menu after switching on en

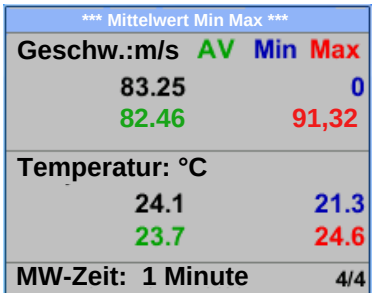


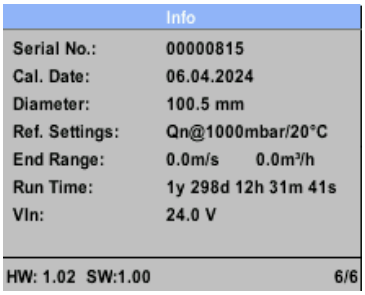
To switch to pages 2-6, press the " >" button











The MW time (averaging period) can be changed via *Sensor settings - Advanced - MW time.*

13.3 Settings menu

From the main menu, press **"OK"** to access the settings menu.
However, access to the settings menu is password protected.

Password on delivery: 0000 (4 x zero).

If necessary, it can be changed under *Basic settings password.*

To select a menu item and change values, press the ***">"*** button to confirm the menu item selection and confirm the values by pressing the ***"OK"*** button.

13.3.1 Sensor Settings

Settings→ Sensor Settings

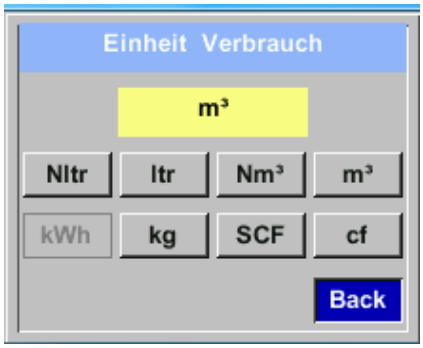
To make changes, first select a menu item with the ***">"*** button and then select with the ***"OK"*** button

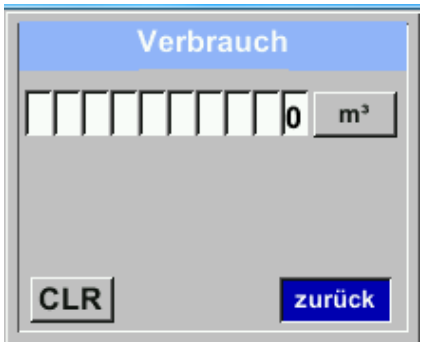
13.3.1.1 Input pipe inside diameter

Cannot be changed (locked) with IVD 520, as it is matched to the measuring section supplied with the corresponding pipe diameter.

13.3.1.2 Entering / changing the consumption meter reading

Settings→ Sensor.→ Consumption→ Units button





To make changes, e.g. to the unit, use the ***">"*** button to select the "Unit" keypad and then select with the ***"OK"*** button
Select the desired unit with the ***">"*** button and confirm / accept twice with the ***"OK"*** button.

Enter / change the consumption meter reading using the ***">"*** button to select the relevant numerical position and activate with the ***"OK"*** button.

Important!

The meter reading is reset to zero when 1000000000 m³ is reached.

13.3.1.3 Definition of units for consumption, flow, temperature and pressure

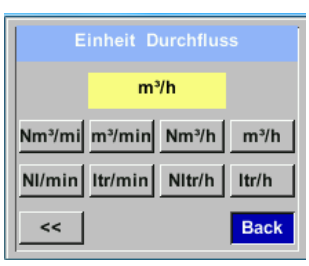
Settings→ Sensor→ Units

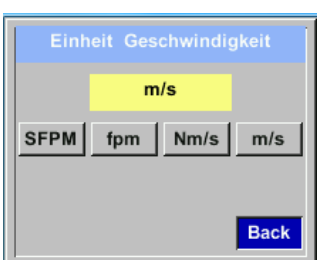
To change the unit for the respective measured value, use the ***">"*** button to select the keypad for the measured value and press the ***"OK"*** button to activate it.

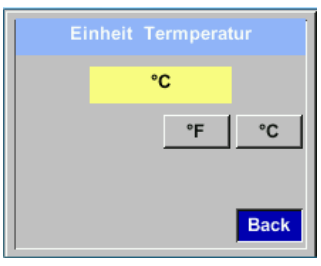
Select the measuring unit using the ***">"*** button

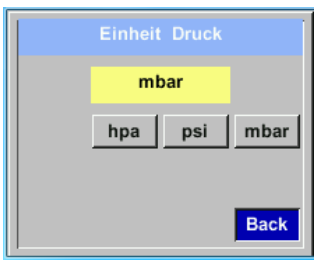
If the number of units cannot be displayed on a page, press the ***"<"*** button to go to the next page.

Accept the selection by pressing the ***"OK"***









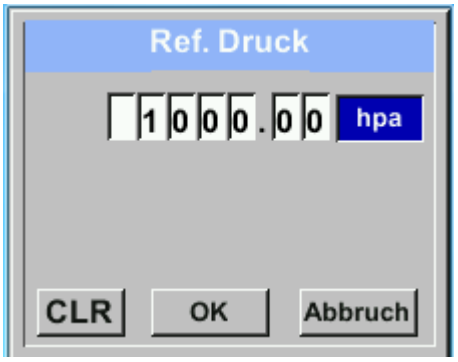
13.3.1.4 Setting the reference conditions

The desired measuring media reference conditions for pressure and temperature can be defined here, as well as times for the filter and averaging.

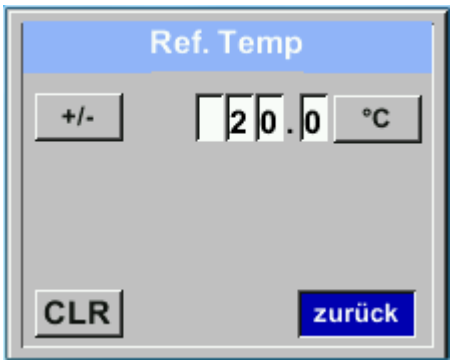
Note:

- The factory settings for reference temperature and reference pressure are 20°C and 1000hPa.
- All volume flow values (m³/h) and consumption values (m³) shown on the display are based on 20°C and 1000hPa (according to ISO 1217 intake condition).
- Alternatively, 0°C and 1013 hPa (= standard cubic meter) can be entered as a reference.
- **Never enter the operating pressure or operating temperature for reference conditions**

Settings*→ *Sensor*→ *Extended*→ *Reference standard*→ *Ref. pressure



Settings*→ *Sensor*→ *Extended*→ *Reference standard*→ *Ref. temp



To make changes, e.g. to the unit, the "Unit" keypad must be selected using the *"□"* button and then select with the *"OK"* button

Select the desired unit with the *"□"* button and confirm / accept twice with the *"OK"* button.

Enter / change the value using the *"□"* button to select the relevant numerical position and activate with the *"OK"* button.

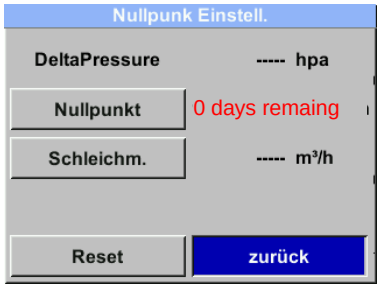
Press *"□"* to increase the value by 1.

Finish with *"OK"* and activate the next number position.

Complete the entry by pressing the *"OK"* button

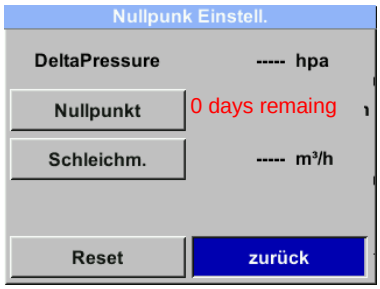
13.3.1.5 Setting zero point and creep suppression

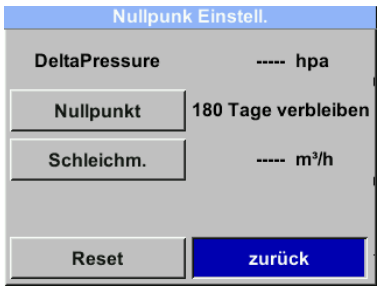
Settings→ Sensor→ Zero point



To make changes, first select a menu item with the *"□"* button and then select with the ***"OK"*** button

Settings→ Sensor→ Zero point→ Zero point





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".

Zero point calibration must be performed under system pressure and without flow .

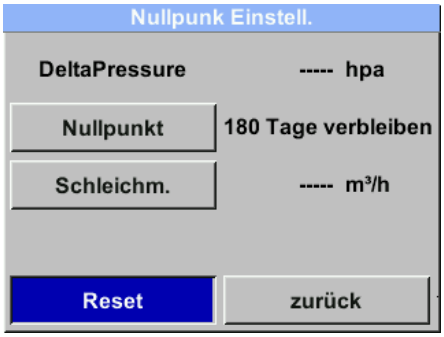
Settings→ Sensor→ Zero point→ Creep speed

Creeping flow suppression is used to display consumption values below the defined "LowFlow Cut off" value as 0 m³/h and also not to add them to the consumption meter reading.

Enter / change the value using the *"□"* button to select the relevant numerical position and activate with the *"OK"* button.

Press *"□"* to increase the value by 1.

Settings→ Sensor→ Zero point→ Reset



Selecting *"Reset"* resets the settings for *"Zero point"* or *"Creep rate*".

Select the menu item with the *"□"* button and then select with the *"OK"* button.

Exit the menu with *"Back".*

13.3.2 Modbus RTU

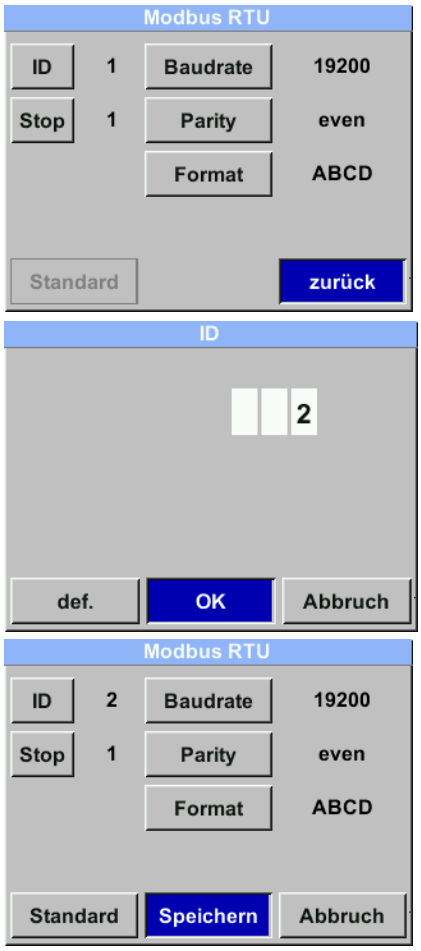
13.3.2.1 Setup

The IVD 520 flow sensor is equipped with an RS 485 interface (Modbus RTU).
Before commissioning the sensor, the communication parameters

- Modbus ID, baud rate, parity and stop bit

must be set to enable communication with the Modbus master.

Settings→ Modbus RTU



To make changes, e.g. to the sensor ID, use the ***">"*** button to select the ***"ID"*** field and then press the ***"OK"*** button.

Select the desired position with the ***">"*** button and activate with the ***"OK"*** button.

Change the values with the ***">"*** button, accept values with the "***OK"*** button.

Inputs for baud rate, stop bit and parity are analog.

It is possible to change the data format (word order) using the ***"Byte Order"*** button. Possible formats are ***"ABCD"*** (Big Endian) and ***"CDAB"*** (Middle Endian)

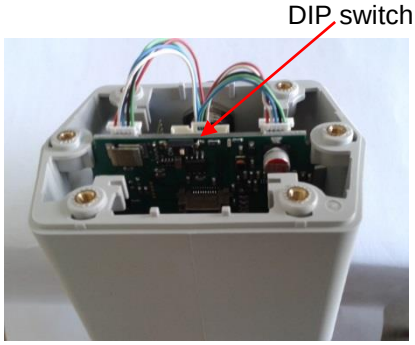
Save the changes using the ***"Save"*** button

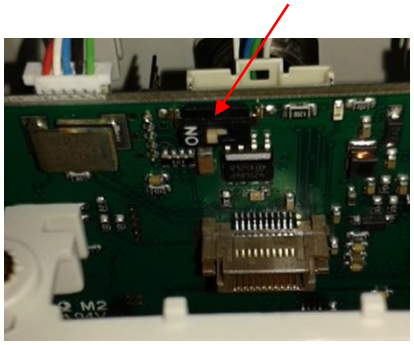
Default settings ex works:

Modbus ID:	1
Baud rate:	19200
Stop bit:	1
Parity:	even
Byte Order:	ABCD

Attention: If the sensor is used at the end of the Modbus system, termination is required. The sensors have an internally switchable termination. To do this, please loosen the 6 screws on the housing cover and set the internal DIP switch to "On" .

DIP switch





Alternatively, a 120R resistor can also be installed in the connector between pin 2 and pin 4. When reassembling, ensure that the housing seal is correctly seated, see also point 4.5.

13.3.3 Modbus TCP (optional)

13.3.3.1 Setup

The IVD 520 flow sensor is optionally equipped with a Modbus TCP interface (HW interface: M12 X-coded female connector).

With this option, the sensor supports the Modbus TCP protocol for communication with SCADA systems. The TCP port is set to 502 by default. The port can be changed on the sensor or using PC service software

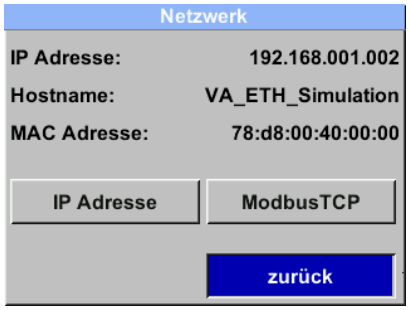
The Modbus device address (unit identifier) can be between 1-247.
The specification and description of the Modbus protocol can be found in download at: www.modbus.org.

Supported Modbus commands (functions):

	Command code	Description
Function code	3	(read holding register)
Function code	16	Write several registers)

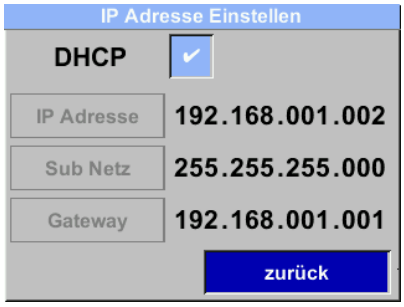
See also the VA 5xx Modbus RTU_TCP installation instructions in the current version.

Settings→ Network



13.3.3.1.1 Network settings DHCP

Settings→ Network→ IP Address



A connection, with or without *DHCP*, to a computer can be set up and established here.

Note:

With *DHCP* activated, the sensor can be automatically integrated into an existing network without manual configuration.

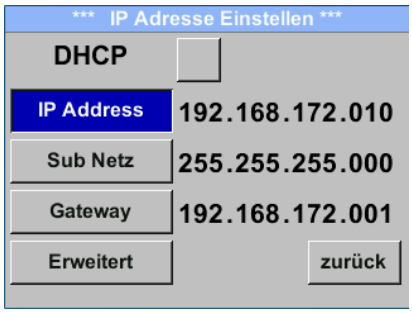
Accept the settings by clicking "*Save".*

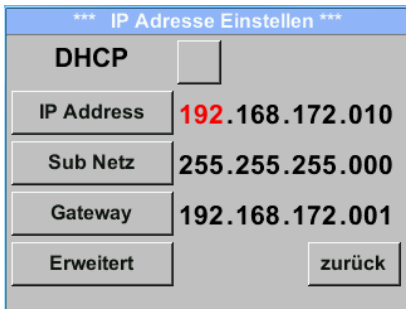
13.3.3.1.2 Network settings static IP

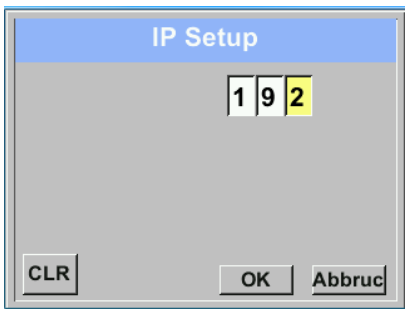
Settings→ Network→ IP address→ IP address

Settings→ Network→ IP address→ Sub network

Settings→ Network→ IP address→ Gateway







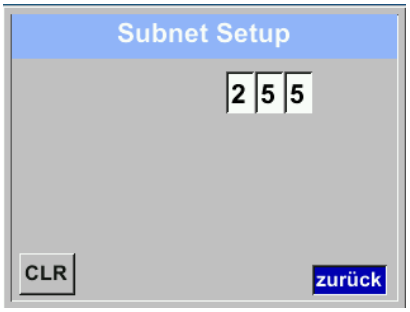
For manual (static) IP, the selection buttons ***"IP Address", "Subnet" and "Gateway"*** must be selected and activated with ***"OK"***.

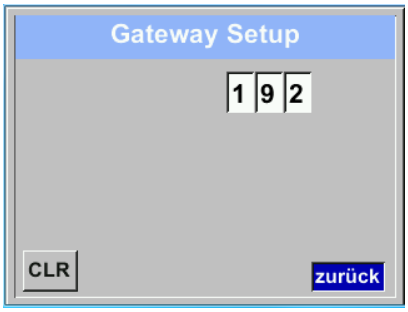
The first data field of the selection, in this case the IP address, is then highlighted (red).

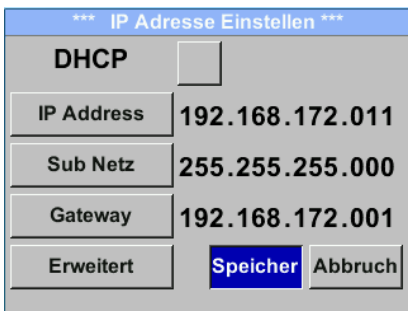
Confirm with ***"OK"*** to open the corresponding input menu.

Use ***">"*** to switch to the next data field.

Select the desired position with the ***">"*** button and activate with the ***"OK"*** button.



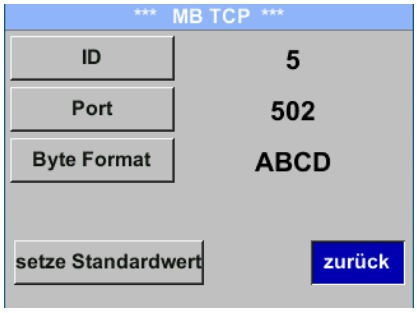




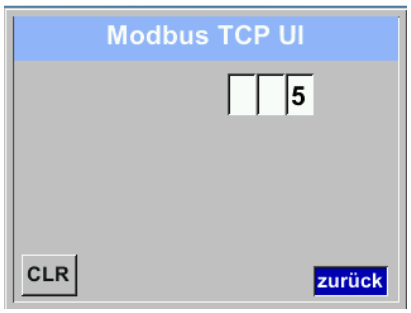
Accept the settings by clicking "*Save".*

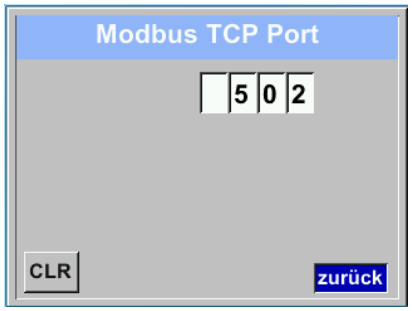
13.3.3.1.3 Modbus TCP settings

Settings→ Network cl. → MODBUS TCP



Settings→ Network. →MODBUS TCP→ ID
Settings→ Network→MODBUS TCP→ Port





To make changes, e.g. to the sensor ID, use the ***">"*** button to select the ***"ID"*** field and then press the ***"OK"*** button.

Select the desired position with the ***">"*** button and activate with the ***"OK"*** button.

Change the values with the ***">"*** button, accept values with the "***OK"*** button.

Port entries are made in the same way.

It is possible to change the data format (word order) using the ***"Byte Format"*** button. Possible formats are ***"ABCD"*** (Big Endian) and ***"CDAB"*** (Middle Endian)

13.3.3.2 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	Baud rate	4	R/W	0= 1200 1 = 2400 2 = 4800 3 = 9600 4 = 19200 5 = 38400 6 = 57600 7 = 115200
2003	2002	2	UInt16	Parity	1	R/W	0 = none 1 = even 2 = odd
2004	2003	2	UInt16	Number of stop bits		R/W	0 = 1 Stop bit 1 = 2 Stop bit
2005	2004	2	UInt16	Word Order	0xABCD	R/W	0xABCD = Big Endian 0xCDAB = Middle Endian
2069	2068	4	Float	Pressure Type (Abs/ Rel)		R/W	0 = Relative 1 = Absolute

13.3.3.3 Values register (1001 ...1500)

Modbus register	Register address	No.of Byte	Data Type	Description	Default Setting	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	

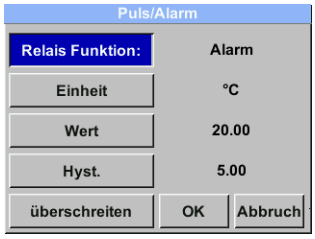
Modbus register	Register address	No.of Byte	Data Type	Description	Default	Read Write	Unit /Comment
1269	1268	4	UInt32	Consumption m³ before comma	x	R	
1275	1274	4	UInt32	Consumption Nm³ before comma	x	R	
1281	1280	4	UInt32	Consumption ltr before comma	x	R	
1287	1286	4	UInt32	Consumption Nltr before comma	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			
1475	1474	4	Float	System pressure mBar		R	Value depending on register "Pressure type" setting
1481	1480	4	Float	System pressure bar		R	
1487	1486	4	Float	System pressure PSIr		R	
1057	1056	4	Float	Delta P		R	Unit as defined in sensor / display

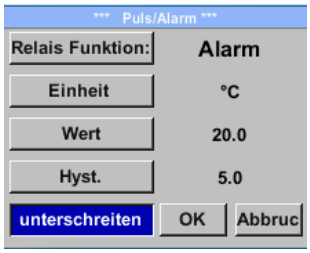
Note:

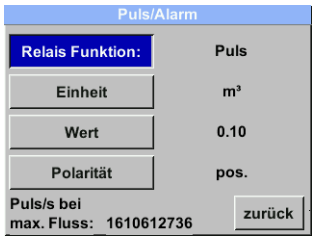
- For DS400 / DS 500 / hand-held devices - Modbus sensor data type "Data type R4-32" corresponds to "Data type float"
- For additional/further Modbus values, see VA5xx_Modbus_RTU_TCP installation in the current version.

13.3.4 Pulse /Alarm

Settings→ Pulse/ Alarm







The galvanically isolated output can be defined as a pulse or alarm output.
Change by selecting the "***Relay function"*** button with the ***"□"*** button and changing with the ***"OK"*** button.

The following units can be selected for the alarm output: 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 the ***"exceed***" or ***"fall below"*** button defines when the alarm is triggered.
Exceeding: Exceeding value
Falling below: Falling below value

The following *"units"* kg, cf, ltr and m³ can be selected for pulse output.
The pulse value can be defined under "***Value"***. The smallest pulse value results from the maximum measurable consumption and the maximum pulse output

13.3.4.1 Pulse output

A maximum of 50 pulses per second can be output.
The output of the pulses 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

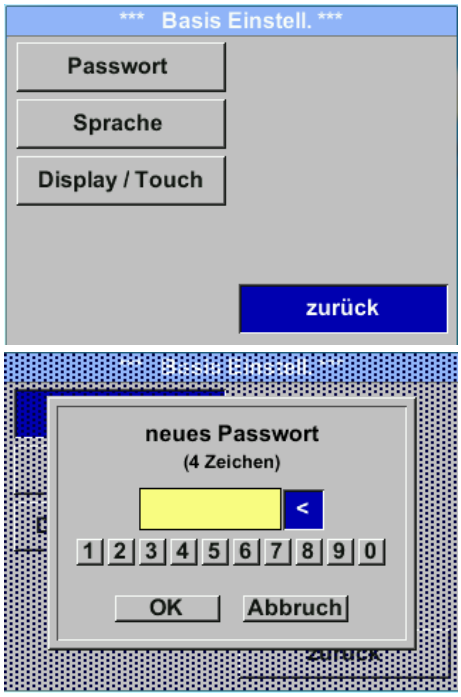
Table 1 Maximum flow rates for pulse output

Entries of pulse values that do not allow a display for the measuring range end value are not permitted. Entries are discarded and an error message is displayed.

13.3.5 User settings.

13.3.5.1 password

Settings→ User→ Password



To make changes, first select a menu item with the ***">"*** button and then select with the ***"OK"*** button

A/new password can be assigned at any time. This always consists of 4 numbers which are selected with the ***">"*** button and then confirmed with the ***"OK"*** button.
Press the ***"<"*** button to delete the last digit.

Password must be entered twice.

Final acceptance with the ***"OK"*** button

13.3.5.2 Language

Settings→ Users. →Language

There are currently 4 integrated languages that can be selected using the ***">"*** button.

Activate the language by confirming with the ***"OK"*** button.
Exit the menu by selecting ***"Back"*** and confirming with the ***"OK"*** button.

13.3.5.3 Display / Touch

Settings→ User. → Display / Touch

The display background brightness can be changed using the ***"-"*** and ***"+"*** buttons. The brightness value is shown in the ***"Brightness"*** diagram.

A display dimming is set by activating ***"Dim after"*** and entering a time.

The display can be rotated by 180° using the ***"Rotate LCD" function***

If ***"Buttons locked"*** is activated, operation of the sensor is prevented/locked.

The keypad can only be unlocked/unlocked

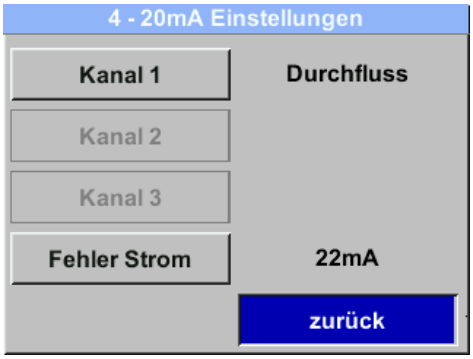
13.3.6 Extended

Settings→ Advanced

The ***"Factory reset"*** button can be used to reset the sensor to the factory settings.

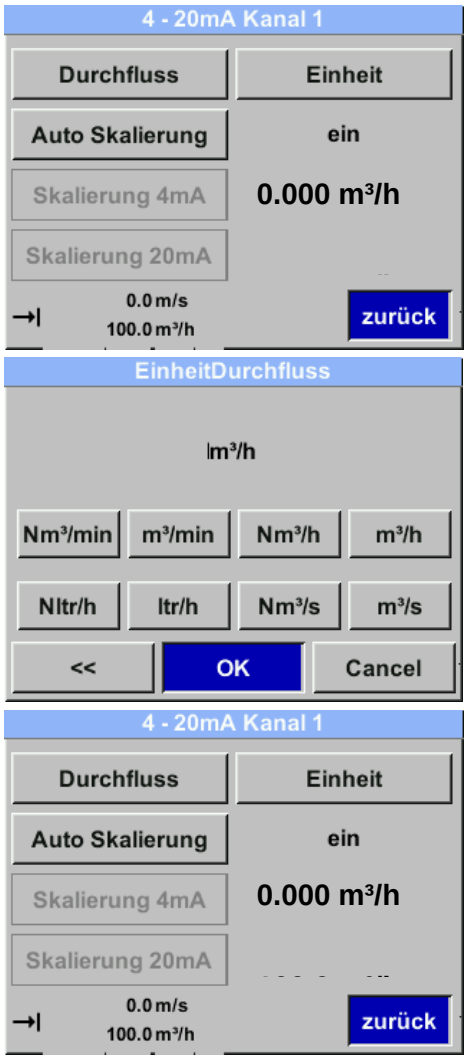
13.3.7 4 -20mA

Settings→ 4-20mA



To make changes, first select a menu item with the ***">"*** button and then select with the ***"OK"*** button.

Settings 4-20mA→ → Channel 1



The 4-20 mA analog output of the IVD 520 sensor can be set individually.

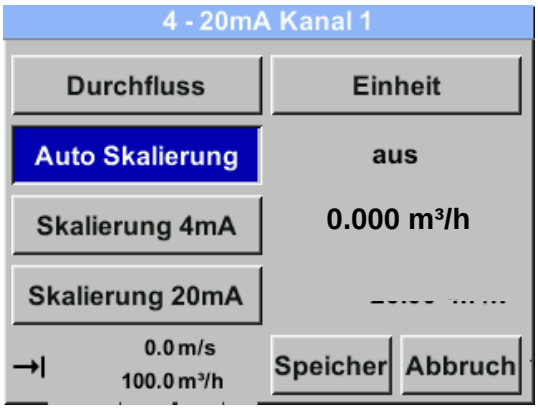
It is possible to select the measured values ***"Temperature"***, ***"Velocity"*** ***"Flow rate"*** and assign them to the channel.

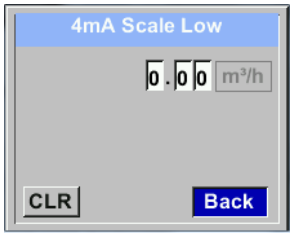
To make changes, select the menu item with the ***">"*** button and then select the corresponding measured variable with the ***"OK"*** button or deactivate the 4-20mA output with ***"unused"***.

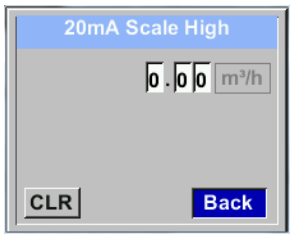
The corresponding units can be selected for the selected measured variable under ***"Unit"***.
Select with the ***">"*** button and then select the corresponding measured variable with the ***"OK"*** button.

Here is an example for the flow rate, the procedure for flow velocity and temperature

Settings 4-20mA→→Channel 1→Auto scaling







The 4-20mA can be scaled automatically with "Auto scaling = on" or manually with "Auto scaling = off". Use the **">"** button to select the "Auto scaling" display and then use the ***"OK"*** button to select the desired scaling method.

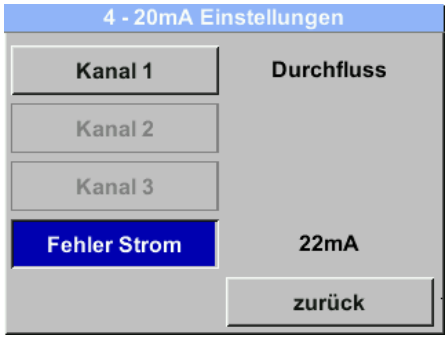
"Scaling 4mA" and "Scaling 20mA" allow you to define the desired scaling, the condition is ***Auto scaling =off***.

Use the **">"** button to select the "Scaling 4mA" or "Scaling 20mA" display and then select with the ***"OK"*** button.

Input is as described above, complete input can be deleted using ***"CLR"***.

If ***"Auto scaling"*** is set, the scaling is calculated

Settings→4 -20mA→Error current



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

- 2 mA Sensor error / system error
- 22 mA Sensor error / system error
- None Output to Namur (3.8mA - 20.5 mA)

< 4mA to 3.8 mA measuring range undercut

>20mA to 20.5 mA Measuring range exceeded

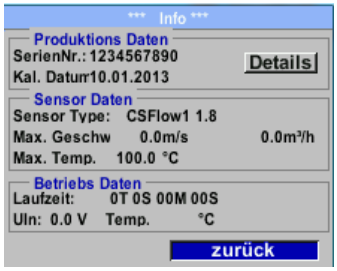
To make changes, first select a menu item "Error Current" with the ***">"*** button and then select the desired mode with the ***"OK"*** button

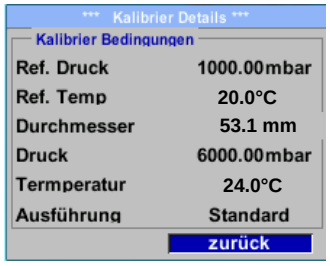
Remark:

Default setting IVD 520 for analog output is Channel 1:0...max. flow rate [m³/h]

13.3.8 IVD 520 Info

***Settings*→ Info**





Brief description of the sensor data including the calibration data.

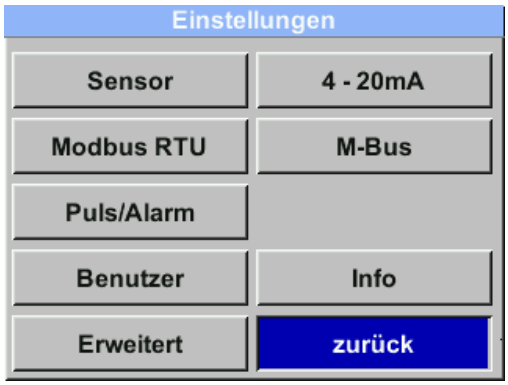
The calibration conditions can also be found under ***Details***.

13.4 M-Bus

13.4.1 Change communication values

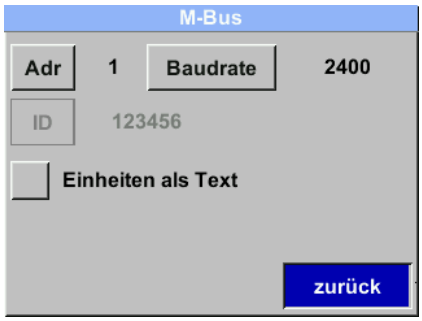
The communication values M-Bus address and the baud rate can be changed on the sensor (with display) and with the PC service software (order no. 0554 2007).

Settings → M-Bus



Settings → M-Bus → Adr

Possible input values are 1-247
(delivery value = 1)



Use ***">"*** and the ***"OK"*** button to select.

Enter / change the value using the ***">"*** button to select the relevant numerical position and activate with the ***"OK"*** button.

Press ***">"*** to increase the value by 1. Finish with ***"OK***" and activate the next number position.

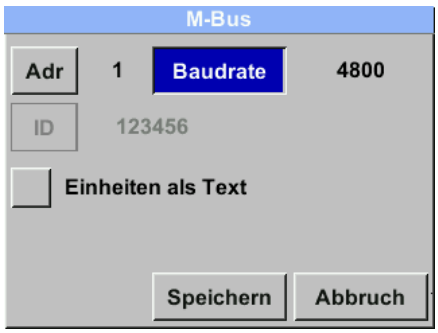
Press "***CLR"*** to delete the entire entry.

Accept the entries by ***clicking "Save***", discard the changes by clicking ***"Cancel".***

Press ***"Back"*** to switch to the settings menu.

Settings → M-Bus → Baud rate

Selection values are 2400, 4800 and 9600 baud (delivery value = 2400).



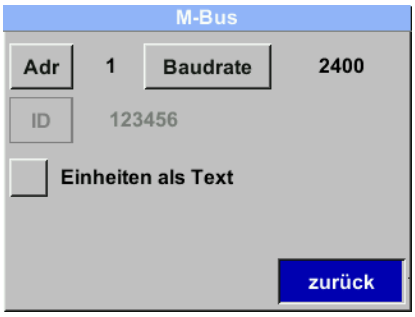
Use ***">"*** to select the "Baud rate" button and then select with the ***"OK"*** button.

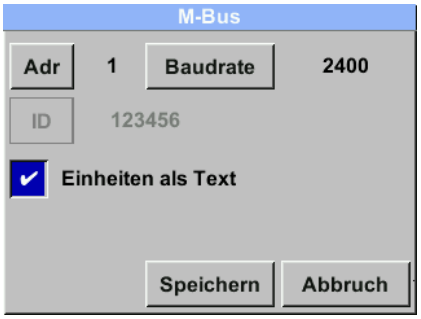
Enter / change the value using the ***"OK"*** button

Accept the entries by ***clicking "Save***", discard the changes by clicking ***"Cancel".***

Press ***"Back"*** to switch to the settings menu.

13.4.2 Coding VIF (Value Information Field)





The sensor offers 2 options for coding the Value Information Field (VIF).

- Primary VIF (The units and multipliers correspond to M-Bus specification chapter 8.4.3
- Plain text VIF (units are transmitted as ASCCII characters, so units not included in M-Bus specification chapter 8.4.3 are also possible

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

13.4.3 Basic communication settings ex works

Primary address*: 1
ID: Serial number of the sensor
Baud rate*: 2400
Medium*: depending on medium (gas or compressed air)
Manufacturer identification: CSI
VIF coding: Primary VIF

Both addresses, Primary Address and ID, can be searched for automatically in the M-Bus system.

13.4.4 Transmission values

Value 1 with [unit]*: Consumption [m³]
Value 2 with [unit]*: Flow rate [m³/h]
Value 3 with [unit]*: Gas temperature [°C]
Value 4 with [unit]*: System pressure [bar]

***All** values can be changed / preset in production or changed / set on site using the CS Service Software (order no. 0554 2007)

14 Error messages

14.1 Error messages

- **Low Voltage**

If the supply voltage is less than 11V, the warning message ***"Low Voltage"*** is displayed.

This means that the sensor can no longer work / measure properly and therefore no measured values for flow rate, consumption and speed are available.

- **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**

For media temperatures outside the specified temperature range, the

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

- **Not calibrated**

If the gas is selected incorrectly in the sensor settings, the error message **"not calibrated"** is displayed, as the sensor is calibrated specifically for your application.

- **Pressure Error**

In the event of a faulty signal or damage to the internal pressure sensor, the error message **"Pressure Error"** is displayed.

- **deltaPressure Error**

In the event of a faulty signal or damage to the internal differential pressure sensor, the error message **"deltaPressure Error"** is displayed.

Status messages

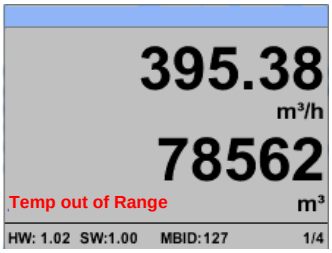
- **dP Range**

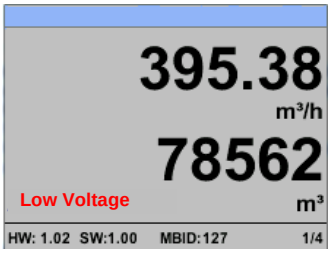
The selected measuring range has been exceeded.

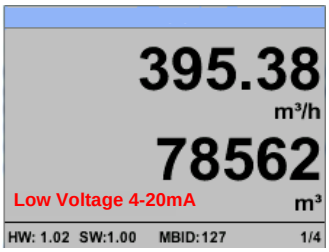
- **next cal. elapsed**

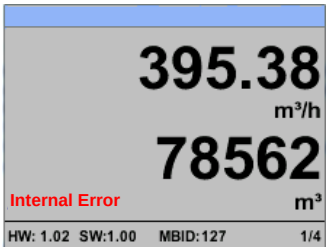
The period for the next calibration has expired.

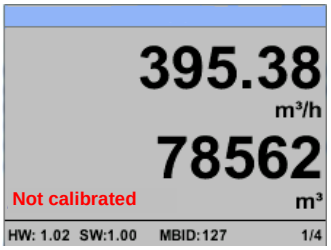
Error messages:

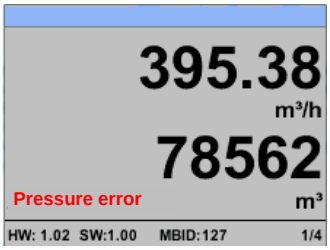


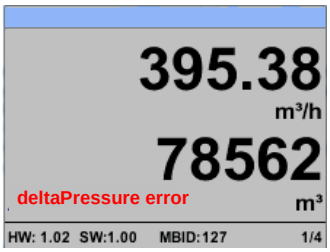




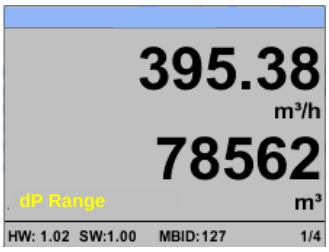


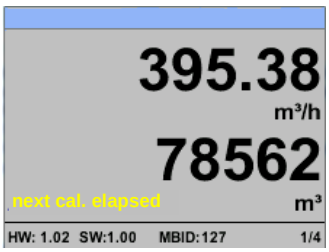






Status messages:





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