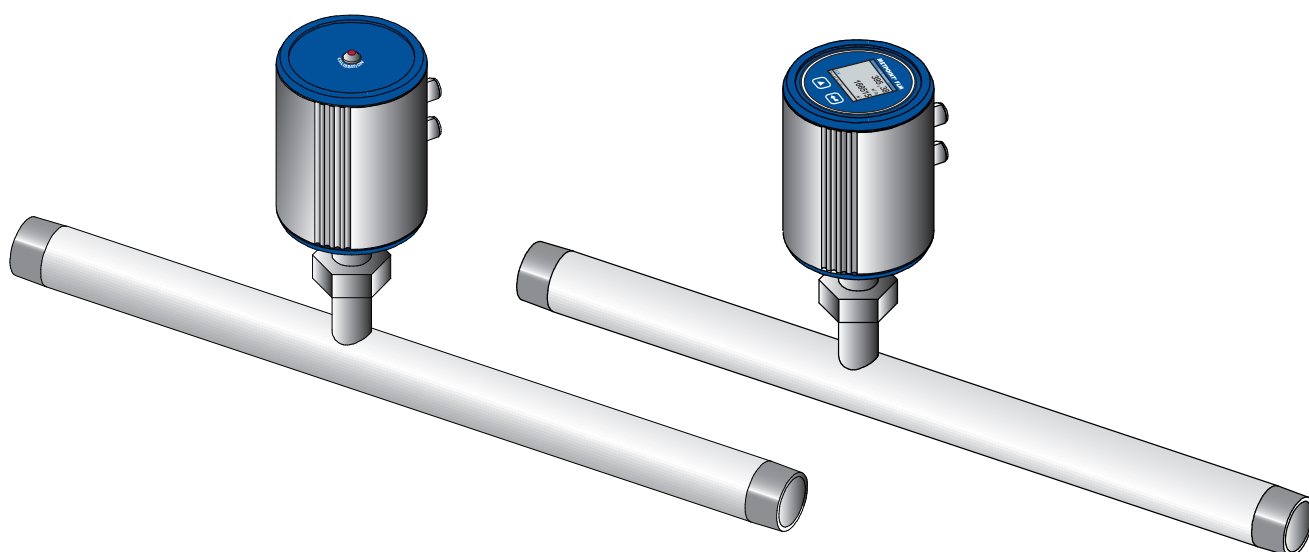


Installation and operating manual

Thermal flow meter

METPOINT® FLM SF13

FLMSF13LD8 | FLMSF13DD8 | FLMSF13LD15 | FLMSF13DD15 | FLMSF13LD20 | FLMSF13DD20 | FLMSF13LD25 |
FLMSF13DD25 | FLMSF13LD32 | FLMSF13DD32 | FLMSF13LD40 | FLMSF13DD40 | FLMSF13LD50 | FLMSF13DD50



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1. Safety information

1.1. Pictograms and symbols

1.1.1. In this documentation



General instructions



Observe installation and operating instructions



General hazard symbol (danger, warning, caution)



General hazard symbol (danger, warning, caution) relating to mains voltage and powered machine parts

1.1.2. On the device



General instructions



General hazard symbol (danger, warning, caution)



Observe installation and operating instructions (on type plate)



1.2. Signal words




| | |
|---------------|--|
| DANGER | Imminent danger Consequences of non-compliance: serious or even fatal injury |
|---------------|--|

| | |
|----------------|---|
| WARNING | Potential danger Consequences of non-compliance: serious or even fatal injury |
|----------------|---|

| | |
|----------------|--|
| CAUTION | Imminent danger Consequences of non-compliance: injury and/or damage to property |
|----------------|--|

| | |
|---------------|---|
| NOTICE | Additional notes, tips and hints Consequences of non-compliance: inefficient operation, extra maintenance; no risk to persons |
|---------------|---|

1.3. Safety instructions


| | |
|---|---|
| DANGER | Escaping compressed gas |
|  | <p>Risk of serious or even fatal injury from contact with escaping compressed gas or from unsecured plant components.</p> <ul style="list-style-type: none"> • Before carrying out any assembly, installation or maintenance work, depressurise the system. All above work must be carried out by authorised specialist technical personnel¹. • Use only pressure-resistant installation materials and suitable tools that are in proper working order. • Before pressurising the system, check all unit parts and repair them, if necessary. Open valves slowly to prevent pressure blows during operation. • Make sure that no persons can be injured or objects can be damaged by condensate or escaping compressed gas. • Protect the device parts against vibration and impact. |
| DANGER | Mains voltage |
|  | <p>Risk of serious or even fatal injury from electric shock when coming into contact with non-insulated, powered components.</p> <ul style="list-style-type: none"> • For the electrical installation of the device, adhere to all applicable regulations (e.g. VDE 0100 / IEC 60364). • Before carrying out any maintenance work, de-energize the system. • All electrical work must be carried out by authorised specialist technical personnel¹. • The permissible operating voltage is printed on the type plate and must be strictly adhered to. • All components of the electrical installation on site must be approved and/or bear the CE mark. • A reliably accessible circuit breaker (e.g. power plug or switch) that shuts off all conductors must be installed close to the unit. |
| WARNING | Operation of device outside limit range |
|  | <p>If the specified limits are exceeded, there is a risk of device malfunction, potentially resulting in injury and/or damage to property.</p> <ul style="list-style-type: none"> • The device must only be operated for the intended purpose and within the permissible limits specified on the type plate and in the technical data. • From 10 bar, install a high-pressure protection element for safe installation and removal of the device. • Do not operate the device in connection with flammable gases. • Strictly adhere to the prescribed operating times and maintenance intervals. • Observe the prescribed storage and transport conditions. • Prevent condensation on the sensor element. Ensure that the air fed through the device is free of droplets. |

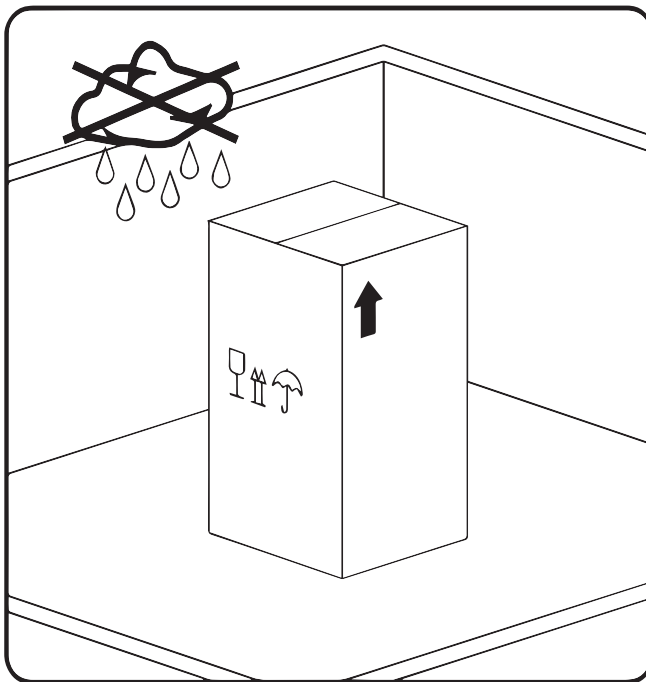
¹Specialist technical personnel

Specialist technical personnel are persons who, due to their professional qualification and knowledge in the field of measuring, control and pneumatic technology, and their knowledge of the applicable statutory regulations, guidelines and standards are in a position to foresee potential dangers in relation to the use of the device and are qualified to perform the tasks described in this manual. Special operating conditions (e.g. aggressive media) require additional knowledge.

1.4. Transport and storage

Despite our best efforts regarding packaging, etc., the device might be damaged during transport. Upon delivery, please remove all packaging material and inspect the device for visible damage. If you detect such damage, immediately notify the carrier company and BEKO TECHNOLOGIES GMBH or one of its agents.



| | |
|---|--|
| CAUTION | Damage caused during transport or storage |
|  | <p>Incorrect transport or storage, or the use of unsuitable lifting equipment might cause damage to the device.</p> <ul style="list-style-type: none"> • The device must only be transported and stored by authorised and suitably trained technical personnel. • If you detect any damage, do not start the device. • Adhere to the permissible storage and transport temperatures (see technical data). • Protect the device against direct sunlight and heat radiation. |



The device must be stored in the original packaging. Seal the packaging and store it in a dry and frost-free room. Ensure that the storage temperature does not exceed the limits specified on the type plate.

Even when packaged, take suitable measures to protect the device against the elements.

While in storage, secure the device so that it cannot topple over or fall, and protect it against vibration.

| | |
|--|--|
| NOTICE | Recycling of packaging material |
|   | <ul style="list-style-type: none"> • The packaging material is recyclable. Dispose of the packaging material according to the applicable statutory regulations. |

1.5. Intended use

The METPOINT® FLM is a thermal flow meter for the measurement of volume flow, consumption and flow velocity. By default, the device is configured for the measurement of volume flow in m³/h, consumption in m³ and velocity in m/s.

- The METPOINT® FLM is primarily used in compressed air systems. On request, the sensor can be programmed by **BEKO TECHNOLOGIES GmbH** for the measurement of other gases: nitrogen
- The device is not suitable for operation in potentially explosive or aggressive atmospheres.
- Protect the device against direct sunlight and heat radiation.

Operate the METPOINT® FLM only for the intended purpose and within the limit range specified in the technical data. Do not operate the device with any media (fluids, gas/vapour mixtures) other than those listed above. Any other use of the device is deemed improper and poses a risk to persons, property and the environment.

1.6. Warranty and liability

All warranty shall be voided, if the METPOINT® FLM is used improperly, for a purpose other than the intended or is operated outside the limits specified in the technical data. In such cases, the manufacturer shall also reject any liability for damages.



Improper operation includes:

- Incorrect installation, commissioning or operation; insufficient maintenance
- Operation with defective components
- Non-compliance with the instructions in this document, in particular the safety instructions
- Modification of the device
- Non-compliance with the prescribed maintenance intervals
- Use of third-party spare parts that have not been approved by the manufacturer

2. Product information

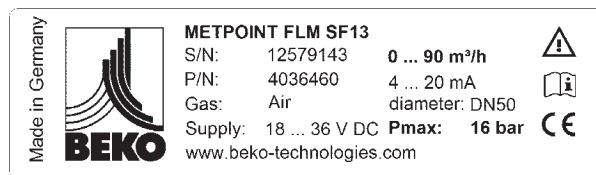
2.1. Scope of delivery

The table below shows the scope of delivery of the METPOINT® FLM.


| Designation | Picture |
|---------------------------|--|
| Calibration certificate |  |
| Connecting cable (5-wire) |  |

2.2. Type plate

The type plate is attached to the device housing. It contains all relevant technical data of the METPOINT® FLM. Please have these details to hand when contacting the manufacturer or supplier:

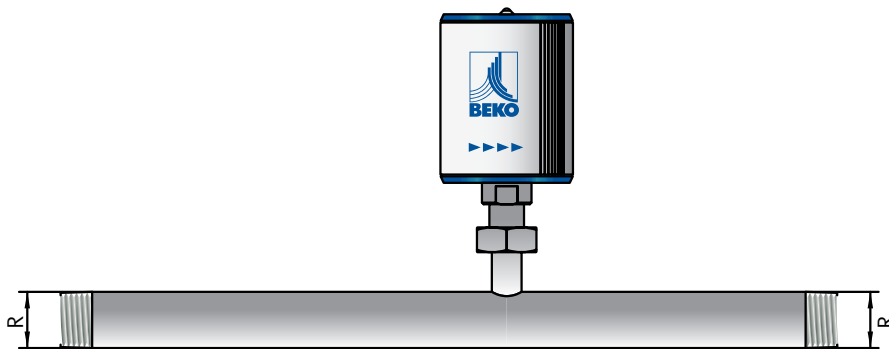
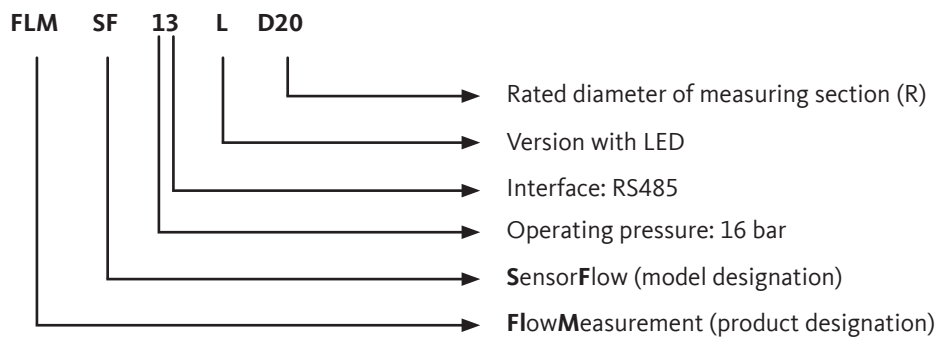


| Designation | Description |
|------------------------------|-------------------------------------|
| METPOINT® FLM SF13 | Type designation |
| S/N: 12579143 | Serial number |
| P/N: 4036460 | Product number |
| Gas: air | Medium |
| Supply: 18 ... 36 VDC | Power supply rating |
| 0 ... 90 m³/h | Min./max. measuring range |
| 4 ... 20 mA | Min./max. current output |
| Diameter: DN50 | Rated diameter of measuring section |
| Pmax: 16 bar | Max. permissible operating pressure |

| NOTICE | Handling of type plate |
|---|---|
|  | Do not remove or cover the type plate, and protect it against damage. For more information regarding the symbols printed on the type plate, see „Pictograms and symbols“ auf Seite 4. |

2.3. Product overview and description

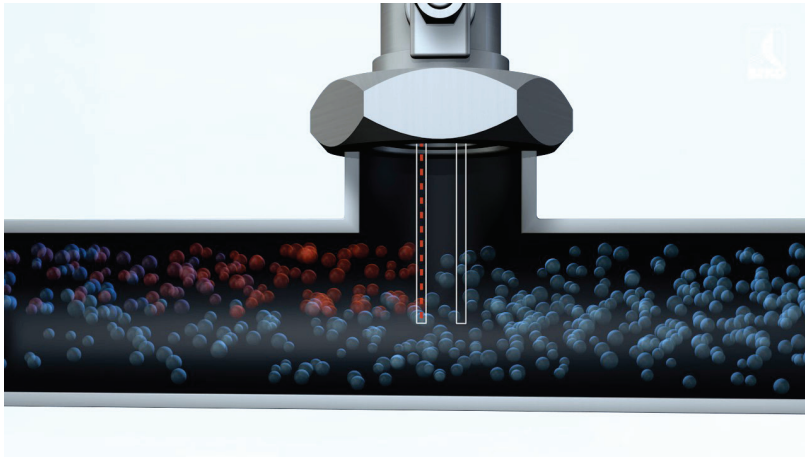
2.3.1. Identification based on product code



2.3.2. Product description

The METPOINT® FLM thermal flow meter measures the volume flow, which forms the basis for intelligent energy management. It can be used to identify potential savings, overloads and weak points in a system to improve its efficiency. By measuring the actual flow to the various production units, operators are in a position to make decisions based on facts. The METPOINT® FLM also indicates whether there are any leaks in their system. The METPOINT® FLM thus provides all the information operators need to correctly dimension and configure their system and system components for improved efficiency. The device is equipped with a Modbus RTU(RS485) interface, a 4 ... 20 mA current output, a galvanically isolated pulse output and an optional MBus interface.

2.3.3. Operating principle

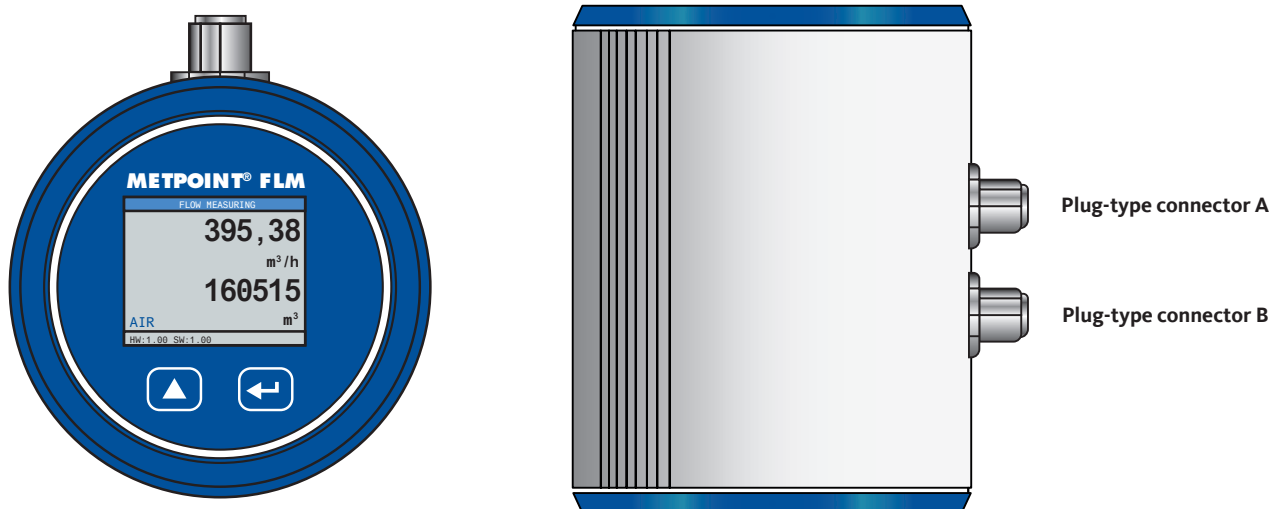



Two temperature sensors are installed in series in the direction of flow. The first temperature sensor measures the current process temperature, while the second sensor is electrically heated to a temperature that is exactly 40 K above the temperature measured by the first sensor. As the volume flow increases, the sensors would normally cool, but the electric heater of the second sensor prevents such a temperature drop.

The electric energy required to maintain the temperature difference is directly proportional to the volume flow. This energy consumption of the heater is converted into the relevant flow measurements. Taking into account the inside diameter of the pipe, the METPOINT® FLM determines the exact mass flow.

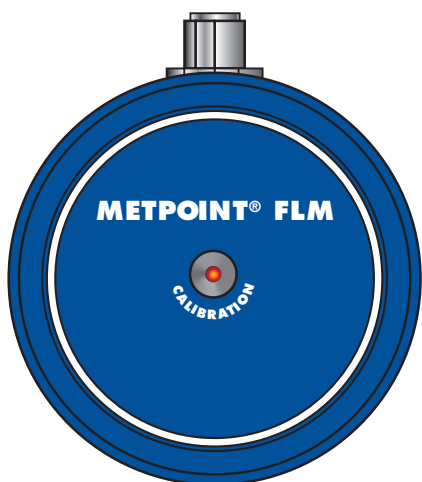
2.4. Control and display elements

2.4.1. Version with display



| NOTICE | Additional information |
|--|---|
|  | For more information regarding the operation of the device, see „Configuration and operation“ auf Seite 24. |

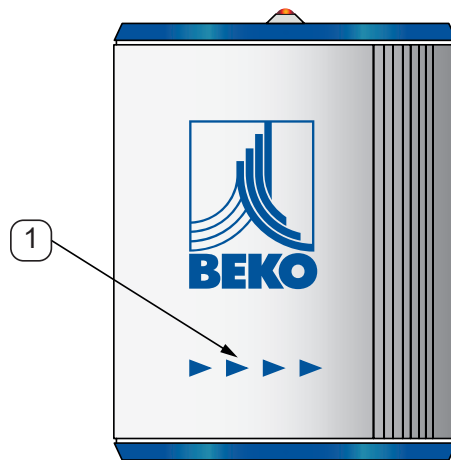
2.4.2. Version with LED




The METPOINT® FLM features a LED calibration indicator mounted at the top of the housing. After 15 months, the LED begins to flash, indicating that the device needs to be calibrated. The flashing LED does not have any effect on the measuring process, and the device continues to provide accurate measuring signals. On request, the calibration interval can be adjusted at the factory.

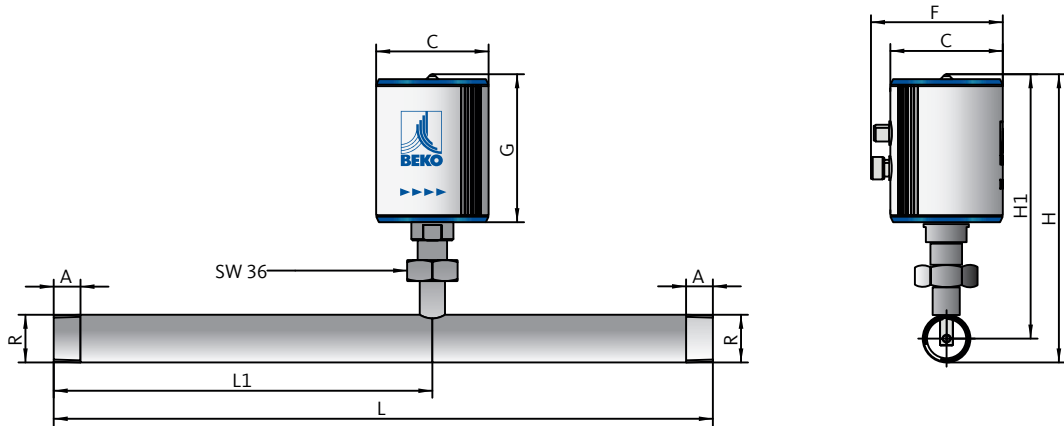
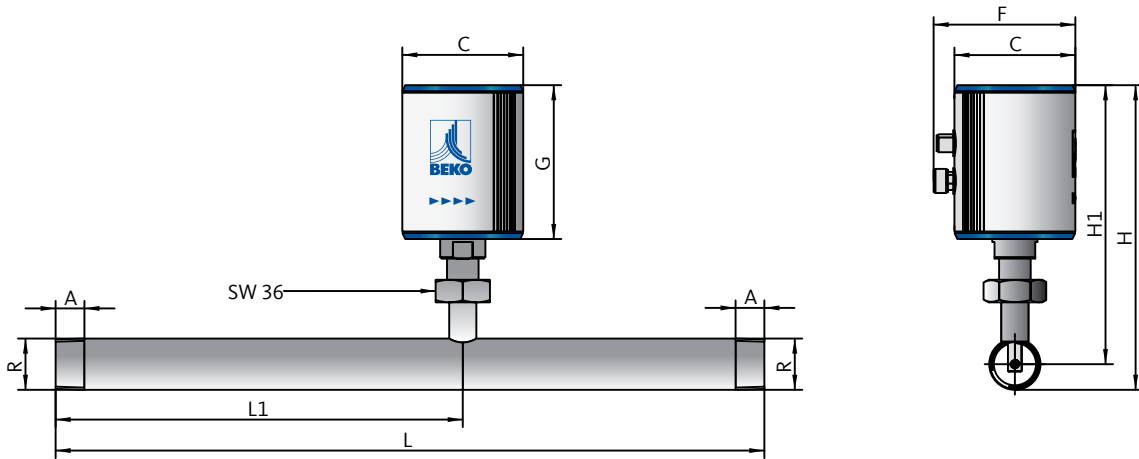
2.4.3. Direction of flow

The direction of flow is indicated by the arrows (1) on the housing of the METPOINT® FLM and on the sensor tube.



| NOTICE | Additional information |
|--|---|
|  | If necessary, turn the housing (e.g. to change the direction of flow through the device). For more information, see „Turning housing“ auf Seite 17. |

2.5. Dimensions



| Dimensions | | |
|------------|----------------------|------------------|
| | Version with display | Version with LED |
| A | G ½" (ISO 228/1) | |
| C (mm) | 80 | |
| F (mm) | 94 | |
| G (mm) | 102 | 105.5 |

| Measuring section dimensions | | | | | | | |
|------------------------------|-------|-------|-------|-------|-------|-------|-------|
| | DN8 | DN15 | DN20 | DN25 | DN32 | DN40 | DN50 |
| R | R¼" | R½" | R¾" | R1" | R1¼" | R1½" | R2" |
| H1 (mm) | 186.7 | 186.7 | 186.7 | 186.7 | 186.7 | 186.7 | 186.7 |
| H (mm) | 193.6 | 197.4 | 200.2 | 203.5 | 207.9 | 210.9 | 216.9 |
| L1 (mm) | 137 | 210 | 275 | 275 | 275 | 275 | 275 |
| L (mm) | 194 | 300 | 475 | 475 | 475 | 475 | 475 |

2.6. Technical data

| Technical data | | |
|-------------------------|---|------------------------------|
| SF13 | | |
| Max. operating pressure | 16 bar | |
| Measuring technique | Calorimetric | |
| Operating temperature | Sensor tube and fittings: -30 ... +140 °C Housing: -30 ... +80 °C | |
| Measured parameters | m ³ /h (factory settings) On the display version, the following units can be chosen: m ³ /min, l/min, l/s, ft/min, cfm, m/s, kg/min, kg/s | |
| Sensor | Pt45, Pt1000 | |
| Media | Compressed air, nitrogen | |
| Humidity of medium | max. 90 % rH (no droplets) | |
| Power supply | 18 ... 36 VDC | |
| Power consumption | max. 5 W | |
| Digital output | RS485 (ModBus RTU) | |
| Current output | 4 ... 20 mA (see table below) (max. resistance < 500 Ω) | |
| | Designation | Current output |
| | Measuring section DN8 (R¼") | 0 ... 90 l/min |
| | Measuring section DN15 (R½") | 0 ... 90 m ³ /h |
| | Measuring section DN20 (R¾") | 0 ... 170 m ³ /h |
| | Measuring section DN25 (R1") | 0 ... 290 m ³ /h |
| | Measuring section DN32 (R1¼") | 0 ... 530 m ³ /h |
| | Measuring section DN40 (R1½") | 0 ... 730 m ³ /h |
| | Measuring section DN50 (R2") | 0 ... 1195 m ³ /h |
| Pulse output | Floating switch contact Passive: max. 48 VDC 150 mA 1 pulse per m ³ or per litre Unit adjustable at display | |
| Accuracy | ± 1.5 % of measured value ± 0.3 % of final value | |
| Display/indicator | Display: TFT 1.8" (resolution: 220 x 167) or service LED | |
| Screw fitting | G½ (ISO 228/1) | |
| Material | Sensor tube and fittings: 1.4301 stainless steel Housing: Powder-coated aluminium Measuring section: 1.4404 (DIN EN 1092-1) | |

Reference conditions according to DIN 1945 / ISO 1217

+20 °C and 1000 mbar; other reference values can be set through the display or service functions.

2.7. Measuring ranges

2.7.1. For air

| Pipe size | Pipe inside \varnothing | Rated diameter | SF13 | Consumption |
|-----------|---------------------------|----------------|-----------------------------|------------------|
| Inch | mm | | Measuring range from ... to | Default settings |
| ¼ | 8.5 | DN8 | 0.8 ... 90 l/min | l |
| ½ | 16.1 | DN15 | 0.2 ... 90 m³/h | m³ |
| ¾ | 21.7 | DN20 | 0.3 ... 170 m³/h | m³ |
| 1 | 27.3 | DN25 | 0.5 ... 290 m³/h | m³ |
| 1¼ | 36.8 | DN32 | 0.7 ... 530 m³/h | m³ |
| 1½ | 41.8 | DN40 | 1.0 ... 730 m³/h | m³ |
| 2 | 53.1 | DN50 | 2.0 ... 1195 m³/h | m³ |


Reference standard DIN 1945 / ISO 1217 (20 °C, 1000 mbar) and compressed air

2.7.2. For other gases

| | ¼" | ½" | ¾" | 1" | 1¼" | 1½" | 2" | 2½" | 3" |
|--|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| | Current output 20 mA | Current output 20 mA | Current output 20 mA | Current output 20 mA | Current output 20 mA | Current output 20 mA | Current output 20 mA | Current output 20 mA | Current output 20 mA |
| | [l/min] | [m³/h] | [m³/h] | [m³/h] | [m³/h] | [m³/h] | [m³/h] | [m³/h] | [m³/h] |
| Reference standard DIN 1945 / ISO 1217:20 °C, 1000 mbar (reference values for sensor calibration) | | | | | | | | | |
| Air | 105 | 90 | 175 | 290 | 530 | 730 | 1195 | 2050 | 2840 |
| Adjustment for DIN 1343: 0 °C, 1000 mbar | | | | | | | | | |
| Air | 100 | 80 | 160 | 270 | 485 | 670 | 1100 | 1885 | 2610 |
| Nitrogen | N₂ | 100 | 80 | 160 | 270 | 485 | 670 | 1100 | 1885 |

3. Installation

3.1. Warning

| | |
|---|---|
| DANGER | Escaping compressed gas |
|  | <p>Risk of serious or even fatal injury from contact with escaping compressed gas or from unsecured plant components.</p> <ul style="list-style-type: none"> • Before carrying out any assembly, installation or maintenance work, depressurise the system. Such work must be carried out by authorised specialist technical personnel only (see „Safety instructions“ auf Seite 5). • From 10 bar, install a high-pressure protection element for safe installation and removal of the device. • Tighten the slotted spring pin with a torque of 20-30 Nm (WS 27). • Use only pressure-resistant installation materials and suitable tools that are in proper working order. • Before pressurising the system, check all unit parts and repair them, if necessary. Open valves slowly to prevent pressure blows during operation. |

3.1.1. Requirements for piping

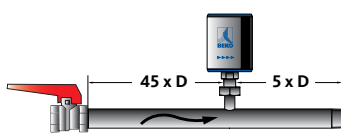
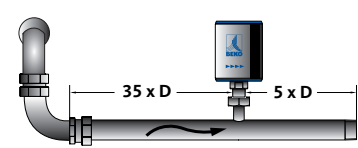
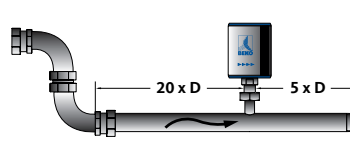
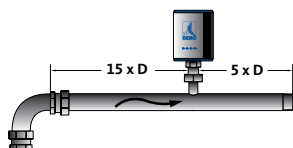
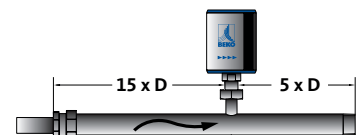
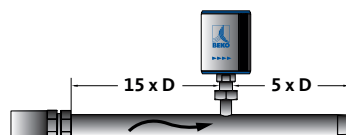
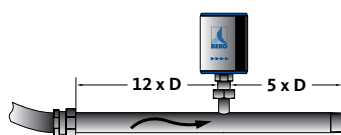
- Correctly dimensioned gaskets.
- Correctly installed and aligned flanges and gaskets.
- Differences in pipe diameters at joints should not exceed 1 mm. For more information, see ISO 14511.
- Clean, properly installed pipes.


3.1.2. Requirements for inlet/outlet sections

The table below shows the required inlet pipe sections with reference to the direction of flow.

Table of additional inlet pipe sections required in specific cases

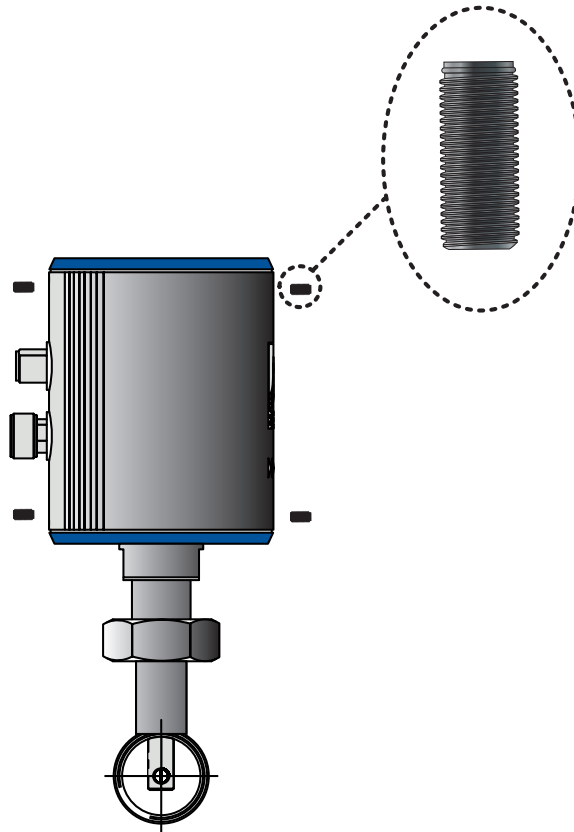
| Flow obstruction <i>upstream</i> of measuring section | Minimum length of inlet pipe section (L1) | Minimum length of outlet pipe section (L-L1) |
|--|---|--|
| Slight bend (angle < 90°) | 12 x D | 5 x D |
| Reduction (pipe diameter becomes smaller towards measuring section) | 15 x D | 5 x D |
| Enlargement (pipe diameter becomes larger towards measuring section) | 15 x D | 5 x D |
| 90° elbow section or T-piece | 15 x D | 5 x D |
| 2x 90° elbow sections in a plane | 20 x D | 5 x D |
| 2x 90° elbow sections change of direction in 3 dimensions | 35 x D | 5 x D |
| Shut-off valve | 45 x D | 5 x D |




| | |
|---|---|
| NOTICE | Deviating measurements |
|  | The above values are required minimum values. If the recommended settling sections cannot be implemented, the measuring deviations might be much greater. |

3.1.3. Turning housing

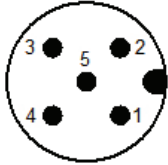
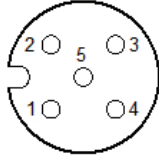
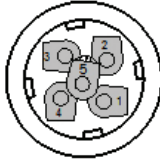
If required by the flow direction, the housing can be turned by 180° by loosening the 4 setscrews with 1.5mm hexagon sockets. Align the housing as required and tighten the setscrews again by hand.

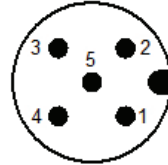
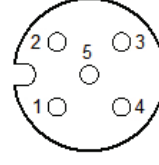
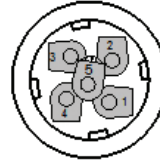


| NOTICE | Risk of damage to device |
|---|---|
|  | Ensure that the connecting pipes are correctly mounted and that the gaskets are installed properly. |

4. Electrical installation

4.1. Pin assignment of plug-type connectors

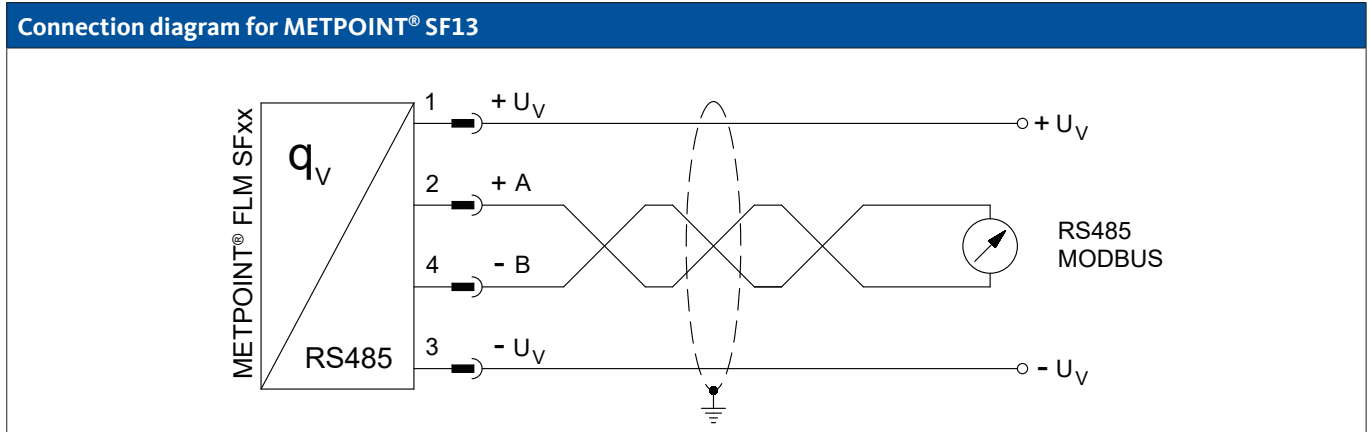
| Pin assignment of plug-type connector A, M12 x 1, 5-pin, A-coded (according to EN 61076-2-101) | | |
|--|---|---|
| Pin assignment of connector Transmitter side | Pin assignment of connector Socket side | Pin assignment of connector Screw side |
|  |  |  |

| Pin assignment of plug-type connector B, M12 x 1, 5-pin, A-coded (according to EN 61076-2-101) | | |
|--|---|---|
| Pin assignment of connector Transmitter side | Pin assignment of connector Socket side | Pin assignment of connector Screw side |
|  |  |  |

4.2. Connection options

4.2.1. Bidirectional RS485 bus system

Connection by means of plug-type connector A.

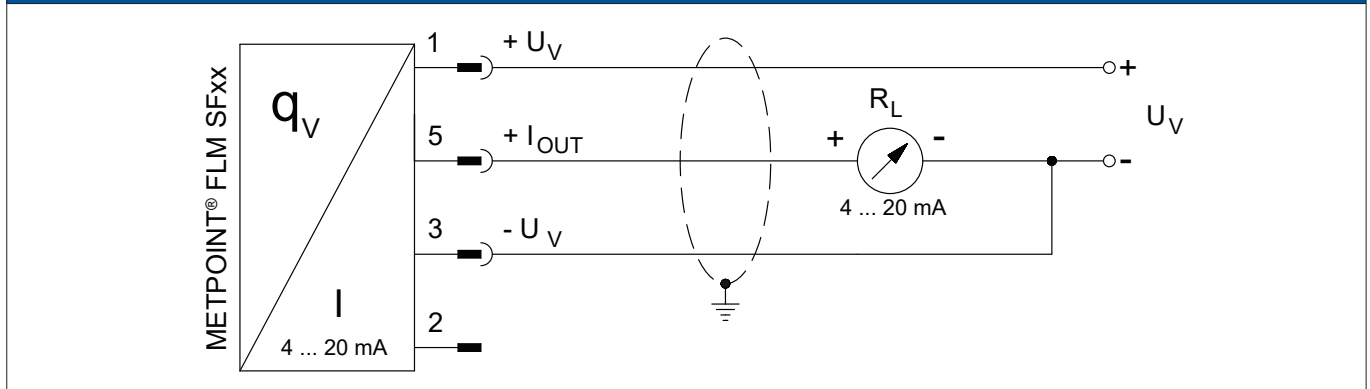


| Pin assignment - sensor | | Function | Wire colour |
|-------------------------|------------------|--|-------------|
| PIN-1 | + U _v | Plus (+) connection, power supply | brown |
| PIN-2 | Bus A (+) | Non-inverted signal (+) from RS485 interface | white |
| PIN-3 | - U _v | Minus (-) connection, power supply | blue |
| PIN-4 | Bus B (-) | Inverted signal (-) from RS485 interface | black |
| PIN-5 | | not assigned | grey |

4.2.2. Current output 4 ... 20 mA, 3-wire

Connection by means of plug-type connector A.

Connection diagram for METPOINT® SF13

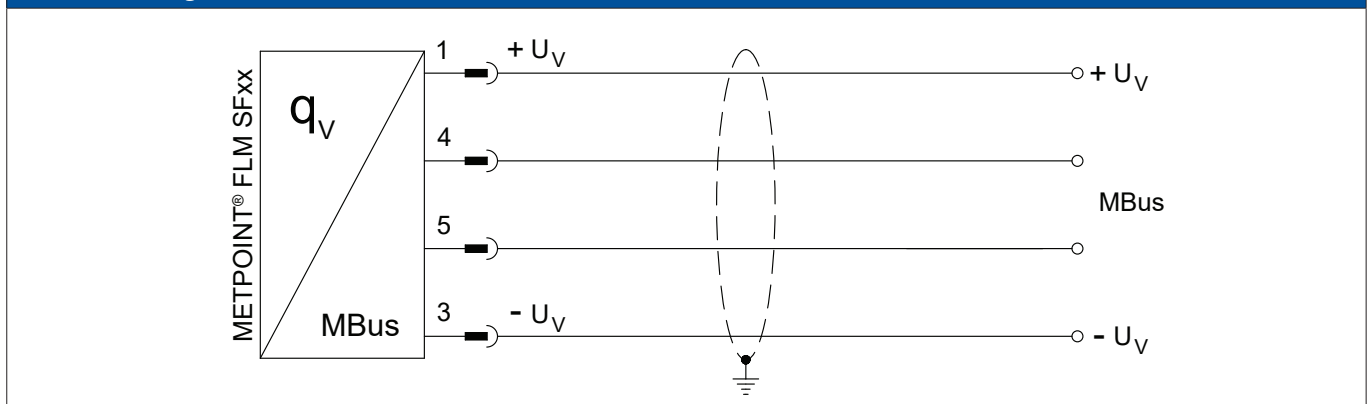


| Pin assignment - sensor | | Function | Wire colour |
|-------------------------|--------------------|------------------------------------|-------------|
| PIN-1 | + U _V | Plus (+) connection, power supply | brown |
| PIN-2 | | not assigned | white |
| PIN-3 | - U _V | Minus (-) connection, power supply | blue |
| PIN-4 | | not assigned | black |
| PIN-5 | + I _{OUT} | Current output | grey |

4.2.3. Mbus (optional)

Connection by means of plug-type connector B.

Connection diagram for METPOINT® SF13

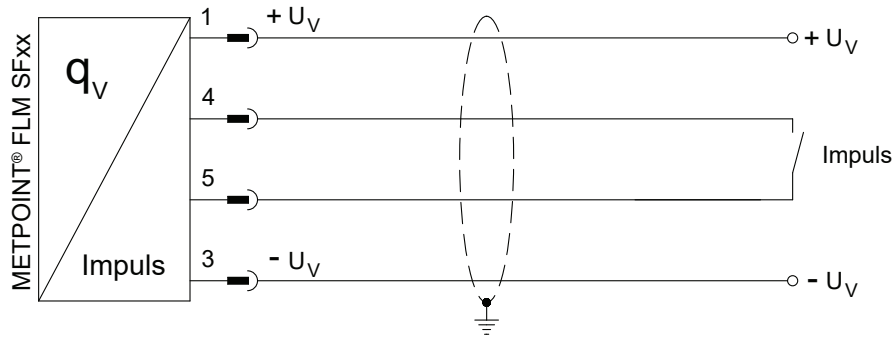


| Pin assignment - sensor | | Function | Wire colour |
|-------------------------|------|--------------|-------------|
| PIN-1 | | not assigned | brown |
| PIN-2 | | not assigned | white |
| PIN-3 | | not assigned | blue |
| PIN-4 | Mbus | Mbus | black |
| PIN-5 | Mbus | Mbus | grey |

4.2.4. Galvanically isolated pulse output

Connection by means of plug-type connector B.

Connection diagram for METPOINT® SF13



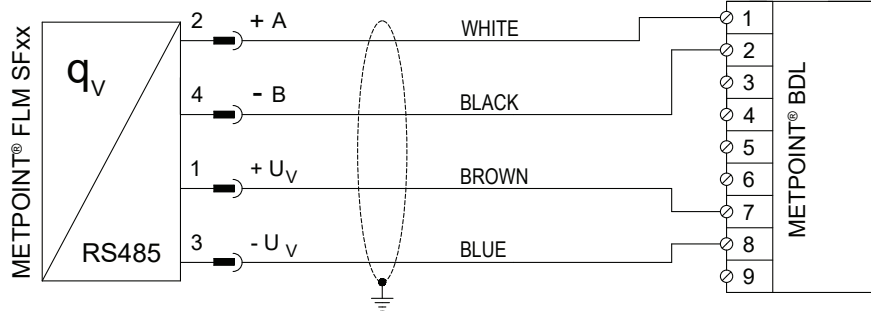
| Pin assignment - sensor | | Function | Wire colour |
|-------------------------|-------|-----------------------------|-------------|
| PIN-1 | | not assigned | brown |
| PIN-2 | | not assigned | white |
| PIN-3 | | not assigned | blue |
| PIN-4 | Pulse | Galvanically isolated pulse | black |
| PIN-5 | Pulse | Galvanically isolated pulse | grey |

4.3. Connection of METPOINT® BDL

4.3.1. Bidirectional RS485 bus system

Connection by means of plug-type connector A.

Connection diagram for METPOINT® SF13 and METPOINT® BDL

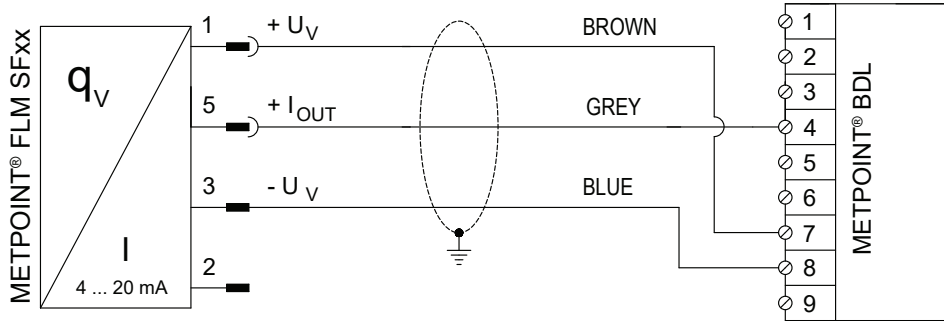


| Pin assignment - sensor | | Function | Wire colour | Pin assignment - BDL | |
|-------------------------|------------------|--|-------------|----------------------|------------------|
| PIN-1 | + U _v | Plus (+) connection, power supply | brown | PIN-7 | + U _v |
| PIN-2 | Bus A (+) | Non-inverted signal (+) from RS485 interface | white | PIN-1 | (+) A / RS485 |
| PIN-4 | Bus B (-) | Inverted signal (-) from RS485 interface | black | PIN-2 | (-) B / RS485 |
| PIN-3 | - U _v | Minus (-) connection, power supply | blue | PIN-8 | - U _v |

4.3.2. Current output 4 ... 20 mA, 3-wire

Connection by means of plug-type connector A.

Connection diagram for METPOINT® SF13 and METPOINT® BDL

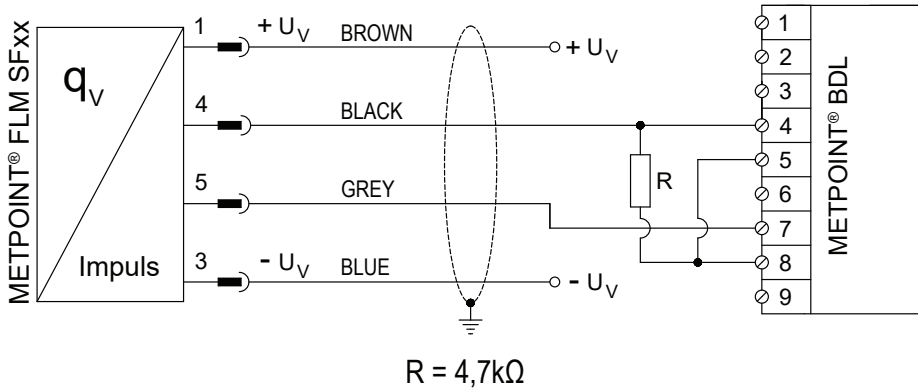


| Pin assignment - sensor | | Function | Wire colour | Pin assignment - BDL | |
|-------------------------|--------------------|------------------------------------|-------------|----------------------|------------------|
| PIN-1 | + U _v | Plus (+) connection, power supply | brown | PIN-7 | + U _v |
| PIN-5 | + I _{OUT} | Current output | grey | PIN-4 | Analog IN (+) |
| PIN-3 | - U _v | Minus (-) connection, power supply | blue | PIN-8 | - U _v |
| PIN-2 | | not assigned | white | | |
| PIN-4 | | not assigned | black | | |

4.3.3. Galvanically isolated pulse output

Connection by means of plug-type connector B.

Connection diagram for METPOINT® SF13 and METPOINT® BDL



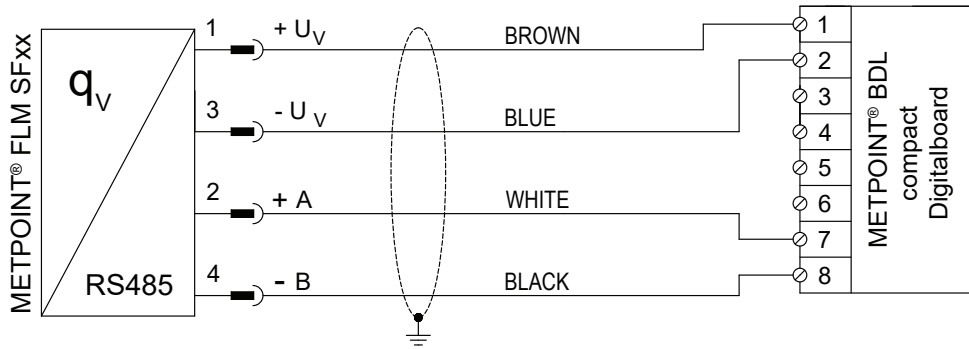
| Pin assignment - sensor | | Function | Wire colour | Pin assignment - BDL | |
|-------------------------|------------------|--------------|-------------|----------------------|------------------|
| PIN-1 | + U _v | not assigned | brown | | |
| PIN-4 | Pulse | Pulse | black | PIN-4 | Analog IN (+) |
| PIN-5 | Pulse | Pulse | grey | PIN-7 | + U _v |
| PIN-3 | - U _v | not assigned | blue | | |
| PIN-2 | | not assigned | white | | |

4.4. Connection to METPOINT® BDL compact

4.4.1. Bidirectional RS485 bus system

Connection by means of plug-type connector A.

Connection diagram for METPOINT® SF13 and METPOINT® BDL compact (digital board)

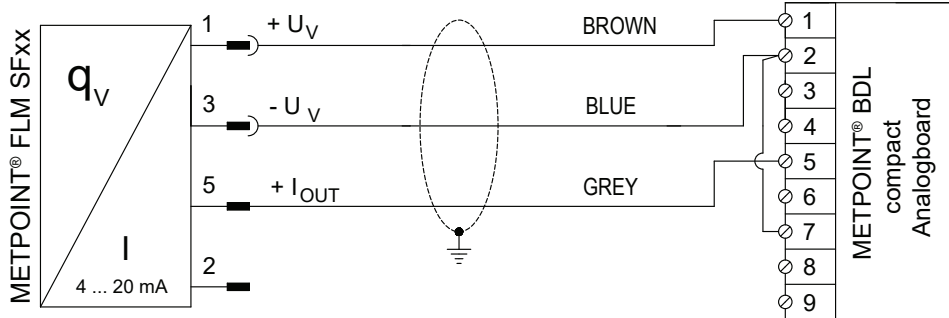


| Pin assignment - sensor | | Function | Wire colour | Pin assignment - BDL compact | |
|-------------------------|------------------|--|-------------|------------------------------|------------------|
| PIN-1 | + U _v | Plus (+) connection, power supply | brown | PIN-1 | + U _v |
| PIN-3 | - U _v | Minus (-) connection, power supply | blue | PIN-2 | - U _v |
| PIN-2 | + A | Non-inverted signal (+) from RS485 interface | white | PIN-7 | (+) RS485 (A) |
| PIN-4 | - B | Inverted signal (-) from RS485 interface | black | PIN-8 | (-) RS485 (B) |
| PIN-5 | | not assigned | grey | | |

4.4.2. Current output 4 ... 20 mA, 3-wire

Connection by means of plug-type connector A.

Connection diagram for METPOINT® SF13 and METPOINT® BDL compact (analog board)

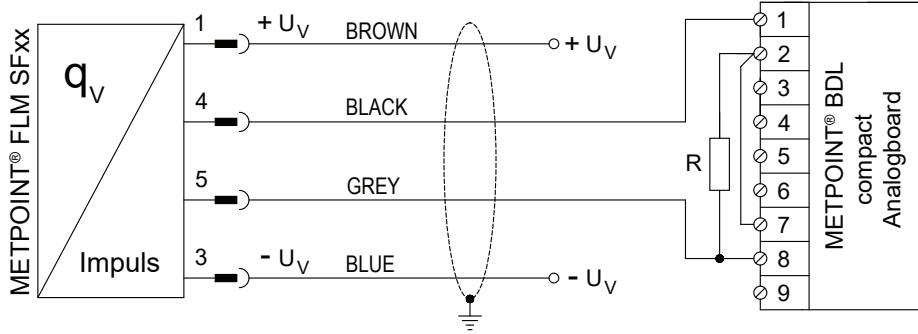


| Pin assignment - sensor | | Function | Wire colour | Pin assignment - BDL compact | |
|-------------------------|--------------------|------------------------------------|-------------|------------------------------|------------------|
| PIN-1 | + U _v | Plus (+) connection, power supply | brown | PIN-1 | + U _v |
| PIN-3 | - U _v | Minus (-) connection, power supply | blue | PIN-2 | - U _v |
| PIN-5 | + I _{OUT} | Current output | grey | PIN-5 | (+) I |
| PIN-2 | | not assigned | white | | |
| PIN-4 | | not assigned | black | | |

4.4.3. Galvanically isolated pulse output

Connection by means of plug-type connector B.

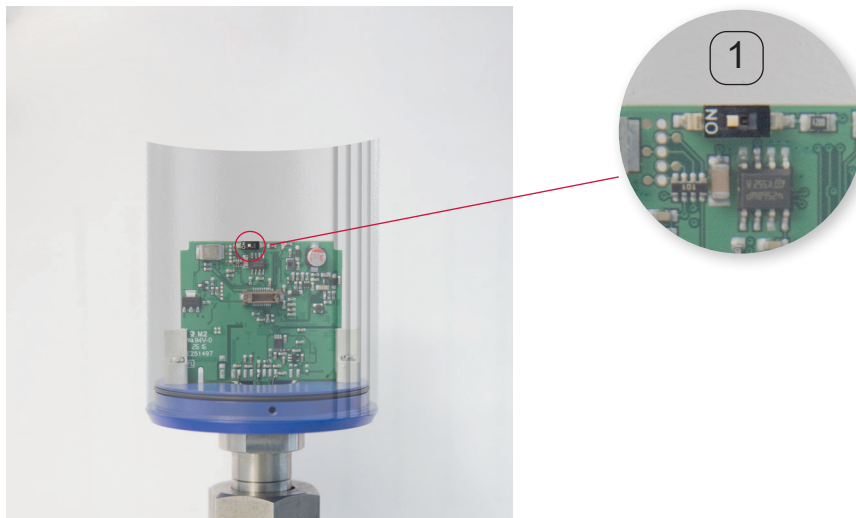
Connection diagram for METPOINT® SF13 and METPOINT® BDL compact (analog board)



| Pin assignment - sensor | | Function | Wire colour | Pin assignment - BDL compact | |
|-------------------------|------------------|--------------|-------------|------------------------------|------------------|
| PIN-1 | + U _v | not assigned | brown | | |
| PIN-4 | Pulse | Pulse | black | PIN-1 | + U _v |
| PIN-5 | Pulse | Pulse | grey | PIN-8 | (+) V - PT |
| PIN-3 | - U _v | not assigned | blue | | |
| PIN-2 | | not assigned | white | | |

4.5. Modbus termination

If the METPOINT® FLM is the last device in the Modbus system, it must be terminated. The sensor is equipped with a built-in terminator. To terminate the device, loosen the 2 top setscrews at the housing. lift off the lid and set the DIP switch (1) to ON. When closing the sensor housing, ensure that the housing gasket is correctly installed.



5. Start-up

To start the METPOINT® FLM, power it and perform the sensor setup as described in „Sensor Setup“ auf Seite 25. Slowly pressurise the pipes.

6. Configuration and operation

When the METPOINT® FLM is powered, it is automatically initialised. After this step is completed, the main menu is displayed.



The device menus are operated through two capacitive buttons:



>>UP<<



>>ENTER<<

6.1. Display during operation

Compressed Air

395.38 m³/h

78562 m³

Gasart / Statusmeldung → Air

HW: 1.02 SW: 1.00 MBID: 127 CAL. 1/4

↑ HW-Version ↑ SW-Version ↑ Modbus ID ↑ Seiten Nr.

CAL indicates that calibration is due:

After 15 months, message **CAL** is displayed, indicating that the device needs to be calibrated. This message does not have any effect on the measuring process, and the device continues to provide accurate measuring signals. On request, the calibration interval can be adjusted at the factory.

Press the >>UP<< button to call up pages 2 - 5.

Compressed Air

83.25 m/s

24.1 °C

Air

HW: 1.02 SW: 1.00 MBID: 127 CAL. 2/4

Average Min Max

Flow: m³/h AV Min Max

395.38 0

207.45 870.87

Total Counter: m³

78562

82.7

AV-Time: 1440 minutes 3/4

Average Min Max

Velocity: m/s AV Min Max

83.25 0

55.92 152.87

Temperature: °C

24.1 21.3

23.7 24.6

AV-Time: 1440 minutes 4/4

6.2. Setup menu

Press the >>ENTER<< button to call up the setup menu.
The setup menu is password-protected.



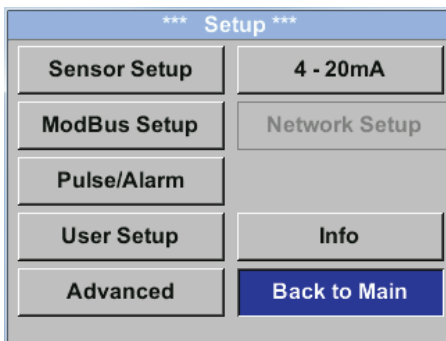
Default password (factory settings): 0000 (4 x zero).

If required, change the password by selecting **Setup→User Setup→Password**.

Press the >>UP<< button to select and to change a value.

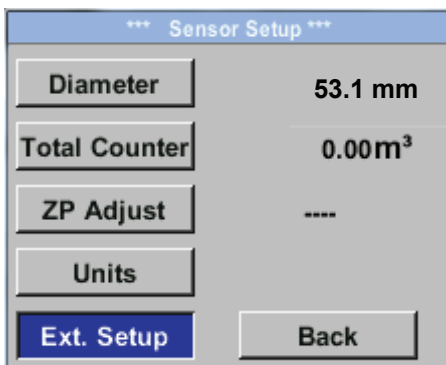


Press the >>ENTER<< button to confirm the selection or change.



6.3. Sensor Setup

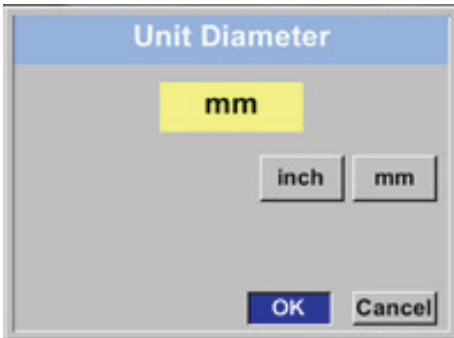
Setup → Sensor Setup



To make a change, select the respective menu option using the >>UP<< button and confirm by pressing the >>ENTER<< button.

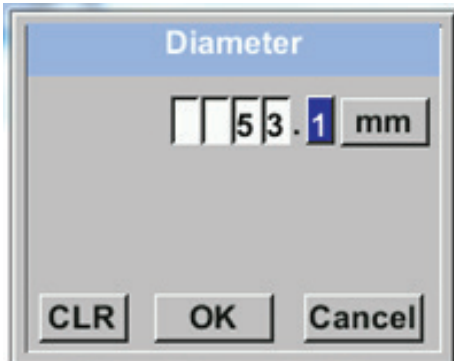
6.3.1. Entering pipe inside diameter

Setup → Sensor Setup → Diameter



To change the unit, press the >>UP<< button to select the "Unit" field and confirm by pressing the >>ENTER<< button.

Press the >>UP<< button to select the desired unit and confirm by pressing the >>ENTER<< button 2x.

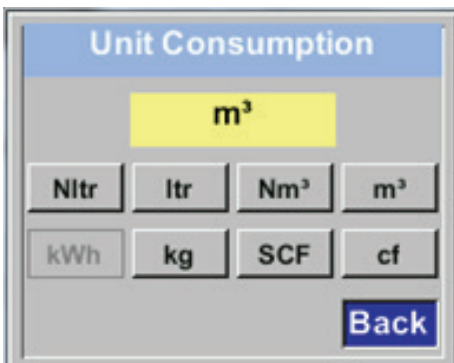


Press the >>UP<< button to select the value to be changed and confirm by pressing the >>ENTER<< button.

Press the >>UP<< button to enter the new value and confirm by pressing the >>ENTER<< button.

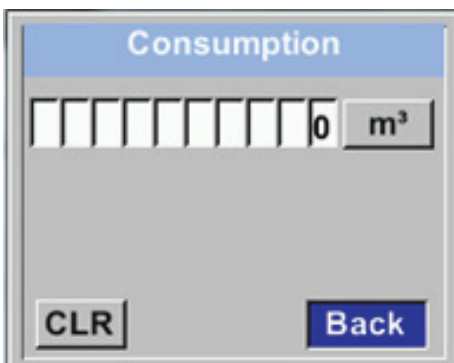
6.3.2. Entering / changing consumption counter value

Setup → Sensor Setup → Total Counter



To change the unit, press the >>UP<< button to select the "Unit" field and confirm by pressing the >>ENTER<< button.

Press the >>UP<< button to select the desired unit and confirm by pressing the >>ENTER<< button 2x.



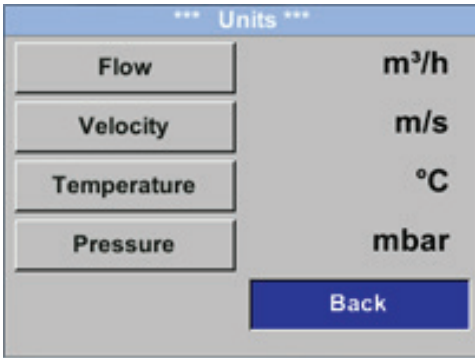
Press the >>UP<< button to select the value to be changed and confirm by pressing the >>ENTER<< button.

Press the >>UP<< button to enter the new value and confirm by pressing the >>ENTER<< button.

| NOTICE | Consumption counter value |
|---|--|
|  | <p>When the consumption counter reaches 1,000,000,000 m³, it is automatically reset to 0.</p> |

6.3.3. Selecting units for consumption, flow, temperature and pressure

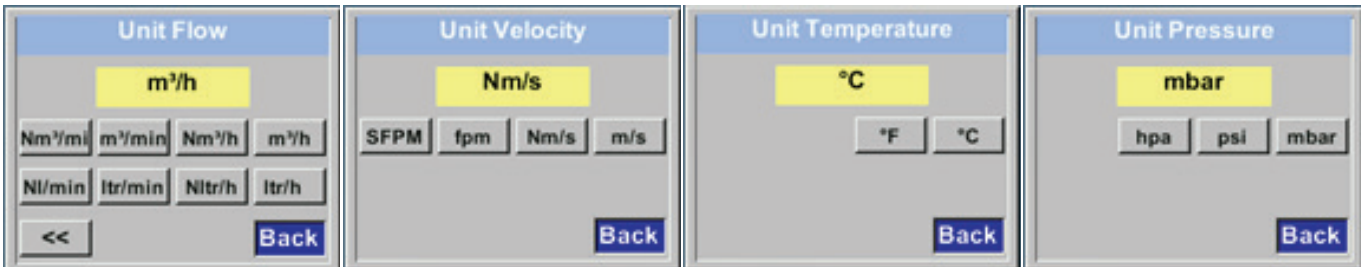
Setup → Sensor Setup → Units



To change the unit, press the >>UP<< button to select the "Unit" field and confirm by pressing the >>ENTER<< button.

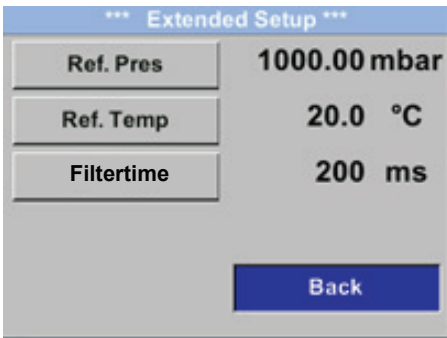
If there are more possible units that fit on the screen, press the "<<" button to call up the next screen.

Press the >>UP<< button to select the desired unit and confirm by pressing the >>ENTER<< button 2x.



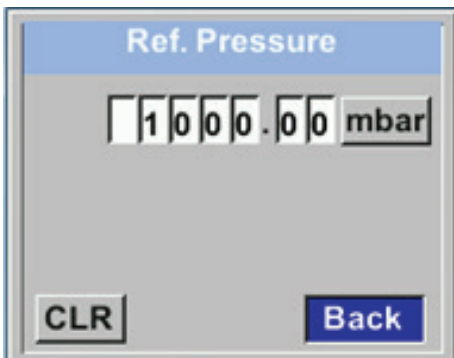
6.3.4. Entering reference conditions

Setup → Sensor Setup → Ext. Setup



Enter the reference parameter values.

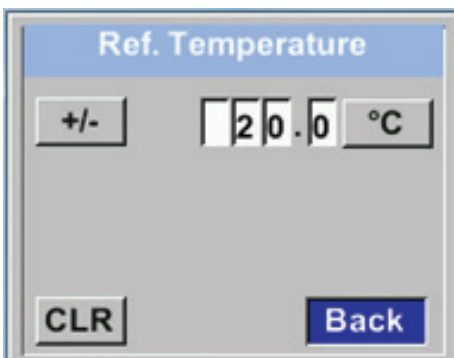
Setup → Sensor Setup → Ext. Setup → Ref. Pres



To change the reference pressure, press the >>UP<< button to select the "Unit" field and confirm by pressing the >>ENTER<< button.

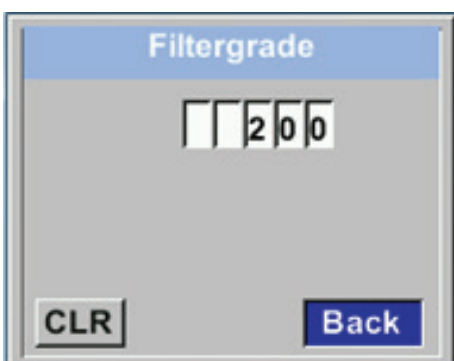
Press the >>UP<< button to select the desired unit and confirm by pressing the >>ENTER<< button 2x.

Setup → Sensor Setup → Ext. Setup → Ref. Temp



Enter the reference temperature.

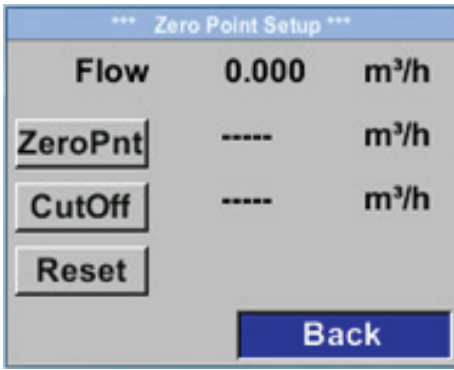
Setup → Sensor Setup → Ext. Setup → Filtertime



Under "Filtertime", you can enter an attenuation, provided that a "Filtergrade" is entered.
Possible values: 0 -10000 in [ms].

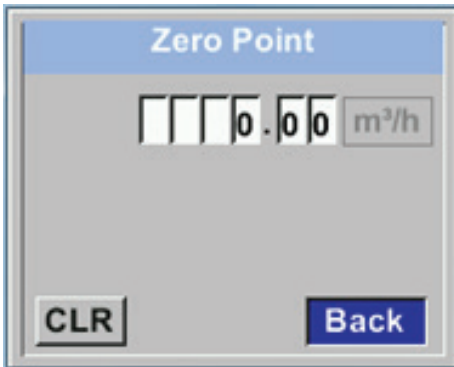
6.3.5. Setting zero point for low-flow cut-off function

Setup → Sensor Setup → ZP Adjust



Enter the zero point and the low-flow cut-off point.

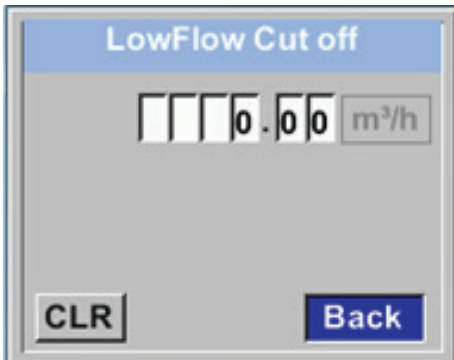
Setup → Sensor Setup → ZP Adjust → ZeroPnt



If the installed sensor shows a flow rate of > 0 m³/h even if there is no flow, you can enter a zero point for the characteristic.

To delete the cut-off point, press the "CLR" button.
To return to the previous screen, press the "Back" button.

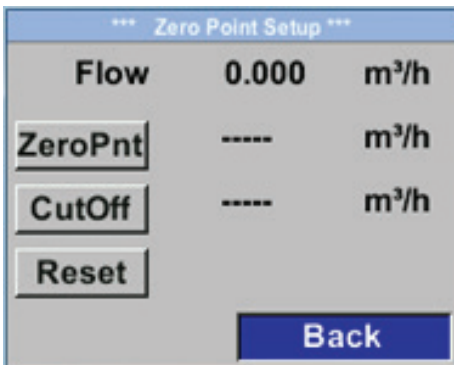
Setup → Sensor Setup → ZP Adjust → CutOff



The low-flow cut-off function is used to set consumption rates below the entered low-flow cut-off point to 0 m³/h so that they do not cause the consumption counter value to increase.

To delete the cut-off point, press the "CLR" button.
To return to the previous screen, press the "Back" button.

Setup → Sensor Setup → ZP Adjust → Reset



To reset the entered zero point or the low-flow cut-off point, press the "Reset" button.

To return to the previous screen, press the "Back" button.

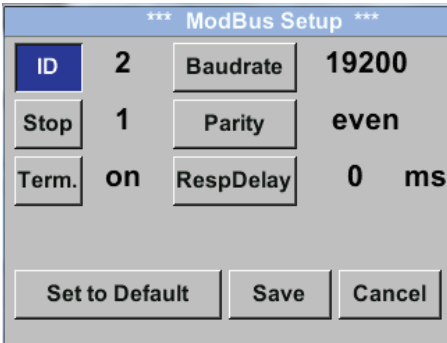
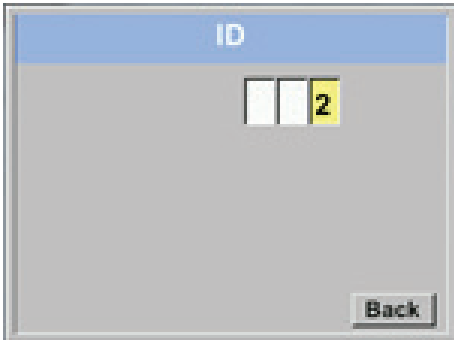
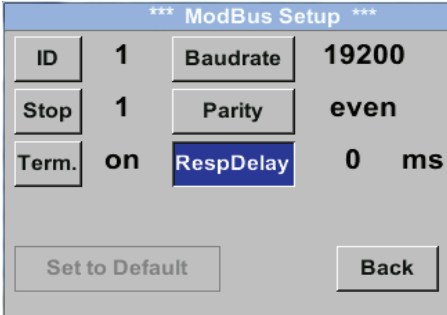
6.4. ModBus setup

The METPOINT® FLM thermal flow meter is equipped with a RS485 interface (ModBus RTU). Before starting the sensor, configure the communication parameters

- ModBus ID, baud rate, parity and stop bit

to enable communication with the ModBus master.

Setup → ModBus Setup



Save the settings by pressing the "Save" button. To apply the default (factory) settings, press the "Set to Default" button.

ModBus default settings:

ModBus ID: 1
 Baud rate: 19200
 Stop bit: 1
 Parity: even

Caution:

If the sensor is the last device in the Modbus system, it must be terminated. The sensors are equipped with a built-in terminator. To activate termination, loosen the 2 setscrews of the housing, remove the lid and set the DIP switch to "On". When closing the sensor housing, ensure that the housing gasket is correctly installed.

6.4.1. ModBus settings (2001 ... 2005)

| ModBus register | Register address | Byte | Data type | Description | Default | 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 |
| 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 bits 1 = 2 stop bits |
| 2005 | 2004 | 2 | UInt16 | Word order | 0xABCD | R/W | 0xABCD = big endian 0xCDAB = middle endian |

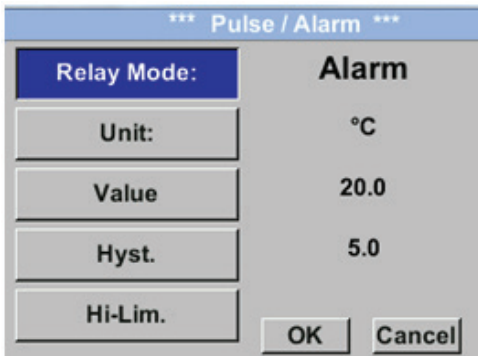
6.4.2. Values register (1001 ...1500)

| Modbus Register | Register Adresse | No. of Byte | Data Type | Description | Default | Read/Write | Holding Register |
|-----------------|------------------|-------------|-----------|--|---------|------------|------------------|
| 1101 | 1100 | 4 | Float | Flow in m ³ /h | | R | X |
| 1109 | 1108 | 4 | Float | Flow in Nm ³ /h | | R | X |
| 1117 | 1116 | 4 | Float | Flow in m ³ /min | | R | X |
| 1125 | 1124 | 4 | Float | Flow in Nm ³ /min | | R | X |
| 1133 | 1132 | 4 | Float | Flow in ltr/h | | R | X |
| 1141 | 1140 | 4 | Float | Flow in Nltr/h | | R | X |
| 1149 | 1148 | 4 | Float | Flow in ltr/min | | R | X |
| 1157 | 1156 | 4 | Float | Flow in Nltr/min | | R | X |
| 1165 | 1164 | 4 | Float | Flow in ltr/s | | R | X |
| 1173 | 1172 | 4 | Float | Flow in Nltr/s | | R | X |
| 1181 | 1180 | 4 | Float | Flow in cfm | | R | X |
| 1189 | 1188 | 4 | Float | Flow in Ncfm | | R | X |
| 1197 | 1196 | 4 | Float | Flow in kg/h | | R | X |
| 1205 | 1204 | 4 | Float | Flow in kg/min | | R | X |
| 1213 | 1212 | 4 | Float | Flow in kg/s | | R | X |
| 1221 | 1220 | 4 | Float | Flow in kW | | R | X |
| 1269 | 1268 | 4 | UInt32 | Consumption m ³ before comma | X | R | X |
| 1275 | 1274 | 4 | UInt32 | Consumption Nm ³ before comma | X | R | X |
| 1281 | 1280 | 4 | UInt32 | Consumption ltr before comma | X | R | X |
| 1287 | 1286 | 4 | UInt32 | Consumption Nltr before comma | X | R | X |
| 1293 | 1292 | 4 | UInt32 | Consumption cf before comma | X | R | X |
| 1299 | 1298 | 4 | UInt32 | Consumption Ncf before comma | X | R | X |
| 1305 | 1304 | 4 | UInt32 | Consumption kg before comma | X | R | X |
| 1311 | 1310 | 4 | UInt32 | Consumption kWh before comma | X | R | X |
| 1347 | 1346 | 4 | Float | Velocity m/s | | R | X |
| 1355 | 1354 | 4 | Float | Velocity Nm/s | | R | X |
| 1363 | 1362 | 4 | Float | Velocity Ft/min | | R | X |
| 1371 | 1370 | 4 | Float | Velocity Nft/min | | R | X |
| 1419 | 1418 | 4 | Float | GasTemp °C | | R | X |
| 1427 | 1426 | 4 | Float | GasTemp °F | | R | X |

6.5. Pulse / alarm

Setup → Pulse/Alarm

The galvanically isolated pulse output can be used as a pulse or as an alarm output.



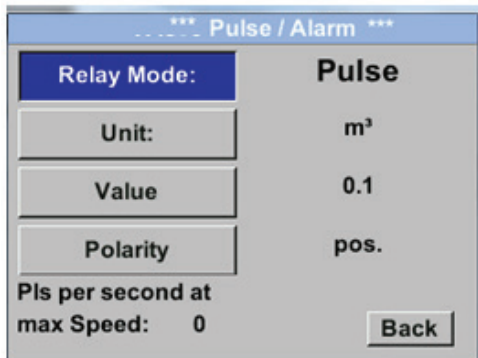
The following units can be selected for the alarm output:

- kg/min, cfm, l/s, m³/h, m/s, °F, °C, kg/s

Press "Value" to enter the alarm value. Press "Hyst." to enter the desired hysteresis.

Hi-Lim: upper limit

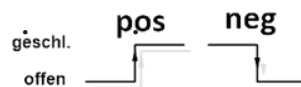
Lo-Lim: lower limit



The following units can be selected for pulse output:

- kg, cd, l, m³

Select "Value" to enter the pulse factor (0.1, 1, 10, 100). Select "Polarity" to enter the switching state (plus = 0 → 1, minus = 1 → 0).



6.5.1. Pulse output

The maximum permissible number of pulses per second is 50. Pulse output is delayed by 1 second.

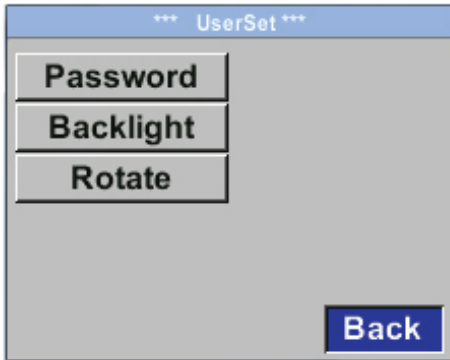
| Pulse factor | [m³/h] | [m³/min] | [l/min] |
|----------------|--------|----------|---------|
| 0.1 l / pulse | 18 | 0.3 | 300 |
| 1 l / pulse | 180 | 3 | 3000 |
| 0.1 m³ / pulse | 18000 | 300 | 300000 |
| 1 m³ / pulse | 180000 | 3000 | 3000000 |

Table 1: Maximum flow volumes for pulse output

| NOTICE | Important information |
|--------|---|
| | Pulse factors that are unsuitable to represent the measuring range limit value are not permissible. Such entries are discarded and an error message is displayed. |

6.6. User Setup

Setup → User Setup



On the user setup screen, you can change the password, rotate the display and adjust its brightness.

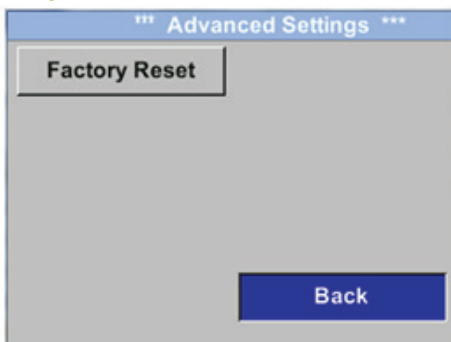
- Password = change password
- Backlight = adjust brightness
- Rotate = rotate display



To change the password, you must enter the new password twice. The password must consist of 4 numerical digits.

6.7. Advanced

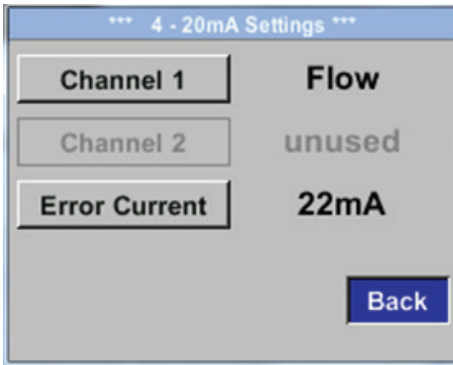
Setup → Advanced



Press the "Factory Reset" button to reset the METPOINT® FLM to its default (factory) settings.

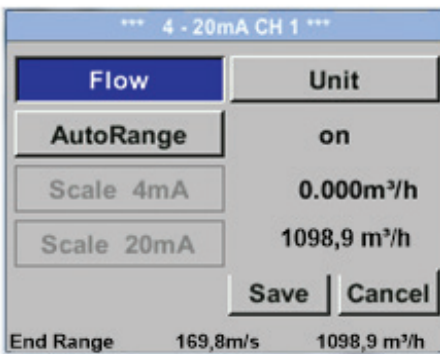
6.8. 4 ... 20 mA

Setup → 4 - 20 mA



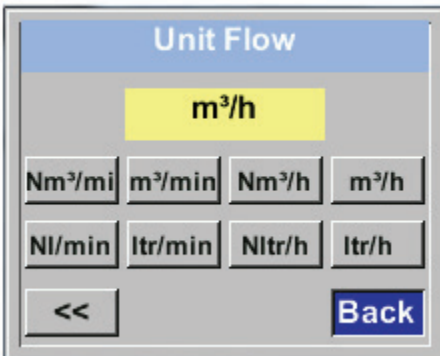
On this screen, you can adjust the settings for the 4 ... 20 mA current output.

Setup → 4 - 20 mA → Channel 1

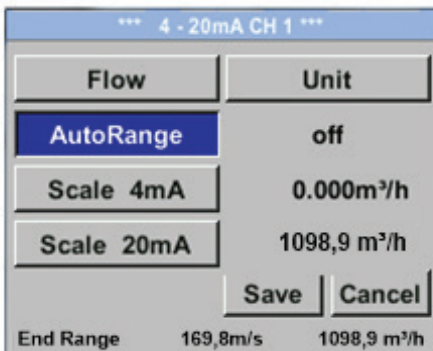


The following measurements can be configured:

- Flow
- Velocity
- Temperature
- unused = deactivate channel



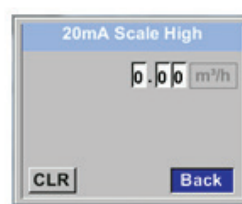
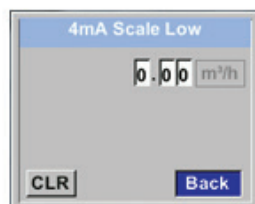
The screenshot to the left shows the available units for flow. Press the "<<" button to call up the next screen.



The scaling of the 4 ... 20 mA current output can be set to automatic ("AutoRange = on") or manual ("AutoRange = off").

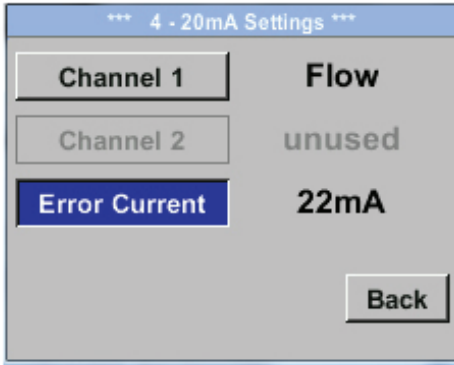
With "AutoRange = on", the sensor automatically calculates the valid measuring range and associated reference conditions, based on the set pipe diameter.

Select "Scale 4mA" and "Scale 20mA" to manually configure the scaling of the output (precondition: "AutoRange = off").



Enter the scale of the current output for 4 mA and 20 mA respectively.

Setup → 4 - 20 mA → Error Current



On this screen, you can enter the error signal to be sent by the current output in the event of a fault.

- 2 mA = sensor fault / system error
- 22 mA = sensor fault / system error
- None = output according to Namur (3.8 mA ... 20.5 mA)
 < 4 mA to 3.8 mA = value below measuring range
 > 20 mA to 20.5 mA = value above measuring range

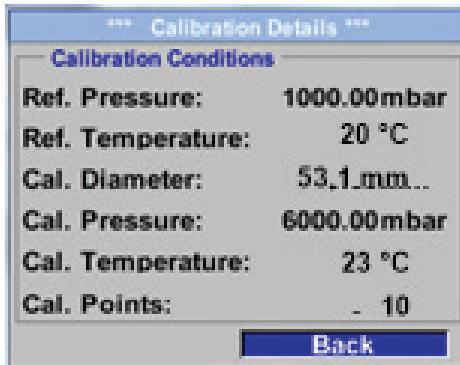
Confirm your entry by pressing the >>ENTER<< button.

6.9. Info

Setup → Info



This screen shows device information.



Press "Details" to view the calibration conditions.

6.10. MBus

6.10.1. Default communication settings

Primary address*: 1
 ID: Serial number of sensor
 Baud rate*: 2400
 Medium*: Gas

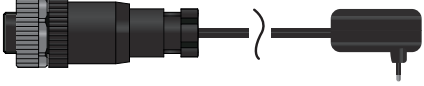
6.10.2. Transferred values

Value 1 with [Unit]*: Flow [m³/h]
 Value 2 with [Unit]*: Consumption [m³]
 Value 3 with [Unit]*: Velocity [m/s]
 Value 4 with [Unit]*: Gas temperature [°C]

* these values can be factory-set or changed on request.

7. Spare parts and accessories

The accessories available for the METPOINT® FLM are listed in the table below.

| Designation | Picture |
|--|--|
| Power supply with plug-type connector A → 4032115 |  |

8. Maintenance and servicing

Regularly check the sensor head for dirt and clean it, if necessary. Dirt, dust or oil deposits on the sensor element can cause incorrect measurements.

We recommend checking the sensor element at least once a year. If the compressed air is heavily contaminated, choose a shorter interval.

9. Cleaning sensor head

To clean the sensor head, immerse it in warm water with a little detergent. Do not clean the sensor with a cloth, sponge, brush or other implement, as any mechanical impact can destroy the sensor. In the event of persistent deposits, return the sensor to the manufacturer for inspection and cleaning.

10. Calibration

If the device is not custom-configured, we recommend having it calibrated every 12 months. For calibration, send the METPOINT® FLM to BEKO TECHNOLOGIES GmbH.

11. LED indicator

The METPOINT® FLM features a LED calibration indicator mounted at the top of the housing. After 15 months, the LED begins to flash, indicating that the device needs to be calibrated. The flashing LED does not have any effect on the measuring process, and the device continues to provide accurate measuring signals.

On request, the calibration interval can be adjusted at the factory.

12. Declaration of Conformity

BEKO TECHNOLOGIES GMBH
 Im Taubental 7
 41468 Neuss, GERMANY
 Tel: +49 2131 988-0
 www.beko-technologies.com



EU-Konformitätserklärung

Wir erklären hiermit, dass die nachfolgend bezeichneten Produkte den Anforderungen der einschlägigen Richtlinien und technischen Normen entsprechen. Diese Erklärung bezieht sich nur auf die Produkte in dem Zustand, in dem sie von uns in Verkehr gebracht wurden. Nicht vom Hersteller angebrachte Teile und/oder nachträglich vorgenommene Eingriffe bleiben unberücksichtigt.

| | |
|-----------------------------------|---|
| Produktbezeichnung: | METPOINT® FLM |
| Typ: | SF53 und SF13 |
| Spannungsversorgung: | 18 ... 36 VDC |
| IP-Schutzart | IP65 |
| Max. Betriebsdruck: | 16 bar(g) |
| Min. / Max. Betriebstemperatur: | -30°C / +80°C |
| Datenblatt: | DB_FLM-0916-FP-A |
| Produktbeschreibung und Funktion: | Thermischer Massen-Durchflussmesser für Druckluft |

Druckgeräte-Richtlinie 2014/68/EU

Die Produkte fallen in keine Druckgerätekategorie und sind gemäß Artikel 4 Absatz 3 in Übereinstimmung mit der in den Mitgliedstaaten geltenden guten Ingenieurspraxis ausgelegt und werden dieser entsprechend hergestellt.

EMV-Richtlinie 2014/30/EU

Angewandte harmonisierte Normen: EN 61326-1:2013, EN 61326-2-3:2013

ROHS II-Richtlinie 2011/65/EU

Die Vorschriften der Richtlinie 2011/65/EU zur Beschränkung der Verwendung bestimmter gefährlicher Stoffe in Elektro- und Elektronikgeräten werden erfüllt.

Die Produkte sind mit dem abgebildeten Zeichen gekennzeichnet:



Die alleinige Verantwortung für die Ausstellung dieser Konformitätserklärung trägt der Hersteller.

Neuss, 27.03.2017

Unterzeichnet für und im Namen von:

BEKO TECHNOLOGIES GMBH

i.V. Christian Riedel

Leiter Qualitätsmanagement International

CE_FLM-896-0317-FP-A

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EU Declaration of Conformity

We hereby declare that the products named below comply with the stipulations of the relevant directives and technical standards. This declaration only refers to products in the condition in which they have been placed into circulation. Parts which have not been installed by the manufacturer and/or modifications which have been implemented subsequently remain unconsidered.

| | |
|-----------------------------------|---------------------------------------|
| Product designation: | METPOINT® FLM |
| Types: | SF53 and SF13 |
| Power supply: | 18 ... 36 VDC |
| IP protection rating | IP65 |
| Max. operating pressure: | 16 bar(g) |
| Min./max. operating temperature: | -30°C / +80°C |
| Data sheet: | DB_FLM-0916-FP-A |
| Product description and function: | Thermal flow meter for compressed air |

Pressure Equipment Directive 2014/68/EU

The products are not classified in any pressure equipment category. In accordance to article 4, section 3, they have been designed and manufactured according to sound engineering practice as applicable in the EU member states.

EMC Directive 2014/30/EU

Applied harmonized standards: EN 61326-1:2013, EN 61326-2-3:2013

RoHS II Directive 2011/65/EU

The products meet the requirements laid down in European Directive 2011/65/EU concerning the restriction of the use of certain hazardous substances in electrical and electronic devices.

The products bear the CE Mark:



This Declaration of Conformity has been issued by the manufacturer.

Neuss, 25/10/2016

Signed on behalf of:
BEKO TECHNOLOGIES GMBH

ppa Christian Riedel
 Head of International Quality Management

CE_FLM-896-0916-FP-A

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