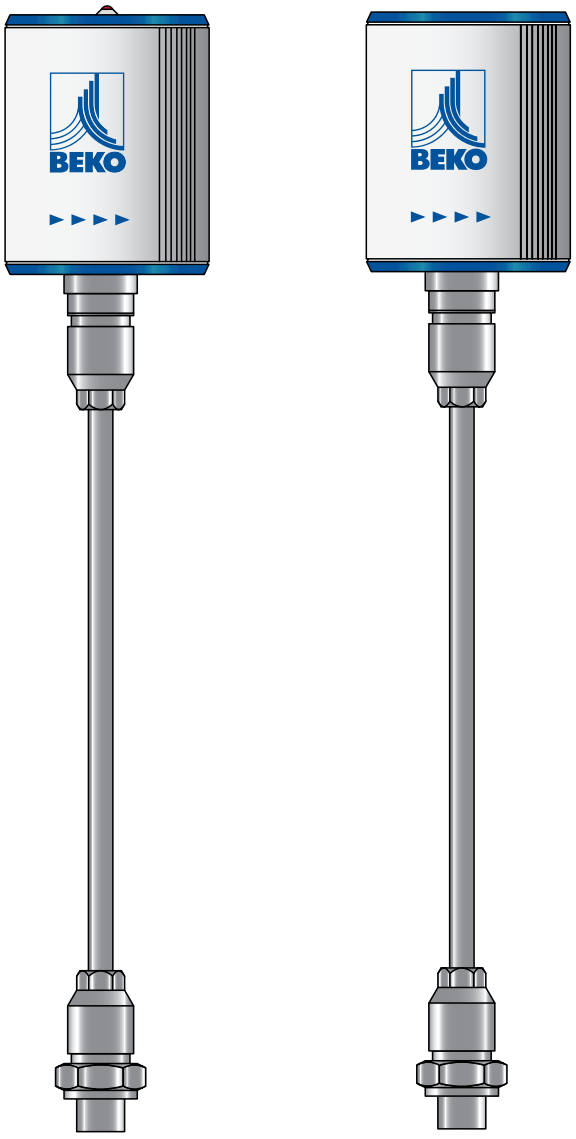
EN - English

Installation and operating manual

Thermal flow meter

METPOINT® FLM SF53

FLMSF53LL220 | FLMSF53DL220 | FLMSF53LL400 | FLMSF53DL400



10-221

Contents

1. Safety-related information ... 4
1.1. Pictograms and symbols ... 4
1.1.1. In this documentation ... 4
1.1.2. On the device ... 4
1.2. Signal words ... 4
1.3. Safety instructions ... 5
1.4. Transport and storage ... 6
1.5. Intended use ... 7
1.6. Warranty and liability for defects ... 7
2. Product information ... 8
2.1. Scope of delivery ... 8
2.2. Type plate ... 8
2.3. Product overview and description ... 9
2.3.1. Identification based on product code ... 9
2.3.2. Product description ... 10
2.3.3. Basic operating principles ... 10
2.4. Control and display elements ... 11
2.4.1. Model with display ... 11
2.4.2. Model with LED ... 11
2.4.3. Direction of flow ... 12
2.5. Dimensions ... 13
2.6. Technical data ... 14
2.7. Measuring ranges ... 15
3. Set up ... 17
3.1. Warning notices ... 17
3.1.1. Requirements for pipelines ... 17
3.1.2. Requirements for the inlet/outlet pipe section ... 17
3.1.3. Turning the housing ... 18
3.2. Assembly steps ... 19
4. Electrical installation ... 20
4.1. Pin assignment of plug-type connectors ... 20
4.2. Connection options ... 20
4.2.1. Bidirectional RS485 bus system ... 20
4.2.2. Current output 4 ... 20 mA, 3-wire ... 21
4.2.3. MBus (optional) ... 21
4.2.4. Galvanically isolated pulse output ... 22
4.3. Connection of METPOINT® BDL / BDL V2 ... 23
4.3.1. Bidirectional RS485 bus system ... 23
4.3.2. Current output 4 ... 20 mA, 3-wire ... 24
4.3.3. Galvanically isolated pulse output ... 25
4.4. Connection to METPOINT® BDL compact ... 26
4.4.1. Bidirectional RS485 bus system ... 26
4.4.2. Current output 4 ... 20 mA, 3-wire ... 26
4.4.3. Galvanically isolated pulse output ... 27
4.5. Modbus end termination ... 28

5. Commissioning 29

6. Configuration and operation 29

6.1. Indicators used in operation 29
6.2. Setup menu 30
6.3. Sensor Setup 30
6.3.1. Entering the pipe inner diameter 31
6.3.2. Entering / changing consumption counter value 31
6.3.3. Selecting units for consumption, flow, temperature and pressure 32
6.3.4. Entering reference conditions 32
6.3.5. Setting zero point for low-flow cut-off function 34
6.4. Modbus setup 35
6.4.1. Modbus settings (2001 ... 2005) 36
6.4.2. Values register (1001 ...1500) 36
6.5. Pulse / alarm 37
6.5.1. Pulse output 37
6.6. User Setup 38
6.7. Advanced 38
6.8. 4 ... 20 mA 39
6.9. Info 40
6.10. MBus 40
6.10.1. Factory communication settings 40
6.10.2. Transmitted values 40

7. Spare parts and accessories 41

8. Maintenance and servicing 41

9. Sensor head cleaning 41

10. Recalibration 41

11. LED display 41

12. Declaration of Conformity 42

1. Safety-related information

1.1. Pictograms and symbols

1.1.1. In this documentation

General instructions

Note the installation and operation manual

General hazard symbol (danger, warning, caution)

General hazard symbol (danger, warning, caution) for mains voltage and mains voltage energised plant and system parts

The packaging material is recyclable. Dispose of it according to the applicable national laws and regulations.

1.1.2. On the device

General instructions

General hazard symbol (danger, warning, caution)

1.2. Signal words

DANGER	**Imminent hazard** Consequences of non-compliance: serious or fatal injury
WARNING	**Potential hazard** Consequences of non-compliance: potentially serious or fatal injury
CAUTION	**Imminent hazard** Consequences of non-compliance: injury and/or damage to property
NOTE	**Additional notes, information, tips** Consequences of non-compliance: Disadvantages during operation and maintenance. No risk to persons.

1.3. Safety instructions

DANGER	Escaping compressed gas
	Risk of serious or even fatal injury from contact with escaping compressed gas or from unsecured plant components.
	• Depressurise the system before carrying out any assembly, installation or maintenance work. This work must be performed by authorised skilled technical personnel[1]. • Use only pressure-resistant installation materials and suitable tools that are in proper working order. • Before pressurising the system, check all device parts and repair them as necessary. Open valves slowly to prevent pressure blow-outs during operation. • Take action to prevent people or objects from being affected by condensate or escaping compressed gas. • Prevent vibrations, oscillations and shocks from being transferred to system parts.

DANGER	Mains voltage
	Risk of electric shock with serious or fatal injuries if contact is made with non-insulated components carrying mains voltage.
	• Observe all applicable regulations with respect to electrical installations (e.g. VDE 0100/IEC 60364). • Only execute installation and maintenance works when the system has been deenergised. • Electrical works may only be executed by authorised skilled technical personnel[1]. • Read off the permissible operating voltage on the rating plate and always comply with it. • Only utilise components for the electrical installation which have a current approval and are labelled with a CE-Identification Marking. • A safely accessible circuit breaker (e.g. power plug or switch) must be provided close to the device for disconnecting all current and/or power lines for the voltage supply.

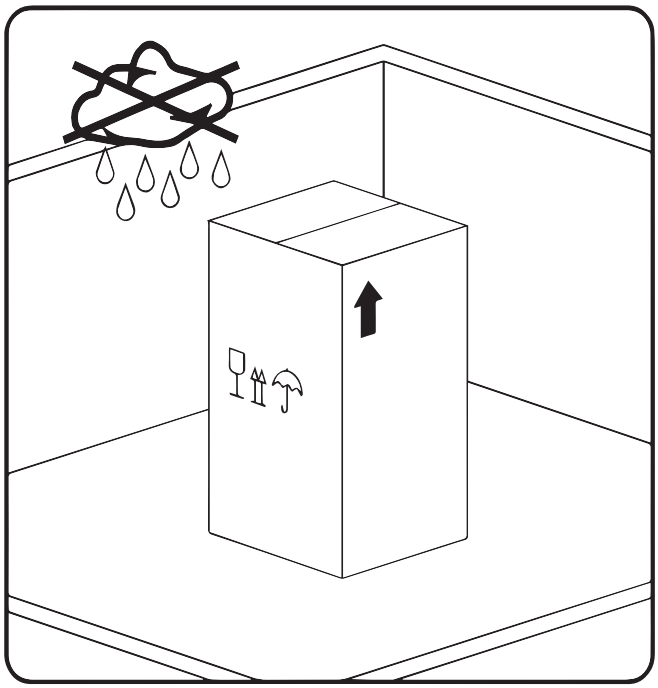
WARNING	Operating outside of limits
	If the specified limits are exceeded, there is a risk of the device malfunctioning, potentially resulting in injury and/or damage to property.
	• The device must only be operated for the intended purpose and within the permissible limits specified on the type plate and in the technical data. • Above 10 bar, use the high-pressure safety device for safe installation and removal. • The device is not designed for use with flammable gases. • Ensure strict observance of operating times and maintenance intervals. • Strictly adhere to the prescribed storage and transport conditions. • Prevent condensation on the sensor element and water droplets in the measurement air.

[1] Skilled technical personnel
Skilled technical personnel use their professional qualifications and knowledge in the field of measuring, control and pneumatic technology, and their knowledge of the applicable statutory regulations, guidelines and standards to independently foresee potential dangers and are qualified to perform the tasks described. Special operating conditions (e.g. aggressive media) require additional knowledge.

1.4. Transport and storage

Despite our best efforts, transport damage cannot be excluded. Please therefore remove all packaging material immediately after receipt and inspect the product for any possible transport 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**
	Incorrect transport or storage, or the use of unsuitable lifting equipment, might cause damage to the device.
	• The device must only be transported and stored by authorised and suitably trained skilled technical personnel. • If you detect any damage, do not start the device. • Always comply with the permissible storage and transport temperatures (refer to technical data). • Never expose the device to continuous, direct sunlight or heat radiation.



The device must be stored in its original packaging. Seal the packaging and store it in a dry and frost-free room. Ensure that the ambient conditions do not fall below or 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.

NOTE	**Recycling packaging material**
	• 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. In its default setup, 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 use with 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 specifications as stated 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 this system, which exceeds the intended use, is hereby deemed to be improper and can cause a hazard for the safety of people and the environment.

1.6. Warranty and liability for defects

Warranty claims are voided if the METPOINT® FLM is used for a purpose other than the intended use or operated outside the limits specified in the technical data. Such uses include (but are not limited to) the following:

- Technically incorrect installation, incorrect commissioning, incorrect maintenance or incorrect operation
- Operation with defective components
- Non-compliance with the instructions in this manual and the safety instructions in particular
- Execution of constructive interventions or modifications on the device
- Failure to observe the prescribed maintenance intervals
- Use of third-party spare parts that have not been approved by the manufacturer for repair and maintenance work

2. Product information

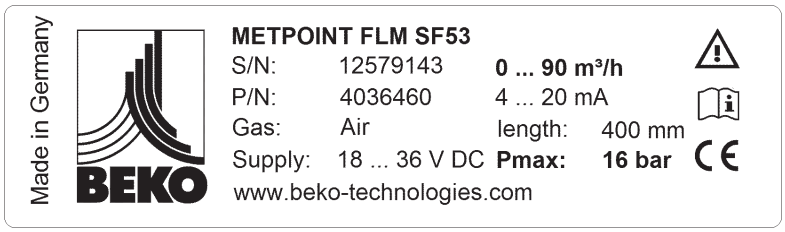
2.1. Scope of delivery

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

Designation	Illustration
Calibration certificate	
Connecting cable (5-wire)	
Alignment tool	

2.2. Type plate

The type plate is attached to the device housing. The plate lists all of the important data for the METPOINT® FLM. Please have these details at hand when contacting the manufacturer or supplier.

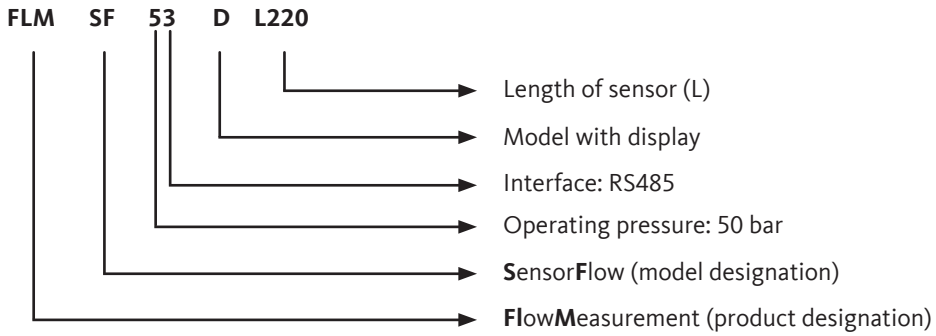


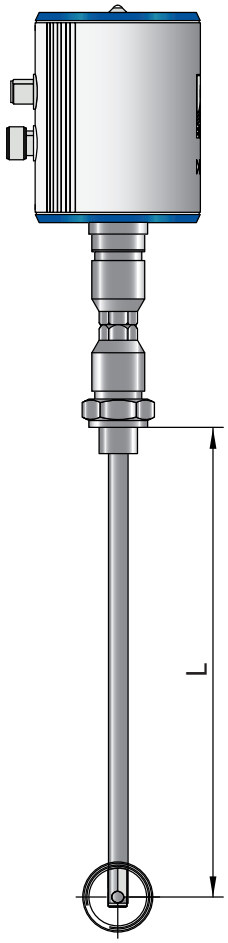
Designation	Description
METPOINT® FLM SF53	Model designation
S/N: 12579143	Serial number
P/N: 4036460	Product number
Gas: air	Measuring medium
Supply: 18 ... 36 VDC	Data for voltage supply
0 ... 90 m³/h	Min./max. measuring range
4 ... 20 mA	Min./Max. data for analogue output
Length: 400 mm	Length of sensor tube
Pmax: 16 bar	Maximum permissible operating pressure

NOTE	Type plate handling
	Never damage, remove or make the type plate illegible. For more information regarding the symbols used, see “Pictograms and symbols” on Page 4.

2.3. Product overview and description

2.3.1. Identification based on product code

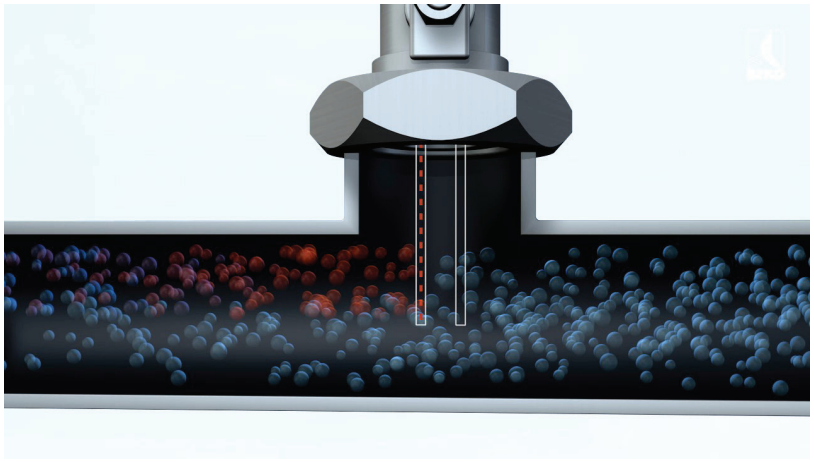




2.3.2. Product description

The METPOINT® FLM thermal flow meter measures the volume flow, which provides the base data needed for intelligent energy management. This can be used to identify potential savings as well overloads or malfunctions and so optimise plant dimensions. The assignment of consumption percentages to production units offers a basis for evidence-based decision-making. The device also indicates the volume of compressed air lost to leaks in the compressed gas system. The METPOINT® FLM therefore provides the data needed to match components properly and design cost-effective plants. The device is equipped with a Modbus RTU(RS485) interface, a 4 ... 20 mA current output and a galvanically isolated pulse output, as well as an optional Mbus interface.

2.3.3. Basic operating principles

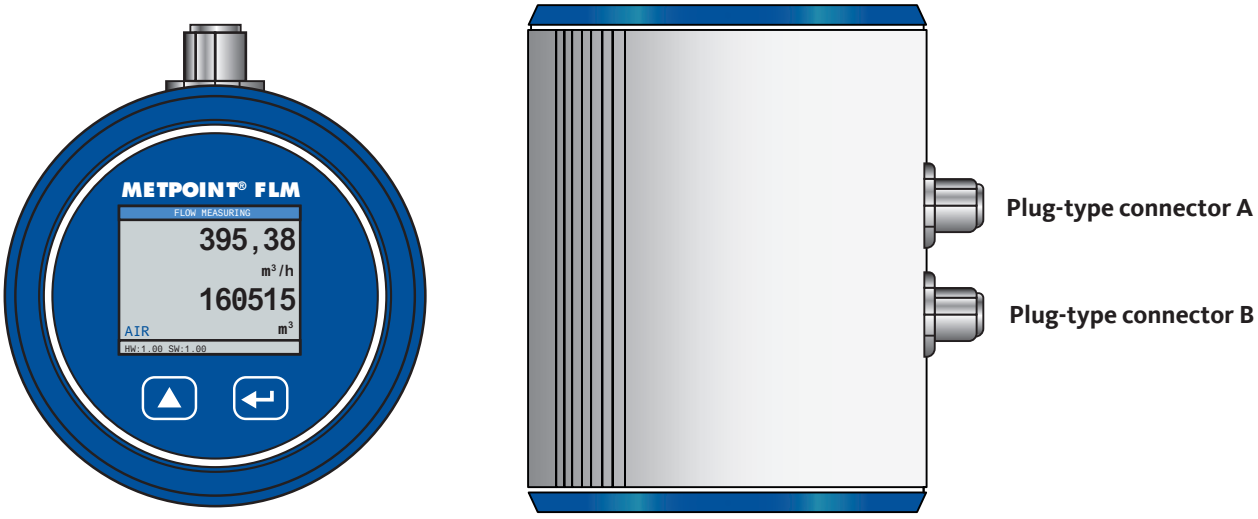


Two temperature sensors are installed in series in the direction of the flow. The first temperature sensor measures the current process temperature, while the second sensor is electrically heated 40 K above the first sensor. As volume flow or mass flow increases, the temperature sensors cool down, so the electrical heating of the second sensor must increase in output.

The electric energy required to maintain the temperature difference is directly proportional to the mass flow. As the mass flow increases, the rising heat output is converted into corresponding measured quantity values. The METPOINT® FLM determines the exact mass flow from these values plus the inside diameter of the pipe.

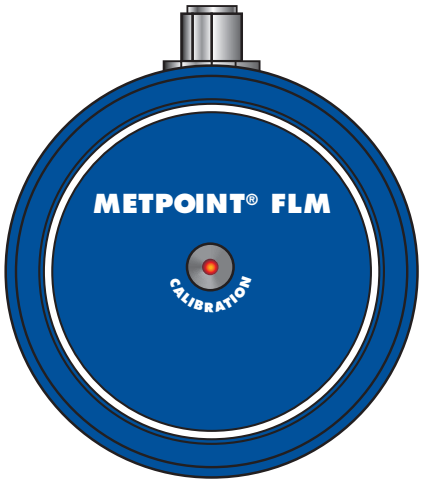
2.4. Control and display elements

2.4.1. Model with display



NOTE	Additional information
	For more information about operation, see “Configuration and operation” on Page 29.

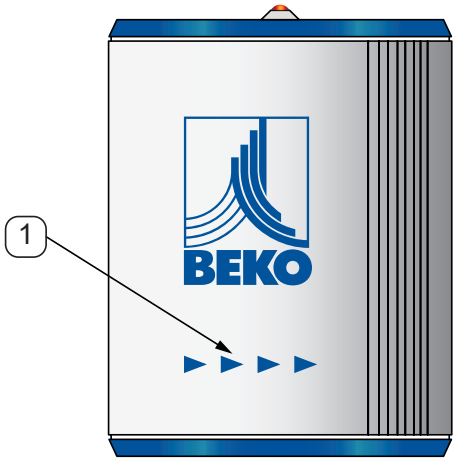
2.4.2. Model with LED



A calibration reminder LED is mounted on the top of the housing of the METPOINT® FLM. After 15 months have elapsed, recalibration becomes due and is indicated by the LED flashing. The flashing LED has no effect on measurement data. The measurement signal is output as before.
The reminder time interval can be adjusted to customer requirements at the manufacturer's works.

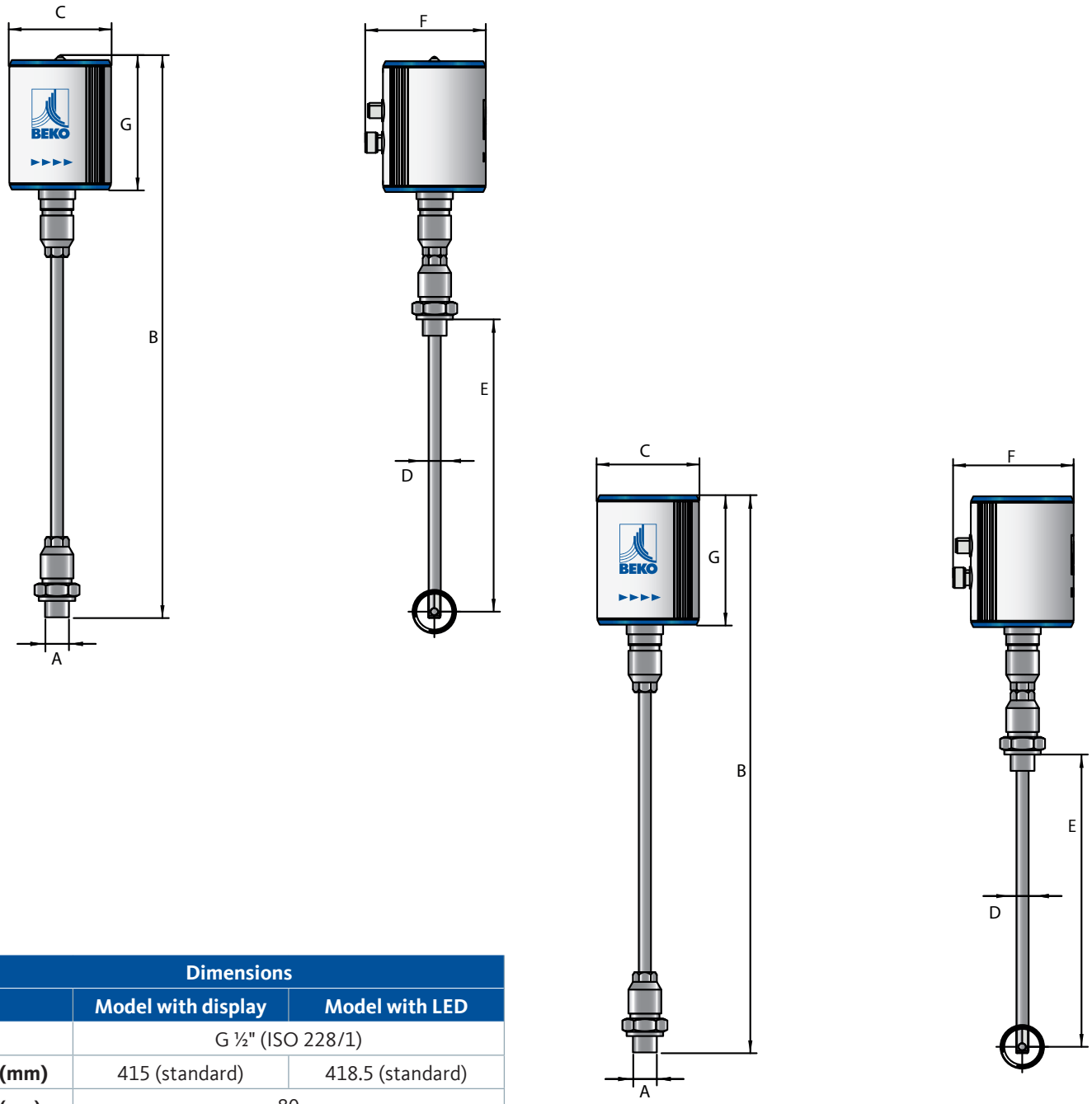
2.4.3. Direction of flow

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



NOTE	Additional information
	Turn the housing as necessary (e.g. to change the direction of flow). For more information, see “Turning the housing” on Page 18.

2.5. Dimensions



Dimensions		
	Model with display	**Model with LED**
A	G ½" (ISO 228/1)	
B (mm)	415 (standard)	418.5 (standard)
C (mm)	80	
D (mm)	Ø 11.7	
E (mm)	220 mm (standard), optional: 400	
F (mm)	94	
G (mm)	102	105.5

2.6. Technical data

Technical data	
	SF53
Maximum positive operating pressure	16 bar, optionally 50 bar
Measuring technique	Calorimetric
Operating temperature	Sensor tube and fittings: −30 ... +140 °C Housing: −30 ... +80 °C
Measuring quantities	m³/h (factory settings) On the display version, the following units can be chosen: m³/min, l/min, l/s, ft/min, cfm, m/s, kg/min, kg/s
Sensor	Pt45, Pt1000
Measuring medium	Compressed air, nitrogen
Humidity of medium	max. 90% rH (non-condensing)
Voltage supply	18 ... 36 VDC
Power consumption	max. 5 W
Digital output	RS485 (Modbus RTU)
Analogue output	4 ... 20 mA (max. ohmic load < 500 Ω)
Pulse output	Floating switch contact Passive: max. 48 VDC 150 mA 1 pulse per m³ or per litre Unit adjustable at display using control keys
Accuracy	±1.5% of measured value ±0.3% of the final value
Display	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 Flange: 1.4404 (DIN EN 1092-1)

2.7. Measuring ranges

The METPOINT® FLM can measure flow velocities up to 185.0 m/s and is preconfigured for an inside pipe diameter of 53.1 mm. At the analogue output of 4 ... 20 mA, this corresponds to:

Rated diameter	Inner Ø	Volume flow (full scale value in Nm³/h)			Max.
Inch	mm	Air *	Air **	N_2**	m/s
1/4"	6.0	9.4	8.7	8.7	185.0
	10.0	29.8	27.4	27.4	185.0
	15.0	77.7	71.4	71.4	185.0
1/2"	16.1	91.0	83.7	83.7	185.0
3/4"	21.7	177.8	163.5	163.5	185.0
1"	25.0	243.9	224.3	224.3	185.0
	26.0	265.2	243.9	243.9	185.0
	27.3	294.7	271.0	271.0	185.0
	28.5	323.3	297.3	297.3	185.0
	30.0	361.1	332.0	332.0	185.0
1 1/4"	32.8	436.7	401.6	401.6	185.0
	36.0	531.5	488.7	488.7	185.0
	36.3	541.1	497.6	497.6	185.0
1 1/2"	39.3	639.8	588.4	588.4	185.0
	40.0	663.7	610.3	610.3	185.0
	41.9	728.4	669.8	669.8	185.0
	43.1	777.3	714.8	714.8	185.0
	45.8	882.2	811.2	811.2	185.0
2"	50.0	1059.2	974.1	974.1	185.0
	51.2	1112.1	1022.6	1022.6	185.0
	53.1	1197.6	1101.3	1101.3	185.0
	54.5	1263.1	1161.6	1161.6	185.0
	57.5	1491.6	1371.7	1371.7	185.0
	60.0	1544.1	1420.0	1420.0	185.0
	64.2	1774.3	1631.7	1631.7	185.0
2 1/2"	65.0	1821.0	1674.6	1674.6	185.0
	70.3	2137.9	1966.0	1966.0	185.0
	71.1	2186.8	2011.0	2011.0	185.0
	76.1	2511.2	2309.3	2309.3	185.0

* According to DIN 1945/ISO 1217 (20 °C, 1000 mbar), with compressed air.

** Adjustment for DIN 1343: 0 °C, 1013.25 mbar

Rated diameter	Inner Ø	Volume flow (full scale value in Nm³/h)			Max.
Inch	mm	Air *	Air **	N_2**	m/s
3"	80.0	2781.9	2558.2	2558.2	185.0
	82.5	2958.5	2720.6	2720.6	185.0
	84.9	3133.1	2881.2	2881.2	185.0
	90.0	3525.1	3241.7	3241.7	185.0
4"	100.0	4357.2	4006.9	4006.9	185.0
	107.1	5003.9	4601.5	4601.5	185.0
	110.0	5278.6	4854.1	4854.1	185.0
5"	125.0	6824.5	6275.7	6275.7	185.0
	133.7	7807.5	7179.7	7179.7	185.0
6"	150.0	9839.0	9047.9	9047.9	185.0
	159.3	11096.9	10204.6	10204.6	185.0
	182.5	14581.9	13409.4	13409.4	185.0
	190.0	15805.1	14534.2	14534.2	185.0
8"	200.0	17533.5	16123.6	16123.6	185.0
	206.5	18691.7	17188.7	17188.7	185.0
10"	250.0	27428.8	25223.2	25223.2	185.0
	260.4	29793.8	27398.1	27398.1	185.0
12"	300.0	39544.5	36364.7	36364.7	185.0
	309.7	42143.0	38754.3	38754.3	185.0
	339.6	50673.3	46598.7	46598.7	185.0
	388.8	70301.3	64648.4	64648.4	185.0
	500.0	109845.8	101013.2	101013.2	185.0
	600.0	158177.9	145459.0	145459.0	185.0
	700.0	215297.7	197985.8	197985.8	185.0
	800.0	281205.2	258593.7	258593.7	185.0
	900.0	355900.4	327282.7	327282.7	185.0
	1000.0	439383.1	404052.7	404052.7	185.0

* According to DIN 1945/ISO 1217 (20 °C, 1000 mbar), with compressed air.

** Adjustment for DIN 1343: 0 °C, 1013.25 mbar

3. Set up

3.1. Warning notices

DANGER	Escaping compressed gas
	Risk of serious or even fatal injury from contact with escaping compressed gas or from unsecured plant components.
	• Depressurise the system before carrying out any set up or maintenance work. Such work must be carried out by authorised skilled technical personnel (see “Safety instructions” on Page 5). • Above 10 bar, use the high-pressure safety device for safe installation and removal. • Tighten the adapter sleeve using a torque of 20–30 N·m (spanner size 27). • Use only pressure-resistant installation materials and suitable tools that are in proper working order. • Before pressurising the system, check all device parts and repair them as necessary. Open valves slowly to prevent pressure blow-outs during operation.

3.1.1. Requirements for pipelines

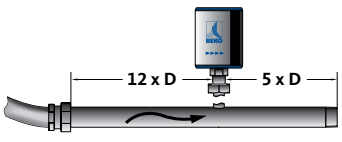
- Correctly dimensioned gaskets
- Correctly aligned flanges and gaskets
- Differences in pipe diameters at joints should be avoided or, if present, should not exceed 1 mm. For more information, see the ISO 14511 standard.
- Clean, properly installed pipes.

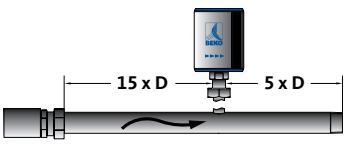
3.1.2. Requirements for the inlet/outlet pipe section

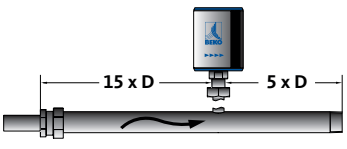
The table below shows the required inlet pipe sections with reference to the existing direction of flow.

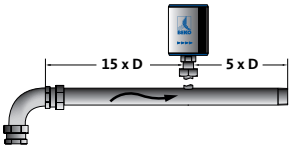
Table of additional inlet pipe sections required

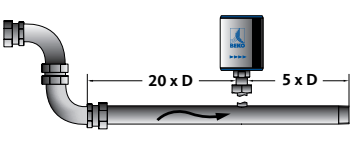
Flow obstruction upstream of measuring section	Minimum length of inlet pipe section (L1)	Minimum length of outlet pipe section (L-L1)
Slight bend (angle < 90°)	12 x D	5 x D
Reduction (pipe narrows as it approaches measuring section)	15 x D	5 x D
Enlargement (pipe widens as it approaches measuring section)	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

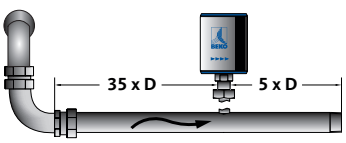


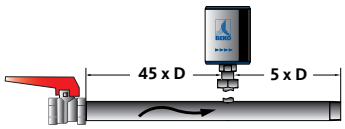








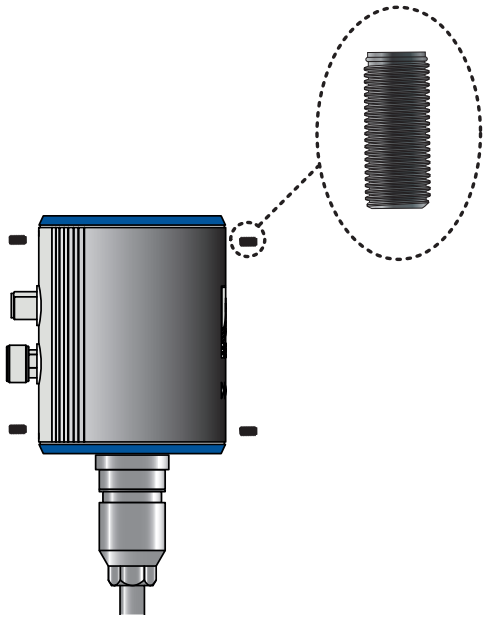




NOTE	Deviating measurements
	The above values are required minimum values (presented in a simplified form). If the recommended settling sections cannot be implemented, the deviations in measurements made may become more frequent or very frequent.

3.1.3. Turning the housing

If the direction of flow changes, the housing can be turned to the required position by undoing the 4 threaded pins with a 1.5 mm hex key. Align the housing as required and then tighten the threaded pins so they are hand-tight.



NOTE	Risk of damage to device
	• Ensure that the connecting pipes are correctly mounted and that the gaskets are installed properly. • Then use the alignment tool to align the sensor with the direction of flow.

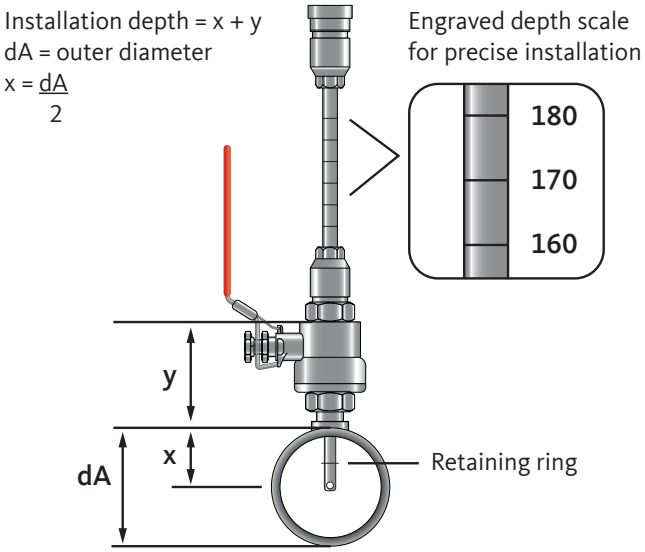
3.2. Assembly steps

The sensor is installed by means of a condensate drain ½, DN 15 ball valve (min. Ø 15 mm).

Install the straight fitting with the O-ring (G½ thread, spanner size 32) into the connecting nozzle. Ensure that the installation is pressure-tight.

Place the sensor head at the centre of the tube and align it to the direction of flow. To do this, the sensor tube is equipped with a depth scale, arrows indicating the direction of flow and an alignment tool. After the sensor is correctly positioned and aligned, tighten the adapter sleeve with a torque of 20–30 N·m (spanner size 27).

When tightening the straight fitting and the adapter sleeve so they are pressure-tight, take care not to change the sensor alignment. Otherwise, you may need to check and re-adjust the sensor position (depth) and alignment.
The angle of the sensor should not deviate by more than ± 2° from the ideal position. Larger angles may result in inaccurate measurement.

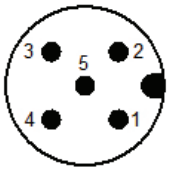
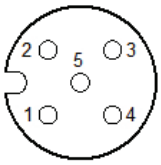
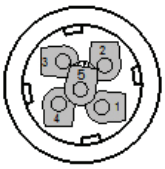


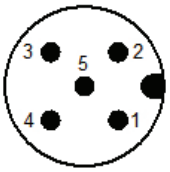
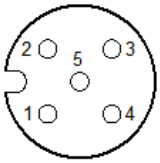
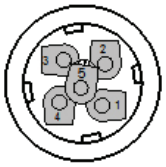
The high-pressure safety device (art. no. 4025892) must be used with operating pressures >10 bar.
This enables pressurised installation and the safe attachment of the sensor to the measuring point.

NOTE	Additional information
	Additional information about assembly of the high-pressure safety device can be found in the enclosed installation and operating manual.

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 view	Pin assignment of connector Bush side view	Pin assignment of connector Screw side view
		

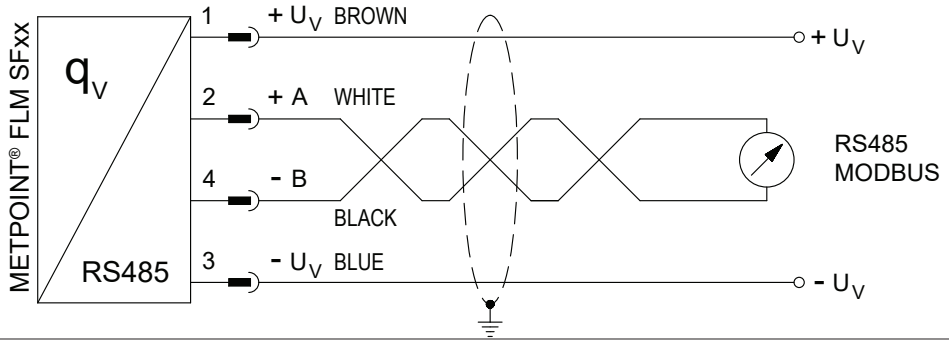
Pin assignment of plug-type connector B, M12 x 1, 5-pin, A-coded (according to EN 61076-2-101)		
Pin assignment of connector Transmitter side view	Pin assignment of connector Bush side view	Pin assignment of connector Screw side view
		

4.2. Connection options

4.2.1. Bidirectional RS485 bus system

Connection is made using the A plug-type connector.

Connection diagram for METPOINT® SF53

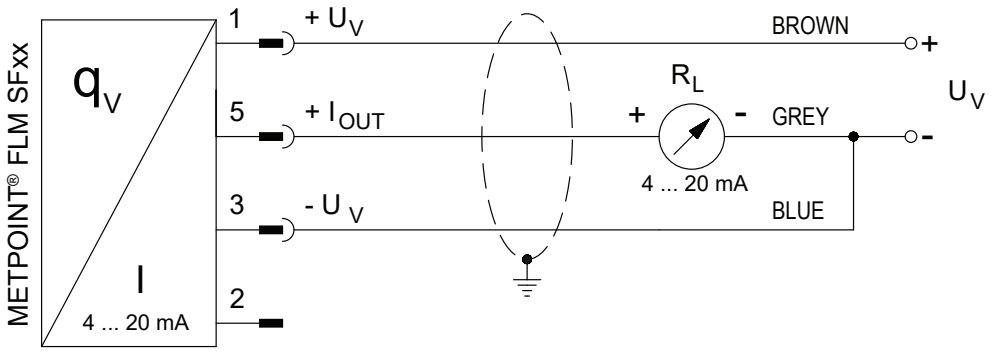


Sensor pin assignment		Function	Wire colour
PIN-1	+ U_V	Plus (+) connection, voltage supply	brown
PIN-2	Bus A (+)	Non-inverted signal (+) from RS485 interface	white
PIN-3	- U_V	Minus (-) connection, voltage supply	blue
PIN-4	Bus B (-)	Inverted signal (-) from RS485 interface	black

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

Connection is made using the A plug-type connector.

Connection diagram for METPOINT® SF53

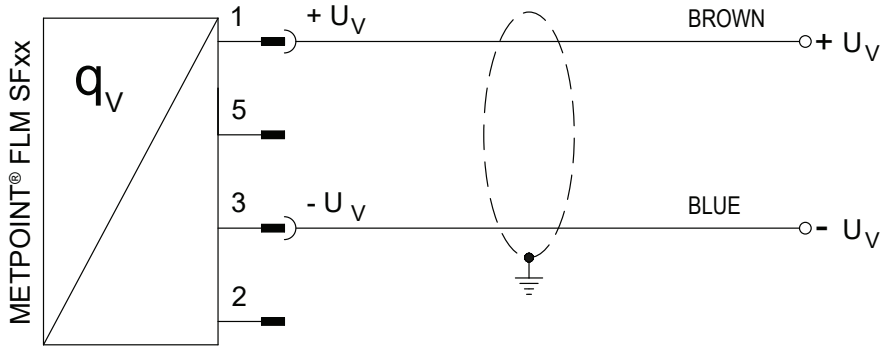


Sensor pin assignment		Function	Wire colour
PIN-1	+ U_V	Plus (+) connection, voltage supply	brown
PIN-2		not assigned	white
PIN-3	- U_V	Minus (–) connection for voltage supply	blue
PIN-4		not assigned	black
PIN-5	+ I_{OUT}	Current output	grey

4.2.3. MBus (optional)

Connection is made using the A plug-type connector.

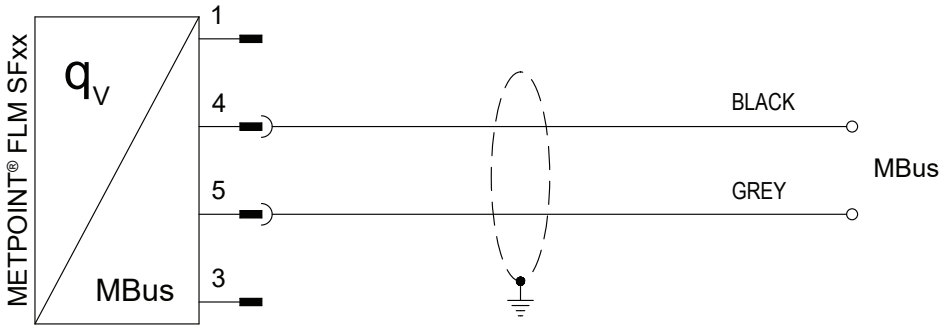
Connection diagram for METPOINT® SF53



Sensor pin assignment		Function	Wire colour
PIN-1	+ U_V	Plus (+) connection, voltage supply	braun
PIN-2		not assigned	
PIN-3	- U_V	Minus (–) connection for voltage supply	blau
PIN-4		not assigned	
PIN-5		not assigned	

Connection is made using the B plug-type connector.

Connection diagram for METPOINT® SF53

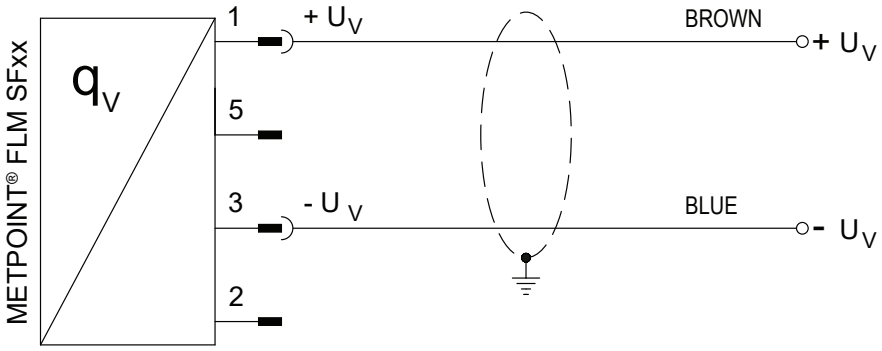


Sensor pin assignment		Function	Wire colour
PIN-1		not assigned	brown
PIN-2		not assigned	white
PIN-3		not assigned	blue
PIN-4	MBus	MBus	black
PIN-5	MBus	MBus	grey

4.2.4. Galvanically isolated pulse output

Connection is made using the A plug-type connector.

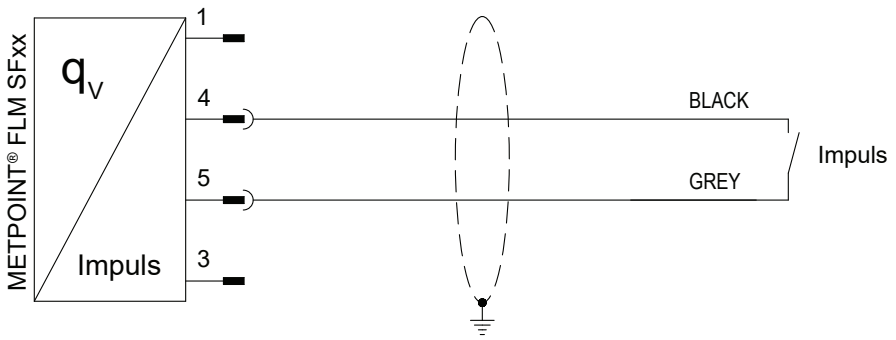
Connection diagram for METPOINT® SF53



Sensor pin assignment		Function	Wire colour
PIN-1	+ U_V	Plus (+) connection, voltage supply	braun
PIN-2		not assigned	
PIN-3	- U_V	Minus (–) connection for voltage supply	blau
PIN-4		not assigned	
PIN-5		not assigned	

Connection is made using the B plug-type connector.

Connection diagram for METPOINT® SF53



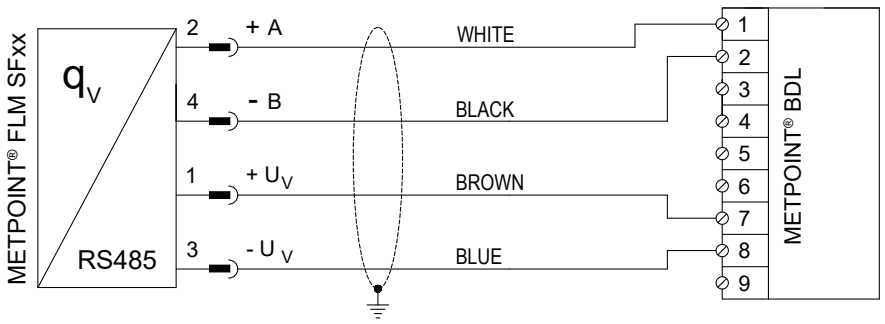
Sensor pin assignment		Function	Wire colour
PIN-1		not assigned	brown
PIN-2		not assigned	white
PIN-3		not assigned	blue
PIN-4	Pulse	Galvanically isolated pulse	black
PIN-5	Pulse	Galvanically isolated pulse	grey

4.3. Connection of METPOINT® BDL / BDL V2

4.3.1. Bidirectional RS485 bus system

Connection is made using the A plug-type connector.

Connection diagram for METPOINT® SF53 and METPOINT® BDL / BDL V2

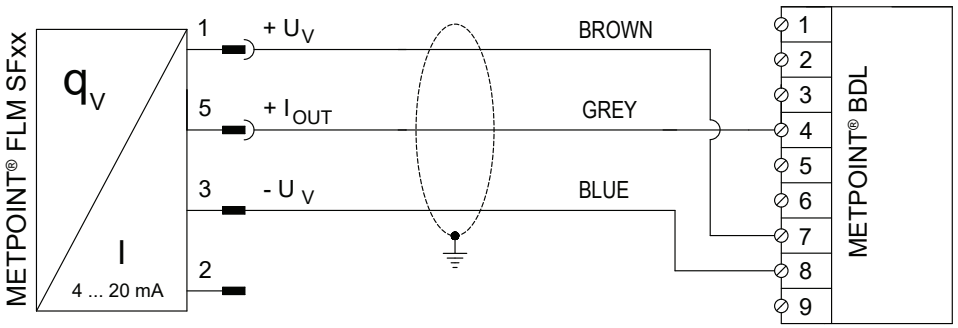


Sensor pin assignment		Function	Wire colour	BDL pin assignment	
PIN-1	+ U_V	Plus (+) connection, voltage supply	brown	PIN-7	+ U_V
PIN-2	Bus A (+)	Non-inverted signal (+) from RS485 interface	white	PIN-1	(+) A / RS485
PIN-4	Bus B (-)	Inverted signal (–) from RS485 interface	black	PIN-2	(-) B / RS485
PIN-3	- U_V	Minus (-) connection, voltage supply	blue	PIN-8	- U_V

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

Connection is made using the A plug-type connector.

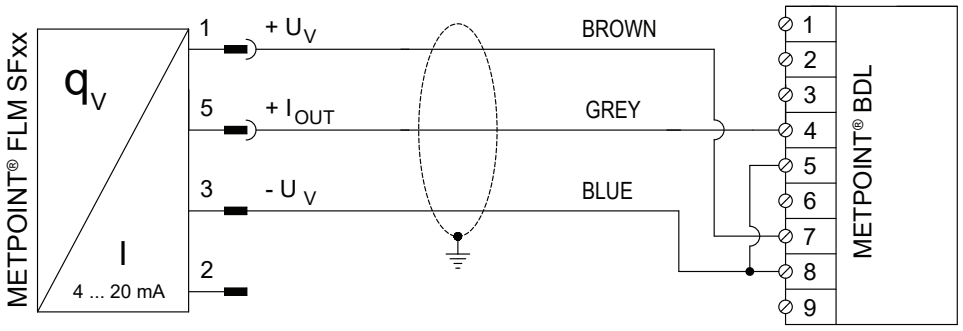
Connection diagram for METPOINT® SF53 and METPOINT® BDL



PIN-Belegung Sensor		Funktion	Aderfarbe	PIN-Belegung BDL	
PIN-1	+ U_V	Plus (+) connection, voltage supply	brown	PIN-7	+ U_V
PIN-5	+ I_{OUT}	Current output	grey	PIN-4	Analogue IN (+)
PIN-3	- U_V	Minus (-) connection, voltage supply	blue	PIN-8	- U_V
PIN-2		not assigned	white		
PIN-4		not assigned	black		

Connection is made using the A plug-type connector.

Connection diagram for METPOINT® SF53 and METPOINT® BDL V2

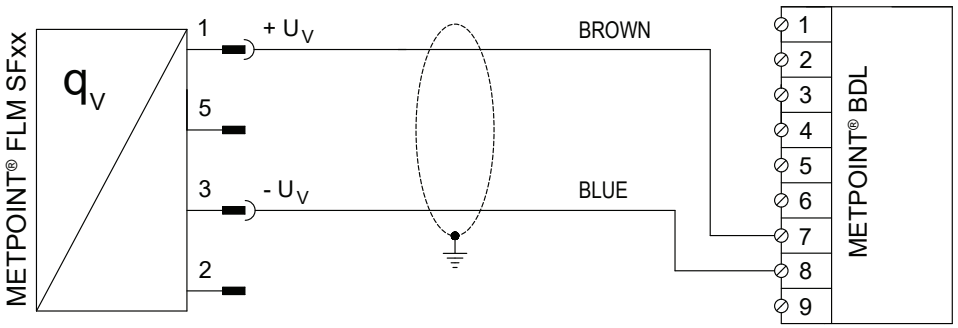


PIN-Belegung Sensor		Funktion	Aderfarbe	PIN-Belegung BDL	
PIN-1	+ U_V	Plus (+) connection, voltage supply	brown	PIN-7	+ U_V
PIN-5	+ I_{OUT}	Current output	grey	PIN-4	Analogue IN (+)
PIN-3	- U_V	Minus (-) connection, voltage supply	blue	PIN-8	- U_V
PIN-2		nicht belegt	white		
PIN-4		nicht belegt	black		

4.3.3. Galvanically isolated pulse output

Connection is made using the A plug-type connector.

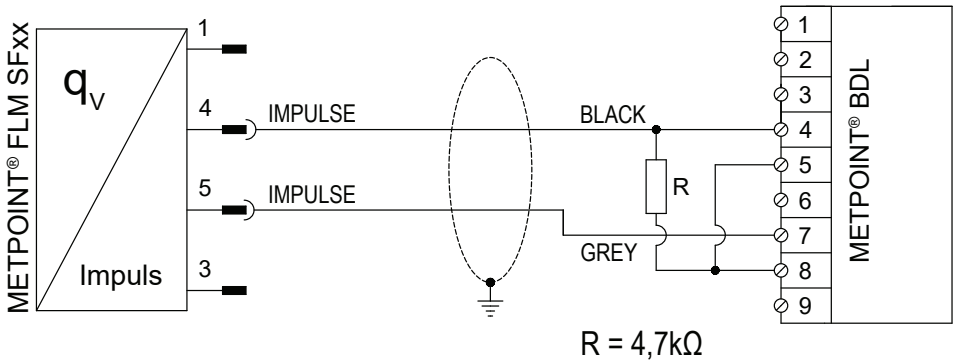
Connection diagram for METPOINT® SF53 and METPOINT® BDL / BDL V2



Sensor pin assignment		Function	Wire colour	BDL pin assignment	
PIN-1	+ U_V	Plus (+) connection, voltage supply	brown	PIN-7	+ U_V
PIN-5		Current output	grey	PIN-4	
PIN-3	- U_V	Minus (-) connection, voltage supply	blue	PIN-8	- U_V
PIN-2		not assigned	white		
PIN-4		not assigned	black		

Connection is made using the B plug-type connector.

Connection diagram for METPOINT® SF53 and METPOINT® BDL / BDL V2



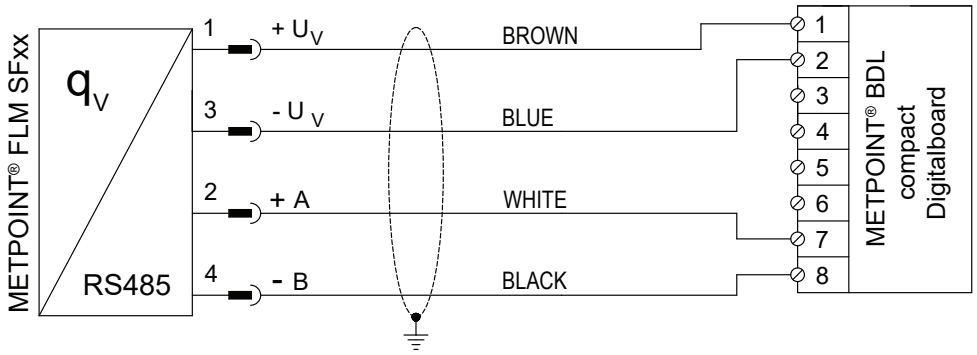
Sensor pin assignment		Function	Wire colour	BDL pin assignment	
PIN-1		nicht belegt	brown		
PIN-4	Pulse	Pulse	black	PIN-4	Analogue IN (+)
PIN-5	Pulse	Pulse	grey	PIN-7	+ U_V
PIN-3		nicht belegt	blue		
PIN-2		nicht belegt	white		

4.4. Connection to METPOINT® BDL compact

4.4.1. Bidirectional RS485 bus system

Connection is made using the A plug-type connector.

Connection diagram for METPOINT® SF53 and METPOINT® BDL compact (digital board)

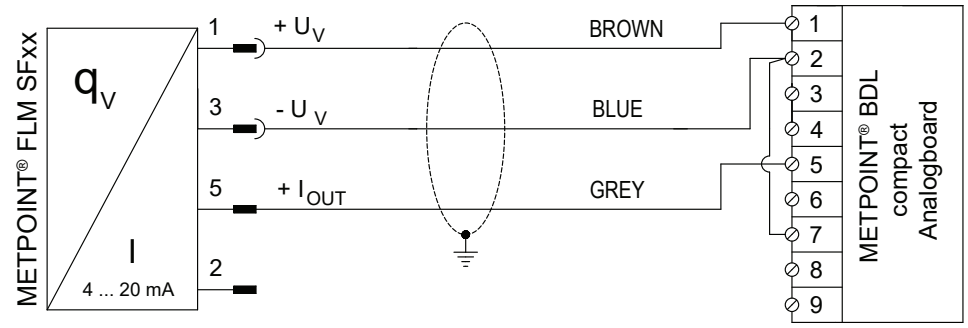


Sensor pin assignment		Function	Wire colour	BDL compact pin assignment	
PIN-1	+ U_V	Plus (+) connection, voltage supply	brown	PIN-1	+ U_V
PIN-3	- U_V	Minus (-) connection, voltage supply	blue	PIN-2	- U_V
PIN-2	+ A	Non-inverted signal (+) from RS485 interface	white	PIN-7	(+) RS485 (A)
PIN-4	- B	Inverted 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 is made using the A plug-type connector.

Connection diagram for METPOINT® SF53 and METPOINT® BDL compact (analog board)

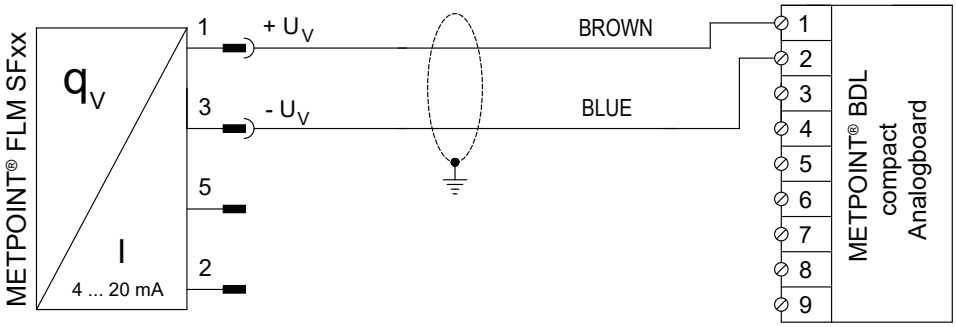


Pin assignment - sensor		Function	Wire colour	BDL compact pin assignment	
PIN-1	+ U_V	Plus (+) connection, voltage supply	brown	PIN-1	+ U_V
PIN-3	- U_V	Minus (-) connection, voltage supply	blue	PIN-2	- U_V
PIN-5	+ I_{OUT}	Current output	grey	PIN-5	(+) I
PIN-2		not assigned	white		
PIN-4		not assigned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

4.4.3. Galvanically isolated pulse output

Connection is made using the A plug-type connector.

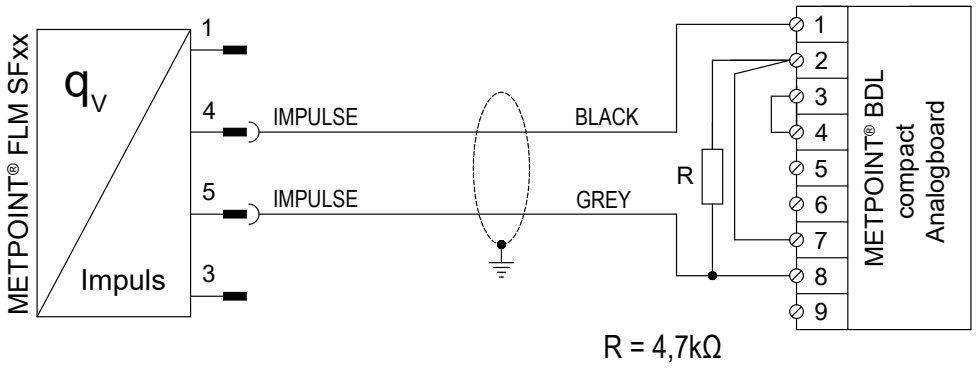
Connection diagram for METPOINT® SF53 and METPOINT® BDL compact (analog board)



Pin assignment - sensor		Function	Wire colour	BDL compact pin assignment	
PIN-1	+ U_V	Plus (+) connection, voltage supply	brown	PIN-1	+ U_V
PIN-3	- U_V	Minus (-) connection, voltage supply	blue	PIN-2	- U_V
PIN-5		not assigned	grey		
PIN-2		not assigned	white		
PIN-4		not assigned	black		

Connection is made using the B plug-type connector.

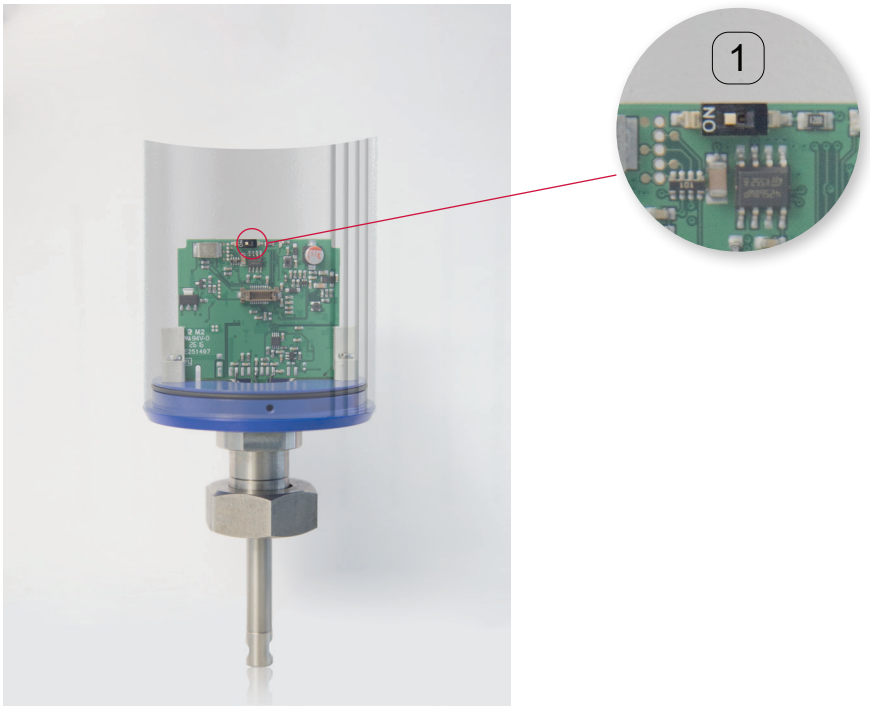
Connection diagram for METPOINT® SF53 and METPOINT® BDL compact (analog board)



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

4.5. Modbus end termination

If the METPOINT® FLM is the last device in the Modbus system, it must be terminated. The sensor has a built-in internal switchable terminator. To activate this terminator, undo the top 2 threaded pins on the housing, lift off the cover and set the DIP switch (1) to "ON". When re-closing the sensor housing, ensure that the housing gasket is correctly installed.



5. Commissioning

To commission the METPOINT® FLM, power it up and perform the sensor setup as described in “Sensor Setup” on Page 30. Following this, slowly pressurise the pipes.

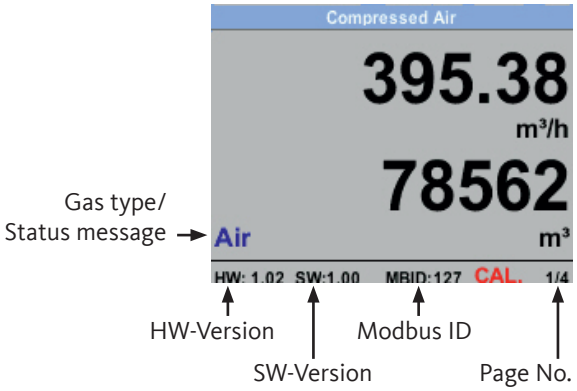
6. Configuration and operation

After powering up, the METPOINT® FLM completes an initialisation procedure and then switches to showing the main menu.

The device menus are operated through two capacitive buttons:

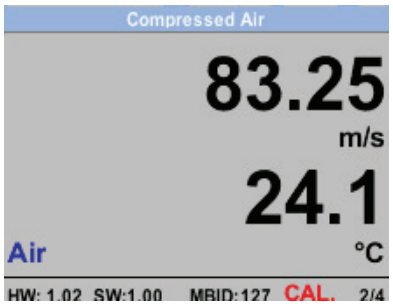
>>UP<< **>>ENTER<<**

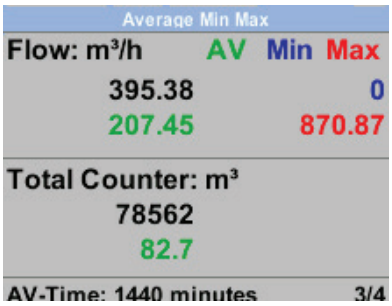
6.1. Indicators used in operation

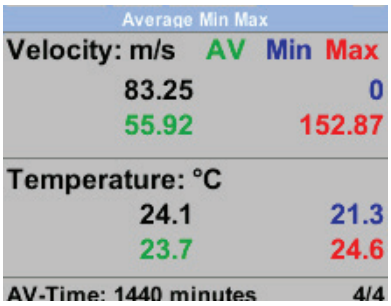


CAL is a calibration indicator:
After 15 months have elapsed, a pending recalibration is indicated by **CAL** being shown on the display. This indicator has no effect on measurement data. The measurement signal is output as before.
The reminder time interval can be adjusted to customer requirements at the manufacturer's works.

Press the >>UP<< button to access pages 2 to 5.







6.2. Setup menu

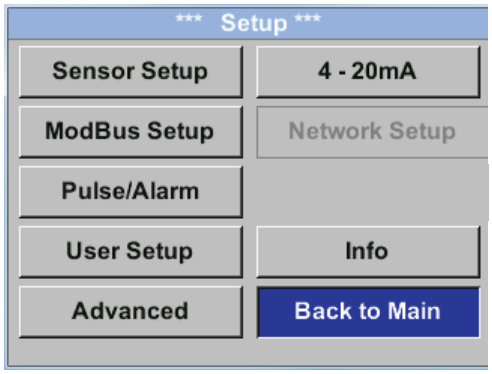
Press the ››ENTER‹‹ button to call up the setup menu.
The setup menu is password-protected.

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

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

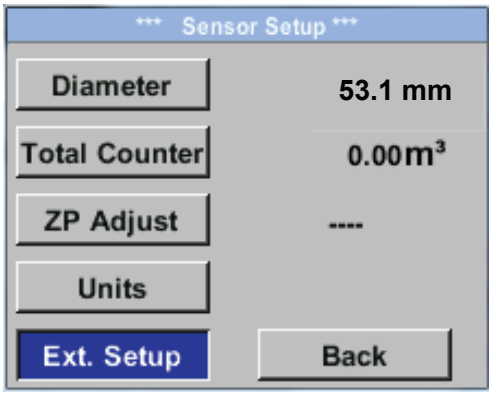
Press the ››UP‹‹ button to select and change values.

Press the ››ENTER‹‹ button to confirm the selection or change.



6.3. Sensor Setup

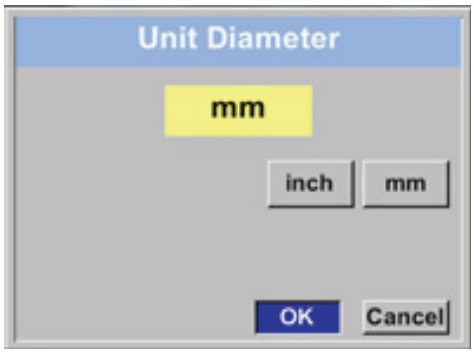
Setup → Sensor Setup



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

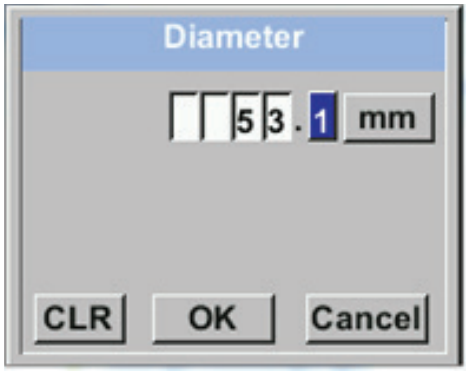
6.3.1. Entering the pipe inner diameter

Setup → Sensor Setup → Diameter



To make changes to the unit (for example), press the ››UP‹‹ button to select the "Unit" field and confirm by pressing the ››ENTER‹‹ button.

Press the ››UP‹‹ button to select the unit to use and then confirm by pressing the ››ENTER‹‹ button twice.

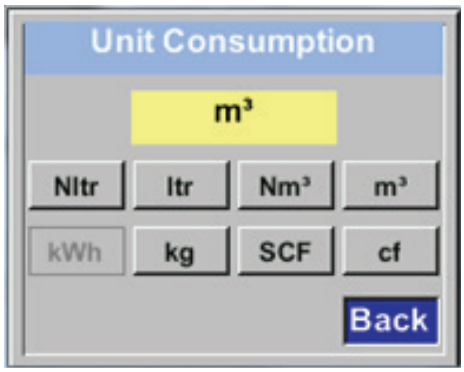


Press the ››UP‹‹ button to select the value to be changed and confirm by pressing the ››ENTER‹‹ button.

Press the ››UP‹‹ button to enter the new value and confirm by pressing the ››ENTER‹‹ button.

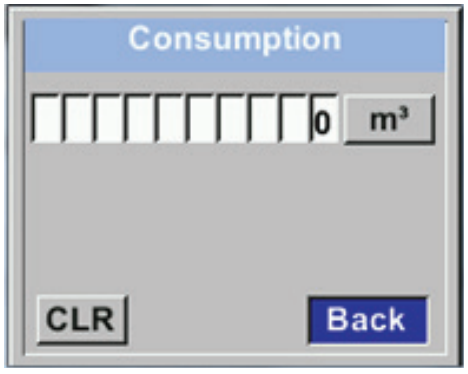
6.3.2. Entering / changing consumption counter value

Setup → Sensor Setup → Total Counter



To make changes to the unit (for example), press the ››UP‹‹ button to select the "Unit" field and confirm by pressing the ››ENTER‹‹ button.

Press the ››UP‹‹ button to select the unit to use and then confirm by pressing the ››ENTER‹‹ button twice.



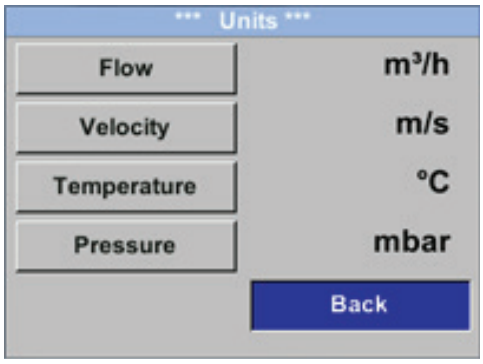
Press the ››UP‹‹ button to select the value to be changed and confirm by pressing the ››ENTER‹‹ button.

Press the ››UP‹‹ button to enter the new value and confirm by pressing the ››ENTER‹‹ button.

NOTE	Consumption counter value
	When the consumption counter reaches 1,000,000,000 m³, it is automatically reset to zero.

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

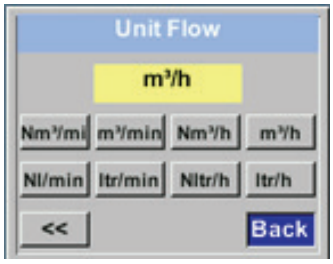
Setup → Sensor Setup → Units

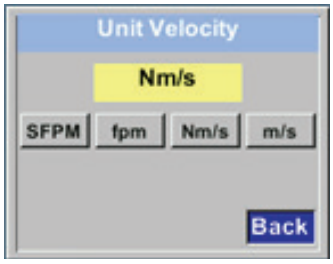


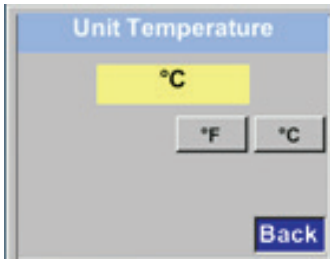
To make changes to the unit (for example), press the >>UP<< button to select the "Unit" field and confirm by pressing the >>ENTER<< button.

If there are too many units to fit on one screen, you can use the "<<" button to access the next screen.

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





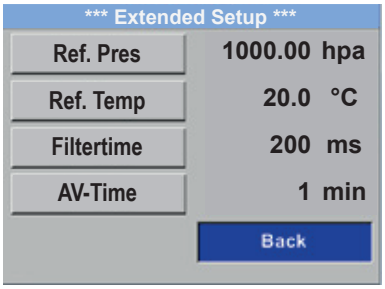


6.3.4. Entering reference conditions

The measuring-fluid reference conditions for pressure and temperature can be set here, as well as time settings for the filter and averaging.

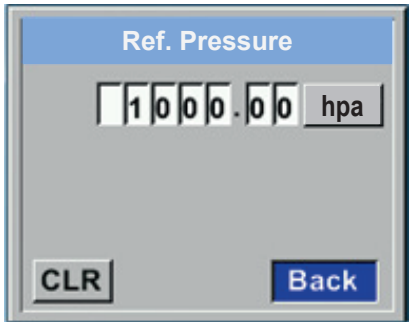
NOTE	Important information
	• The factory settings for reference temperature and reference pressure are 20 °C and 1000 hPa. • All volumetric flow rates (m³/h) and consumption values (m³) shown on the display relate to 20 °C and 1000 hPa (according to ISO 1217 intake condition). • Alternatively, 0 °C and 1013 hPa (= standard cubic metre) can be entered as reference values. • Do not under any circumstances enter the operating pressure or operating temperature in the reference conditions.

Setup → Sensor Setup → Ext. Setup



Enter the reference conditions here.

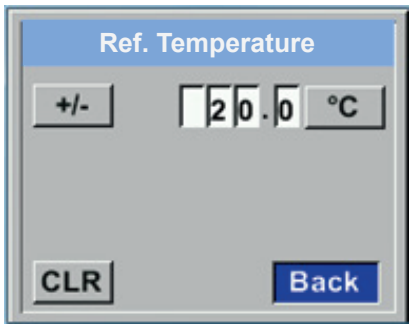
Setup → Sensor Setup → Ext. Setup → Ref.Pres



To make changes to the reference conditions, press the >>UP<< button to select the “Unit” field and confirm by pressing the >>ENTER<< button.

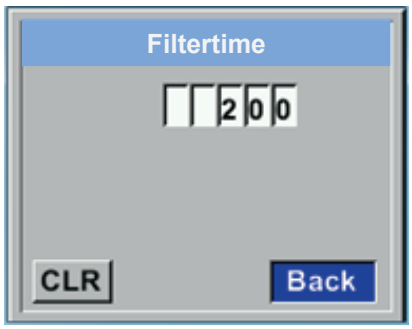
Press the >>UP<< button to select the unit to use and then confirm by pressing the >>ENTER<< button twice.

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



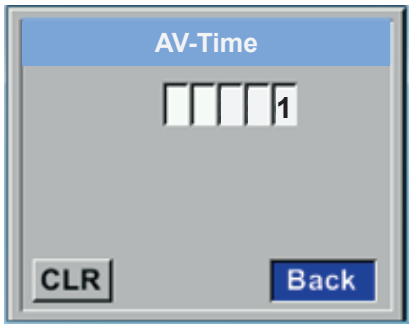
Set the reference temperature here.

Setup → Sensor Setup → Ext. Setup → Filtertime



Under "Filtertime", an attenuation can be defined, provided that a "Filtergrade" is entered.
Possible values: 0–10000 in [ms].

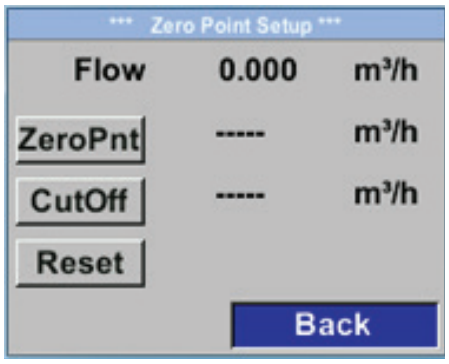
Setup → Sensor Setup → Ext. Setup → AV-Time



“AV-Time” is where the time period for averaging can be entered.
Possible values: 0–1440 in [minutes].

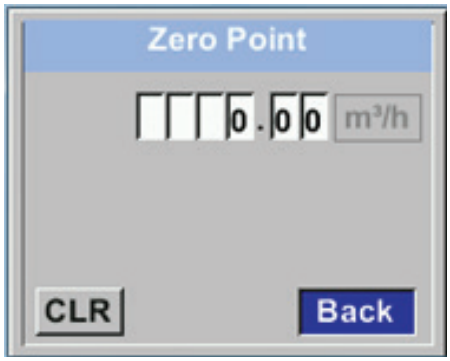
6.3.5. Setting zero point for low-flow cut-off function

Setup → Sensor Setup → ZP Adjust



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

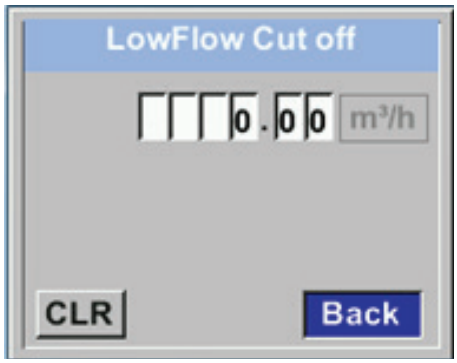
Setup → Sensor Setup → ZP Adjust → ZeroPnt



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.

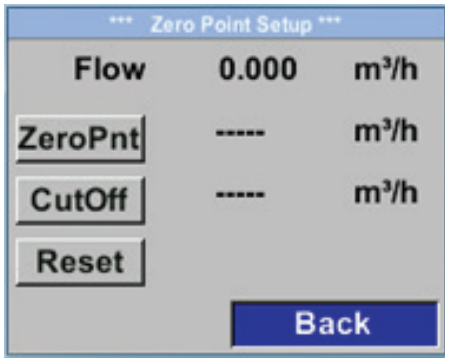
Setup → Sensor Setup → ZP Adjust → CutOff



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.

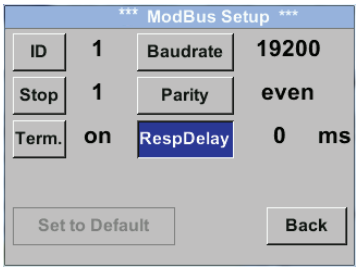
6.4. Modbus setup

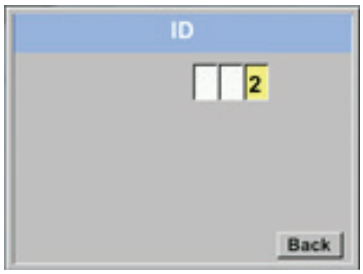
The METPOINT® FLM thermal flow meter is equipped with an RS-485 interface (Modbus RTU). Before starting the sensor, configure the communication parameters

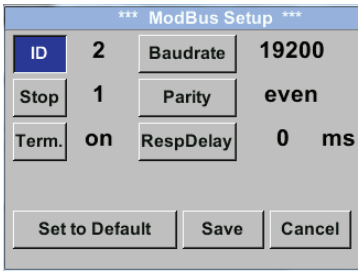
- Modbus ID, baud rate, parity and stop bit

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.

Default (factory) 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. For further information, see chapter “4.5. Modbus end termination” on Page 28.

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

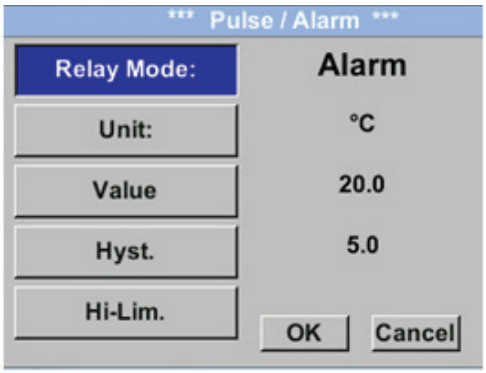
6.4.2. Values register (1001 ...1500)

Modbus Register	Register Adresse	No. of Byte	Data Type	Description	Default	Read/ Write	Holding Register
1101	1100	4	Float	Flow in m³/h		R	X
1109	1108	4	Float	Flow in Nm³/h		R	X
1117	1116	4	Float	Flow in m³/min		R	X
1125	1124	4	Float	Flow in Nm³/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 m³ before comma	X	R	X
1275	1274	4	UInt32	Consumption Nm³ 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.

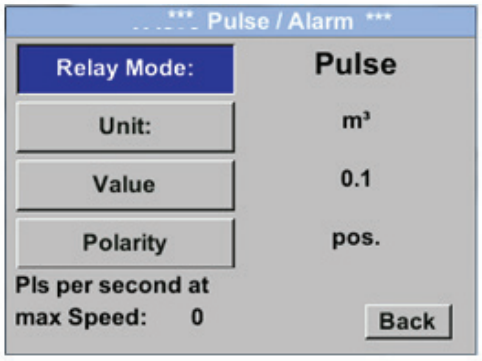


The following units can be selected for the alarm output:

- 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 hysteresis to use.

Hi-Lim: Upper limit
Lo-Lim: lower limit



The following units can be selected for the 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 number of pulses that can be output per second is 50. Pulse output is delayed by 1 second.

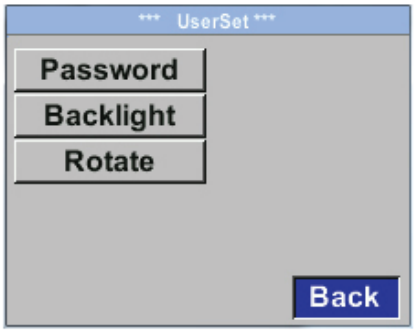
Pulse factor	[m³/h]	[m³/min]	[l/min]
0.1 ltr / pulse	18	0.3	300
1 ltr / pulse	180	3	3000
0.1m³ / pulse	18000	300	300000
1 m³ / pulse	180000	3000	3000000

Table 1: Maximum flow volumes for pulse output

NOTE	Important information
	Pulse factors cannot be used if they would make it impossible to represent the full scale value. Such entries are discarded and an error message is displayed.

6.6. User Setup

Setup → User Setup

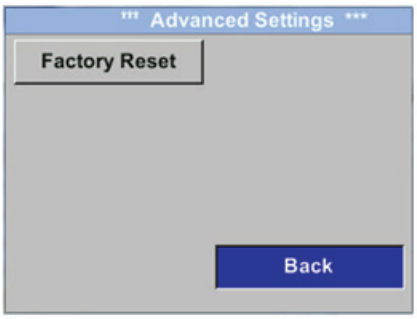


On the user setup screen, you can change the password, rotate the display and adjust its brightness.

To change the password, you must enter the new password twice.

6.7. Advanced

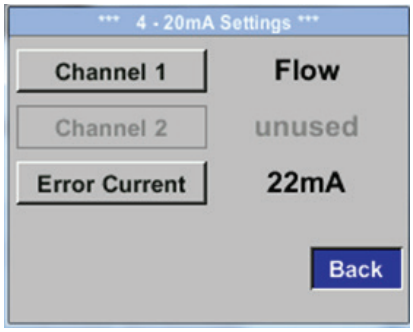
Setup → Advanced



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

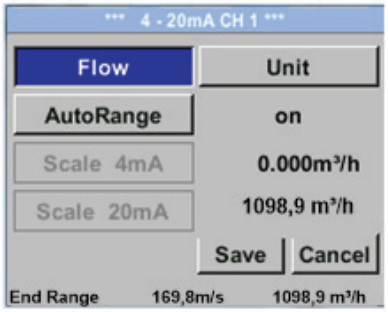
6.8. 4 ... 20 mA

Setup → 4 - 20 mA



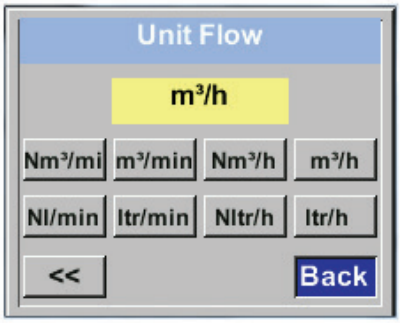
On this screen, you can adjust the settings for the 4 ... 20 mA analogue output.

Setup → 4 - 20 mA → Channel 1

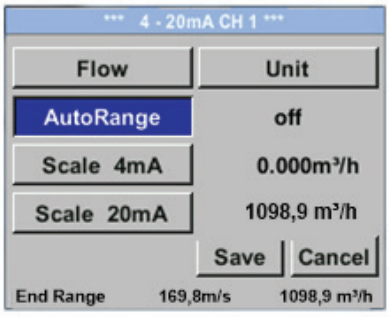


The following measurement data can be configured:

- Flow = volume flow
- Velocity
- Temperature
- unused = deactivate channel



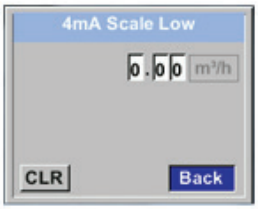
This screenshot shows the available units for volume flow. Press the "<<" button to page to the next screen.

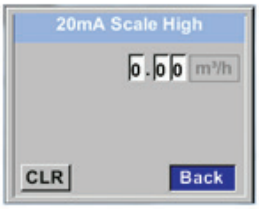


The scaling of the 4 ... 20 mA analogue output can be set to automatic ("AutoRange = on") or manual ("AutoRange = off").

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

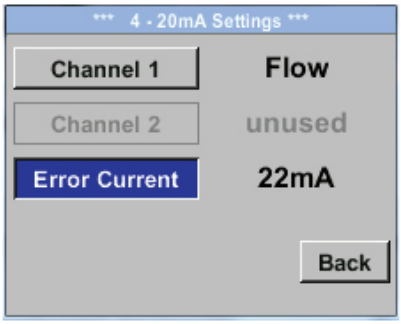
Select "Scale 4mA" and "Scale 20mA" to manually configure the scaling of the output (precondition: "AutoRange = off").





Enter the scale 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 analogue output in the event of a fault.

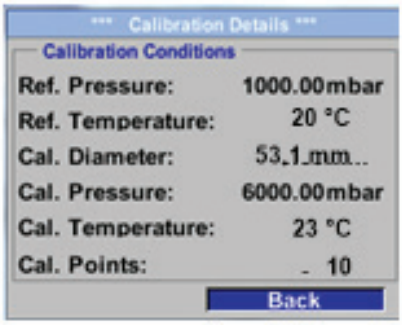
- 2 mA = sensor fault/system error
- 22 mA = sensor fault/system error
- None = output according to Namur (3.8 mA ... 20.5 mA)
  ‹ 4mA to 3.8 mA = value below measuring range
  › 20 mA to 20.5 mA = value above measuring range

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. Factory communication settings

Primary address*: 1
ID: Sensor serial number
Baud rate*: 2400
Medium*: Gas

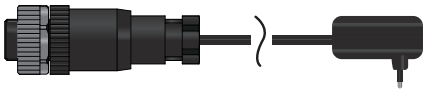
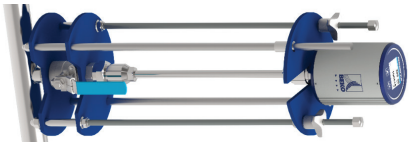
6.10.2. Transmitted values

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

* All 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	Illustration
Power supply unit with A plug-type connector ➞ 4032115	
High-pressure safety device ➞ 4025892	

8. Maintenance and servicing

Regularly check the sensor head for dirt and clean as necessary. Dirt, dust or oil deposits on the sensor element cause incorrect measurements.
We recommend checking the sensor element at least once a year. If the compressed air is heavily soiled, use a shorter inspection interval.

9. Sensor head cleaning

To clean the sensor head, immerse it in warm water with a small amount of washing-up liquid. Do not clean the sensor with a cloth, sponge, brush or other implement, as any mechanical shock can destroy the sensor. If dirt deposits cannot be removed, return the sensor to the manufacturer for inspection and maintenance.

10. Recalibration

Unless otherwise agreed with the customer, we recommend having the device calibrated every 12 months. For calibration, send the METPOINT® FLM to **BEKO** TECHNOLOGIES GmbH.

11. LED display

A calibration reminder LED is mounted on the top of the housing of the METPOINT® FLM. After 15 months have elapsed, recalibration becomes due and is indicated by the LED flashing. The flashing LED has no effect on measurement data. The measurement signal is output as before.
The reminder time interval can be adjusted to customer requirements at the manufacturer's works.

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:

CE

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

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

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:

CE

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

BEKO TECHNOLOGIES GmbH

Im Taubental 7
D - 41468 Neuss
Tel. +49 2131 988 0
Fax +49 2131 988 900
info@beko-technologies.com
service-eu@beko-technologies.com

DE

BEKO TECHNOLOGIES LTD.

Unit 11-12 Moons Park
Burnt Meadow Road
North Moons Moat
Redditch, Worcs, B98 9PA
Tel. +44 1527 575 778
info@beko-technologies.co.uk

GB

BEKO TECHNOLOGIES S.à.r.l.

Zone Industrielle
1 Rue des Frères Rémy
F - 57200 Sarreguemines
Tél. +33 387 283 800
info@beko-technologies.fr
service@beko-technologies.fr

FR

BEKO TECHNOLOGIES B.V.

Veenen 12
NL - 4703 RB Roosendaal
Tel. +31 165 320 300
benelux@beko-technologies.com
service-bnl@beko-technologies.com

NL

BEKO TECHNOLOGIES (Shanghai) Co. Ltd.

Rm.715 Building C, VANTONE Center
No.333 Suhong Rd.Minhang District
201106 Shanghai
Tel. +86 (21) 50815885
info.cn@beko-technologies.cn
service1@beko.cn

CN

BEKO TECHNOLOGIES s.r.o.

Na Pankraci 58
CZ - 140 00 Praha 4
Tel. +420 24 14 14 717 /
+420 24 14 09 333
info@beko-technologies.cz

CZ

BEKO Tecnológica España S.L.

Torruella i Urpina 37-42, nave 6
E - 08758 Cervelló
Tel. +34 93 632 76 68
Mobil +34 610 780 639
info.es@beko-technologies.es

ES

BEKO TECHNOLOGIES LIMITED

Room 2608B, Skyline Tower,
No. 39 Wang Kwong Road
Kwoloon Bay Kwoloon, Hong Kong
Tel. +852 2321 0192
Raymond.Low@beko-technologies.com

HK

BEKO TECHNOLOGIES INDIA Pvt. Ltd.

Plot No.43/1 CIEEP Gandhi Nagar
Balanagar Hyderabad
IN - 500 037
Tel. +91 40 23080275 /
+91 40 23081107
Madhusudan.Masur@bekoindia.com
service@bekoindia.com

IN

BEKO TECHNOLOGIES S.r.l

Via Peano 86/88
I - 10040 Leinì (TO)
Tel. +39 011 4500 576
Fax +39 0114 500 578
info.it@beko-technologies.com
service.it@beko-technologies.com

IT

BEKO TECHNOLOGIES K.K

KEIHIN THINK Building 8 Floor
1-1 Minamiwatarida-machi
Kawasaki-ku, Kawasaki-shi
JP - 210-0855
Tel. +81 44 328 76 01
info@beko-technologies.jp

JP

BEKO TECHNOLOGIES Sp. z o.o.

ul. Pańska 73
PL - 00-834 Warszawa
Tel. +48 22 314 75 40
info.pl@beko-technologies.pl

PL

BEKO TECHNOLOGIES S. de R.L. de C.

BEKO Technologies, S de R.L. de C.V.
Blvd. Vito Alessio Robles 4602 Bodega 10
Zona Industrial
Saltillo, Coahuila, 25107
Mexico
Tel. +52(844) 218-1979
informacion@beko-technologies.com

MX

BEKO TECHNOLOGIES, CORP.

900 Great Southwest Pkwy SW
Atlanta, GA 30336
USA
Tel. +1 404 924-6900
beko@bekousa.com

US

mp_flm_sf53_ba_10-221_en_08_00

www.beko-technologies.com