

Thermal Mass Flowmeter **FMT200-D (Sensyflow D)**

for compressed air, nitrogen and biogas



Thermal Mass Flowmeter FMT200-D (Sensyflow D)

Operating instruction

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1 Important information in advance

Symbols

In order that you can make the best use of this document and to ensure safety during commissioning, operation and maintenance of the equipment, please note the following explanation of the symbols used.

Explanation of the symbols used.

Symbol	Signal Word	Definitions
	DANGER	DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury. (High level of risk.)
	WARNING	WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury. (Medium level of risk.)
	CAUTION	CAUTION indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury. (Low level of risk.)
	NOTICE	NOTICE indicates a potentially harmful situation which, if not avoided, may result in damage of the product itself or of adjacent objects. (Damage to property)
	IMPORTANT	IMPORTANT indicates useful hints or other special information which, if not observed, could lead to a decline in operating convenience or affect the functionality. (Does not indicate a dangerous or harmful situation.)

As well as the instructions in this document, you must also follow the generally applicable accident prevention and safety regulations.

If the information in this document is insufficient in any situation, please contact our service department, who will be happy to help you.

Please read this document carefully before installation and commissioning.

In case of questions

If you cannot find any information concerning technical questions or malfunctions in these operating instruction, please apply to one of our external service points or contact our technical user assistance hotline directly. For all questions concerning the measuring system, please have the calibration certificate readily at hand.

Sensyflow Hotline	Tel: +49 6023 92-3597 or -3267 Fax: +49 6023 92-3210 E-mail: sensyflow.deapr@de.abb.com
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2 Application according to designation, general safety instructions

2.1 Range of application, application according to designation

The thermal mass flowmeter FMT400-VTS/-VTCS is designed for flow rate measurements of compressed air, nitrogen and biogas. It is only suitable to be mounted:

- as insertion sensor in a pipe component in pipes of nominal widths from 1 ... 3",
- via weld-on adapter directly in pipes with nominal widths up from DN 100 ... DN 250 (4 ... 10").
- The standard process temperature range is between -25 °C ... 150 °C (-13 ... 302 °F).



DANGER

- **The device is not certified for use in hazardous areas**
- Modification of construction details at the device by the user are not permitted.

Any other use is considered improper.



WARNING

For proper use it is required to observe the Technical data section in the data sheets. You will find the data sheets in section chapter 10 "Technical Data" on page 21 of these operating instructions.

2.2 General safety instructions

2.2.1 Safe operation

The technology of the mass flow meter is state of the art.

The devices were designed, produced and tested in accordance with IEC 1010-1 (corresp. to EN 61010-1 and DIN VDE 0411 part 1) „Safety requirements for electrical measurement, control and laboratory equipment“ CE-certified, and delivered in a safe condition. To maintain this state and guarantee hazard-free operation, all safety instructions in this manual headed by "**DANGER**", "**WARNING**", "**CAUTION**" or "**NOTICE**" must be observed. Otherwise, personnel might be endangered and the mass flow meter itself or other devices and equipment could be damaged.

Prerequisites for safe operation

These operating instructions contain important information about the safe and proper operation of the equipment. Observing these instructions is mandatory for safe operation.

Failure to observe the instructions can cause hazards for life and limb of the user respectively property damages at the devices or the entire system.

Proper and safe operation of the mass flow meter requires proper transportation and storage, installation and commissioning by qualified personnel, operation within its design limits, and careful maintenance observing all information in these operating instructions.

Qualification of personnel

Only personnel familiar with the installation, commissioning, and maintenance of similar devices and having the required qualifications for their tasks are allowed to work on the device.

Operator

The operator of the plant is fully and solely responsible for proper and workmanlike and, thus, safe operation.

The operator must make sure that the operating instructions have been understood by the target audience.

A copy of the operating instructions must be stored in a suitable place at the usage location of the device at all times.

Read these operating instructions prior to commissioning, decommissioning, maintaining, or repairing a device.

National regulations

The regulations, standards, and guidelines mentioned in these operating instructions are valid for Germany. When using the devices in other countries the appropriate and valid national regulations must be observed.

Notes and regulations to be observed

- Observe
- the contents of these operating instructions and references to other documents and their contents
 - the safety instructions attached to the mass flow meter
 - the application data indicated in the calibration certificate
 - the appropriate and valid safety instructions for the construction and operation of electrical systems
 - the appropriate and valid safety instructions for handling gases
 - the regulations and directives regarding explosion protection.

During operation

The operator must commission a qualified electrician to inspect and examine the system at defined intervals. The examination intervals must be chosen in such a way that any damages that can be expected can be recognised in time.

The examinations must be performed at least every three years.

The examinations can be skipped if the electrical system is continuously monitored by a responsible engineer.

Duties of the operator:

- maintain the system in proper condition
- continuously monitor the system
- execute required maintenance and repair work immediately
- carry out required safety measures.

If the devices are used in areas where dusts can cause explosion hazards, you must clean the devices frequently.

Use genuine spare parts, only.

2.2.2 Notice according to the German Hazardous Material Directive

According to the German Waste Disposal Act dated 1986-08-27 (AbfG, §11 Special Waste) the owner of special waste is responsible for its disposal. According to the German Hazardous Material Directive dated 1986-10-01 (GefStoffV, §17 General Protection Duties) the employer is also obliged to protect his employees. Therefore, we must point out the following:

- a) All flow sensors and/or flow transducers sent to ABB Automation Products GmbH for repair must be free of any hazardous substances (acids, lyes, solutions, solids).
- b) Flow sensors must be flushed and rinsed in order to neutralize hazardous substances. Flow sensors have cavities. Therefore, the cavity must be neutralized after operation with hazardous materials (refer to German Hazardous Material Directive, GefStoffV).
- c) In case of service or repair, the measures listed in a) and b) must be confirmed in writing. This confirmation (return report), which has been created and signed by specialist personnel, must be enclosed with the device whenever a device is returned to the factory.
- d) Costs arising from increased efforts for handling of contaminated devices and the disposal of hazardous substances during repair shall be invoiced to the owner of the device!

2.2.3 Instructions acc. to Directive 97/23/EC, pressure Devices

2.2.3.1 General

- The thermal mass flowmeters FMT200-D and the pipe components:
 - partial measuring section with external threads
 - partial measuring section with flanges
 - weld-on adapter
 are part of the pipeline. A rating of the entire system according to PED is to be carried out by the approved regulatory agency on the customer side.
- The "FMT200-D" measuring systems are intended to be used for flow measurement of gaseous media, only.
- The device may be used for the specific application and under the conditions specified in the order confirmation, only. Otherwise, the device may be impaired, damaged or even destroyed.
- Only those media (fluids) may be measured which – according to the state of the art or the operator's experience – do not affect the chemical or physical material properties of process-wetted parts that are essential for operational reliability.
- The device must be included in the routine maintenance procedure of the plant and checked accordingly.
- The used materials must be checked by the user for compatibility with the respective application.
- The max. temperature and pressure specified on the rating plate must not be exceeded.
- Prior to mounting or dismounting the pipe components or transducers always make sure that the pipe is fully depressurized.
- Prior to starting any installation work on pipes with aggressive, toxic, irritant or noxious substances always rinse the pipes carefully. When working on the pipes observe the applicable regulations for the prevention of accidents.
- Do not use damaged pipe components or transducers. Such units must be withdrawn immediately and returned to the vendor for repair.
- Dismounted pipe components or transducers that have been in contact with aggressive, toxic, irritant or noxious substances must be cleaned thoroughly and wrapped and marked accordingly when they are returned to the vendor.
- If a leakage should occur at a measuring point, the respective point must be put out of service.
- Immediately replace defective gaskets or O-ring seals. Do not re-use.
- Mechanically marking or making alterations to pipe components or sensors can lead to damage to the components and is thus prohibited. For weld-on adapters, cutting to length and welding on to the pipe are permitted.

2.2.3.2 Mounting/Dismounting the pipe component

- When mounting the pipe components, make sure that the flow direction is in accordance with the marking.
- Observe the respective welding regulations when welding in a weld-on adapter. Do not apply more heat than absolutely necessary to avoid that the sealing face of the mounting flange gets distorted.
- When mounting a pipe component insert a flat flange gasket between the two pipe flanges. The gasket must be intact and resistant to the conducted substances.
- Prior to mounting always check the pipe component or transducer incl. the gaskets for possible damage.
- Make sure that the pipe components are not twisted when they are mounted.
- Use the appropriate screws with the required strength and dimensions for screwing the flanges together.
- Fasten the flange screws evenly and with the appropriate torque specified for the built-in gasket.
- After mounting the pipe components, close the insertion pipe with an appropriate blind flange with gasket, or close the existing stop valve, if applicable.

2.2.3.3 Mounting/Dismounting the transducer

- When mounting the transducer make sure that its specifications are in accordance with the specifications of the measuring point.
- Exclusively use the flawless, media-resistant gasket seal delivered with the transducer for mounting. Do not use a flat packing.
- The gasket is to be inserted into the provided groove of the flowmeter primary.
- Handle the transducer with care when inserting it into the pipe. Make sure that the sensor unit is not damaged.
- The flowmeter primary is to be firmly bolted together with the lock nut of the insertion connection.

2.2.3.4 Potential risks that may occur during operation

- The surfaces of parts run through by hot fluids may get very hot. Do not touch. Otherwise, there is a risk of being burnt.
- Aggressive fluids may cause corrosion or abrasion which may result in leakage of fluids under pressure.
- The flange or process gaskets may become leaky due to material fatigue. Media under pressure might escape then.

**WARNING**

An uncontrolled escaping of the measuring fluid poses a danger to life and/or health.

3 Design and function

The mass flowmeter works according to the thermal measuring principle of a hot-film anemometer. Heat is withdrawn from a heated body by a gas circulating around it. This flow-dependent cooling is utilized as measuring effect. Since the heat loss depends on the number of particles that hit the surface of the heated body, it is possible to directly determine the mass of flow. Thus omitting the need for a correction of pressure and temperature influences.

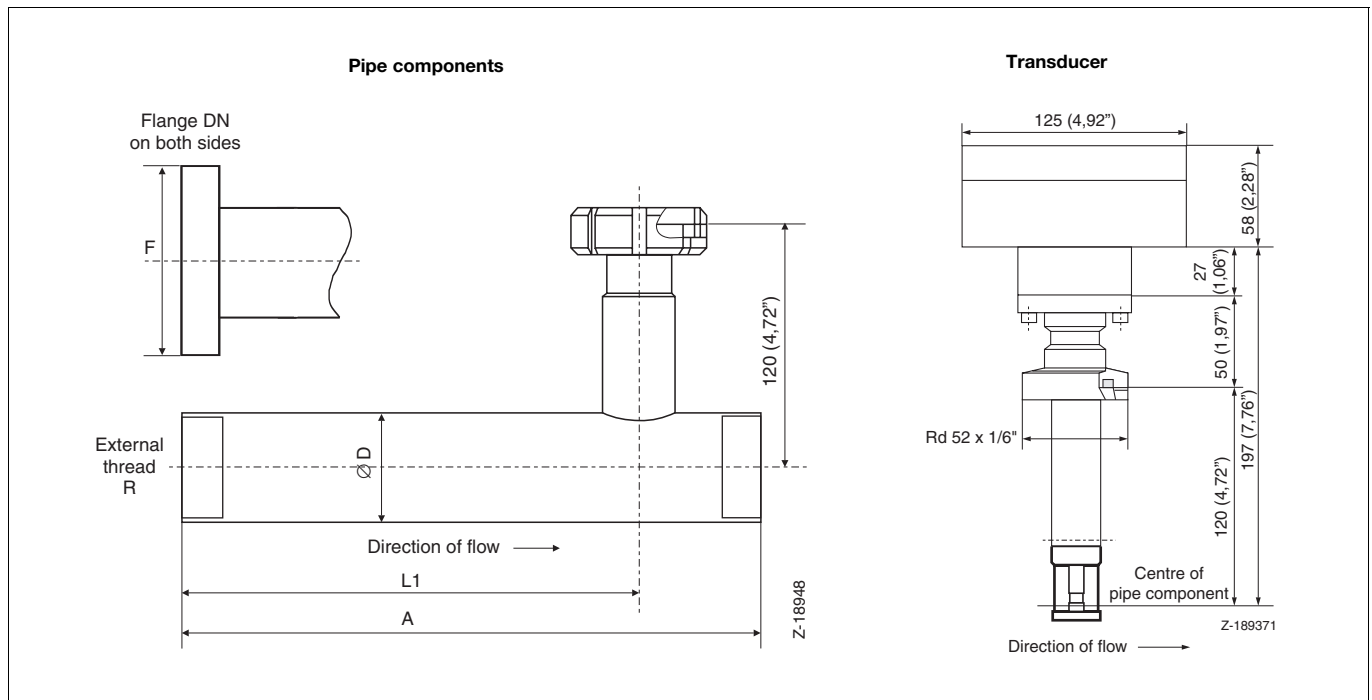
The calibration of the devices is done on a highly precise flow test machine with air as calibration medium. For standard biogas applications, the calibration data are subsequently converted, based on a medium gas composition of 53 Vol% methane, 45 Vol% carbon dioxide and 2 Vol% air. Devices for applications that clearly deviate from this gas composition must be ordered with a special calibration for biogas. In this case, the exact gas composition is to be specified with the order.

The measuring systems FMT200-D consist of only the 2 components:

- transducer and
- pipe component.

3.1 Pipe components

Pipe components are available in various types for nominal pipe widths from 1 ... 3". In addition it is possible to integrate the transducer directly into pipes as of DN 100 ... DN 250 (4 ... 10") or into pipes with non-circular cross-sections using a weld-on adapter.



Nominal size	A	L1	Ø D interior	Thread R	Flange F
1"	550 (21,65")	410 (16,14")	27,3 (1,07")	R1": 33,7 × 1,2	DN 25: 115 (4,53")
1½"	820 (32,28")	615 (24,21")	41,9 (1,65")	R1½": 48,3 × 3,2	DN 40: 150 (5,91")
2"	1080 (42,52")	810 (31,89")	53,9 (2,12")	R2": 60,3 × 3,2	DN 50: 165 (6,50")
3"	1600 (62,99")	1200 (47,24")	79,9 (3,15")	R3": 88,9 × 4,5	DN 80: 200 (7,87")

The pipe components and weld-on adapters guarantee the defined installation of the transducer in the pipeline. Moreover, they allow simple removal and installation of the transducer for inspection and/or cleaning.

By closing the pipe component with a blind flange, it is possible to use the measuring section even without installed transducer.

The versions available as standard – depending on the respective nominal width and the desired adaptation – are shown in chapter 10, “Technical Data”.

3.2 Transducer (detecting element)

The detecting element which is designed as a plug-in sensor contains, apart from the sensor unit, the completely cast transmitter circuit installed in the connection head. This is mainly composed of the passive part of the differential temperature controller for the sensor elements, a memory for all parameter-related measuring points, the connector for the LKS adapter and the computer for generating flow-specific data.

In addition, a flow-linearized analog signal of 0/4...20 mA (electrically isolated) is directly provided. No special supply/evaluation device is required.

The transducer is screwed into pipe component as a plug-in sensor with a centering pin in a defined manner.

See also chapter 10, “Technical Data”.

4 Mechanical installation

4.1 Important information to begin with (check list)



WARNING

Prior to commissioning please pay attention to the following points and read the operating instructions carefully.

Each measuring system is delivered with a calibration certificate containing all important information on the respective device such as measuring medium, measuring range, operating temperature range, nominal size, serial number and order number.

The following points should be given special attention:

1. Do the operating data of the existing measuring point correspond to the data stated on the calibration certificate (e.g. medium, operating temperature, pressure, measuring range, ...)?
2. Have the permissible ambient temperatures been kept?
3. Is the pipe component or the weld-on adapter correctly installed (pay attention to the flow direction!)?
4. Have the recommended input and output lengths been complied with?
5. Is the installation between detecting element and pipe component correctly done?
6. Are the used sealings in their correct positions and in good condition?
7. Have the electrical connections U_{IN} (24 V) and I_{OUT} (0/4...20 mA) been correctly made?

4.2 Place of installation

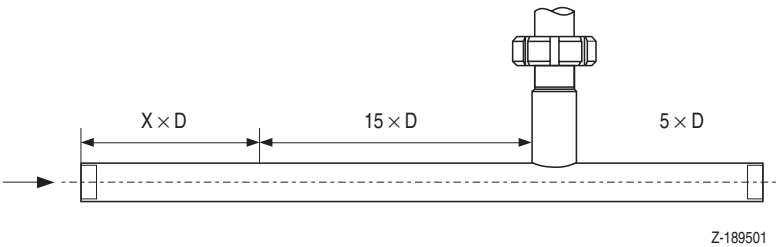
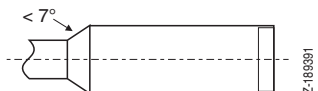
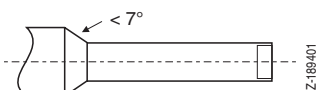
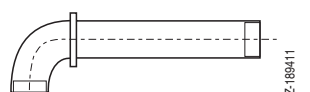
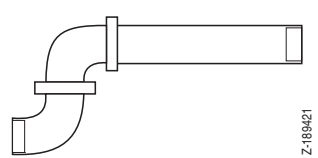
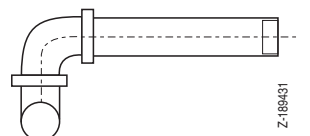
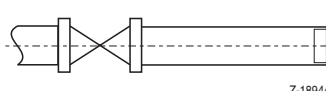
- The installation site must fulfill the requirements stated in the chapter "Technical Data: Operating Conditions, Environmental Conditions".
- In order to avoid adverse effects on the measurement accuracy, input and output measuring sections should be provided. These steadying lengths ensure that faults in the flow profile are eliminated before reaching the actual measuring point on the detecting element.
- Straight, uninterrupted pipes with lengths determined by the type of fault from the input side should be used as steadying lengths.
- Installations of components which influence the flow rate, such as valves or shut-off fittings should possibly be located on the output side (behind the measuring point).
- When matching up the detecting element with a weld-on adapter, please read the information in chapter 4.5.

Please make sure that the units are easily accessible when they are installed.

4.3 Recommended steadying run lengths for inlet run disturbances

Inlet and outlet runs must be provided to avoid negative effects on the measuring accuracy. These steadying run lengths make sure that disturbances of the flow profile are eliminated before they can reach the actual measuring point at the transducer. Straight, undisturbed pipe lengths are used as steadying run lengths, their length depends on the type of the inlet run disturbance.

Recommended steadying lengths according to DIN EN ISO 5167-1

		
	Type	Steadying length (D = pipe diameter)
	Expansion $X = 0$	$0 \times D$
	Reducer $X = 0$	$0 \times D$
	90°-elbow $X = 5$	$5 \times D$
	Two 90°-elbows in 1 level $X = 10$	$10 \times D$
	Two 90°-elbows in 2 levels $X = 25$	$25 \times D$
	Valve/slide $X = 35$	$35 \times D$

To achieve the stated measuring accuracy, the steadying lengths seen above must be provided. The inlet and outlet run lengths are stated as multiples of the pipe diameter D.

For combinations of inlet run disturbances, e. g. valve and reducer, you must always consider the longer inlet run length.

In confined spaces at the mounting location the outlet run length can be shortened to $3 \times D$. The reduction of the minimum inlet run length, however, will impact on the achievable accuracy. High repeatability of the measuring value is still provided.

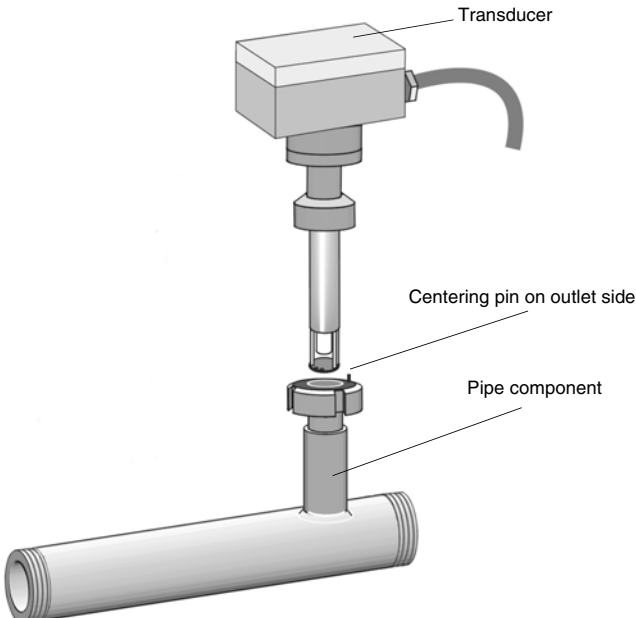
Under certain circumstances, special calibration can be performed for insufficient steadying lengths. For this purpose and in individual cases, consult the DKD Calibration Department of ABB Automation Products GmbH at Alzenau. An on-site adjustment is also possible, if reference flow values are precisely known, by entering a calibration factor.

The specifications for the steadying sections relate to air and most other measurable gases.

Components that influence the flow (e. g. valves, shut-off fittings and similar components) should possibly be mounted at the outlet run length, i. e. behind the measuring point.

4.4 Installation

The installation is described using the example of a pipe component. The description analogously also applies to the installation using a weld-on adapter.

	1. The flow direction must agree with the direction shown by the arrow on the pipe component. 2. The opening diameter of the sealings used may not be changed and should on completion of the component installation guarantee that the detecting element and the pipe are absolutely leakproof. 3. The centering pin on the pipe component or weld-on adapter must be located downstream side (behind the measuring point). 4. Check the supplied gasket G according to DIN 11851 between the transducer and the pipe component / weld-on adapter for signs of damage prior to installation. 5. For flange pipe components, all flange screws must be installed properly. 6. Connecting threads are to be connected with the pipelines of the system using suitable sealant. All screw connections are to be checked for tightness.
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4.5 Weld-on adapter for FMT200-D (Sensyflow D)-transducers



NOTICE

The weld-on adapter must be welded to the pipe always together with the cap-nut. It is not possible to mount the cap-nut after the welding process! Attach the cap-nut to the sensor connection nipple with a wire (or similar) while welding.

When installing the transducer in pipes up from 100 mm (4") to approx. 250 mm (10") outer diameter, the weld-on adapter must be welded to the pipeline under consideration of the following information:

a) For outer pipe diameters from 100 ... 150 mm (4 ... 6"):

The weld-on adapter must have a length L after welding (see Fig. 4-1). Thus, a measuring position in the pipe centre will be achieved.

$$L = H1 - \frac{1}{2} \times \text{Ø D outside with } H1 = 120 \text{ mm (4,72")}$$

The weld-on adapter must be shortened to the corresponding length before welding. The distance H1 from the upper edge of the adapter to the the pipe central axis must be within a tolerance of $\pm 2 \text{ mm (0.08")}$.

b) For outer pipe diameters from 150 ... 250 mm (6 ... 10"):

The weld-on adapter must be shortened in a way that a fixed length L of 45 mm (1,77") is achieved after welding. A measuring position out of the pipe centre will thus be achieved. For an accurate calibration, information about the exact inner pipe diameter and wall thickness in mm must be provided together with the purchase order.

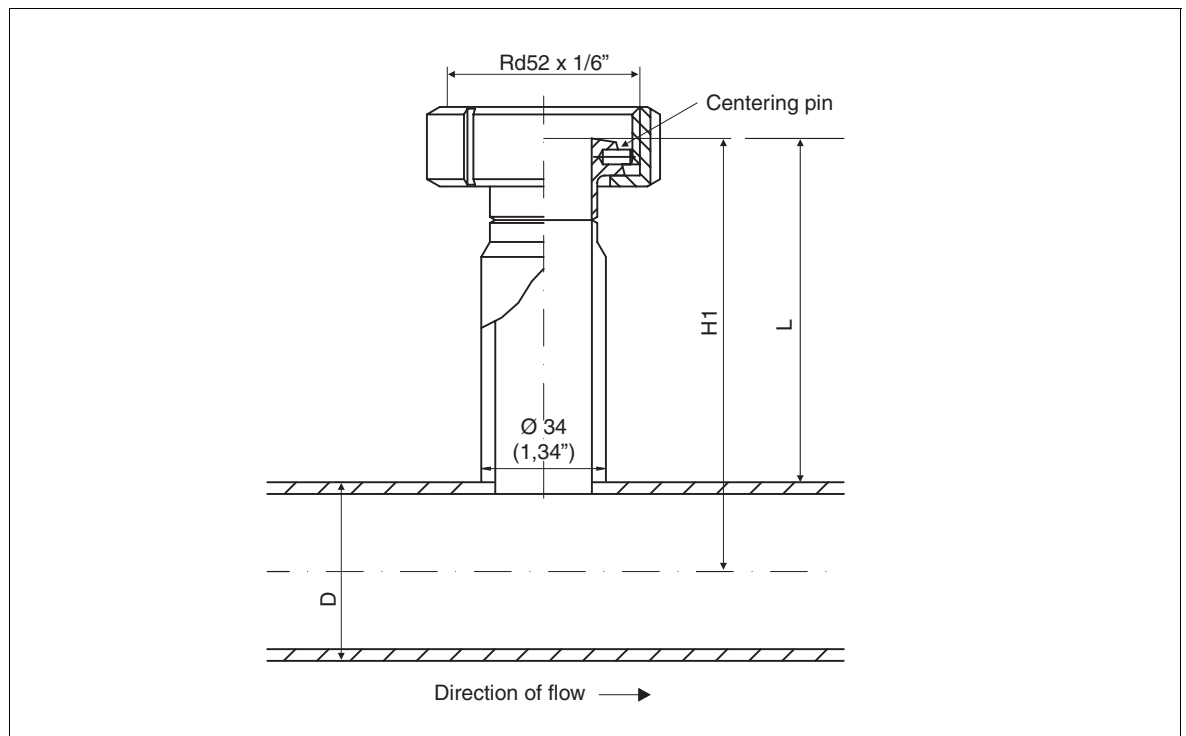


Fig. 4-1 Weld-on adapter DIN 11851 with cap-nut

Please observe the following points valid for all pipe diameters:

1. Observe the pipeline wall thickness and amount of shrinkage when welding!
2. Rectangularity to the pipe axis must be absolutely kept (max. tolerance: 2°).
3. The centering pin of the adapter must be aligned in flow direction to the pipe axis exactly (at outlet run length, behind measuring point).
4. After welding the free passage for inserting the transducer must be at least 28 mm (if required, use drill to clear).
5. Transducer installation
 - Insert the supplied gasket into the provided groove of the transducer.
 - Push the transducer into the adapter and screw it together with the cap-nut.



Bild 4-2 Weld-on adapter DIN11851 mounted to pipeline, centering pin right (outflow side)

5 Electrical installation

Requirement Prior to connecting electrical cables the device must be mounted properly. The auxiliary power is switched off.

Destination Measuring system is ready for operation.

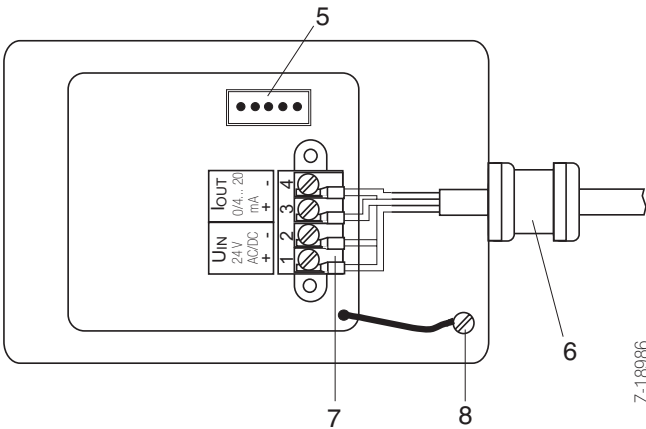


Fig. 5-1 Detecting connection head (without cap of connection head)

1 ... 4 Terminals Fig. 5-2

5 Terminals for parameter setting (Plug connection for LKS adapter)

6 Cable entry with shielding connected

7 Terminal board

8 Ground

1. A shielded, four-wire cable (e. g. 4 x 1 mm² / AWG 18) is required to connect the detector.
2. Remove the connecting head cap of the detector by undoing the 4 screws.
3. Connect the four wires to the terminal of the detector electronic unit (see Fig. 5-2).

CAUTION
Electrical isolation is only safeguarded when terminal 4 is not connected to terminal 2 of the auxiliary voltage!

4. Connect the shielding to the EMC cable entry.

IMPORTANT
For reasons of EMC the shielding should not be routed through the case, in order to preserve the shielding effect!

5. Replace the connection head cap and screw tightly. Make sure that the sealing is in the correct position.

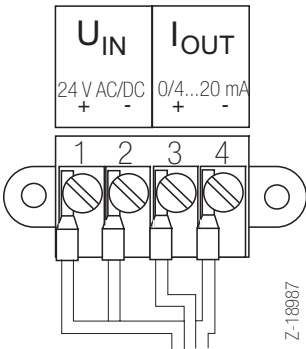


Fig. 5-2

1 Power supply 24 V AC / DC +

2 Power supply 24 V AC / DC -

3 Analog output 0/4...20 mA (electrically isolated) +

4 Analog output 0/4...20 mA (electrically isolated) -

**CAUTION**

When powering the device with 24 V UC exclusively use extra low voltage with protective separation from other circuits (German standard DIN VDE 0106).

Do not connect mains voltage 115 V AC or 230 V AC to the 24 V UC input.

This will damage the device electronics!

Connecting**Connecting power supply 24 V**

Step	Action
1.	 Check whether the operating voltage specified on the device matches the power supply voltage.
2.	Use a power supply line with sufficient dimensions and ratings (recommended line safety switches as of 2 A, slow-blow).
3.	Provide a mains switch or switchable power socket close to the device to be able to disconnect the device from all power if required. Mark the mains switch accordingly to allow for a clear allocation to the respective equipment.
4.	Connect the power cable to the mains.
5.	Absolutely observe the notes in chapter 6 before switching on the power supply.

6 Start-up – Safety instructions

Requirements

The device must be installed and the electrical signal lines must be connected prior to start-up.

6.1 Checking the installation

Prior to starting the device, make sure that it has been installed properly.
Follow the checklist:

Step	Check	✓
1.	Is the unit securely fastened?	☐
2.	Are the electrical signal, control and interface cable laid and connected correctly?	☐
3.	Do the operating data of the existing measuring point correspond to the data stated on the calibration certificate (e.g. medium, operating temperature, pressure, measuring range, ...)?	☐
4.	Have the permissible ambient temperatures been kept?	☐
5.	Is the pipe component or the weld-on adapter correctly installed (pay attention to the flow direction!)?	☐
6.	Have the recommended input and output lengths been complied with?	☐
7.	Is the installation between detecting element and pipe component correctly done?	☐
8.	Are the used sealings in their correct positions and in good condition?	☐
9.	Have the electrical connections U_{IN} (24 V) and I_{OUT} (0/4...20mA) been made correctly?	☐

6.2 Switching on

CAUTION

Prior to switching on the device make sure that all steps described in chapter 4 and chapter 5 have been executed properly.

Check again that the operating voltage specified on the device is identical with the local mains voltage.

🔊 After power-on, the device is automatically in operation.



7 Changing the configuration

The configuration/parameter definition of the measuring systems can be modified via LKS adapter (local communication interface) (Fig. 5-1).

This adapter is provided separately as an accessory and will be supplied completely with software and appropriate instructions.

The following parameters can be changed or imported:

• Read device data	display current settings
• Measuring range	select within the calibration measuring range
• Low-flow cutoff	zero setting, 0...20 % upper range of measuring range
• Filter factor	attenuation, 1...500 adjustable (standard 50)
• Output in case of fault	MIN. (< 3.5 mA) or MAX. (> 22.5 mA)
• Analog output	0/4...20 mA
• Save modified data	adjustments are stored
• Factory setting	basic settings
• Status	Check function
• Reset	Start anew
• Printout	print out current settings
• Passwort	only for service technician!

To activate the configuration changes, the device must be restarted. To do so, use the command "reset" or interrupt the power supply for approximately 10 seconds.

8 Fault messages

If faults occur (e. g. sensor leakage), the 0/4...20 mA output will accept the configured value, i. e. the following settings will be possible in case of fault:

The following settings will be possible in case of fault:

- MIN < 3.5 mA
- MAX > 22.5 mA

Notice:

The standard setting in case of fault is 0...20 mA for (MAX.) and 4...20 mA for (MIN.).

These settings can be modified via the LKS interface and the respective configuration software.

Further fault messages (e.g. data error) can be received via the status function („Check function“, chapter 7).

9 Maintenance

All measuring systems are calibrated with our own calibration equipment for which the manufacturer is associated with the German Calibration Service. They are calibrated with air and the values are converted for the respective application if necessary.

The mass flowmeter is almost maintenance-free. Only gases with moist impurities may cause the transducer to require occasional cleaning (depending on the degree of contamination).



9.1 Cleaning the detecting element

1. Switch off the supply voltage.
2. Remove the detector from the pipe component or weld-on adapter (make sure that the pipe is not under pressure).
3. Messwertaufnehmer aus dem Rohrbauteil bzw. Aufschweißadapter ausbauen.
4. Clean **carefully** the sensor unit with warm water or alcohol. We recommend the use of a soft brush or a cotton-tipped stick.
CAUTION
Under no circumstance should hard objects like screwdrivers, pincers or similar articles be used. These could cause irreparable, mechanical damage to the sensor unit!
The unit **must not** be cleaned in an ultrasonic bath.
5. Dry sensor unit for some minutes or dry with warm air.
6. Check the sealing between the detector and pipe component or weld-on adapter for correct status and neatness, and if need be replace sealing with a new one. Sealing G acc. to DIN 11851.
7. Install the detector in the pipe component or weld-on adapter (see also chapter 4.4 "Installation" on page 13).
8. The commissioning may only be carried out according to the specified procedures and under observation of the safety instruction listed in chapter 6.

9.2 Decommissioning

When there is a chance that safe operation is no longer possible, put the device out of operation and secure it against unintended operation.

It can be assumed that safe operation is no longer possible

- if the device shows visible signs of damage,
- if the device does no longer work,
- after long storage under unfavorable conditions,
- after transport under unfavorable conditions.

10 Technical Data

Measuring ranges

Nominal size (inch)	Maximal upper range value for air/nitrogen				
	kg/h	Nm ³ /h ¹⁾	NI/min ²⁾	lb/h	SCFM
1"	165	125	2100	360	70
1 1/2"	430	330	5500	940	190
2"	740	570	9500	1600	330
3"	1775	1375	22800	3900	800
6"	7500	5800	97000	16500	3400

Nominal size (inch)	Maximal upper range value for standard biogas				
	kg/h	Nm ³ /h ¹⁾	NI/min ²⁾	lb/h	SCFM
1"	130	95	1600	280	55
1 1/2"	310	260	4300	680	150
2"	510	390	6500	1120	230
3"	1200	920	15000	2640	540
6"	5700	4400	73000	12500	2500

¹⁾ Notation also m³/h - qn

²⁾ Notation also l/min - qn

All volume flow rate specifications are referenced to 0 °C/ 1013.25 hPa (32 °F/14.696 psi).

Output

Analog output signal

0/4...20 mA, switchable

Load

< 750 Ω, electrically isolated

Characteristics

Measured error

Air, nitrogen <1.5 % of rate + 0.05 % of end value
Biogas <1.8% of rate + 0.1% of end value
under calibration conditions in specified flow range

Repeatability

< ± 0.25 % of measured value

Response time

T₆₃ ≈ 500 ms

Influences

Temperature effect

< 0.05 %/K of measured value

Pressure effect

≤ 0.2 %/100 kPa (bar [14.5 psi]) of measured value

Pressure drop

<1 kPa (10 mbar [0.145 psi]) at full scale
decreasing quadratically for smaller flow rates

Ambient conditions

Ambient temperature for transducer

-25...+70 °C

Degree of protection

IP 65

Storage temperature

-25 ... 85 °C (-13 ... 185 °F)

Measured medium conditions

Operating temperature

-25 ... 150 °C (-13 ... 302 °F)

Maximum operating pressure

Standard 16 × 10² kPa (= 16 bar [230 psi abs])

Construction

Weight in kg (lbs)

Threaded pipe component			Flange pipe component	
Meter size	kg	(lbs)	kg	(lbs)
1"	1.5	3.3	5.6	12.3
1 1/2"	3.0	6.6	8.4	18.5
2"	5.5	12.1	11.0	24.3
3"	9.5	20.9	19.0	41.9

Weld-on adapter incl. lock nut

kg	(lbs)
0.5	1.1

Flowmeter primary

kg	(lbs)
1.8	4.0

Materials, process connection

Flowmeter primary Stainless steel, e.g. 1.4301

Pipe component with external threads
R 1"...3" Galvanized steel

Pipe component with connection
flanges DN 25 ... DN 80 Stainless steel, e.g. 1.4301

Weld-on adapter Stainless steel, e.g. 1.4301

Connection flange according to EN1092-1 Form B1, PN40

Power supply

Voltage

24 V AC/DC ± 25 %

Power consumption

< 15 W

Current consumption

< 600 mA, slow-blow fuse of at least 2 A recommended,
cable gland M20 x 1.5

Communication interface

LKS (Local communication interface) adapter

Accessories (optional)

- Power supply unit
- Display unit
- Totalizer with display (current-to-pulse converter)

Configuration

The analog output of the FMT200-D (Sensyflow D) can be switched between 0...20 mA and 4...20 mA.

Additionally, there is the opportunity to define a measurement window in a way that a flow rate smaller than the calibrated one causes an output signal of 20 mA. The signal for error indication can be set to < 3.5 mA and > 22 mA.

The device can be configured via the LKS (local communication interface) adapter by using a PC or laptop. You can select the output signal to be used and define the measuring range.

11 Packaging for transport

If the original packaging material is no longer available, wrap the device in a padded plastic film or corrugated paper board and place it in a box of sufficient size lined with a shock-absorbing material (e. g. foam rubber). The thickness of the shock-absorber should be in accordance with the device weight and the type of shipment.

The box must be handled with care and has to be labeled accordingly.

For overseas shipment always add a desiccant (e.g. silica gel) and wrap the device and the desiccant bag in apolyethylene foil of 0.2 mm. Adapt the amount of desiccant to the packing volume and the expected transport time (at least sufficient for 3 months). Additionally line the box with a layer of union paper.

Without exception, all returned ABB devices must be supplied with a decontamination confirmation (return-report) that has been completely filled out and signed by authorized specialist personnel (see chapter 2.2.2). Processing of the return is not possible without this confirmation.

ABB has Sales & Customer Support
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