

SIEMENS

SITRANS F

Electromagnetic flowmeters SITRANS FMS500

Operating Instructions

Introduction	1
Safety notes	2
Description	3
Installing/Mounting	4
Connecting	5
Service and maintenance	6
Diagnostics and Troubleshooting	7
Technical specifications	8
Product documentation and support	A
Appendix	B

7ME653 (SITRANS FMS500 with FMT020)




07/2025

A5E52677520-AD

Legal information

Warning notice system

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

 DANGER
indicates that death or severe personal injury will result if proper precautions are not taken.
 WARNING
indicates that death or severe personal injury may result if proper precautions are not taken.
 CAUTION
indicates that minor personal injury can result if proper precautions are not taken.
NOTICE
indicates that property damage can result if proper precautions are not taken.


If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Qualified Personnel

The product/system described in this documentation may be operated only by **personnel qualified** for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified persons are those who, because of their training and experience, are familiar with the installation, assembly, commissioning, operation, decommissioning and disassembly of the product and can recognize risks and avoid possible hazards.

Proper use of Siemens products

Note the following:

 WARNING
Siemens products may only be used for the application described in the catalog and the associated usage information. If products and components from other manufacturers are used, these must be recommended or approved by Siemens. Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be complied with. The information in the relevant documentation must be observed.

Trademarks

All names identified by ® are registered trademarks of Siemens Aktiengesellschaft. The remaining trademarks in this publication may be trademarks whose use by third parties for their own purposes could violate the rights of the owner.

Disclaimer of Liability

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

Table of contents

1	Introduction	7
1.1	Purpose of this documentation	7
1.2	Document history	7
1.3	Designated use	7
1.4	Checking the consignment.....	7
1.5	Items supplied	8
1.6	Industrial use note	8
1.7	Cybersecurity information	8
1.8	Transportation and storage	9
1.9	Notes on warranty	9
2	Safety notes	11
2.1	Laws and directives	11
2.2	Conformity with European directives	12
2.3	Conformity with PED directive	12
2.4	Improper device modifications.....	14
2.5	Custody transfer	14
2.5.1	MID (MI-001)	14
2.5.2	OIML R49 - Class 1 and 2	17
3	Description	19
3.1	System components.....	19
3.2	Design	19
3.3	Theory of operation	20
4	Installing/Mounting	23
4.1	Introduction.....	23
4.2	Installation safety precautions	23
4.3	Determining a location.....	23
4.4	Vibrations	24
4.5	Inlet and outlet conditions	24
4.6	Orienting the sensor	26
4.7	Mounting	28
4.8	Potential equalization.....	31
4.9	Installing a breathing vent (optional).....	32

5	Connecting	35
5.1	General information.....	35
5.2	Connecting the sensor for a remote transmitter.....	36
5.3	Electrical connection.....	40
5.4	Installation check.....	44
5.5	Potting	45
5.6	Direct burial.....	46
5.7	Custody transfer	47
5.7.1	Internal seal.....	47
5.7.2	User seal.....	47
6	Service and maintenance	51
6.1	Maintenance.....	51
6.2	Technical support.....	51
6.3	Transportation and storage	52
6.4	Return procedure	53
6.5	Disposal.....	53
7	Diagnostics and Troubleshooting	55
7.1	Sensor check	55
7.2	Fluctuating process values	56
8	Technical specifications	57
8.1	Technical specifications	57
8.2	Certificates and approvals.....	60
8.3	Certification symbols.....	61
8.4	Cable data	62
8.5	Effect of temperature on working pressure	63
8.6	Process fluid conductivity.....	64
8.7	Liner and electrodes selection	65
8.8	Sizing tables	66
8.9	Dimensions and weight.....	68
A	Product documentation and support	73
A.1	Product documentation	73
A.2	Technical support.....	74
B	Appendix	75
B.1	Measuring ranges	75
B.2	Flange mating dimensions (metric)	76

B.3	Factory settings	79
B.4	Coil resistance	81
B.5	Conductivity coefficients	82
	Glossary	85
	Index	87

Introduction

1.1 Purpose of this documentation

These instructions contain all information required to commission and use the device. Read the instructions carefully prior to installation and commissioning. In order to use the device correctly, first review its principle of operation.

The instructions are aimed at persons mechanically installing, connecting and commissioning the device, as well as service and maintenance engineers.

1.2 Document history

The contents of these instructions are regularly reviewed and corrections are included in subsequent editions. We welcome all suggestions for improvement.

The following table shows the most important changes in the documentation compared to each previous edition.

Edition	Remarks
07/2025	MID (MI-001) and OIML R49 - Class 1 and 2 approval
04/2025	Chinese Pattern Approval
12/2024	Factory settings table added in appendix; operation in MCERTS certification conditions
01/2024	First edition

1.3 Designated use

Use the device in accordance with the information on the nameplate and in the Technical specifications (Page 57).

1.4 Checking the consignment

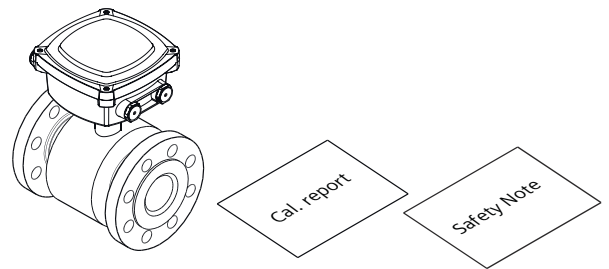
1. Check the packaging and the delivered items for visible damages.
2. Report any claims for damages immediately to the shipping company.

3. Retain damaged parts for clarification.
4. Check the scope of delivery by comparing your order to the shipping documents for correctness and completeness.

⚠ WARNING
Using a damaged or incomplete device
Risk of explosion in hazardous areas.
<ul style="list-style-type: none">• Do not use damaged or incomplete devices.

1.5 Items supplied

- SITRANS FMS500
- Calibration report
- Safety Note



1.6 Industrial use note

NOTICE
Use in a domestic environment
This Class A Group 1 equipment is intended for use in industrial areas. In a domestic environment this device may cause radio interference.

1.7 Cybersecurity information

Siemens provides products and solutions with industrial cybersecurity functions that support the secure operation of plants, systems, machines and networks.

In order to protect plants, systems, machines and networks against cyber threats, it is necessary to implement – and continuously maintain – a holistic, state-of-the-art industrial cybersecurity concept. Siemens' products and solutions constitute one element of such a concept.

Customers are responsible for preventing unauthorized access to their plants, systems, machines and networks. Such systems, machines and components should only be connected to an enterprise network or the internet if and to the extent such a connection is necessary

and only when appropriate security measures (e.g. firewalls and/or network segmentation) are in place.

For additional information on industrial cybersecurity measures that may be implemented, please visit
<https://www.siemens.com/cybersecurity-industry>.

Siemens' products and solutions undergo continuous development to make them more secure. Siemens strongly recommends that product updates are applied as soon as they are available and that the latest product versions are used. Use of product versions that are no longer supported, and failure to apply the latest updates may increase customer's exposure to cyber threats.

To stay informed about product updates, subscribe to the Siemens Industrial Cybersecurity RSS Feed under
<https://new.siemens.com/cert>.

1.8 Transportation and storage

To guarantee sufficient protection during transport and storage, observe the following:

- Keep the original packaging for subsequent transportation.
- Devices/replacement parts should be returned in their original packaging.
- If the original packaging is no longer available, ensure that all shipments are properly packaged to provide sufficient protection during transport. Siemens cannot assume liability for any costs associated with transportation damages.

NOTICE

Insufficient protection during storage

The packaging only provides limited protection against moisture and infiltration.

- Provide additional packaging as necessary.

Special conditions for storage and transportation of the device are listed in Technical specifications (Page 57).

1.9 Notes on warranty


The contents of this manual shall not become part of or modify any prior or existing agreement, commitment or legal relationship. The sales contract contains all obligations on the part of Siemens as well as the complete and solely applicable warranty conditions. Any statements regarding device versions described in the manual do not create new warranties or modify the existing warranty.

The content reflects the technical status at the time of publishing. Siemens reserves the right to make technical changes in the course of further development.

Safety notes

This device left the factory in good working condition. In order to maintain this status and to ensure safe operation of the device, observe these instructions and all the specifications relevant to safety.

Observe the information and symbols on the device. Do not remove any information or symbols from the device. Always keep the information and symbols in a completely legible state.

 CAUTION
Correct, reliable operation of the product requires proper transport, storage, positioning and assembly as well as careful operation and maintenance.
Only qualified personnel should install or operate this instrument.

Note

Alterations to the product, including opening or improper modifications of the product are not permitted.

If this requirement is not observed, the CE mark and the manufacturer's warranty will expire.

If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

2.1 Laws and directives

Observe the safety rules, provisions and laws applicable in your country during connection, assembly and operation. These include, for example:

- National Electrical Code (NEC - NFPA 70) (USA)
- Canadian Electrical Code (CEC Part I) (Canada)

Further provisions for hazardous area applications are for example:

- IEC 60079-14 (international)
- EN 60079-14 (EU and UK)

2.2 Conformity with European directives

The product described in this document is in conformity with the relevant harmonization legislation, and its amendments, of the European Union.

Electromagnetic compatibility EMC 2014/30/EU	Directive of the European Parliament and of the Council on the harmonisation of the laws of the Member States relating to electromagnetic compatibility
Low voltage directive LVD 2014/35/EU	Directive of the European Parliament and of the Council on the harmonisation of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits
Pressure equipment directive PED 2014/68/EU	Directive of the European Parliament and of the Council on the harmonisation of the laws of the Member States relating to the making available on the market of pressure equipment
Measuring instruments directive MID 2014/32/EU	Directive of the European Parliament and the Council on the harmonisation of the laws of the Member States relating to the making available on the market of measuring instruments
Restriction of hazardous substances directive RoHS 2011/65/EU	Directive of the European Parliament and the Council on the restriction of the use of certain hazardous substances in electrical and electronic equipment

The applicable directives can be found in the EU Declaration of Conformity of the specific device.

2.3 Conformity with PED directive

Instrument safety standards

The device has been tested at the factory, based on the safety requirements. In order to maintain this condition over the expected life of the device the requirements described in these Operating Instructions must be observed.

NOTICE
Material compatibility Siemens Flow Instruments can provide assistance with the selection of wetted sensor parts. However, the full responsibility for the selection rests with the customer and Siemens Flow Instruments can take no responsibility for any failure due to material incompatibility.

Conformity with PED directive

"Pressure Equipment Directive" (PED) is mandatory for all pressure equipment sold within the EU and EFTA.

Note

Liquids danger group

The device is designed for liquids of danger group "Liquids fluid group 1"

Siemens Flow Instruments products confirm to PED by following the tables below.

Table 2-1 PED Compliance for fluids under 100 °C (PED classification: liquids) EN 1092, ANSI B16.5, AWWA C207, AS4087 and JIS2220 flanges

Flange mm	EN 1092				ANSI B16.5	AWWA C207	AS4087	JIS B 2220
	PN 6	PN 10	PN 16	PN 40	Class 150	Class D	class16 (AS16)	K 10
15	N/A	N/A	N/A	SEP	SEP	N/A	N/A	SEP
25	N/A	N/A	N/A	SEP	SEP	N/A	N/A	SEP
40	N/A	N/A	N/A	SEP	SEP	N/A	N/A	SEP
50	N/A	N/A	SEP	N/A	SEP	N/A	SEP	SEP
65	N/A	N/A	SEP	N/A	SEP	N/A	SEP	SEP
80	N/A	N/A	SEP	N/A	SEP	N/A	SEP	SEP
100	N/A	N/A	SEP	N/A	SEP	N/A	SEP	SEP
125	N/A	N/A	SEP	N/A	PED (II)	N/A	N/A	SEP
150	N/A	N/A	PED (II)	N/A	PED (II)	N/A	SEP	PED (II)
200	N/A	SEP	PED (II)	N/A	PED (II)	N/A	SEP	PED (II)
250	N/A	PED (I)	PED (II)	N/A	PED (II)	N/A	SEP	PED (II)
300	N/A	PED (I)	PED (II)	N/A	PED (II)	N/A	SEP	PED (II)
350	N/A	PED (I)	PED (II)	N/A	PED (II)	N/A	PED (I)	PED (II)
400	N/A	PED (I)	PED (II)	N/A	PED (II)	N/A	PED (I)	PED (II)
450	N/A	PED (I)	PED (II)	N/A	PED (II)	N/A	PED (I)	PED (II)
500	N/A	PED (I)	PED (II)	N/A	PED (II)	N/A	PED (I)	PED (II)
600	N/A	PED (I)	PED (II)	N/A	PED (II)	N/A	PED (I)	PED (II)
700	N/A	PED (I)	PED (II)	N/A	N/A	PED (I)	PED (I)	N/A
750	N/A	N/A	N/A	N/A	N/A	PED (I)	N/A	N/A
800	N/A	PED (I)	PED (II)	N/A	N/A	PED (I)	PED (I)	N/A
900	N/A	PED (I)	PED (II)	N/A	N/A	PED (I)	PED (I)	N/A
1000	N/A	PED (I)	PED (II)	N/A	N/A	PED (I)	PED (I)	N/A
1050	N/A	N/A	N/A	N/A	N/A	PED (I)	N/A	N/A
1100	N/A	N/A	N/A	N/A	N/A	PED (I)	N/A	N/A
1200	N/A	PED (I)	PED (II)	N/A	N/A	PED (I)	PED (I)	N/A


2.5 Custody transfer

The key to the tables is as follows:

Table 2-2 Table key

SEP	Product covered by PED under category SEP (Sound Engineering Practice)
PED	Product covered by PED under category I to III as fully PED-conforming
N/A	Size/pressure not available in the size range

2.4 Improper device modifications

 **WARNING**

Improper device modifications

Risk to personnel, system, and environment can result from modifications to the device, particularly in hazardous areas.

- Only carry out modifications that are described in the instructions for the device. Failure to observe this requirement cancels the manufacturer's warranty and the product approvals. Do not operate the device after unauthorized modifications.

2.5 Custody transfer

FM520 (7ME6532) is approved for custody transfer applications.

Note

Communication modules

Communication modules HART, PROFINET, MODBUS and EtherNet/IP have been certified and can only be used where national regulations permit it. The reading of ancillary devices may be used for testing and verification and for remote reading of the water meter. Communication modules need to be ordered together with the system. A retrofit of the communication module is not possible since it would break the CT seals.

2.5.1 MID (MI-001)

FM520 is approved, verified and labeled according to Directive 2014/32/EU of the European Parliament and Council of 26 February, 2014 on measuring instruments in the sizes from DN 50 to DN 300.

The MID certification is obtained as a module B + module D approval according to the above mentioned directive:

- Module B: EU-Type examination certificate according to Measuring Instrument Directive (tested according to OIML R 49/ISO 4064)
- Module D: Quality Assurance certificate (Production of meters and sub-assemblies)

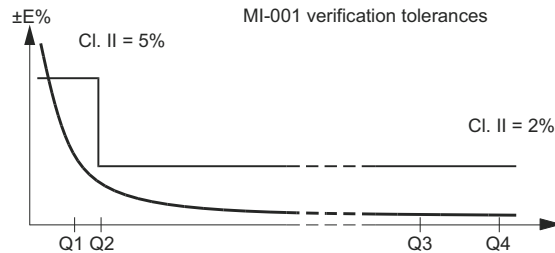


Figure 2-1 MI-001 verification tolerances

FM520 MI-001 approval is valid for:

- Sizes: DN 50 to 300 mm (2" to 12")
- Performance range: R400
- Installation: all orientation
- Sensitivity class: UODO
- Pressure loss class: Δp_{10}
- MAWP (Maximum allowable Working Pressure): 16 bar (232 psi)
- Temperature class: T30 & T50
- Mechanical class: M1
- Electromagnetic class: E2
- Protection class: IP67 or IP68
- Compact or remote with max. 500 m cable
- Forward

Note

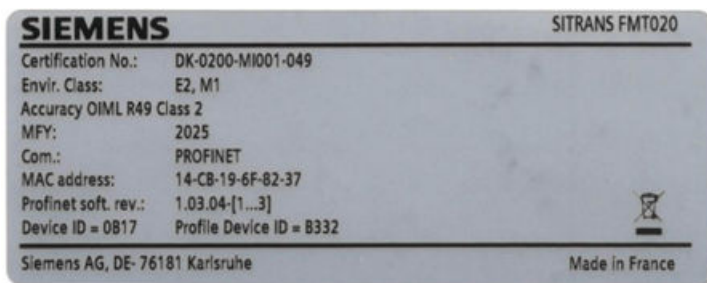
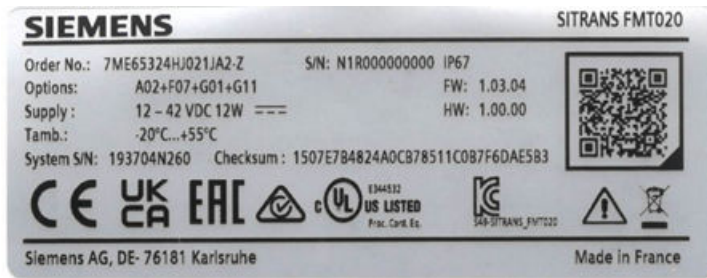
Installation restrictions

- Even if the pressure rating of the flange is designed to reach higher pressure, the MAWP of FM520 product is limited at 16 bar for MID and OIML R49 certified products. The Maximum allowable pressure is printed on the label for the minimum and for the maximum media temperatures.
 - The product has been certified in forward mode but is also designed to measure in reverse.
 - Other restrictions may apply (see certificate).
-

Labeling

A special label is required for MI-001 approved meters. An example of the product label is shown below:

2.5 Custody transfer



Verification

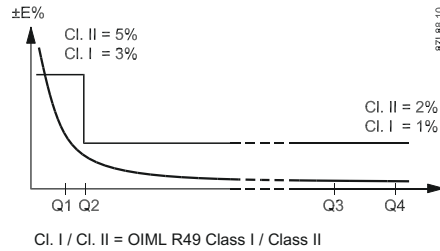
FM520 (7ME6532) product is verified at a given Q3 according to the certificate.

- Q3/Q4 = 1.25
- Q2/Q1 = 1.6

For detailed measuring ranges, see Measuring ranges (Page 75).

2.5.2 OIML R49 - Class 1 and 2

FM520 is approved, verified and labeled according to OIML R49 for **class 1 and 2** from DN 50 to DN300.



FM520 OIML R49 approval is valid for:

- Sizes: DN 50 to 300 mm (2" to 12")
- Performance range: R400
- Installation: all orientation
- Sensitivity class: UODO
- Pressure loss class: Δp_{10}
- MAWP (Maximum allowable Working Pressure): 16 bar (232 psi)
- Temperature class: T30 & T50
- Mechanical class: B and O
- Electromagnetic class: E2
- Protection class: IP 67 or IP68
- Compact or remote with max. 500 m cable
- Forward

Note



Installation restrictions



- Even if the pressure rating of the flange is designed to reach higher pressure, the MAWP of FM520 is limited at 16 bar for MID and OIML R49 certified products. The Maximum allowable pressure is printed on the label for the minimum and for the maximum media temperatures.
- The product has been certified in Forward mode but is also designed to measure in reverse.
- Other restrictions may apply (see certificate).


Labeling

A special label is required for OIML R49 approved meters. An example of the product label is shown below:

2.5 Custody transfer

SIEMENS		SITRANS FMS500	
Order No.: 7ME65325B5021JA3-Z	S/N: N1R000000000	MFY: 2025	
Options: A00+F01+J00+L50+G05+G20	Tamb.: -20°C...+55°C	IP68 (2m,10days)	
Process connection: AS 4087, PN16	Sensor material: ASTM A 105	Elec.Hastelloy C276/2.4819	
Cal Factor: 8.88888888	Size: DN300/12"	Q3/Q1 = 400 U0D0	
Tmedia min/max: 0,1°C/50°C	Liner: EPDM	Q3: 1600m ³ /h Δp 10	
MAWP (PS) at 0,1°C: 16bar/232psi/1.6MPa	CE	UK CA	
MAWP (PS) at 50°C: 16bar/232psi/1.6MPa	Siemens AG, DE- 76181 Karlsruhe		Made in France

SIEMENS		SITRANS FMT020	
Order No.: 7ME65325B5021JA3-Z	S/N: N1R000000000	IP67	
Options: A00+F01+J00+L50+G05+G20	FW: 1.03.04	HW: 1.00.00	
Supply: 100 - 240 VAC 50 - 60 Hz 25VA	Checksum: 1507E7B4824A0C878511C087F6DAE5B3		
Tamb.: -20°C...+55°C	System S/N: 193704N260		
CE	UK CA	EAC	
Siemens AG, DE- 76181 Karlsruhe		Made in France	

SIEMENS		SITRANS FMT020	
Certification No.:	R49/2013-A-DK2-25.02		
Envir. Class:	E2 , O		
Accuracy OIML R49 Class 2			
MFY:	2025		
Com.:	HART		
Siemens AG, DE- 76181 Karlsruhe		Made in France	

Verification

FM520 (7ME6532) product is verified at a given Q3 according to the certificate.

- Q3/Q4 = 1.25
- Q2/Q1 = 1.6

For detailed measuring ranges, see Measuring ranges (Page 75).

Description

The main applications of the SITRANS FM electromagnetic flow sensors can be found in the following fields:

- Process industry
- Chemical industry
- Steel industry
- Mining
- Pulp & paper
- Utility
- Power generation & distribution
- Oil & gas / hydrocarbon processing industry
- Water & wastewater

3.1 System components

The SITRANS FMS500 sensor is compatible with:

- Transmitter (type: SITRANS FMT020)

3.2 Design

The SITRANS FMS500 is an electromagnetic flow sensor designed to meet the requirements in ground water, drinking water, waste water, sewage or sludge applications. With its coned design, increased low-flow accuracy is achieved making it especially useful for leak detection. It is suitable for direct burial and constant flooding. FMS500 complies with drinking water approvals.

The SITRANS FMS500 is constructed identically to the SITRANS MAG5100W.

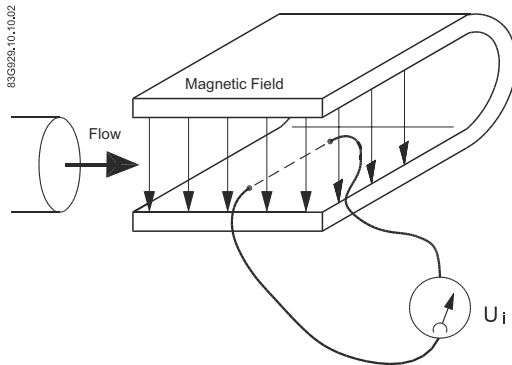


FMS500 compact version with FMT020 transmitter FMS500 remote version (FM520)

The sensors carry a wide range of approvals, see Technical specifications (Page 57).

3.3 Theory of operation

The flow measuring principle is based on Faraday's law of electromagnetic induction.



U_i = When an electrical conductor of length L is moved at velocity v , perpendicular to the lines of flux through a magnetic field of strength B , the voltage U_i is induced at the ends of the conductor

$$U_i = L \times B \times v$$

- U_i = Induced voltage
- L = Conductor length = Inner pipe diameter = k_1
- B = Magnetic field strength = k_2
- v = Velocity of conductor (media)
- $k = k_1 \times k_2$

$U_i = k \times v$, the electrode signal is directly proportional to the fluid velocity

Operating principle

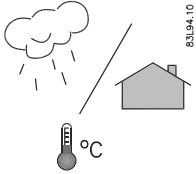
The transmitter generates a pulsating magnetizing current that drives the coils in the sensor. The current is permanently monitored and corrected. Errors or cable faults are registered by the self-monitoring circuit.

The input circuit amplifies the flow-proportional induced voltage signal from the electrodes. The input impedance is extremely high: $>10^{14} \Omega$ which allows flow measurements on fluids with conductivities as low as $5 \mu\text{S/cm}$. Measuring errors due to cable capacitance are eliminated due to active cable screening.

3.3 Theory of operation

Installing/Mounting

4.1 Introduction



SITRANS F flowmeters are suitable for indoor and outdoor installations.

- Make sure that pressure and temperature specifications indicated on the device nameplate / label will not be exceeded.

4.2 Installation safety precautions

<p>! WARNING</p> <p>High pressure hazard</p> <p>In applications with working pressures/media that can be dangerous to people, surroundings, equipment or others in case of pipe fracture, we recommend that special precautions such as special placement, shielding or installation of a pressure guard or a safety valve are taken when the flowmeter is mounted.</p>

4.3 Determining a location

Note

The sensor must always be completely filled with liquid.

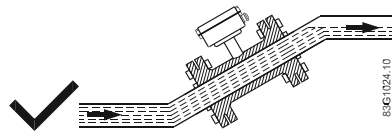


Figure 4-1 Correct installation with filled pipes

- Avoid the following installations
 - Installation at the highest point in the pipe system
 - Installation in vertical pipes with free outlet

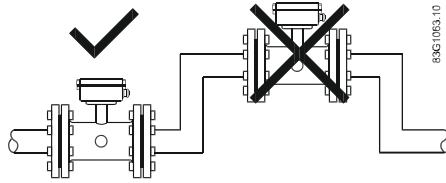


Figure 4-2 Wrong installation at high point

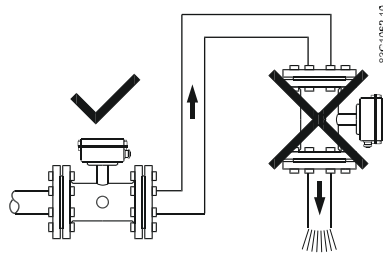


Figure 4-3 Correct installation at low point before outlet

4.4 Vibrations

Vibrations

In installations with strong vibrations remote installation of the transmitter is recommended. Alternatively mitigate vibrations by installing pipe support in close proximity to the flowmeter.

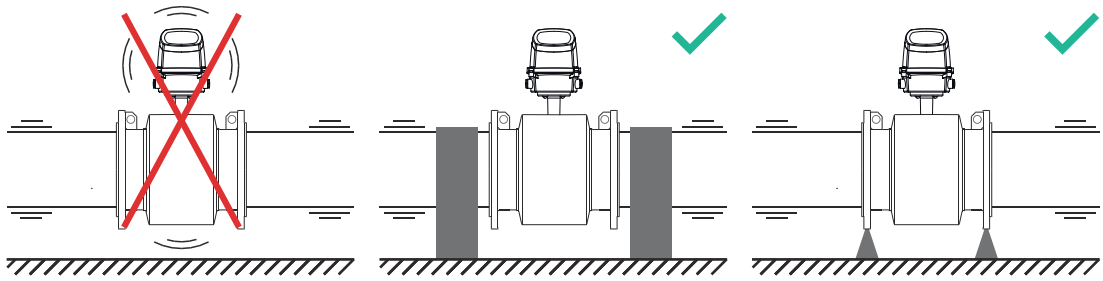


Figure 4-4 Avoid vibrations

4.5 Inlet and outlet conditions

Inlet and outlet conditions

To achieve accurate flow measurement it is essential to have straight lengths of inlet and outlet pipes and a certain distance to pumps and valves.

It is also important to centre the flowmeter in relation to pipe flanges and gaskets.

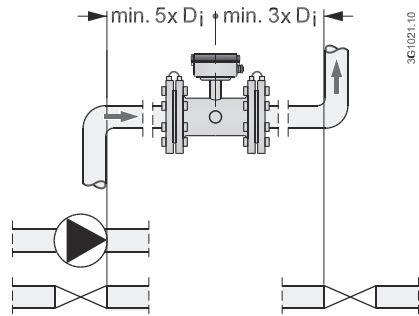


Figure 4-5 Inlet and outlet conditions

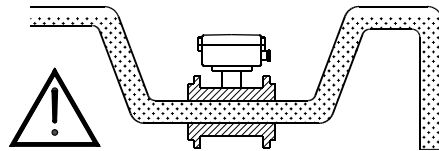
Note

MI-001 & OIML R49 conditions

MI-001 & OIML R49 approved with OD inlet and OD outlet conditions

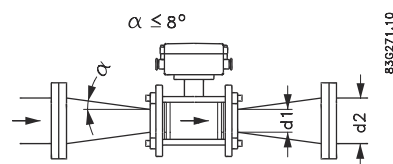
Installation in partially filled pipes

For partially filled pipes or pipes with downward flow and free outlet the flowmeter should be located in a U-tube.

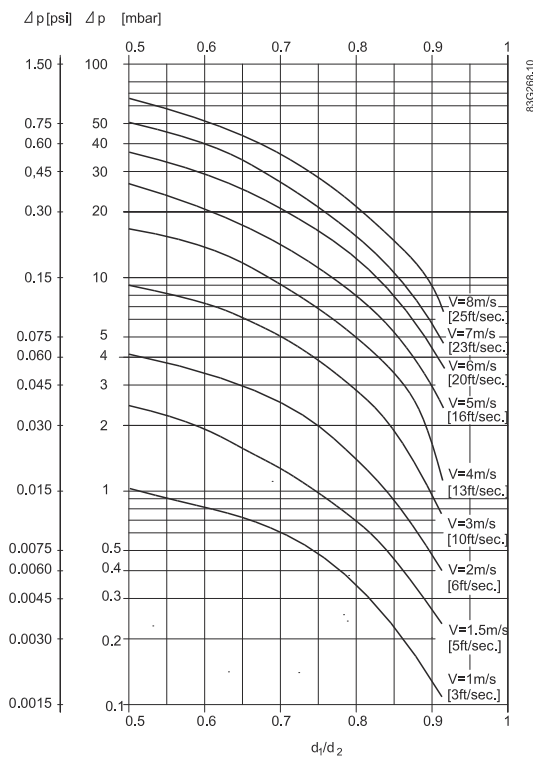


Installation in large pipes

The flowmeter can be installed between two reducers (for example DIN 28545). At $\alpha \leq 8^\circ$ the following pressure drop curves apply. The curves are applicable to water.



4.6 Orienting the sensor



Example:

A flow of 3 m/s (v) in a sensor with a diameter reduction from DN 100 to DN 80 ($d_1/d_2 = 0.8$) gives a pressure drop of 2.9 mbar.

4.6 Orienting the sensor

Flow direction

The calibrated flow direction is marked by the arrow on the sensor. Flow in this direction is indicated as positive by default. The accuracy of the sensor does not change with reverse flow.

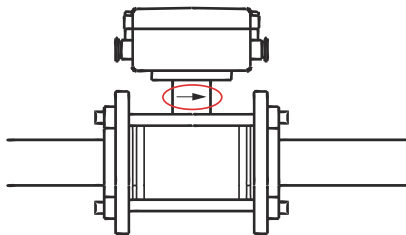


Figure 4-6 Flow direction indicator

Orientation

The sensor operates in all orientations, but Siemens has the following recommendations:

- Vertical installation with an upwards flow

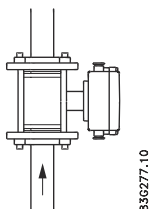


Figure 4-7 Vertical orientation, upwards flow

NOTICE

Abrasive liquids / liquids containing solid particles

A vertical installation minimizes wear and deposits in the sensor

Note

Gas/air bubbles in the liquid

A vertical installation minimizes any negative effect of gas/air bubbles in the liquid

- Horizontal installation, terminal box upwards or downwards

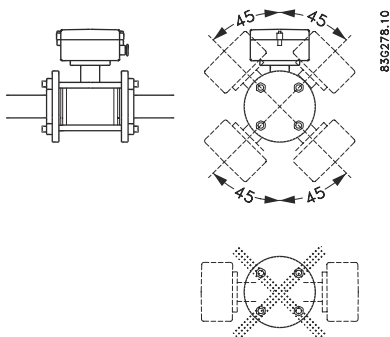


Figure 4-8 Horizontal installation, various terminal box positions

NOTICE

Do NOT mount the sensor with the terminal box sideways

This will position the electrodes at the top where there is possibility for air bubbles and at the bottom where there is possibility for mud, sludge, sand etc.

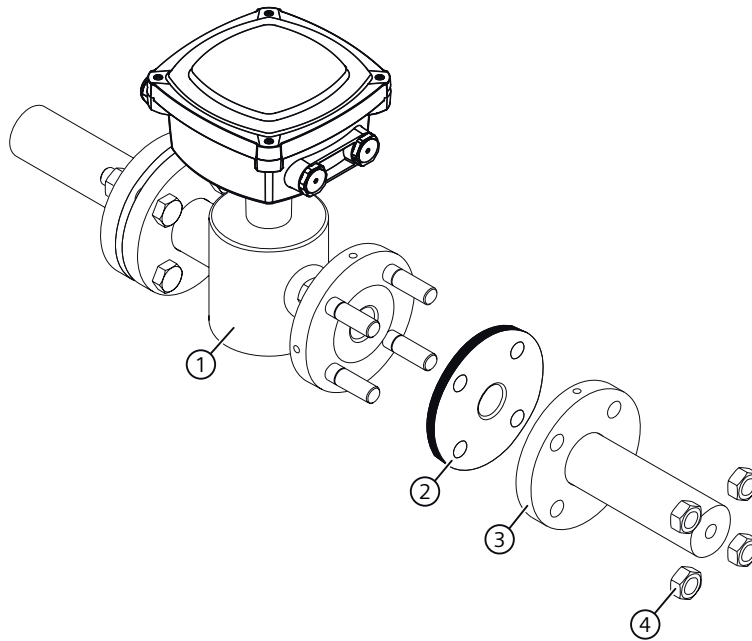
Note

Empty pipe detection

For applications with empty pipe detection, the sensor can be tilted 45°, as shown above.

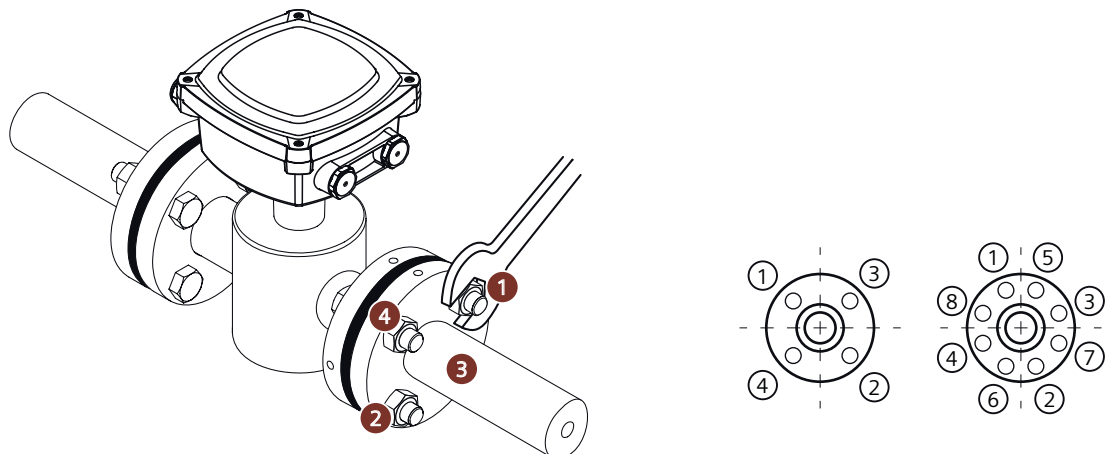
4.7 Mounting

- Install the sensor in rigid pipelines in order to support the weight of the meter.
- Center the connecting pipelines axially in order to avoid turbulent flow profiles.
- Use proper gaskets according to liner type (not included).



- ① Sensor
- ② Gasket
- ③ Process connection
- ④ Nuts

Tightening



1. Cross-tighten the bolts in the shown sequence.
2. Fasten bolts according to the torques values below.

Note**Conversion to F/Lbs**

To convert the torque values from Nm to F/Lbs multiply by 0.74.

Note

Torque values are calculated on the basis of use of gaskets.

Table 4-1 Minimum and maximum torques for EN 1092-1 in Nm

Nominal size		EN 1092-1							
		PN 6		PN 10		PN 16		PN 40	
Liner		EPDM, NBR		EPDM, NBR		EPDM, NBR		EPDM, NBR	
mm	inch	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
15	½	-	-	-	-	-	-	3.2	4
25	1	-	-	-	-	-	-	6.9	7
40	1½	-	-	-	-	-	-	15.0	16
50	2	-	-	-	-	9.2	10	-	-
65	2½	-	-	-	-	6.7	7	-	-
80	3	-	-	-	-	8.2	9	-	-
100	4	-	-	-	-	11.6	12	-	-
125	5	-	-	-	-	16.4	17	-	-
150	6	-	-	-	-	26.8	28	-	-
200	8	-	-	26.1	27	27.9	29	-	-
250	10	-	-	25.5	27	48.8	51	-	-
300	12	-	-	34.0	36	65.1	68	-	-
350	14	-	-	33.7	35	67.0	70	-	-
400	16	-	-	50.7	53	94.3	99	-	-
450	18	-	-	49.4	52	95.1	100	-	-
500	20	-	-	59.8	63	130.6	137	-	-
600	24	-	-	92.3	97	200.6	211	-	-
700	28	-	-	104.9	110	201.0	211	-	-
750	30	-	-	-	-	-	-	-	-
800	32	-	-	149.8	157	282.3	296	-	-
900	36	-	-	158.4	166	298.8	314	-	-
1000	40	-	-	210.1	221	400.6	421	-	-
1050	42	-	-	-	-	-	-	-	-
1100	44	-	-	-	-	-	-	-	-
1200	48	-	-	289.1	304	575.4	604	-	-
1400	54	181.5	191	369.2	388	676.9	711	-	-

Installing/Mounting

4.7 Mounting

Nominal size		EN 1092-1							
		PN 6		PN 10		PN 16		PN 40	
Liner		EPDM, NBR		EPDM, NBR		EPDM, NBR		EPDM, NBR	
mm	inch	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
1500	59	206.3	217	424.0	445	-	-	-	-
1600	66	209.4	220	503.8	529	917.5	963	-	-
1800	72	263.0	276	568.1	596	1035.8	1088	-	-
2000	78	318.4	334	638.3	670	1246.9	1309	-	-

Table 4-2 Minimum and maximum torques for ANSI B16.5, AWWA C-207, AS 4087 and JIS B2220 in Nm

Nominal size		ANSI B16.5		AWWA C-207		AS 4087		JIS B2220	
		Class 150		Class D		PN 16		10K	
Liner		EPDM, NBR		EPDM, NBR		EPDM, NBR		EPDM, NBR	
mm	inch	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
15	½	3.6	4	-	-	-	-	3.2	4
25	1	7.8	8	-	-	-	-	9.1	10
40	1½	12.9	14	-	-	-	-	15.0	16
50	2	11.9	13	-	-	7.5	8	8.1	9
65	2½	17.2	18	-	-	13.3	14	11.7	12
80	3	21.2	22	-	-	16.4	17	7.2	8
100	4	15.0	16	-	-	23.2	24	10.1	11
125	5	25.0	26	-	-	-	-	17.9	19
150	6	32.8	34	-	-	21.6	23	23.5	25
200	8	51.1	54	-	-	33.6	35	24.4	26
250	10	56.0	59	-	-	61.2	64	39.3	41
300	12	74.7	78	-	-	54.4	57	39.3	41
350	14	103.7	109	-	-	89.3	94	47.9	50
400	16	100.8	106	-	-	111.4	117	69.0	72
450	18	145.9	153	-	-	141.9	149	68.7	72
500	20	140.1	147	-	-	129.6	136	83.7	88
600	24	216.4	227	-	-	203.9	214	121.9	128
700	28	-	-	116.9	123	206.0	216	-	-
750	30	-	-	131.7	138	-	-	-	-
800	32	-	-	178.3	187	338.8	356	-	-
900	36	-	-	194.1	204	350.8	368	-	-
1000	40	-	-	212.3	223	408.5	429	-	-
1050	42	-	-	233.7	245	-	-	-	-
1100	44	-	-	230.7	242	-	-	-	-
1200	48	-	-	246.8	259	446.7	469	-	-
1400	54	-	-	360.8	379	-	-	-	-
1500	59	-	-	374.0	393	-	-	-	-
1600	66	-	-	452.6	475	-	-	-	-

Nominal size		ANSI B16.5		AWWA C-207		AS 4087		JIS B2220	
		Class 150		Class D		PN 16		10K	
Liner		EPDM, NBR		EPDM, NBR		EPDM, NBR		EPDM, NBR	
mm	inch	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
1800	72	-	-	464.1	487	-	-	-	-
2000	78	-	-	575.3	604	-	-	-	-

Torque calculations

All values are theoretical and are calculated making the following assumptions:

1. All bolts are new and material selection is according to EN 1515-1 table 2.
2. Gasket material not exceeding 75 shore A durometer is used between the flowmeter and mating flanges.
3. All bolts are galvanized and adequately lubricated.
4. The values are calculated for use with carbon steel flanges.
5. Flowmeter and mating flanges are correctly aligned.

4.8 Potential equalization

To obtain optimum results from the measuring system, the sensor must have the same electrical potential as the liquid being measured.

This is achieved by means of built-in grounding electrodes.

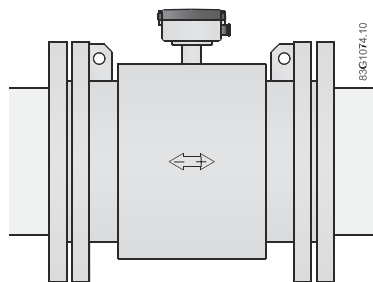


Figure 4-9 Potential equalization with grounding electrodes

Cathodic protected piping

Special attention must be paid to systems with cathodic protection.

⚠ WARNING
Use in hazardous area!
Cathodic pipe protection is not allowed in hazardous areas

4.9 Installing a breathing vent (optional)

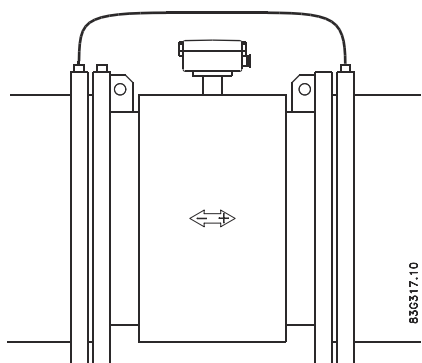


Figure 4-10 Cathodic protection

- Isolate the sensor from cathodic protected pipes using insulated bolts.
- Use bypass cable between the mating flanges

Note

Remote mounted sensor versions

If the above is not acceptable, remote mounted sensors can alternatively be connected as follows:

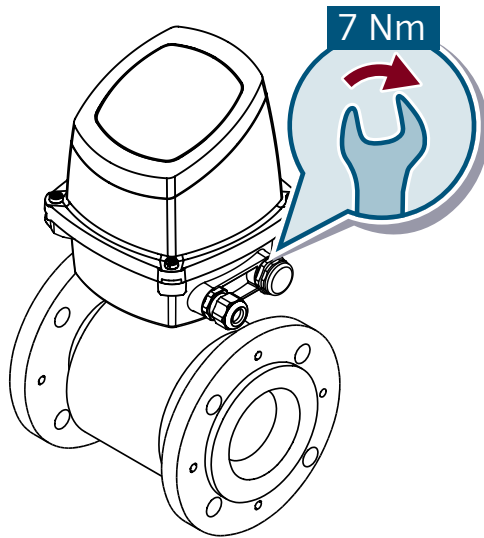
- Connect coil current cable shield at sensor end via a 1.5 μ F condensator
 - Make sure that electrode cable shield is not connected at both ends
-

4.9 Installing a breathing vent (optional)

To prevent buildup of moisture which can cause corrosion and in turn device failures, a breathing vent can be ordered and installed. The breathing vent is certified for IP67 for pressures up to 0.5 bars (1 hour) and Ex e II. The membrane is water-, oil- and dirt-repellent. It can be installed in compact or remote design on transmitter or sensor side.

Procedure

1. Remove one of the blanking plugs on the side of the terminal box. Do not use the entries on the bottom side of the terminal box.
2. Tighten the breathing vent to 7 Nm.




Connecting


5.1 General information

The following contains a short description of how to connect a remote mounted sensor to a transmitter type SITRANS FMT020. For more information, e.g. about wiring of power supply and outputs, refer to the Operating Instructions for the respective transmitter.

Before connecting


- Check that serial numbers on sensor and SENSORPROM® unit are identical.

 WARNING
The pertinent regulations must be observed for electrical installation. <ul style="list-style-type: none">• Never install the device with the mains voltage switched on!• Danger of electric shock!• The electrodes and magnetic current line may only be connected when the device is not connected to the power supply.• If the housing is under voltage (power supply), the cover may be unscrewed by qualified personnel only.

 WARNING
Mains supply from building installation Class II <p>A switch or circuit breaker (max. 15 A) must be installed in close proximity to the equipment and within easy reach of the operator. It must be marked as the disconnecting device for the equipment.</p>

Cable specifications

- Only use cables with at least the same degree of protection as the sensor to install the sensor.
- The line length from the cable gland to the terminals must be kept as short as possible. Line loops in the terminal box must be avoided.
- To guarantee the IP67 degree of protection, use cables with the required specifications.

 WARNING
--

Protective conductor terminal

The required cable is min. AWG16 or 1.5 mm ² Cu. Refer to FMT020 Operating Instructions for acceptable conductor cross sections.

 WARNING
--

Wire insulation

For field wiring installation: Ensure that the national requirements of the country in which the flowmeters are installed is met.

See also

Cable data (Page 62)

NOTICE

Only use cable glands and O-rings provided by Siemens for this device
--

The usage of other cable glands and O-rings voids UL61010-1 certification, can damage the device and downgrade IP rating.

5.2 Connecting the sensor for a remote transmitter

Before you start

- Read the Safety notes (Page 11)
- Read the Basic safety notes: Installing/mounting (Page 23)
- Read the Basic safety notes: Connecting (Page 35)

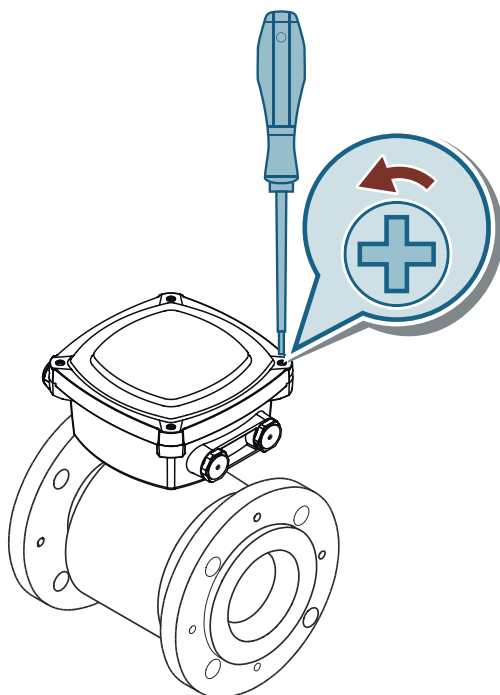
NOTICE

Do not use rigid conduits

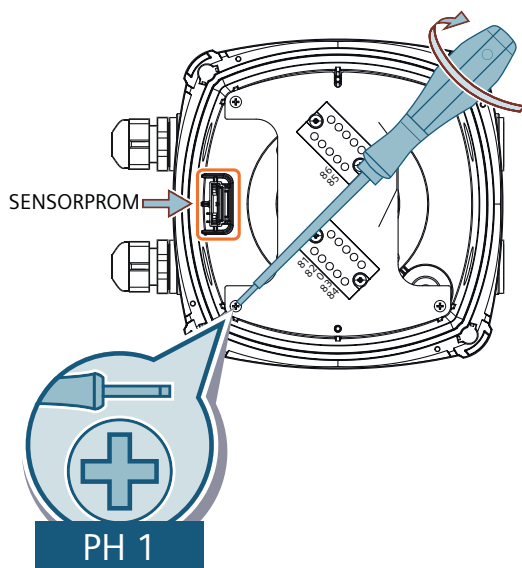
Using rigid conduits can damage the terminal box.

Procedure

1. Remove the lid from the sensor terminal box.



2. Remove SENSORPROM from the holder in the sensor terminal box. The SENSORPROM has to be mounted in the transmitter terminal box. Ensure that the serial number on the SENSORPROM label is identical to the sensor serial number.
3. The terminal board with premounted terminal blocks is included in the delivery of the wall mounting unit. Mount the sensor terminal board in the sensor terminal box. Tighten completely to maximum torque: 1 Nm.

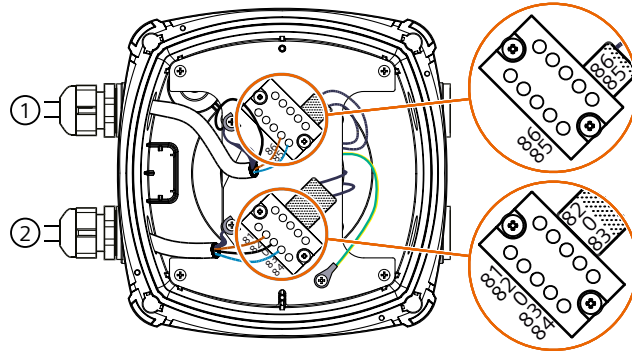


4. Fit the coil cable ① and electrode cable ② through the cable glands. Connect the cables to the corresponding terminals on the terminal blocks. Tighten all terminal screws to the specified maximum torque: 0.5 Nm.

Note

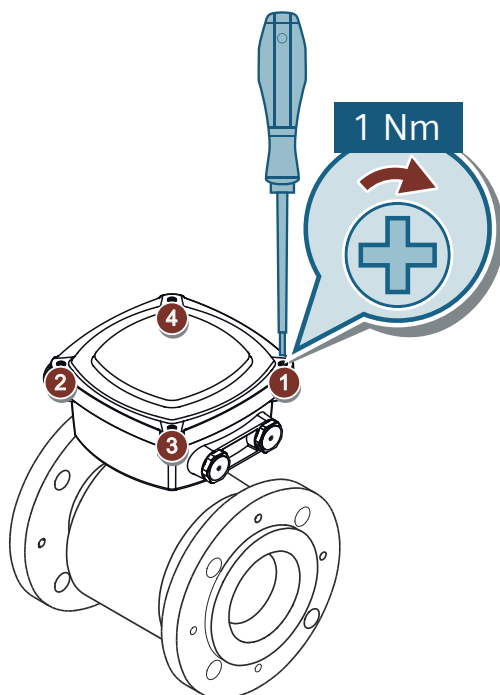
Electrode cable with two or three wires

Depending on your configuration, the electrode connector can have either two or three wires. In both cases, the grounding is always connected through the center pin.



5. Connect the coil and electrode cable shields and grounding cables to the terminal board by using grounding lugs.
The black wire can be used as an alternative way to equalize potential, or, if not needed, it can be cut off. Use the black wire to equalize potential if you are using:
 - 24 V DC PSU without PE
 - Sensor without grounding electrode

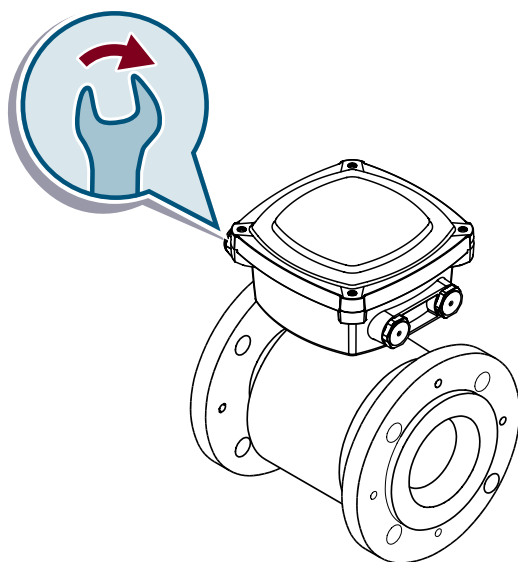
6. Remount terminal box lid by cross tightening as indicated. Do not tighten fully at first to avoid damage to the device.




7. To obtain optimum sealing, tighten cable glands. For the right torque values refer to FMT020 Operating Instructions (<https://sieportal.siemens.com/su/blxYS>).


NOTICE**Do not overtighten the NPT adapter**


Overtightening can result in cracks of the terminal box. Use a second wrench to hold the NPT adapter firmly in place while tightening the cable glands or flexible conduits.





5.3 Electrical connection


 WARNING
Safety requirement for DC power supply input
The DC power supply version is intended to be supplied from one of the following:
<ul style="list-style-type: none">• Isolated limited energy source UL61010-1, 3rd ed cl. 9.4• Limited power source per UL62368-1• PS2 per UL62368-1• Class 2 per NEC

 WARNING
Safety requirement for power supply for communication terminals
When applicable, the communication terminals are intended to be supplied from one of the following:
<ul style="list-style-type: none">• Isolated limited energy source UL61010-1, 3rd ed cl. 9.4• Limited power source per UL62368-1• PS2 per UL62368-1• Class 2 per NEC

 WARNING
Safety requirement for power supply for communication terminals
The device is intended to be supplied from an isolated Limited Energy Source per UL61010-1, 3rd ed cl. 9.4 or Limited Power Source per UL62368-1 or Class 2 per NEC.

 WARNING
Disconnecting the device from power
To be able to disconnect the device from the electrical supply source, install an external switch or a circuit breaker upstream to the device. Choose a position so that it is easy to operate the disconnecting protection device.

 WARNING
Grounding
Connect mains protective ground earth to PE terminal in accordance with diagram (due to class 1 power supply).

 WARNING
High vibration environment
Use relay output only in NO mode in an environment with high vibration.

Note**Mains cable connection**

Mains cable connection with cable glands is allowed for NFPA79 applications only.

Note

For mains wiring: Use cables in copper material, with a conductor temperature rating of at least 65 °C.

Note

Terminals 81 and 84 are only to be connected if a special electrode cable with double shielding is used.

Note

In applications with a risk of low supply voltage below the specifications for more than 10 minutes, install an under voltage relay or protection circuit for DC installations.

Note**Output cables**

Use shielded cables if long cables are used in noisy environments.

Note**Digital output**

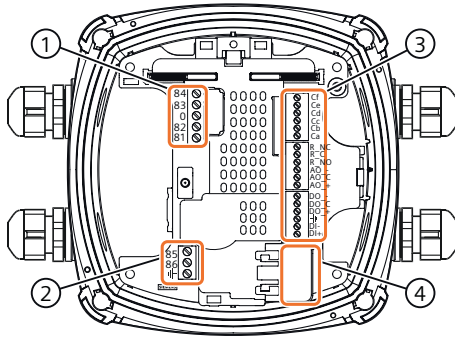
If internal resistance of a load exceeds 10 k Ω , connect an external 10 k Ω load resistor in parallel to this load.

Note**Mains frequency**

Select the right mains frequency in parameter 2.1.2 for the mains supply frequency, that you are using.

For input and output specification refer to Technical specifications (Page 57).



Connection board overview



- ① Electrode cable terminals
- ② Coil cable terminals
- ③ Input/Output and communication terminals
- ④ Power supply terminal

Power supply

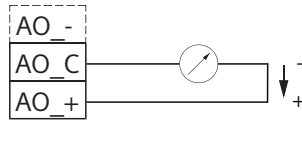
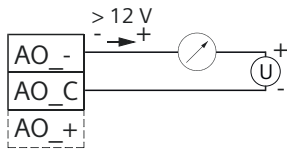
Table 5-1 Power supply transmitter side

AC power supply	DC power supply
 ← P N ← N L ← L	 ← PE + ← + - ← -

Cable section and insulation as described in Technical specifications (Page 57).

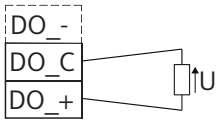
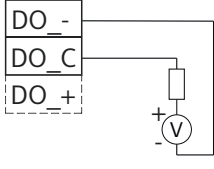


Current output

Table 5-2 Current output

Active output	Passive output
	

Digital output

Table 5-3 Digital output - current driven

Active output	Passive output	Menu setup
		<p>Negative:  Positive: </p> <p>R = Pull up/down resistor < 1 kΩ may be required - depending on Cables/Input resistance</p>

Relay output

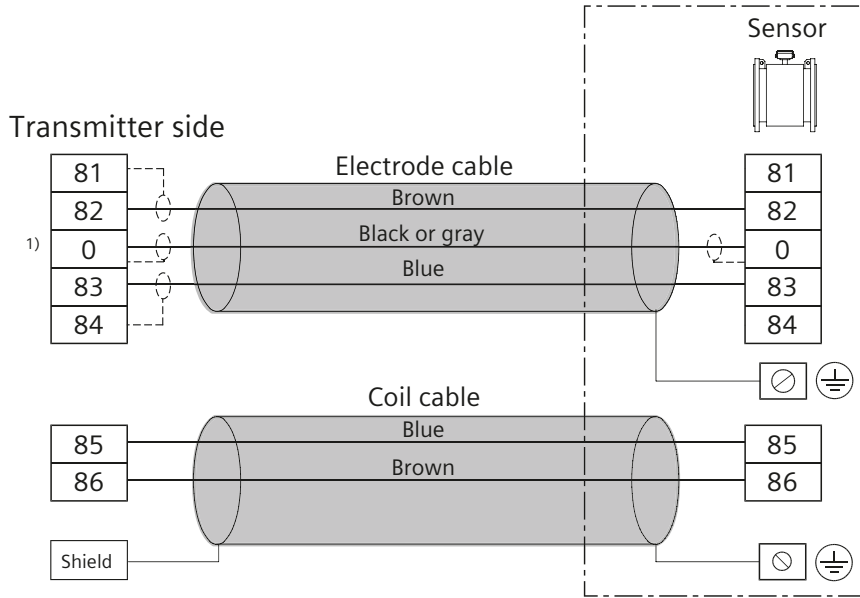
Table 5-4 Relay output

Terminal	Description
R_NC	Normally closed
R_C	Common
R_NO	Normally open

Communication cable

Ca, Cb, Cc, Cd, Ce, Cf are reserved for communication modules as described in FMT020 Operating Instructions (<http://www.siemens.com/processinstrumentation/documentation>).

Transmitter to sensor cable connection



1) Note:
Special cable with individual wire shields (shown as dotted lines) are only required when using empty pipe function or long cables.

Figure 5-1 Electrode and coil cable

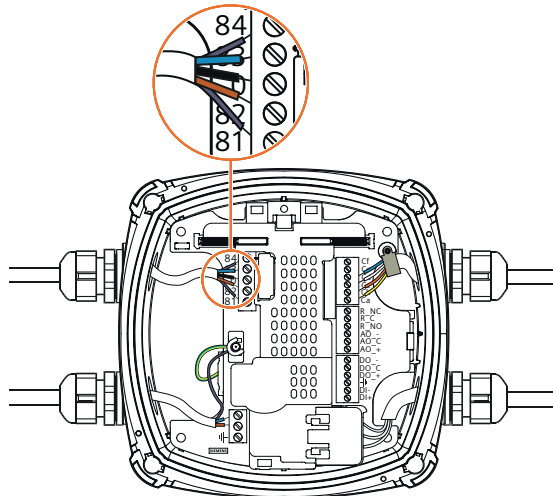


Figure 5-2 Electrode cable with individual wire shields

5.4 Installation check

The meter is now ready to go into normal operation - for commissioning and setting of parameters refer to the relevant transmitter manual.

Before commissioning it must be checked that:

- The device has been installed and connected in accordance with the guidelines provided previous in this chapter and in Installing/Mounting (Page 23).

5.5 Potting

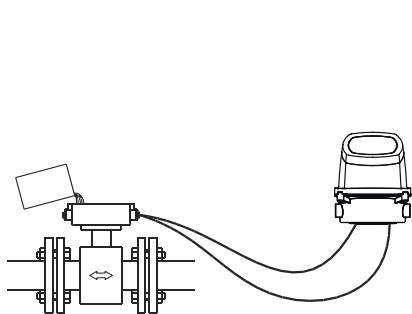
If sensor is buried or permanently submerged, terminal box must be encapsulated with silicon dielectric gel (non-toxic, transparent and self-healing gel).

NOTICE

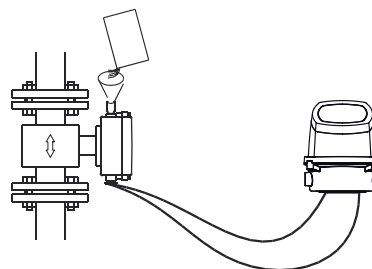
Electrical connections

Do **not** pot meter before electrical connections have been made.

- Mix the two components of the potting kit well and pour into terminal box.
- Let cure for approximately 24 hours at approximately 25°C (77°F). Curing time increases by 100% per -10°C (-18°F).



Horizontal orientation



Vertical orientation

Note

Gel can be penetrated with test instruments or be removed in case of cable replacement.

5.6 Direct burial

Recommendations for direct burial of remote sensor:

- Check for visible damages in paint finish !
- Use protection conduit !
- Protect sensor with pea gravel at least 300 mm around sensor. This provides some drainage and also avoids caking sensor with earth. It also helps to locate sensor in case excavation takes place.

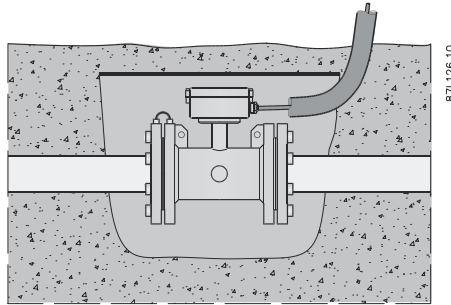


Figure 5-3 Direct burial of sensor

⚠ CAUTION

Sensor should not be subject to heavy vehicles applying excessive weight above sensor or pipeline

NOTICE

SENSORPROM memory unit

Remove the SENSORPROM from terminal box on sensor and relocate in remote transmitter prior to burying sensor.

All sensor data plate information and serial number should be recorded for each sensor prior to burying. This will ensure correct matching with SENSORPROM unit.

⚠ WARNING

Electrical cable identification

Use suitable coil and electrode cables

Lay electrical cable identification tape above pea gravel before it is covered with earth.

5.7 Custody transfer

5.7.1 Internal seal

To prevent any unauthorized manipulation of data on CT version, the memory card, SENSORPROM as well as CT switch are factory sealed.

Note

For type-approved and verified MID CT products

The verification sealing may only be broken by an authorized person, with the acceptance and under direction of the local authorities.

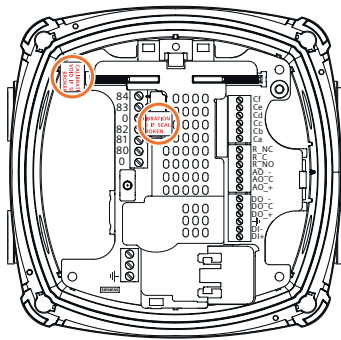


Figure 5-4 SENSORPROM and CT switch seal

5.7.2 User seal

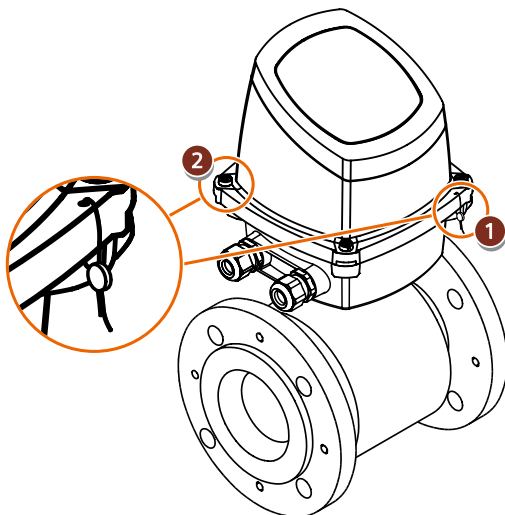
User seals are supplied in delivery to seal after commissioning the device. These seals prevent unauthorized opening and manipulation of the device.

Before you start

- You are authorized to seal the device,
- You have finished the installation and electrical connection of your device.

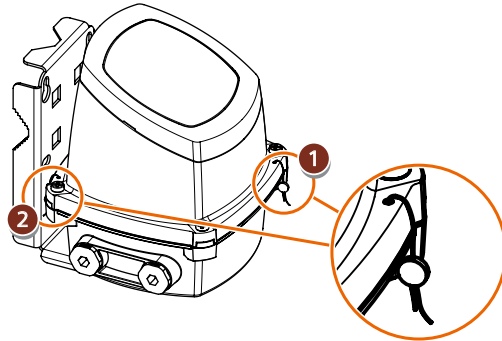
Procedure for compact design

Seal the transmitter through the already existing holes to the terminal box. Make sure to seal the terminal box on both sides.

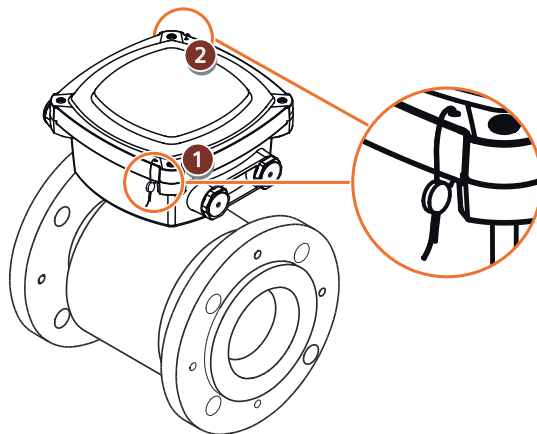


Procedure for remote design

1. Seal the transmitter through the already existing holes to the terminal box. Make sure to seal the terminal box on both sides.



2. Seal the terminal box lid on sensor side. Make sure to seal the terminal box lid on both sides.



Service and maintenance

6.1 Maintenance

The device is maintenance-free. However, a periodic inspection according to pertinent directives and regulations must be carried out.

An inspection can include check of:

- Ambient conditions
- Seal integrity of the process connections, cable entries, and cover screws
- Reliability of power supply, lightning protection, and grounds

Note

Siemens defines flow sensors as non-repairable products.

 WARNING
--

Impermissible repair and maintenance of the device

- | |
|--|
| <ul style="list-style-type: none">• Repair and maintenance must be carried out by Siemens authorized personnel only. |
|--|

6.2 Technical support

If you have any technical questions about the device described in these Operating Instructions and do not find the right answers, you can contact Customer Support:

- Via the Internet using the **Support Request:**
Support request (<http://www.siemens.com/automation/support-request>)
- Via Phone:
 - Europe: +49 (0)911 895 7222
 - America: +1 423 262 5710
 - Asia-Pacific: +86 10 6475 7575

Further information about our technical support is available on the Internet at Technical support (<http://support.automation.siemens.com/WW/view/en/16604318>)

Service & Support on the Internet

In addition to our documentation, we offer a comprehensive knowledge base online on the Internet at:

Service and support (<http://www.siemens.com/automation/service&support>)

6.3 Transportation and storage

There you will find:

- The latest product information, FAQs, downloads, tips and tricks.
- Our newsletter, providing you with the latest information about your products.
- Our bulletin board, where users and specialists share their knowledge worldwide.
- You can find your local contact partner for Industry Automation and Drives Technologies in our partner database.
- Information about field service, repairs, spare parts and lots more under **Services**.

Additional Support

If you have additional questions about the device, please contact your local Siemens representative and offices at:

Local contact person (<http://www.automation.siemens.com/partner>)

6.3 Transportation and storage

To guarantee sufficient protection during transport and storage, observe the following:

- Keep the original packaging for subsequent transportation.
- Devices/replacement parts should be returned in their original packaging.
- If the original packaging is no longer available, ensure that all shipments are properly packaged to provide sufficient protection during transport. Siemens cannot assume liability for any costs associated with transportation damages.

NOTICE
Insufficient protection during storage
The packaging only provides limited protection against moisture and infiltration.
<ul style="list-style-type: none">• Provide additional packaging as necessary.

Special conditions for storage and transportation of the device are listed in Technical specifications (Page 57).

Handling

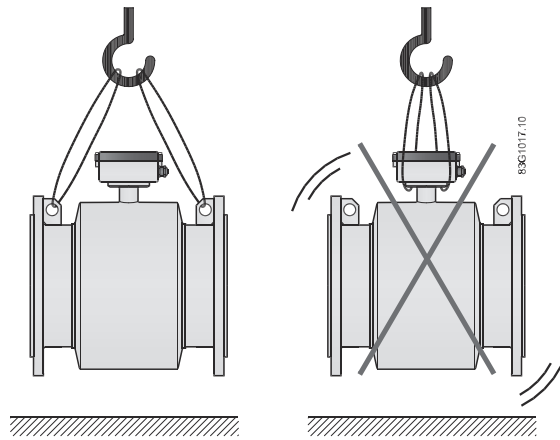


Figure 6-1 Handling of sensor

6.4 Return procedure

To return a product to Siemens, see Returns to Siemens (www.siemens.com/returns-to-siemens).

Contact your Siemens representative to clarify if a product is repairable, and how to return it. They can also help with quick repair processing, a repair cost estimate, or a repair report/cause of failure report.

NOTICE

Decontamination

The product may have to be decontaminated before it is returned. Your Siemens contact person will let you know for which products this is required.

6.5 Disposal



Devices described in this manual should be recycled. They may not be disposed of in the municipal waste disposal services according to the Directive 2012/19/EC on waste electronic and electrical equipment (WEEE).

Devices can be returned to the supplier within the EC and UK, or to a locally approved disposal service for eco-friendly recycling. Observe the specific regulations valid in your country.

Further information about devices containing batteries can be found at: Information about battery / product return (WEEE) (<https://support.industry.siemens.com/cs/document/109479891/>)

NOTICE

Data misuse resulting from non-secure deletion of data

Incomplete or non-secure deletion of data from data memories can result in data misuse by third parties.

For this reason, ensure secure deletion of data from all storage media used before disposing of the product.

Diagnostics and Troubleshooting

7.1 Sensor check

Requirement

To check the SITRANS FM sensors the following test instruments will be required:

- Digital Meter/Multimeter
- Ohmmeter "Megger"
- (Moving Coil Meter)

Sensor check

Remove the transmitter from the sensor or remote position before making the following checks.

Coil resistance check

- Measure the coil resistance between connection numbers 85 and 86 using a digital meter. Resistance should be within range stated in Coil resistance table (Page 81).

A low reading may indicate moisture within the coil housing or shorted coil turns.

A high reading would indicate an open circuit coil.

Note

In case of deviation from nominal coil values, the sensor is damaged and must be replaced

Coil insulation check

 WARNING
Potential hazard!
Only carry out a coil insulation check in non-hazardous area!

- Megger between connection number 85 and the sensor body. The resistance should be above 20 M Ω .

A low megger reading would indicate the coil insulation is breaking down. This is usually due to fluid ingress into the coil housing.

Sensors with an insulation resistance down to 1 M Ω may still work satisfactorily but this is not guaranteed.

Electrode resistance check

- Measure the electrode resistance between connections 82 and 0 with a moving coil meter. With a sensor full of fluid the resistance should be between 5 k Ω and 50 k Ω . If the sensor is empty the resistance will be infinite.
- Repeat the resistance measurements between connections 83 and 0. The results should be the same.

If the resistance is low there may be a short on the electrodes or wiring (in the case of a remote mounted transmitter). Alternatively there may be water ingress or moisture in the terminal box.

If the resistance is high and the pipe is completely full of fluid check the following:

1. Fluid is electrically conductive.
2. Electrodes are not coated with grease or any deposit.
3. Electrode circuit is not open.
4. Remote mounted transmitter has a 3 core cable with an overall shield continuously from sensor to transmitter, including junction boxes and terminal rails inside panels.
5. Shield is connected to 0 or to earth terminal (PE) on sensor.

Note

Sensors removed from line

For sensors removed from line with dry bore, use megger between terminal 82 and compression plate, and 83 and compression plate to show any water ingress behind electrodes or within enclosure.

7.2 Fluctuating process values

Question

Why do the displayed process values fluctuate when the electrode cable is moved?

Answer

There can be several causes for fluctuating process values:

- Deposits on electrodes
 - Clean the electrodes.
- Defect electrode cable
 - Replace the cable
- Incorrect cable connection
 - Connect the electrode cable (82, 83, 0 and shield) according to the instructions in Electrical connection (Page 40)

Technical specifications

8.1 Technical specifications

Table 8-1 Technical specifications

Version	FMS500
Product characteristic	EPDM or NBR lining
Design and nominal size	<i>Coned sensor:</i> <ul style="list-style-type: none"> • DN 15 to 300 (½" to 12") <i>Full bore sensor:</i> <ul style="list-style-type: none"> • DN 350 to 2000 (14" to 78")
Measuring principle	Electromagnetic induction
Excitation frequency (Mains supply: 50 Hz/60 Hz)	<i>DN 15 to 65 (½" to 2½"):</i> <ul style="list-style-type: none"> • 12.5 Hz / 15 Hz <i>DN 80 to 150 (3" to 6"):</i> <ul style="list-style-type: none"> • 6.25 Hz / 7.5 Hz <i>DN 200 to 300 (8" to 12"):</i> <ul style="list-style-type: none"> • 3.125 Hz / 3.75 Hz <i>DN 350 to 2000 (14" to 78"):</i> <ul style="list-style-type: none"> • 1.5625 Hz / 1.875 Hz

Technical specifications

8.1 Technical specifications

Table 8-2 Process connections

Version	FMS500
EN 1092-1	PN 6 <ul style="list-style-type: none"> DN 1400 to 1200 (56" to 48") Raised face flanges PN 10 (145 psi): <ul style="list-style-type: none"> DN 200 to 300 (8" to 12") Flat face flanges PN 10 (145 psi): <ul style="list-style-type: none"> DN 350 to 2000 (14" to 78") Raised face flanges PN 16 (232 psi): <ul style="list-style-type: none"> DN 50 to 300 (2" to 12") Flat face flanges PN 16 (232 psi): <ul style="list-style-type: none"> DN 350 to 2000 (14" to 78") Raised face flanges PN 40 (580 psi): <ul style="list-style-type: none"> DN 15 to 40 (½" to 1½") Flat face flanges
ANSI B16.5	Class 150 lb: ½" to 24"
AWWA C-207	Class D: <ul style="list-style-type: none"> 28" to 78", Flat face flanges
AS4087	PN 16 (230 psi): <ul style="list-style-type: none"> DN 50 to 1200 (2" to 48")
JIS B 2220	K10 (1" to 24")

Table 8-3 Rated operating conditions

Version	FMS500
Ambient temperature	
Sensor	-20...+65 °C (-4...+149 °F)
With compact transmitter FMT020	-20...+65 °C (-4...+149 °F)
Operation in MCERTS certification conditions	-20...+65 °C (-4...+149 °F)
Operation in MID or OIML R49 conditions	-20...+55 °C (-4...+131 °F)
Operating pressure [abs. bar] ¹⁾	
	DN 15 to 40 (½" to 1½")
	0.01 to 40 bar (0.15 to 580 psi) ²⁾
	DN 50 to 300 (2" to 12") ²⁾
	0.03 to 20 bar (0.44 to 290 psi) ²⁾
	DN 350 to 2000 (14" to 78")
	0.01 to 16 bar (0.15 to 232 psi) ²⁾
Enclosure rating	
Standard	IP66/67, NEMA 4X/6

Version	FMS500
Optional	IP68 and NEMA 6P (2m, 10 days) for sensor in compact (integral mount) and remote design IP68 and NEMA 6P (10m, continuously) for sensor in remote design
Corrosive category	C4 (C5 optional) according to ISO 12944-2
Pressure drop	DN 15 and 25 (½" and 1"): <ul style="list-style-type: none"> Max. 20 mbar (0.29 psi) at 1 m/s (3 ft/s) DN 40 to 300 (1½" to 12"): <ul style="list-style-type: none"> Max. 25 mbar (0.36 psi) at 3 m/s (10ft/s) DN 350 to 2000 (14" to 78"): <ul style="list-style-type: none"> Insignificant
Test pressure	1.5 x PN (where applicable) 1.6 x MAP for MID/OIML R49
Mechanical load (vibration) - compact version	
With compact transmitter FMT020	<ul style="list-style-type: none"> Vibration, sinusoidal according to IEC 60068-2-6: 1 g peak Vibration broad-band random, according to IEC 60068-2-64: 1.54 g rms
Mechanical load (vibration) - remote version	
Sensor	<ul style="list-style-type: none"> Vibration, sinusoidal according to IEC 60068-2-6: 2 g peak Vibration broad-band random, according to IEC 60068-2-64: 1.54 g rms
Transmitter FMT020	<ul style="list-style-type: none"> Vibration, sinusoidal according to IEC 60068-2-6: 0.7 g peak Vibration broad-band random, according to IEC 60068-2-64: 1.54 g rms
Process fluid temperature	
NBR for MI-001 and OIML R49 approvals	-10...+70 °C (14 to 158 °F) +0.1...+50 °C (32 to 122 °F)
EPDM for MI-001 and OIML R49 approvals	-10...+70 °C (14 to 158 °F) +0.1...+50 °C (32 to 122 °F)
EMC	EMC 2014/30/EU

¹⁾ Maximum operating pressure decreases with increasing operating temperature

²⁾ Limited to 16 bar (232 psi) for MID and OIML R49 approvals

Table 8-4 Design

Version	FMS500
Housing and flange material	Carbon steel, with corrosion resistant coating of corrosive category C4 or C5, according to ISO 12944-2
Measuring pipe	DN 15 to DN 300 (½" to 12"): Carbon steel ≥ DN 350 (14"): Stainless steel
Electrodes	Hastelloy

8.2 Certificates and approvals

Version	FMS500
Grounding electrodes (standard)	Hastelloy
Terminal box	Polycarbonate







8.2 Certificates and approvals

Table 8-5 Certificates and approvals



Version	FMS500
Calibration	Zero-point, 2 x 25 % and 2 x 90 %
Standard production calibration, calibration report shipped with sensor	
Drinking water approvals	<p>EPDM liner:</p> <ul style="list-style-type: none"> • WRAS (WRc, BS6920 cold water, GB) • NSF/ANSI standards 61 Annex G & 372 (cold water, US) • ACS listed (F) • Compliance to Trinkwasserverordnung §14 (Germany) • Belgaqua (B) • AS/NZS 4020 (Australia & New Zealand) • GB/T 5750 (China) <p>Ebonite liner</p> <ul style="list-style-type: none"> • WRAS (WRc, BS6920 cold water, GB) • NSF/ANSI standards 61 Annex G & 372 (cold water, US) • AS/NZS 4020 (Australia & New Zealand) • GB/T 5750 (China)
Custody transfer (CT)	<p>FM520 (FMS500 sensor with FMT020 transmitter):</p> <ul style="list-style-type: none"> • MID - MI-001(EU): DN 50 to 300 (2" to 12") • OIML R49 - Class 1 & 2: DN 50 to 300 (2" to 12")

Version	FMS500	
Performance / MCERTS MC240428 CPA	<ul style="list-style-type: none"> Test Procedures for Continuous Water Monitoring Equipment, Part 3: Performance standards and test procedures for water flowmeters Chinese Pattern Approval 	
Ex approval	<p>Compact version: FM25ATEX0004X IECEx FMG 25.0003X Ⓔ II 3 GD Ex ec IIC T4...T3 Gc Ex tc IIIC T135°C Dc</p> <p>FM25US0016X FM25CA0008X Class I Zone 2 AEx ec nC IIC T4...T3 Gc Class II Zone 22 AEx tc IIIC T135°C Dc</p> <p>Class I Division 2 Groups ABCD T4 Class II III Division 2 Groups EFG T135°C</p>	<p>Remote version: FM25ATEX0004X IECEx FMG 25.0003X Ⓔ II 3 GD Ex ec IIC T6...T3 Gc Ex tc IIIC T*°C Dc</p> <p>FM25US0016X FM25CA0008X Class I Zone 2 AEx ec IIC T6...T3 Gc Class II Zone 22 AEx tc IIIC T*°C Dc</p> <p>Class I Division 2 Groups ABCD</p>

8.3 Certification symbols

Symbol	Certificate number	Marking
		CE marking for EU Declaration of Conformity
		UKCA marking for UK Declaration of Conformity
	E344532	UL approval
	MC240428/XX ¹⁾	MCERTS product certification
		ATEX marking
		FM APPROVED mark




8.4 Cable data

Symbol	Certificate number	Marking
		KC Mark Korea Certification
	2024F305-21 with FMT020	Chinese Pattern Approval

¹⁾ XX depending on the version of the certificate

8.4 Cable data

Description

Cable for standard electrode or coil	
Electrode cable, double shielded	
Cable kit with standard coil cable and electrode cable double shielded (also available as low noise cable for MAG 1100 sensor)	

Standard applications

Table 8-6 Technical data, standard application cables

		Coil cable	Standard electrode cable
Basic data	No. of conductors	2	3
	Min. sqr. area	0.5 mm ²	0.2 mm ²
	Shield	Yes	Yes
	Max. capacitance	N/A	350 pF/m
Max. cable loop resistance	Media temperature:		
	< 100 °C (212 °F)	40 Ω	N/A
	> 200 °C (392 °F)	6 Ω	N/A
Cable glands on sensor and transmitter	M20x1.5 gland - Cable ø 5 to 13 mm (0.20 to 0.51 inches)		
	½ NPT gland - cable ø 5 to 9 mm (0.20 to 0.35 inches)		

Special applications, for example low conductivity or electrical noise

Table 8-7 Technical data, special application cables

		Coil cable	Special electrode cable
Basic data	No. of conductors	3	3
	Sqr. area	1.5 mm ²	0.25 mm ²
	Shield	Yes	Double
	Color code	Brown, blue, black	Brown, blue, black
	Outside color	Grey	Grey
	Ext. diameter	7.8 mm	8.1 mm
	Conductor	Flexible CU	Flexible CU
	Isolation material	PVC	PVC
Ambient temperature	Flexible installation	-5 to +70°C (23 to 158°F)	-5 to +70°C (23 to 158°F)
	Non-flexible installation	-30 to +70°C (-22 to 158°F)	-30 to +70°C (-22 to 158°F)
Cable parameter	Capacity	161.50 pF/m	N/A
	Inductance	0.583 μH/m	N/A
	L/R	43.83 μH/Ω	N/A

8.5 Effect of temperature on working pressure

Effect of temperature on working pressure.

Table 8-8 Metric measures (pressure in bar)

Flange specifications	Flange rating	Temperature (°C)			
		-5	10	50	90
Sizes DN 25 to 2000					
EN 1092-1	PN 10	10.0	10.0	9.7	9.4
	PN 16	16.0	16.0	15.5	15.1
	PN 40	40.0	40.0	38.7	37.7
ANSI B16.5	150 lb	19.7	19.7	19.3	18.0
AWWA C-207	Class D	10.3	10.3	10.3	10.3
AS		16.0	16.0	15.5	15.1
JIS	10K	14.0	14.0	14.0	14.0
Sizes DN 15 to 300					
EN 1092-1	PN 10	10.0	10.0	10.0	8.2
	PN 16	10.0	16.0	16.0	13.2
	PN 40	40.0	40.0	38.7	37.7
ANSI B16.5	150 lb	10.0	19.7	19.7	16.2
AS		16.0	16.0	16.0	13.2
JIS		14.0	14.0	14.0	

8.6 Process fluid conductivity

Table 8-9 Imperial measures (pressure in psi)

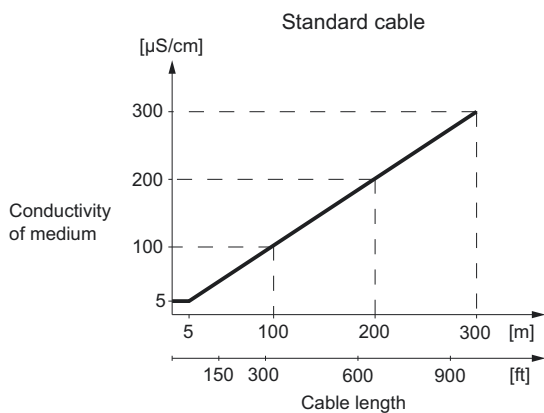
Flange specifications	Flange rating	Temperature (°F)			
		23	50	120	200
Sizes 1" to 78"					
EN 1092-1	PN 10	145	145	141	136
	PN 16	232	232	225	219
	PN 40	580	580	561	547
ANSI B16.5	150 lb	286	286	280	261
AWWA C-207	Class D	150	150	150	150
Sizes ½" to 12"					
EN 1092-1	PN 10	145	145	145	119
	PN 16	145	232	232	191
ANSI B16.5	150 lb	145	286	286	235

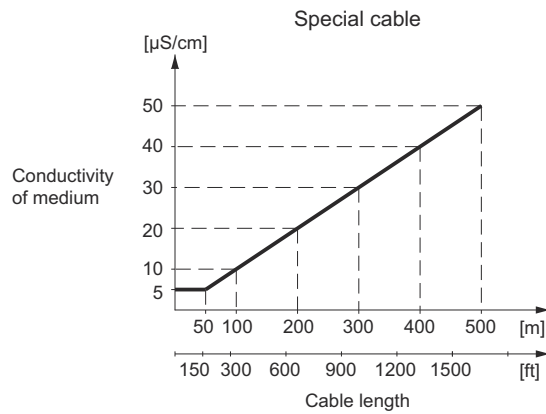
8.6 Process fluid conductivity

Compact installation

Liquids with an electrical conductivity $\geq 5 \mu\text{S/cm}$.

Remote installation





Electrical conductivity

Repeatability at 25 °C (77 °F)

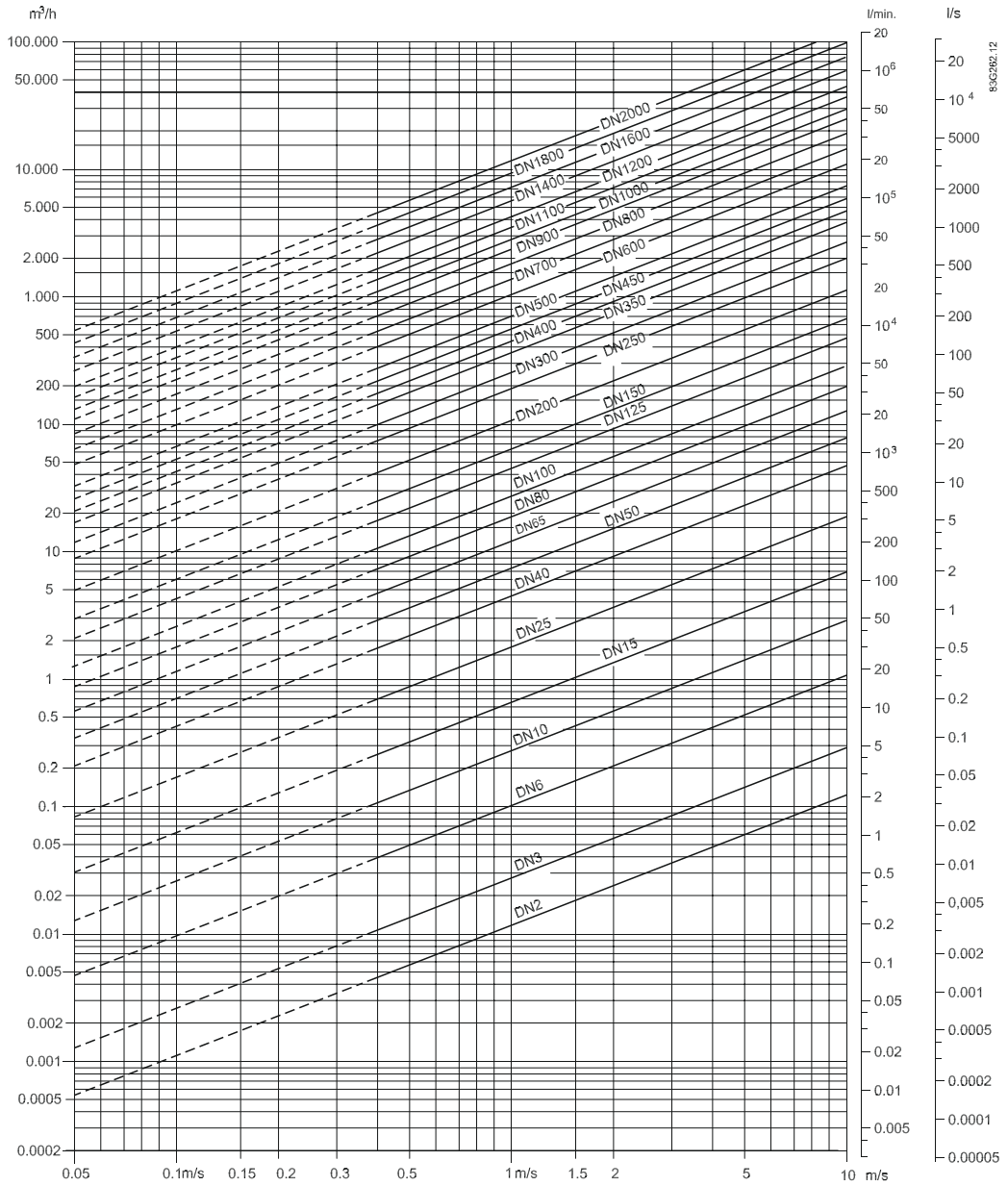
+5 % between 15 $\mu\text{S/cm}$ and 5000 $\mu\text{S/cm}$

8.7 Liner and electrodes selection

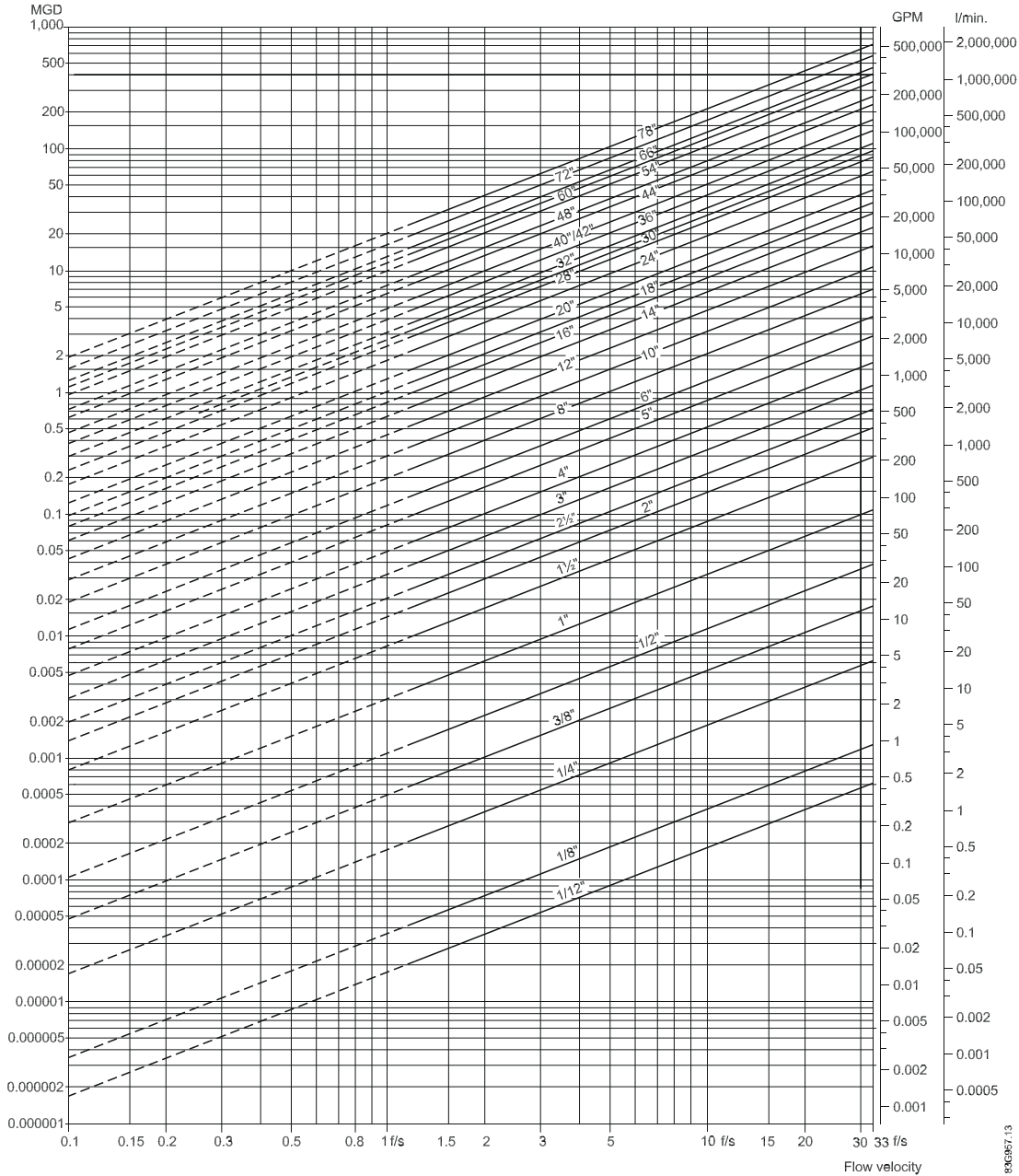
To find the right liner and electrodes for your application, refer to the SITRANS FM Selection Guide (<https://support.industry.siemens.com/cs/ww/en/view/109792872>).

8.8 Sizing tables

Sizing table (DN 2 to DN 2000)



Sizing table (DN 1/12" to DN 78")



The tables show the relationship between flow velocity v , flow quantity Q and sensor dimension DN.

Guidelines for selection of sensor

Min. measuring range: 0 to 0.25 m/s (0 to 0.8 ft/s)

Max. measuring range: 0 to 10 m/s (0 to ft/s)

Normally the sensor size is selected so that the nominal flow velocity v lies within the measuring range 1 to 3 m/s (1 to 15 ft/s).

8.9 Dimensions and weight

Flow velocity calculation formula:

(metric measures)

$$v = \frac{1273.24 \times Q \text{ [l/s]}}{DN^2 \text{ [mm]}} \text{ [m/s]} \text{ or } v = \frac{353.68 \times Q \text{ [m}^3\text{/h]}}{DN^2 \text{ [mm]}} \text{ [m/s]}$$

(imperial measures)

$$v = \frac{0.408 \times Q \text{ [GPM]}}{(\text{Pipe ID})^2 \text{ [inch]}} \text{ [ft/s]} \text{ or } v = \frac{283.67 \times Q \text{ [MGD]}}{(\text{Pipe ID})^2 \text{ [inch]}} \text{ [ft/s]}$$

8.9 Dimensions and weight

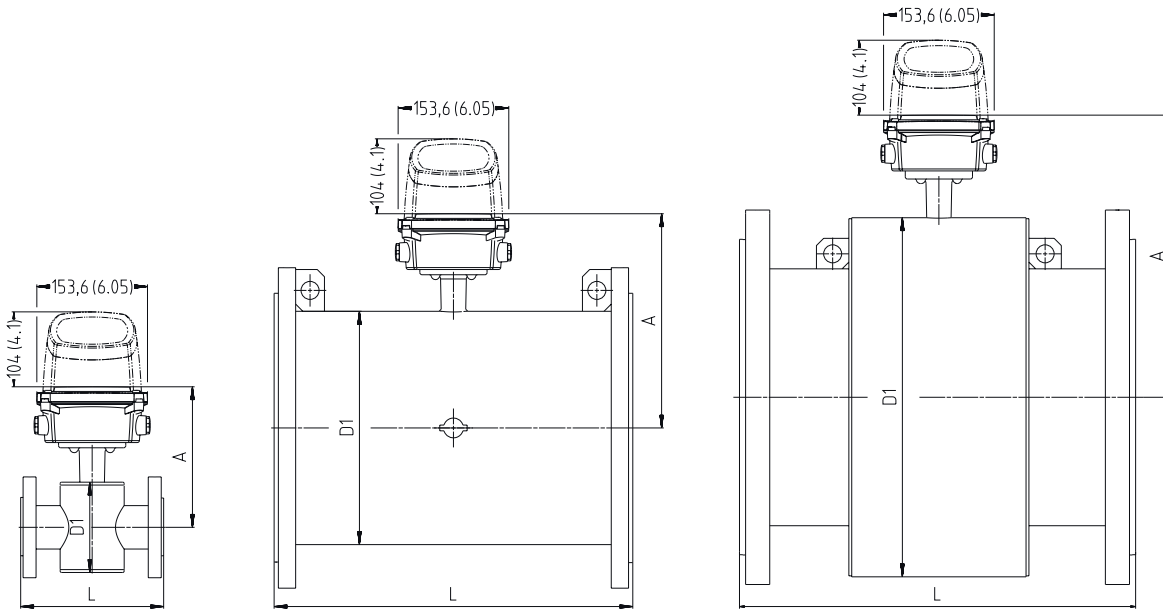


Figure 8-1 FMS500 with FMT020

Dimensions

Table 8-10 Nominal size A

Nominal size		A	
		NBR or EPDM liner	
mm	inch	mm	inch
15	½	170	6.7
25	1	180	7.1
40	1½	195	7.7
50	2	181	7.1
65	2½	187	7.4
80	3	193	7.6

Nominal size		A	
		NBR or EPDM liner	
mm	inch	mm	inch
100	4	200	7.9
125	5	210	8.3
150	6	225	8.9
200	8	250	9.8
250	10	277	10.9
300	12	303	11.9
350	14	375	14.8
400	16	400	15.7
450	18	431	17
500	20	456	18
600	24	507	20
700	28	557	21.9
750	30	584	23
800	32	609	24
900	36	656	25.8
1000	40	707	27.8
1050	42	707	27.8
1100	44	758	29.8
1200	48	813	32
1400	54	918	36.1
1500	60	965	37.9
1600	66	1018	40.1
1800	72	1116	43.9
2000	78	1216	47.8

Table 8-11 Nominal size L

Nominal size		L													
		PN 10		PN 16 ¹⁾		PN 40		Class 150		AWWA C-207		AS 16		JIS10K	
mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch
15	½	N/A	N/A	N/A	N/A	200	7.9	200	7.9	N/A	N/A	N/A	N/A	200	7.9
25	1	N/A	N/A	N/A	N/A	200	7.9	200	7.9	N/A	N/A	N/A	N/A	200	7.9
40	1½	N/A	N/A	N/A	N/A	200	7.9	200	7.9	N/A	N/A	N/A	N/A	200	7.9
50	2	N/A	N/A	200	7.9	N/A	N/A	200	7.9	N/A	N/A	200	7.9	200	7.9
65	2½	N/A	N/A	200	7.9	N/A	N/A	200	7.9	N/A	N/A	200	7.9	200	7.9
80	3	N/A	N/A	200	7.9	N/A	N/A	200	7.9	N/A	N/A	200	7.9	200	7.9
100	4	N/A	N/A	250	9.8	N/A	N/A	250	9.8	N/A	N/A	250	9.8	250	9.8
125	5	N/A	N/A	250	9.8	N/A	N/A	250	9.8	N/A	N/A	N/A	N/A	250	9.8
150	6	N/A	N/A	300	11.8	N/A	N/A	300	11.8	N/A	N/A	300	11.8	300	11.8
200	8	350	13.8	350	13.8	N/A	N/A	350	13.8	N/A	N/A	350	13.8	350	13.8

8.9 Dimensions and weight

Nominal size		L													
		PN 10		PN 16 ¹⁾		PN 40		Class 150		AWWA C-207		AS 16		JIS10K	
mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch
250	10	450	17.7	450	17.7	N/A	N/A	450	17.7	N/A	N/A	450	17.7	450	17.7
300	12	500	19.7	500	19.7	N/A	N/A	500	19.7	N/A	N/A	500	19.7	500	19.7
350	14	550	21.7	550	21.7	N/A	N/A	550	21.7	N/A	N/A	550	21.7	550	21.7
400	16	600	23.6	600	23.6	N/A	N/A	600	23.6	N/A	N/A	600	23.6	600	23.6
450	18	600	23.6	600	23.6	N/A	N/A	600	23.6	N/A	N/A	600	23.6	600	23.6
500	20	600	23.6	600	23.6	N/A	N/A	600	23.6	N/A	N/A	600	23.6	600	23.6
600	24	600	23.6	600	23.6	N/A	N/A	600	23.6	N/A	N/A	600	23.6	600	23.6
700	28	700	27.6	700	27.6	N/A	N/A	N/A	N/A	700	27.6	700	27.6	N/A	N/A
750	30	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	750	29.5	N/A	N/A	N/A	N/A
800	32	800	31.5	800	31.5	N/A	N/A	N/A	N/A	800	31.5	800	31.5	N/A	N/A
900	36	900	35.4	900	35.4	N/A	N/A	N/A	N/A	900	35.4	900	35.4	N/A	N/A
1000	40	1000	39.4	1000	39.4	N/A	N/A	N/A	N/A	1000	39.4	1000	39.4	N/A	N/A
1050	42	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1000	39.4	N/A	N/A	N/A	N/A
1100	44	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1100	43.3	N/A	N/A	N/A	N/A
1200	48	1200	47.2	1200	47.2	N/A	N/A	N/A	N/A	1200	47.2	1200	47.2	N/A	N/A
1400	54	1400	55.1	1400	55.1	N/A	N/A	N/A	N/A	1400	55.1	N/A	N/A	N/A	N/A
1500	60	1500	59.1	1500	59.1	N/A	N/A	N/A	N/A	1500	59.1	N/A	N/A	N/A	N/A
1600	66	1600	63	1600	63	N/A	N/A	N/A	N/A	1600	63	N/A	N/A	N/A	N/A
1800	72	1800	70.9	1800	70.9	N/A	N/A	N/A	N/A	1800	70.9	N/A	N/A	N/A	N/A
2000	78	2000	78.7	2000	78.7	N/A	N/A	N/A	N/A	2000	78.7	N/A	N/A	N/A	N/A

Weight

Table 8-12 Weight

Nominal size		PN 10		PN 16 ¹⁾		PN 40		Class 150		AWWA C-207		AS 16		JIS10K	
mm	inch	kg	lbs	kg	lbs	kg	lbs	kg	lbs	kg	lbs	kg	lbs	kg	lbs
15	½	N/A	N/A	N/A	N/A	5	11	5	11	N/A	N/A	N/A	N/A	5	11
25	1	N/A	N/A	N/A	N/A	6	13	6	13	N/A	N/A	N/A	N/A	6	13
40	1½	N/A	N/A	N/A	N/A	9	20	9	20	N/A	N/A	N/A	N/A	9	20
50	2	N/A	N/A	10	22	N/A	N/A	10	22	N/A	N/A	10	22	10	22
65	2½	N/A	N/A	12	26	N/A	N/A	12	26	N/A	N/A	12	26	12	26
80	3	N/A	N/A	13	29	N/A	N/A	13	29	N/A	N/A	13	29	13	29
100	4	N/A	N/A	17	37	N/A	N/A	18	40	N/A	N/A	17	37	17	37
125	5	N/A	N/A	20	44	N/A	N/A	21	46	N/A	N/A	N/A	N/A	20	44
150	6	N/A	N/A	27	60	N/A	N/A	30	66	N/A	N/A	21	46	26	57
200	8	38	84	39	86	N/A	N/A	47	104	N/A	N/A	34	75	35	77
250	10	52	115	56	123	N/A	N/A	64	141	N/A	N/A	48	106	51	112
300	12	62	137	72	159	N/A	N/A	92	203	N/A	N/A	61	134	59	130
350	14	99	218	115	254	N/A	N/A	131	289	N/A	N/A	106	234	88	194

Nominal size		PN 10		PN 16 ¹⁾		PN 40		Class 150		AWWA C-207		AS 16		JIS10K	
mm	inch	kg	lbs	kg	lbs	kg	lbs	kg	lbs	kg	lbs	kg	lbs	kg	lbs
400	16	121	267	143	315	N/A	N/A	161	355	N/A	N/A	124	273	113	249
450	18	144	317	177	390	N/A	N/A	182	401	N/A	N/A	145	320	135	298
500	20	165	364	222	489	N/A	N/A	217	478	N/A	N/A	175	386	151	333
600	24	225	496	321	708	N/A	N/A	305	672	N/A	N/A	285	628	179	395
700	28	272	600	331	730	N/A	N/A	N/A	N/A	284	626	350	772	N/A	N/A
750	30	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	331	730	N/A	N/A	N/A	N/A
800	32	300	661	386	851	N/A	N/A	N/A	N/A	394	869	485	1069	N/A	N/A
900	36	372	820	482	1063	N/A	N/A	N/A	N/A	487	1074	645	1422	N/A	N/A
1000	40	454	1001	672	1482	N/A	N/A	N/A	N/A	589	1299	696	1534	N/A	N/A
1050	42	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	693	1528	N/A	N/A	N/A	N/A
1100	44	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	774	1706	N/A	N/A	N/A	N/A
1200	48	728	1605	1116	2460	N/A	N/A	N/A	N/A	916	2019	1116	2460	N/A	N/A
1400	54	1592	3502	1890	4158	N/A	N/A	N/A	N/A	1592	3502	N/A	N/A	N/A	N/A
1500	60	1850	4070	2238	4924	N/A	N/A	N/A	N/A	1950	4290	N/A	N/A	N/A	N/A
1600	66	2110	4642	2525	5555	N/A	N/A	N/A	N/A	2110	4642	N/A	N/A	N/A	N/A
1800	72	2560	5632	3460	7612	N/A	N/A	N/A	N/A	2560	5632	N/A	N/A	N/A	N/A
2000	78	3640	8008	4205	9251	N/A	N/A	N/A	N/A	3640	8008	N/A	N/A	N/A	N/A

Product documentation and support

A.1 Product documentation

Process instrumentation product documentation is available in the following formats:

- Certificates (<http://www.siemens.com/processinstrumentation/certificates>)
- Downloads (firmware, EDDs, software) (<http://www.siemens.com/processinstrumentation/downloads>)
- Catalog and catalog sheets (<http://www.siemens.com/processinstrumentation/catalogs>)
- Manuals (<http://www.siemens.com/processinstrumentation/documentation>)
You have the option to show, open, save, or configure the manual.
 - "Display": Open the manual in HTML5 format
 - "Configure": Register and configure the documentation specific to your plant
 - "Download": Open or save the manual in PDF format
 - "Download as html5, only PC": Open or save the manual in the HTML5 view on your PC

You can also find manuals with the Mobile app at Industry Online Support (<https://support.industry.siemens.com/cs/ww/en/sc/2067>). Download the app to your mobile device and scan the device ID link.

Product documentation by serial number

Using the PIA Life Cycle Portal, you can access the serial number-specific product information including technical specifications, spare parts, calibration data, or factory certificates.

Entering a serial number

1. Open the PIA Life Cycle Portal (<https://www.pia-portal.automation.siemens.com>).
2. Select the desired language.
3. Enter the serial number of your device. The product documentation relevant for your device is displayed and can be downloaded.

To display factory certificates, if available, log in to the PIA Life Cycle Portal using your login or register.

Scanning an ID link

1. Scan the ID link on your device with a mobile device.
2. Click "PIA Portal".

To display factory certificates, if available, log in to the PIA Life Cycle Portal using your login or register.

A.2 Technical support

Technical support

If this documentation does not completely answer your technical questions, you can enter a Support Request (<http://www.siemens.com/automation/support-request>).

For help creating a support request, view this video here (www.siemens.com/opensr).

Additional information on our technical support can be found at Technical Support (<http://www.siemens.com/automation/csi/service>).

Service & support on the Internet

In addition to our technical support, Siemens offers comprehensive online services at service & support (<https://sieportal.siemens.com/en-ww/support>).

Contact

If you have further questions about the device, contact your local Siemens representative, by doing the following:

1. Visit Contact at Siemens (<http://www.automation.siemens.com/partner>).
2. Select "All Products and Branches" > "Products & Services" > "Industrial automation".
3. Choose either "Process analytics" or "Process instrumentation", depending on your product.
4. Select the product category ("Pressure measurement", for example), then select your product.
5. Click "Search".
The contacts for your product in all regions display.

Contact address for business unit:
Siemens AG
Digital Industries
Process Automation
Östliche Rheinbrückenstr. 50
76187 Karlsruhe, Germany

Appendix

B.1 Measuring ranges

Option G01 (MI-001)

or Option G05 (OIML R49 - class 2)

or Option G06 (OIML R49 – class 1)

Table B-1 Verification R40

Order code: G11	50 (2")	65 (2½")	80 (3")	100 (4")	125 (5")	150 (6")	200 (8")	250 (10")	300 (12")
"R" Q ₃ /Q ₁	40	40	40	40	40	40	40	40	40
Q ₁ [m ³ /h]	1.58	2.5	4	6.25	10	15.75	25	40	40
Q ₂ [m ³ /h]	2.52	4	6.4	10	16	25.2	40	64	64
Q ₃ [m ³ /h]	63	100	160	250	400	630	1000	1600	1600
Q ₄ [m ³ /h]	78.75	125	200	312.5	500	787.5	1250	2000	2000

Table B-2 Verification R80

Order code: G13	50 (2")	65 (2½")	80 (3")	100 (4")	125 (5")	150 (6")	200 (8")	250 (10")	300 (12")
"R" Q ₃ /Q ₁	80	80	80	80	80	80	80	80	80
Q ₁ [m ³ /h]	0.79	1.25	2	3.13	5	7.88	12.5	20	20
Q ₂ [m ³ /h]	1.26	2	3.2	5.00	8	12.6	20	32	32
Q ₃ [m ³ /h]	63	100	160	250	400	630	1000	1600	1600
Q ₄ [m ³ /h]	78.75	125	200	312.5	500	787.5	1250	2000	2000

Table B-3 Verification R160

Order code: G16	50 (2")	65 (2½")	80 (3")	100 (4")	125 (5")	150 (6")	200 (8")	250 (10")	300 (12")
"R" Q ₃ /Q ₁	160	160	160	160	160	160	160	160	160
Q ₁ [m ³ /h]	0.39	0.63	1	1.56	2.5	3.94	6.25	10	10
Q ₂ [m ³ /h]	0.63	1	1.6	2.5	4	6.3	10	16	16
Q ₃ [m ³ /h]	63	100	160	250	400	630	1000	1600	1600
Q ₄ [m ³ /h]	78.75	125	200	312.5	500	787.5	1250	2000	2000

Table B-4 Verification R200

Order code: G17	50 (2")	65 (2½")	80 (3")	100 (4")	125 (5")	150 (6")	200 (8")	250 (10")	300 (12")
"R" Q ₃ /Q ₁	200	200	200	200	200	200	200	200	200
Q ₁ [m ³ /h]	0.32	0.5	0.8	1.25	2	3.15	5	8	8

B.2 Flange mating dimensions (metric)

Order code: G17	50 (2")	65 (2½")	80 (3")	100 (4")	125 (5")	150 (6")	200 (8")	250 (10")	300 (12")
Q ₂ [m ³ /h]	0.50	0.8	1.28	2	3.2	5.04	8	12.8	12.8
Q ₃ [m ³ /h]	63	100	160	250	400	630	1000	1600	1600
Q ₄ [m ³ /h]	78.75	125	200	312.5	500	787.5	1250	2000	2000

Table B-5 Verification R400

Order code: G20	50 (2")	65 (2½")	80 (3")	100 (4")	125 (5")	150 (6")	200 (8")	250 (10")	300 (12")
"R" Q ₃ /Q ₁	400	400	400	400	400	400	400	400	400
Q ₁ [m ³ /h]	0.16	0.25	0.4	0.63	1	1.6	2.5	4	4
Q ₂ [m ³ /h]	0.25	0.4	0.63	1	1.6	2.5	4	6.4	6.4
Q ₃ [m ³ /h]	63	100	160	250	400	630	1000	1600	1600
Q ₄ [m ³ /h]	78.75	125	200	312.5	500	787.5	1250	2000	2000

B.2 Flange mating dimensions (metric)

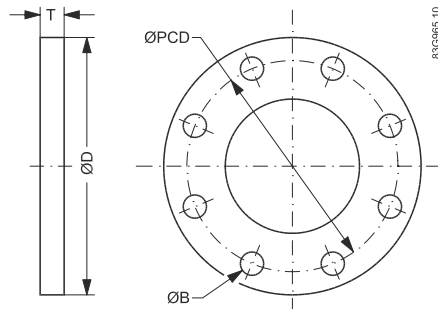


Figure B-1 Flange mating dimensions

Table B-6 Flange mating dimensions (metric)

DN	Dimensions (mm)				Bolting	
	D	PCD	T	B	Holes	Bolts
PN6						
1400	1630	1560	56	36	36	M33
1500	1730	1660	80	36	36	M33
1600	1830	1760	63	36	40	M33
1800	2045	1970	69	39	44	M36
2000	2265	2180	74	42	48	M39
PN10						
200	340	295	24	22	8	M20
250	395	350	26	22	12	M20
300	445	400	26	22	12	M20
350	505	460	30	22	16	M20
400	565	515	32	26	16	M24

B.2 Flange mating dimensions (metric)

DN	Dimensions (mm)				Bolting	
	mm	D	PCD	T	B	Holes
450	615	565	36	26	20	M24
500	670	620	38	26	20	M24
600	780	725	42	30	20	M27
700	895	840	35	30	24	M27
800	1015	950	38	33	24	M30
900	1115	1050	38	33	28	M30
1000	1230	1160	44	36	28	M33
1200	1455	1380	55	39	32	M36
1400	1675	1590	65	42	36	M39
1500	1785	1700	105	42	36	M39
1600	1915	1820	75	48	40	M45
1800	2115	2020	85	48	44	M45
2000	2325	2230	90	48	48	M45
PN16						
50	165	125	20	18	4	M16
65	185	145	20	18	8	M16
80	200	160	20	18	8	M16
100	220	180	22	18	8	M16
125	250	210	22	18	8	M16
150	285	240	24	22	8	M20
200	340	295	26	22	12	M20
250	405	355	30	26	12	M24
300	460	410	36	26	12	M24
350	520	470	37	26	16	M24
400	580	525	41	30	16	M27
450	640	585	46	30	20	M27
500	715	650	50	33	20	M30
600	840	770	56	36	20	M33
700	910	840	40	36	24	M33
800	1025	950	41	39	24	M36
900	1125	1050	48	39	28	M36
1000	1255	1170	59	42	28	M39
1200	1485	1390	78	48	32	M45
1400	1685	1590	84	48	36	M45
1500	1820	1710	130	56	36	M45
1600	1930	1820	102	56	40	M52
1800	2130	2020	110	56	44	M52
2000	2345	2230	124	62	48	M56
PN40						
15	95	65	14	14	4	M12
25	115	85	16	14	4	M12
40	150	110	18	18	4	M16

Appendix

B.2 Flange mating dimensions (metric)

DN mm	Dimensions (mm)				Bolting	
	D	PCD	T	B	Holes	Bolts
150 lb						
15	89	60	12	16	4	M12
25	108	79	16	16	4	M12
40	127	98	19	16	4	M12
50	150	121	21	19	4	M16
65	180	140	24	19	4	M16
80	190	152	26	19	4	M16
100	230	191	27	19	8	M16
125	255	216	28	22	8	M20
150	279	241	31	22	8	M20
200	343	298	34	22	8	M20
250	406	362	38	25	12	M24
300	483	432	42	25	12	M24
350	535	476	35	29	12	M27
400	595	540	37	29	16	M27
450	635	578	40	32	16	M30
500	700	635	43	32	20	M30
600	815	749	48	35	20	M33
AWWA						
700	927	864	33	35	28	M33
750	984	914	35	35	28	M33
800	1060	978	38	41	28	M39
900	1168	1086	41	41	32	M39
1000	1289	1200	41	41	36	M39
1050	1346	1257	45	41	36	M39
1100	1403	1315	45	41	40	M39
1200	1511	1422	48	41	44	M39
1400	1683	1594	54	48	44	M45
1500	1854	1759	57	48	52	M45
1600	2032	1930	64	48	52	M45
1800	2197	2096	67	48	60	M45
2000	2362	2261	70	54	64	M52
AS 4087 PN16						
50	150	114	20	18	4	M16
65	165	127	20	18	4	M16
80	185	146	20	18	4	M16
100	215	178	20	18	4	M16
150	280	235	23	18	8	M16
200	335	292	24	18	8	M16
250	405	356	30	22	8	M20
300	455	406	33	22	12	M20
350	525	470	30	26	12	M24

DN mm	Dimensions (mm)				Bolting	
	D	PCD	T	B	Holes	Bolts
400	580	521	30	26	12	M24
450	640	584	30	26	12	M24
500	705	641	38	26	16	M24
600	825	756	48	30	16	M27
700	910	845	56	30	20	M27
800	1060	984	56	36	20	M33
900	1175	1092	66	36	24	M33
1000	1255	1175	66	36	24	M33
1200	1490	1410	76	36	32	M33
K10						
15	95	70	12	15	4	M12
25	125	90	16	19	4	M16
40	140	105	18	19	4	M16
50	155	120	20	19	4	M16
65	175	140	20	19	4	M16
80	185	150	20	19	8	M16
100	210	175	20	19	8	M16
125	250	210	22	23	8	M20
150	280	240	22	23	8	M20
200	330	290	22	23	12	M20
250	400	355	24	25	12	M22
300	445	400	24	25	16	M22
350	490	445	26	25	16	M22
400	560	510	28	27	16	M24
450	620	565	30	27	20	M24
500	675	620	30	27	20	M24
600	795	730	32	33	24	M30

B.3 Factory settings

DN		Flow velocity cut-off	Volume flow cut-off	Qmax DN/ Analog output upper range (20 mA)	Volume flow unit ¹⁾	Totalizer unit ¹⁾	Volume/pulse	Pulse width	Excitation frequency	
mm	Inch								m/s	m ³ /h
15	½	0.015	0.0095	6.36	m ³ /h	m ³	0.01	0.1	12.5 Hz	15 Hz
25	1	0.015	0.0265	17.67	m ³ /h	m ³	0.01	0.1	12.5 Hz	15 Hz
40	1½	0.015	0.0679	45.24	m ³ /h	m ³	0.01	0.1	12.5 Hz	15 Hz
50	2	0.015	0.1060	70.69	m ³ /h	m ³	0.01	0.1	12.5 Hz	15 Hz

B.3 Factory settings

DN		Flow velocity cut-off	Volume flow cut-off	Qmax DN/ Analog output upper range (20 mA)	Volume flow unit ¹⁾	Totalizer unit ¹⁾	Volume/pulse	Pulse width	Excitation frequency	
mm	Inch								m/s	m ³ /h
65	2½	0.015	0.1792	119.46	m ³ /h	m ³	0.1	0.1	12.5 Hz	15 Hz
80	3	0.015	0.2714	180.96	m ³ /h	m ³	0.1	0.1	6.25 Hz	7.5 Hz
100	4	0.015	0.4241	282.74	m ³ /h	m ³	0.1	0.1	6.25 Hz	7.5 Hz
125	5	0.015	0.6627	441.79	m ³ /h	m ³	0.1	0.1	6.25 Hz	7.5 Hz
150	6	0.015	0.9543	636.17	m ³ /h	m ³	0.1	0.1	6.25 Hz	7.5 Hz
200	8	0.015	1.6965	1130.97	m ³ /h	m ³	1	0.1	3.125 Hz	3.75 Hz
250	10	0.015	2.6507	1767.15	m ³ /h	m ³	1	0.1	3.125 Hz	3.75 Hz
300	12	0.015	3.8170	2544.69	m ³ /h	m ³	1	0.1	3.125 Hz	3.75 Hz
350	14	0.015	5.1954	3463.61	m ³ /h	m ³	1	0.1	1.5625 Hz	1.875 Hz
400	16	0.015	6.7858	4523.89	m ³ /h	m ³	1	0.1	1.5625 Hz	1.875 Hz
450	18	0.015	8.5883	5725.55	m ³ /h	m ³	1	0.1	1.5625 Hz	1.875 Hz
500	20	0.015	10.6029	7068.58	m ³ /h	m ³	1	0.1	1.5625 Hz	1.875 Hz
600	24	0.015	15.2681	10178.76	m ³ /h	m ³	10	0.1	1.5625 Hz	1.875 Hz
700	28	0.015	20.7816	13854.42	m ³ /h	m ³	10	0.1	1.5625 Hz	1.875 Hz
750	30	0.015	23.8565	15904.31	m ³ /h	m ³	10	0.1	1.5625 Hz	1.875 Hz
800	32	0.015	27.1434	18095.57	m ³ /h	m ³	10	0.1	1.5625 Hz	1.875 Hz
900	36	0.015	34.3533	22902.21	m ³ /h	m ³	10	0.1	1.5625 Hz	1.875 Hz
1000	40	0.015	42.4115	28274.33	m ³ /h	m ³	10	0.1	1.5625 Hz	1.875 Hz
1050	42	0.015	46.7587	31172.45	m ³ /h	m ³	10	0.1	1.5625 Hz	1.875 Hz
1100	44	0.015	51.3179	34211.94	m ³ /h	m ³	10	0.1	1.5625 Hz	1.875 Hz
1200	48	0.015	61.0726	40715.04	m ³ /h	m ³	10	0.1	1.5625 Hz	1.875 Hz
1400	54	0.015	83.1265	55417.69	m ³ /h	m ³	10	0.1	1.5625 Hz	1.875 Hz
1500	60	0.015	95.4259	63617.25	m ³ /h	m ³	10	0.1	1.5625 Hz	1.875 Hz
1600	64	0.015	108.5734	72382.29	m ³ /h	m ³	10	0.1	1.5625 Hz	1.875 Hz
1800	72	0.015	137.4133	91608.84	m ³ /h	m ³	10	0.1	1.5625 Hz	1.875 Hz
2000	80	0.015	169.6460	113097.34	m ³ /h	m ³	10	0.1	1.5625 Hz	1.875 Hz

¹⁾ Depending on selected Y-option during ordering, the unit can differ. Convert maximum volume flow accordingly.

Table B-7 CT (Custody Transfer) version

DN		Flow velocity cut-off	Volume flow cut-off	Q3 nominal flow	Q4 overload flow/ Analog output upper range (20 mA)	Volume flow unit ¹⁾	Totalizer unit ¹⁾	Volume/pulse	Pulse width	Excitation frequency	
mm	Inch	m/s	m ³ /h	m ³ /h	m ³ /h			m ³	s	50 Hz	60 Hz
50	2	0.009	0.0636	63	78.75	m ³ /h	m ³	0.01	0.1	12.5 Hz	15 Hz
65	2½	0.009	0.1075	100	125	m ³ /h	m ³	0.1	0.1	12.5 Hz	15 Hz
80	3	0.009	0.1629	160	200	m ³ /h	m ³	0.1	0.1	6.25 Hz	7.5 Hz
100	4	0.009	0.2545	250	312.5	m ³ /h	m ³	0.1	0.1	6.25 Hz	7.5 Hz
125	5	0.009	0.3976	400	500	m ³ /h	m ³	0.1	0.1	6.25 Hz	7.5 Hz
150	6	0.009	0.5726	630	787.5	m ³ /h	m ³	0.1	0.1	6.25 Hz	7.5 Hz
200	8	0.009	1.0179	1000	1250	m ³ /h	m ³	1	0.1	3.125 Hz	3.75 Hz
250	10	0.009	1.5904	1600	2000	m ³ /h	m ³	1	0.1	3.125 Hz	3.75 Hz
300	12	0.009	2.2902	1600	2000	m ³ /h	m ³	1	0.1	3.125 Hz	3.75 Hz

¹⁾ Depending on selected Y-option during ordering, the unit can differ. Convert maximum volume flow accordingly.

B.4 Coil resistance

Table B-8 Coil resistance [Ω]

DN	Inch	Resistance min.	Resistance max.
15	½	82	100
25	1	82	100
40	1½	89	99
50	2	114.4	124.4
65	2½	118	128
80	3	119	133
100	4	112	122
125	5	113	123
150	6	111	121
200	8	104	114
250	10	99	109
300	12	103	113
350	14	94	106
400	16	94	106
450	18	94	106
500	20	94	106
600	24	90	102
700	28	90	102

DN	Inch	Resistance min.	Resistance max.
750	30	90	102
800	32	90	102
900	36	90	102
1000	40	82	94
1050	42	82	94
1100	44	82	94
1200	48	82	94
1400	54	128	146
1500	60	123	141
1600	66	132	150
1800	72	135	153
2000	78	137.8	155.8

Note**Reference values**

- All resistance values are at 20 °C
- The resistance changes proportionally 0.4% / °C

B.5 Conductivity coefficients

Conductivity coefficients can be set in menu 2.1.5.5 Conductivity calculation.

DN		Linear coefficient	Quadratic coefficient
mm	Inch	-	-
15	½	131.79	11133.83
25	1	121.40	6403.46
40	1½	134.69	6449.84
50	2	111.54	2871.26
65	2½	121.53	9504.28
80	3	118.16	588.33
100	4	128.06	4217.77
125	5	125.15	920.08
150	6	128.61	1553.51
200	8	130.07	319.86
250	10	127.32	969.16
300	12	124.58	1618.45
350	14	148.22	503.20
400	16	130.50	419.25
450	18	139.04	4161.50
500	20	130.50	335.40
600	24	130.50	279.50

DN		Linear coefficient	Quadratic coefficient
700	28	123.94	1263.19
750	30	130.50	223.60
800	32	130.50	209.63
900	36	130.50	186.33
1000	40	130.50	167.70
1050	42	130.50	159.71
1100	44	130.50	152.45
1200	48	130.50	139.75
1400	54	130.50	119.79
1500	60	130.50	111.80
1600	66	130.50	104.81
1800	72	130.50	93.17
2000	78	130.50	83.85

Glossary

EMC

Electromagnetic compatibility (EMC) is the branch of electrical sciences which studies the unintentional generation, propagation and reception of electromagnetic energy with reference to the unwanted effects (Electromagnetic Interference, or EMI) that such energy may induce. The goal of EMC is the correct operation, in the same electromagnetic environment, of different equipment which use electromagnetic phenomena, and the avoidance of any interference effects.

IP

An IP (Ingress Protection) number is used to specify the environmental protection of enclosures around electronic equipment. These ratings are determined by specific tests. The IP number is composed of two numbers, the first referring to the protection against solid objects and the second against liquids. The higher the number, the better the protection. For example, in IP67 the first Number (6) means that the device is totally protected against dust, and the second (7) that it is protected against the effect of immersion between 15cm and 1m

LVD

Low voltage directive (LVD) is a directive from the European Commission (2014/35/EU) that ensures, that electrical equipment within certain voltage limits provides a high level of protection for European citizens, and benefits fully from the single market.

PED

Pressure Equipment Directive (PED) is a directive from the European Commission (2014/68/EU) that applies to the design, manufacture and conformity assessment of stationary pressure equipment with a maximum allowable pressure greater than 0,5 bar.

SENSORPROM

All sensor related settings/data saved on an EPROM. SENSORPROM technology automatically configures the transmitter at start up providing calibration data, pipe size, sensor type, and output settings. The SENSORPROM automatically stores values or settings changed by users, and automatically re-programs any new transmitter without loss of accuracy.

Index

A

Abrasive liquids, 27
Applications, 19

C

Cable specifications, 36, 62
Catalog
 catalog sheets, 73
Cathodic protection, 31
Certificates, 11, 73
Coil insulation check, 55
Coil resistance check, 55
Customer Support, (Refer to Technical support)
Customer Support Hotline, 51

D

Dimensions, 68
Direct burial, 46
Disposal, 53
Document history, 7
Downloads, 73

E

Electrical connection
 Cable specifications, 36
 Safety instructions, 35
Electrode resistance check, 56
Empty pipe detection, 27

F

FAQ
 Fluctuating process values, 56
Flange mating dimensions, 76

G

Gas / Air bubbles, 27

H

Hazardous area
 Laws and directives, 11
Horizontal Pipes, 27
Hotline, 51, (Refer to Support request)

I

Inlet / outlet conditions, 24
Installation
 Horizontal Pipes, 27
 in U-tube, 23
 Indoor/outdoor, 23
 Large pipes, 25
 Location in system, 23
 Mounting of sensor, 28
 Partially filled pipes, 25
 Pipes with free outlet, 24
 Safety instructions, 23
 Vertical pipes, 27
Internet
 Contact person, 52
 Support, 51
Items supplied, 8

L

Laws and directives
 Disassembly, 11
 Personel, 11

M

Mains supply, 35
Maintenance, 51
Manuals, 73
Material compatibility, 12
Measurement principle, 20
Modifications
 correct usage, 14
 improper, 14
Mounting, (See Installation)

P

- Potential equalization, 31
- Potting, 45
- Pressure
 - Safety instructions, 23
- Pressure Equipment Directive, 13
- Process fluid
 - Conductivity, 64
- Protective conductor terminal, 36
- Protective earth, 36

R

- Repair, 51
- Return procedure, 53

S

- Safety, 11
 - Instrument safety standards, 12
 - Sensor installation, 23
- Safety instructions
 - Electrical connection, 35
- Scope of delivery, 8
- Sensor check, 55
- Sensor orientation, 27
- Service, 51, 74
- Service and support
 - Internet, 74
- Support, 51, 74
- Support request, 74
- System components, 19

T

- Technical support, 74
 - partner, 74
 - personal contact, 74
- Test certificates, 11
- Theory of operation, 20
- Torques values, 29

V

- Vertical Pipes, 27
- Vibrations, 24

W

- Warranty, 9
- Weight, 70
- Wire insulation, 36