SIEMENS

SITRANS F

Electromagnetic flowmeters SITRANS FMS300

Operating Instructions

Sensors
7ME636

11/2024
A5E53661646-AA

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 personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

Proper use of Siemens products

Note the following:

⚠ WARNING

Siemens products may only be used for the applications described in the catalog and in the relevant technical documentation. 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.

Siemens Aktiengesellschaft
Digital Industries
Postfach 48 48
90026 NÜRNBERG
GERMANY

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Introduction

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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
11/2024	First edition

Use the device in accordance with the information on the nameplate and in the Technical specifications (Page 59).

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.

1.3 Checking the consignment

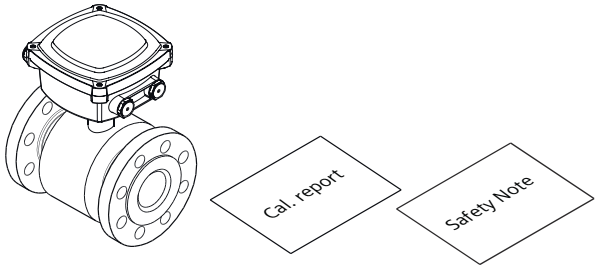
1. Check the packaging and the delivered items for visible damages.
2. Report any claims for damages immediately to the shipping company.

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. • Do not use damaged or incomplete devices.

1.4 Items supplied

- SITRANS FMS300
- Calibration report
- Safety note



See also

Instructions and manuals (https://www.siemens.com/processinstrumentation/documentation)

NOTICE
Unauthorized product information or software
Use only authorized Siemens websites when accessing any product information or software, including firmware updates, device integration files (EDD, for example), as well as other product documentation. Using unauthorized product information or software could result in a security incident, such as breach of confidentiality, or loss of integrity and availability of the system. For more information, see Product documentation and support (Page 79).

1.5 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.

1.6 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 59).

1.7 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

2

2.1 Precondition for use

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.

2.2 Warning symbols on the device

Symbol	Explanation
	Consult operating instructions

2.3 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)

Conformity with UK regulations

The product described in this document is in conformity with the relevant harmonization legislation, and its amendments, of the United Kingdom. The applicable regulations can be found in the UKCA declaration of conformity of the specific device.

See also

Certificates (http://www.siemens.com/processinstrumentation/certificates)

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 European directives

The product FMS300 in association with FMT020 is in conformity with the relevant harmonization legislation, and its amendments, of the European Union.

Electromagnetic compatibility directive 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 (optional)	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
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.

Compliance with PED directive

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

PED compliance is an optional order configuration. Siemens Flow Instruments products comply with PED as stated in the following table.

Table 2-1 FMS300 (7ME636) PED Compliance for fluids under 100 °C (PED classification: liquids) EN 1092 and B16.5 flanges

Flange mm	EN 1092							B16.5		
	PN 6	PN 10	PN 16	PN25	PN 40	PN 63	PN 100	Class 150	Class 300	Class 600
15	N/A	N/A	N/A	N/A	SEP	N/A	N/A	SEP	SEP	N/A
25	N/A	N/A	N/A	N/A	SEP	N/A	SEP	SEP	SEP	SEP
32	N/A	N/A	N/A	N/A	SEP	N/A	PED (II)	SEP	SEP	PED (II)
40	N/A	N/A	N/A	N/A	SEP	N/A	PED (II)	SEP	PED (II)	PED (II)
50	N/A	N/A	N/A	N/A	SEP	PED (II)	PED (II)	SEP	PED (II)	PED (II)
65	SEP	N/A	SEP	N/A	PED (II)	PED (II)	PED (II)	SEP	PED (II)	PED (II)
80	SEP	N/A	SEP	N/A	PED (II)	PED (II)	PED (II)	SEP	PED (II)	PED (II)
100	SEP	N/A	SEP	N/A	PED (II)	PED (II)	PED (II)	SEP	PED (II)	PED (II)
125	SEP	N/A	SEP	N/A	PED (II)	PED (II)	PED (II)	PED (II)	PED (II)	PED (II)
150	SEP	N/A	PED (II)	N/A	PED (II)	PED (II)	PED (II)	PED (II)	PED (II)	PED (II)
200	SEP	SEP	PED (II)	PED (II)	PED (II)	PED (II)	PED (II)	PED (II)	PED (II)	PED (II)
250	SEP	PED (I)	PED (II)	PED (II)	PED (II)	PED (II)	PED (II)	PED (II)	PED (II)	PED (II)
300	SEP	PED (I)	PED (II)	PED (II)	PED (II)	PED (II)	PED (II)	PED (II)	PED (II)	PED (II)
350	PED (I)	PED (I)	PED (II)	PED (II)	PED (II)	N/A	N/A	PED (II)	PED (II)	PED (II)
400	PED (I)	PED (I)	PED (II)	PED (II)	PED (II)	N/A	N/A	PED (II)	PED (II)	PED (II)
450	PED (I)	PED (I)	PED (II)	PED (II)	PED (II)	N/A	N/A	PED (II)	PED (II)	N/A
500	PED (I)	PED (I)	PED (II)	PED (II)	PED (II)	N/A	N/A	PED (II)	PED (II)	N/A
600	PED (I)	PED (I)	PED (II)	PED (II)	PED (II)	N/A	N/A	PED (II)	PED (II)	N/A
700	PED (I)	PED (I)	PED (II)	N/A	N/A	N/A	N/A	N/A	N/A	N/A
750	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
800	PED (I)	PED (I)	PED (II)	N/A	N/A	N/A	N/A	N/A	N/A	N/A
900	PED (I)	PED (I)	PED (II)	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1000	PED (I)	PED (I)	PED (II)	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1050	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1100	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1200	PED (I)	PED (I)	PED (II)	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1400	PED (I)	PED (I)	PED* (II)	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1500	PED (I)	PED (I)	PED* (II)	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1600	PED (I)	PED (I)	PED* (II)	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Flange mm	EN 1092							B16.5		
	PN 6	**PN 10**	**PN 16**	**PN25**	**PN 40**	**PN 63**	**PN 100**	**Class 150**	**Class 300**	**Class 600**
1800	PED (I)	PED (I)	PED* (II)	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2000	PED (I)	PED (I)	PED* (II)	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2200	PED (I)	PED (I)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table 2-2 FMS300 (7ME636) PED Compliance for fluids under 100 °C (PED classification: liquids) JIS2220, AS2129, AS4087, AWWA C207 flanges

Flange mm	JIS2220		AS2129	AS4087			AWWA C207
	10K / E	**20K**	**Table E**	**class16 *(AS16)***	**class21 *(AS21)***	**class35 *(AS35)***	**Class D**
15	SEP	SEP	SEP	N/A	N/A	N/A	N/A
25	SEP	SEP	SEP	N/A	N/A	N/A	N/A
32	SEP	SEP	SEP	N/A	N/A	N/A	N/A
40	SEP	SEP	SEP	N/A	N/A	N/A	N/A
50	SEP	SEP	SEP	SEP	SEP	SEP	N/A
65	SEP	PED (II)	SEP	SEP	SEP	SEP	N/A
80	SEP	PED (II)	SEP	SEP	SEP	SEP	N/A
100	SEP	PED (II)	SEP	SEP	SEP	SEP	N/A
125	SEP	PED (II)	SEP	N/A	N/A	N/A	N/A
150	PED (II)	PED (II)	PED (II)	SEP	SEP	SEP	N/A
200	PED (II)	PED (II)	PED (II)	SEP	SEP	SEP	N/A
250	PED (II)	PED (II)	PED (II)	SEP	PED (I)	PED (I)	N/A
300	PED (II)	PED (II)	PED (II)	SEP	PED (I)	PED (I)	N/A
350	PED (II)	PED (II)	PED (II)	PED (I)	PED (I)	PED (I)	N/A
400	PED (II)	PED (II)	PED (II)	PED (I)	PED (I)	PED (I)	N/A
450	PED (II)	PED (II)	PED (II)	PED (I)	PED (I)	PED (I)	N/A
500	PED (II)	PED (II)	PED (II)	PED (I)	PED (I)	PED (I)	N/A
600	PED (II)	PED (II)	PED (II)	PED (I)	PED (I)	PED (I)	N/A
700	N/A	N/A	PED (II)	PED (I)	N/A	N/A	PED (I)
750	N/A	N/A	PED (II)	N/A	N/A	N/A	PED (I)
800	N/A	N/A	PED (II)	PED (I)	N/A	N/A	PED (I)
900	N/A	N/A	PED (II)	PED (I)	N/A	N/A	PED (I)
1000	N/A	N/A	PED (II)	PED (I)	N/A	N/A	PED (I)
1050	N/A	N/A	N/A	N/A	N/A	N/A	PED (I)
1100	N/A	N/A	N/A	N/A	N/A	N/A	PED (I)
1200	N/A	N/A	PED (II)	PED (I)	N/A	N/A	PED (I)
1400	N/A	N/A	N/A	N/A	N/A	N/A	PED (I)
1500	N/A	N/A	N/A	N/A	N/A	N/A	PED (I)
1600	N/A	N/A	N/A	N/A	N/A	N/A	PED (I)
1800	N/A	N/A	N/A	N/A	N/A	N/A	PED (I)

Flange mm	JIS2220		AS2129	AS4087			AWWA C207
	10K / E	20K	Table E	class16 *(AS16)*	class21 *(AS21)*	class35 *(AS35)*	Class D
2000	N/A	N/A	N/A	N/A	N/A	N/A	PED (I)
2200	N/A	N/A	N/A	N/A	N/A	N/A	PED (I)

Table 2-3 PED 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
PED*	Product outside PED scope (2014-68-EU Art1.2)
N/A	Size/pressure not available in the size range

CAUTION

All products sold outside of EU and EFTA are excluded from the Pressure Equipment directive, also products sold into certain market sectors are excluded. These include:

1. Meters used in networks for the supply, distribution and discharge of water.
2. Meters used in pipelines for the conveyance of any fluid from offshore to onshore.
3. Meters used in the extraction of petroleum or gas, including christmas tree and manifold equipment.
4. Any meter mounted on a ship or mobile offshore platform.

Description

3

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 FM flowmeter system includes:

- Transmitter (types: SITRANS FMT020)
- Sensor (types: SITRANS FMS300)
- Communication module (optional) (types: HART, PROFINET, Modbus, EtherNet/IP)
- SENSORPROM memory unit

Communication solutions

The SITRANS FM range of add-on modules, presently including HART, PROFINET. Modbus, and EtherNet/IP, are all applicable with the SITRANS FMT020 transmitter.

3.2 Design

SITRANS FMS300 is available in a wide range of sizes (DN 15 to DN 2200 (½" to 88")) and pressure ratings (PN 6 to PN 100 / ANSI Class 150 / 300 / 600, AS 2129 / AS 4087) - higher pressure on request. The fully welded construction provides a ruggedness that suits the toughest applications and environments.

Sensor housing and flanges are designed in stainless steel (AISI 304) or carbon steel (ASTM A 105) and terminal box in polycarbonate. Measuring pipe is made of stainless steel (AISI 304) while liners and electrodes are available in various material, which makes the sensor highly resistant to a wide range of chemicals.

The present range of liner types includes:

- PTFE
- PFA
- Neopren
- EPDM
- Linatex
- Ebonite

Electrodes are available in:

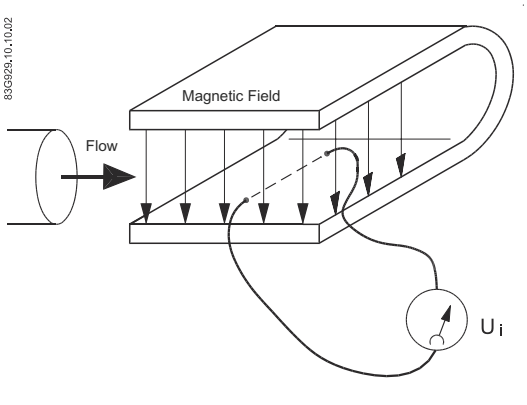
- Hastelloy C276 or C22
- AISI 316Ti (1.4571)
- Platinum

- Titanium
- Tantalum

The sensors carry a wide range of approvals, see Certificates and approvals (Page 64).

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 x B x 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 x k_2

U_i = k x 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: $>10^{14}$ Ω which allows flow measurements on fluids with conductivities as low as 5 µS/cm. Measuring errors due to cable capacitance are eliminated due to active cable screening.

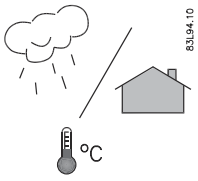
The digital signal processor converts the analog flow signal to a digital signal and suppresses electrode noise through a digital filter. Inaccuracies in the transmitter as a result of long-term drift and temperature drift are monitored and continuously compensated for via the

self-monitoring circuit. The analog to digital conversion takes place in an ultra low noise ASIC with 23 bit signal resolution. This has eliminated the need for range switching. The dynamic range of the transmitter is therefore unsurpassed with a turn down ratio of minimum 3000:1.

Installing/Mounting

4

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.

WARNING

High pressure hazard

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.

4.2 Determining a location

Note

The sensor must always be completely filled with liquid.

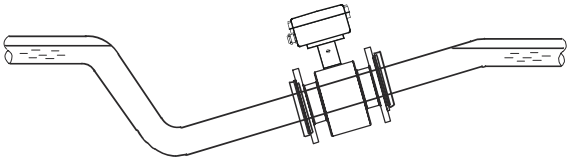


Figure 4-1 Correct installation with filled pipes

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

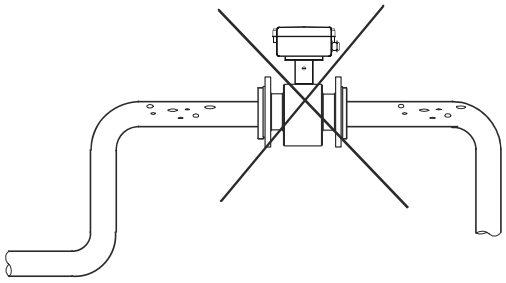


Figure 4-2 Wrong installation at high point

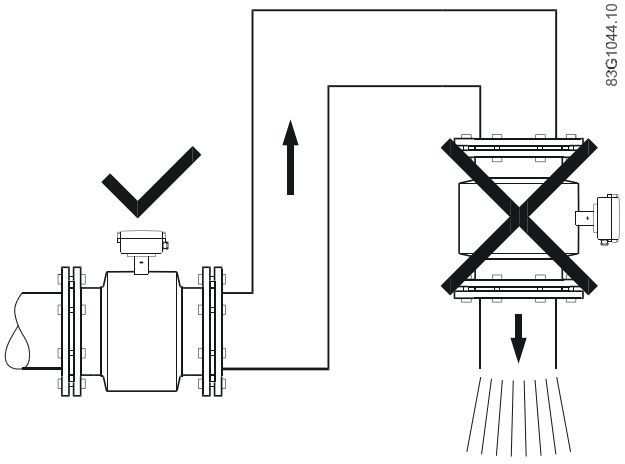


Figure 4-3 Correct installation at low point before outlet

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.

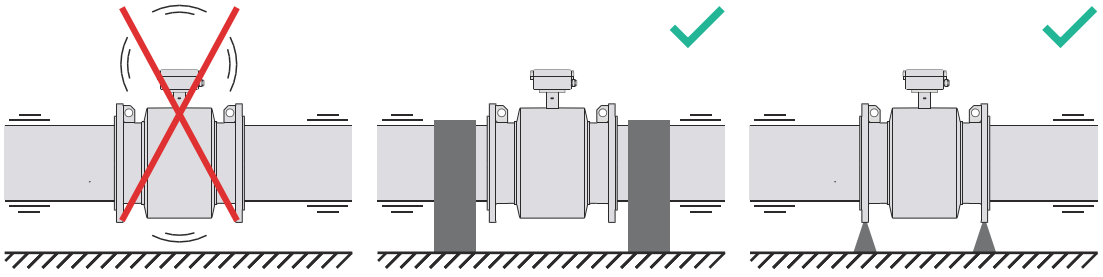
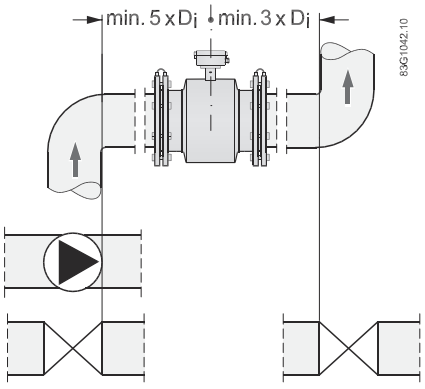


Figure 4-4 Avoid vibrations

Inlet and outlet conditions

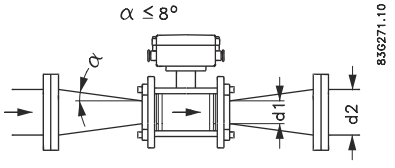
To achieve accurate flow measurement it is essential to have straight lengths of inlet and outlet pipes and a certain distance to pumps and valves.

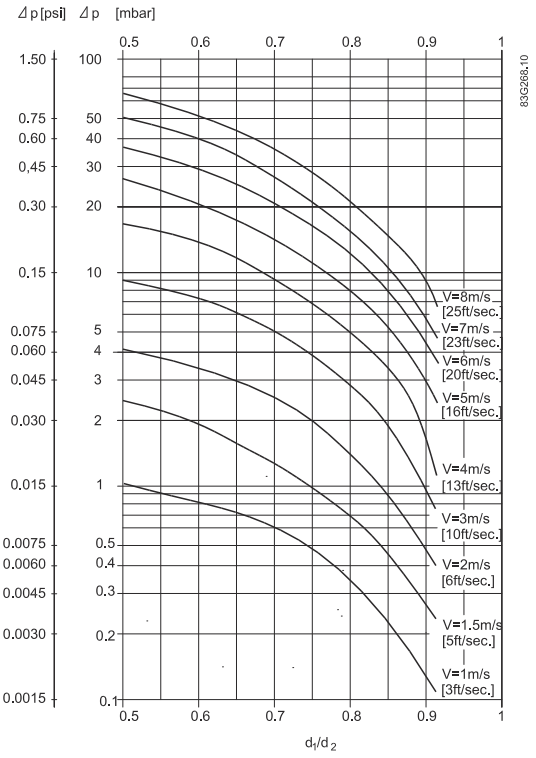
It is also important to centre the flowmeter in relation to pipe flanges and gaskets.



Installation in large pipes

The flowmeter can be installed between two reducers (for example DIN 28545). At α ≤ 8° the following pressure drop curves apply. The curves are applicable to water.





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.

4.3 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.

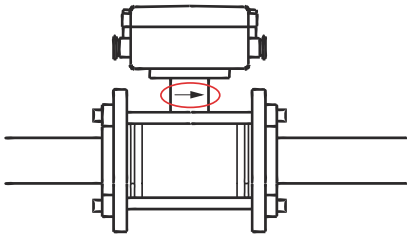


Figure 4-5 Flow direction indicator

Orientation

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

- Vertical installation with an upwards flow

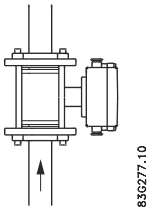


Figure 4-6 Vertical orientation, upwards flow

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

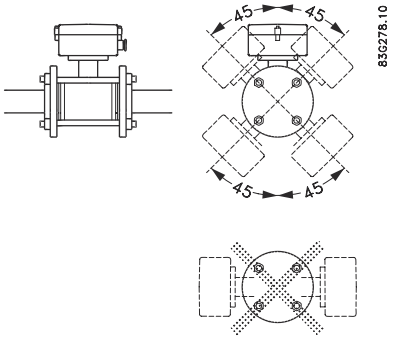


Figure 4-7 Horizontal installation, various terminal box positions

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.

4.4 Mounting

4.4.1 Installation preparation

Installation conditions

The following points must be observed during installation:

- Install the sensor in rigid pipelines in order to support the weight of the meter.
- The device must be installed without mechanical tension (torsion, bending).
- Install flange devices with plane parallel counter-flanges and only use appropriate gaskets.
- Use proper gaskets made from a material that is compatible with the measuring medium and measuring medium temperature.
- Gaskets must not extend into the flow area, since possible turbulence could influence the accuracy of the device.
- The piping may not exert any inadmissible forces or torques on the device.
- Make sure that the temperature limits are not scaled up during operation of the device.
- Vacuum shocks in the piping should be avoided to prevent damage to the liners (PTFE liner). Vacuum shocks can destroy the device.

- Do not remove the blind plugs in the cable glands until you are ready to install the electrical cable
- If earthing rings are used, use standard flange gaskets on both sides of the ring.

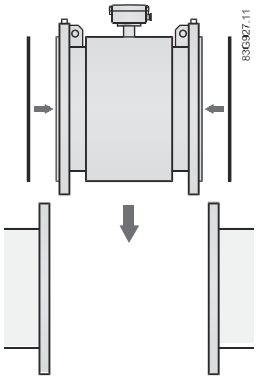


Figure 4-8 Correct installation with gaskets

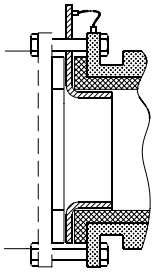


Figure 4-9 Inlet protection

Transporting

⚠ WARNING

Lifting the sensor

Do **NOT** lift the sensor by the terminal box. Do **NOT** use a forklift. If available lift the sensor by the lifting eyes fitted to the device. Otherwise lift the sensor by the process connections.

⚠ CAUTION

Flange devices ≤ DN 300

- Use carrying straps to transport devices with flange sizes smaller than DN 300.
- Wrap the carrying straps around both process connections when lifting the device.
- Chains should not be used, since these may damage the enclosure.

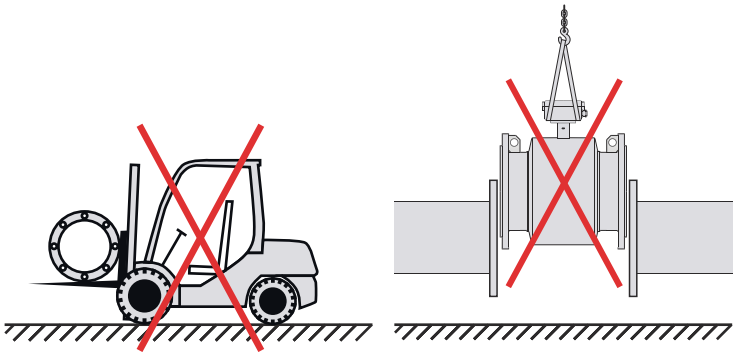


Figure 4-10 Incorrect transportation

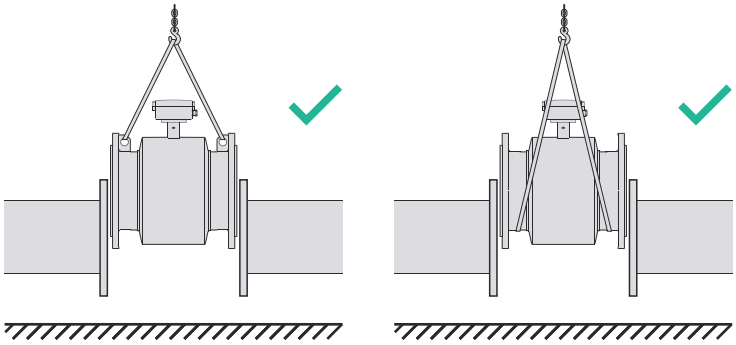


Figure 4-11 Correct transportation

4.4.2 Removing the liner protectors

Removing the liner protectors

NOTICE
Sensors with PTFE or PFA liners only The following information is only relevant for sensor types with PTFE or PFA liners.

Sensors with PTFE liner

At delivery, the sensor is mounted with wooden blanks to hold the liner in place during transportation and storage. Do not remove the blanks until you are ready for installation. After only a few hours without the blanks, the liner creeps back towards its original shape. As a result, the installation is more difficult to carry out.

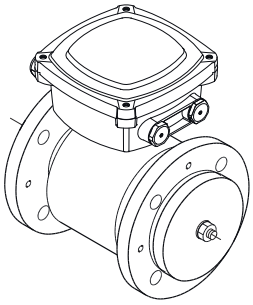


Figure 4-12 Sensor with wooden blanks

Remove the blanks immediately before mounting the sensor

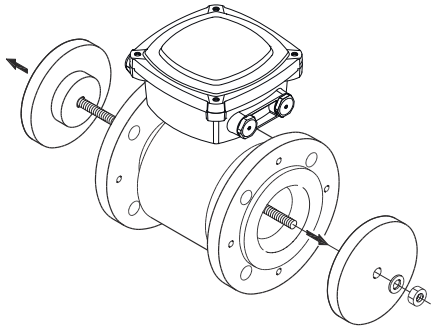


Figure 4-13 Removing wooden blanks

Sensors with PFA liner

NOTICE
Sharp objects can damage the liner Do not use sharp objects to remove the blanks as this can damage the liner.

At delivery, the sensor is mounted with blanks to protect the liner during transportation and storage.

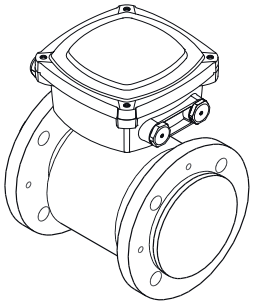


Figure 4-14 Sensor with blanks

Remove the blanks immediately before mounting the sensor

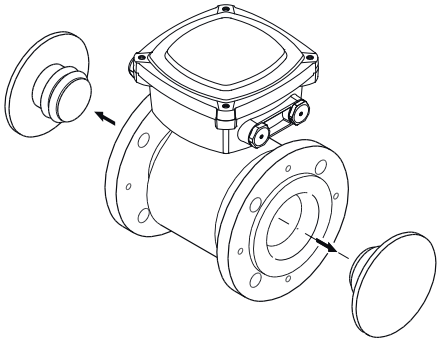


Figure 4-15 Removing blanks

4.4.3 Installing the sensor

Before you start

- Consider the installation conditions as described under Determining a location (Page 19).
- Read the safety notes (Page 9).

Gasket selection

NOTICE
Devices with a PTFE or PFA liner Devices with a PTFE or PFA liner do not require additional gaskets.

NOTICE
Gaskets shall not protrude Ensure the gaskets fit concentrically. Otherwise the flow profile can get distorted.

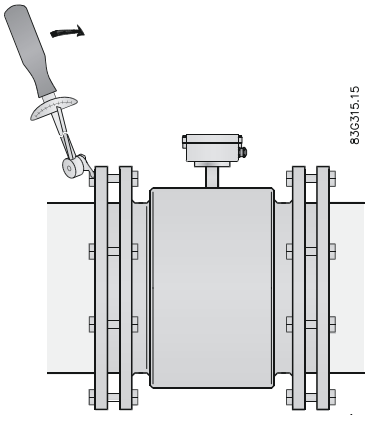
NOTICE
Devices with hard rubber or soft rubber liner • Devices with a hard or soft rubber liner always require additional gaskets. • Siemens recommends using gaskets made from rubber or rubber-like sealing materials. • Do not scale up the tightening torques to fit your gasket selection. See Torque values (Page 30).

Guideline:

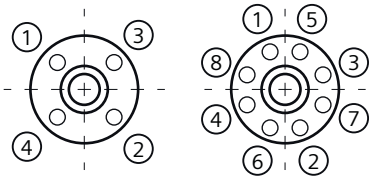
- Gasket hardness softer than the liner hardness and softer than ebonite.
- Gasket temperature range larger than the media termperature range and larger than the ambient temperature of the sensor.
- Gasket inner diameter larger than the inner diameter of the sensor.
- Check with the gasket supplier that the gasket is suitable for the expected working pressure.

Procedure

1. Remove the liner protectors, if present. Removing the liner protectors (Page 26).
2. Position the sensor plane parallel and centered between the pipes.
3. Install gaskets between mating surfaces according to recommendations.
4. Consider the torque values and use appropriate bolts.
5. Tighten the bolts crosswise as shown in the torque sequence. Increase the torque gradually:
   - Tighten the bolts to 50 % of maximum torque.
   - Tighten the bolts to 80 % of maximum torque.
   - Tighten the bolts to maximum torque, but do **NOT** exceed.



Mounting



Torque sequence

4.4.4 Torque values

Torque calculations

⚠ CAUTION

Overtightened bolts

Leakage/damage to flowmeter or piping may arise if bolts are overtightened.

All values are theoretical and are calculated on the assumption that:

- All bolts are new and material selection is according to EN 1515-1 table 2.
- Gasket material not exceeding 75 shore A is used between the flowmeter and mating flanges.
- All bolts are galvanized and adequately lubricated.
- Flowmeter and mating flanges are correctly aligned.

Torque values

Note

Conversion to F/Lbs

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

Table 4-1 Minimum and maximum torques for EN 1092-1 PN 6 to PN 16 in Nm

Nominal size		EN 1092-1											
		PN 6				PN 10				PN 16			
Liner		PFA, PTFE, Ebonite		Soft rubber, EPDM, Linatex		PFA, PTFE, Ebonite		Soft rubber, EPDM, Linatex		PFA, PTFE, Ebonite		Soft rubber, EPDM, Linatex	
mm	inch	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
15	½	-	-	-	-	-	-	-	-	-	-	-	-
25	1	-	-	-	-	-	-	-	-	-	-	-	-
32	1¼	-	-	-	-	-	-	-	-	-	-	-	-
40	1½	-	-	-	-	-	-	-	-	-	-	-	-
50	2	-	-	-	-	-	-	-	-	-	-	-	-
65	2½	3.9	4	3.2	4	-	-	-	-	8.5	9	6.9	7
80	3	6.9	7	5.7	6	-	-	-	-	10.8	11	8.8	9
100	4	10.3	11	8.7	9	-	-	-	-	13.8	14	11.6	12
125	5	6.4	7	5.5	6	-	-	-	-	19.2	20	16.5	17
150	6	8.1	9	7.2	8	-	-	-	-	29.8	31	26.1	27
200	8	13.0	14	11.7	12	29.3	31	26.2	27	31.2	33	27.9	29
250	10	12.5	13	11.4	12	27.4	29	24.9	26	52.4	55	47.7	50
300	12	21.0	22	19.5	20	36.2	38	33.3	35	72.6	76	66.5	70

Nominal size		EN 1092-1											
		PN 6				PN 10				PN 16			
Liner		PFA, PTFE, Ebonite		Soft rubber, EPDM, Linatex		PFA, PTFE, Ebonite		Soft rubber, EPDM, Linatex		PFA, PTFE, Ebonite		Soft rubber, EPDM, Linatex	
mm	inch	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
350	14	27.3	29	25.1	26	36.9	39	33.7	35	73.5	77	67.0	70
400	16	25.5	27	23.7	25	55.0	58	50.7	53	102.6	108	94.3	99
450	18	31.7	33	29.6	31	53.2	56	49.4	52	102.9	108	95.1	100
500	20	30.3	32	28.5	30	64.0	67	59.8	63	140.7	148	130.6	137
600	24	49.7	52	47.1	49	97.8	103	92.3	97	214.7	225	200.6	211
700	28	55.4	58	52.5	55	111.3	117	104.9	110	213.5	224	201.0	211
750	30	-	-	-	-	-	-	-	-	-	-	-	-
800	32	79.9	84	76.2	80	158.0	166	149.8	157	298.1	313	282.3	296
900	36	98.6	104	94.5	99	166.3	175	158.4	166	313.7	329	298.8	314
1000	40	102.2	107	98.4	103	219.8	231	210.1	221	419.6	441	400.6	421
1050	42	-	-	-	-	-	-	-	-	-	-	-	-
1100	44	-	-	-	-	-	-	-	-	-	-	-	-
1200	48	143.0	150	138.1	145	301.0	316	289.1	304	599.7	630	575.4	604
1400	54	187.5	197	181.5	191	382.8	402	369.2	388	702.1	737	676.9	711
1500	59	212.1	223	206.3	217	437.8	460	424.0	445	-	-	-	-
1600	66	215.7	226	209.4	220	521.6	548	503.8	529	951.2	999	917.5	963
1800	72	270.2	284	263.0	276	586.3	616	568.1	596	1069.0	1122	1035.8	1088
2000	78	326.6	343	318.4	334	657.5	690	638.3	670	1284.4	1349	1246.9	1309
2200	87	363.9	382	-	-	832.4	874	-	-	1423.3	1494	1386.9	1456

Table 4-2 Minimum and maximum torques for EN 1092-1 PN 40 to PN 63 in Nm

Nominal size		EN 1092-1											
		PN 25				PN 40				PN 63			
Liner		PFA, PTFE, Ebonite		Soft rubber, EPDM, Linatex		PFA, PTFE, Ebonite		Soft rubber, EPDM, Linatex		PFA, PTFE, Ebonite		Soft rubber, EPDM, Linatex	
mm	inch	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
15	½	-	-	-	-	4.7	5	-	-	-	-	-	-
25	1	-	-	-	-	10.7	11	8.0	9	-	-	-	-
32	1¼	-	-	-	-	18.2	19	13.8	14	-	-	-	-
40	1½	-	-	-	-	22.9	24	17.6	19	-	-	-	-
50	2	-	-	-	-	30.3	32	23.9	25	60.2	63	46.5	49
65	2½	-	-	-	-	21.3	22	17.2	18	42.4	45	33.5	35
80	3	-	-	-	-	26.9	28	22.0	23	53.6	56	43.0	45
100	4	-	-	-	-	45.2	47	38.0	40	86.5	91	71.3	75
125	5	-	-	-	-	77.8	82	59.9	63	128.7	135	108.4	114
150	6	-	-	-	-	94.8	99	82.6	87	190.4	200	163.0	171
200	8	63.2	66	56.1	59	120.0	126	106.1	111	232.3	244	202.4	212
250	10	101.7	107	91.8	96	193.5	203	173.7	182	336.5	353	296.9	312

Nominal size		EN 1092-1											
		PN 25				PN 40				PN 63			
Liner		PFA, PTFE, Ebonite		Soft rubber, EPDM, Linatex		PFA, PTFE, Ebonite		Soft rubber, EPDM, Linatex		PFA, PTFE, Ebonite		Soft rubber, EPDM, Linatex	
mm	inch	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
300	12	105.3	111	95.7	101	203.5	214	184.1	193	352.7	370	314.8	331
350	14	152.6	160	138.6	146	284.5	299	257.4	270	-	-	-	-
400	16	207.4	218	189.9	199	410.4	431	373.4	392	-	-	-	-
450	18	198.9	209	183.5	193	355.4	373	327.5	344	-	-	-	-
500	20	243.3	255	225.4	237	459.8	483	426.1	447	-	-	-	-
600	24	362.1	380	338.6	356	753.0	791	702.2	737	-	-	-	-
700	28	-	-	-	-	-	-	-	-	-	-	-	-
750	30	-	-	-	-	-	-	-	-	-	-	-	-
800	32	-	-	-	-	-	-	-	-	-	-	-	-
900	36	-	-	-	-	-	-	-	-	-	-	-	-
1000	40	-	-	-	-	-	-	-	-	-	-	-	-
1050	42	-	-	-	-	-	-	-	-	-	-	-	-
1100	44	-	-	-	-	-	-	-	-	-	-	-	-
1200	48	-	-	-	-	-	-	-	-	-	-	-	-
1400	54	-	-	-	-	-	-	-	-	-	-	-	-
1500	59	-	-	-	-	-	-	-	-	-	-	-	-
1600	66	-	-	-	-	-	-	-	-	-	-	-	-
1800	72	-	-	-	-	-	-	-	-	-	-	-	-
2000	78	-	-	-	-	-	-	-	-	-	-	-	-
2200	87	-	-	-	-	-	-	-	-	-	-	-	-

Table 4-3 Minimum and maximum torques for EN 1092-1 PN 100 and AS 2129 in Nm

Nominal size		EN 1092-1				AS 2129			
		PN 100				Table E			
Liner		PFA, PTFE, Ebonite		Soft rubber, EPDM, Linatex		PFA, PTFE, Ebonite		Soft rubber, EPDM, Linatex	
mm	inch	Min	Max	Min	Max	Min	Max	Min	Max
15	½	-	-	-	-	1.8	2	-	-
25	1	35.3	37	25.8	27	3.2	4	2.4	3
32	1¼	57.3	60	42.5	45	3.6	4	2.7	3
40	1½	72.3	76	54.5	57	4.8	5	3.7	4
50	2	114.8	121	88.1	93	8.2	9	6.5	7
65	2½	80.5	85	63.6	67	10.5	11	8.6	9
80	3	101.8	107	81.7	86	14.6	15	12.1	13
100	4	155.3	163	127.2	134	11.4	12	9.7	10
125	5	229.2	241	191.8	201	16.4	17	14.1	15
150	6	202.9	213	172.4	181	24.8	26	21.8	23
200	8	370.7	389	321.0	337	39.7	42	35.5	37

Nominal size		EN 1092-1				AS 2129			
		PN 100				Table E			
Liner		PFA, PTFE, Ebonite		Soft rubber, EPDM, Linatex		PFA, PTFE, Ebonite		Soft rubber, EPDM, Linatex	
mm	inch	Min	Max	Min	Max	Min	Max	Min	Max
250	10	586.6	616	516.2	542	40.4	42	36.6	38
300	12	665.6	699	590.0	620	62.0	65	57.0	60
350	14	-	-	-	-	85.7	90	78.1	82
400	16	-	-	-	-	105.9	111	97.4	102
450	18	-	-	-	-	100.9	106	93.1	98
500	20	-	-	-	-	122.2	128	113.4	119
600	24	-	-	-	-	210.9	221	197.4	207
700	28	-	-	-	-	211.0	222	199.6	210
750	30	-	-	-	-	277.4	291	261.6	275
800	32	-	-	-	-	313.4	329	296.4	311
900	36	-	-	-	-	323.2	339	306.9	322
1000	40	-	-	-	-	406.9	427	389.5	409
1050	42	-	-	-	-	-	-	-	-
1100	44	-	-	-	-	-	-	-	-
1200	48	-	-	-	-	444.2	466	426.3	448
1400	54	-	-	-	-	-	-	-	-
1500	59	-	-	-	-	-	-	-	-
1600	66	-	-	-	-	-	-	-	-
1800	72	-	-	-	-	-	-	-	-
2000	78	-	-	-	-	-	-	-	-
2200	87	-	-	-	-	-	-	-	-

Table 4-4 Minimum and maximum torques for ANSI B16.5 in Nm

Nominal size		ANSI B16.5											
		Class 150				Class 300				Class 600			
Liner		PFA, PTFE, Ebonite		Soft rubber, EPDM, Linatex		PFA, PTFE, Ebonite		Soft rubber, EPDM, Linatex		PFA, PTFE, Ebonite		Soft rubber, EPDM, Linatex	
mm	inch	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
15	½	1.5	2	-	-	3.9	4	-	-	-	-	-	-
25	1	3.1	4	2.5	3	10.0	11	8.0	9	21.0	22	15.6	16
32	1¼	5.0	6	3.9	4	15.9	17	12.5	13	32.9	35	24.4	26
40	1½	6.6	7	5.2	6	24.7	26	19.4	20	50.6	53	38.2	40
50	2	12.7	13	10.0	11	16.5	17	13.1	14	33.7	35	25.9	27
65	2½	16.0	17	13.1	14	24.5	26	20.1	21	50.2	53	39.8	42
80	3	23.5	25	19.3	20	36.0	38	29.7	31	73.2	77	58.9	62
100	4	17.6	19	14.9	16	54.1	57	45.6	48	124.2	130	101.8	107
125	5	28.5	30	24.5	26	74.2	78	63.9	67	193.7	203	162.2	170
150	6	38.0	40	33.2	35	66.0	69	57.6	61	172.4	181	146.5	154

Nominal size		ANSI B16.5											
		Class 150				Class 300				Class 600			
Liner		PFA, PTFE, Ebonite		Soft rubber, EPDM, Linatex		PFA, PTFE, Ebonite		Soft rubber, EPDM, Linatex		PFA, PTFE, Ebonite		Soft rubber, EPDM, Linatex	
mm	inch	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
200	8	58.1	61	51.9	54	113.5	119	101.2	106	296.1	311	257.6	270
250	10	61.7	65	56.0	59	137.3	144	124.6	131	346.8	364	306.9	322
300	12	84.8	89	77.6	81	211.9	222	194.0	204	381.4	400	340.1	357
350	14	112.6	118	103.7	109	197.9	208	182.2	191	491.1	516	440.6	463
400	16	108.8	114	100.8	106	280.4	294	259.8	273	683.1	717	618.4	649
450	18	157.1	165	145.9	153	300.4	315	279.0	293	942.8	990	857.0	900
500	20	149.9	157	140.1	147	358.3	376	334.8	352	936.2	983	857.0	900
600	24	229.9	241	216.4	227	596.3	626	561.3	589	1478.5	1552	1365.7	1434
700	28	-	-	-	-	-	-	-	-	-	-	-	-
750	30	-	-	-	-	-	-	-	-	-	-	-	-
800	32	-	-	-	-	-	-	-	-	-	-	-	-
900	36	-	-	-	-	-	-	-	-	-	-	-	-
1000	40	-	-	-	-	-	-	-	-	-	-	-	-
1050	42	-	-	-	-	-	-	-	-	-	-	-	-
1100	44	-	-	-	-	-	-	-	-	-	-	-	-
1200	48	-	-	-	-	-	-	-	-	-	-	-	-
1400	54	-	-	-	-	-	-	-	-	-	-	-	-
1500	59	-	-	-	-	-	-	-	-	-	-	-	-
1600	66	-	-	-	-	-	-	-	-	-	-	-	-
1800	72	-	-	-	-	-	-	-	-	-	-	-	-
2000	78	-	-	-	-	-	-	-	-	-	-	-	-
2200	87	-	-	-	-	-	-	-	-	-	-	-	-

Table 4-5 Minimum and maximum torques for AS 4087

Nominal size		AS 4087											
		PN 16				PN 21				PN 35			
Liner		PFA, PTFE, Ebonite		Soft rubber, EPDM, Linatex		PFA, PTFE, Ebonite		Soft rubber, EPDM, Linatex		PFA, PTFE, Ebonite		Soft rubber, EPDM, Linatex	
mm	inch	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
15	½	-	-	-	-	-	-	-	-	-	-	-	-
25	1	-	-	-	-	-	-	-	-	-	-	-	-
32	1¼	-	-	-	-	-	-	-	-	-	-	-	-
40	1½	-	-	-	-	-	-	-	-	-	-	-	-
50	2	9.4	10	7.5	8	16.2	17	12.8	13	27.0	28	21.3	22
65	2½	12.0	13	9.8	10	11.2	12	9.0	10	18.6	20	15.0	16
80	3	16.7	17	13.8	15	14.8	16	12.1	13	24.6	26	20.1	21
100	4	26.1	27	22.1	23	20.3	21	17.0	18	33.8	36	28.4	30
125	5	-	-	-	-	-	-	-	-	-	-	-	-

Nominal size		AS 4087											
		PN 16				PN 21				PN 35			
Liner		PFA, PTFE, Ebonite		Soft rubber, EPDM, Linatex		PFA, PTFE, Ebonite		Soft rubber, EPDM, Linatex		PFA, PTFE, Ebonite		Soft rubber, EPDM, Linatex	
mm	inch	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
150	6	23.7	25	20.8	22	31.6	33	27.4	29	52.7	55	45.6	48
200	8	37.7	40	33.6	35	50.7	53	44.6	47	64.0	67	57.5	60
250	10	69.3	73	62.8	66	82.9	87	74.3	78	107.5	113	98.5	103
300	12	60.7	64	55.6	58	83.3	88	75.5	79	108.1	113	100.2	105
350	14	98.0	103	89.3	94	119.8	126	108.6	114	164.3	173	150.9	158
400	16	121.0	127	111.4	117	120.2	126	109.8	115	174.0	183	160.4	168
450	18	153.7	161	141.9	149	163.3	171	150.1	158	234.8	247	218.1	229
500	20	139.7	147	129.6	136	167.1	175	154.2	162	245.0	257	228.0	239
600	24	218.0	229	203.9	214	244.6	257	227.9	239	361.8	380	340.0	357
700	28	217.9	229	206.0	216	-	-	-	-	-	-	-	-
750	30	-	-	-	-	-	-	-	-	-	-	-	-
800	32	358.2	376	338.8	356	-	-	-	-	-	-	-	-
900	36	369.4	388	350.8	368	-	-	-	-	-	-	-	-
1000	40	427.2	449	408.5	429	-	-	-	-	-	-	-	-
1050	42	-	-	-	-	-	-	-	-	-	-	-	-
1100	44	-	-	-	-	-	-	-	-	-	-	-	-
1200	48	465.9	489	446.7	469	-	-	-	-	-	-	-	-
1400	54	-	-	-	-	-	-	-	-	-	-	-	-
1500	59	-	-	-	-	-	-	-	-	-	-	-	-
1600	66	-	-	-	-	-	-	-	-	-	-	-	-
1800	72	-	-	-	-	-	-	-	-	-	-	-	-
2000	78	-	-	-	-	-	-	-	-	-	-	-	-
2200	87	-	-	-	-	-	-	-	-	-	-	-	-

Table 4-6 Minimum and maximum torques for JIS B2220 and AWWA C-207 in Nm

Nominal size		JIS B2220								AWWA C-207			
		10K				20K				Class D			
Liner		PFA, PTFE, Ebonite		Soft rubber, EPDM, Linatex		PFA, PTFE, Ebonite		Soft rubber, EPDM, Linatex		PFA, PTFE, Ebonite		Soft rubber, EPDM, Linatex	
mm	inch	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
15	½	2.2	3	-	-	5.2	6	-	-	-	-	-	-
25	1	4.7	5	3.5	4	11.5	12	8.6	9	-	-	-	-
32	1¼	6.0	7	4.6	5	14.7	15	11.1	12	-	-	-	-
40	1½	6.8	7	5.2	6	16.5	17	12.7	13	-	-	-	-
50	2	9.4	10	7.4	8	11.4	12	9.0	10	-	-	-	-
65	2½	13.4	14	10.9	11	16.3	17	13.2	14	-	-	-	-
80	3	7.8	8	6.4	7	26.0	27	21.3	22	-	-	-	-
100	4	11.0	12	9.3	10	37.4	39	31.5	33	-	-	-	-

Nominal size		JIS B2220								AWWA C-207			
		10K				20K				Class D			
Liner		PFA, PTFE, Ebonite		Soft rubber, EPDM, Linatex		PFA, PTFE, Ebonite		Soft rubber, EPDM, Linatex		PFA, PTFE, Ebonite		Soft rubber, EPDM, Linatex	
mm	inch	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
125	5	19.5	20	16.8	18	60.3	63	51.6	54	-	-	-	-
150	6	26.1	27	22.9	24	32.5	34	28.2	30	-	-	-	-
200	8	26.0	27	23.3	25	45.4	48	40.4	42	-	-	-	-
250	10	43.3	45	39.3	41	77.1	81	69.2	73	-	-	-	-
300	12	41.2	43	38.1	40	74.8	79	68.1	71	-	-	-	-
350	14	52.0	55	47.9	50	116.4	122	106.0	111	-	-	-	-
400	16	74.6	78	69.0	72	146.2	154	134.3	141	-	-	-	-
450	18	73.9	78	68.7	72	149.2	157	137.5	144	-	-	-	-
500	20	89.6	94	83.7	88	179.0	188	165.9	174	-	-	-	-
600	24	129.4	136	121.9	128	241.4	253	225.7	237	-	-	-	-
700	28	-	-	-	-	-	-	-	-	124.1	130	116.9	123
750	30	-	-	-	-	-	-	-	-	139.4	146	131.7	138
800	32	-	-	-	-	-	-	-	-	188.4	198	178.3	187
900	36	-	-	-	-	-	-	-	-	204.2	214	194.1	204
1000	40	-	-	-	-	-	-	-	-	222.8	234	212.3	223
1050	42	-	-	-	-	-	-	-	-	246.8	259	233.7	245
1100	44	-	-	-	-	-	-	-	-	241.4	254	230.7	242
1200	48	-	-	-	-	-	-	-	-	257.7	271	246.8	259
1400	54	-	-	-	-	-	-	-	-	373.4	392	360.8	379
1500	59	-	-	-	-	-	-	-	-	388.6	408	374.0	393
1600	66	-	-	-	-	-	-	-	-	471.5	495	452.6	475
1800	72	-	-	-	-	-	-	-	-	480.8	505	464.1	487
2000	78	-	-	-	-	-	-	-	-	592.6	622	575.3	604
2200	87	-	-	-	-	-	-	-	-	802.5	843	-	-

4.5 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.

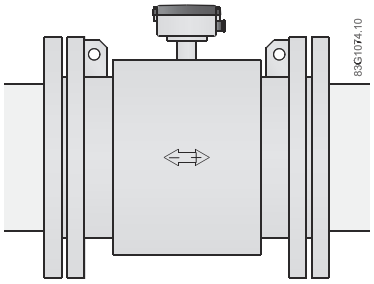


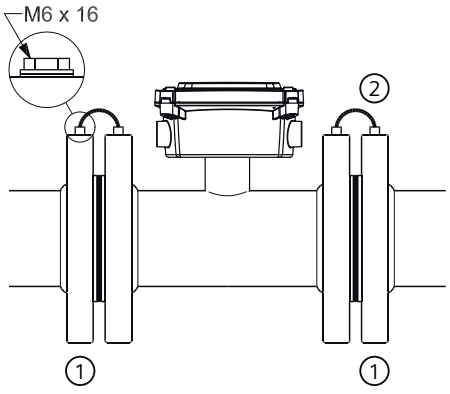
Figure 4-16 Potential equalization with grounding electrodes

4.6 Grounding

The sensor body must be grounded using grounding/bonding straps and/or grounding rings to protect flow signal against stray electrical noise and/or lightning. This ensures that noise is carried through sensor body and that the measuring area within sensor body is noise-free.

Metal pipes

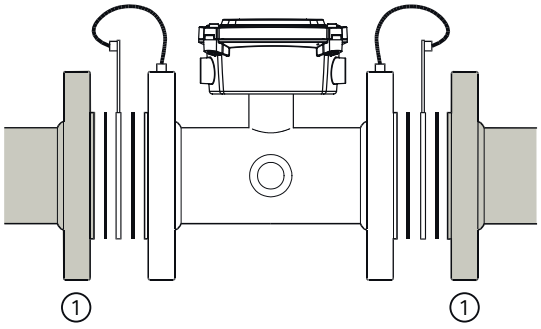
Connect straps to both flanges with 6 mm (1/4") screws.



① Metal pipes
② Grounding straps

Plastic pipes and lined metal pipes

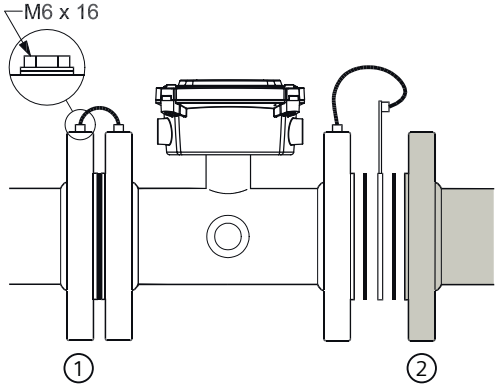
Use optional grounding rings at both ends for sensors without grounding electrodes



① Plastic pipes or lined metal pipes

Combination of metal and plastic pipes

Use straps for metal pipe and grounding rings for plastic pipe.



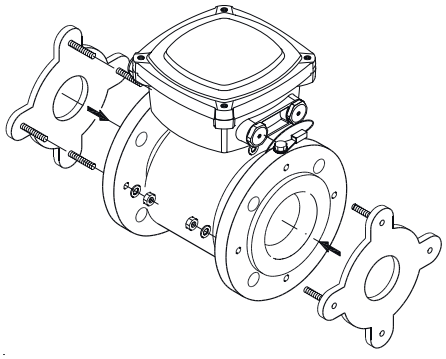
① Metal pipe
② Plastic pipe

Note

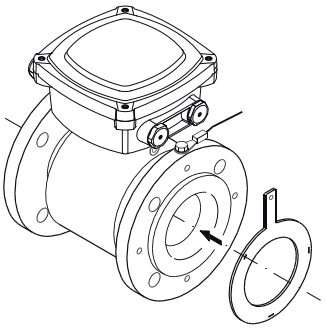
All straps or grounding wires must be 12 AWG (or heavier) copper wire and connected with 6 mm screws.

4.7 Installation with grounding rings

- Mount grounding rings where necessary on non-conductive pipes.



Installation with grounding rings on sensors with PTFE liner



Installation with flat grounding rings on sensors with PFA liner

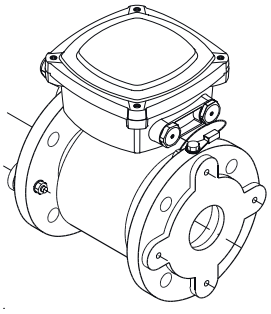
Note

Potential equalization

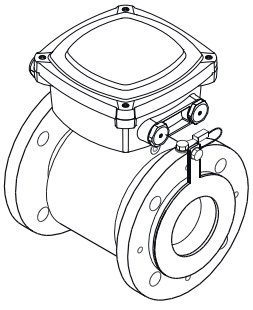
For potential equalization one grounding ring is sufficient.

By unidirectional flow it is recommended to mount the grounding ring on the inlet side.

- Connect the grounding rings to the sensor with the enclosed grounding straps.



Grounding strap connection on type E grounding rings



Grounding strap connection on flat grounding rings

Note

Abrasive liquids

In special cases the grounding rings can work as inlet protection.

4.8 Cathodic protection

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

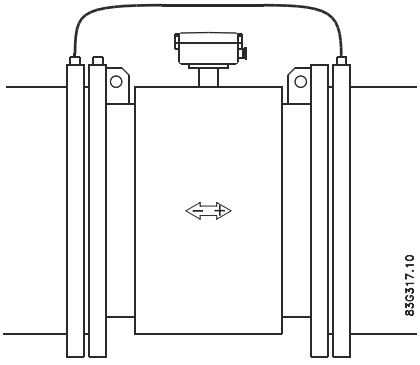


Figure 4-17 Cathodic protection

- 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 µF condensator
- Make sure that electrode cable shield is not connected at both ends

Connecting

5

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.

5.2 General safety requirements

⚠ WARNING

The pertinent regulations must be observed for electrical installation.

- 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

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.

5.3 Wiring in hazardous locations

⚠ WARNING

Terminal box

Before opening the terminal box check that:

- No explosion hazard exists
- All connection leads are potential free

⚠ WARNING

Grounding

The mains protective earth wire must be connected to the PE terminal in accordance with the diagram (class 1 power supply)

Mechanical counters

When mounting a mechanical counter to terminals 57 and 58 (active output), a 1000 µF capacitor must be connected to terminals 56 and 58. Capacitor + is connected to terminal 56 and capacitor - to terminal 58.

Output cables

If long cables are used in electrically noisy environments, it is recommended to use screened cables.

Electrode cables

Dotted connections are only to be made when using special electrode cables.

⚠ WARNING

National requirements

Observe country-specific installation directives for field wiring.

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 65)

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.

5.4 Connecting the sensor for a remote transmitter

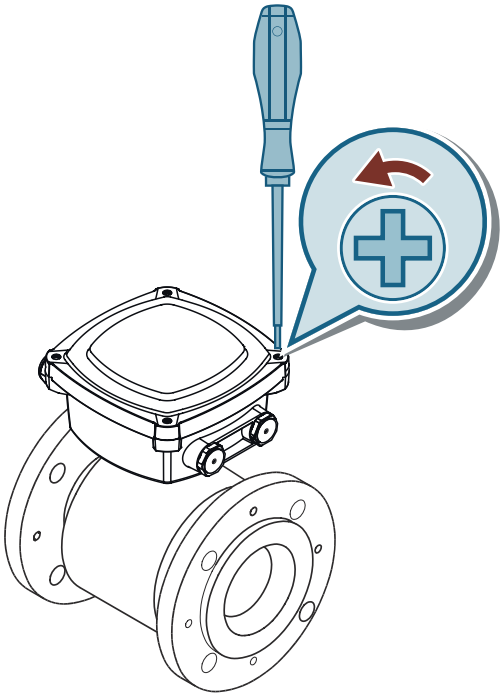
Before you start

- Read the Safety notes (Page 9)
- Read the Basic safety notes: Installing/mounting (Page 19)
- Read the Basic safety notes: Connecting (Page 41)

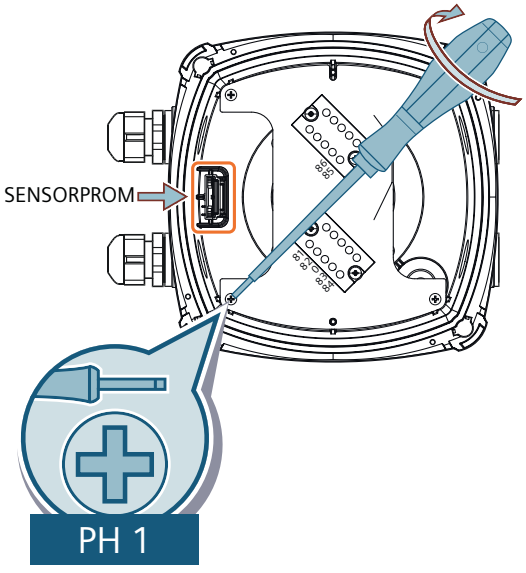
NOTICE
Do not use rigid conduits Using rigid conduits can damage the terminal box.

Procedure

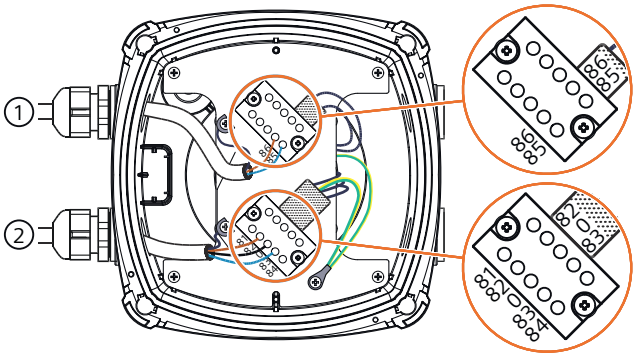
1. Remove the lid from the sensor terminal box.



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 with maximum torque: 1 Nm.

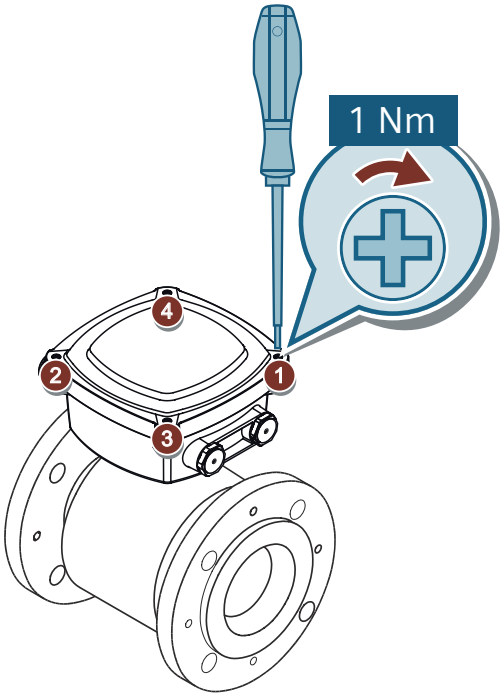


4. Cut off the black wire on the coil cable. Fit coil and electrode cable through the cable glands.
5. Connect coil cable ① and electrode cable ② in the corresponding terminals on the terminal blocks. Tighten all terminal screws with maximum torque: 0.5 Nm.



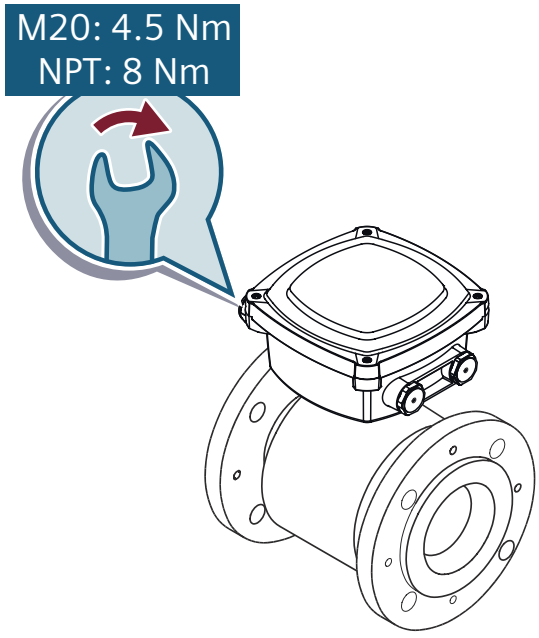
6. Connect the coil and electrode cable shields and grounding cables to the terminal board by using grounding lugs.

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



8. To obtain optimum sealing, tighten cable glands.
   - Tighten M20 cable glands with 4.5 Nm.
   - Tighten NPT adapters with 8 Nm.

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.



5.5 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:

- 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:

- 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 kΩ, connect an external 10 kΩ load resistor in parallel to this load.

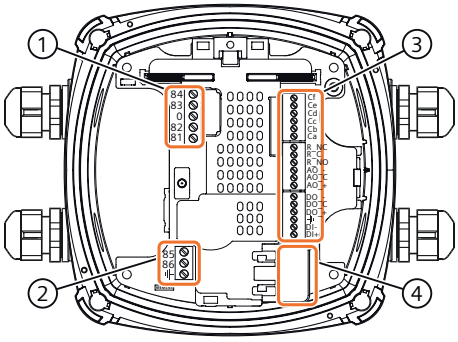
Note

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 59).

Connection board overview



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

Power supply

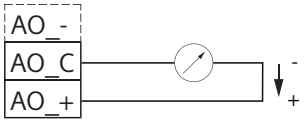
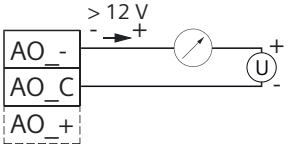
Table 5-1 Power supply transmitter side

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

Cable section and insulation as described in FMT020 Operating Instructions (http://www.siemens.com/processinstrumentation/documentation).

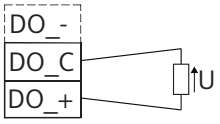
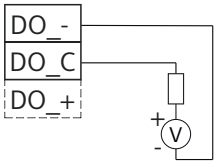
Current output

Table 5-2 Current output

Active output	Passive output
	

Digital output

Table 5-3 Digital output - current driven

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

Relay output

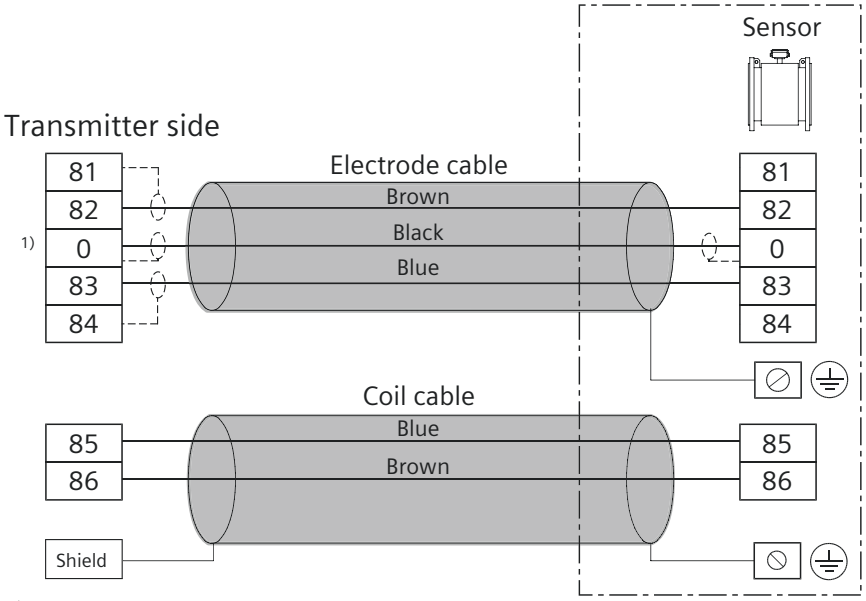
Table 5-4 Relay output

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

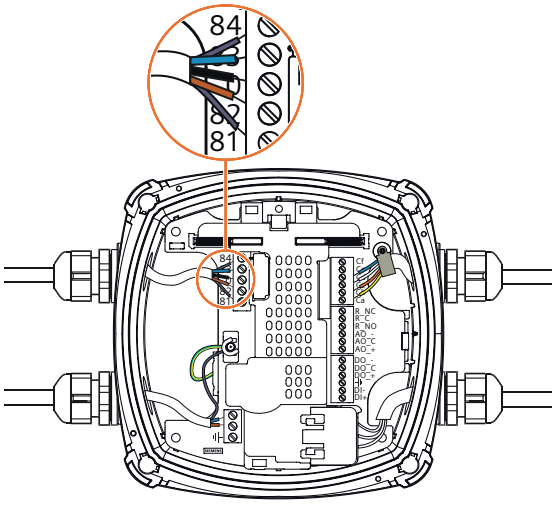


Figure 5-2 Electrode cable with individual wire shields

5.6 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:

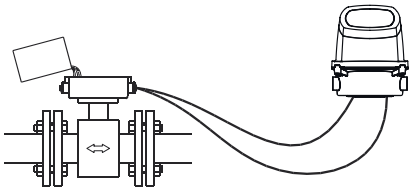
- The device has been installed and connected in accordance with the guidelines provided previous in this chapter and in Installing/Mounting (Page 19).

5.7 Potting

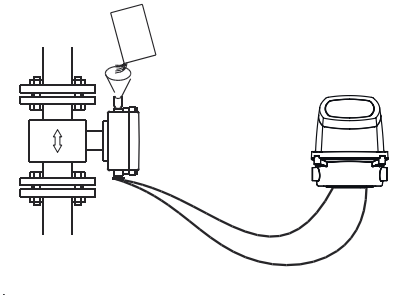
If sensor is buried or permanently submerged, terminal box must be encapsulated with silicon dielectric gel (non-toxic, transparent and self-healing gel).

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.

Service and maintenance

6

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

- Repair and maintenance must be carried out by Siemens authorized personnel only.

6.2 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.

⚠ CAUTION

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 data (Page 59).

6.3 Repair

WARNING

Impermissible repair of explosion protected devices

Risk of explosion in hazardous areas

- Repair must be carried out by Siemens authorized personnel only.

WARNING

Impermissible accessories and spare parts

Risk of explosion in areas subject to explosion hazard.

- Only use original accessories or original spare parts.
- Observe all relevant installation and safety instructions described in the instructions for the device or enclosed with the accessory or spare part.

6.4 Ordering of spare parts

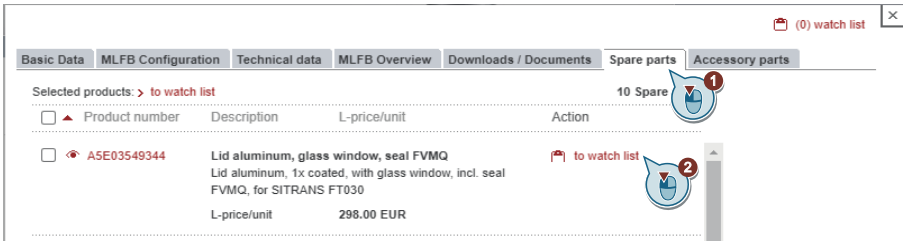
Condition

- You have a Siemens Industry Mall account.

Procedure

1. Open the Process instrumentation catalog (https://www.siemens.com/processinstrumentation/catalogs).
2. Select the desired language.
3. To find spare parts for your device, do one of the following:
   - Enter the complete order number of your device (e.g. 7ME4633-4KA51-8DC3-Z A05+B11+E06+F11) into the "Product number" field and click "Go".
   - Enter the serial number of your device (e.g. N1KXXXXXXX) in the "Serial number" field and click "Go".
   - If you do not know the product or serial number, search for your device under "Product family".

4. Navigate to the "Spare parts" tab.
   You see the list of spare parts available for your device.



5. Select a spare part and add it to your watch list.
   The watch list opens.
6. Click "Add to cart of Industry Mall".

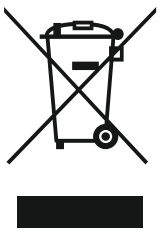
   The Siemens Industry Mall opens and you can order your spare part.

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.

Troubleshooting

7

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 82).

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 MΩ.

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 MΩ 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 kΩ and 50 kΩ. 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 Connecting (Page 41)

Technical specifications

8

Table 8-1

Version	FMS300
Product characteristic	Flexible product program
Nominal size	DN 15...2200 (½"...88")
Measuring principle	Electromagnetic induction
Excitation frequency (Mains supply: 50 Hz/60 Hz)	• DN 15...65 (½" to 2½"): 12.5 Hz/15 Hz • DN 80...150 (3" to 6"): 6.25 Hz/7.5 Hz • DN 200...1200 (8" to 48"): 3.125 Hz/3.75 Hz • DN 1400...2200 (54" to 88"): 1.5625 Hz/1.875 Hz
Enclosure rating	IP67 (EN/IEC 60529) / NEMA 4X/6, 1 mH_2O for 30 min Option: IP68 (EN/IEC 60529) / NEMA 6P,10 mH_2O cont. (not for Ex)
Test pressure	1.5 x PN (where applicable)
Pressure drop at 3 m/s	As straigth pipe
EMC	According to 2014/30/EU
Maximum cable lengh	500 m

8.1 Process connections

Table 8-2 Process connections

Version	FMS300
EN 1092-1, raised face (EN 1092-1, DIN 2501 & BS 4504 have the same mating dimensions)	• DN 65...2200 (2½"...88"): PN 6 (87 psi) • DN 200...2200 (8"...88"): PN 10 (145 psi) • DN 65...2000 (2½"...80"): PN 16 (232 psi) • DN 200...600 (8"...24"): PN 25 (362 psi) • DN 15...600 (½"...24"): PN 40 (580 psi) • DN 50...300 (2"...12"): PN 63 (913 psi) • DN 25...300 (1"...12"): PN 100 (1450 psi)
ANSI B16.5 (~BS 1560), raised face	• ½"...24": Class 150 (20 bar (290 psi)) • ½"...24": Class 300 (50 bar (725 psi)) • 1"...16": Class 600 (100 bar (1450 psi))
AWWA C-207, flat face	28"...88": Class D (10 bar)
AS 2129, raised face	½"...48": Table E
AS 4087, raised face	• PN 16 (DN 50...1200, 16 bar (232 psi)) • PN 21 (DN 50...600, 21 bar (304 psi)) • PN 35 (DN 50...600, 35 bar (508 psi))
JIS B 2220:2004	• 10K (½"...24") • 20K (½"...24")
Other flanges and pressure ratings	On request

8.2 Rated operating conditions

Table 8-3 Rated operating conditions (Ambient temperatures)[1)]

Version	Liner material	FMS300
Sensor	EPDM	-20...+70 °C (-4...+158 °F)
	Ebonite	0...+95 °C (+32...+203 °F)
	Linatex® [2)]	-40...+70 °C (-40...+158 °F)
	Soft Rubber	0...+70 °C (+32...+158 °F)
	PTFE	-20...+100 °C (-4...+212 °F)
	PFA	-20...+100 °C (-4...+212 °F)
With compact transmitter		
With compact transmitter FMT020		-20...+65 °C (-4...+149 °F)

1) With HART communication the max. ambient temperature is 50 °C (122 °F)

2) With carbon steel flanges the min. ambient temperature is -20 °C (-4 °F)

8.3 Operating pressure

Table 8-4 Operating pressure [abs.bar][1)]

Version	FMS300
PTFE	• DN ≤ 300 (≤ 12"): 0.3...50 bar (4...725 psi) • 350 ≤ DN ≤ 600 (14" ≤ DN ≤ 24"): 0.3...40 bar (4...580 psi)
PFA	DN 15...150 (½ " to 6"): Vacuum 0.02...50 bar (0.29...725 psi)
Soft rubber	0.01...100 bar (0.15...1450 psi)
EPDM	0.01...40 bar (0.15...580 psi)

Version	FMS300
Linatex®	0.01...40 bar (0.15...580 psi)
Ebonite	0.01...100 bar (0.15...1450 psi)

1) Maximum operating pressure decreases with increasing operating temperature and with stainless steel flanges

8.4 Vibration

Table 8-5 Mechanical load/Vibration

Version		FMS300
Mechanical load (vibration) - compact version		
	With compact transmitter FMT020	• 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	• Vibration, sinusoidal according to IEC 60068-2-6: – 2...8.4 Hz, 7.5 mm peak – 8.4...500 Hz, 2.0 g peak • Vibration broad-band random, according to IEC 60068-2-64: – 10 to 200 Hz, 0.01 g^2/Hz – 200 to 500 Hz, 0.003 g^2/Hz – Total: 1.54 g rms • Noise induced vibrations according to DIN EN 60068-2-64 Fc: – Stationary installation: Frequency range 10Hz ...500Hz, category 3 (modified)
	Transmitter FMT020	• 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

8.5 Media temperature

Table 8-6 Media temperature

Version	FMS300
EPDM	-10 to +70 °C (14 to 158 °F)
Ebonite	0 to 95 °C (32 to 203 °F)
Linatex®	-40 to +70 °C (-40 to +158 °F) For temperatures below -20 °C (-4 °F) AISI 304 or 316 flanges must be used
Soft rubber	0 to +70 °C (32 to 158 °F)
PTFE 100/150/180 °C	-20 to +100 °C (-4 to +212 °F)
PFA 100 °C	-20 to +100 °C (-4 to +212 °F)

8.6 Design

Table 8-7 Design

Version	FMS300
Weight	See dimensional drawings
Flange and housing material	• Carbon steel ASTM A 105, with corrosion resistant coating of category C4 or C5, according to ISO 12944-2 • Stainless steel AISI 316L (1.4404) flanges and housing, polished • Stainless steel AISI 304 (1.4301) flanges and carbon steel housing, with corrosion resistant coating of category C4, according to ISO 12944-2
Measuring pipe material	AISI 304 (1.4301)
Electrode material	• AISI 316Ti (1.4571) • Hastelloy • Platinum/Iridium, • Titanium • Tantalum
Grounding Electrode material	Material as measuring electrodes Exceptions - see ordering data
Terminal box	Polycarbonate
Cable entries	

Version		FMS300
	Remote installation	• 2 x M20 • 2 x ½" NPT with M20 to NPT adapters
	Compact installation	FMT020: • 4 x M20 • 4 x ½" NPT with M20 to NPT adapters

8.7 Certificates and approvals

Table 8-8 Certificates and approvals

Version	FMS300
Calibration Standard production calibration, calibration report shipped with sensor	Zero-point, 2 x 25 % and 2 x 90 %
Conforms to	optionally PED (all flanges conform to PED except PN 16 with short face-to-face length[1])
Material certificate EN 10204 3.1	On request
General purpose	CE, UKCA
Drinking water approvals	• WRAS (WRc, BS6920 cold water, GB) • NSF/ANSI Standard 61 (Cold water, US) • ACS listed (F) • DVGW W270 (D) • Belgaqua (B) • AS/NZS 4020 (Australia / New Zealand) • GB/T 5750 (China)
Others	• Environmental Product Declaration (EPD) • CRN (Canadian Registration Number) • EAC (Kazakhstan)

[1] For sizes larger than 600 mm (24") in PN 16 PED conformity is available as a cost-added option. The basic version will carry out CE or UKCA marking.

8.8 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 8-9 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 8-10 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)

		Coil cable	Special electrode cable
Cable parameter	Capacity	161.50 pF/m	N/A
	Inductance	0.583 µH/m	N/A
	L/R	43.83 þH/Ω	N/A

8.9 Pressure / temperature range

The following diagrams and tables show the maximum allowable working pressure at various working temperatures. For maximum allowable working pressure (MAWP) at 20 °C and at maximum working temperature, see the nameplate on the device.

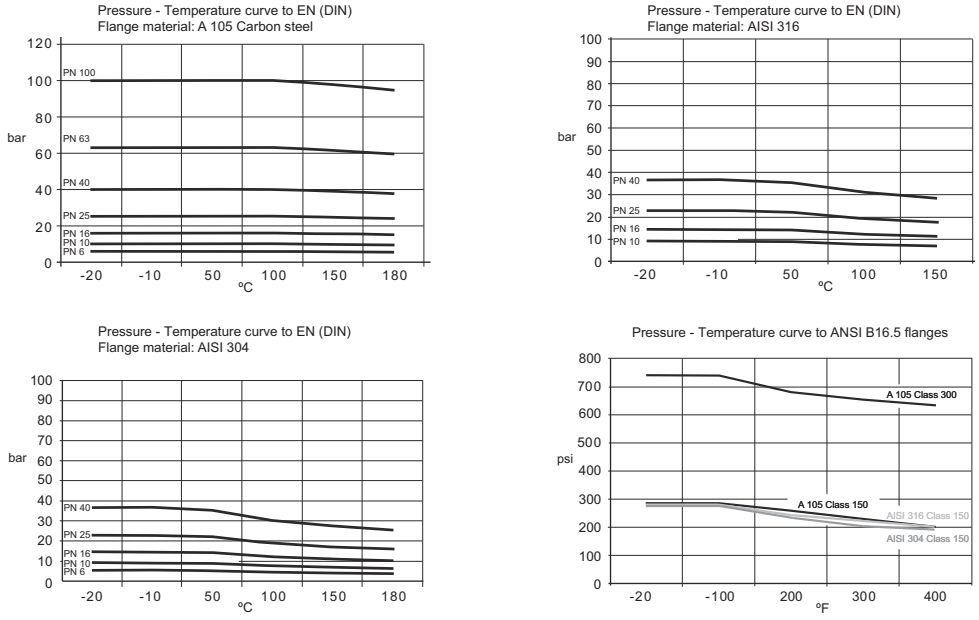


Table 8-11 Metric measures (pressure in bar) - Sizes 25 mm, 40 mm and >300 mm

Flange specifications	Flange rating	Temperature (°C)			
		-5	10	50	90
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

Table 8-12 Imperial measures (pressure in psi) - Sizes 1", 1½" and >12"

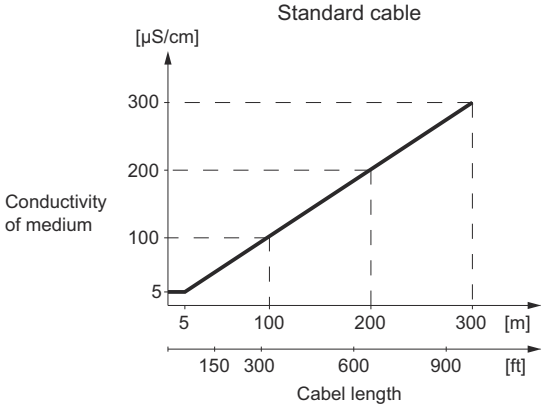
Flange specifications	Flange rating	Temperature (°F)			
		23	50	120	200
EN 1092-1	PN 10	145	145	141	136
	PN 16	232	232	225	219
	PN 40	580	580	561	547
ANSI B16.5	150 lb	286	286	280	261
AWWA C-207	Class D	150	150	150	150l

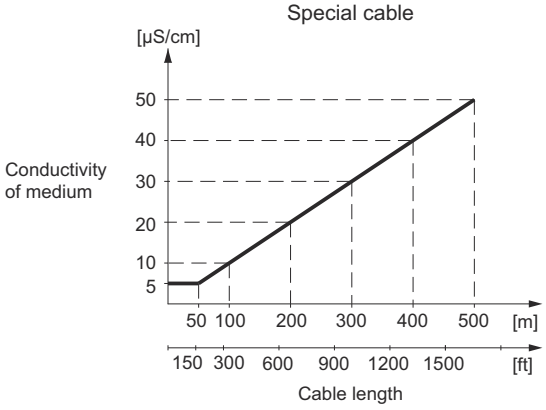
8.10 Process fluid conductivity

Compact installation

Liquids with an electrical conductivity ≥ 5 µS/cm.

Remote installation





8.11 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).

Dimension drawings

9

9.1 Dimensions and weight

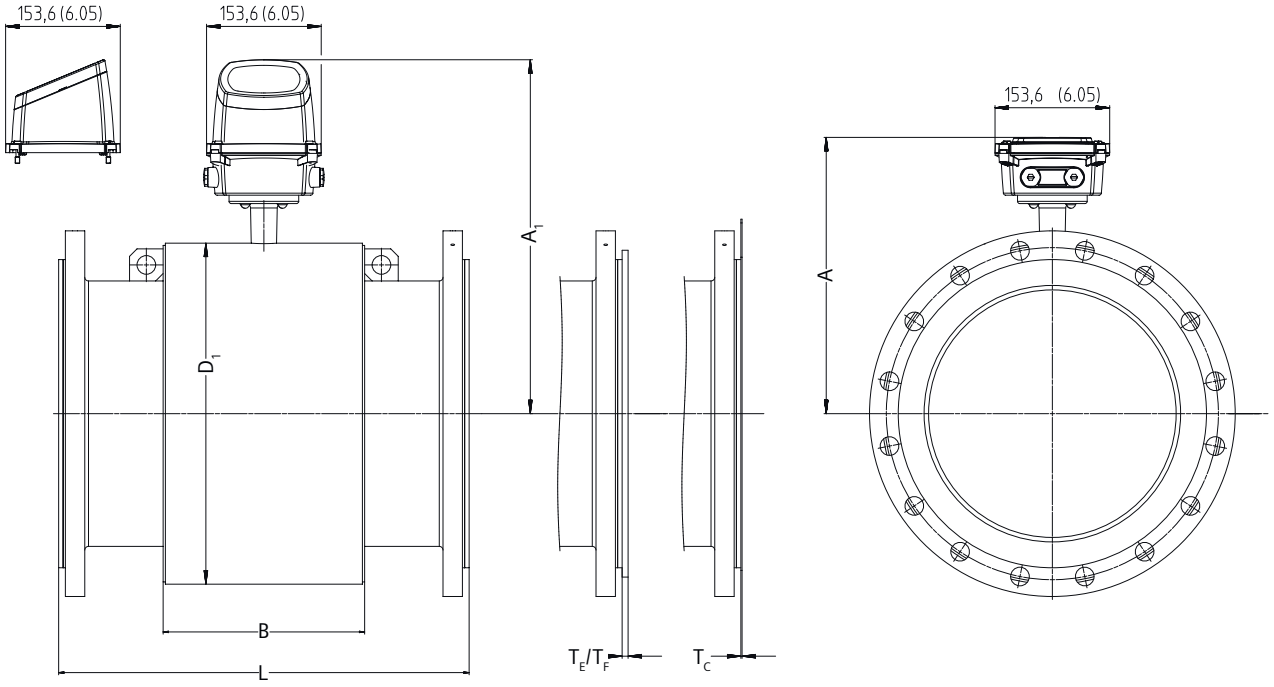


Figure 9-1 FMS300 dimensional drawings

Table 9-1 Dimensions

Nominal size		A[1)]		A_1[1)]		B		D_1	
mm	inch	mm	inch	mm	inch	mm	inch	mm	inch
15	½	180	7.1	284	11.2	59	2.4	104	4.1
25	1	180	7.1	284	11.2	59	2.4	104	4.1
32	1¼	190	7.5	294	11.6	82	3.3	114	4.5
40	1½	190	7.5	294	11.6	82	3.3	124	4.9
50	2	198	7.8	302	11.9	72	2.9	139	5.5
65	2½	205	8.1	309	12.2	72	2.9	154	6.1
80	3	215	8.5	319	12.6	72	2.9	174	6.9
100	4	235	9.3	339	13.3	85	3.4	214	8.5
125	5	248	9.8	352	13.9	85	3.4	239	9.5
150	6	269	10.6	373	14.7	85	5.4	282	11.1
200	8	297	11.7	401	15.8	137	5.4	338	13.4
250	10	325	12.8	429	16.9	157	6.2	393	15.5
300	12	350	13.8	454	17.9	157	6.2	444	17.5

Nominal size		A[1]		A_1[1]		B		D_1	
mm	inch	mm	inch	mm	inch	mm	inch	mm	inch
350	14	355	14	459	18.1	270	10.7	451	17.8
400	16	380	15	484	19.1	270	10.7	502	19.8
450	18	411	16.2	515	20.3	310	12.2	563	22.2
500	20	436	17.2	540	21.3	350	13.8	614	24.2
600	24	487	19.2	591	23.3	320	12.6	715	28.2
700	28	537	21.1	641	25.2	450	17.8	816	32.2
750	30	564	22.2	668	26.3	556	21.9	869	34.3
800	32	599	23.6	703	27.7	560	22.1	927	36.5
900	36	646	25.4	750	29.5	630	24.9	1032	40.7
1000	40	697	27.4	801	31.5	670	26.4	1136	44.8
1050	42	697	27.4	801	31.5	670	26.4	1136	44.8
1100	44	748	29.4	847	33.3	770	30.4	1238	48.8
1200	48	803	31.6	907	35.7	792	31.2	1348	53.1
1400	54	918	36.1	1022	40.2	1000	39.4	1574	62.0
1500	60	965	38	1069	42.1	1020	40.2	1672	65.9
1600	66	1018	40.1	1122	44.2	1130	44.5	1774	69.8
1800	72	1116	43.9	1220	48	1250	49.3	1974	77.8
2000	80	1216	47.9	1320	52	1375	54.2	2174	85.6
2200	88	1346	53	1450	57.1	1496	58.9	2400	94.5

[1] 1 mm shorter with aluminium terminal box

Table 9-2 Built-in lengths

Nominal size		L[1]											
		EN 1092-1											
		PN 6 / PN 10		PN 16 std[2]. / PN 16 short[3]		PN 25		PN 40		PN 63		PN 100	
mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch
15	1	-	-	-	-	-	-	200	7.9	-	-	-	-
25	1	-	-	-	-	-	-	200	7.9	-	-	260	10.3
32	1¼	-	-	-	-	-	-	200	7.9	-	-	280	11.1
40	1½	-	-	-	-	-	-	200	7.9	-	-	280	11.1
50	2	-	-	-	-	-	-	200	7.9	276	10.9	300	11.9
65	2½	200	7.9	200 / -	7.9/ -	-	-	200	7.9	320	12.6	350	13.8
80	3	200	7.9	200 / -	7.9/ -	-	-	272	10.8	323	12.8	340	13.4
100	4	250	9.8	250/ -	9.8/ -	-	-	250	9.9	380	15.0	400	15.7
125	5	250	9.8	250/ -	9.8/ -	-	-	250	9.9	420	16.6	450	17.7
150	6	300	11.8	300/ -	11.8/ -	-	-	300	11.9	415	16.4	450	17.7
200	8	350	13.8	350/ -	13.8/ -	350	13.8	350	13.8	480	18.9	530	20.9
250	10	450	17.7	450/ -	17.7/ -	450	17.7	450	17.8	550	21.7	620	24.4
300	12	500	19.7	500/ -	19.7/ -	500	19.7	500	19.7	600	23.6	680	26.8
350	14	550	21.7	550/ -	21.7/ -	550	21.7	550	21.7	-	-	-	-

Nominal size		L[1]											
		EN 1092-1											
		PN 6 / PN 10		PN 16 std[2]. / PN 16 short[3]		PN 25		PN 40		PN 63		PN 100	
mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch
400	16	600	23.6	600/ -	23.6/ -	600	23.6	600	23.7	-	-	-	-
450	18	600	23.6	600/ -	23.6/ -	600	23.6	600	23.7	-	-	-	-
500	20	600	23.6	600/ -	23.6/ -	625	24.6	680	26.8	-	-	-	-
600	24	600	23.6	600/ -	23.6/ -	750	30.0	800	31.5	-	-	-	-
700	28	700	27.6	875 / 700	31.5 / 27.6	800	31.5	-	-	-	-	-	-
750	30	-	-	-	-	-	-	-	-	-	-	-	-
800	32	800	31.5	1000 / 800	39.4 / 31.5	900	35.4	-	-	-	-	-	-
900	36	900	35.4	1125 / 900	49.2 / 35.4	1000	39.4	-	-	-	-	-	-
1000	40	1000	39.4	1250 / 1000	49.2 / 39.4	1100	43.4	-	-	-	-	-	-
1050	42	-	-	-	-	-	-	-	-	-	-	-	-
1100	44	-	-	-	-	-	-	-	-	-	-	-	-
1200	48	1200	47.2	1500 / 1200	59.1 / 47.2	1300	51.2	-	-	-	-	-	-
1400	54	1400	55.1	- / 1400	- / 55.1	-	-	-	-	-	-	-	-
1500	60	1500	59.1	- / 1500	- / 59.1	-	-	-	-	-	-	-	-
1600	66	1600	63.0	- / 1600	- / 63.0	-	-	-	-	-	-	-	-
1800	72	1800	70.9	- / 1800	- / 70.9	-	-	-	-	-	-	-	-
2000	80	2000	78.7	- / 2000	- / 78.7	-	-	-	-	-	-	-	-
2200	88	2200	86.6	-	-	-	-	-	-	-	-	-	-

[1] When grounding flanges are used, the thickness of the grounding flange must be added to the built-in length

[2] PN 16 flanges, standard face-to-face length for sensor (1.3 × DN)

[3] PN 16 flanges, short face-to-face length for sensor (1.0 × DN) (not concerned by PED)

Table 9-3 Built-in lengths

Nominal size		**L[1]**													
		ANSI B16.5 Class 150		**ANSI B16.5 Class 300**		**ANSI B16.5 Class 600**		**AS 2129 E AS 4087 PN 16, 21, 35**		**AWWA C-207 Class D**		**JIS K10**		**JIS K20**	
mm	**inch**	**mm**	**inch**	**mm**	**inch**	**mm**	**inch**	**mm**	**inch**	**mm**	**inch**	**mm**	**inch**	**mm**	**inch**
15	1	200	7.9	200	7.9	-	-	200	7.9	-	-	200	7.9	200	7.9
25	1	200	7.9	200	7.9	280	11.0	200	7.9	-	-	200	7.9	200	7.9
32	1¼	200	7.9	200	7.9	300	11.8	200	7.9	-	-	200	7.9	240	9.5
40	1½	200	7.9	200	7.9	320	12.6	200	7.9	-	-	200	7.9	240	9.5
50	2	200	7.9	200	7.9	330	13.0	200	7.9	-	-	200	7.9	240	9.5
65	2½	200	7.9	272	10.8	370	14.6	200	7.9	-	-	200	7.9	272	10.7
80	3	272	10.8	272	10.8	350	13.8	200[2]	7.9	-	-	200	7.9	272	10.7
100	4	250	9.9	310	12.2	460	18.1	250	9.9	-	-	250	9.9	310	12.2
125	5	250	9.9	335	13.1	480	18.9	250	9.9	-	-	250	9.9	335	13.2
150	6	300	11.8	300	11.9	500	19.7	300	11.9	-	-	300	11.9	300	11.9
200	8	350	13.8	350	13.8	600	23.6	350	13.8	-	-	350	13.8	350	13.8
250	10	450	17.7	450	17.8	600	23.6	450	17.8	-	-	450	17.8	450	17.8
300	12	500	19.7	500	19.7	700	27.6	500	19.7	-	-	500	19.7	500	19.7
350	14	550	21.7	550	21.7	800	31.5	550	21.7	-	-	550	21.7	550	21.7
400	16	600	23.7	600	23.7	820	32.3	600	23.7	-	-	600	23.7	600	23.7
450	18	600	23.7	640	23.7	-	-	600	23.7	-	-	600	23.7	640	25.2
500	20	600	23.7	730	28.7	-	-	600[3]	23.7	-	-	600	23.7	680	26.8
600	24	600	23.7	860	33.8	-	-	600[4]	23.7	-	-	600	23.7	800	31.5
700	28	700	31.5	-	-	-	-	700[5]	27.6	700	27.6	-	-	-	-
750	30	950	37.4	-	-	-	-	750[5]	29.6	750	29.6	-	-	-	-
800	32	900	35.5	-	-	-	-	800[5]	31.5	800	31.5	-	-	-	-
900	36	1100	43.4	-	-	-	-	900[5]	35.5	900	35.5	-	-	-	-
1000	40	1100	43.4	-	-	-	-	1000[5]	39.4	1000	39.4	-	-	-	-
1050	42	-	-	-	-	-	-	-	-	1000	39.4	-	-	-	-
1100	44	-	-	-	-	-	-	-	-	1100	43.4	-	-	-	-
1200	48	1400	55.2	-	-	-	-	1200[5]	47.3	1200	47.3	-	-	-	-
1400	54	-	-	-	-	-	-	-	-	1400	55.2	-	-	-	-
1500	60	-	-	-	-	-	-	-	-	1500	59.1	-	-	-	-
1600	66	-	-	-	-	-	-	-	-	1600	63.0	-	-	-	-
1800	72	-	-	-	-	-	-	-	-	1800	70.9	-	-	-	-
2000	80	-	-	-	-	-	-	-	-	2000	78.8	-	-	-	-
2200	88	-	-	-	-	-	-	-	-	2200	86.6	-	-	-	-

[1]: When grounding flanges are used, the thickness of the grounding flange must be added to the built-in length

[2]: PN 35 DN 80 = 272 mm (not according to ISO 13359)

[3]: PN 35 DN 500 = 680 mm

[4]: PN 35 DN 600 = 750 mm

[5]: Not AS 4087 PN 21 or PN 35

Table 9-4 Grounding rings

Nominal size		T_c[1]		T_E[1]		T_F[1]		Wgt.[2]	
mm	inch	mm	inch	mm	inch	mm	inch	kg	lbs
15	1	-	-	6	0.3	2	0.1	4	9
25	1	1.2	0.1	6	0.3	2	0.1	5	11
32	1¼	-	-	-	-	2	0.1	7	15
40	1½	1.2	0.1	6	0.3	2	0.1	8	17
50	2	1.2	0.1	6	0.3	2	0.1	9	20
65	2½	1.2	0.1	6	0.3	2	0.1	11	24
80	3	1.2	0.1	6	0.3	2	0.1	12	26
100	4	1.2	0.1	6	0.3	2	0.1	16	35
125	5	1.2	0.1	6	0.3	2	0.1	19	42
150	6	1.2	0.1	6	0.3	2	0.1	27	60
200	8	1.2	0.1	8	0.3	2	0.1	40	88
250	10	1.2	0.1	8	0.4	2	0.1	60	132
300	12	1.6	0.1	8	0.4	2	0.1	80	176
350	14	1.6	0.1	8	0.4	-	-	110	242
400	16	1.6	0.1	10	0.4	-	-	125	275
450	18	1.6	0.1	10	0.4	-	-	175	385
500	20	1.6	0.1	10	0.4	-	-	200	440
600	24	1.6	0.1	10	0.4	-	-	287	633
700	28	2.0	0.1	-	-	-	-	330	728
750	30	2.0	0.1	-	-	-	-	360	794
800	32	2.0	0.1	-	-	-	-	450	992
900	36	2.0	0.1	-	-	-	-	530	1168
1000	40	2.0	0.1	-	-	-	-	660	1455
1050	42	2.0	0.1	-	-	-	-	660	1455
1100	44	2.0	0.1	-	-	-	-	1140	2513
1200	48	2.0	0.1	-	-	-	-	1180	2601
1400	54	2.0	0.1	-	-	-	-	1600	3528
1500	60	3.0	0.1	-	-	-	-	2460	5423
1600	66	3.0	0.1	-	-	-	-	2525	5566
1800	72	3.0	0.1	-	-	-	-	2930	6460
2000	80	3.0	0.1	-	-	-	-	3665	8080
2200	88	-	-	-	-	-	-	5690[3]	12544[3]

[1]: T_C = Type C grounding ring
T_E = Type E grounding ring (included and factory-mounted on high-temperature 180 °C PTFE sensor)
T_F = Flat type grounding rings

[2]: Weights are approx. (for PN 16) without transmitter

[3]: Approx. weight for AWWA without transmitter

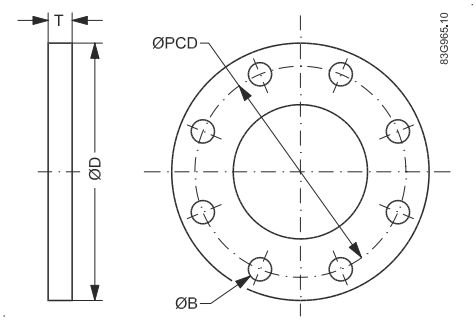


Figure 9-2 Flange mating dimensions

Table 9-5 Flange mating dimensions (metric)

DN	Dimensions (mm)				Bolting	
mm	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
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

DN	Dimensions (mm)				Bolting	
mm	**D**	**PCD**	**T**	**B**	**Holes**	**Bolts**
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
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

DN	Dimensions (mm)				Bolting	
mm	**D**	**PCD**	**T**	**B**	**Holes**	**Bolts**
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
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

DN	Dimensions (mm)				Bolting	
mm	D	PCD	T	B	Holes	Bolts
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

Product documentation and support

A

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.

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

B.1 Factory settings

DN		Maximum volume flow (Q4)	Volume flow unit [1]	Totalizer unit [1]	Volume/ pulse	Pulse unit	Pulse width	Pulse width unit	Excitation frequency	Excitation frequency
mm	Inch	m³/h							50 Hz	60 Hz
15	½	6.36	m³/h	m³	1	l	0.1	s	12.5 Hz	15 Hz
25	1	17.67	m³/h	m³	1	l	0.1	s	12.5 Hz	15 Hz
32	1¼	28.95	m³/h	m³	1	l	0.1	s	12.5 Hz	15 Hz
40	1½	45.24	m³/h	m³	1	l	0.1	s	12.5 Hz	15 Hz
50	2	70.69	m³/h	m³	1	l	0.1	s	12.5 Hz	15 Hz
65	2½	119.46	m³/h	m³	1	l	0.1	s	12.5 Hz	15 Hz
80	3	180.96	m³/h	m³	1	l	0.1	s	6.25 Hz	7.5 Hz
100	4	282.74	m³/h	m³	1	l	0.1	s	6.25 Hz	7.5 Hz
125	5	441.79	m³/h	m³	1	l	0.1	s	6.25 Hz	7.5 Hz
150	6	636.17	m³/h	m³	1	l	0.1	s	6.25 Hz	7.5 Hz
200	8	1130.97	m³/h	m³	1	l	0.1	s	3.125 Hz	3.75 Hz
250	10	1767.15	m³/h	m³	1	l	0.1	s	3.125 Hz	3.75 Hz
300	12	2544.69	m³/h	m³	1	l	0.1	s	3.125 Hz	3.75 Hz
350	14	3463.61	m³/h	m³	1	l	0.1	s	3.125 Hz	3.75 Hz
400	16	4523.89	m³/h	m³	1	l	0.1	s	3.125 Hz	3.75 Hz
450	18	5725.55	m³/h	m³	1	l	0.1	s	3.125 Hz	3.75 Hz
500	20	7068.58	m³/h	m³	1	l	0.1	s	3.125 Hz	3.75 Hz
600	24	10178.76	m³/h	m³	1	l	0.1	s	3.125 Hz	3.75 Hz
700	28	13854.42	m³/h	m³	1	l	0.1	s	3.125 Hz	3.75 Hz
750	30	15904.31	m³/h	m³	1	l	0.1	s	3.125 Hz	3.75 Hz
800	32	18095.57	m³/h	m³	1	l	0.1	s	3.125 Hz	3.75 Hz
900	36	22902.21	m³/h	m³	1	l	0.1	s	3.125 Hz	3.75 Hz
1000	40	28274.33	m³/h	m³	1	l	0.1	s	3.125 Hz	3.75 Hz
1050	42	31172.45	m³/h	m³	1	l	0.1	s	3.125 Hz	3.75 Hz
1100	44	34211.94	m³/h	m³	1	l	0.1	s	3.125 Hz	3.75 Hz
1200	48	40715.04	m³/h	m³	1	l	0.1	s	3.125 Hz	3.75 Hz
1400	56	55417.69	m³/h	m³	1	l	0.1	s	1.5625 Hz	1.875 Hz
1500	60	63617.25	m³/h	m³	1	l	0.1	s	1.5625 Hz	1.875 Hz
1600	64	72382.29	m³/h	m³	1	l	0.1	s	1.5625 Hz	1.875 Hz
1800	72	91608.84	m³/h	m³	1	l	0.1	s	1.5625 Hz	1.875 Hz
2000	78	113097.34	m³/h	m³	1	l	0.1	s	1.5625 Hz	1.875 Hz
2200	88	136847.78	m³/h	m³	1	l	0.1	s	1.5625 Hz	1.875 Hz

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

B.2 Coil resistance

Table B-1 Coil resistance [Ω]

DN	Inch	Resistance min.	Resistance max.
15	½	95	113
25	1	89	97
32	1¼	83	101
40	1½	83	101
50	2	83	101
65	2½	91	109
80	3	85	103
100	4	83	101
125	5	83	101
150	6	85	103
200	8	81	99
250	10	83	101
300	12	91	109
350	14	101.6	119.6
400	16	103.2	121.2
450	18	103.8	121.8
500	20	109	127
600	24	121	139
700	28	115	133
750	30	144.2	162.2
800	32	120.4	138.4
900	36	118.6	136.6
1000	40	123.2	141.2
1050	42	125.4	143.4
1100	44	125.4	143.4
1200	48	116	134
1400	54	128	146
1500	60	123	141
1600	66	132	150
1800	72	135	153
2000	78	137.8	155.8
2200	88	137.8	155.8

Note

Reference values

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

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