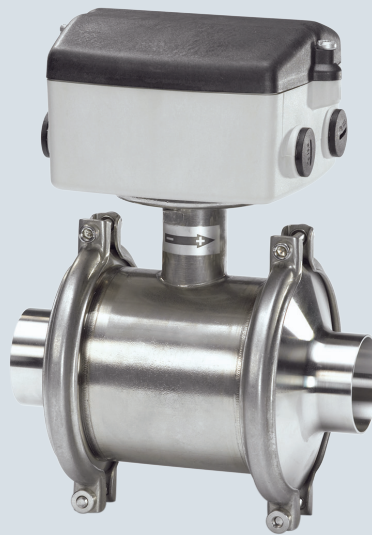


**SIEMENS**



# SITRANS F

Electromagnetic flowmeters

SITRANS F M MAG 1100

Operating Instructions

Edition

12/2014

Answers for industry.



## Electromagnetic Flowmeters MAG 1100 sensor

### Operating Instructions

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Electromagnetic flow sensor designed for use with transmitter types SITRANS F M MAG 5000 / 6000 and MAG 6000 I

## 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.

<b>⚠ DANGER</b>
indicates that death or severe personal injury <b>will</b> result if proper precautions are not taken.
<b>⚠ WARNING</b>
indicates that death or severe personal injury <b>may</b> result if proper precautions are not taken.
<b>⚠ CAUTION</b>
indicates that minor personal injury can result if proper precautions are not taken.
<b>NOTICE</b>
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:

<b>⚠ WARNING</b>
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 AG. 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.

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# Introduction

These instructions contain all the information you need for using the device.

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

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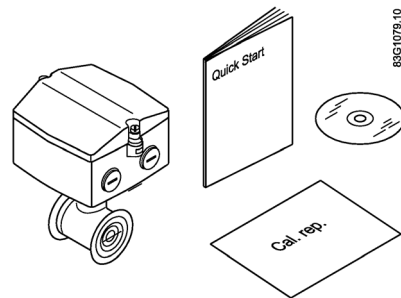
## Note

It is the responsibility of the customer that the instructions and directions provided in the operating instructions are read, understood, and followed by the relevant personnel before installing the device.

---

## 1.1 Items supplied

- SITRANS F M MAG 1100
- Calibration report
- SITRANS F M literature CD
- Quick Start guide



## 1.2 Device identification

### Inspection

1. Check for mechanical damage due to possible improper handling during shipment. All claims for damage are to be made promptly to the shipper.
2. Make sure the scope of delivery, and the information on the type plate correspond to the ordering information

Identification

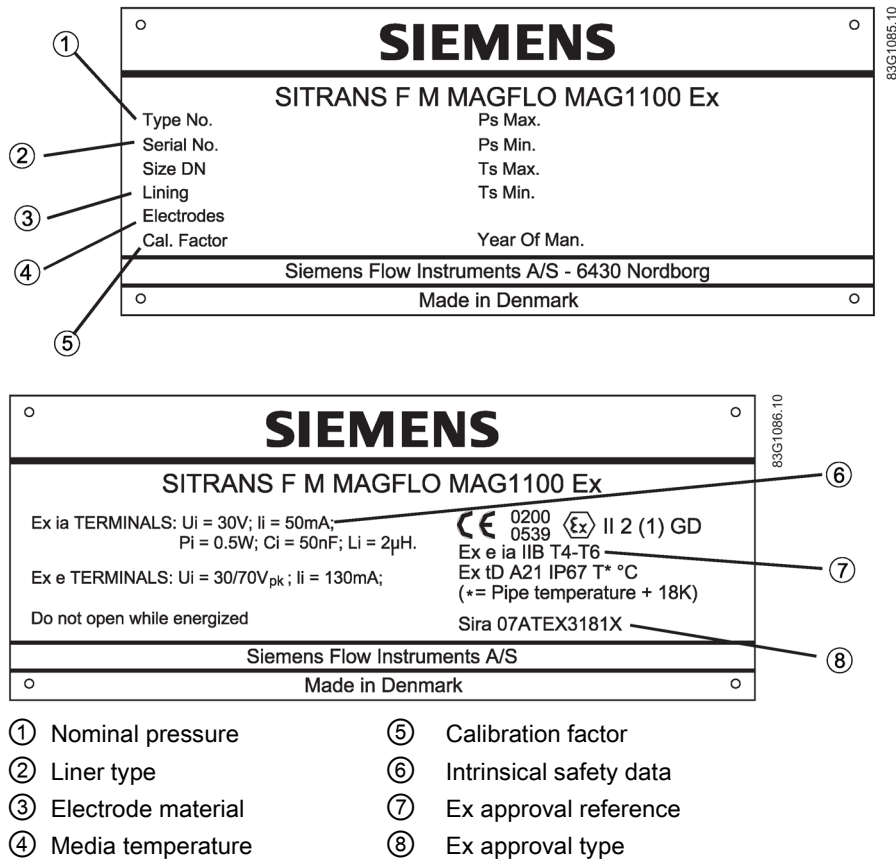


Figure 1-1 Nameplate example, MAG 1100 Ex

1.3 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
02/2011	First edition The Operating Instructions replaces: <ul style="list-style-type: none"> <li>• MAG 1100 part of SITRANS F M HANDBOOK (A5E02435647)</li> <li>• SITRANS F M MAG 1100 DN 2- DN 100</li> <li>• SITRANS F M MAG 1100 DN 2- DN 3</li> </ul>



## 1.4 Further Information

### Product information on the Internet

The Operating Instructions are available on the documentation disk shipped with the device, and on the Internet on the Siemens homepage, where further information on the range of SITRANS F flowmeters may also be found:

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

### Worldwide contact person


If you need more information or have particular problems not covered sufficiently by these Operating Instructions, get in touch with your contact person. You can find contact information for your local contact person on the Internet:

Product information on the internet (<http://www.siemens.com/flow>)

### See also

Technical support (Page 36)



 <b>CAUTION</b>
<b>Correct, reliable operation of the product requires proper transport, storage, positioning and assembly as well as careful operation and maintenance.</b>
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.

## 2.1 Laws and directives

### General requirements

Installation of the equipment must comply with national regulations. For example EN 60079-14 for the European Community.

### 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.

<b>NOTICE</b>
<b>Material compatibility</b>
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.

### CE marked equipment

The CE-mark symbolizes the compliance of the device with the following directives:

- EMC-directive 89/336/EWG
- Low voltage directive 73/23/EWG
- Pressure equipment directive (PED/DGRL) 93/23/EG
- ATEX Directive 94/9/EG

**PED directive**

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

Siemens Flow Instruments products comply with PED as stated in the following table.

Table 2- 1 MAG 1100 and MAG 1100 HT PED compliance


Flange mm	MAG 1100		MAG 1100 HT	MAG 1100 F	
	Ceramic	PFA	Ceramic	Ceramic	PFA
2	EXC.PED	N/A	N/A	N/A	N/A
3	EXC.PED	N/A	N/A	N/A	N/A
6	EXC.PED	N/A	N/A	N/A	N/A
10	EXC.PED	EXC.PED	N/A	EXC.PED	EXC.PED
15	EXC.PED	EXC.PED	EXC.PED	EXC.PED	EXC.PED
25	EXC.PED	EXC.PED	EXC.PED	EXC.PED	EXC.PED
40	PED	EXC.PED	PED	PED	EXC.PED
50	PED	PED	PED	PED	PED
65	PED	PED	PED	PED	PED
80	PED	PED	PED	PED	PED
100	PED	PED	PED	PED	PED

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

**EXC. PED** = Excluded from PED under SEP or LVD

**PED**= Product covered by PED

**N/A**= Size/pressure outside of PED scope or not available in the size range

<p> <b>CAUTION</b></p> <p><b>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</b></p> <ol style="list-style-type: none"> <li>1. Meters used in networks for the supply, distribution and discharge of water.</li> <li>2. Meters used in pipelines for the conveyance of any fluid from offshore to onshore.</li> <li>3. Meters used in the extraction of petroleum or gas, including christmas tree and manifold equipment.</li> <li>4. Any meter mounted on a ship or mobile offshore platform.</li> </ol>
---

## 2.2 Installation in hazardous area

### WARNING

Equipment used in hazardous areas must be Ex-approved and marked accordingly.

It is required that the special conditions for safe use provided in the manual and in the Ex certificate are followed!

### Hazardous area approvals

The device is approved for use in hazardous area and has the following approval:

- II 2 (1) GD Ex e ia IIB T3-T6 (MAG 1100 Ex remote mounted)
- II 2 (1) (2) GD Ex d [ia] [ib] IIB T3-T6 (MAG 1100 Ex compact mounted with MAG 6000 I Ex de)

### WARNING

Make sure the hazardous area approval is suitable for the environment in which the device will be installed.

### Intrinsically safe data

Table 2- 2 Intrinsically safe data for remote mounted MAG 1100 Ex

Sensor circuit (Terminal \$\$\$)	
Ui	
\$\$\$	

### WARNING

#### Compact mounted versions

For intrinsically safe data for MAG 3100 Ex compact mounted with MAG 6000 I Ex d, refer to the Operating Instructions of MAG 6000 I or to certificate number Sira 07ATEX1182X, available here: Auto hotspot.

### WARNING

**With intrinsically safe circuits, use only certified meters appropriate for the transmitter.**

If a non-conforming supply unit is used, the "fail-safe" type of protection will no longer be effective and the approval certification will be invalid.

**Temperature specifications for Ex use**

Maximum process fluid temperature [°C]	Maximum process fluid temperature [°C]	Ambient temperature [°C]
67	T6 (85 °C)	-25 ... +60
82	T5 (100 °C)	-25 ... +60
117	T4 (135 °C)	-25 ... +60
180 (Remote configuration)	T3 (200 °C)	-25 ... +60
150 (Compact configuration)	T3 (200 °C)	-25 ... +50


For dust protection, the surface temperature is equal to the process fluid temperature plus 5 °C


**Special conditions for safe use**

It is required that:

Electrical connections are in accordance with IEC/EN60079-14 (Installing Electrical Systems in Explosion Hazardous Areas).

- The protective cover over the power supply is properly installed. For intrinsically safe circuits the connection area can be opened.
- Appropriate cable connectors are used for the output circuits:
  - Intrinsically safe: blue
  - Non-intrinsically safe: black
- Sensor and transmitter are connected to the potential equalization. For intrinsically safe output circuits potential equalization must be maintained along the entire connection path.
- Sensor insulation thickness is max. 100 mm (only insulated sensors).
- EN50281-1-2 is considered for installation in areas with combustible dust.
- When protective earth (PE) is connected, no potential difference between the protective earth (PE) and the potential equalization (PA) can exist, even during a fault condition.

 <b>WARNING</b>
<p><b>"Flameproof enclosure" type of protection</b></p> <p>Only open devices with type of protection "Flameproof enclosure" in hazardous areas when the power to the device is turned off, otherwise there is a risk of explosion.</p>

 <b>WARNING</b>
<p><b>Laying of cables</b></p> <p>Cable for use in zone 1 and 2 or 21 and 22 must satisfy the requirements for having a proof voltage &lt; AC 500 V applied between the conductor/ground, conductor/shield and shield/ground.</p> <p>Connect the devices that are operated in hazardous areas as per the stipulations applicable in the country of operation, e.g. for Ex "d" and "nA", permanent cables must be laid.</p>

## 2.3 Certificates

Certificates are posted at  
Auto hotspot  
and can also be found on the documentation disk shipped with the device.

### See also

Technical data (Page 43)

Certificates on the Internet (<http://www.siemens.com/processinstrumentation/certificates>)





## Description

### 3.1 Applications

The pulsed DC-powered magnetic flowmeters are suitable for measuring the flow of almost all electrically conductive liquids, pastes, and slurries with max. 40% solids.

The main applications can be found in the following sectors:

- Water and waste water
- Chemical and pharmaceutical industries
- Food & beverage industry
- Mining and cements industries
- Pulp and paper industry
- Steel industry
- Power generation; utility and chilled water industry

### 3.2 System components

The SITRANS F M flowmeter system includes:

- Transmitter (types: SITRANS F M MAG 5000/6000 or MAG 6000 I)
- Sensor (types: SITRANS F M MAG 1100/1100 F, MAG 3100/3100 P or MAG 5100 W)
- Communication module (optional) (types: HART, PROFIBUS PA/DP, MODBUS RTU RS 485, Foundation Fieldbus H1, Devicenet)
- SENSORPROM memory unit

#### Communication solutions

The SITRANS F M range of add on modules, presently including HART, Foundation Fieldbus, MODBUS RTU RS 485, PROFIBUS PA / DP and Devicenet, are all applicable with the SITRANS F M MAG 6000 transmitter.

### 3.3 Design

The SITRANS F M MAG 1100 is an electromagnetic flow sensor in a compact wafer design designed for flow applications in the process industry.



MAG 1100



MAG 5000



MAG 6000I

Sensor housing and flanges are designed in carbon steel (ASTM A 105) and terminal box in fibre glass reinforced polyamide or optionally in stainless steel (AISI 316). Measuring pipe is made of stainless steel (AISI 304) while liners and electrodes are available in various materials, making the sensor highly resistant to a wide range of chemicals.

The present range of liner types includes:

- PFA
- Ceramic
- EPDM

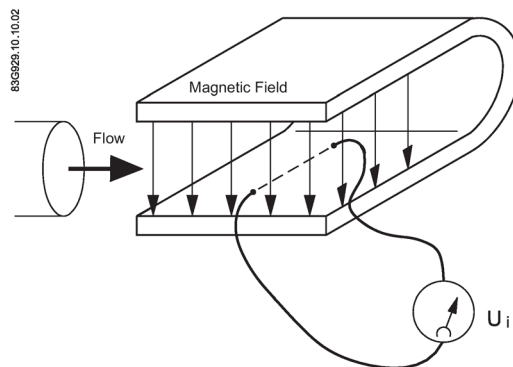
Electrodes are available in:

- Hastelloy C276 or C22
- AISI 316 / 1.4571
- Platinum / platinum with gold/Titanium brazing alloy

The sensors carry a wide range of approvals, see Technical data (Page 43).

## 3.4 Theory of operation

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



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

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

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

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

### Operating principle

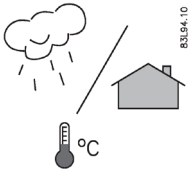
The coil current module generates a pulsating magnetizing current that drives the coils in the sensor. The current is permanently monitored and corrected. Errors or cable faults are registered by the self-monitoring circuit.

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

*3.4 Theory of operation*

## Installing/Mounting



SITRANS F flowmeters with minimum IP65/NEMA 4X enclosure rating 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**

#### **Installation in hazardous location**

Special requirements apply to the location and interconnection of sensor and transmitter. See "Installation in hazardous area"

### 4.1 Installation safety precautions

### **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.

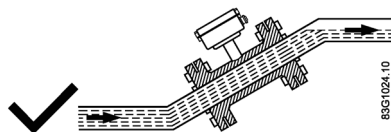


Figure 4-1 Correct installation with filled pipes

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

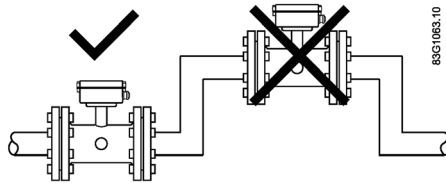


Figure 4-2 Wrong installation at high point

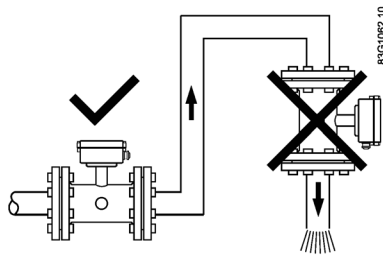
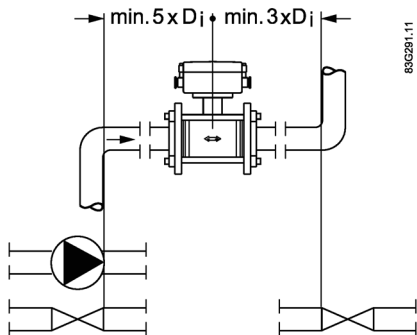


Figure 4-3 Correct installation at low point before outlet

### 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.



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### Note

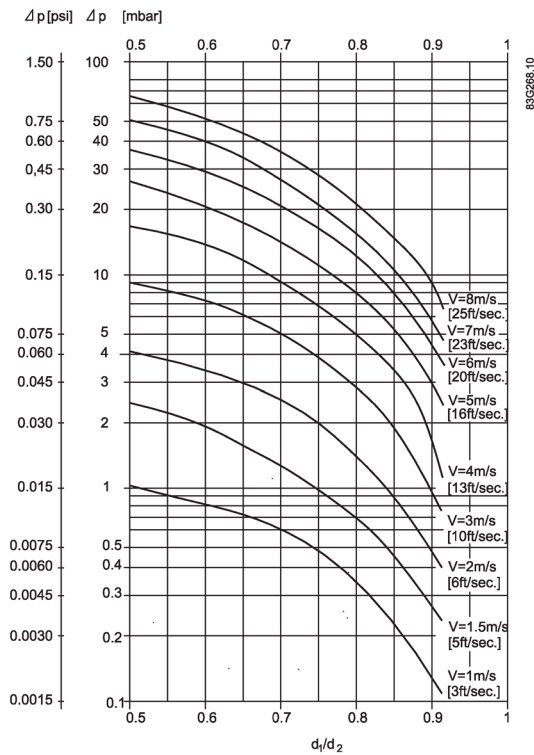
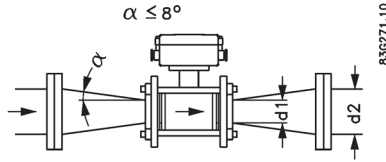
#### Empty pipe detection

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

---

### Installation in large pipes

The flowmeter can be installed between two reducers (e.g. DIN 28545). At 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

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

- Vertical installation with an upwards flow

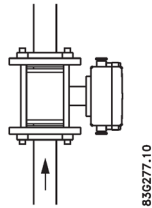


Figure 4-4 Vertical orientation, upwards flow

<b>NOTICE</b>
<b>Abrasive liquids / liquids containing solid particles</b> 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

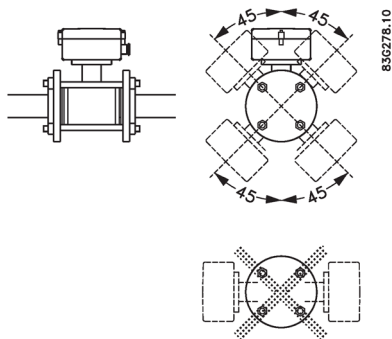


Figure 4-5 Horizontal installation, various terminal box positions

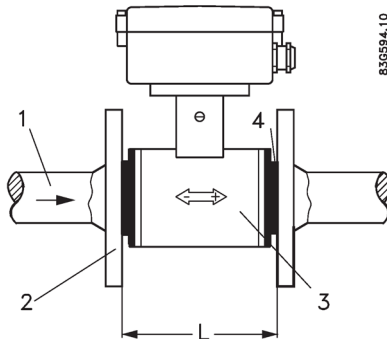
<b>NOTICE</b>
<b>Do NOT mount the sensor with the terminal box sideways</b> This will position the electrodes at the top where there is possibility for air bubbles and at the bottom where there is possibility for mud, sludge, sand etc.



## 4.4 Mounting

- Install the sensor in rigid pipelines in order to support the weight of the meter.
- Center the connecting pipelines axially in order to avoid turbulent flow profiles.
- Use proper gaskets according to liner type

Remove liner protectors before installing the flow meter



1. Existing pipe
2. Flange
3. Sensor
4. Gaskets
5. Sensor length incl. gaskets

## Tightening

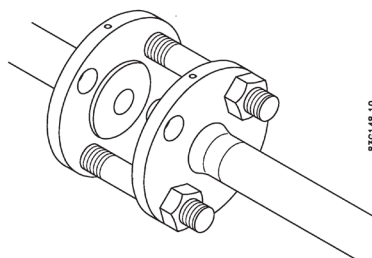
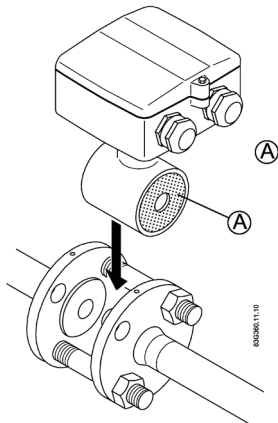


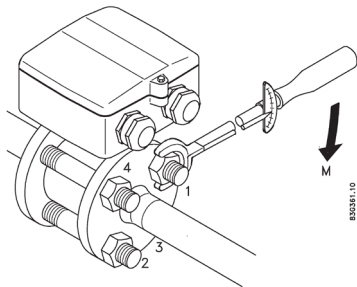
Figure 4-6 First place three stay-bolts to locate the sensor

These should be tightened gently, making sure that each gasket fits exactly into its recess at either end of the sensor

4.4 Mounting



The remaining flange bolts can now be inserted and tightened using about 25% of the actual tightening torque, see table below.



The bolts must be tightened using up to 50% of the max. tightening torque for the pipe dimensions stated. The max. tightening torque for different size pipes is given in the table.

The bolts must now be cross-tightened in the sequence shown, using up to 100% torque.

DN	MA[Nm]
2	13
3	13
6	13
10	13
15	16
25	30
40	54
50	90
65	90
80	90
100	115

10 Nm - 1 kpm

**NOTICE**  
Do not use sharp objects to remove the blanks as this can damage the liner!

## Vibrations

Avoid strong vibrations.

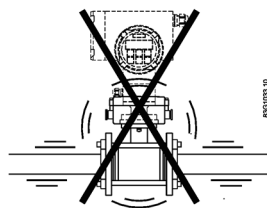


Figure 4-7 Avoid vibrations

### CAUTION

In applications with strong vibrations, Siemens recommends remote mounting of the transmitter!

## 4.5 Torques values

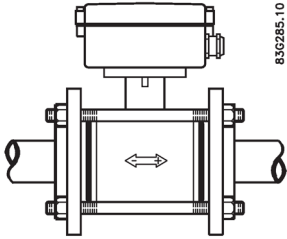
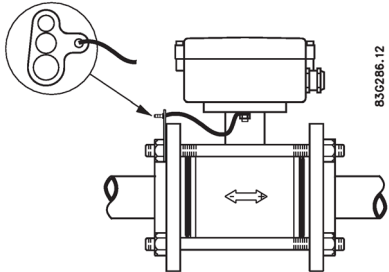
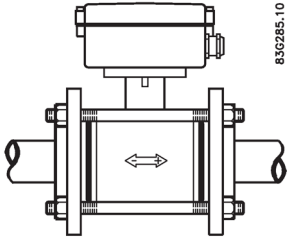
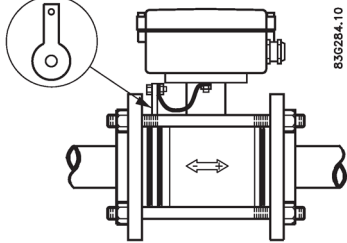
### Note

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

DN mm/inch	Nm
2 / 1/12	13
3 / 1/8	13
6 / 1/4	13
10 / 3/8	13
15 / 1/2	16
25 / 1	30
40 / 1 1/2	54
50 / 2	90
65 / 2 1/2	90
80 / 3	90
100 / 4	115

## 4.6 Potential equalization

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

	Graphite	EPDM or PTFE gaskets
Electrically conductive piping	 <p>Potential equalization with electrically graphite gaskets</p>	 <p>Potential equalization using earth strap supplied</p>
Electrically non-conductive piping	 <p>Potential equalization with electrically conductive graphite gaskets</p>	 <p>Potential equalization using separate potential equalization ring</p> <p><b>NOTE</b> For unidirectional flow use two ground-ing rings</p>

**NOTICE**

For sizes DN 2-10 with Hastelloy or stainless steel adaptors potential equalization is done ensured through adaptors

## Cathodic protection

Special attention must be paid to systems with cathodic protection

 <b>WARNING</b>
--

<b>Use in hazardous area!</b>
-------------------------------

Cathodic pipe protection is not allowed in hazardous areas
--

- 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  $\mu$ F condensator
  - Make sure that electrode cable shield is not connected at both ends
-



## Connecting

The following contains a short description of how to connect a remote mounted sensor to transmitter types:

- SITRANS F M MAG 5000 / 6000 (standard versions)
- SITRANS F M MAG 6000 19" with Safety barrier
- SITRANS F M MAG 6000 I Ex de

For more information, e.g. about wiring of power supply and outputs, refer to the operating instructions for the respective transmitters.

---

### Note


It is very important to make sure the software version is an issue 2.07 or higher.


---

### Before connecting

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

## 5.1 General safety requirements

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

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

**Note**

**Hazardous area applications**

Special requirements apply to the location and interconnection of sensor and transmitter. See "Installation 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  $\mu$ F 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.

**See also**

Installation in hazardous area (Page 11)



## 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 IP 67 degree of protection, use cables with the required specifications.

<b>⚠ WARNING</b>
<b>Protective conductor terminal</b> The required cable is min. AGW16 or 1.5 Cu.
<b>⚠ WARNING</b>
<b>Wire insulation</b> For field wiring installation: Ensure that the national requirements of the country in which the flowmeters are installed is met.

## 5.2 Remote installation

---

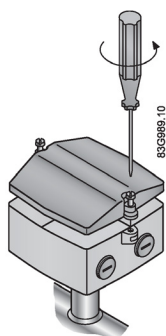
### Note

#### Remote installation only

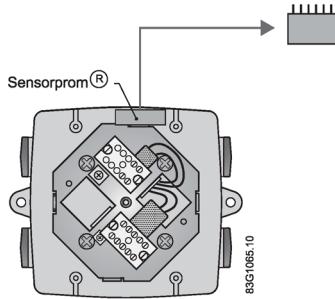
The following applies to remote installation of MAG 5000 / 6000 or MAG 6000 I.

---

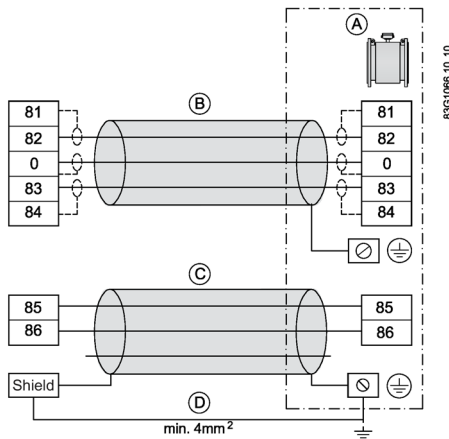
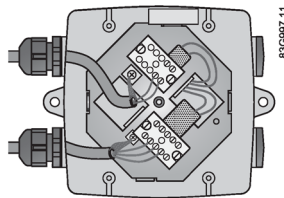
1. Unscrew and remove terminal box lid.




- Remove SENSORPROM® unit from sensor and mount it on connection plate in transmitter, see relevant transmitter operating instructions.



- Fit the ½" NPT or M20 cable glands for supply and output cables.
- Fit and connect electrode and coil cables as shown below.



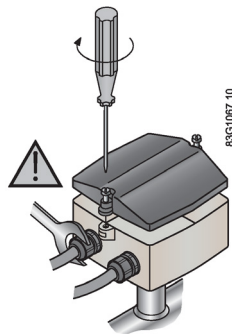
- A Sensor
- B Electrode cable
- C Coil cable
- D Only required for ATEX applications

 <b>CAUTION</b>
<b>Unscreened cable ends</b> Keep unscreened cable ends as short as possible.

<b>⚠ CAUTION</b>
<b>Prevent interference</b> Separate electrode and coil cables to prevent interference.

<b>⚠ WARNING</b>
<b>Use in hazardous area</b> Connect mains protective earth to the PE terminal in accordance with the above diagram in order to obtain potential equalization.

5. Tighten cable glands well to obtain optimum sealing.



<b>⚠ WARNING</b>
Mount terminal box lid before power up.

## 5.3 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 chapter 4 Installing/mounting (Page 19).

## 5.4 Potting

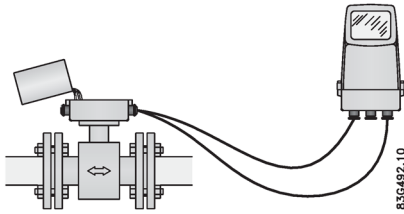
The sensor can be potted with silicon dielectric gel (non-toxic, transparent and self-healing gel)

### NOTICE

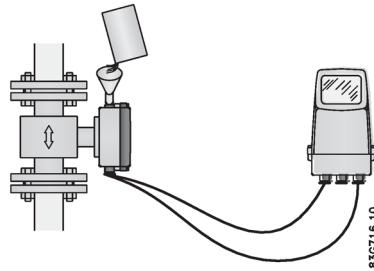
#### Electrical connections

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

### 6.1 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

<b>NOTICE</b>
Repair and service must be carried out by Siemens authorized personnel only.

**Note**

Siemens defines flow sensors as non-repairable products.

### 6.2 Recalibration

Siemens A/S Flow Instruments offers to recalibrate the sensor. The following calibration is offered:

- Standard matched pair calibration
- Customer-specified calibration up to 10 points
- Customer-witnessed calibration

**Note**

For recalibration the memory unit must always be returned with the sensor.

### 6.3 Unit repair

<b>NOTICE</b>
Repair and service must be carried out by Siemens authorized personnel only.

**Note**

Siemens defines flow sensors as non-repairable products.

## 6.4 Technical support

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

- Via the Internet using the **Support Request:**  
Auto hotspot
- Via Phone:
  - Europe: +49 (0)911 895 7222
  - America: +1 423 262 5710
  - Asia-Pacific: +86 10 6475 7575

Further information about our technical support is available on the Internet at Auto hotspot

### Service & Support on the Internet

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

Auto hotspot

There you will find:

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

### Additional Support

Please contact your local Siemens representative and offices if you have additional questions about the device.

Find your local contact partner at: <http://www.automation.siemens.com/partner>

### See also

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

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

Technical support (<http://support.automation.siemens.com/WW/view/en/16604318>)

Support request (<http://www.siemens.com/automation/support-request>)

## 6.5 Return procedures

Enclose the delivery note, the cover note for return delivery and the declaration of decontamination form on the outside of the package in a well-fastened clear document pouch.

### Required forms

- **Delivery Note**
- **Cover Note for Return Delivery** with the following information
  - Cover note (<http://support.automation.siemens.com/WW/view/en/16604370>)
    - product (ordering number)
    - number of devices or spare parts returned
    - reason for the return
- **Declaration of Decontamination**
  - Declaration of Decontamination ([http://pia.khe.siemens.com/efiles/feldg/files/Service/declaration\\_of\\_decontamination\\_en.pdf](http://pia.khe.siemens.com/efiles/feldg/files/Service/declaration_of_decontamination_en.pdf))
  - With this declaration you certify *that the returned products/spare parts have been carefully cleaned and are free from any residues.*
  - If the device has been operated together with toxic, caustic, flammable or water-damaging products, clean the device before return by rinsing or neutralizing. Ensure that all cavities are free from dangerous substances. Then, double-check the device to ensure the cleaning is completed.
  - We shall not service a device or spare part unless the declaration of decontamination confirms proper decontamination of the device or spare part. Shipments without a declaration of decontamination shall be cleaned professionally at your expense before further proceeding.

You can find the forms on the Internet and on the CD delivered with the device.

## 6.6 Disposal



In accordance with EU directive 2002/96/EC, it is not allowed to dispose of the device using municipal waste disposal services.

Exact instructions on how to dispose of the device can be found in the disposal declaration of the device. Contact your local Siemens contact (<http://www.automation.siemens.com/partner>) for further information

Alternatively Siemens Flow Instruments will accept back and dispose of the old instrument at no cost. Follow the return procedures of Siemens Flow Instruments described in chapter: Return procedures (Page 37)





# Troubleshooting

## 7.1 Improving the application

The first step in the troubleshooting procedure is to check for some easily resolved problems.

Check that:

- Sensor and SENSORPROM unit correspond (serial numbers)
- The sensor is properly installed.
- The sensor is located in a vibration-free position. Vibrations can disturb the sensor and therefore cause measurement error.
- The sensor is filled with liquid and liquid only. Air or gas bubbles in the liquid cause instability and can result in measurement errors.

---

### Note

The liquid must be homogeneous in order to achieve high-accuracy measurements. If the liquid contains solid particles of greater density than the liquid, then these solids can precipitate, especially at low flow rates, which will cause instability in the sensor and lead to measurement errors.

---

### Resolving problems

1. Make sure that the serial numbers on the sensor and the SENSORPROM® unit are identical.
2. Make sure that the sensor is installed as described in the installation chapter of the sensor Operating Instructions.
3. Flush the pipe systems and the sensor for several minutes at maximum flow rate to remove any air bubbles which may be present.

## 7.2 Sensor check

### Requirement

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

- Digital Meter/Multimeter
- 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.

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

 <b>WARNING</b>
<b>Potential hazard!</b>
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 normally 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.

---

## 7.3 Fluctuating process values

### Question

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

### Answer

There are several causes of the 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 chapter Connecting (Page 29)

---

**Note**

**Vibrating environments**

It is recommended to use special low noise cables for sensor sizes DN 2 and 3 installed in vibrating environments.

---



## Technical data

### 8.1 Process connections

Table 8- 1 Process connections

Version	MAG 1100	MAG 1100 HT
<b>Nominal size</b>		
- Ceramic	- DN 2 ... 100 (1/12" ... 4")	- DN 15 ... 100 (½" ... 4")
- PFA	- DN 10 ... 100 (3/8" ... 4")	
Mating flanges	EN 1092-1 (DIN 2501), ANSI B 16.5 class 150 and 300 or equivalent Option: DN 2 ... 10 (1/12" ... 3/8"): G½" / NPT ½" pipe connection adapters	EN 1092-1 (DIN 2501), ANSI B 16.5 class 150 and 300 or equivalent

### 8.2 Rated operating conditions

Table 8- 2 Ambient temperatures<sup>1</sup>

Version	MAG 1100	MAG 1100 HT
Standard Sensor	-40 ... +100 °C (-40 ... +212 °F)	-40 ... +100 °C (-40 ... +212 °F)
Ex Sensor	-20 ... +60 °C (-4 ... +140 °F)	-20 ... +60 °C (-4 ... +140 °F)
With compact transmitter		
MAG 5000/6000	-20 ... +60 °C (-4 ... +140 °F)	
MAG 6000 I	-20 ... +60 °C (-4 ... +140 °F)	
MAG 6000 I Ex de	-10 ... +60 °C (14 ... 140 °F)	

<sup>1</sup> Conditions also dependent on liner characteristics

Table 8- 3 Media temperature

Version	MAG 1100	MAG 1100 HT
Ceramic	-20 ... +150 °C (-4 ... +302 °F)	-20 ... +200 °C (-4 ... +392 °F)
	<i>MAG 1100 Ex</i>	<i>MAG 1100 Ex</i>
PFA	-20 ... +150 °C (-4 ... +302 °F)	-20 ... +180 °C (-4 ... +356 °F)
	-30 ... +130 °C (-20 ... +266 °F) Suitable for steam sterilization at 150 °C (302 °F)	

## 8.3 Temperature shock

Table 8- 4 Temperature shock

Version	MAG 1100	MAG 1100 HT
Ceramic Duration ≤ 1 min, followed by 10 min rest	DN 2 and 3 (1/12" and 3/8"): No limitations DN 6, 10, 15 and 25: Max ΔT ≤ 80 °C/min (1/4", 3/8", 1/2" and 1":: Max ΔT ≤ 144 °F/min) DN 40, 50 and 65: Max ΔT ≤ 70 °C/min (1 1/2", 2", and 2 1/2":: Max ΔT ≤ 126 °F/min) DN 80 and 100: Max ΔT ≤ 60 °C/min (3" and 4":: Max ΔT ≤ 108 °F/min)	DN 15 and 25: Max ΔT ≤ 80 °C/min (1/2" and 1":: Max ΔT ≤ 144 °F/min) DN 40 and 50: Max ΔT ≤ 70 °C/min (1 1/2" and 2":: Max ΔT ≤ 126 °F/min) DN 80 and 100: Max ΔT ≤ 60 °C/min (3" and 4":: Max ΔT ≤ 108 °F/min)
PFA	Max. ±100 °C (210 °F) momentarily	

Table 8- 5 Operating pressure

Version	MAG 1100	MAG 1100 HT
Ceramic	<ul style="list-style-type: none"> <li>DN 2 ... 65: 40 bar (1/12" ... 2 1/2":: 580 psi)</li> <li>DN 80: 37.5 bar (3": 540 psi)</li> <li>DN 100: 30 bar (4": 435 psi)</li> </ul> Vacuum 1 x 10 <sup>-6</sup> bar <sub>abs</sub> (1.5 x 10 <sup>-5</sup> psi <sub>abs</sub> )	<ul style="list-style-type: none"> <li>DN 2 ... 65: 40 bar (1/12" ... 2 1/2":: 580 psi)</li> <li>DN 80: 37.5 bar (3": 540 psi)</li> <li>DN 100: 30 bar (4": 435 psi)</li> </ul> Vacuum 1 x 10 <sup>-6</sup> bar <sub>abs</sub> (1.5 x 10 <sup>-5</sup> psi <sub>abs</sub> )
PFA	20 bar ... (290 psi) Vacuum 0.02 bar <sub>abs</sub> (0.3 psi <sub>abs</sub> ) DN 80 ... 100: CO <sub>2</sub> pressure max. 7 bar (101.5 psi)	

Table 8- 6 Mechanical load/Vibration

Version	MAG 1100	MAG 1100 HT
	<ul style="list-style-type: none"> <li>18 ... 1000 Hz random in x, y, z, directions for 2 hours according to EN 60068-2-36</li> <li>Sensor: 3.17 grms</li> <li>Sensor with compact MAG 5000/ 6000 mounted transmitter: 3.17 grms</li> <li>Sensor with compact MAG 6000 I/ 6000 I Ex de mounted transmitter: 1.14 grms</li> <li>For compact installation with the MAG 6000 I, transmitter to be supported to avoid tension on sensor part.</li> </ul>	<ul style="list-style-type: none"> <li>18 ... 1000 Hz random in x, y, z, directions for 2 hours according to EN 60068-2-36</li> <li>Sensor: 3.17 grms</li> </ul>

Table 8- 7 Mechanical load/Vibration

Version	MAG 1100	MAG 1100 HT
EMC	IP67 to EN 60529 (NEMA 4X), 1 mH <sub>2</sub> O for 30 min 2004/108/EC	IP67 to EN 60529 (NEMA 4X), 1 mH <sub>2</sub> O for 30 min 2004/108/EC

## 8.4 Design

Table 8- 8 Design

Version	MAG 1100	MAG 1100 HT
Weight	See dimensional drawings	
Material		
<ul style="list-style-type: none"> <li>• Enclosure                             <ul style="list-style-type: none"> <li>– MAG 1100</li> </ul> </li> </ul>	Stainless steel AISI 316L (1.4404)	Stainless steel AISI 316L (1.4404)
<ul style="list-style-type: none"> <li>• Terminal box                             <ul style="list-style-type: none"> <li>– Standard</li> <li>– Option</li> </ul> </li> </ul>	Fibre glass reinforced polyamide (not for Ex) Stainless steel AISI 316 (1.4436)	Stainless steel AISI 316 (1.4436)
<ul style="list-style-type: none"> <li>• Fixing studs</li> </ul>	Stainless steel AISI 304 (1.4301), Number and size to EN 1092-1:2001	Stainless steel AISI 304 (1.4301), Number and size to EN 1092-1:2001
<ul style="list-style-type: none"> <li>• Gaskets                             <ul style="list-style-type: none"> <li>- Standard</li> <li>- Option</li> </ul> </li> </ul>	EPDM (max. 150 °C, PN 40 (max. 300 °F, 600 psi))  Graphite (max. 200 °C, PN 40 (max. 390 °F, 600 psi)) PTFE (max. 130 °C, PN 25 (max. 270 °F, 300 psi))	Graphite (max. 200 °C, PN 40 (max. 390 °F, 600 psi))
<ul style="list-style-type: none"> <li>• Pipe connection adapt-ers: DN 2, 3, 6 and 10 (1/12", 1/8", ¼" and 3/8")</li> </ul>	<ul style="list-style-type: none"> <li>• Stainless steel</li> <li>• Hastelloy</li> <li>• PVDF</li> </ul>	

## 8.5 Liner

Table 8- 9 Liner

Version	MAG 1100	MAG 1100 HT
Ceramic	DN 2 and 3 (1/12" and 1/8"): Zirconium oxide (ZrO <sub>2</sub> ) (ceramic) DN 6 ... 100 (¼" ... 4"): Aluminum oxide Al <sub>2</sub> O <sub>3</sub>	DN 15 ... 100 (½" ... 4"): Aluminum oxide Al <sub>2</sub> O <sub>3</sub>
PFA	Reinforced PFA (not for Ex)	

## 8.6 Electrodes

Table 8- 10 Electrodes

Version	MAG 1100	MAG 1100 HT
Ceramic	DN 10 ... 100 (3/8" ... 4") : Platinum with gold / Titanium brazing alloy	Platinum with gold / Titanium brazing alloy
	DN 2 ... 6 (1/12" ... 1/4"): Platinum	
PFA	DN 10 ... 15 (3/8" ... 1/2"): Hastelloy C276	
	DN 25 ... 100 (1" ... 4"): Hastelloy C22	

## 8.7 Cable entries

Table 8- 11 Cable entries

Version	MAG 1100	MAG 1100 HT
	<ul style="list-style-type: none"> <li>• Remote installation 2 x M20 or 2 x 1/2" NPT</li> <li>• Compact installation</li> <li>• MAG 5000/MAG 6000: 4 x M20 or 4 x 1/2" NPT</li> <li>• MAG 6000 I: 2 x M25 (for supply/output)</li> <li>• MAG 6000 I Ex de: 2 x M25 (for supply/output)</li> </ul>	Remote installation 2 x M20 or 2 x 1/2" NPT



## 8.8 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.

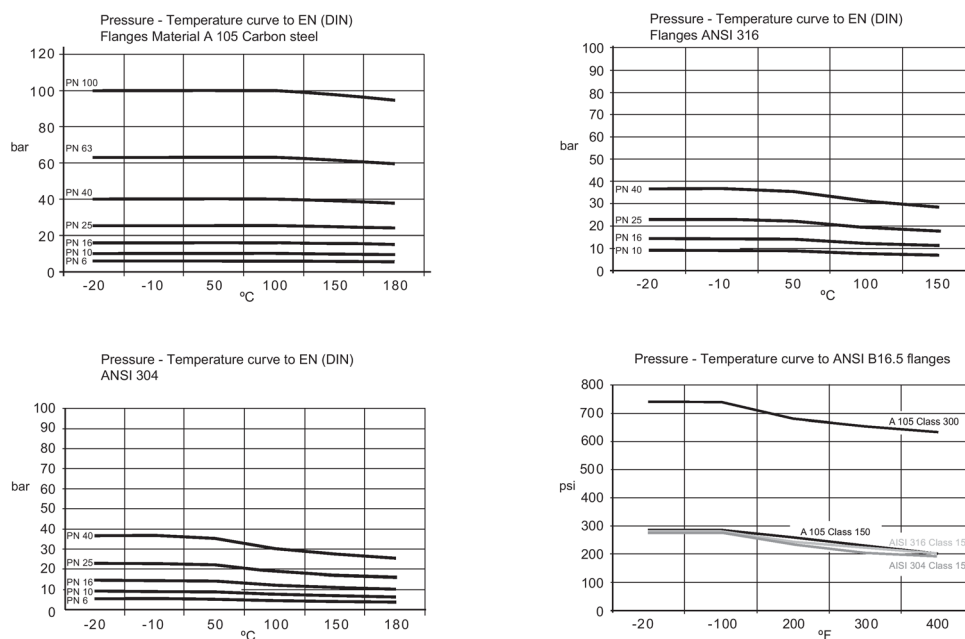


Table 8- 12 Metric measures (pressure in bar) - Sizes 25 mm, 40 mm and >300 mm

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

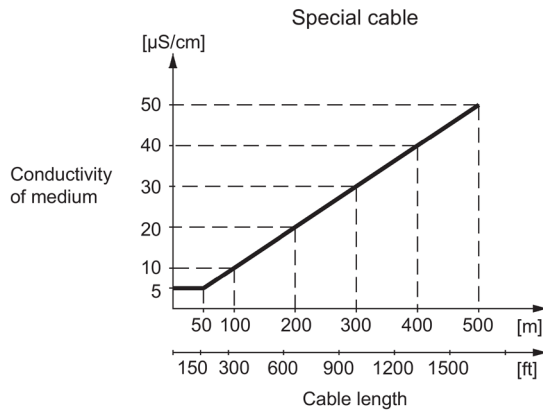
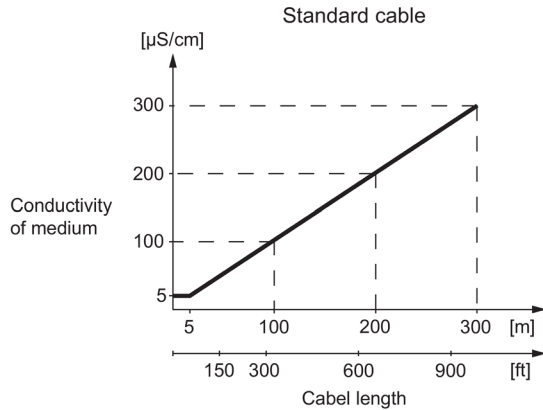
Flange specifications	Flange rating	Temperature (°F)			
		23	50	120	200
EN 1092-1	PN 10	145	145	141	136
	PN 16	232	232	225	219
	PN 40	580	580	561	547
ANSI B16.5	150 lb	286	286	280	261
AWWA C-207	Class D	150	150	150	150

## 8.9 Process fluid conductivity

### Compact installation

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

### Remote installation



#### **WARNING**

For detection of empty sensor the min. conductivity must always be  $>50 \mu\text{S/cm}$  and the max. length of the electrode cable when remote mounted is 50 meters (164 ft). Special cable must be used!

For 19" Ex applications with safety barriers special cable cannot be used and the empty pipe function can therefore not be used. For these applications 25 meters (82 ft) of cable can be used in order to obtain 0.2% and 50 meters (164 ft) to obtain 0.4%.

For remote MID installations the max. cable length is 3 meters (9.8 ft). For other CT application standard requirements are applicable.

## 8.10 Dimensions and weight

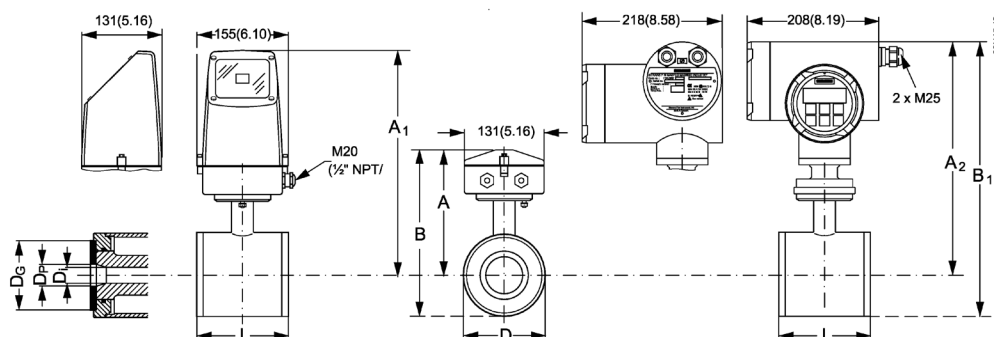


Table 8- 14 Dimensions

Nominal size		A <sup>1)</sup>		A <sub>1</sub> /A <sub>2</sub> <sup>8)</sup>		B		D <sub>1</sub>	
mm	inch	mm	inch	mm	inch	mm	inch	mm	inch
2	1½	161	6.34	315	12.40	186	7.33	2	0.08
3	1/8	161	6.34	315	12.40	186	7.33	3	0.12
6	¼	161	6.34	315	12.40	186	7.33	6	0.24
10	3/8	161	6.34	315	12.40	186	7.33	10	0.39
15	½	161	6.34	315	12.40	186	7.33	15	0.59
25	1	169	6.66	323	12.72	201	7.92	25	0.98
40	1½	179	7.05	333	13.11	221	8.70	40	1.57
50	2	188	7.40	342	13.47	239	9.41	50	1.97
65	2½	198	7.80	351	13.82	258	10.16	65	2.56
80	3	204	8.03	357	14.06	270	10.63	80	3.15
100	4	217	8.54	370	14.57	296	11.65	100	3.94

1) 14.5 mm shorter with AISI terminal box (Ex and high temperature version)

8) A<sub>2</sub> is 3 mm shorter than A<sub>1</sub>

Table 8- 15 Built-in lengths

Nominal size		L <sup>2)</sup>									
		EN 1092-1-201									
		EPDM		Graphite		PTFE (Teflon)		Without gasket		PN 63	
mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch
15	½	-	-	-	-	-	-	200	7.9	-	-
25	1	-	-	-	-	-	-	200	7.9	-	-
40	1½	-	-	-	-	-	-	200	7.9	-	-
50	2	-	-	-	-	-	-	200	7.9	276	10.9
65	2½	200	7.9	200 / -	7.9/ -	-	-	200	7.9	320	12.6
80	3	200	7.9	200 / -	7.9/ -	-	-	272	10.8	323	12.8
100	4	250	9.8	250/ -	9.8/ -	-	-	250	9.9	380	15.0

2) When earthing flanges are used, the thickness of the earthing flange must be added to the built-in length

## 8.11 Certificates and approvals

Table 8- 16 Certificates and approvals

Version	MAG 1100	MAG 1100 HT
Calibration Standard production calibration, calibration report shipped with sensor	Zero-point, 2 x 25 % and 2 x 90 %	Zero-point, 2 x 25 % and 2 x 90 %
Conforms to	PED – 97/23/EC and CRN (PFA)	PED – 97/23/EC and CRN (PFA)
Ex approvals		
Ceramic		
<ul style="list-style-type: none"> <li>Ex sensor or Compact with MAG 6000 I Ex</li> </ul>	ATEX 2G D sensor Ex de ia IIB T3 - T6	ATEX 2G D sensor Ex de ia IIB T3 - T6
<ul style="list-style-type: none"> <li>Sensor with/without MAG 5000/6000/6000 I</li> </ul>	FM Class 1, Div 2	FM Class 1, Div 2
PFA		
<ul style="list-style-type: none"> <li>Sensor with/without MAG 5000/6000/6000 I</li> </ul>	FM Class 1, Div 2	
Custody transfer approval (MAG 5000/6000 CT)	<ul style="list-style-type: none"> <li>Cold water pattern approval PTB (Germany)</li> <li>Hot water pattern approval PTB (Germany)</li> <li>Heat meter pattern approval - OIML R 75 (Denmark)</li> <li>Other media than water pattern ap- proval - OIML R 117  (Ceramic liner) (Denmark)</li> </ul>	<ul style="list-style-type: none"> <li>Hot water pattern approval PTB (Germa- ny)</li> <li>Heat meter pattern approval - OIML R 75 (Denmark)</li> </ul>

## Appendix

### A.1 Factory settings

#### Dimension-dependent factory settings

Table A- 1 50 Hz version

DN		Qmax			Unit	Volume/ pulse	Pulse unit	Totalizer unit
mm	Inch	Fac. set- tings	Min.	Max.				
2	1/12	<b>30</b>	3.9	156	l/h	0.1	ml	ml
3	1/8	<b>70</b>	6.3	254	l/h	0.1	ml	ml
6	¼	<b>300</b>	25.4	1017	l/h	1	l	l
10	3/8	<b>900</b>	70.6	2827	l/h	1	l	l
15	½	<b>2000</b>	159	6361	l/h	1	l	l
25	1	<b>5000</b>	441	17671	l/h	10	l	l
40	1½	<b>12</b>	1.1	45	m³/h	10	l	l
50	2	<b>20</b>	1.7	70	m³/h	10	l	l
65	2½	<b>30</b>	2.9	119	m³/h	100	l	l
80	3	<b>50</b>	4.5	180	m³/h	100	l	l
100	4	<b>120</b>	7	282	m³/h	100	l	l

Table A- 2 60 Hz version

DN		Qmax			Unit	Volume/ pulse	Pulse unit	Totalizer unit
mm	Inch	Fac. set- tings	Min.	Max.				
	1/12	0.13	0.01717	0.68	US GPM	1	US G	US G
	1/8	0.31	0.02801	1.12	US GPM	1	US G	US G
	¼	1.3	0.11	4.4	US GPM	1	US G	US G
	3/8	4	0.31	12.4	US GPM	1	US G	US G
15	½	9	0.7	28.0	US GPM	1	US G	US G
25	1	<b>22</b>	1.9	77.8	US GPM	1	US G	US G
40	1½	<b>52</b>	4.9	199.1	US GPM	1	US G	US G
50	2	<b>88</b>	7.7	311.2	US GPM	1	US G	US G
65	2½	<b>132</b>	13.1	525.9	US GPM	1	US G	US G
80	3	<b>220</b>	19.9	796.7	US GPM	1	US G	US MG
100	4	<b>528</b>	31.1	1244.8	US GPM	1	US G	US MG

## Dimension-dependent batch and pulse output settings

Table A-3 50 Hz version

DN		Qmax	
mm	Inch	Min.	Max.
2	1/12	-	-
3	1/8	-	-
6	¼	-	-
10	3/8	-	-
15	½	-	-
25	1	409 µl	10.7 m <sup>3</sup>
40	1½	1.05 ml	27.5 m <sup>3</sup>
50	2	1.46 ml	42.9 m <sup>3</sup>
65	2½	2.31 ml	72.5 m <sup>3</sup>
80	3	3.71 ml	110 m <sup>3</sup>
100	4	5.79 ml	172 m <sup>3</sup>

Table A-4 60 Hz version

DN		Qmax	
mm	Inch	Min.	Max.
2	1/12	0.00000095	25
3	1/8	0.00000156	41
6	¼	0.00000622	163
10	3/8	0.00001729	453
15	½	0.0000389	1019
25	1	0.000108	2833
40	1½	0.000277	7252
50	2	0.000433	11331
65	2½	0.000730	19149
80	3	0.00111	29007
100	4	0.00173	45325

## A.2 Coil resistance

Table A- 5 Coil resistance [ $\Omega$ ]

DN	Inch	MAG 1100, MAG 1100F	
		Resistance	Tolerance
2	1/12	104	+/- 5
3	1/8	104	+/- 5
6	1/4	99	+/- 17
10	3/8	99	+/- 17
15 <sup>1)</sup>	1/2	91	+/- 9
25	1	91	+/- 17
40	1 1/2	91	+/- 9
50	2	91	+/- 9
65	2 1/2	99	+/- 17
80	3	91	+/- 17

1) On MAG 1100 DN 15 produced as from May 1999 the coil resistance must be 86 ohm, +8/-4 ohm.

---

### Note

#### Reference values

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

## A.3 Ordering

Ensure that your ordering data is not outdated. The latest ordering data is always available on the Internet: Catalog process instrumentation

(<http://www.siemens.com/processinstrumentation/catalogs>)





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## For more information

[www.siemens.com/flow](http://www.siemens.com/flow)

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