# SIEMENS

## SITRANS F

## Electromagnetic flowmeters SITRANS FM MAG 8000 Battery-operated water meter

Operating Instructions

7ME681. MAG 8000
7ME682. MAG 8000 CT

**08/2022**
A5E03071515-AL

## 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 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.

# Table of contents

# Introduction

# 1

## 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 the device, connecting it electronically, configuring the parameters and commissioning it, 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 |
|---------|---------|
| 04/2022 | • Update for software version 3.13/device revision 16 |
| 10/2021 | •  Correction of torque values |
| 09/2021 | • Update for software version 3.12 |
| 03/2020 | • Corrections regarding pulse B output |
| 02/2020 | • Update for software version 3.11/device revision 15 |
| 07/2019 | • MAG 8000 Irrigation discontinued and removed |
| 11/2018 | • Update for software version 3.09<br>• Technical data and Appendix C.2 updated |
| 05/2014 | • NMI M 10 approval for MAG 8000 Irrigation |
| 10/2012 | • Primary operation software changed from Flow Tool to PDM (Flow Tool moved to appendix)<br>• Qualification Certificate functionality added |
| 03/2010 | • Integration of MAG 8000 for irrigation applications<br>• Restructuring of the document |

## 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 F M MAG 8000 Standard, MAG 8000 CT
- Siemens Process Instrumentation documentation disk containing certificates, and manuals
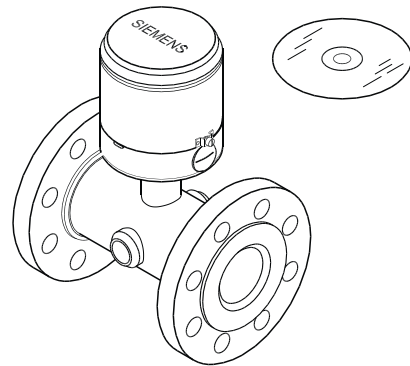


**Note**

Scope of delivery may vary, depending on version and add-ons. Make sure the scope of delivery and the information on the nameplate correspond to your order and the delivery note.

## 1.5 Security information

Siemens provides products and solutions with industrial security 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 security 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 security measures that may be implemented, please visit
https://www.siemens.com/industrialsecurity.

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 Security RSS Feed under
https://www.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 93).

## 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 General safety instructions

> ⚠️ **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.

## 2.2 Laws and directives

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

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

Further provisions for hazardous area applications are for example:

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

## 2.3 Conformity with European directives

The CE marking on the device symbolizes the conformity with the following European directives:

| | |
|---|---|
| Electromagnetic compatibility EMC 2014/30/EU | Directive of the European Parliament and of the Council on the harmonisation of the laws of the Member States relating to electromagnetic compatibility |
| Low voltage directive LVD 2014/35/EU | Directive of the European Parliament and of the Council on the harmonisation of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits |
| Pressure equipment directive PED 2014/68/EU | Directive of the European Parliament and of the Council on the harmonisation of the laws of the Member States relating to the making available on the market of pressure equipment |

| | |
|---|---|
| RED 2014/53/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 radio equipment and repealing Directive 1999/5/EC |
| Measuring instruments directive MID 2014/32/EU | Directive of the European Parliament and the Council on the harmonisation of the laws of the Member States relating to the making available on the market of measuring instruments |
| 2011/65/EU RoHS | Directive of the European Parliament and the Council on the restriction of the use of certain hazardous substances in electrical and electronic equipment |

The applicable directives can be found in the EU declaration of conformity of the specific device.

## 2.4      Lithium batteries

Lithium batteries are primary power sources with high energy content designed to provide the highest possible degree of safety.

---

### ⚠ WARNING

**Potential hazard**

Lithium batteries may present a potential hazard if they are abused electrically or mechanically. Observe the following precautions when handling and using lithium batteries:

- Do not short-circuit, recharge or connect with false polarity.
- Do not expose to temperatures beyond the specified temperature range.
- Do not incinerate.
- Do not crush, puncture or open cells or disassemble.
- Do not weld or solder to the battery's body.
- Do not expose contents to water.

---

This device is not approved for use in hazardous areas.

# Description

<div align="right">

# 3

</div>

## 3.1 System components

A SITRANS F M MAG 8000 water meter system includes:

- A transmitter and a sensor. The transmitter is either compact mounted (integral) or remote mounted at a distance of maximum 30 m (100 ft).

- An internally or externally mounted battery supply or 115 to 230 V AC or 12/24 V AC/DC power supply with battery backup.

### Communication solutions

The following communication modules are available:

- RS 232/RS 485 Modbus RTU

- Encoder interface for AMR solutions

- 3G/UMTS module

- 4G/LTE module

## 3.2 Operating principle

MAG 8000 is a microprocessor-based water meter with graphical display and key for optimum customer operation and information on site. The transmitter drives the magnetic field in the sensor, evaluates the flow signal from the sensor, and calculates the volume passing through. Its intelligent functionality, information and diagnostics ensure optimum meter performance and information to optimize water supply and billing.

MAG 8000 Standard and MAG 8000 CT can be ordered as a Basic or an Advanced version.

## 3.3 Design

MAG 8000 is a battery-supplied magnetic inductive water meter for revenue, district metering application.



Figure 3-1     MAG 8000 product program

## Compact



Figure 3-2      MAG 8000 Standard compact

## Remote



Figure 3-3      MAG 8000 Standard remote

## Custody transfer

Compact and remote versions.



Figure 3-4      MAG 8000 CT (compact version)

## SIEMENS

| | SITRANS F M MAG 8000 CT | |
|---|---|---|
| Order No.: | 7ME68205RJ031AA1 | MAWP (PS) at 0.1°C/32°F (TS): 16bar/232psi |
| | | MAWP (PS) at 50°C/122°F (TS): 16bar/232psi |
| Serial No.: | 888888H88 | T. media min.: 0.1°C/32°F |
| Size DN: 400 (16 inch.) | Lining: EPDM | T. media max.: 50°C/122°F |
| Sensor material: | ASTM A 105 | Process connection: ANSI Class 150 |
| Meter orientation | Horizontal (H) | Year of Mauf.: 2020 |
| Enclosure: | E2, M1 IP68/NEMA 6P | SW/HW V.: 3.11/15  Tamb.: -25°C to 55°C |
| Cal Factor: 8.88888888 | Fluid group: PED/L2 | Q3: 1600 m³/H  Q3/Q1: 80 |
| Supply | Lithium battery inside | |
| Certification No.: | DK-0200-MI001-011 | |
| | U3D3   **C€** M20 0200 | |

Siemens AG, DE-76181 Karlsruhe

Made in France

| ① | Product name | ⑪ | Manufacturer and place of manufacture |
|---|---|---|---|
| ② | Article number and serial number | ⑫ | Maximum allowable working pressures |
| ③ | Size and liner type | ⑬ | Process media temperature |
| ④ | Sensor material | ⑭ | Process connection |
| ⑤ | Permitted meter orientation | ⑮ | Manufacturing year |
| ⑥ | Degree of protection | ⑯ | Permitted ambient temperature |
| ⑦ | Calibration factor and fluid group | ⑰ | Dynamic range |
| ⑧ | Power supply | ⑱ | Software version and hardware version |
| ⑨ | Certification number | ⑲ | Maximum flow rate |
| ⑩ | Sensitivity class | ⑳ | Conformity with country-specific directives |

Figure 3-5    MAG 8000 CT nameplate example

## 3.4    Benefits

- Simple placement of the meter - bury the meter underground or in a floating chamber. The IP 68 (NEMA 6P) design is unaffected by meter position or in-line piping stresses, and there is no requirement for filters.

- Minimal pressure loss - an unrestricted flow tube ensures minimal pressure loss, even at the highest flow rates. Overall network system pressures can be reduced, helping to prevent leakage from burst pipes ánd excess stress placed on pumping stations. This also saves energy.

- Zero maintenance - designed without moving parts and a battery lifetime of up to 15 years.

- Measurement in both directions - only one meter required for measuring in both direction.

- Intelligent meter - only one meter for leak detection, data logger function, and self-detection of errors.

# Installing/Mounting

# 4
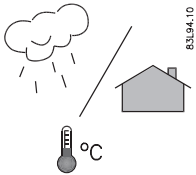
MAG 8000 water meters are suitable for indoor and outdoor installations.

• Make sure that pressure and temperature specifications indicated on the device nameplate / label are not exceeded.

### General information

This chapter describes how to install the water meter in the compact version as well as in the remote version.
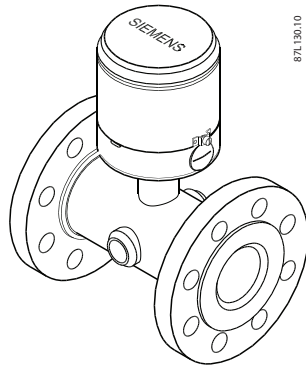
Figure 4-1        Compact installation
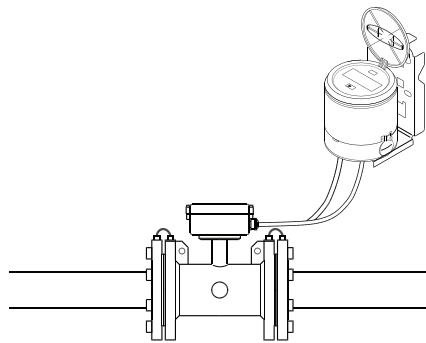
Figure 4-2        Remote installation

The installation consists of two steps:

1. Sensor installation.

2. Transmitter installation (remote version only).

# 4.1 Sensor installation

The sensor installation consists of three steps:

1. Locating the sensor (Page 18).
2. Orienting the sensor (Page 20).
3. Mounting the sensor (Page 22).

## 4.1.1 Locating the sensor

Ensure that the sensor is located in the most optimum place and no magnetic fields are present.
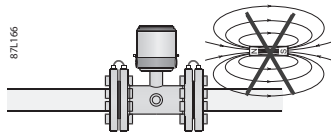


### Flow direction

Ensure that sensor is mounted in correct flow direction as indicated on label.
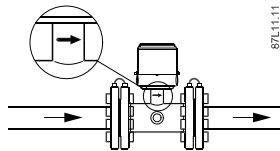


If process flow direction is opposite of flow direction indicated on sensor label, forward flow rates can be restored via parameter 327, if factor is adjusted to "-1".

MAG 8000 CT is approved for bidirectional measurement for class 2 OIML R49.



Flow direction
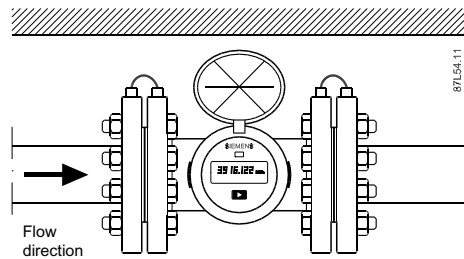
### Inlet and outlet condition

To achieve most accurate flow measurement it is essential to have certain straight inlet and outlet pipe lengths as shown ($D_i$: sensor diameter).

MAG 8000 CT is approved with OIML R49:2013 and MID for the following installations:

- DN 50 to DN 300 with 0x $D_i$ of straight pipe upstream to the sensor and 0x $D_i$ of straight pipe downstream from the sensor.

- DN 350 to DN 600 with 3x $D_i$ of straight pipe upstream to the sensor and 3x $D_i$ of straight pipe downstream from the sensor.

For optimal measurement performance, it is recommended to follow the installation guidelines for the MAG 8000 standard water meter.
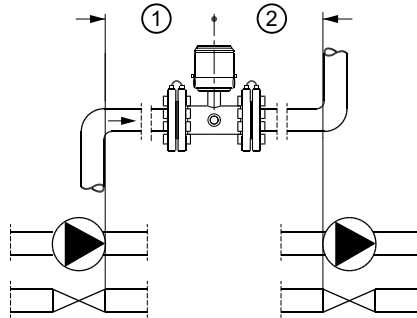


| | MAG 8000 (recommended) | MAG 8000 CT DN 50 to DN 300 | MAG 8000 CT DN 350 to DN 600 |
|---|---|---|---|
| ① Minimum straight inlet pipe length | 5x $D_i$ | 0x $D_i$ | 3x $D_i$ |
| ② Minimum straight outlet pipe length | 3x $D_i$ | 0x $D_i$ | 3x $D_i$ |

## Sensor must be completely full of liquid
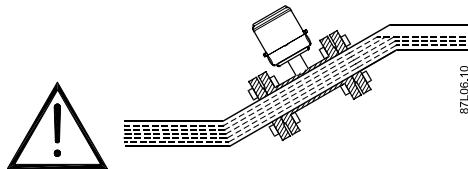
Therefore avoid:

- Air in pipe.

- Installation at the highest point in pipe system.

- Installation in vertical pipes with free outlet.
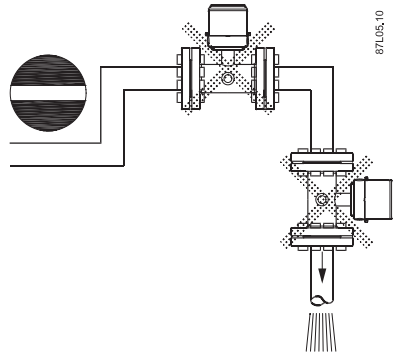


## Partially filled pipes

For partially filled pipes or pipes with downwards flow and free outlet, sensor must be mounted in a U-tube.
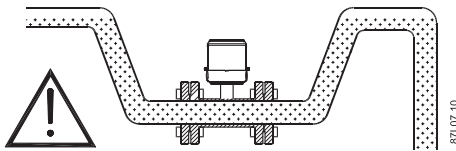


## 4.1.2 Orienting the sensor

MAG 8000 CT with OIML R49:2013 and MID approval DN 50 to DN 600 can only be installed horizontally.

## Horizontal pipes
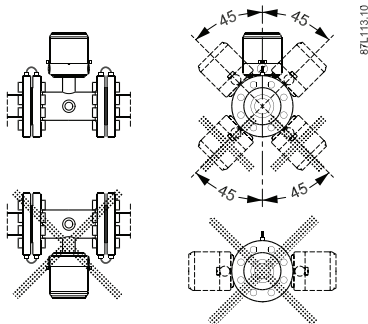
Sensor must be mounted as shown in upper part of figure. Do not mount sensor as shown in lower part of figure as electrodes then will be positioned at top where air bubbles may occur and in bottom, where mud, sludge, sand etc. may deposit and cover the electrode, thus impacting the measurement.

If "Empty Pipe Detection" is used, sensor should be tilted 45° as shown in upper right figure to maximize full pipe detection and provide accurate volume calculations.

**Note**

Physical installation of battery pack may influence battery capacity. Optimal battery capacity is achieved with battery pack in an upright position. Installation examples marked with dotted cross will affect battery capacity.

## Vertical pipes (MAG 8000)

Recommended installation is in a vertical/inclined pipe to minimize wear and deposits in sensor.
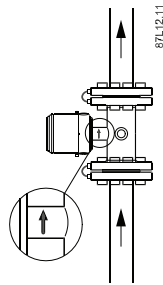


## Installation in large pipes (MAG 8000)

The water meter can be installed between two reducers (e.g. DIN 28545).
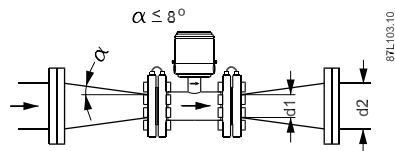


With an 8° reducer, the following pressure drop curve applies. The curves are applicable to water.
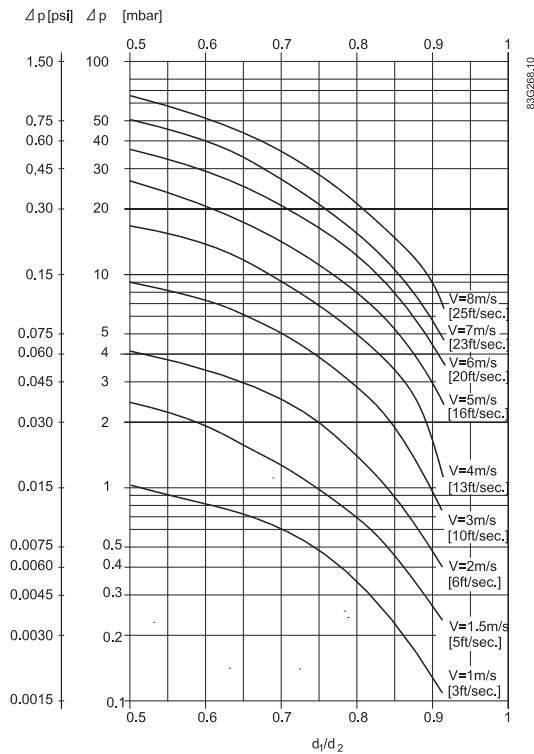
*Example:*

A flow velocity of 3 m/s (10 ft./sec.) (V) in a sensor with a diameter reduction from DN 100 to DN 80 (4" to 3") ($d_1/d_2 = 0.8$) gives a pressure drop of 2.9 mbar (0.04 psi).

### 4.1.3    Mounting the sensor

1. Install gaskets.

2. Ensure connection flange has a smooth surface and is in line with sensor.
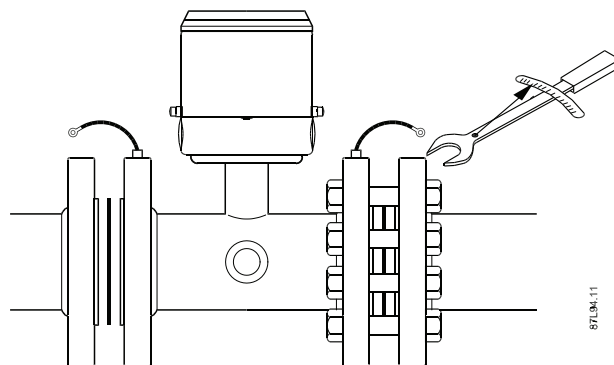


Gaskets are recommended but not included in water meter delivery.

**Advice for gasket selection:**

• Only use flat rubber gaskets.

• Thickness 1 to 6 mm (0.0 to 0.02 ft) dependent on gap/tolerance.

• Inner diameter must be larger than bore of water meter.

• Material should be compatible with process fluid.

• Hardness should be maximum 75 Shore A.

**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.
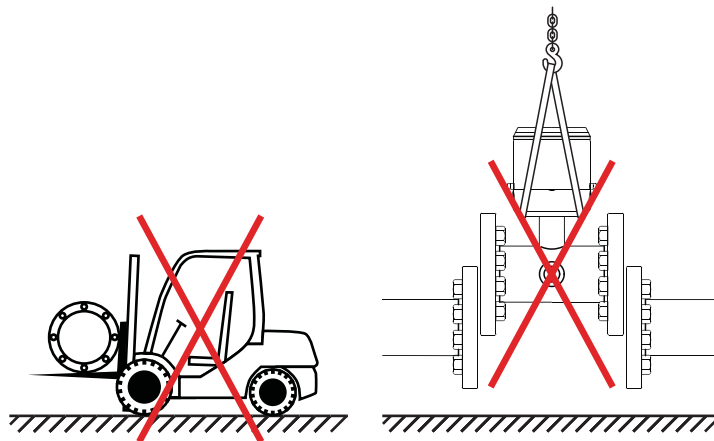
Figure 4-3    Incorrect transportation
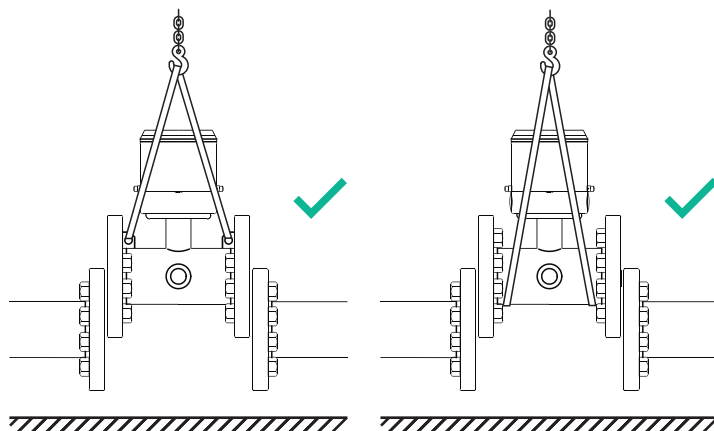
Figure 4-4    Correct transportation

## 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 water meter.
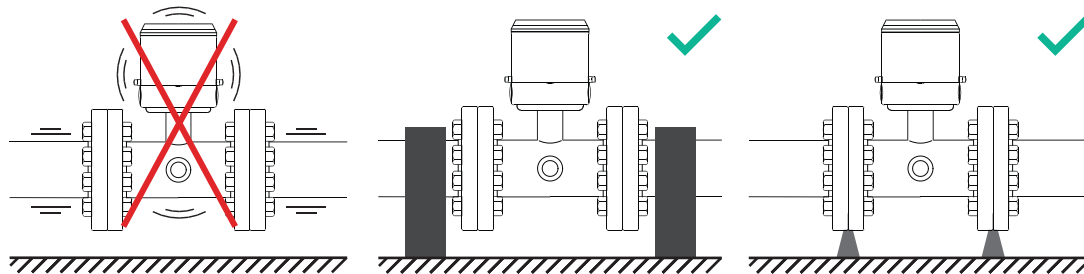


Figure 4-5        Vibration mitigation

## Maximum allowable torques

Standard bolts must be well lubricated and tightened evenly around gasket.
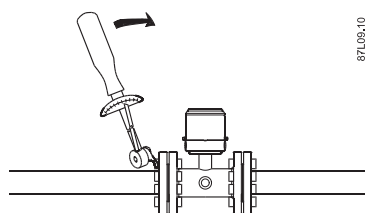


Leakage/damage to water meter or piping may arise if bolts are overtightened.

### Torque calculations

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 water meter and mating flanges.

- All bolts are galvanized and adequately lubricated.

- Flanges are made of carbon steel.

- Water meter and mating flanges are correctly aligned.

Table 4-1        Minimum and maximum torques for 7ME6810 and 7ME6820, EN 1092-1 in Nm

| Nominal size | | EN 1092-1 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | PN 10 | | PN 16 | | PN 25 | | PN 40 | |
| Liner | | EPDM | | EPDM | | EPDM | | EPDM | |
| mm | inch | Min. | Max. | Min. | Max. | Min. | Max. | Min. | Max. |
| 25 | 1 | - | - | - | - | - | - | 6.9 | 7 |
| 40 | 1 ½ | - | - | - | - | - | - | 15.0 | 16 |
| 50 | 2 | - | - | 9.2 | 10 | - | - | - | - |

| Nominal size | | EN 1092-1 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | PN 10 | | PN 16 | | PN 25 | | PN 40 | |
| Liner | | EPDM | | EPDM | | EPDM | | EPDM | |
| mm | inch | Min. | Max. | Min. | Max. | Min. | Max. | Min. | Max. |
| 65 | 2 ½ | - | - | 6.7 | 7 | - | - | - | - |
| 80 | 3 | - | - | 8.2 | 9 | - | - | - | - |
| 100 | 4 | - | - | 11.6 | 12 | - | - | - | - |
| 125 | 5 | - | - | 16.4 | 17 | - | - | - | - |
| 150 | 6 | - | - | 26.8 | 28 | - | - | - | - |
| 200 | 8 | 26.1 | 27 | 27.9 | 29 | - | - | - | - |
| 250 | 10 | 25.5 | 27 | 48.8 | 51 | - | - | - | - |
| 300 | 12 | 34.0 | 36 | 65.1 | 68 | - | - | - | - |
| 350 | 14 | 33.7 | 35 | 67.0 | 70 | 138.6 | 146 | 257.4 | 270 |
| 400 | 16 | 50.7 | 53 | 94.3 | 99 | 189.9 | 199 | 373.4 | 392 |
| 450 | 18 | 49.4 | 52 | 95.1 | 100 | 183.5 | 193 | 327.5 | 344 |
| 500 | 20 | 59.8 | 63 | 130.6 | 137 | 225.4 | 237 | 426.1 | 447 |
| 600 | 24 | 92.3 | 97 | 200.6 | 211 | 338.6 | 356 | 702.2 | 737 |
| 700 | 28 | 104.9 | 110 | 201.0 | 211 | - | - | - | - |
| 750 | 30 | - | - | - | - | - | - | - | - |
| 800 | 32 | 149.8 | 157 | 282.3 | 296 | - | - | - | - |
| 900 | 36 | 158.4 | 166 | 298.8 | 314 | - | - | - | - |
| 1000 | 40 | 210.1 | 221 | 400.6 | 421 | - | - | - | - |
| 1050 | 42 | - | - | - | - | - | - | - | - |
| 1100 | 44 | - | - | - | - | - | - | - | - |
| 1200 | 48 | 289.1 | 304 | 575.4 | 604 | - | - | - | - |

Table 4-2    Minimum and maximum torques for 7ME6810 and 7ME6820, ANSI B16.5, AWWA C-207 and AS 4087 in Nm

| Nominal size | | ANSI B16.5 | | AWWA C-207 | | AS 4087 | |
|---|---|---|---|---|---|---|---|
| | | Class 150 | | Class D | | PN 16 | |
| Liner | | EPDM | | EPDM | | EPDM | |
| mm | inch | Min. | Max. | Min. | Max. | Min. | Max. |
| 25 | 1 | 7.8 | 8 | - | - | - | - |
| 40 | 1 ½ | 12.9 | 14 | - | - | - | - |
| 50 | 2 | 11.9 | 13 | - | - | 7.5 | 8 |
| 65 | 2 ½ | 17.2 | 18 | - | - | 13.3 | 14 |
| 80 | 3 | 21.2 | 22 | - | - | 16.4 | 17 |
| 100 | 4 | 15.0 | 16 | - | - | 23.2 | 24 |
| 125 | 5 | 25.0 | 26 | - | - | - | - |
| 150 | 6 | 32.8 | 34 | - | - | 21.6 | 23 |
| 200 | 8 | 51.1 | 54 | - | - | 33.6 | 35 |
| 250 | 10 | 56.0 | 59 | - | - | 61.2 | 64 |
| 300 | 12 | 74.7 | 78 | - | - | 54.4 | 57 |

| Nominal size | | ANSI B16.5 | | AWWA C-207 | | AS 4087 | |
|---|---|---|---|---|---|---|---|
| | | Class 150 | | Class D | | PN 16 | |
| Liner | | EPDM | | EPDM | | EPDM | |
| mm | inch | Min. | Max. | Min. | Max. | Min. | Max. |
| 350 | 14 | 103.7 | 109 | - | - | 89.3 | 94 |
| 400 | 16 | 100.8 | 106 | - | - | 111.4 | 117 |
| 450 | 18 | 145.9 | 153 | - | - | 141.9 | 149 |
| 500 | 20 | 140.1 | 147 | - | - | 129.6 | 136 |
| 600 | 24 | 216.4 | 227 | - | - | 203.9 | 214 |
| 700 | 28 | - | - | 116.9 | 123 | 206.0 | 216 |
| 750 | 30 | - | - | 131.7 | 138 | - | - |
| 800 | 32 | - | - | 178.3 | 187 | 338.8 | 356 |
| 900 | 36 | - | - | 194.1 | 204 | 350.8 | 368 |
| 1000 | 40 | - | - | 212.3 | 223 | 408.5 | 429 |
| 1050 | 42 | - | - | 233.7 | 245 | - | - |
| 1100 | 44 | - | - | 230.7 | 242 | - | - |
| 1200 | 48 | - | - | 246.8 | 259 | 446.7 | 469 |

## 4.2 Potential equalization

Liquid potential equalization or grounding is accomplished with built-in grounding electrodes and/or grounding rings. The electrodes ensure electrical connection between liquid and meter providing a stable and accurate measurement.
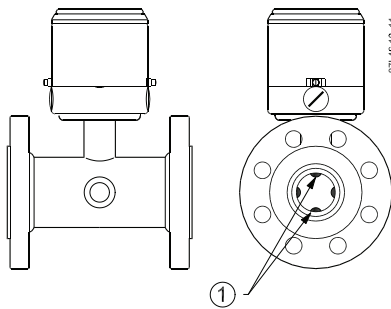


①     Built-in grounding electrode
(7ME6810 and 7ME6820)

## 4.3 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.

---

**Note**

**Grounding connector rotated by 90°**

For sensor sizes between DN 25 (1") and DN 300 (12"), the grounding connector on the sensor is rotated by 90°.

---

**Metal pipes**

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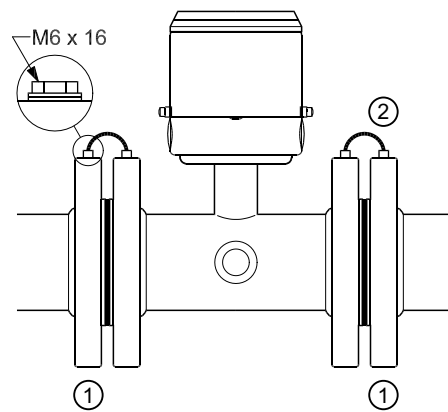


①      Metal pipes

②      Grounding straps (rotated by 90° on DN 350 to DN 1200)

Grounding straps are part of delivery and pre-mounted on water meter.

## Plastic pipes and lined metal pipes

Use optional grounding rings at both ends.
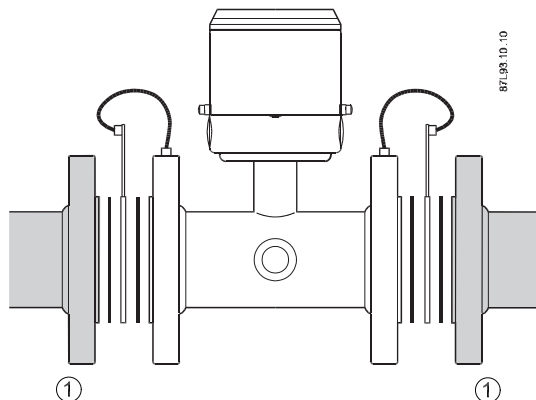


①      Plastic pipes or lined metal pipes

Grounding rings are not included in delivery.

## Combination of metal and plastic pipes

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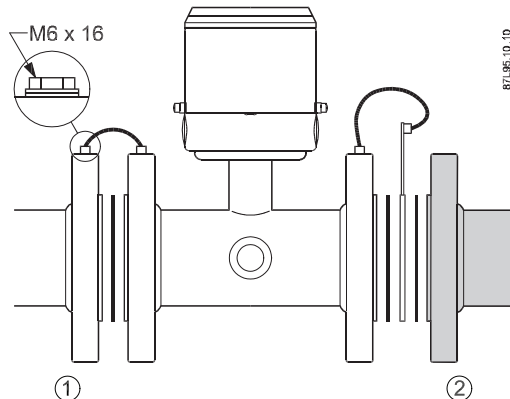


①      Metal pipe
②      Plastic pipe

Bonding/grounding straps, grounding rings and straps are not included in delivery.

---

**Note**

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

---

## 4.4 Cathodic-protected pipes

Pay special attention to meter installation in cathodic-protected pipe.
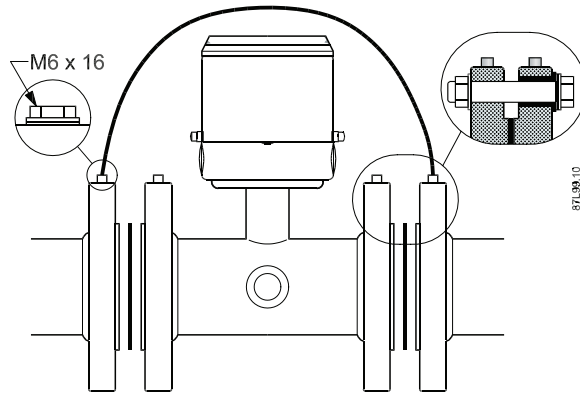


Isolate meter from pipeline by mounting isolation sleeves and washers on flange bolts and connect a wire dimensioned to manage the cathodic current and environmental influence, between pipelines.

## 4.5 Potting and direct burial

| NOTICE |
| --- |
| **Electrical connections** |
| Do **not** pot meter before electrical connections have been made. |

Meter is rated IP68/NEMA 6P from the factory as standard. If cable glands are used, IP68/NEMA 6P enclosure rating is obtained by potting transmitter bottom with Sylgard potting kit. Otherwise only an IP67/NEMA 4 rating is obtained.
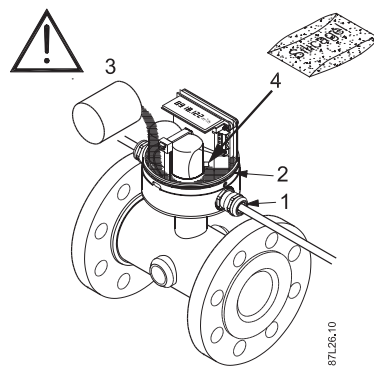


**Sealing of transmitter**

1. Select the proper gland size to fit installed cable size.

2. Mount O-ring properly and correctly and grease with gel.

3. Fill Sylgard potting kit in bottom part of casing.

4. Renew Silicagel bag (placed behind battery cup) to prevent condensation within meter, if necessary.

5. Mount the enclosure carefully and make sure not to damage the O-ring.

   **Note**

   **Potting**

   Ensure not to fill the potting kit in the space for the battery pack.

   Ensure Silicagel bag is not in contact with the potting compound.

See also Potting kit instruction (http://support.automation.siemens.com/WW/view/en/43208835).

**Direct burial of remote sensor**
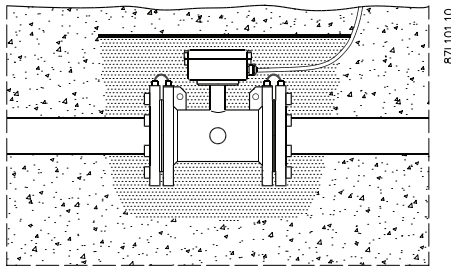


Remote sensor is protected to IP68/NEMA 6P and can be buried.

The use of pea gravel, at least 300 mm (12 inches) all around sensor, is mandatory to provide some drainage and to prevent dirt from solidifying on sensor.

It also helps to locate the sensor should excavation be necessary. Before covering pea gravel with earth, use electrical cable identification tape above gravel.

Run remote sensor cable through a plastic conduit of minimum 50 mm (2 inches).

# 4.6 Transmitter installation

Mount bracket on a wall as shown below or on a horizontal or a vertical pipe using ordinary hose clips or duct straps.

**Wall mounting**
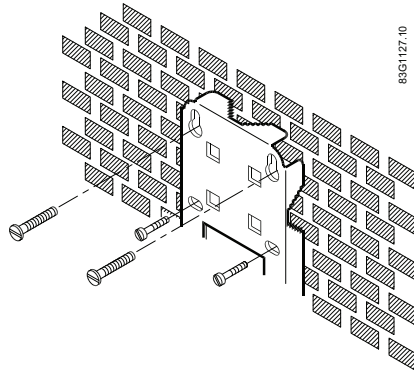


Figure 4-6     Wall mounting

**Pipe mounting**
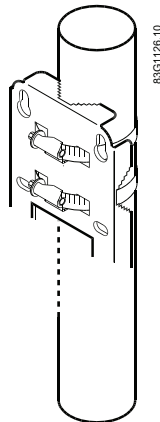


Figure 4-7     Pipe mounting - vertical
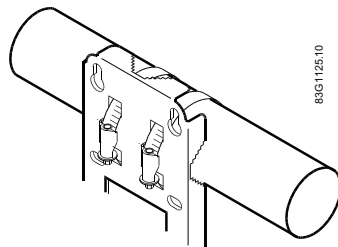


Figure 4-8     Pipe mounting - horizontal

## 4.7     MAG 8000 CT

Calibration sealing has been carried out at calibration.

## 4.7.1 Sealing of MAG 8000 CT

### 4.7.1.1 Verification sealing

---

**Note**

The verification sealing is done at factory after initial verification.

---

**Note**

**For type-approved and verified MID MAG 8000 CT products**

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

---
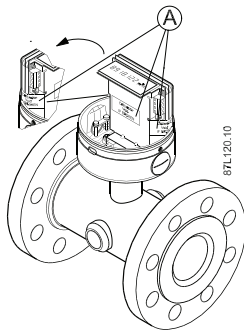


Figure 4-9     MAG 8000 CT verification sealing (A)

### 4.7.1.2 User sealing

---

**Note**

User sealing has to be done after commissioning by an authorized person.

---

1. Lead one or two wires through the sealing bolts.
2. Seal the ends of each wire.
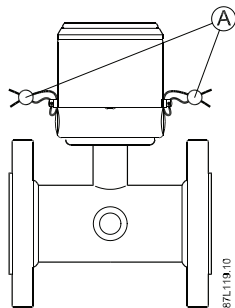
MAG 8000 CT user sealing (A) - compact          MAG 8000 CT user sealing - remote
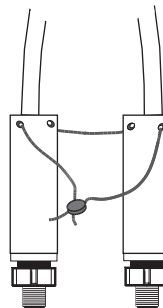
## 4.7.2 Installation conditions

### 4.7.2.1 MID option (MI-001)

MAG 8000 CT are approved for MI-001 under the following installation conditions.

- DN 50 to 300 (2" to 12") in all orientations
- DN 350 to 600 (14" to 24") only in horizontal installation

---

**Note**

**Straight pipe upstream and downstream**

- DN 50 to DN 300 requires 0x D of straight pipe upstream and downstream from the sensor.
- DN 350 to DN 600 requires 3x D of straight pipe upstream and 3x D downstream from the sensor

---

Other restrictions may apply (see certificate).

# Connecting

# 5

This chapter consists of general safety requirements as well as a description of how to connect the device.

The connection of the device is done in four steps.

1. Wiring sensor and transmitter (remote version only) (Page 37).

2. Connecting power supply (Page 38).

3. Connecting outputs (Page 40).

4. Connecting add-on module (Page 44).

**Connection diagram**
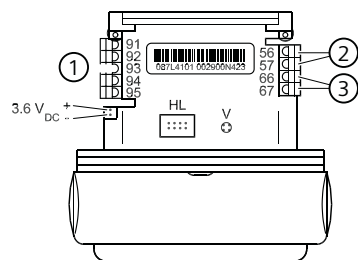


①      Module Interface (Option)

②      Output A

③      Output B

The 3.6 V DC battery connector - plug and pulse connection terminals are placed in the left side of the PCB board - see figure.

Connection for add-on interface modules is placed on the left side.

HL = Hardware lock key connection

V = Verification button (enables verification mode for 4 hours)

To configure the outputs via PDM, see "Output configuration" (Page 58).

To configure the outputs via Flow Tool, see "Output configuration" (Page 131) in the Flow Tool appendix.

## 5.1 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. 16 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. |

## 5.2        Remote version

**Remote installation**



MAG 8000 CT user sealing
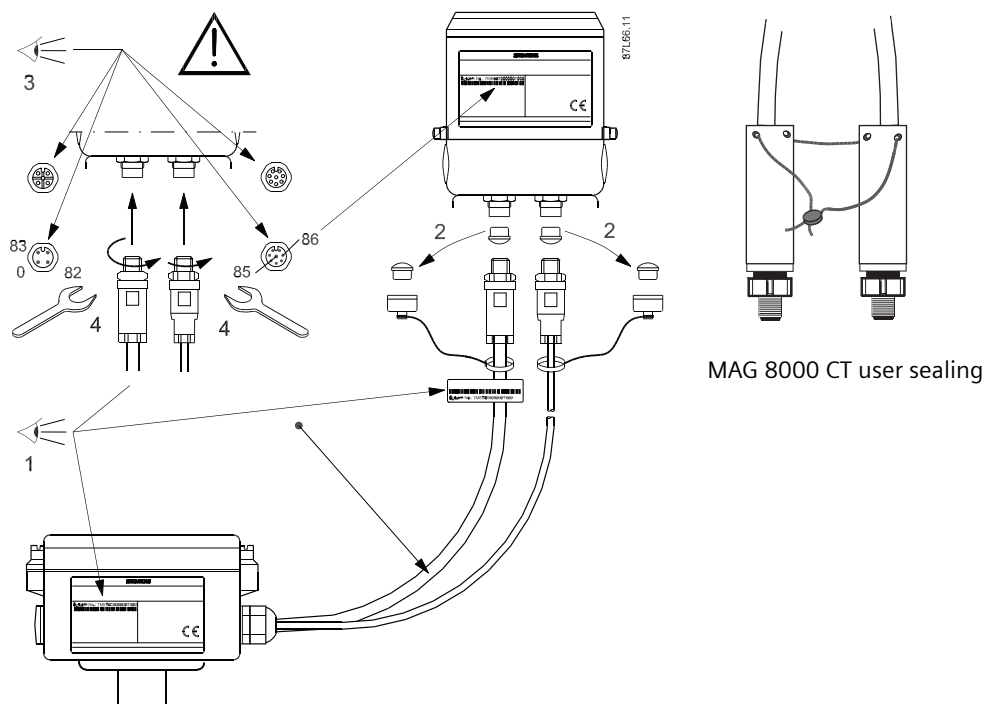
1.  Verify that model and serial numbers shown on labels of sensor and transmitter are matched properly.

2.  Ensure that cable is safely installed to avoid damage of cable and connectors. Please note the different coil and electrode connector types both having a minimum RADIUS of 45 mm (1.8 inches); otherwise there s a risk of damaging the cable. Save dust covers for future use and protection.

3.  Ensure connectors are clean.

4.  Ensure connectors are fastened securely to achieve a good connection and watertight seal.

**Note**

If dirt enters connector ends, use plain water for cleaning. Ensure connectors are completely dry before making connections.

For MAG 8000 CT user sealing, see Sealing of MAG 8000 CT (Page 32).

# 5.3 Power supply

**Connection diagram for 115 to 230 V AC (mains) or 12/24 V AC/DC (line) power supply**
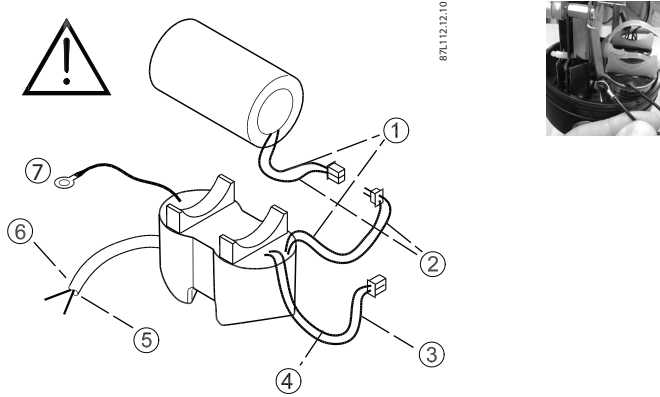


| Backup battery connection | ① | Red |
| | ② | Black |
| MAG 8000 PCB connection | ③ | Blue |
| | ④ | Yellow |
| External power supply connection | ⑤ | Blue (**N**eutral / **-**) |
| | ⑥ | Brown (**L**ine / **+**) |
| Shielding | ⑦ | Shielding wire |

It is mandatory to connect the shielding wire to the MAG 8000 device earthing; otherwise IrDA communication will not work satisfactorily.

**115 to 230 V AC (mains) power supply**

| Mains power input | Factory mounted PUR cable with 2 x 1 mm$^2$ (brown wire, blue wire) cable length = 3 m |
| --- | --- |
| | Brown wire - L (**L**ine, **+**) and blue wire - N (**N**eutral, **-**) |
| Mains power output | Battery cable socket with blue and yellow wires; blue wire is ground. Battery cable socket has to be connected to 3.6 V DC cable plug on PCB board |
| Battery backup input | Battery cable plug with black and red wires; black wire is ground. Battery cable plug has to be connected to cable socket on backup battery |
| Functional ground | Black wire with terminal must be connected to the device encapsulation with a screw |
| Mains power supply has to be connected to a switch near water meter according to IEC 61010-1 clause 5.4.3.d | |

**12/24 V AC/DC (line) power supply**

| Line power input | Factory mounted PUR cable with 2 x 1 mm$^2$ (brown wire, blue wire) cable length = 3 m |
| --- | --- |
| | Brown wire - L (line, hot, positive) and blue wire - N (neutral, cold, negative) |
| Line power output | Battery cable socket with blue and yellow wires; blue wire is ground. Battery cable socket has to be connected to 3.6 V DC cable plug on PCB board |

| Battery backup input | Battery cable plug with black and red wires; black wire is ground. Battery cable plug has to be connected to cable socket on backup battery |
|---|---|
| Functional ground | Black wire with terminal must be connected to the device encapsulation with a screw |

## Cable installation
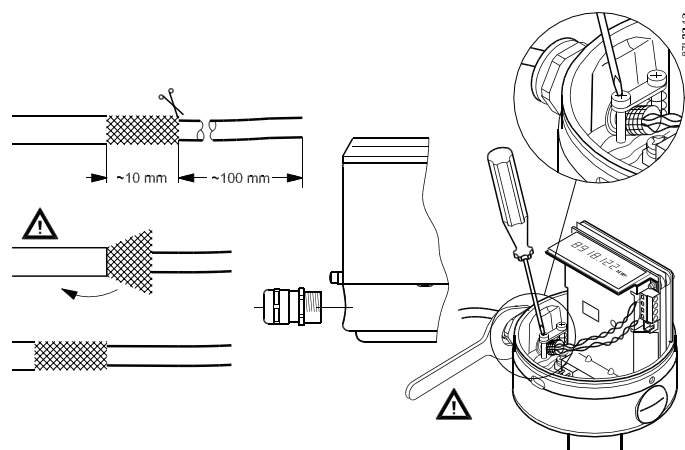


Choose the correct glands for the selected cable type, see Accessories for glands selection. Ensure shield is mounted under cable clamps - do not make pig tails.

---

**Note**

Mains or line-powered PUR cable (no shield) has to be mounted under cable clamps. All cable glands have to be sufficiently tightened to ensure IP-rating.

---

## 5.4 Outputs

**Pulse output connection diagram for MAG 8000**

| MAG 8000 internal connection | | |
|---|---|---|
|  | ① ② ③ | Output A<br>Output B<br>Passive output - no polarization - open drain |
| **External connection variant** | | |
|  | ④ ⑤ ⑥ | Positive pulse logic<br>Negative pulse logic<br>Signal |
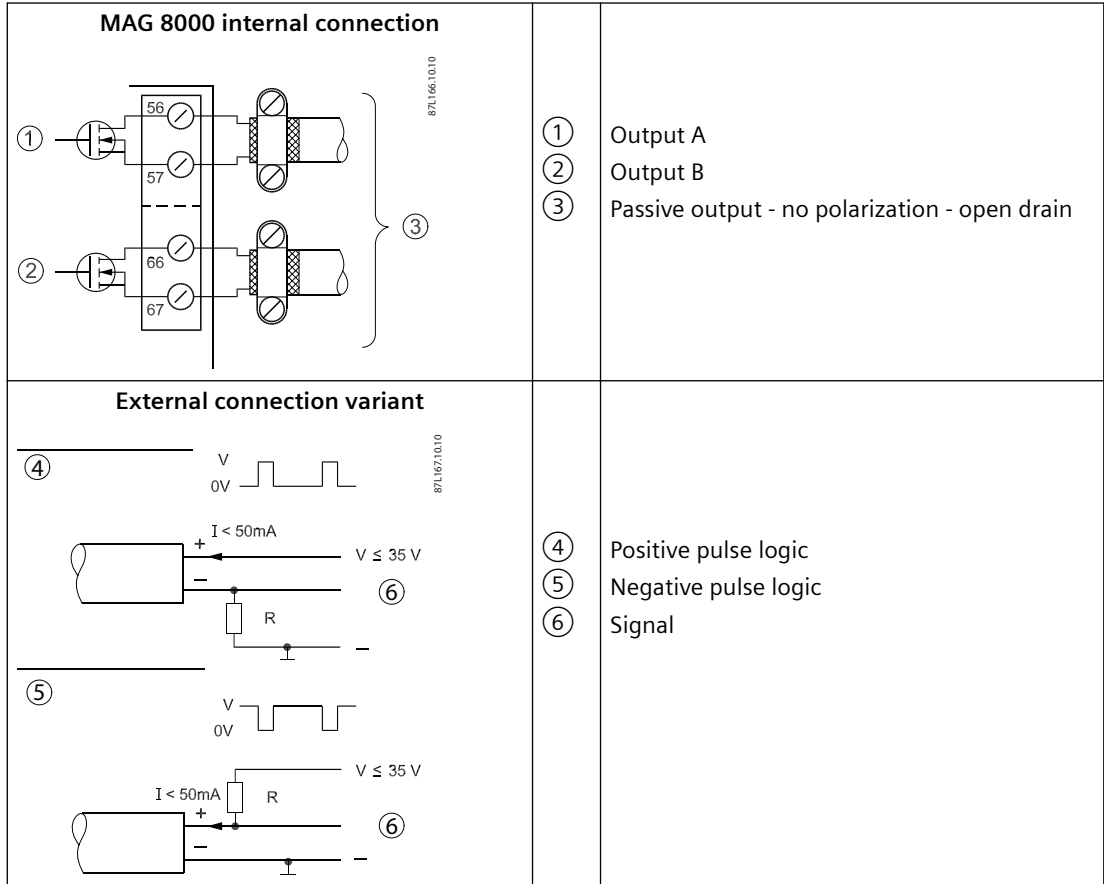
Pulse output can be configured as volume, alarm or call-up, see Commissioning (Page 58).

Pulse output is not polarized and can be connected for positive or negative logic.

Pull up/down resistor (R) is selected in relation to power supply voltage (V) and with a max. current (I) of 50 mA.

---

**Note**

**Pulse output isolation**

The MAG 8000 pulse output has a functional isolation only and must therefore be connected to equipment complying with the Low Voltage Directive in order to be considered safe.

---

**Note**

**Pulse output is not part of the MID-001 approval**

The use of the pulse output for billing purposes is only permitted if:

- The legislation in the country of use permits an ancillary device for verification required billing. The regulations are not uniform within the European Union. In some countries, the local display of the water meter is the only permitted display for use in legal metrology.
- The system consisting of the MAG 8000 CT pulse output and the pulse count of an external measured-value display is certified by the national metrological authority.
- Pulse B function is only allowed to be set to Alarm or call up in MAG 8000 CT with MID-001 approval.

## 5.5 Communication modules

**RS 232 connection diagram**
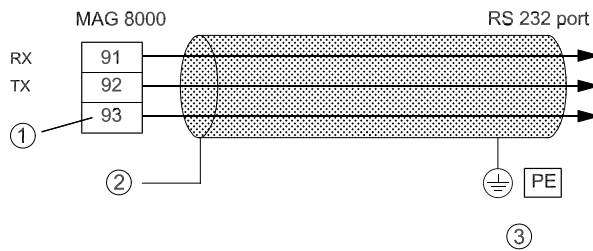


B7L109.10 .10

①      Common

②      Connect shield to encapsulation

③      Shield must be connected to protective ground
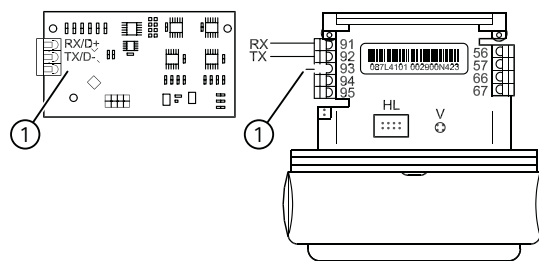


①      Common

A Modbus over serial line cable must be shielded.

At one end of each cable its shield must be connected to protective ground. If a connector is used at this end, connector shell must be connected to cable shield.

**RS 485 connection diagram**



① Common

② Connect shield to encapsulation

③ Shield must be connected to protective ground



① Common

② Termination
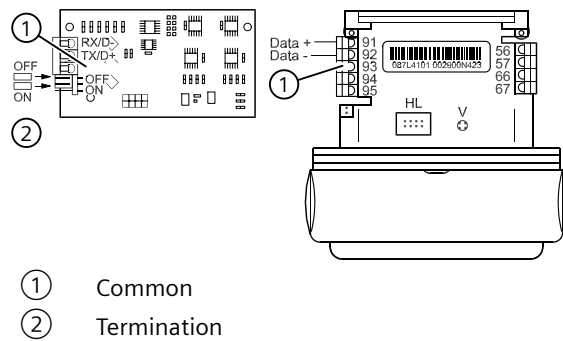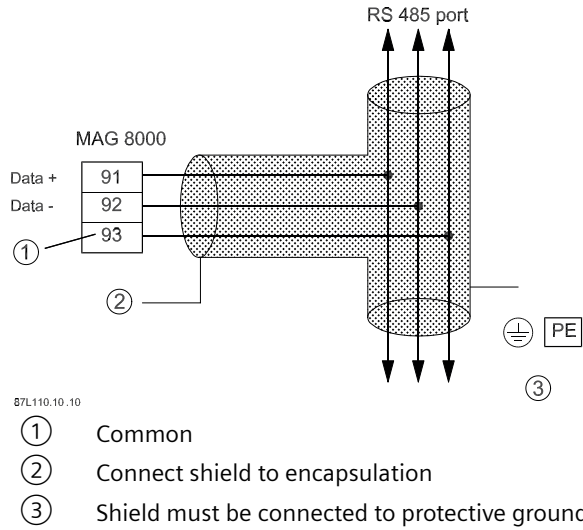
A Modbus RS 485 must use a balanced pair (for D+ - D−) and a third wire (for common).

For the balanced pair used in an RS 485 system, a characteristic impedance with a value between 100 and 120 ohms must be used.

Shield must always be connected to MAG 8000 encapsulation using cable clamp as shown in figure in section cable installation, see Power supply (Page 38).

**Bus termination:**

All RS 485-based networks must be terminated correctly to function properly. A termination must be placed at each end of segment.

The Modbus RTU module can add a 120 ohm termination if a jumper is placed beside terminals in position "ON".

Termination is set to "ON" from factory.

**Encoder interface connection diagram**



①      Black wire
②      Red wire
③      Unshielded wire
④      Endpoint
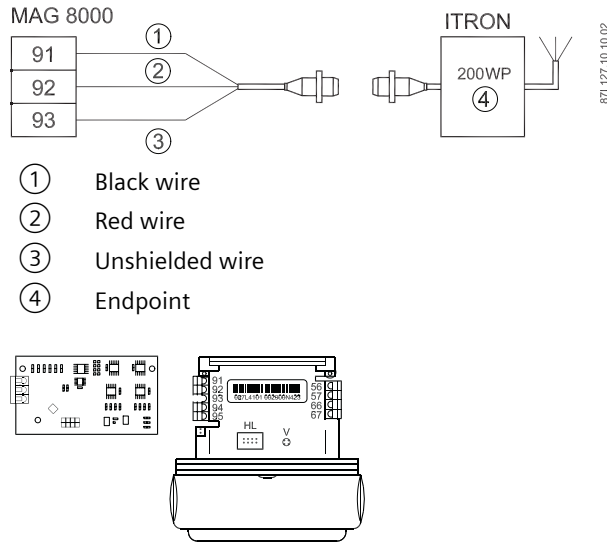


Figure 5-1      Encoder interface cable connection between MAG 8000 and ITRON 200WP with Itron cable

Connect black wire to terminal 91, red wire to terminal 92 and unshielded wire to terminal 93.

| ⚠ **WARNING** |
| --- |
| **Unshielded wire** |
| It is important that unshielded wire does not touch any metal parts of MAG 8000 housing. |

Other radio interface cable has to be a 3-wire cable with a shield connected to MAG 8000 housing (mounting cable shield is shown to the right).



①      Power clock
②      Connect shield to encapsulation
③      Radio interface
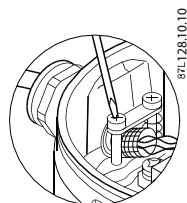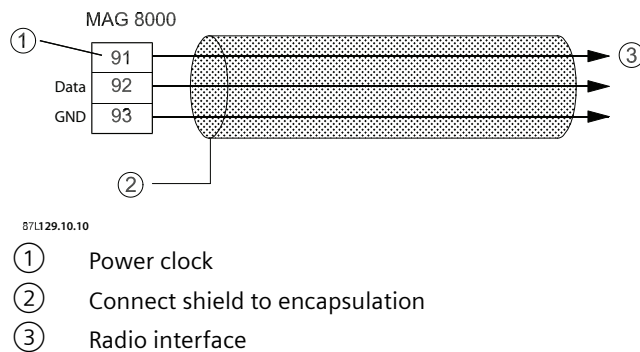
## 5.6 Connection of add-on modules

When the add-on module has been installed, the electrical connections are available on terminal rows 91-97.

**For more information**

Refer to the relevant BUS communication Quick Start or Operating Instructions available on an included DVD or on the internet, at: www.siemens.com/flowdocumentation (www.siemens.com/flowdocumentation).

**Information on the operation of communication modules**

For information on how to operate the various communication modules, see:

- 3G/UMTS add-on module Operating Instructions (https://support.industry.siemens.com/cs/ww/en/view/109751612)

- Modbus RTU Operating Instructions (http://support.automation.siemens.com/WW/view/en/54091509)

# Commissioning 6

The meter can be configured using a PC software package - either SIMATIC PDM or Flow Tool.

Both SIMATIC PDM and Flow Tool are software packages for configuring, parameterizing, commissioning and maintaining devices (e.g. transducers) and for configuring networks and PCs.

For commissioning via Flow Tool, refer to the appendix "Flow Tool" (Page 121).

## 6.1 Overview SIMATIC PDM

SIMATIC PDM (Process Device Manager) is a general-purpose, manufacturer-independent tool for the configuration, parameter assignment, commissioning, diagnostics and maintenance of intelligent field devices and field components. Follow-up installations and additional information on SIMATIC PDM are available on the Internet at SIMATIC PDM (https://www.siemens.com/simatic-pdm).

SIMATIC PDM monitors the process values, alarms and status signals of the device. It allows you to display, compare, adjust, verify, and simulate process device data; also to set schedules for calibration and maintenance.

For information on, for example, how to install and integrate devices, commission the software, see Operating Manual 'Help for SIMATIC PDM'. The manual is delivered with SIMATIC PDM software. Once the SIMATIC PDM is installed on your computer you find the manual under: Start > All programs > Siemens Automation > SIMATIC > Documentation. Link at our website: SIMATIC PDM instructions and manuals (https://support.industry.siemens.com/cs/ww/en/ps/16983/man).

---

**Note**

**Field device parameters**

- For a list of parameters and additional information, consult section "Parameter lists (Page 145)".
- The field device remains in measurement mode during the time you configure the field device.

---

## 6.2 Initial commissioning via SIMATIC PDM

### 6.2.1 Check SIMATIC PDM version

**Procedure**

1. Go to SIMATIC PDM Download ([http://www.siemens.com/simaticpdm/downloads](http://www.siemens.com/simaticpdm/downloads)).

2. Check the support page to make sure you have:

   – The latest version of SIMATIC PDM

   – The most recent Service Pack (SP)

   – The most recent hot fix (HF)

### 6.2.2 Updating the Electronic Device Description (EDD) or Field Device Integration (FDI)

**Procedure**

1. Check that the EDD or FDI revision match the Firmware revision in the device according to the table in section Document history (Page 7).

2. Go to the support page Software downloads ([https://www.siemens.com/processinstrumentation/downloads](https://www.siemens.com/processinstrumentation/downloads)).

3. Enter the product name in the field "Enter search term...".

4. Download the most current EDD or FDI of your device.

5. Save files to your computer in an easily accessed location.

6. Launch SIMATIC PDM – Device Integration Manager.
   From the File menu, click "Read device descriptions from compressed source...".

7. Browse to the compressed EDD or FDI files, select and open it.

8. Use the "Integration" function to integrate the EDD or FDI into the device catalog. The EDD or FDI is now accessible via SIMATIC Manager.

This chapter describes how to install the PDM device driver (EDD). The newest EDD driver is available on the internet ([http://support.automation.siemens.com/WW/view/en/19701862/133100](http://support.automation.siemens.com/WW/view/en/19701862/133100)).

The PDM device driver (EDD) is compatible with PDM 6, PDM 8 and PDM 9.

Install the EDD files from SIMATIC PDM "Manage Device Catalog" via the following steps:

Windows START menu → program folder "SIMATIC" → SIMATIC PDM → Manage device catalog.
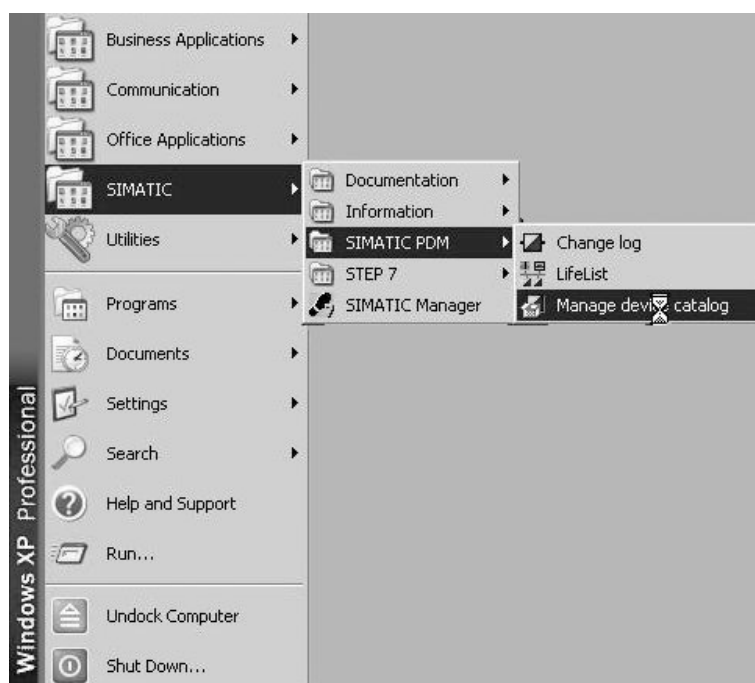
In the SIMATIC PDM "Manage Device Catalog" window, click on **"**Browse" and navigate to the driver and the path where the file was downloaded and saved. The PDM will show a tree with the Software options. Click on the "Siemens" checkbox to select all options.

Click OK to install the new EDD files.
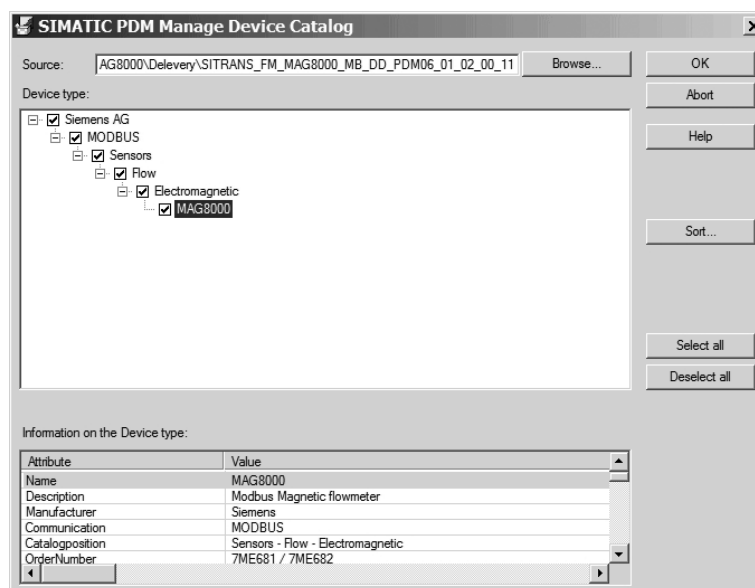
### 6.2.3    Configuring the device

This chapter describes how to set up the meter for communication with the PC. The options in both SIMATIC PDM and Flow Tool software are the same; only the views on the PC screen differ.

**Setting up meter**

1. Click on "File".

2. Select "New".

3. Assign a new project name in the "Name" box, e.g. MAG8000.
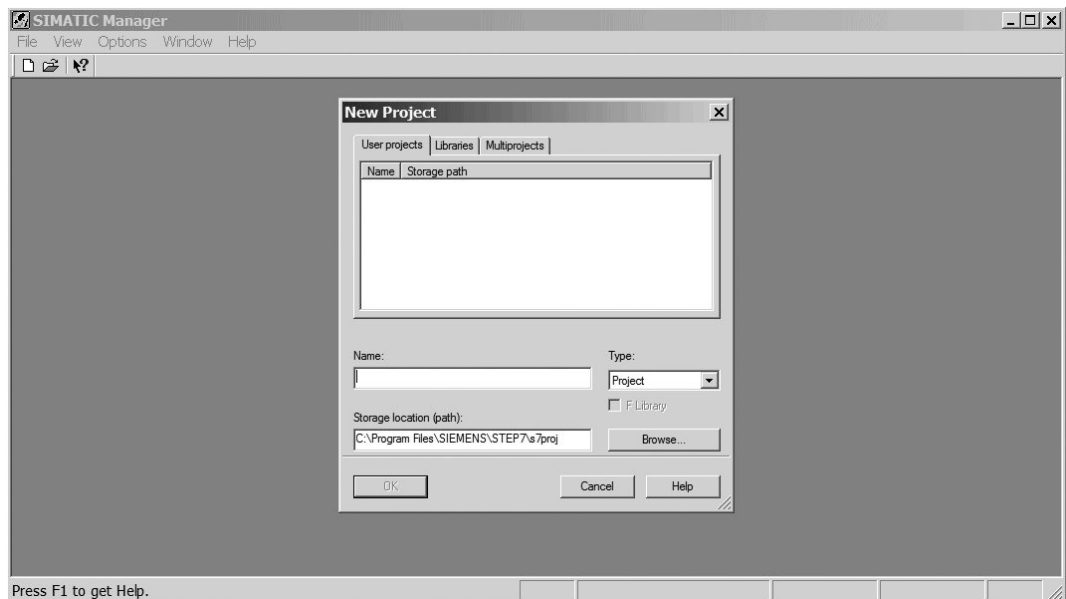


4. In Process Device Network View, right-click on "Net" → select "Insert New Object" → "MODBUS net".

5.  Right-click on "MODBUS net" → select "Object Properties...".
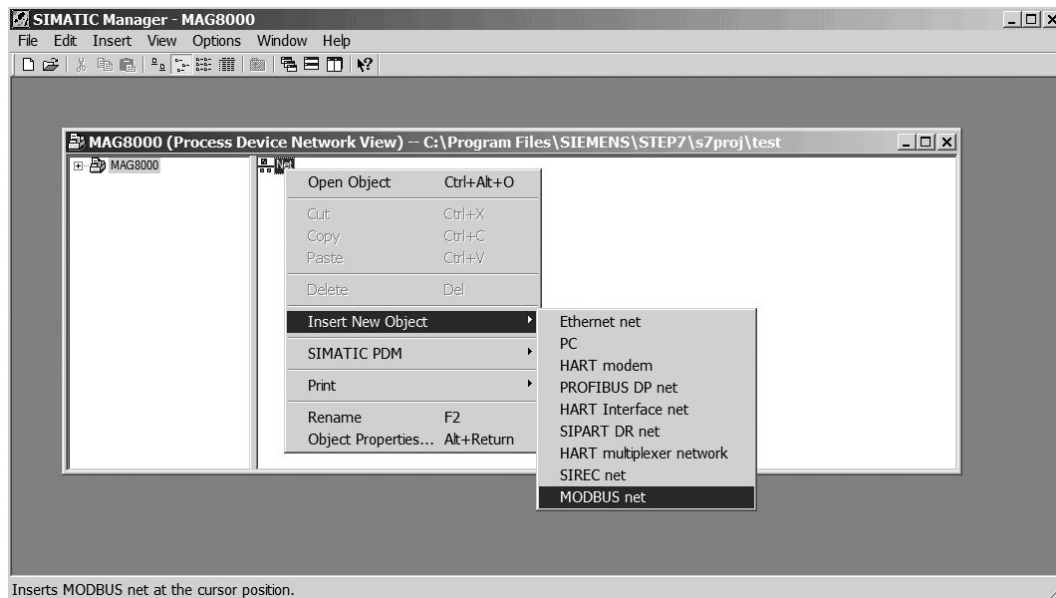
6. Click on "Connection" tab and select "activated" for IrDA. Click "OK".
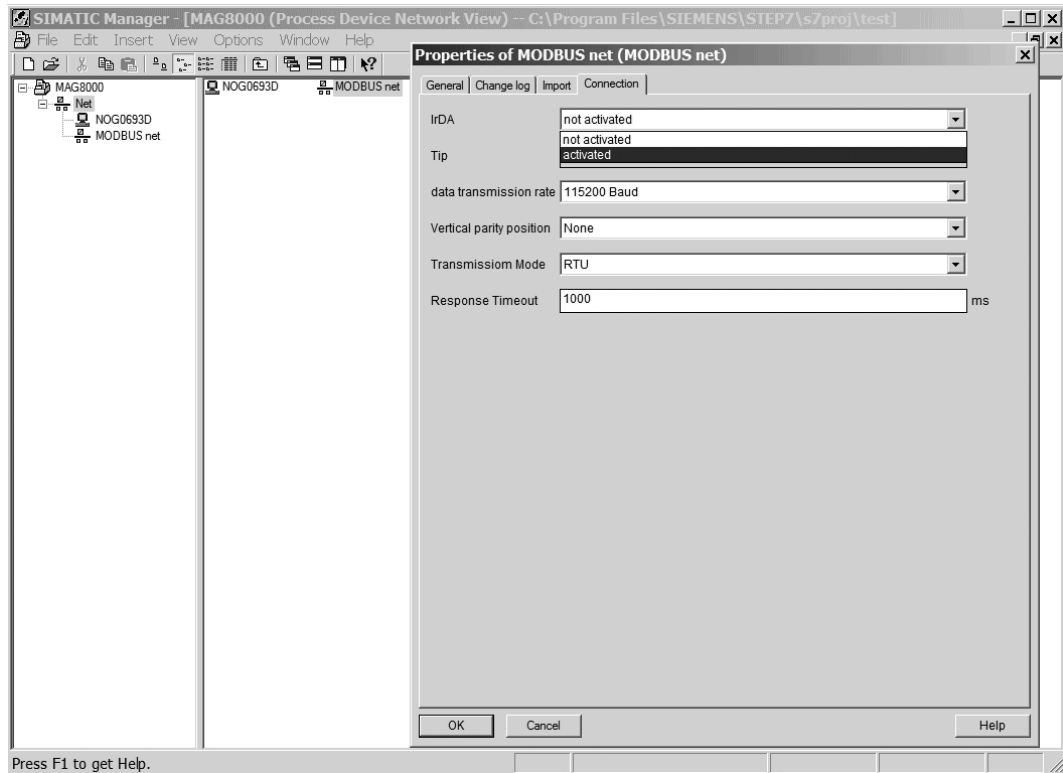


**Note**

**Maximum data transmission rate**

The maximum data transmitter rate for the MAG 8000 is 19 200 baud.

If the IrDA adapter is connected properly, a small IrDA icon will appear in the Windows notification area.
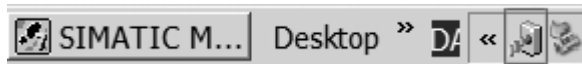


When placing mouse at this icon, the device information will be shown (e.g. "MAG8000 SN1234 is in range").

7.  In Process Device Network View, right-click on "MODBUS net" → "Insert New Object" → "MODBUS device".
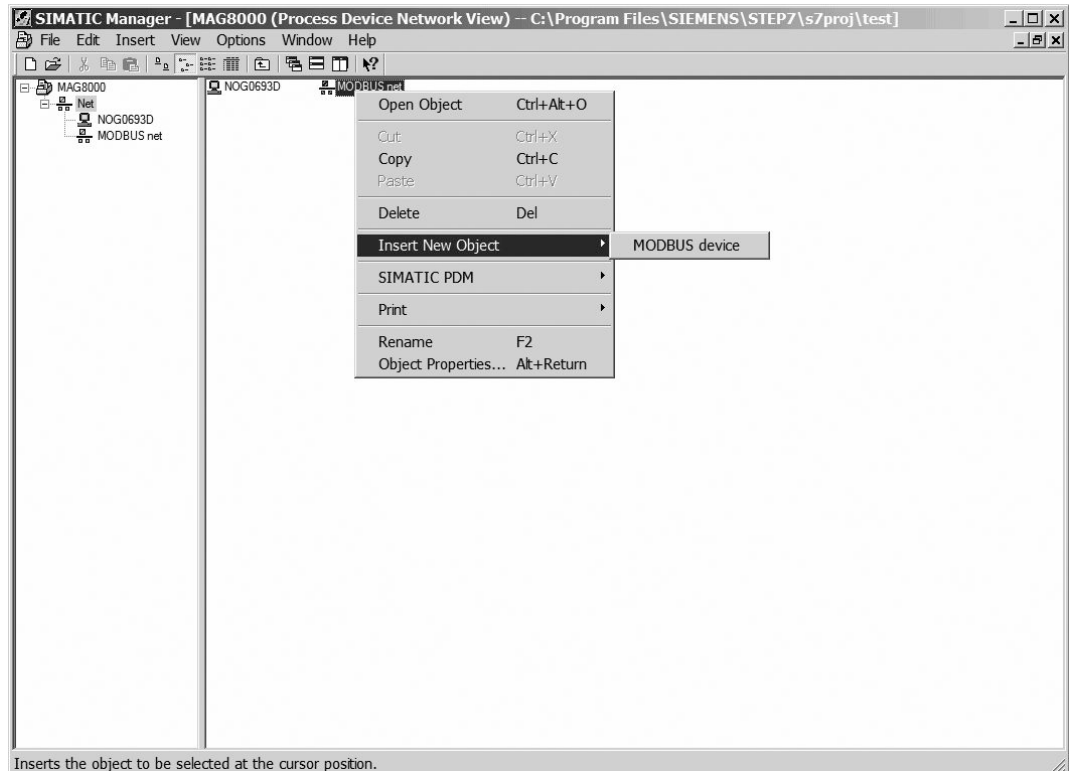


8.  Click on "Assign". In new pop-up window, click on "Flow" → "Electromagnetic" → "Siemens AG" → "MAG8000".

9.  Select the proper device (MAG 8000 Advanced, MAG 8000 Basic, MAG 8000 CT Advanced, or MAG 8000 CT Basic) depending on transmitter version to be controlled.

10. Click on "OK".
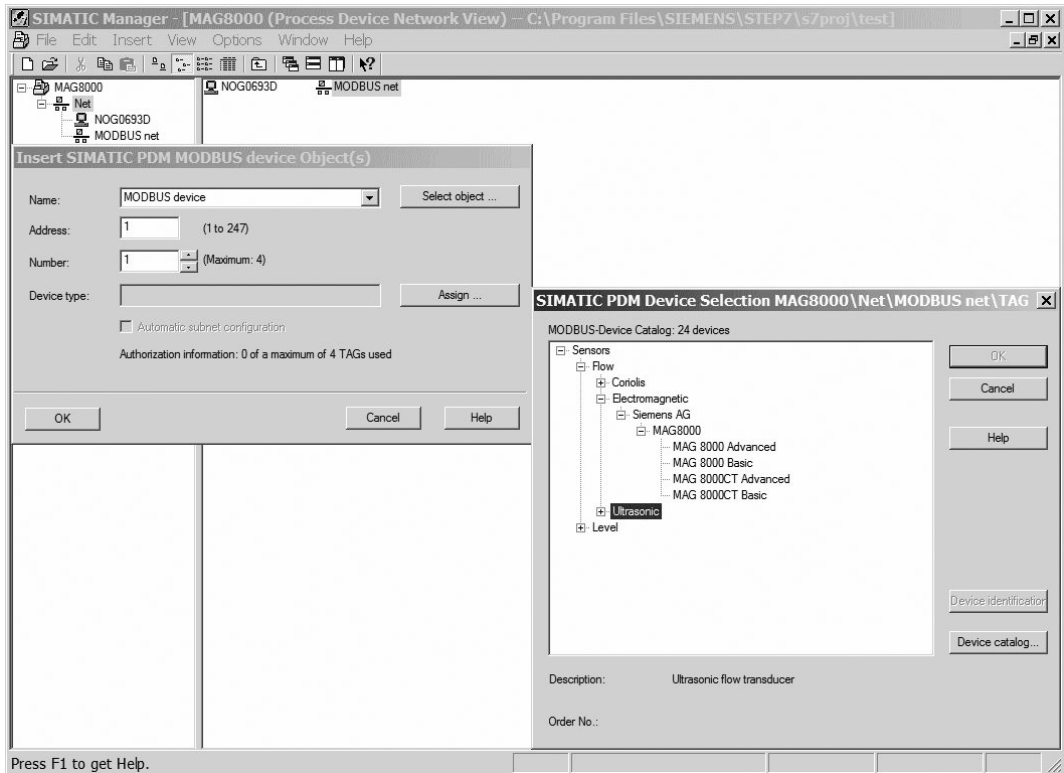


11. Double-click created device, e.g. "MAG8000 Advanced". A new window will pop up for device parameter configuration.
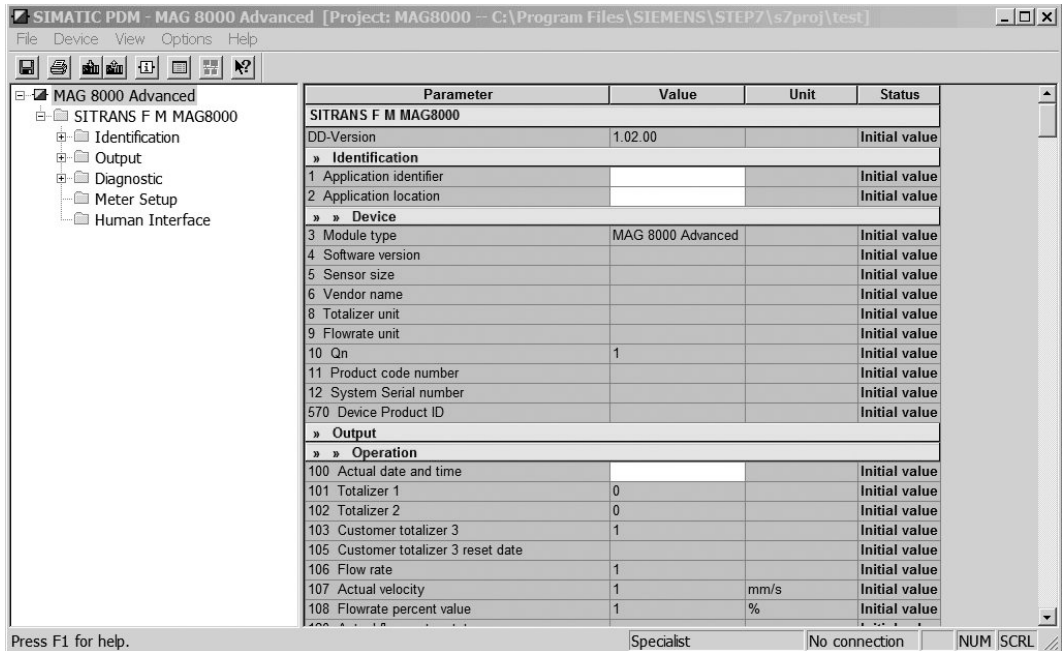
## 6.3    Setting the basic parameters

**Note**

**No factory reset**

The device is delivered with factory settings that are not stored as default values. Because no default values are present in the meter, an automatic return to factory values is not possible.

**Enter password**

The "User" dialog box is always displayed on the first start-up after installation of SIMATIC PDM but not on the first start-up for a specific device.

You can also use the menu command "Options" → "Settings" to specify whether you are permanently registered as a "Maintenance engineer" or "Specialist" and/or whether to disable the display of the "User" dialog box. Refer to SIMATIC PDM help manual for more details of "Maintenance engineer" and "Specialist".

Proceed as follows:

Click the appropriate button ("Maintenance engineer" or "Specialist").

If the option "Specialist" is selected, enter the password in the "Password" box in order to work with additional parameters. The default password is "1000", and can be changed after gaining access to the meter.
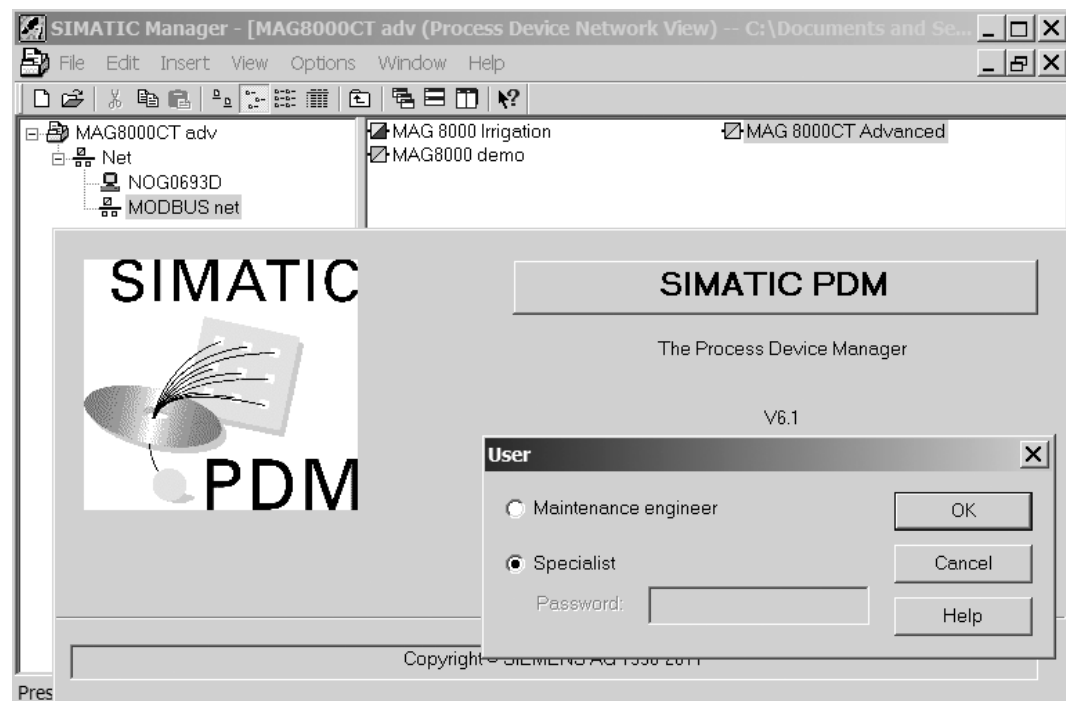
**Read, write, print or export meter data**

Select "Device" → "Upload to PC/PG" to load all device parameters from the device to the offline data storage.
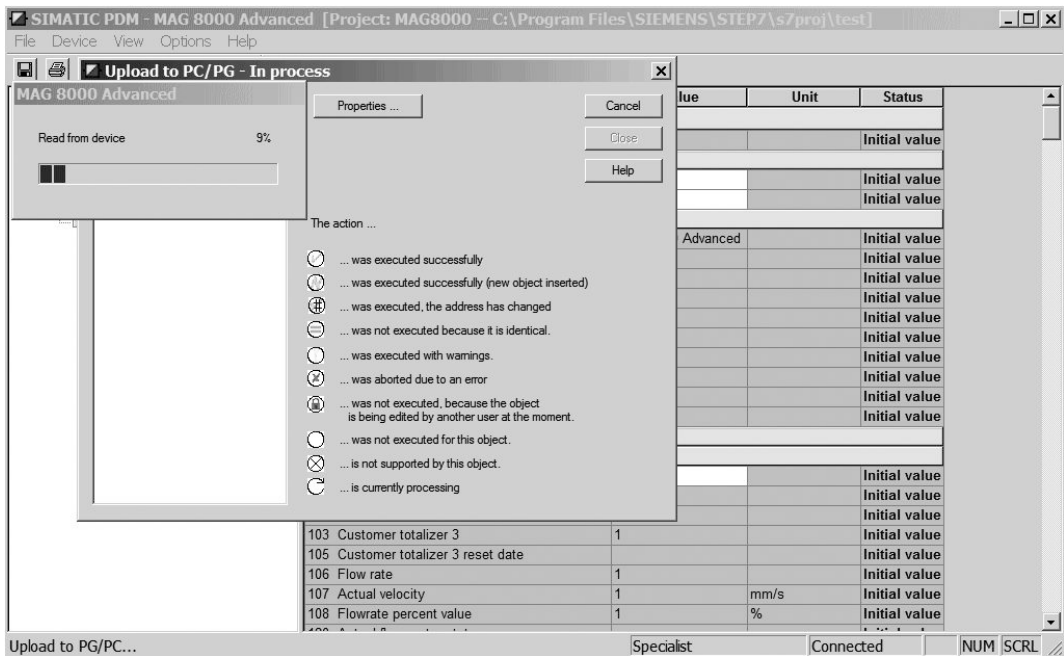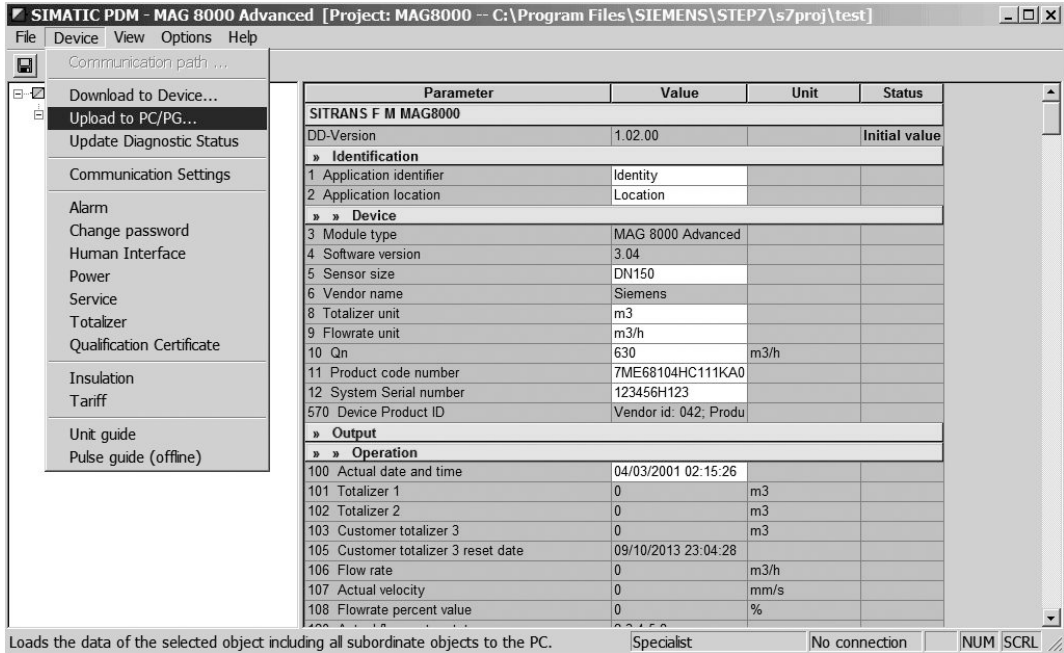




Only parameters (data) shown on white background can be changed. Red texts are off-line data which are not stored in the MAG 8000 yet, whereas black texts show the actual meter data. Each adjustable parameter has a "Default Value", a "Minimum Value", and a "Maximum Value" which are prompted by right-clicking on the parameter. More information will be available when the "Help" button is clicked.

Each parameter has a description (prompt) advising how the parameter can be programmed and which settings are programmable.

The figure below shows alarm status with the marked alarms enabled. Click on "Transfer" to instantly synchronize alarm configurations between the PC and the device.
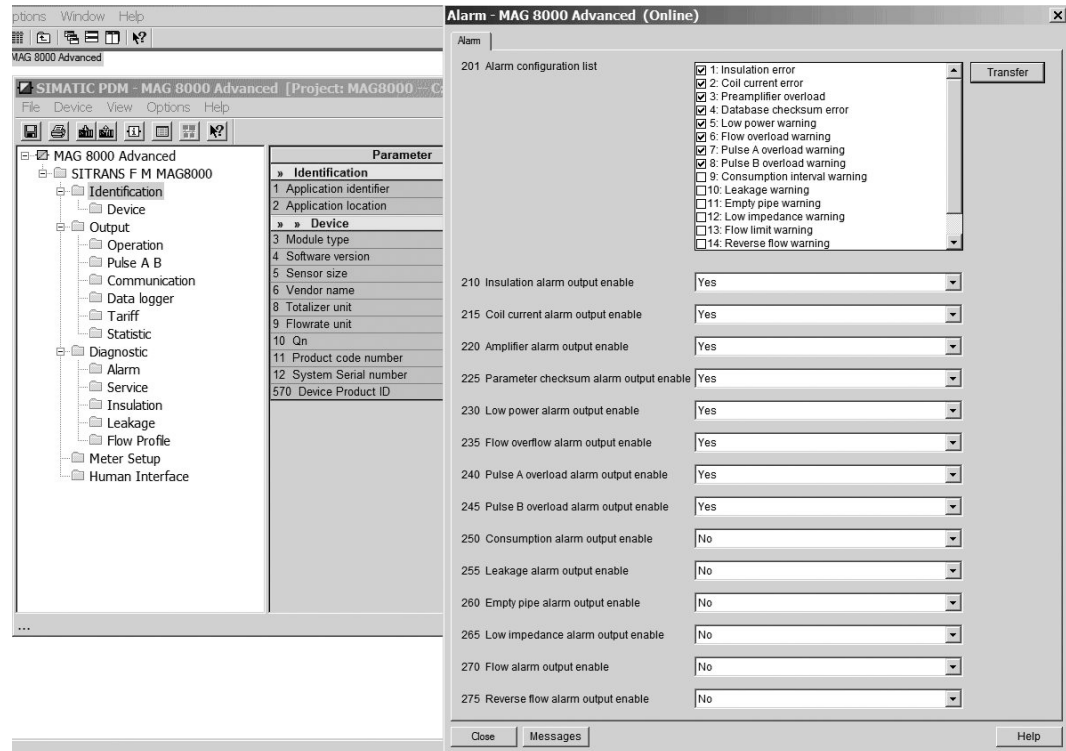


Figure 6-1        Alarm status - marked alarms are enabled

Select "Device" → "Download to Device..." to download all the changed parameters to the device.
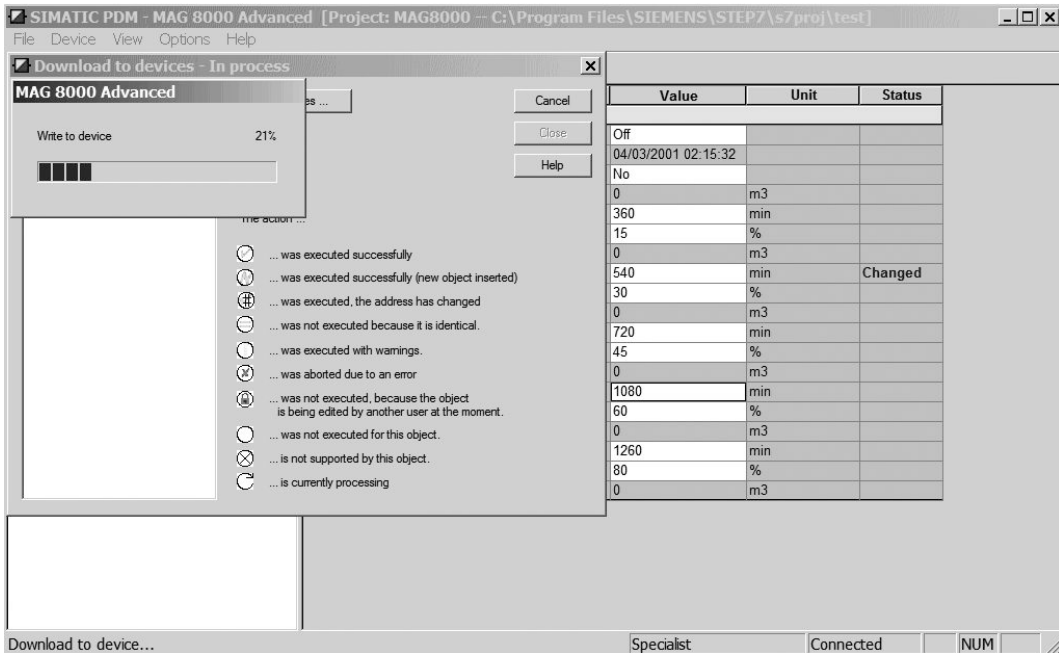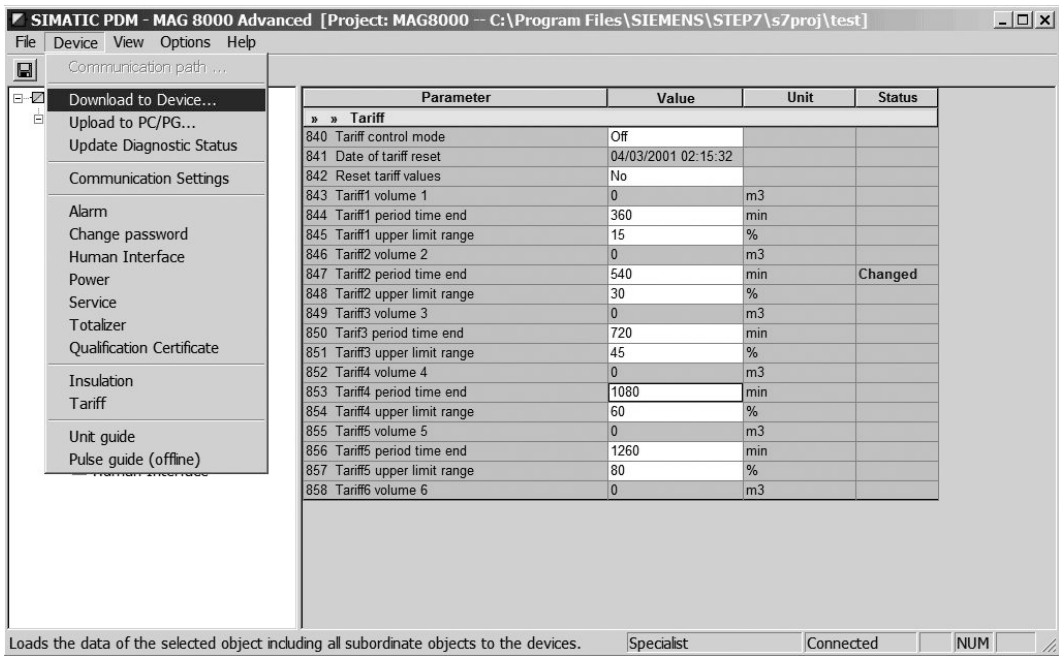
The meter configuration and parameters can also be exported as PDM data, and imported to another location, e.g. another project or PC.

In the SIMATIC Manager view, right-click on the PDM object to be exported, select "Export...". In the subsequent dialog box, specify the type of export as well as the name and location where the PDM file containing the exported data is to be saved. Confirm the entries by clicking "OK".
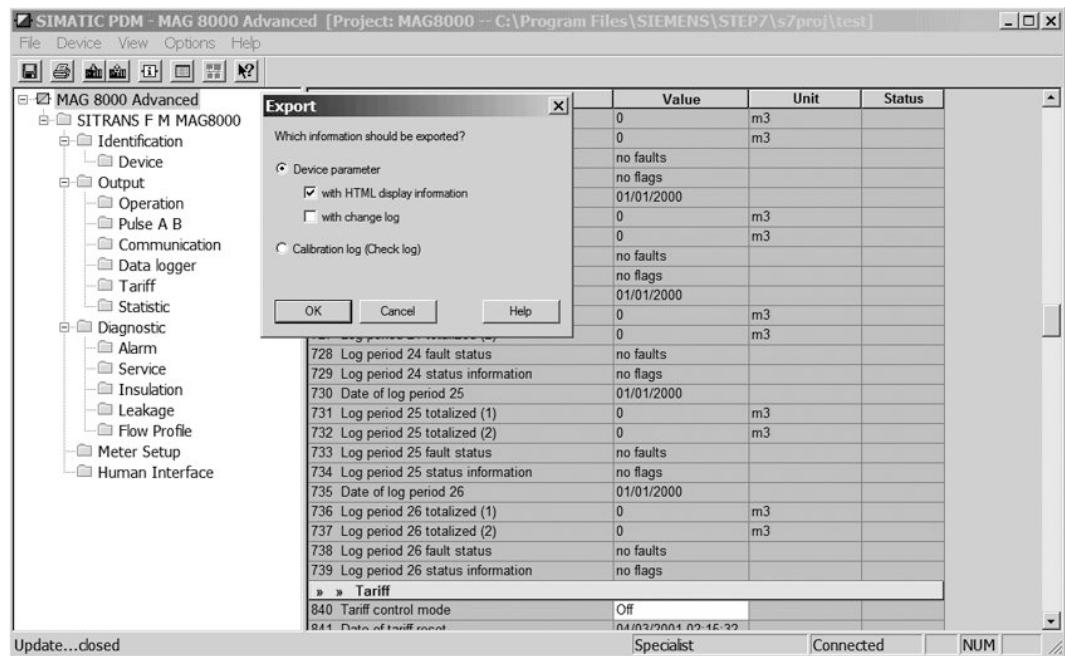
During the export process, a dialog box is displayed showing export progress. After the export is completed, the status "Result" is displayed.
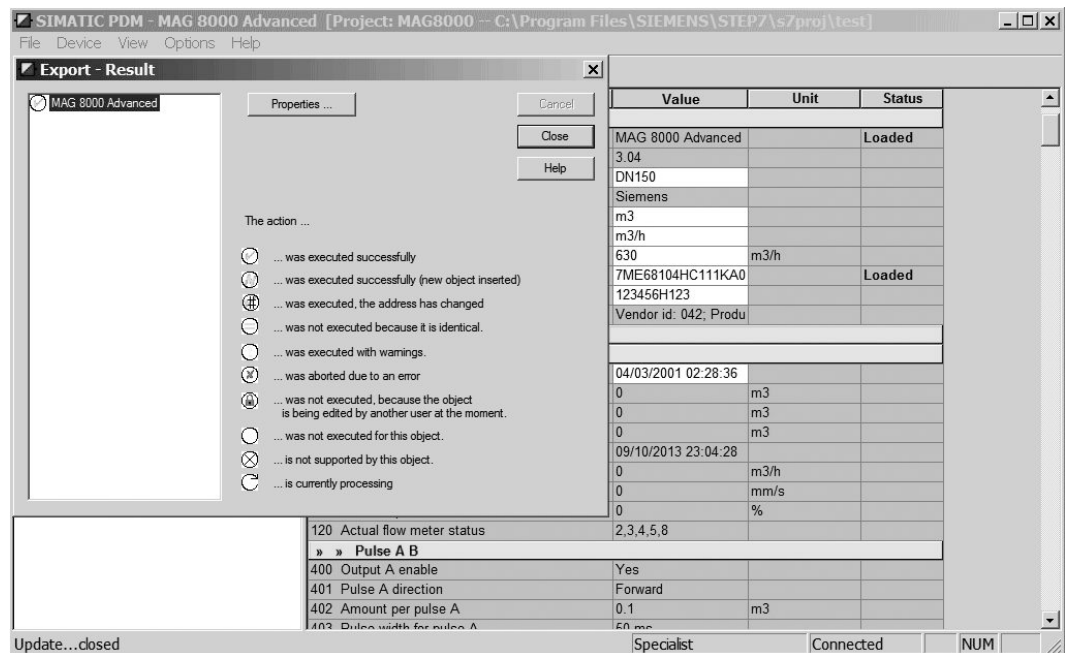


**See also**

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

## 6.4 Unit selection

The device is delivered with totalizer and flow rate units in m and m$^3$/h, respectively, as standard. However, it is possible to manually configure the device to operate with other units.

**Changing the units**

1. Select "Device" → "Unit guide".

2. Select the new unit from the list.

3. Click on "Apply Change of Units".
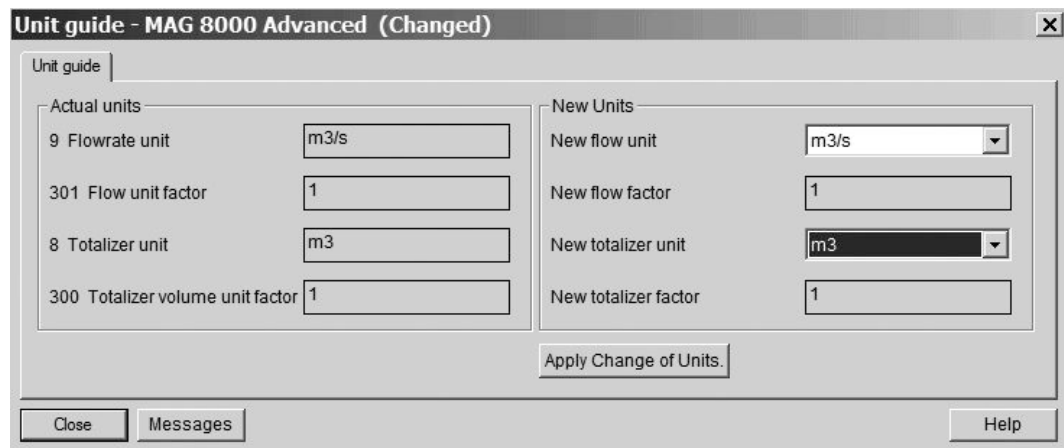


Afterwards, the change must be stored into the transmitter via "Download to Device".

## 6.5 Output configuration

Pulse output can be configured as volume pulse, alarm or call-up. Default factory setting is with output A enabled for forward flow and output B for alarm output.

**Output configuration in SIMATIC PDM**

Select "Output". The software window shows the parameters for output configuration. Each parameter has its own guideline for selecting the correct parameter setting.

See "Output characteristics" (Page 99) for more information on how the outputs work.

## 6.6 Data protection

**Using the hardware key**
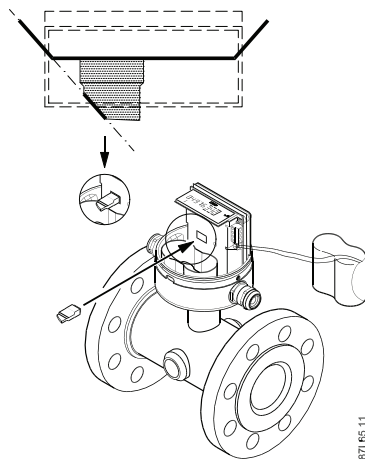


A hardware key is installed in the hardware lock hole to change protected parameters. The hardware lock hole is located in the front of the PCB board behind the battery. For a complete list of protected parameters go to Unit selection (Page 128).

# Operating 7

## 7.1 Operation via key and display

The meter is designed with a single key and a symbolic display for optimal dialog.

**Display**

Display is divided into 3 areas.
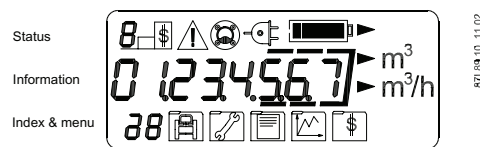


Figure 7-1     Display

- Top area with symbols for status information.

- Middle area with actual information.

- Bottom area with index for actual information and selected menu.

Some of the information has additional information connected and display will automatically toggle between information, see menu overview (Page 66). If key is not pressed for 10 minutes, display will time-out and return to default configured operator menu.

**Key**

There are three different ways the interface key will respond to being pressed:

1. A brief press (less than 2 seconds) will advance screen to next index or menu.

2. A short press (2 to 5 seconds) will enter a menu or escape menu selection.

3. A long press (more than 5 seconds) while in the operator menu (━) will activate a reset of selected value (e.g., call-up function) indicated by an "r".

A flashing "r" indicates a reset. A request for time and date setup is shown during power-up.
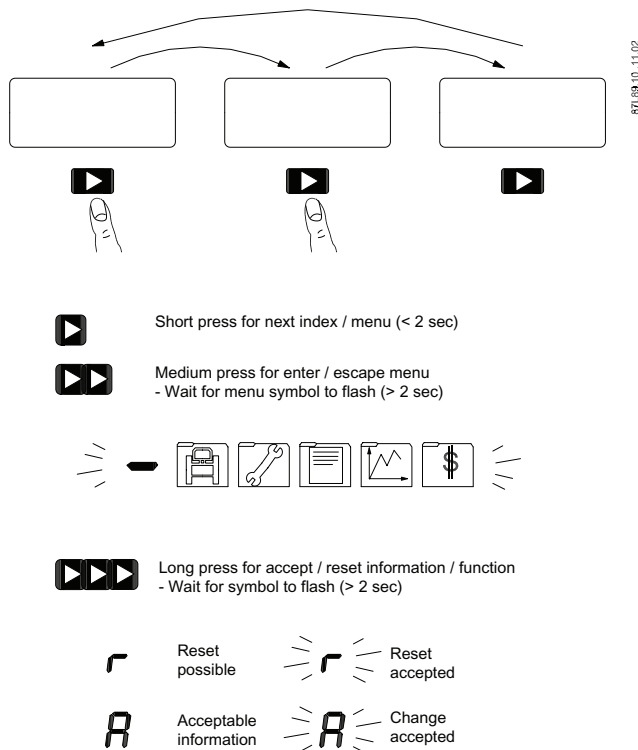
Figure 7-2     Key and display operation

It will take 3 to 5 minutes for the capacitive touch key's self-calibration once the MAG 8000 transmitter enclosure is removed and mounted again. There will be no response from the touch key during self-calibration.

## 7.2     Display symbols

Top area of display shows status bar.
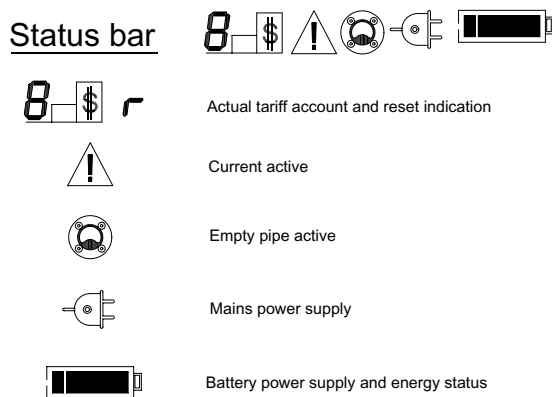


Figure 7-3     Status bar

Status information symbols show actual operation of meter.

**Tariff** symbol shows actual accounting tariff. In operator menu, tariff value will change to "r" if information is resettable.

**Alarm** symbol is active when an alarm is active and shown independently of alarm output configuration.

**Empty pipe** symbol indicates an empty pipe condition. To conserve power and prevent false readings due to exposed measurement electrodes, flow measurement is disabled until a full pipe is detected and the symbol has disappeared.

Power supply type is automatically detected by meter.
**Plug** symbol indicates that mains power is supplied.
**Battery** symbol indicates that battery power is supplied. It also indicates remaining battery capacity, see Operation menu index 1 (Page 66) for more information.

Bottom part of display shows menu bar.

## Menu bar



| | |
|---|---|
| Index for shown menu and acceptable value indication | |
| Default operator menu | |
| Meter information menu | |
| Service menu | |
| Data logger menu | |
| Statistics menu (advanced version only) | |
| Tariff menu (advanced version only) | |
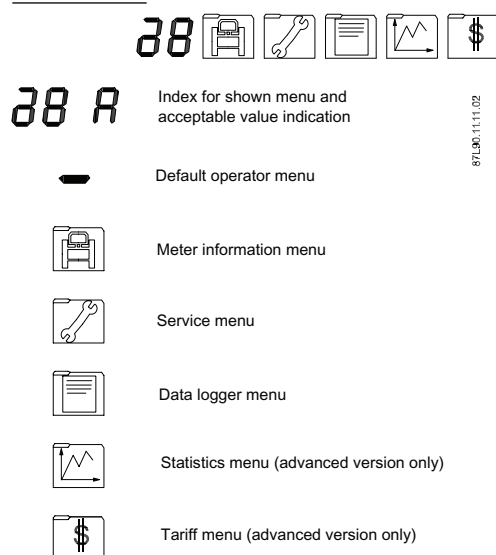
Figure 7-4      Menu bar

The **menu bar icons** indicate actual selected menu and related index for selected information. Display overview shows relation between menu, index and information.

Only operator menu (➖) has information and functions that can be reset. During power-up function battery power can be preset to 100% capacity and time and date can be adjusted - an "A" in index shows acceptable values. The menu shown in each menu index is the menu bar.
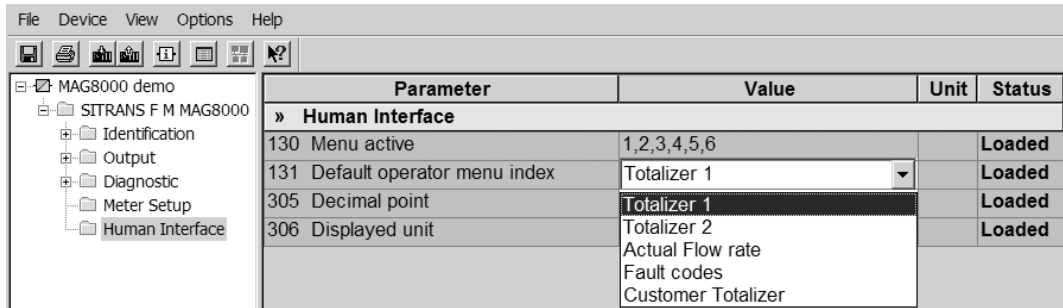
## 7.3      Default display information and accessible display menus

Parameter 131 defines the default display information with selection between

- Totalizer 1 (Index 1)

- Totalizer 2 (Index 2)

- Actual flow rate (Index 3, updated with selected measuring frequency)

- Fault codes (Index 4)

- Net totalizer



Default information is shown after power-up as well as after no key operation for 10 minutes.

Parameter 130 defines accessible display menus with selection of one or more of the following menus:

- Operator menu

- Meter info menu

- Service menu

- Data logger menu

- Statistic menu (advanced version only)

- Revenue menu (advanced version only)

## 7.4 Operator menu

The operator menu consists of several indexes described in the following.
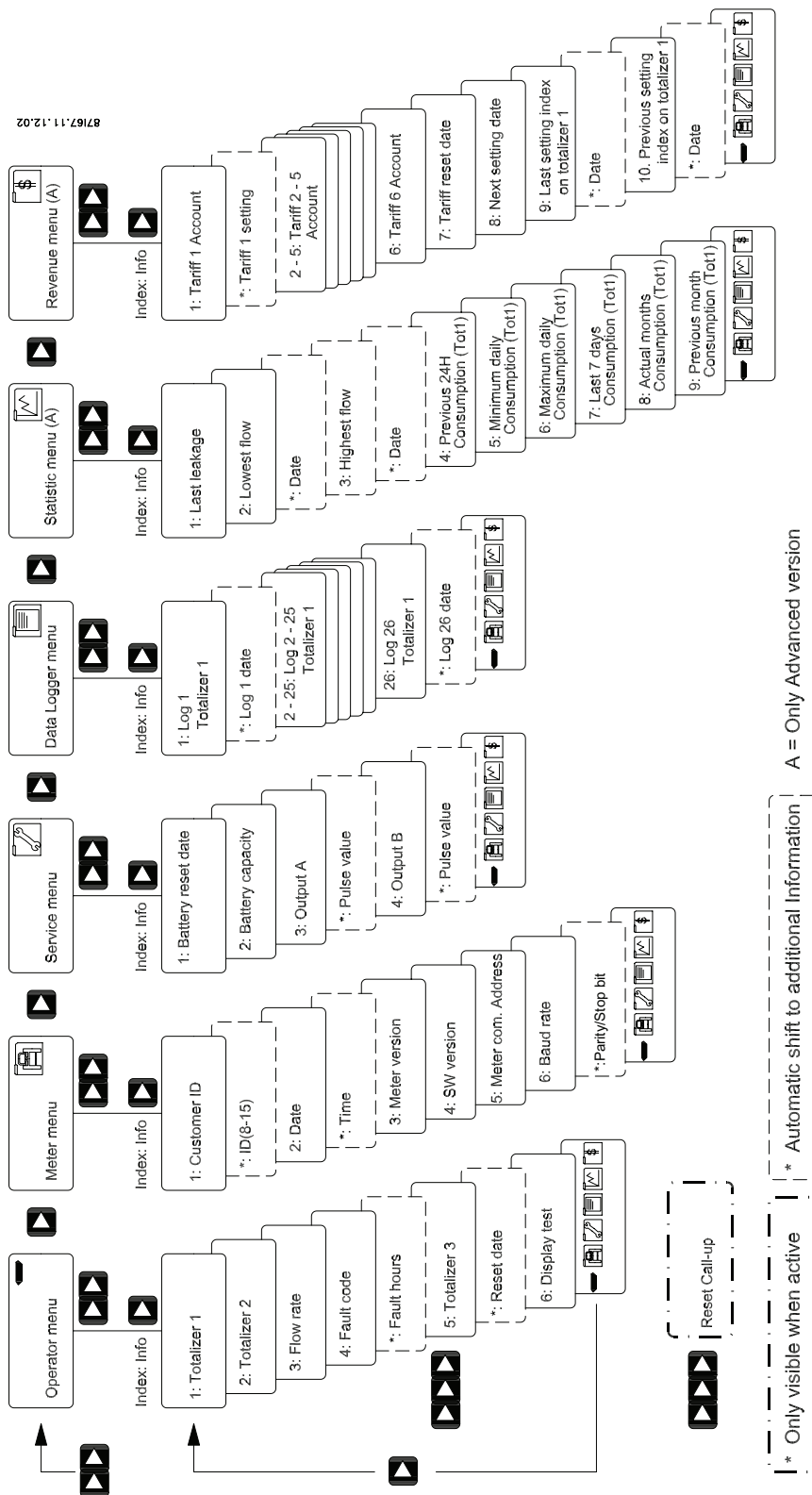
Figure 7-5    Menu overview

**Index 1**
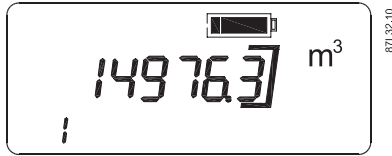
Totalizer 1



Figure 7-6      Operator menu - Totalizer 1

Flow volume totalizer 1 (factory-configured for forward flow calculation).

For MAG 8000, the value of totalizer 1 can be reset to zero or set to any value desired via PDM or Flow Tool (example - replacing an existing old meter).

**Index 2**

Totalizer 2
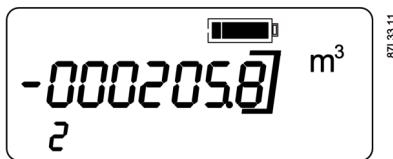


Figure 7-7      Operator menu - Totalizer 2

Flow volume totalizer 2 (factory-configured for reverse flow). A negative value indicates reverse flow calculation.

For MAG 8000, the value of totalizer 2 can be reset to zero or set to any value desired via PDM or Flow Tool (example - replacing an existing old meter).

**Index 3**

Flow rate
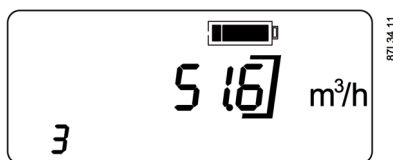


Figure 7-8      Operator menu - Flow rate

Index 3 shows actual flow rate. If a negative value is indicated, flow is in reverse direction.

**MAG 8000 CT**

> **Note**
>
> **Reset of totalizer 1 or 2**
>
> For MAG 8000 CT, the value of totalizer 1 or 2 can only be reset to zero if verification sealing is broken and a hardware key is mounted on device. This is only allowed to be done by an authorized person, with the acceptance and under direction of the local authorities.

> **Note**
>
> **Totalizer 3**
>
> • FW 3.09 and earlier: Customer resettable totalizer (following totalizer 1).
>
> • FW 3.11 and later: Net totalizer protected by HW key in MAG 8000 CT.

**Index 4**

Active alarm
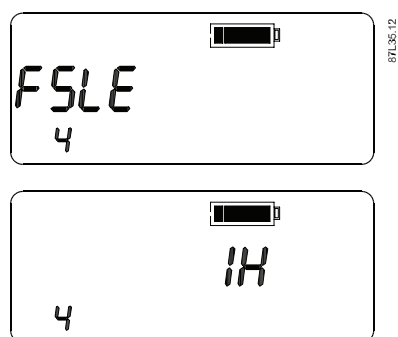


Figure 7-9        Operator menu - Active alarm

Faults are indicated with the lowest number first. The left of display indicates 3 alarm conditions: low power warning (5), leakage warning (L), and empty pipe warning (E).

Faults 1 to 4 affect meter performance and remain active until alarm condition disappears. Faults 5 to d are warnings that will disappear when alarm condition has been corrected and they are reset via communication interface.

Fault evaluation and service guidelines are made in service section.

After all faults have disappeared, display shows total hours of faults until meter was reset.

Fault information. Each number indicates a dedicated fault:

| | |
|---|---|
| 1 | Insulation fault |
| 2 | Coil current fault*) |
| 3 | Amplifier overload fault*) |
| 4 | Data base checksum fault |
| 5 | Low power warning (alarm limits are configurable) |
| 6 | Flow overload > Qmax. (Q4) (125% Qn) flow overload |
| 7 | Pulse output 1 overflow > PF [Hz] pulse output 1 overflow |

| 8 | Pulse output 2 overflow > PF [Hz] pulse output 2 overflow |
|---|---|
| 9 | Consumption interval warning (alarm limits are configurable) |
| L | Leakage warning (alarm limits are configurable) |
| E | Empty pipe / low conductivity - when enabled* |
| C | High conductivity / low impedance warning (alarm limits are configurable) |
| d | High flow rate warning (alarm limits are configurable) |
| A | Reverse high flow rate warning (alarm limits are configurable) |

*) Meter disables measurement to reduce power consumption during fatal faults.

**Index 5**

Customer totalizer
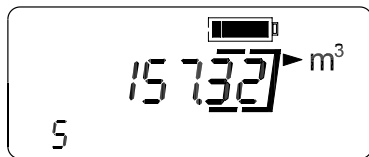


Figure 7-10    Operator menu - Totalizer

The value of the customer totalizer can be reset to zero or set to any other value through SIMATIC PDM or Flow Tool.

For the CT version the totalizer is neither configurable nor resettable.

**Display test**
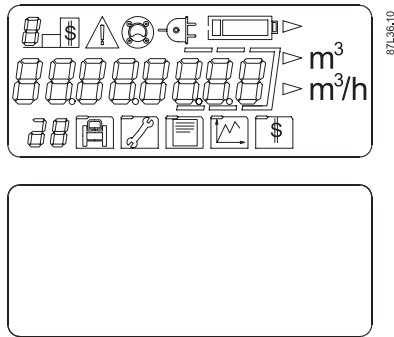


Figure 7-11    Operator menu - Display test

All segments of display are alternately flashed on and off during this test.

**Menu selection**
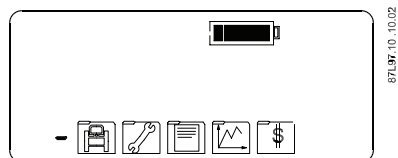




Short press for enter / escape menu
- Wait for menu symbol to flash (> 2 sec)



Figure 7-12      Operator menu - Menu selection

If key is pressed shortly (2 to 5 seconds), menu selection will flash indicating that a new selection can be made.

After toggling to desired menu, a short press on key will enable chosen menu, which must be activated in parameter 130 in advance.

**Index 0 (when active)**

Call up reset





Long press for accept / reset information / function
- Wait for symbol to flash (> 2 sec)

Reset possible          Reset accepted

Figure 7-13      Operator menu - Call up reset

Call-up reset window (index 0) is only shown when call-up function is activated. "r" indicates that it can be reset by a long press on key. When releasing key while "r" is flashing, call-up function will be reset and window disappears.

# 7.5 Internal data handling
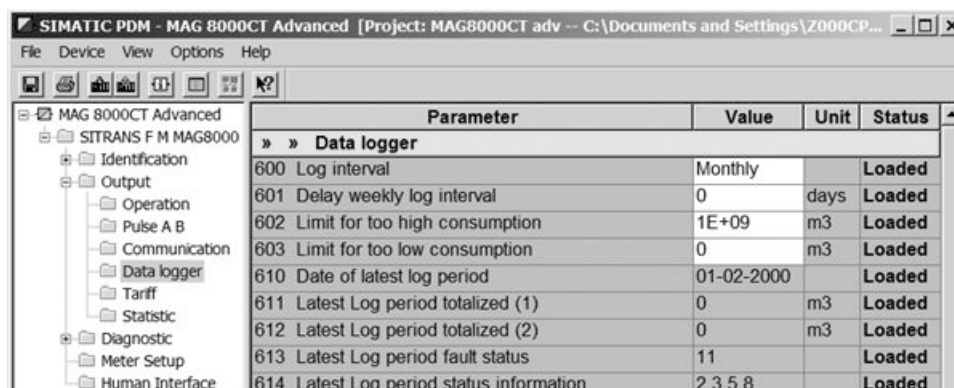
**Meter status**

Meter status parameter (120) gives a fast indication of reliability of revenue data.

**Data logger / Consumption alarm**

The integrated data logger has 26 logging periods in which data can be stored daily, weekly or monthly. The logger stores the consumption for totalizer 1 and totalizer 2 in the selected period. Forward consumption is stored as a positive value and reverse consumption is stored as a negative value. Alarm and meter status are also stored for the same period to indicate alarms that have been active, or that revenue data has been influenced in the specific period.



The logged information has a time and date stamp. The data logger never stops storing data - old data is overwritten following the first in/first out principle, i.e. log 1 is the last stored information which is moved to log 2 when the next logging is made and so on.

The consumption alarm indicates that the actual consumption on totalizer 1 is above or below the consumption limits.

---

**Note**

**Invalid log date**

If the log date "00.00.2000" is shown in the device display, the log period was never set.

---

## 7.6 Battery-powered operation

The MAG 8000 Standard (7ME6810) and MAG 8000 CT (7ME6820) are factory-configured for 7 years of typical operation on internal battery pack (2 D-cell). High or low temperature, frequent use of IrDA communication, high pulse output rate, high excitation frequency in leakage detection mode, and use of add-on communication module will reduce actual operation time.

The MAG 8000 power management function controls each power consuming element and measures the temperature for optimal calculation of remaining battery power capacity.

## Battery status and alarm indication

Battery power capacity for operation is indicated in 3 levels.
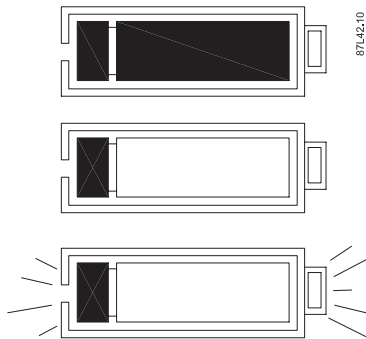


Figure 7-14      Battery status

- Full symbol indicates battery capacity is above battery alarm level (% preset parameter 206).

- Low symbol indicates that battery should be replaced; however, measurement will remain active. Level is based on a preset alarm level.

- When low symbol is flashing, measurement and communication is disabled until battery pack has been replaced and reset.

"Low battery" is a selectable % (parameter 206) of 100% full capacity. The meter calculates the remaining capacity every four hours, including all consuming elements and the influence of temperature changes.

## Consumption and operation time calculation

Battery operation time depends on connected battery pack as well as operation conditions of meter. Every 4 hours the advanced power management system calculates the real power consumption and remaining operation capacity.

Power consumption calculation includes flow measurement, meter dialog (communication and display) and pulse output.

Temperature is also measured to control and adjust its influence on the battery capacity.

The internal 2 D-cell battery pack has a nominal capacity of 33 Ah giving a typical operation of 7 years for MAG 8000 Standard and MAG 8000 CT. The nominal capacity of external battery pack

(4 D-cell) is 66 Ah and gives typically 10 years operation time for MAG 8000 Standard and MAG 8000 CT.

| Scenario - Revenue application | |
|---|---|
| Output A | Pulse - 10 Hz |
| Output B | Alarm or Call up |
| Meter dialog | 1 hour per month |
| Excitation frequency | 1/15 Hz |
| Country main frequency | 50 Hz / 60 Hz |

### MAG 8000 Standard (7ME6810) and MAG 8000 CT (7ME6820)

| Excitation frequency (24 hours operation) | | 1/60 Hz | 1/30 Hz | 1/15 Hz | 1/5 Hz | 1.5625 Hz | 3.125 Hz | 6.25 Hz |
|---|---|---|---|---|---|---|---|---|
| Two D-Cell battery 33 Ah Internal battery pack | DN 25 to 150 (1" to 6") | 9 years | 9 years | 7 years | 43 months | 8 months | 3 months | 2 months |
| | DN 200 to 600 (8" to 24") | 9 years | 6 years | 4 years | 22 months | 3 months | 1 month | N/A |
| | DN 700 to 1200 (28" to 48") | 7 years | 4 years | 2 years | 1 year | 1 month | N/A | N/A |
| Four D-Cell battery 66 Ah External battery pack | DN 25 to 150 (1" to 6") | 15 years | 15 years | 14 years | 86 months | 16 months | 7 months | 4 months |
| | DN 200 to 600 (8" to 24") | 15 years | 13 years | 8 years | 44 months | 7 months | 3 months | N/A |
| | DN 700 to 1200 (28" to 48") | 14 years | 9 years | 5 years | 2 years | 3 months | N/A | N/A |

Typical operation time of 7 years is based on an operation time/temperature profile of 5% at 0 °C (32 °F), 80% at 15 °C (59 °F) and 15% at 50 °C (122 °F), 0.1 % at menu 3 operation and 0.1 % at IrDA operation, and no use of add-on communication module.

Leakage detection (advanced version only) will affect battery operation time if a higher excitation frequency is selected during leakage period.

The effect of other temperatures is shown in the figure below.
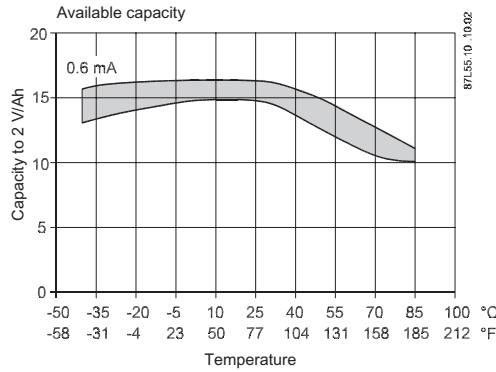


Figure 7-15     Available capacity of one D-cell battery in relation to discharge current and temperature

**Note**

Installation orientation of battery pack may influence battery capacity. Optimal battery capacity is achieved with battery pack in an upright position.

**Note**

**Stop Modbus communication before changing the battery**

In order to avoid a checksum error, stop Modbus communication before changing the battery.

**Battery configuration**

The battery figures show power management information, which can be accessed via "Device" → "Power".



At each battery replacement the actual battery capacity is reset to 100% (parameters 508 to 510), which is then reduced with real meter consumption every 4 hours.

Power related alarm settings are located in "Alarm" group, e.g. "Battery limit" (parameter 206), which is the level at which low power alarm is activated generating an alarm or call-up (if configured), as well as low power fault related parameters 230 to 234.

When switching between battery power from the internal and the external battery packs, "Battery power" (parameter 507) must be adjusted to match the actual number of batteries connected.

# Service and maintenance

# 8

## 8.1 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

| NOTICE |
| --- |
| Repair and service must be carried out by Siemens authorized personnel only. |

**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. |

## 8.2 MAG 8000 service guidelines

The MAG 8000 battery-operated water meters are based on a very reliable measurement technology and the advanced alarm monitoring and diagnostics provide valuable information concerning the meter performance, faults, and service conditions.

Optimal meter performance requires proper meter selection, proper installation, and proper commissioning for the particular application. This service guideline section indicates how to detect and solve the most common problems. Meter and application problems are indicated by the alarm program via the main fault and warning symbol on the display and the comprehensive data logging and monitoring available via the communication interface.

Alarm monitoring includes individual registration of each alarm, how many hours the alarm has been active, when the alarm first appeared, and when it disappeared last. The alarm log can be reset with its own date and time registration. A common fault hour counter includes all active alarms in one counter. Additionally, active alarms are logged in the data logger to monitor when the alarms have been activated.

Fatal faults 1 through 4 are the most important to resolve as they influence the operation of the meter. Fatal faults will disappear as soon as the alarm condition is corrected.

## 8.3 Replacing transmitter or PCB board

The MAG 8000 and MAG 8000 CT do not have a removable SENSORPROM. Therefore special care must be taken when replacing a damaged or defective transmitter or PCB board to ensure proper operation and continued accuracy. There are 3 ways to achieve an easy and successful replacement meter:

1. Order a transmitter replacement kit as a spare part, which comes with the factory default settings and original product label. To order you need to provide a serial number 087L4166 is for compact version, 087L4202 is for remote version.

2. Order a complete transmitter as a spare part with default settings and a blank product label. Final configuration is done on-site. Missing data and configuration can be uploaded from the old meter, or it can be read from the old meter product label.

3. Order only a replacement PCB board. The PCB board can only be ordered for basic or advanced versions with default settings. When making the configuration on-site, the service mode must be selected in the Flow Tool/SIMATIC PDM and the hardware key must be mounted on the PCB board, to change important parameters.

### Note

**Re-verification**

If MAG 8000 CT transmitter or sensor must be replaced, a re-verification of the whole water meter is necessary, to re-obtain custody transfer approval. The re-verification must be performed by an authorized person, with the acceptance and under direction of the local authorities.

### Note
**SITRANS F M Verificator**

The SITRANS F M Verificator cannot be used with MAG 8000.

## 8.4 Battery replacement

**Condition**

Only use the following battery type supplied by Siemens:

Internal battery pack (2D cells): A5E50698081

External battery pack (4D cells): A5E50698048

Ordering of spare parts (Page 119)

**Replacing battery**

1. Loosen screws on transmitter top.

2. Remove transmitter top using a screwdriver.
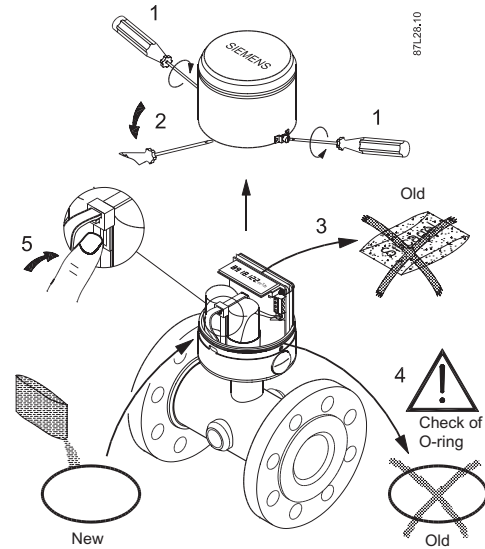


3. Dispose of silica gel bag.

4. Replace O-ring to ensure continued IP68 enclosure rating.

   – Check O-ring for damage or deformity.

   – Smear O-ring with acid-free lubricating gel.

5. Push locking tab and loosen strip.
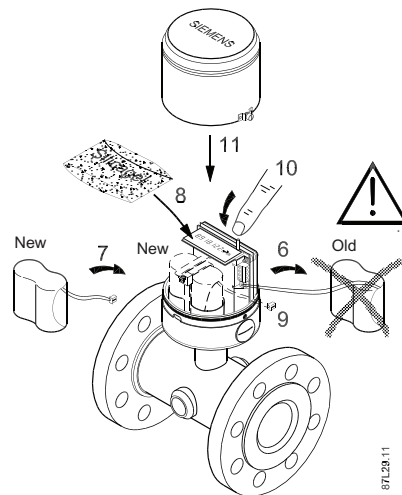


6. Remove battery pack with power still connected.

7. Place and secure new battery pack.

   **Note**

   Battery packs must be installed with the top part in upwards direction to reach maximum capacity.

8. Add new Silica gel bag

   – Remove plastic bag from new silica gel bag.

   – Place new silica gel bag on top of battery pack to prevent condensation within meter.

   – To maintain IP68 enclosure the silica gel bag may **not** be in contact with the potting compound.

9. Disconnect old battery pack and connect new one.

10. Press key within 6 seconds to reset battery (i.e. operating time and remaining capacity) when display shows:
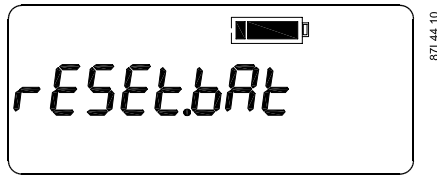


11. Mount top lid.

12. Fasten screws to reassemble meter completely.
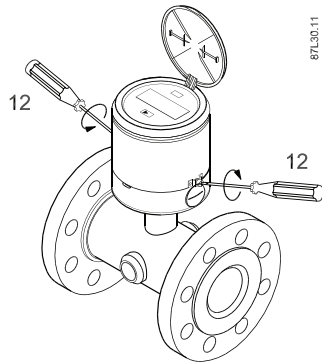


If necessary, adjust time and date via software, see "Power up with battery reset, date and time set up".

**Note**

**Re-verification**

All sealed MAG 8000 CT meters must be re-verified when sealings (marked "A") have been broken. The re-verification must be performed by an authorized person, with the acceptance and under direction of the local authorities.
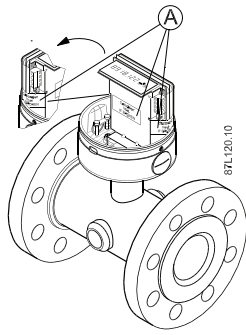
Figure 8-1    Verification sealings

## 8.5    Power up with battery reset, date and time set up
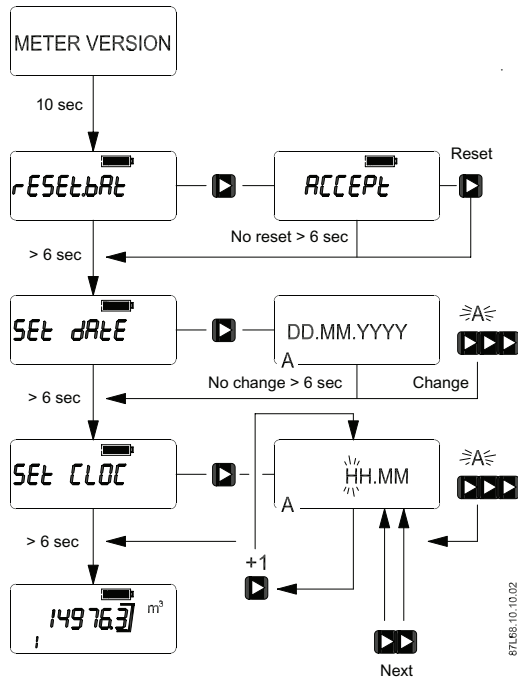


When new batteries have been installed, power-up procedure will enable resetting battery capacity and setting up date and time. Battery capacity reset, date and time can also be corrected via parameters 508 and 100.

When battery plug is connected, meter will display meter version for 10 seconds. Display will then show "rESEt.bAt" indicating the option to reset internal battery power calculation. To execute reset, press key within 6 seconds. If key is not pressed, meter will proceed to set date, set clock, and finally normal operation mode.

If key is pressed within reset battery time, display will indicate "Accept" to ensure that reset should take place. Reset will take place only if key is pressed again within the next 6 seconds. If not, normal operation will begin.

For setting up date and time, the different key function must be used - see Operator menu (Page 66). An "A" indicates an acceptable value and a flashing "A" indicates that value is stored when key is released.

Reset function also sets actual date as battery replacement date.

## 8.6        Verification mode

Verification mode increases measurement frequency to provide maximum measurements per second. All other parameters stay the same. This function is especially useful to minimize calibration time when validating water meter accuracy. Frame around digits will blink slowly to indicate that verification mode is enabled. Maximum pulse rate on output A is increased to 1 kHz and pulse width is set to 0.5 ms. When verification mode is exited the previous pulse setting is restored. Pulse widths other than 1 ms can be selected by storing new pulse values. This setting remains when verification mode is exited.
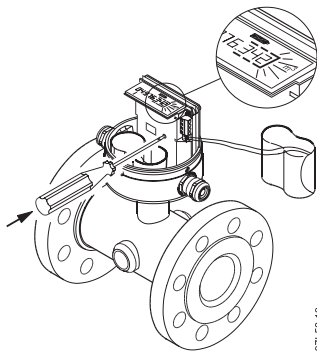


### Activation of verification mode

Verification mode is enabled in one of the following ways:

• Pressing verification button through hole in front screen.

• Writing integer '1' to parameter 320.

### Verification mode

The following indicate that meter is in verification mode:

• Frame surrounding digits in LCD starts flashing.

• Excitation frequency is set to maximum allowable frequency.

  – (ExcitationFreqNo = ExcitationFreqNoLimit)

• Resolution in display is set to 3 digits after decimal point.

  – (DecimalPoint = 3)

**Deactivation of verification mode**

Verification mode is deactivated in one of the following ways:

- Pressing verification button again.

- Writing integer '0' to parameter 320 (Calibration mode).

Verification mode automatically stops after 4 hours, unless manually deactivated.

# 8.7 Transport

| NOTICE |
|---|
| **Transport with fitted battery** |
| If the battery is still present in the device when transporting, it could become loose as a result of vibrations and cause damage within the device.<br>• Remove the batteries before returning the device.<br>• Dispose of the batteries according to regulations or include them separately in the return consignment. |

# 8.8 Return procedure

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

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

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

**Note**

**Return of products with lithium batteries**

Lithium batteries are dangerous goods according to the Regulation of Dangerous Goods, UN 3090 and UN 3091.

- Remove lithium batteries prior to shipment.

- If the battery cannot be removed, return the product according to the Regulation of Dangerous Goods with special transport documentation.

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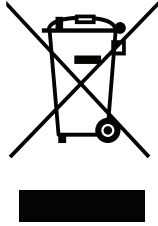
Devices described in this manual should be recycled. They may not be disposed of in the municipal waste disposal services according to the Directive 2012/19/EC on waste electronic and electrical equipment (WEEE).

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/)

### 8.9.1      Battery disposal

In accordance with EU directive 2006/66/EC, batteries are not to be disposed of via municipal waste disposal services.

Waste industrial batteries from our products are accepted back by Siemens and by the local Siemens representatives. Please follow the return procedures (Page 85) of Siemens or  talk to your local Siemens partner.

# Diagnostics and Troubleshooting

# 9

## 9.1 Fault codes

**Error system**

MAG 8000 can detect and report 13 different faults.

The faults are divided into two types: Fatal errors and Warnings.

**Fatal errors: Faults 1, 2, 3, and 4**

**Warnings: Faults 5, 6, 7, 9, L, E, C, d, and 14**

| Fault codes | Name/text | Description | Cause | Remedy |
|---|---|---|---|---|
| 1 | **Insulation fault** | "Cross-talk" between coil circuit and electrodes. An insulation fault will result in a offset error on flow measurement<br><br>(Advanced version only) | • Defect cables between sensor and transmitter<br>• Wrong connections of remote cables<br>• Water between coils and electrodes – could be caused by a broken liner<br>• Pollution/moisture on PCB caused by water in encapsulation | Check cable and wiring installation and disturbing elements in the surrounding.<br>Re-activation of insulation test (parameter 800) will reset alarm and start a new insulation test.<br>During the 4 minute insulation test, measurement is disabled.<br>Alarm remains active until a new test period detects no failures. |
| 2 | **Coil current fault** | Error in the coil circuit. Coil current has not settled within specified period.<br>A short-circuit in the coil can **NOT** be detected | • Coils have been disconnected could be caused by broken cable or wires | Check cable and wiring installation.<br>Alarm remains active until the fault condition is corrected. |
| 3 | **Amplifier overload** | Input signal is outside expected range.<br>Input amplifier circuit can not provide a stable measurement.<br>A short circuit between the two electrodes or between a electrode and common can NOT be detected | • Electrodes have been disconnected, or connected to ground | Check cable and wiring installation.<br>Alarm remains active until the fault condition is corrected. |

| Fault codes | Name/text | Description | Cause | Remedy |
|---|---|---|---|---|
| 4 | **Database checksum** | Corrupted data in ee-prom detected by check-sum test made during power-up | • Power failure during Ee-prom write | 1. Reset checksum repair alarm via parameter 560 and check data.<br><br>– All data is checked after operation (e.g., new flow calculation, writing to the EEprom, etc.) with a checksum control. If the checksum result fails, data will not be considered as valid and repair data must be made.<br><br>2. If data is wrong or checksum error reoccurs, replace the PCB board.<br><br>The alarm is active until the fault condition is corrected. |
| 5 | **Low Power Alarm** | Battery capacity is below preset threshold (default 10%).<br><br>Power up (temporary warning – will disappear after 4 hours) | • Battery capacity low<br>• Meter has been powered up | Check calculated battery capacity (parameter 510) versus battery alarm limit (parameter 206) and replace batteries if necessary<br><br>Flow measurement and communication stop, but display remains active as long as power is available.<br><br>The alarm remains active until the fault condition is resolved. |
| 6 | **Flow Overload** | Flow rate has exceeded 125% of Q3 | • Wrong sizing – flow sensor too small | Check meter sizing for actual installation<br><br>Alarm remains active until fault condition is resolved. |
| 7 | **PulseA overload** | Duty cycle of output A has exceeded maximum possible of 50 | • Wrong settings for output A | Change volume per pulse to a higher value - see Technical data (Page 99) for pulse selection.<br><br>Note: Pulse A is limited to 100Hz.<br><br>The alarm remains active until output pulse rate drops below maximum pulse rate. |
| 9 | **Consumption Interval** | Accumulated volume on totalizer 1 during data log period has exceeded the too low or too high consumption limit | • Flowrate higher or lower than expected<br>• Wrong parameter setup | Check data logger values and consumption limit.<br><br>Alarm remains active until it is manually reset via parameter 209. |
| L | **Leakage** | Lowest flow rate or volume during leakage period has exceeded leakage detection settings | • Leakage in water network | Check setting and pipe installation.<br><br>Alarm is active until it is manually reset by parameter 208.<br><br>Alarm reset resets information as does leakage period reset (parameter 820). |
| E | **Empty Pipe** | Measured electrode impedance has exceeded the empty-pipe detection level (parameters 540, 541 and 334) | • Pipe is not filled with water | Ensure sensor is filled with water.<br><br>Alarm remains active until fault condition is resolved. |

| Fault codes | Name/text | Description | Cause | Remedy |
|---|---|---|---|---|
| C | Low Impedance | Measured electrode impedance is below low impedance threshold (parameter 542), i.e. water has a high conductivity | • Water is polluted (e.g. saltwater in fresh water) | -<br><br>Alarm is active until water resistance is above low media alarm limit. |
| d | Flow Limit | The forward flow rate is greater than the high flow alarm limit (parameter 553). | • Water network failure – pipe burst | -<br><br>Alarm remains active until flow rate drops below flow alarm limit. |
| A | *Reverse Flow Limit* | *Reverse flow rate is below a preset threshold (default -1E9)* | • *Water network failure – non-return valve is broken* | -<br><br>Alarm remains active until reverse flow rate drops below reverse flow alarm limit. |

**Note**

Reset of fault log (parameter 204) also resets all alarms. Once reset, only active alarms become visible again.

## 9.2 Built-in functions

**Empty pipe detection**

Electrode impedance is measured with 800 Hz at 50 Hz mains frequency (960 Hz at 60 Hz mains frequency). This is done by toggling the electrode control pin every 6 respectively 5 samples – the sample frequency is 9600 Hz. The impedance value is averaged over 100 measurements. The electrode impedance A and B are measured in turns.

The unfiltered impedance value (a fast warning indication) is compared with a limit and the empty pipe warning is reported when it exceeds this limit – but only if the detection is ON and if there is no overload failure.

During empty pipe detection the coil current is held OFF and the flow value is forced zero.

Default settings for Electrode Impedance Limit is 25 000 ohm corresponding to a water conductivity of 20 µS/cm (10 000 ohm ≈ 50 µS/cm)

**Insulation test**

Insulation measurement is working like the normal measurement by excitation of the magnetic coils in the sensor. Value is checked against a default limit of 2.5 mm/s. A value above this limit results in a failure report. The "Insulation upper limit" can be adjusted through SIMATIC PDM or Flow Tool.

Measurement will NOT stop if an insulation fault occurs.

The last flow value is used for totalization during insulation test.

Insulation test interval according to register "Insulation Test Interval". Minimum 1 day between tests.

The insulation test can be enabled/disabled with register "Insulation Test".

When the insulation test is enabled the test starts immediately. All following insulation tests will start at 00:00:00 (midnight).

Duration of insulation test is 2 min 42 sec (1024 samples @ 6.25 Hz)

Insulation test will always be made with an excitation frequency of 6.25 Hz.

**Note**

For firmware versions < 3.07: The insulation test cannot be enabled in the basic versions of MAG 8000 and MAG 8000 CT.

## Coil-current test

When H-bridge is turned and just before making samples (4 times each measurement), the coil current is checked via a comparator. If the coil current is not settled, a failure is reported.

During coil current failure the flow value is forced zero.

## Amplifier test

Overload is possible both from the AD conversion of sensor signal and from the pre-amplifier. These checks are made at each sample and if one of the sample fails with an overload, this measurement is cancelled and a failure is reported.

During overload detection the coil current is held OFF and the flow value is forced zero.

## Checking facilities

The MAG 8000 and MAG 8000 CT are equipped with checking facilities of types P, I, and N. (in OIML R49). The automatic checks are performed without operator intervention.

**Type P** permanent checking facilities are automatic checks performed constantly during meter operation. They include:

- Coil current test
- Amplifier test
- Empty pipe test
- Flow overload
- Pulse overload

**Type I** intermittent checking facilities are automatic checks performed at certain time intervals or per fixed number of measurements. They include:

- Checksum calculation (10 min. interval on totalizer checksum)
- Insulation test (minimum 24 hour interval)
- Battery capacity check (4 hours interval)

**Type N** non-automatic checking facilities are checks that are **not** performed automatically including all other diagnosis functions in the MAG 8000 and the MAG 8000 CT.

## 9.3 Flow simulation

MAG 8000 and MAG 8000 CT has a built-in flow simulator (parameters 551 and 552) to verify and adjust pulse output to any connected device or system.

| ⚠ WARNING |
|---|
| **Totalized values are changed during simulation and actual flow is NOT measured.** |
| Simulation will stop automatically in 4 hours. |
| For MAG 8000 CT flow simulation is forbidden. |

# Technical specifications

<div style="text-align: right; font-size: 2em; font-weight: bold;">10</div>

## 10.1 MAG 8000 water meter

---

**Note**

**Further information**

For further information, see certificates. ([http://www.siemens.com/processinstrumentation/certificates](http://www.siemens.com/processinstrumentation/certificates))

---

| Meter | | MAG 8000 Standard (7ME6810) | MAG 8000 CT (7ME6820) |
|---|---|---|---|
| Accuracy | Standard calibration | ± 0.4% of rate ± 2 mm/s | - |
| | Extended calibration | ± 0.2% of rate ± 2 mm/s | - |
| | OIML R49:2013 | - | Class 1 (DN50-DN600) and Class 2 (DN50-DN600) |
| | MI-001 according to 2014/32/UE | - | Q3/Q1=315 (DN50-DN300 horizontal), Q3/Q1=200 (DN350-DN600 horizontal) |
| | NMI (Australia) | ± 2.5% (Q1 ≤ Q ≤ Q4) | - |
| Media conductivity | | Clean water > 20 µs/cm | |
| Temperature | Ambient | −20 to +60 °C (−4 to +140 °F) | −25 to +55 °C (−4 to +131 °F) |
| | Media | 0 to 70 °C (+32 to +158 °F) | 0.1 to 50 °C (+32 to +122 °F) |
| | Storage | −40 to +70 °C (−22 to +158 °F) | −40 to +70 °C (−22 to +158 °F) |
| Rated operating conditions | Device installation | indoor / outdoor / wet locations | |
| | Air humidity | max. 100 % | |
| | Altitude | max. 2000 m | |
| | Overvoltage category | II | |
| | Pollution degree | 2 | |
| Enclosure | | IP68/NEMA 6P rating. Cable glands mounted requires potting kit to remain IP68/NEMA 6P, otherwise IP67/NEMA 4 rating is obtained. Factory mounted cable provides IP68/NEMA 6P rating | |

| Meter | | MAG 8000 Standard (7ME6810) | MAG 8000 CT (7ME6820) |
|---|---|---|---|
| Approvals | Drinking water approvals | NSF 61 (cold water) USA WRAS (BS 6920 cold water) UK ACS Listed France DVGW W270 Germany Belgaqua (B) AS/NZS 4020 | NSF 61 (cold water) USA WRAS (BS 6920 cold water) UK ACS Listed France DVGW W270 Germany Belgaqua (B) AS/NZS 4020 KIWA |
| | Custody transfer approval | NMI | OIML R49:2013 OIML R 49 MI-001 (DK-0200-MI001-011) NMI KIWA |
| Conformity | | - | ISO 4064 |
| | PED | 2014/68/EU | |
| | EMC | EN 61326-1:2020 | |
| | FM Fire Service | Class Number 1044 | |

For further features, see "Features" (Page 169).

## 10.2 Sensor

**Technical specifications**

| Sensor | | MAG 8000 (7ME6810) | MAG 8000 CT (7ME6820) |
|---|---|---|---|
| Size, flange and pressure range | EN 1092-1 (DIN 2501) | DN 25, DN 40, DN 350 - DN 600: PN 40 DN 50 to 150: PN 16 DN 200 to 1200: PN 10 or PN 16 DN 350 - DN 600: PN 25 | DN 50 to 600: PN 16 |
| | ANSI 16.5 Class 150 lb | 1" to 24": 20 bar (290 psi) | 2" to 24": 16 bar (232 psi) |
| | AWWA C-207 | 28" to 48": PN 10 | - |
| | AS 4087 | DN 50 to 1200: PN 14 | DN 50 to 600: PN 16 |
| | AS 2091-1 Table D | - | - |
| | AS 2191 Table E | | |

| Sensor | | MAG 8000 (7ME6810) | MAG 8000 CT (7ME6820) |
|---|---|---|---|
| Max. excitation frequency Basic version | Battery-powered | 1/15 Hz for sensor size DN 25 to 150 (1" to 6") | 1/15 Hz for sensor size DN 50 to 150 (1" to 6") |
| | | 1/30 Hz for sensor size DN 200 to 600 (8" to 24") | 1/30 Hz for sensor size DN 200 to 600 (9" to 24") |
| | | 1/60 Hz for sensor size DN 700 to 1200 (28" to 48") | |
| | Mains-powered | 6.25 Hz for sensor size DN 25 to 150 (1" to 6") | 6.25 Hz for sensor size DN 25 to 150 (1" to 6") |
| | | 3.125 Hz for sensor size DN 200 to 600 (8" to 24") | 3.125 Hz for sensor size DN 200 to 600 (8" to 24") |
| | | 1.5625 Hz for sensor size DN 700 to 1200 (28" to 48") | |
| Max. excitation frequency Advanced version | Battery-powered | 1/15 Hz for sensor size DN 25 ... 150 (1" ... 6") adjustable up to 6.25 Hz | 1/15 Hz for sensor size DN 50 ... 150 (2" ... 6") adjustable up to 6.25 Hz |
| | | 1/30 Hz for sensor size DN 200 ... 600 (8" ... 24") adjustable up to 3.125 Hz | 1/30 Hz for sensor size DN 200 ... 600 (8" ... 24") adjustable up to 3.125 Hz |
| | | 1/60 Hz for sensor size DN 700 ... 1200 (28" ... 48") adjustable up to 1.5625 Hz | |
| | Mains-powered | 6.25 Hz for sensor size DN 25 ... 150 (1" ... 6") | 6.25 Hz for sensor size DN 25 ... 150 (1" ... 6") |
| | | 3.125 Hz for sensor size DN 200 ... 600 (8" ... 24") | 3.125 Hz for sensor size DN 200 ... 600 (8" ... 24") |
| | | 1.5625 Hz for sensor size DN 700 ... 1200 (28" ... 48") | |
| Liner | | EPDM | EPDM |
| Electrode and grounding | | Hastelloy C276 | Hastelloy C276 |

## 10.3    Transmitter

| Transmitter | | MAG 8000Standard (7ME6810) | MAG 8000 CT (7ME6820) |
|---|---|---|---|
| Installation | | Integral (compact) or remote with factory-mounted cable in 5, 10, 20 or 30 m lengths with IP68/NEMA 6P connectors. Connection is made at the transmitter bottom. | |
| Material | Top housing | Stainless steel (AISI 316) | |
| | Wall mounting bracket | Stainless steel (AISI 304). | |

| Transmitter | | MAG 8000Standard (7ME6810) | MAG 8000 CT (7ME6820) |
|---|---|---|---|
| Display and key | Display | 8 digits for main information. Index, menu and status symbols for dedicated information | |
| | Key | For toggling through information and resetting of customer totalizer and call-up function | |
| | Menus | Selectable default information and accessible menus: - Operator - Meter - Service - Data Logger - Statistic (Advanced version only) - Revenue and Tariffs (Advanced version only) | |
| | Resolution | Totalized information can be displayed with 1, 2 or 3 decimals or automatic adjustment for maximum resolution | |
| Flow unit | Europe std. | Volume: $m^3$ Flow rate: $m^3/h$ | |
| | US std. | Volume: Gallon Flow rate: GPM | Volume: $m^3$ Flow rate: $m^3/h$ |
| | Australia std. | Volume: ML Flow rate: ML/d | Volume: $m^3$ Flow rate: $m^3/h$ |
| | Other selectable units | Volume: $m^3$ x 100, L x 100, G x 100, G x 1000, MG, CF x 100, CF x 1000, AF, Al, kL, BBL42 Flow rate: $m^3$/min, $m^3$/h, $m^3$/d, L/s, L/min, L/h, ML/ d, GPS, GPH, GPD, MGD, GPM, CFS, CFM, CFH, BBL42/s, BBL42/min, BBL42/ h, BBL42/d | - |
| | | Other units than $m^3$ and $m^3/h$ (ordered from factory or manually configured on-site by changing scaling factors) are shown by a label stuck onto display | |
| Digital output | Nos. | 2 passive outputs (MOS), individually galvanically isolated | |
| | Load | Max. ± 35 V DC, 50 mA short circuit protected | |
| | Output A | Programmable as: Pulse volume, Forward, Reverse, Forward/net, Reverse/net | |
| | Output B | Programmable as: Pulse volume, Forward, Reverse, Forward/net, Reverse/net , Alarm, Call-up | |
| | Pulse rate | Pulse A: Max. 100 Hz Pulse B: Max. 50 Hz | |
| | Pulse width | 5, 10, 25, 50, 100, 500 ms | |

| Transmitter | | MAG 8000Standard (7ME6810) | MAG 8000 CT (7ME6820) |
|---|---|---|---|
| Communication | IrDA | Standard integrated infrared communication interface with MODBUS RTU proto-col | |
| | Add-on modules | RS 232 serial interface with MODBUS RTU (Rx/Tx/GND), point to point with max. 15 m cable | |
| | | RS 485 serial interface with MODBUS RTU (+/-/GND), multidrop with up to 32 devices with max. 1000 m cable | |
| | | Encoder interface module (for Itron 200WP) "Sensus protocol" | |
| | | Wireless communication module with or without analog input cable | |

# 10.4 Power supply

| Power supply | | |
|---|---|---|
| Battery power supply [1] | Internal battery pack | 1 D-Cell 3.6 V / 16 Ah |
| | Internal battery pack | 2 D-Cell 3.6 V / 33 Ah |
| | External battery pack | 4 D-Cell 3.6 V / 66 Ah |
| 12-24 V AC/DC power supply | Input voltage range | 12/24 V AC/DC (10 ... 32 V DC) |
| | Power consumption | 2 VA |
| | Isolation | Class II |
| | Fuse | 1000 mA T - Not replaceable |
| | Short circuit protection | Module is protected from short circuit on the output con-nector. Both during mains and backup supply |
| | Conformity | IEC 61010-1 OIML R49:2013 EMC: EN 61326-1 |
| 115 to 230 V AC mains supply | Input voltage range | 115 to 230 V AC, +15% to −20%, 50-60 Hz |
| | Power consumption | 2 VA |
| | Isolation | Class II |
| | Fuse | 250 mA T - Not replaceable |
| | External circuit breaker[2] | 10 A ... 16 A |
| | Short circuit protection | Module is protected from short circuit on the output con-nector. Both during mains and backup supply in the range of 10 A ... 16 A |
| | Conformity | IEC 61010-1 OIML R49:2013 EMC: EN 61326-1 |

**Power supply**

| Input cable for 12/24 V AC/DC and 115 to 230 V AC power supply | Factory-mounted PUR cable | 2 x 1 mm² (brown, blue) Length = 3 m | |
| --- | --- | --- | --- |
| | Resistance | Sunlight and water | |
| | Outer diameter | 7 mm (0.28") | |
| | Rated voltage | 300 ... 500 V AC | |
| | Testing voltage | 2000 V AC | |
| | Temperature range | Fixed laying: | −40 to +90 °C (-40 to 194 °F) |
| | | Flexible application: | −30 to +80 °C (-22 to 176 °F) |
| | Bending radius | Min. 28 mm (fixed installation) | |
| | Pulling force | Max. 200 N | |
| | Output | Socket | |
| | Backup battery | Plug | |

[1] Lithium batteries are subject to special transportation regulations according to United Nations "Regulation of Dangerous Goods, UN 3090 and UN 3091". Special transport documentation is required to observe these regulations. This may influence both transport time and costs.

[2] Circuit breaker must be marked as the disconnecting device for the equipment

# 10.5    Modbus RTU

**Siemens Flow Instruments Modbus RTU specification for add-on modules**

| | |
| --- | --- |
| Device type | Slave |
| Baud rates | 1200, 2400, 4800, 9600, 19 200, 38 400 bits/sec. |
| Number of stations | Recommended: max. 31 per segment without repeaters for RS 485 |
| Device address range | 1 to 247 |
| Protocol | RTU |
| | (Other Modbus protocols like ASCII, Plus or TCP/IP are not supported) |
| Electrical interface | RS 485, 2-wire and RS 232, 2-wire |
| Connecter type | Screw terminals |
| Supported function codes | 1:    read coils |
| | 3:    read holding registers |
| | 5:    write single coil |
| | 16:    write multiple registers |
| | 17:    report slave ID |
| Broadcast | Yes |
| Maximum cable length | 1200 meters (@38 400 bps) |
| Standard | Modbus over serial line v1.0 |
| Certified | No |
| Device profile | None |

| Siemens Flow Instruments Modbus RTU specification for add-on modules | |
| --- | --- |
| Add-on modules comply with | MODBUS over serial line specification & implementation guide v. 1.0 |
| | modbus.org 12/02/02 |
| | MODBUS application protocol specification v. 1.1 |
| | modbus.org 12/06/02 |
| Isolation | 500 V AC functional isolation of data signals and common |

Add-on modules must be connected to equipment complying with "Low Voltage Directive" in order to be considered safe. The isolation within the MAG 8000 and MAG 8000 CT add-on MODBUS module is only functional isolation.

## 10.6 Output characteristics

This chapter describes how the MAG 8000 and MAG 8000 CT outputs work.

**Output A and B as pulse volume**



$$PR\,[s] = \frac{1}{PF\,[Hz]}$$

PW 5, 10, 50 100 & 500 mS

| ① | Forward | PR | Pulse rate |
| ② | Reverse | PF | Pulse frequency |
| ③ | Cut-off | PW | Pulse width |
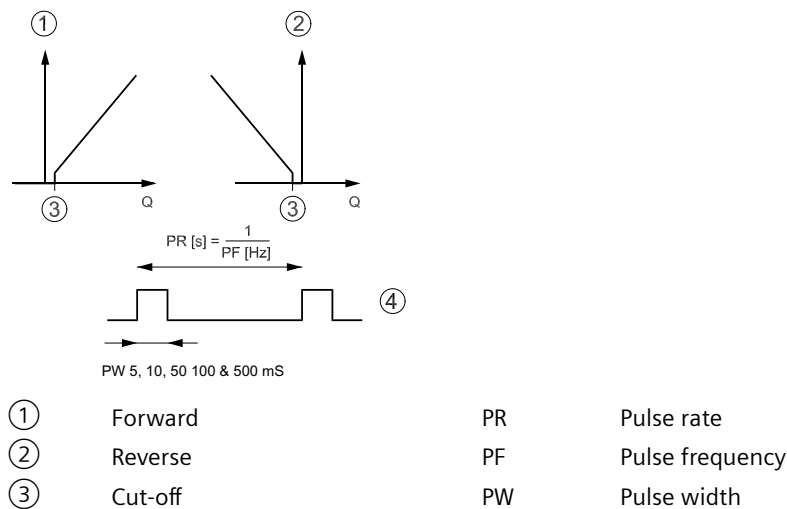
**MAG 8000**

When output A or B is configured as volume per pulse, the output delivers a pulse when the preset volume based on either Forward/Reverse or Net Forward/Net Reverse flow has passed the sensor in the selected direction. The volume per pulse is freely scalable, from 0.000001 to 10 000 units per pulse, and should not exceed the pulse rate of the output configuration table.

**MAG 8000 CT**

The volume per pulse is defined in the MAG 8000 CT version to 0.001 or 0.01 or 0.1 or 1 $m^3$ per pulse.

## Output B as alarm output



①      Alarm output
②      Alarm status
③      On - Off
④      No Error
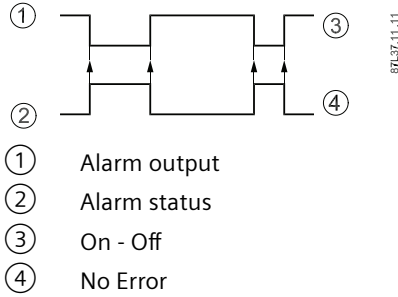
**MAG 8000**

When output B is configured as an "alarm" output, it will follow the internal alarms that were previously chosen in the Alarm Configuration List (Page 55).

**Note**

Alarm output is inverted to a pulse output providing an alarm if power disappears or cable connection is interrupted.

## Output B as call-up output



①      Call up output
②      Call up reset
③      Call up status
④      On - Off
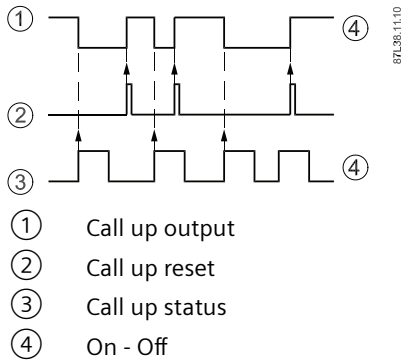
When output B is configured as "call-up", the output is activated by an alarm condition and remains on until it is reset via meter display key or communication interface.

A new alarm will not activate a "call-up" function if the "call-up" function is still active from a previous alarm.

**Note**

Like alarm output, call-up output inverts to a pulse output providing a call-up if power disappears or cable connection is interrupted.

**MAG 8000**

When output B is configured as an "call-up" output, it will follow the internal alarms that were previously chosen in the Alarm Configuration List.

#### Note

Call-up output is inverted to a pulse output providing an alarm if power disappears or cable connection is interrupted.

### Regional factory default settings

| DN<br>mm | size<br>(inch) | Pulse width<br>ms | Amount per pulse<br>m³ (Europe) | Amount per pulse<br>Gallons (USA) | Amount per pulse<br>ML (Australia) |
|---|---|---|---|---|---|
| 25, 40, 50 | (1", 1½", 2") | 50 | 0.01 | 1 | 0.001 |
| 65, 80, 100, 125, 150 | (2½", 3", 4", 5", 6") | 50 | 0.1 | 10 | 0.001 |
| 200, 250, 300, 350, 400, 450, 500 | (8", 10", 12", 14", 16", 18", 20") | 50 | 1 | 100 | 0.01 |
| 600, 700, 800, 900, 1000, 1050, 1100, 1200 | (24", 28", 30", 32", 36", 40", 42", 44", 48") | 50 | 10 | 100 | 0.01 |

Pulse A is set to ON - Forward flow. Pulse B is set to Alarm.

#### Note

Via the MLFB order system is it possible to select other units than the default region units. The pulse output will only be enabled if the pulse settings are selected in the MLFB no.

### Pulse output, volume selection (MAG 8000)

| DN<br>(inches) | Max.<br>flow<br>rate Qn<br>(Q3) | Guidelines for min. volume per pulse at Qn<br>Volume [m³] = Qn [m³/s] * (2*PW [s]) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| (inches) | m³ | 5 ms<br>PW m³<br>[100Hz] | 10 ms<br>PW m³<br>[50Hz] | 50 ms<br>PW m³<br>[10Hz] | 50 ms<br>PW gallon<br>[10Hz] | 50 ms<br>PW ML<br>[10Hz] | 100 ms<br>PW m³<br>[5Hz] | 500 ms<br>PW m³<br>[1Hz] |
| 25 (1") | 17.67 | 0.00005 | 0.0001 | 0.0005 | 0.130 | 0.000001 | 0.001 | 0.005 |
| 40 (1½") | 45 | 0.0001 | 0.0003 | 0.001 | 0.330 | 0.000001 | 0.003 | 0.013 |
| 50 (2") | 63 | 0.0002 | 0.0004 | 0.002 | 0.462 | 0.000002 | 0.004 | 0.018 |
| 65 (2½") | 100 | 0.0003 | 0.0006 | 0.003 | 0.734 | 0.000003 | 0.006 | 0.028 |
| 80 (3") | 160 | 0.0004 | 0.0009 | 0.004 | 1.174 | 0.000004 | 0.009 | 0.044 |
| 100 (4") | 250 | 0.0007 | 0.0014 | 0.007 | 1.835 | 0.000007 | 0.014 | 0.069 |
| 125 (5") | 400 | 0.0011 | 0.0022 | 0.011 | 2.935 | 0.000011 | 0.022 | 0.111 |
| 150 (6") | 630 | 0.0018 | 0.0035 | 0.018 | 4.623 | 0.000018 | 0.035 | 0.175 |
| 200 (8") | 1000 | 0.0028 | 0.0056 | 0.028 | 7.338 | 0.000028 | 0.056 | 0.278 |

| DN (inches) | Max. flow rate Qn (Q3) | Guidelines for min. volume per pulse at Qn Volume [m³] = Qn [m³/s] * (2*PW [s]) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| (inches) | m³ | 5 ms PW m³ [100Hz] | 10 ms PW m³ [50Hz] | 50 ms PW m³ [10Hz] | 50 ms PW gallon [10Hz] | 50 ms PW ML [10Hz] | 100 ms PW m³ [5Hz] | 500 ms PW m³ [1Hz] |
| 250 (10") | 1600 | 0.0044 | 0.0089 | 0.044 | 11.741 | 0.000044 | 0.089 | 0.444 |
| 300 (12") | 2500 | 0.0069 | 0.0139 | 0.069 | 18.345 | 0.000069 | 0.139 | 0.694 |
| 350 (14") | 3463 | 0.0096 | 0.0192 | 0.096 | 25.412 | 0.000096 | 0.192 | 0.962 |
| 400 (16") | 4523 | 0.0126 | 0.0251 | 0.126 | 33.190 | 0.000126 | 0.251 | 1.256 |
| 450 (18") | 5725 | 0.0159 | 0.0318 | 0.159 | 42.010 | 0.000159 | 0.318 | 1.590 |
| 500 (22") | 7068 | 0.0196 | 0.0393 | 0.196 | 51.865 | 0.000196 | 0.393 | 1.963 |
| 600 (24") | 10178 | 0.0283 | 0.0565 | 0.283 | 74.687 | 0.000283 | 0.565 | 2.827 |
| 700 (28") | 13854 | 0.0385 | 0.0770 | 0.385 | 101.662 | 0.000385 | 0.770 | 3.848 |
| 750 (30") | 15904 | 0.0442 | 0.0884 | 0.442 | 116.705 | 0.000442 | 0.884 | 4.418 |
| 800 (32") | 18095 | 0.0503 | 0.1005 | 0.503 | 132.782 | 0.000503 | 1.005 | 5.026 |
| 900 (36") | 22902 | 0.0636 | 0.1272 | 0.636 | 168.057 | 0.000636 | 1.272 | 6.362 |
| 1000 (40") | 28274 | 0.0785 | 0.1571 | 0.785 | 207.477 | 0.000785 | 1.571 | 7.854 |
| 1050 (42") | 31175 | 0.0866 | 0.1732 | 0.866 | 228.750 | 0.000866 | 1.732 | 8.659 |
| 1100 (44") | 34211 | 0.0950 | 0.1901 | 0.950 | 251.043 | 0.000950 | 1.901 | 9.503 |
| 1200 (48") | 40715 | 0.1131 | 0.2262 | 1.131 | 298.770 | 0.001131 | 2.262 | 11.310 |

PW = pulse width

**Note**

The calculated numbers of pulses are an average of the measuring period.
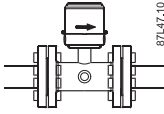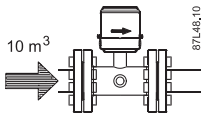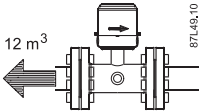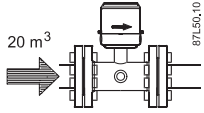
The factory value of pulse width shall be 10ms by if Z option L70-L74 for pulse A or L90-L94 for pulse B selected.

For MAG 8000 CT please see definition of Q3 flow rates in the certificates for OIML R 49 or MI 001.

**Net flow output**

The MAG 8000 has a special net pulse output that includes bi-directional flow calculations.

The example shows that over time, the net pulse output indicates the bi-directional totalizer as calculated internally. The same principle applies for forward and reverse flow calculation. By changing the status of the pulse output, the internal pulse calculator will be reset.

| Flow | Net totalizer in meter display (Bi-directional) Volume [m³] | Pulse output forward Uni-directional mode Volume [m³] | | Pulse output net forward Bi-directional mode Volume [m³] | |
|---|---|---|---|---|---|
| | *Volume [m³]* | *Internal calculation* | *Delivered volume* | *Internal calculation* | *Delivered volume* |
| (87L.47.10) | 0 | - | 0 | 0 | 0 |
| 10 m³ (87L.48.10) | 10 | - | 10 | 0 | 10 |
| 12 m³ (87L.49.10) | −2 | - | 0 | -12 | 0 |
| 20 m³ (87L.50.10) | 18 | - | 20 | −12+20= | 8 |
| Total accounted volume [m³] Forward/Reverse | 18F | | 30F | | 18F |

**Encoder output interface read out**

| | | | MSD LSD | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Digits in MAG 8000 display** | | | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | | | |
| **Model** | **Size** | **Unit** | **Display configuration** | | | | | | | | | **$Q_3$** | **Digits after dec. point** |
| 7ME 6820 2Y | DN50 (2") | m³ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 63 | 1 |
| 7ME 6820 3F | DN65 (2½") | m³ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 100 | 1 |
| 7ME 6820 3M | DN80 (3") | m³ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 160 | 1 |
| 7ME 6820 3T | DN100 (4") | m³ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 250 | 1 |
| 7ME 6820 4B | DN125 (5") | m³ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 400 | 1 |
| 7ME 6820 4H | DN150 (6") | m³ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 630 | 1 |
| 7ME 6820 4P | DN200 (8") | m³ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1000 | 1 |
| 7ME 6820 4V | DN250 (10") | m³ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1600 | 1 |
| 7ME 6820 5D | DN300 (12") | m³ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1600 | 1 |

Parameter 305 Decimal Point should be configured to "1 digit after decimal point" in case Encoder interface module is selected in MAG 8000 or MAG 8000 CT; otherwise proper reading from the device cannot be performed.

# 10.7    Meter uncertainty

To ensure continuous accurate measurement, water meters must be calibrated. The calibration is conducted at Siemens flow facilities with traceable instruments referring directly to the physical unit of measurement according to the International System of Units (SI).

Therefore, the calibration certificate ensures recognition of the test results worldwide, including the US (NIST traceability).

Siemens offers accredited calibrations assured to ISO 17025 in the flow range from 0.0001 m³/h to 10 000 m³/h.

Siemens Flow Instruments accredited laboratories are recognized by ILAC MRA (International Laboratory Accreditation Corporation- Mutual Recognition Arrangement) ensuring international traceability and recognition of the test results worldwide.

The selected calibration determines the accuracy of the water meter. An extended calibration of the MAG 8000 (7ME6810) sizes DN50 (2") to DN 300 (12") results in a max. ±0.2% of rate ±2 mm/s uncertainty. A calibration certificate is included with every sensor and calibration data is stored within the meter.

| | | | |
|---|---|---|---|
| ① | MAG 8000 Standard | Standard calibration | ±0.4 % of rate ±2 mm/s |
| ② | MAG 8000 Standard | Extended calibration | ±0.2 % of rate ±2 mm/s |

Calibration references conditions (ISO 9104 and DIN EN 29104)

Media temperature: 20°C ± 5K (68°F ± 9°F)

Ambient temperature: 20°C ± 5K (68°F ± 9°F)

Warming-up time: 30 min.

Incorporation in pipe section

Inlet section: 10 x DN

Outlet section: 5 x DN

Flow conditions: Fully developed flow profile

## 10.8 FM Fire Service applications (MAG 8000 and MAG 8000 CT)

Devices ordered with Z-option P20, P21 or P22 are FM Fire Service approved for automatic fire protection systems according to the Fire Service Meters Standard, Class Number 1044. The approval is applicable for the sizes DN 50, DN 80, DN 100, DN 150, DN 200, DN 250, and DN 300 (2", 3", 4", 6", 8", 10", and 12") with ANSI B16.5 Class 150 flanges.
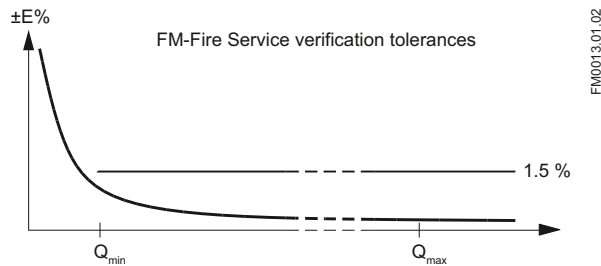
## 10.9 MAG 8000 CT (7ME6820) (Revenue program) water meter type approval

MAG 8000 CT program is type-approved according to international water meter standard OIML R49:2013. The Custody Transfer program is approved as Class I and Class II, for the sensor program from DN 50 to DN 600, at different Q3 and Q3/Q1.

Q2/Q1 = 1.6 and follows standard OIML R49 specification.



Cl. I / Cl. II = OIML R49 Class I / Class II
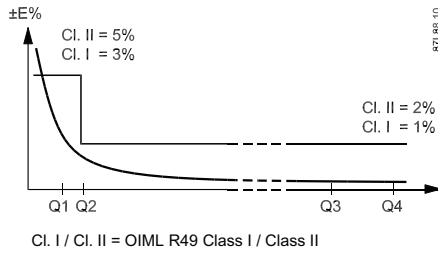
Table 10-1    OIML R49:2013 for Class 1 (not approved for bi-directional measurements)

| Size | 50 (2") | 65 (2½") | 80 (3") | 100 (4") | 125 (5") | 150 (6") | 200 (8") | 250 (10") | 300 (12") | 350 (14") | 400 (16") | 450 (18") | 500 (20") | 600 (24") |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| "R" $Q^3$/Q1 | | | | | 200 | | | | | | | 125 | | |
| Q4 [m³/h] | 78.75 | 125 | 200 | 312.5 | 500 | 787.5 | 1250 | 2000 | 2000 | 3125 | 5000 | 5000 | 7875 | 7875 |
| Q3 [m³/h] | 63 | 100 | 160 | 250 | 400 | 630 | 1000 | 1600 | 1600 | 2500 | 4000 | 4000 | 6300 | 6300 |
| Q2 [m³/h] | 0.504 | 0.8 | 1.28 | 2 | 3.2 | 5.04 | 8 | 12.8 | 12.8 | 32 | 51.2 | 51.2 | 80.64 | 80.64 |
| Q1 [m³/h] | 0.315 | 0.5 | 0.8 | 1.25 | 2 | 3.15 | 5 | 8 | 8 | 20 | 32 | 32 | 50.4 | 50.4 |

Table 10-2    OIML R49:2013 for Class 2

| Size | 50 (2") | 65 (2½") | 80 (3") | 100 (4") | 125 (5") | 150 (6") | 200 (8") | 250 (10") | 300 (12") | 350 (14") | 400 (16") | 450 (18") | 500 (20") | 600 (24") |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| "R" $Q^3$/Q1 | | | | | 315 | | | | | | | 200 | | |
| Q4 [m³/h] | 78.75 | 125 | 200 | 312.5 | 500 | 787.5 | 1250 | 2000 | 2000 | 3125 | 5000 | 5000 | 7875 | 7875 |
| Q3 [m³/h] | 63 | 100 | 160 | 250 | 400 | 630 | 1000 | 1600 | 1600 | 2500 | 4000 | 4000 | 6300 | 6300 |
| Q2 [m³/h] | 0.32 | 0.508 | 0.813 | 1.27 | 2.032 | 3.2 | 5.079 | 8.127 | 8.127 | 20 | 32 | 32 | 50.4 | 50.4 |
| Q1 [m³/h] | 0.2 | 0.317 | 0.508 | 0.794 | 1.27 | 2 | 3.175 | 5.079 | 5.079 | 12.5 | 20 | 20 | 31.5 | 31.5 |

## 10.10 MAG 8000 CT (7ME6820) (Revenue program) MID option (MI-001)

MAG 8000 CT program is type approved according to international water meter standard OIML R49. Since 1 November 2006 the MI-001 water meter directive has been in force, which means that all water meters can be sold across the EU borders if the water meters contain a MI-001 label.

The MAG 8000 CT MI-001 verified and labeled products are equivalent to OIML R49 accuracy Class 2 according to Directive 2014/32/EU of the European Parliament and Council of February 26, 2014 on measuring instruments (MID), Annex MI-001 in the sizes from DN 50 to DN 600.

The MID certification is obtained as a module B and module D approvals according to the above mentioned directive.

Module B : Type approval according to OIML R49

Module D : Quality insurance approval of production
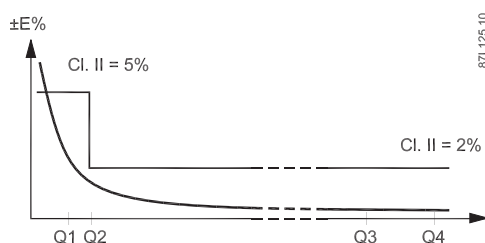


MAG 8000 CT MI-001 verified and labelled products at a given Q3 and Q4/Q3 = 1.25 and Q2/Q1 = 1.6 measuring ranges see below table:

| Size | 50 (2") | 65 (2½") | 80 (3") | 100 (4") | 125 (5") | 150 (6") | 200 (8") | 250 (10") | 300 (12") | 350 (14") | 400 (16") | 450 (18") | 500 (20") | 600 (24") |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| "R" Q³/Q1 | | | | | | | | 40 | | | | | | |
| Q4 [m³/h] | 20 | 31.25 | 50 | 78.75 | 125 | 200 | 312.5 | 500 | 787.5 | 787.5 | 1250 | 2000 | 3125 | 5000 |
| **Q3 [m³/h]** | **16** | **25** | **40** | **63** | **100** | **160** | **250** | **400** | **630** | **630** | **1000** | **1600** | **2500** | **4000** |
| Q2 [m³/h] | 0.64 | 1 | 1.6 | 2.52 | 4 | 6.4 | 10 | 16 | 25.2 | 25.2 | 40 | 64 | 100 | 160 |
| Q1 [m³/h] | 0.4 | 0.63 | 1 | 1.58 | 2.5 | 4 | 6.25 | 10 | 15.75 | 15.75 | 25 | 40 | 62.5 | 100 |

| Size | 50 (2") | 65 (2½") | 80 (3") | 100 (4") | 125 (5") | 150 (6") | 200 (8") | 250 (10") | 300 (12") | 350 (14") | 400 (16") | 450 (18") | 500 (20") | 600 (24") |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| "R" Q³/Q1 | | | | | | | | 63 | | | | | | |
| Q4 [m³/h] | 20 | 31.25 | 50 | 79 | 125 | 200 | 312.5 | 500 | 788 | 1250 | 2000 | 3125 | 5000 | 7875 |
| **Q3 [m³/h]** | **16** | **25** | **40** | **63** | **100** | **160** | **250** | **400** | **630** | **1000** | **1600** | **2500** | **4000** | **6300** |
| Q2 [m³/h] | 0.41 | 0.64 | 1.02 | 1.6 | 2.54 | 4.07 | 6.35 | 10.16 | 16 | 25.4 | 40.63 | 63.5 | 101.59 | 160 |
| Q1 [m³/h] | 0.26 | 0.4 | 0.64 | 1 | 1.59 | 2.54 | 3.97 | 6.35 | 10 | 15.88 | 25.4 | 39.69 | 63.49 | 100 |

| Size | 50 (2") | 65 (2½") | 80 (3") | 100 (4") | 125 (5") | 150 (6") | 200 (8") | 250 (10") | 300 (12") | 350 (14") | 400 (16") | 450 (18") | 500 (20") | 600 (24") |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| "R" Q³/Q1 | | | | | | | | 80 | | | | | | |
| Q4 [m³/h] | 31.25 | 50 | 79 | 125 | 200 | 312.5 | 500 | 788 | 1250 | 2000 | 3125 | 3125 | 5000 | 7875 |
| **Q3 [m³/h]** | **25** | **40** | **63** | **100** | **160** | **250** | **400** | **630** | **1000** | **1600** | **2500** | **2500** | **4000** | **6300** |
| Q2 [m³/h] | 0.5 | 0.8 | 1.26 | 2 | 3.2 | 5 | 8 | 12.6 | 20 | 32 | 50 | 50 | 80 | 126 |
| Q1 [m³/h] | 0.32 | 0.5 | 0.79 | 1.25 | 2 | 3.13 | 5 | 7.88 | 12.5 | 20 | 31.25 | 31.25 | 50 | 78.75 |

| Size | 50 (2") | 65 (2½") | 80 (3") | 100 (4") | 125 (5") | 150 (6") | 200 (8") | 250 (10") | 300 (12") | 350 (14") | 400 (16") | 450 (18") | 500 (20") | 600 (24") |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| "R" Q³/Q1 | | | | | | | | 160 | | | | | | |
| Q4 [m³/h] | 50 | 79 | 125 | 200 | 312.5 | 500 | 788 | 1250 | 2000 | 3125 | 5000 | 5000 | 7875 | 7875 |

*10.10 MAG 8000 CT (7ME6820) (Revenue program) MID option (MI-001)*

| Size | 50 (2") | 65 (2½") | 80 (3") | 100 (4") | 125 (5") | 150 (6") | 200 (8") | 250 (10") | 300 (12") | 350 (14") | 400 (16") | 450 (18") | 500 (20") | 600 (24") |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Q3 [m³/h] | 40 | 63 | 100 | 160 | 250 | 400 | 630 | 1000 | 1600 | 2500 | 4000 | 4000 | 6300 | 6300 |
| Q2 [m³/h] | 0.4 | 0.63 | 1 | 1.6 | 2.5 | 4 | 6.3 | 10 | 16 | 25 | 40 | 40 | 63 | 63 |
| Q1 [m³/h] | 0.25 | 0.40 | 0.63 | 1 | 1.57 | 2.5 | 3.94 | 6.25 | 10 | 15.63 | 25 | 25 | 39.38 | 39.38 |

| Size | 50 (2") | 65 (2½") | 80 (3") | 100 (4") | 125 (5") | 150 (6") | 200 (8") | 250 (10") | 300 (12") | 350 (14") | 400 (16") | 450 (18") | 500 (20") | 600 (24") |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| "R" Q³/Q1 | | | | | | | 200 | | | | | | | |
| Q4 [m³/h] | 78.75 | 125 | 200 | 312.5 | 500 | 787.5 | 1250 | 2000 | 2000 | - | - | - | - | - |
| Q3 [m³/h] | 63 | 100 | 160 | 250 | 400 | 630 | 1000 | 1600 | 1600 | - | - | - | - | - |
| Q2 [m³/h] | 0.51 | 0.8 | 1.28 | 2 | 3.2 | 5.04 | 8 | 12.8 | 12.8 | - | - | - | - | - |
| Q1 [m³/h] | 0.32 | 0.5 | 0.8 | 1.25 | 2 | 3.15 | 5 | 8 | 8 | - | - | - | - | - |

| Size | 50 (2") | 65 (2½") | 80 (3") | 100 (4") | 125 (5") | 150 (6") | 200 (8") | 250 (10") | 300 (12") | 350 (14") | 400 (16") | 450 (18") | 500 (20") | 600 (24") |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| "R" Q³/Q1 | | | | | | | 250 | | | | | | | |
| Q4 [m³/h] | 78.75 | 125 | 200 | 312.5 | 500 | 787.5 | 1250 | 2000 | 2000 | - | - | - | - | - |
| Q3 [m³/h] | 63 | 100 | 160 | 250 | 400 | 630 | 1000 | 1600 | 1600 | - | - | - | - | - |
| Q2 [m³/h] | 0.41 | 0.64 | 1.03 | 1.6 | 2.56 | 4.04 | 6.4 | 10.24 | 10.24 | - | - | - | - | - |
| Q1 [m³/h] | 0.26 | 0.4 | 0.64 | 1 | 1.6 | 2.52 | 4 | 6.4 | 6.4 | - | - | - | - | - |

### Operating Conditions

| | |
|---|---|
| Environment class | E2, M1 |
| Climatic class | -25...55 °C, condensing, closed |
| Verification tolerance | $\pm 5\%\ Q_1 < Q < Q_2$<br>$\pm 2\%\ Q_2 \leq Q \leq Q_4$ |
| Unit of measurement | Cubic meters |
| Temperature | T30 (0.1 °C - 30 °C) / tested up to T50 according to OIML R49:2013 |
| Pressure | PN ≔ 16 bar or PN ≔ 10 bar or PN ≔ 6 bar |
| Power supply | 3.6 V Lithium Battery, 12 - 24 VAC/VDC, 115 - 230 VAC |
| Compact/Remote | Max. 30 m cable |

## 10.11 The effect of temperature MAG 8000 (7ME6810) and MAG 8000 CT (7ME6820)

| Metric (Pressures in bar) | | | | | |
|---|---|---|---|---|---|
| Flange spec. | Flange rating | Temperature °C | | | |
| | | 0 | 10 | 50 | 70 |
| **Sizes 25 mm, 40 mm and > 300 mm** | | | | | |
| 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 16.5 | 150 lb | 19.7 | 19.7 | 19.3 | 18.0 |
| **Sizes 50 mm to 300 mm** | | | | | |
| EN 1092-1 | PN 10 | 10.0 | 10.0 | 10.0 | 8.2 |
| | PN 16 | 10.0 | 16.0 | 16.0 | 13.2 |
| ANSI 16.5 | 150 lb | 10.0 | 19.7 | 19.7 | 16.2 |

| Imperial (Pressures in Psi) | | | | | |
|---|---|---|---|---|---|
| Flange spec. | Flange rating | Temperature °F | | | |
| | | 32 | 50 | 122 | 158 |
| **Sizes 1", 1½", and > 12"** | | | | | |
| EN 1092-1 | PN 10 | 145 | 145 | 141 | 136 |
| | PN 16 | 232 | 232 | 225 | 219 |
| | PN 40 | 580 | 580 | 561 | 547 |
| ANSI 16.5 | 150 lb | 286 | 286 | 280 | 261 |
| **Sizes 2" to12"** | | | | | |
| EN 1092-1 | PN 10 | 145 | 145 | 145 | 119 |
| | PN 16 | 145 | 232 | 232 | 191 |
| ANSI 16.5 | 150 lb | 145 | 286 | 286 | 235 |

*10.11 The effect of temperature MAG 8000 (7ME6810) and MAG 8000 CT (7ME6820)*

# Dimension drawings

**Meter dimensions**
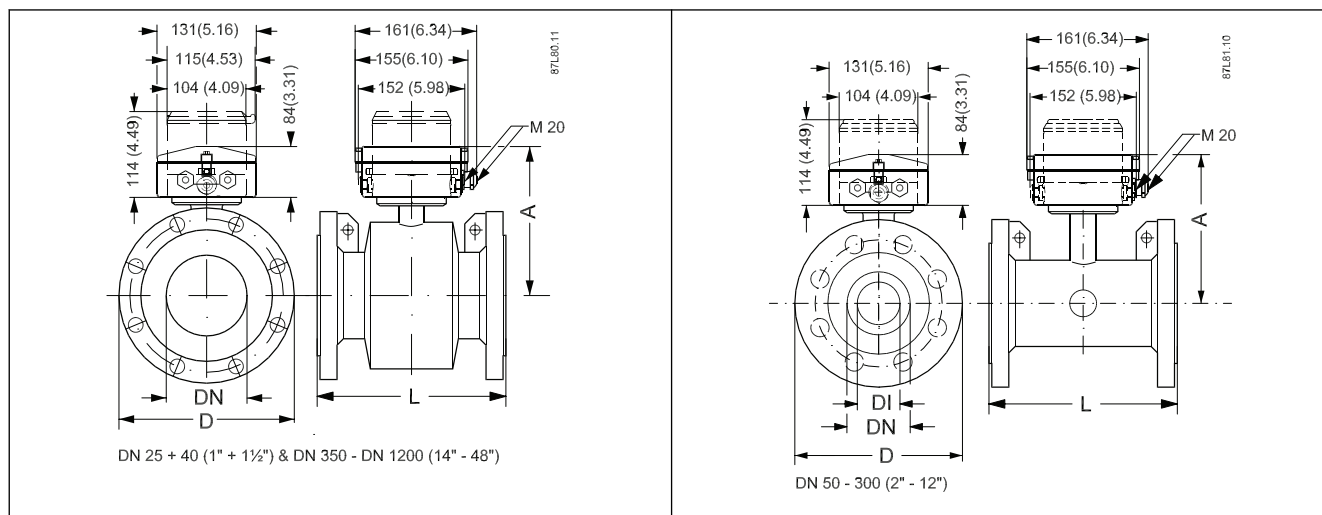


Dimensions for MAG 8000 Standard (7ME6810) and MAG 8000 CT (7ME6820).

| Nominal size DN | A | L, length | | | | | | | D, diameter | | Weight 1) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | EN 1092-1 | | | ANSI 16.5 Cl.150 | AS 4087 PN 16 | AS 2129 Table E | AWWA | | DI | D | AS 4087 PN 16 | |
| | | PN 10 | PN 16 | PN 40 | | | | | | | | | |
| mm (inch) | mm (inch) | mm | mm | mm | inch | mm | mm | mm | inch | mm (inch) | | kg | lbs |
| 25 (1") | 194 (7.7") | - | - | 200 | 7.9" | 200 | 200 | N/A | N/A | 25 (0.98") | 2) | 6 | 13 |
| 40 (1½") | 204 (8.1") | - | - | 200 | 7.9" | 200 | 200 | N/A | N/A | 40 (1.57") | 2) | 9 | 20 |
| 50 (2") | 195 (7.7") | - | 200 | - | 7.9" | 200 | - | N/A | N/A | 42 (1.65") | 2) | 11 | 25 |
| 65 (2½") | 201 (8") | - | 200 | - | 7.9" | 200 | - | N/A | N/A | 55 (2.17") | 2) | 13 | 29 |
| 80 (3") | 207 (8.2") | - | 200 | - | 7.9" | 200 | - | N/A | N/A | 67 (2.64") | 2) | 15 | 34 |
| 100 (4") | 214 (8.5") | - | 250 | - | 9.8" | 250 | - | N/A | N/A | 81 (3.19") | 2) | 17 | 38 |
| 125 (5") | 224 (8.9") | - | 250 | - | 9.8" | 250 | 250 | N/A | N/A | 101 (3.98") | 2) | 22 | 50 |
| 150 (6") | 239 (9.5") | - | 300 | - | 11.8" | 300 | - | N/A | N/A | 131 (5.16") | 2) | 28 | 63 |
| 200 (8") | 264 (10.5") | 350 | 350 | - | 13.8" | 350 | - | N/A | N/A | 169 (6.65") | 2) | 50 | 113 |
| 250 (10") | 291 (11.5") | 450 | 450 | - | 17.7" | 450 | - | N/A | N/A | 212 (8.35") | 2) | 71 | 160 |

| Nominal size DN | A | L, length | | | | | | | | D, diameter | | Weight 1) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | EN 1092-1 | | | ANSI 16.5 Cl.150 | AS 4087 PN 16 | AS 2129 Table E | AWWA | | DI | D | AS 4087 PN 16 | |
| | | PN 10 | PN 16 | PN 40 | | | | | | | | | |
| mm (inch) | mm (inch) | mm | mm | mm | inch | mm | mm | mm | inch | mm (inch) | | kg | lbs |
| 300 (12") | 317 (12.6") | 500 | 500 | - | 19.7" | 500 | - | N/A | N/A | 265 (10.43") | 2) | 88 | 198 |
| 350 (14") | 369 (14.6") | 550 | 550 | - | 21.7" | 550 | - | N/A | N/A | 350 (13.78") | 2) | 127 | 279 |
| 400 (16") | 394 (15.6") | 600 | 600 | - | 23.6" | 600 | - | N/A | N/A | 400 (15.75") | 2) | 145 | 318 |
| 450 (18") | 425 (16.8") | 600 | 600 | - | 23.6" | 600 | - | N/A | N/A | 450 (17.72") | 2) | 175 | 394 |
| 500 (20") | 450 (17.8") | 600 | 600 | - | 23.6" | 600 | - | N/A | N/A | 500 (19.68") | 2) | 225 | 494 |
| 600 (24") | 501 (19.8") | 600 | 600 | - | 23.6" | 600 | - | N/A | N/A | 600 (23.62") | 2) | 340 | 747 |
| 700 (28") | 544 (21.4") | 700 | 875 | - | N/A | 700 | - | 700 | 27.6" | 700 (27.55") | 2) | 316 | 694 |
| 750 (30") | 571 (22.5") | N/A | N/A | - | N/A | N/A | - | 750 | 29.5" | 750 (29.52") | 2) | N/A | N/A |
| 800 (32") | 606 (23.9") | 800 | 1000 | - | N/A | 800 | - | 800 | 31.5" | 800 (31.49") | 2) | 398 | 1045 |
| 900 (36") | 653 (25.7") | 900 | 1125 | - | N/A | 900 | - | 900 | 35.4" | 900 (35.42") | 2) | 476 | 1045 |
| 1000 (40") | 704 (27.7") | 1000 | 1250 | - | N/A | 1000 | - | 1000 | 39.4" | 1000 (39.36") | 2) | 602 | 1322 |
| 1050 (42") | 704 (27.7") | N/A | N/A | - | N/A | N/A | - | 1050 | 41.3" | 1050 (41.33") | 2) | N/A | N/A |
| 1100 (44") | 755 (29.7") | N/A | N/A | - | N/A | N/A | - | 1100 | 43.3" | 1100 (43.30") | 2) | N/A | N/A |
| 1200 (48") | 810 (31.9") | 1200 | 1500 | - | N/A | 1200 | - | 1200 | 47.2" | 1200 (47.23") | 2) | 887 | 1996 |

1) For remote version the sensor weight is reduced with 2 kg (4.5 lb)

2) See flange table (Page 111)

## Remote version
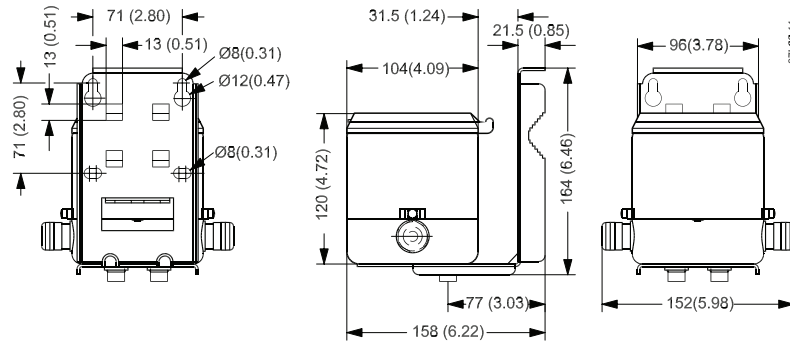


Figure 11-1    Dimensions in mm (inch), weight 3.5 kg (8 lbs)

## Flange dimensions
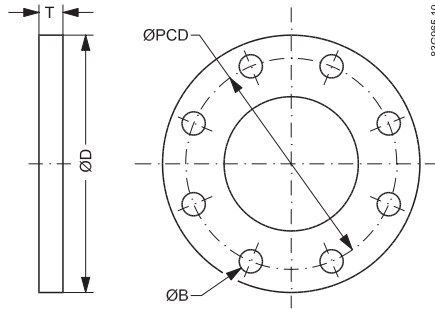


### MAG 8000 (7ME8610) and MAG 8000 CT (7ME6820)

| Dimensions mm | | | | | Bolting | |
|---|---|---|---|---|---|---|
| Size | D | PCD | T | B | Holes | Bolts |
| **PN 10** | | | | | | |
| 200 | 340 | 295 | 24 | 22 | 8 | M20 |
| 250 | 395 | 350 | 26 | 22 | 12 | M20 |
| 300 | 445 | 400 | 26 | 22 | 12 | M20 |
| 350 | 505 | 460 | 28 | 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 | - | 30 | 24 | M27 |
| 750 | - | - | - | - | - | - |
| 800 | 1015 | 950 | - | 33 | 24 | M30 |
| 900 | 1115 | 1050 | - | 33 | 28 | M30 |
| 1000 | 1230 | 1160 | - | 36 | 28 | M33 |
| 1050 | - | - | - | - | - | - |

| Dimensions mm | | | | | Bolting | |
|------|------|------|------|------|-------|-------|
| Size | D | PCD | T | B | Holes | Bolts |
| 1100 | - | - | - | - | - | - |
| 1200 | 1455 | 1380 | - | -39 | 32 | M36 |
| **PN 16** | | | | | | |
| 50 | 165 | 125 | 19 | 18 | 4 | M16 |
| 65 | 185 | 145 | 20 | 18 | 8 | M16 |
| 80 | 200 | 160 | 20 | 18 | 8 | M16 |
| 100 | 220 | 180 | 22 | 18 | 8 | M16 |
| 125 | 250 | 210 | 22 | 18 | 8 | M16 |
| 150 | 285 | 240 | 24 | 22 | 8 | M20 |
| 200 | 340 | 295 | 26 | 22 | 12 | M20 |
| 250 | 405 | 355 | 29 | 26 | 12 | M24 |
| 300 | 460 | 410 | 32 | 26 | 12 | M24 |
| 350 | 520 | 470 | 35 | 26 | 16 | M24 |
| 400 | 580 | 525 | 38 | 30 | 16 | M27 |
| 450 | 640 | 585 | 42 | 30 | 20 | M27 |
| 500 | 715 | 650 | 46 | 33 | 20 | M30 |
| 600 | 840 | 770 | 52 | 36 | 20 | M33 |
| 750 | | | | | | |
| 800 | 1015 | 950 | - | 33 | 24 | M30 |
| 900 | 1125 | 1050 | - | 39 | 28 | M36 |
| 1000 | 1255 | 1170 | - | 42 | 28 | M39 |
| 1050 | - | - | - | - | - | - |
| 1100 | - | - | - | - | - | - |
| 1200 | 1485 | 1390 | - | 48 | 32 | M45 |
| **PN 40** | | | | | | |
| 25 | 115 | 85 | 16 | 14 | 4 | M12 |
| 40 | 150 | 110 | 18 | 18 | 4 | M16 |

## MAG 8000 (7ME8610) and MAG 8000 CT (7ME6820)

| Dimensions Inches | | | | | Bolting | |
|------|------|------|------|------|-------|-------|
| Size | D | PCD | T | B | Holes | Bolts |
| **ANSI Class 150** | | | | | | |
| 1" | 4.25 | 3.12 | 0.56 | 0.62 | 4 | 9/16" |
| 1 ½" | 5 | 3.88 | 0.68 | 0.62 | 4 | 9/16" |
| 2" | 6 | 4.75 | 0.75 | 0.75 | 4 | 5/8" |
| 2 ½" | 7 | 5.5 | 0.88 | 0.75 | 4 | 5/8" |
| 3" | 7.5 | 6 | 0.94 | 0.75 | 4 | 5/8" |
| 4" | 9 | 7.5 | 0.94 | 0.75 | 8 | 5/8" |
| 5" | 10 | 8.5 | 0.94 | 0.88 | 8 | 3/4" |
| 6" | 11 | 9.5 | 1 | 0.88 | 8 | 3/4" |
| 8" | 13.5 | 11.75 | 1.12 | 0.88 | 8 | 3/4" |

| Dimensions Inches | | | | | Bolting | |
|---|---|---|---|---|---|---|
| Size | D | PCD | T | B | Holes | Bolts |
| 10" | 16 | 14.25 | 1.19 | 1.00 | 12 | 7/8" |
| 12" | 19 | 17 | 1.25 | 1.00 | 12 | 7/8" |
| 14" | 21 | 18.75 | 1.38 | 1.12 | 12 | 1" |
| 16" | 23.5 | 21.25 | 1.44 | 1.12 | 16 | 1" |
| 18" | 25 | 22.75 | 1.56 | 1.25 | 16 | 1 1/8" |
| 20" | 27.5 | 25 | 1.69 | 1.25 | 20 | 1 1/8" |
| 24" | 32 | 29.5 | 1.88 | 1.38 | 20 | 1 1/4" |

**External battery pack and cable**
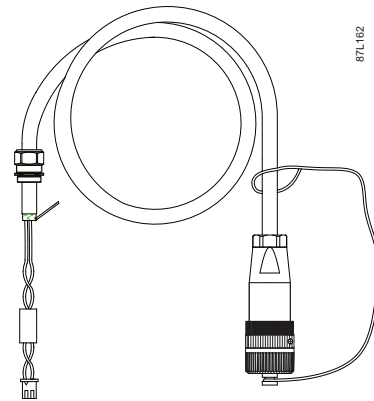


**Note**

**Physical orientation of battery pack may influence battery capacity.**

Optimal battery capacity is achieved with battery pack in an upright position as shown.

The cable for the battery pack connection must be ordered separately.

For information about battery disposal, see Battery disposal (Page 86).

## Grounding rings

### Sizes DN 25 to 300 (7ME6810 and 7ME6820)
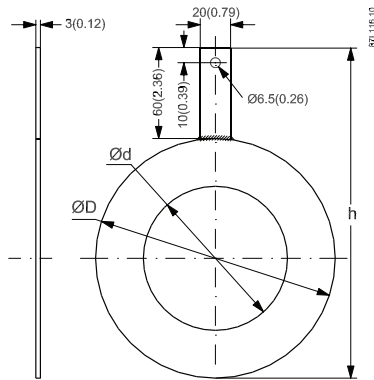


Figure 11-2      Flat ring

### Sizes DN 350 to 600 (7ME6810 and 7ME6820) and DN 700 to 1200 (7ME6810)
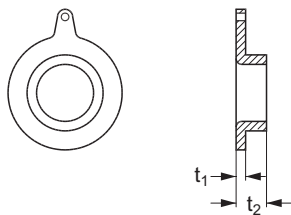


Figure 11-3      Type C grounding ring

# Product documentation and support $\quad$ A

## A.1 $\quad$ 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 QR code.

### 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 a QR code**

1. Scan the QR code 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.

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

**Service & support on the Internet**

In addition to our technical support, Siemens offers comprehensive online services at Service & Support (http://www.siemens.com/automation/service&support).

**Contact**

If you have further questions about the device, contact your local Siemens representative at Personal Contact (http://www.automation.siemens.com/partner).

To find the contact for your product, go to "all products and branches" and select "Products & Services > Industrial automation > Process instrumentation".

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

# Spare parts/Accessories

<div align="right">

# B

</div>

## B.1    Ordering of spare parts

**Condition**

- You have a Siemens Industry Mall account.

**Procedure**

1. Open the PIA Life Cycle Portal (https://www.pia-portal.automation.siemens.com).

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.
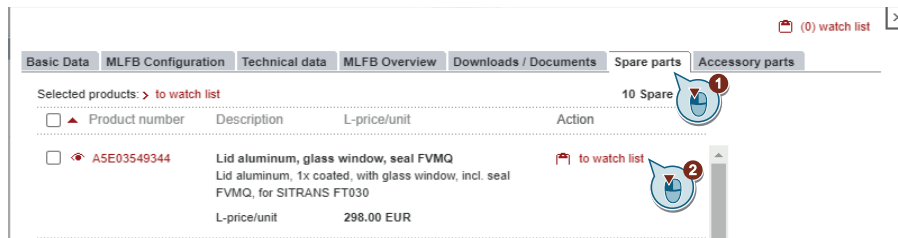


5. Select a spare part and add it to your watch list.
   The watch list opens.

6. Click "Add to cart of Industry Mall".



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

# Flow Tool

<div style="text-align: right; font-size: 3em;">C</div>

## C.1 Flow Tool

### Condition

In order to commission the water meter, it is necessary to install the Flow Tool program/software on your computer and connect the IrDA communication adaptor in the built-in IrDA communication interface on transmitter. The Flow Tool software is compatible with Windows 2000, Windows XP, and Windows 7 32/64 bit.

Read Flow Tool FAQ and Release Note installed with the Flow Tool software.

Go to Siemens Industry Online Support (https://support.industry.siemens.com/cs/products?dtp=Download&mfn=ps&pnid=17328&lc=en-US) to download the latest version of the Flow Tool.

### Device driver

The Device Drivers are related to meter version and is automatically selected in "Automatic" mode. In "Manual" mode, meter version is manually selected and version check is automatically made when data is uploaded or downloaded.

### Data backup

Meter information is stored in an internal data prom that secures data in case of power failure.

Information like totalizer 1 and 2, date and time, and the statistic data in Advanced version is stored every 10 minutes. Every 4 hours battery consumption is calculated and remaining battery capacity is updated together with "operation time since first power up" and "battery operation time".

## C.2 Initial commissioning via Flow Tool

This chapter describes how to start up commissioning via Flow Tool software.

**Connecting PC to meter**

Connect IrDa communication adaptor to its interface on transmitter and connect PC to adaptor.
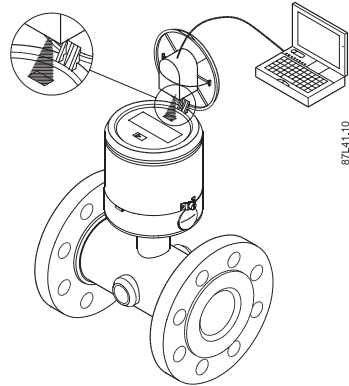


Figure C-1     MAG 8000 or MAG 8000 CT has a built-in IrDA communication interface on top of meter. IrDA adaptor can be fixed to lid by rubber band.

**Starting Flow Tool software program**

Double-click on Flow Tool icon on windows desktop to start program.



---
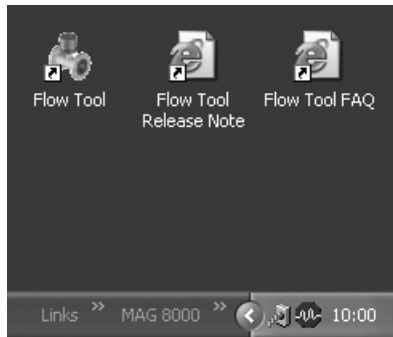
**Note**

For on-line communication make sure the IrDA symbol is visible in the toolbar status menu before starting Flow Tool.

---

## C.3     Configuring the device

This chapter describes how to set up meter for communication with PC. The options in both Flow Tool and SIMATIC PDM software are the same; only the views on the PC screen differ.

**Setting up meter**

1. Right-click on "Project".

2. Select "New".

3. Select "Flow Meter".
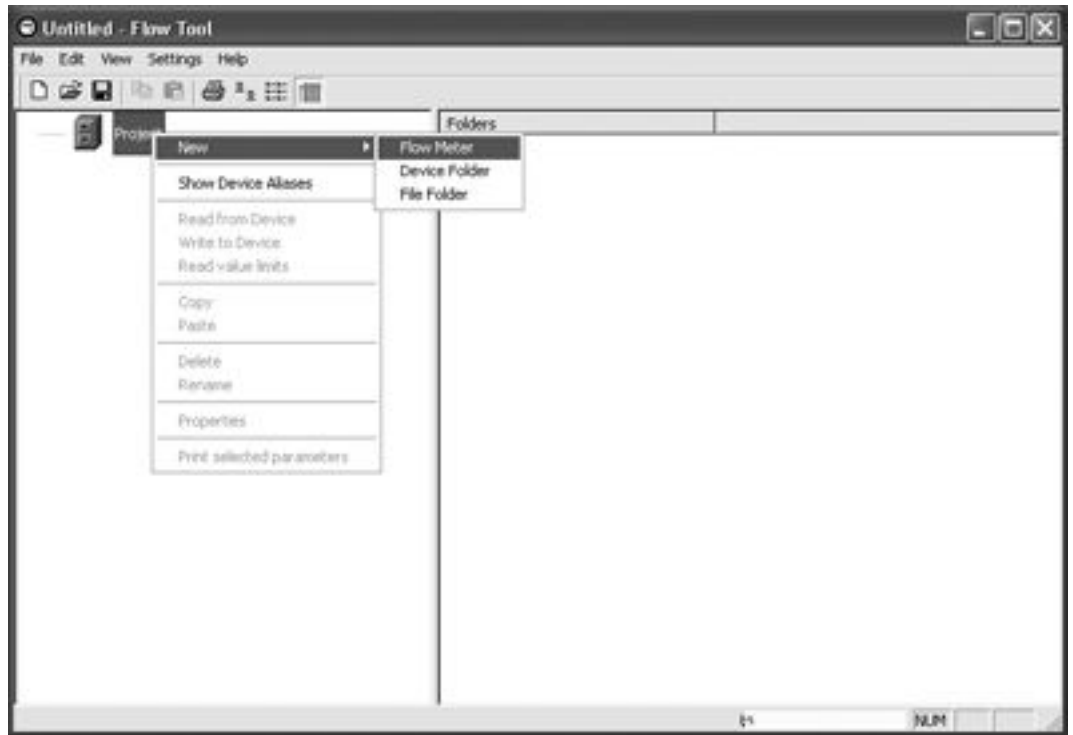


4. Name device.

5. Select configuration type ("Automatic" or "Manual").
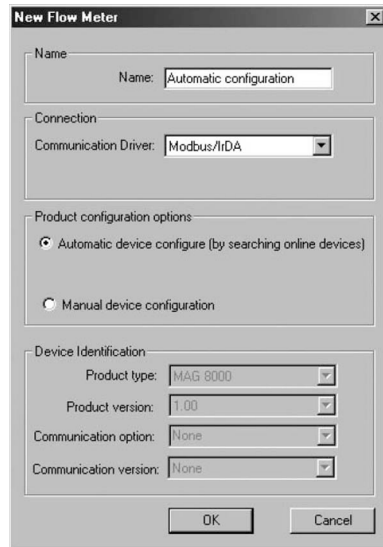
"Automatic" configuration is selected if PC is connected directly to meter.
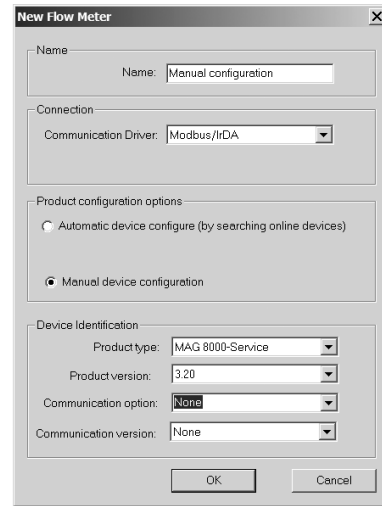
"Manual" configuration is selected if configuration is made without any connection to a meter.
Configuration is downloaded to the meter afterwards.

## C.4 Setting the basic parameters

**Note**

**No factory reset**

The device is delivered with factory settings that are not stored as default values. Because no default values are present in the meter, an automatic return to factory values is not possible.

**Setting parameters**

The meter information is password-protected. The default factory password is "1000" and can be changed after gaining access to the meter. The password can be reset using a hardware key, see Data protection (Page 59).



**Read, write, print or export meter data**

A single parameter or a parameter group to be read, written, printed or exported to a CSV file.

Only parameters (data) shown on white background can be changed. Red texts are off-line data which are not stored in the MAG 8000 yet, whereas black texts show the actual meter data.

Each parameter has a description (prompt) advising how the parameter can be programmed and which settings are programmable.

The figure below shows alarm status with the marked alarms enabled.
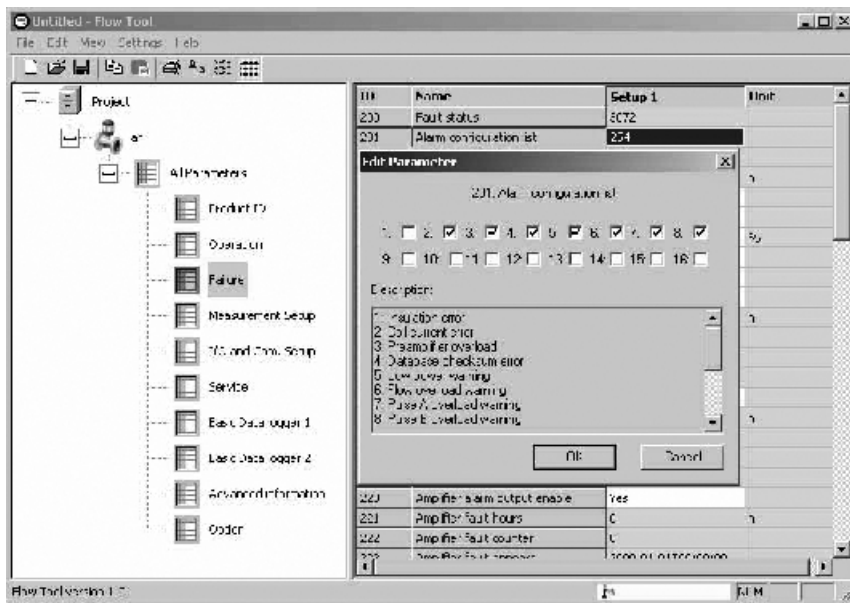
Figure C-2       Alarm status - marked alarms are enabled

**Customer-selected parameter list**

The default parameter list is divided into various functional groups with maximum 99 parameters included. For a complete parameter overview, see "Parameter lists" in the appendix.

Customized parameter list can be configured by creating a new parameter folder.
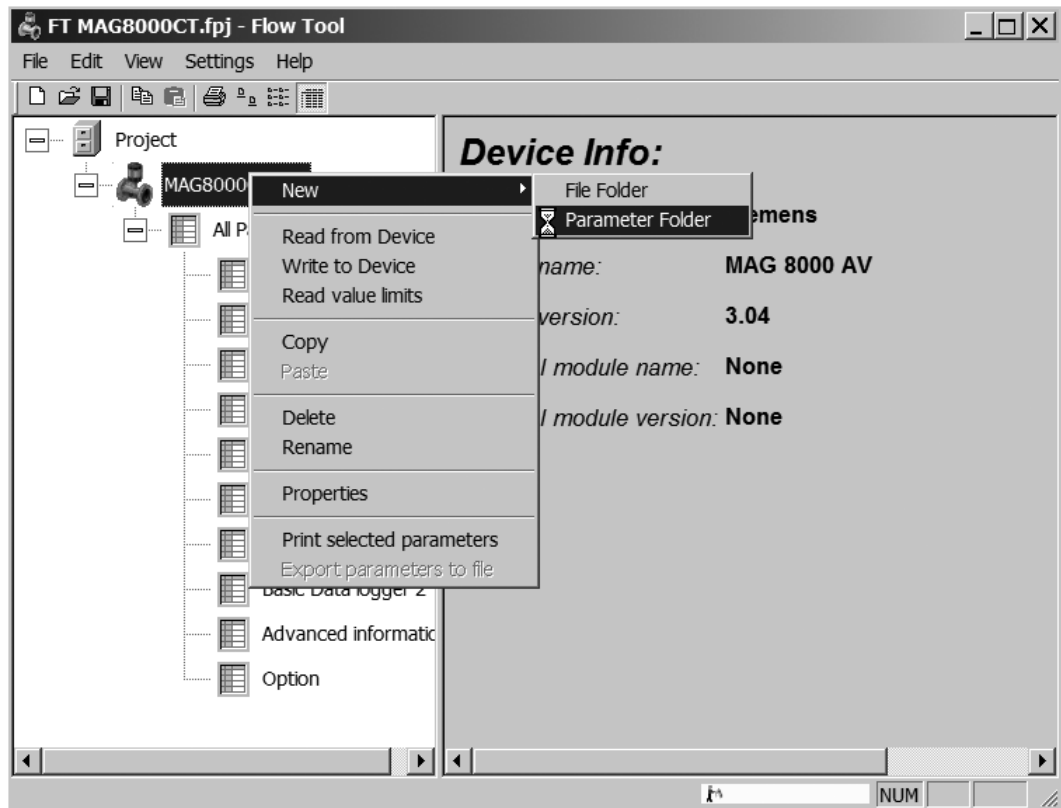
Figure C-3    Creating new parameter folder

Copy any existing parameter to the new folder. These parameters are updated and handled as the original parameters and listed in the same order as copied to the customized parameter list.
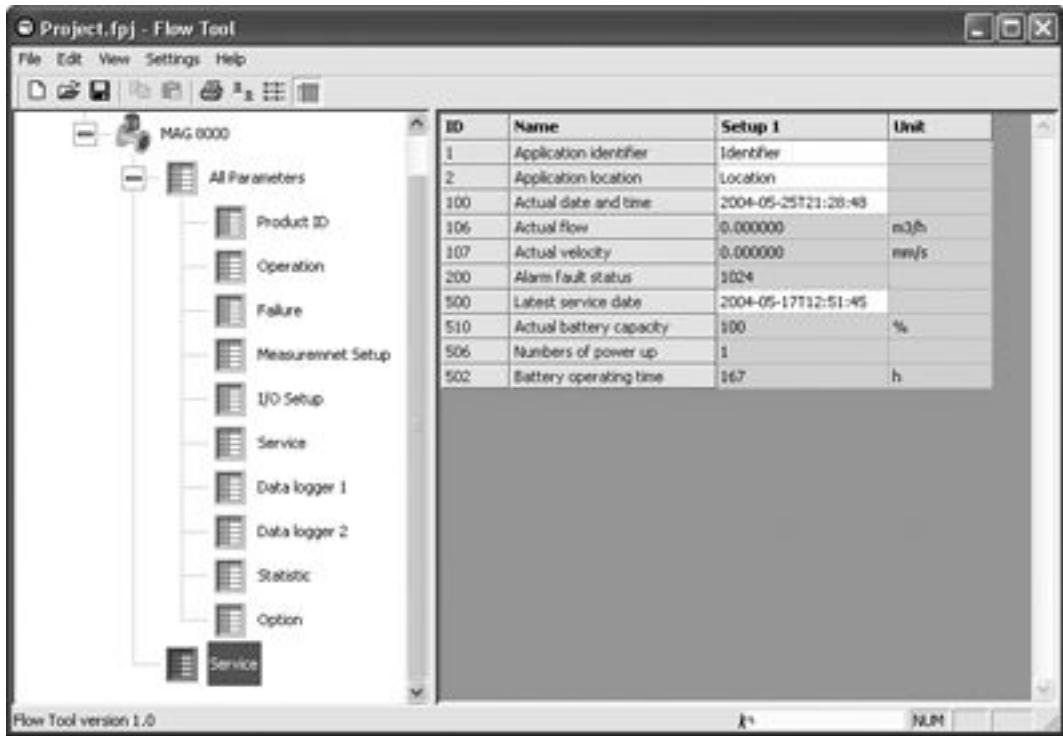
Figure C-4    Customer-specified parameter list

There is no limitation on the number of customer-specified parameter lists.

Saving the project will make the parameter list configuration available for future use.

---

**Note**

Saving the file with only the customized parameter list expanded will make future monitoring and changes of parameters easier.

---

**See also**

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

## C.5    Unit selection

MAG 8000 and MAG 8000 CT are delivered with totalizer and flow rate units as ordered via the MLFB structure.

The standard MAG 8000 units for each region are:

- **Europe**: m³ for totalizer and m³/h for flow rate
- **US**: Gallon for totalizer and GPM (Gallon per minute) for flow rate
- **Australia**: ML for totalizer and ML/d (Mega liter/day) for flow rate

The following MAG 8000 units and combinations are available:

**Volume:** m$^3$, m$^3$ × 100, L × 100, Gallon, G × 100, G × 1000, MG, CF × 100, CF × 1000, AF, AI, kl, ML, BBL42

**Flow rate**: m$^3$/min, m$^3$/h, m$^3$/d, L/s, L/min, L/h, ML/d, GPS, GPM, GPH, GPD, MGD, CFS, CFM, CFH, BBL42/s, BBL42/min, BBL42/h, BBL42/d

The MAG 8000 CT format for all regions is:

• m$^3$ for totalizer and m$^3$/h for flow rate

To ensure selection of correct conversion factor, see unit conversion table in appendix.
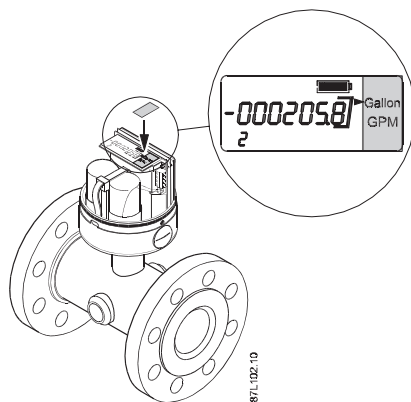


All measurement units are printed on a label affixed to the display (except the European version). Some meter sizes have a factor included to secure the 8 digit display value will not overrun after short time of operation. Manual configuration of new units is allowed. A new sticker showing the new settings must then be affixed to the display.

**Protected parameters**

The following parameters are protected by HW key (for a complete overview of paramters go to Parameter lists (Page 145)):

| MAG 8000 Standard / MAG 8000 CT | | MAG 8000 CT (additionally) | |
| --- | --- | --- | --- |
| Parameter no. | Parameter name | Parameter no. | Parameter name |
| 5 | Sensor tube diameter | 100 | Actual date and time |
| 8 | Totalizer unit | 101 | Totalizer 1 |
| 9 | Flow unit | 102 | Totalizer 2 |
| 10 | Qn (Q3) | 103 | Net totalizer (since FW 3.11) |
| 11 | Poduct code number | 201 | Alarm configuration list |
| 12 | Meter serial number | 206 | Battery alarm limit |
| 300 | Totalizer unit factor | 303 | Operation excitation frequency |
| 301 | Flow unit factor | 305 | Decimal point place |
| 302 | Pipe size | 307 | Measurement direction |
| 306 | Dsplayed unit | 310 | Flow direction totalizer 1 |
| 321 | Calibration date | 312 | Flow direction totalizer 2 |
| 323 | Calibration factor | 327 | Adjustment factor |
| 325 | Sensor offset | 328 | Low flow cut-off |

| MAG 8000 Standard / MAG 8000 CT | | MAG 8000 CT (additionally) | |
|---|---|---|---|
| Parameter no. | Parameter name | Parameter no. | Parameter name |
| 332 | Max. sensor frequency excitation | 329 | Filter time constant |
| 506 | Numbers of power up | 333 | Empty pipe detection |
| 520 | Calibration temperature | 334 | Empty pipe impedance |
| 522 | Temperature calibration start | 420 | Device Communication Address |
| 840 | Tariff control mode | 511 | Communication module type |
| 842 | Tariff 1 period time end | 550 | Coil current active |
| 844 | Tariff 1 upper limit range | 551 | Fix flow mode active |
| 845 | Tariff 2 period time end | 552 | Fixed flow value |
| 847 | Tariff 2 upper limit range | 805 | Insulation upper limit |
| 848 | Tariff 3 period time end | | |
| 850 | Tariff 3 upper limit range | | |
| 851 | Tariff 4 period time end | | |
| 853 | Tariff 4 upper limit range | | |
| 854 | Tariff 5 period time end | | |
| 856 | Tariff 5 upper limit range | | |
| 857 | Reset tariff values | | |

## Hardware key

To gain access to protected parameters a hardware key must be installed. The hardware key hole is located in front part of PCB behind battery, see connection diagram (Page 35).

---

**Note**

**Hardware key on MAG 8000 CT**

For MAG 8000 CT only authorized persons, with the acceptance and under direction of the local authorities are allowed to use the hardware key.

---

## Changing units

---

**Note**

**Not allowed on MAG 8000 CT**

This function is not allowed on MAG 8000 CT.

---

1. Select service mode and meter version – upload data from meter.

2. Open transmitter.

3. Remove battery (keep connected).

4. Attach hardware key to PCB board (for correct attachment, see upper part of figure).
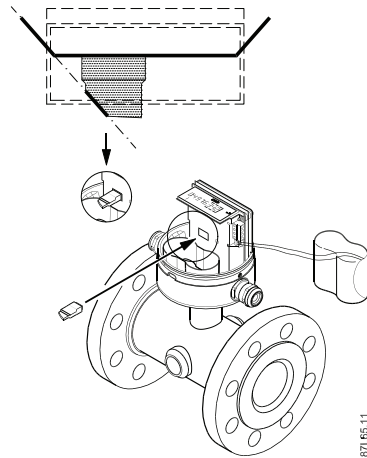


5. Change units description in parameters 8 and 9, see Unit conversion table.

6. Change units factor in parameters 300 and 301, see Unit conversion table.

7. Change maximum flow rate Qn (Q3) to new unit selection in parameter 10.

8. Select display unit in parameter 306.

9. Download each parameter to meter.

10. Remove hardware key.

11. Re-assemble meter.

---

**Note**

**Important**

The service mode opens many parameters. If these parameters are changed, it can seriously affect meter accuracy and operation. Be careful when writing new parameter values as meter has **no default settings** to return to.

---

## C.6 Output configuration

Pulse output can be configured as volume pulse, alarm or call-up. Default factory setting is with output A enabled for forward flow and output B for alarm output.

**Output configuration in Flow Tool**

Select "I/O and Com.Setup". The software window shows the parameters for output configuration. Each parameter has its own guideline for selecting the correct parameter setting.
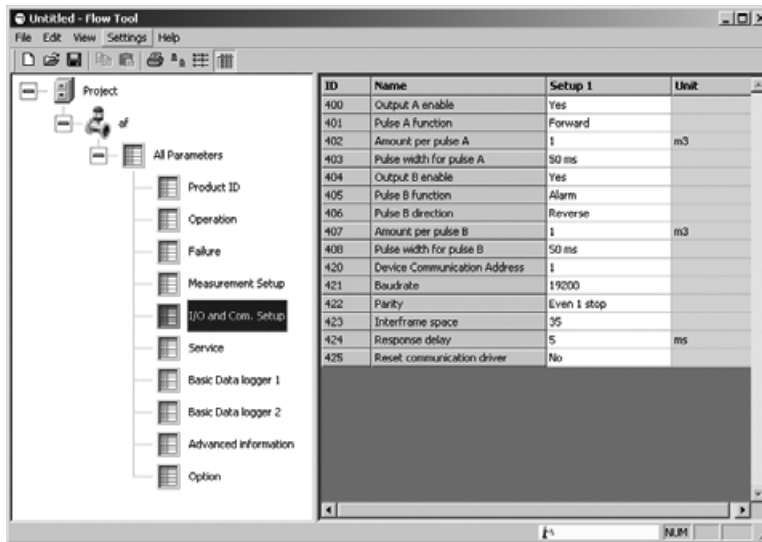
To see how the outputs work, please see "Output characteristics" (Page 99).

## C.7 Default display information and accessible display menus

Parameter 131 defines default display information with selection between

- Totalizer 1 (Index 1)
- Totalizer 2 (Index 2)
- Flow rate (Index 3, updated with selected measuring frequency)
- Fault codes (Index 4)
- Customer totalizer (Index 5 - resettable)

Default information is shown after power-up as well as after no key operation for 10 minutes.

Parameter 130 defines accessible display menus with selection of one or more of the following menus:

- Operator menu
- Meter info menu
- Service menu
- Data logger menu
- Statistic menu (advanced version only)
- Tariff menu (advanced version only)

Disabling display of menu data will not affect operation of functions.

# C.8    Internal data handling

**Meter status**

Meter status parameter (120) gives a fast indication of reliability of revenue data.
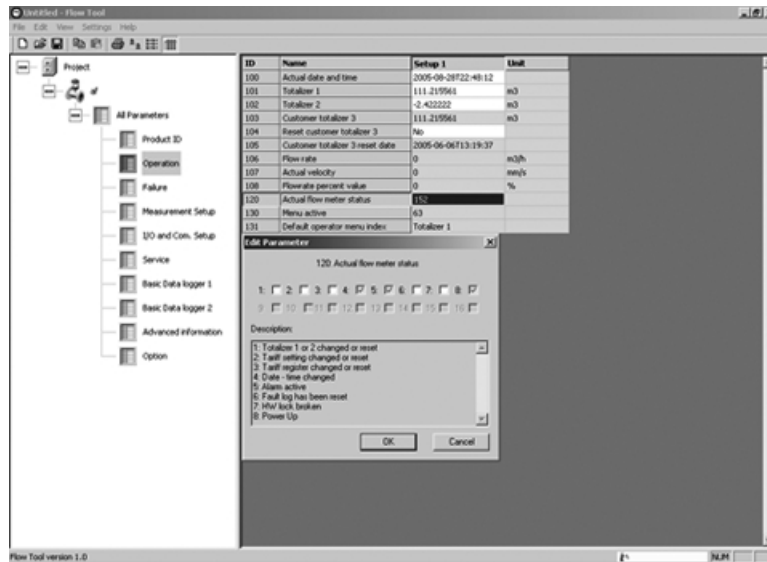


It shows whether important information has been reset or manipulated, for instance if meter has been powered down.

Status information can only be reset while hardware key is mounted.

**Data logger / Consumption alarm**
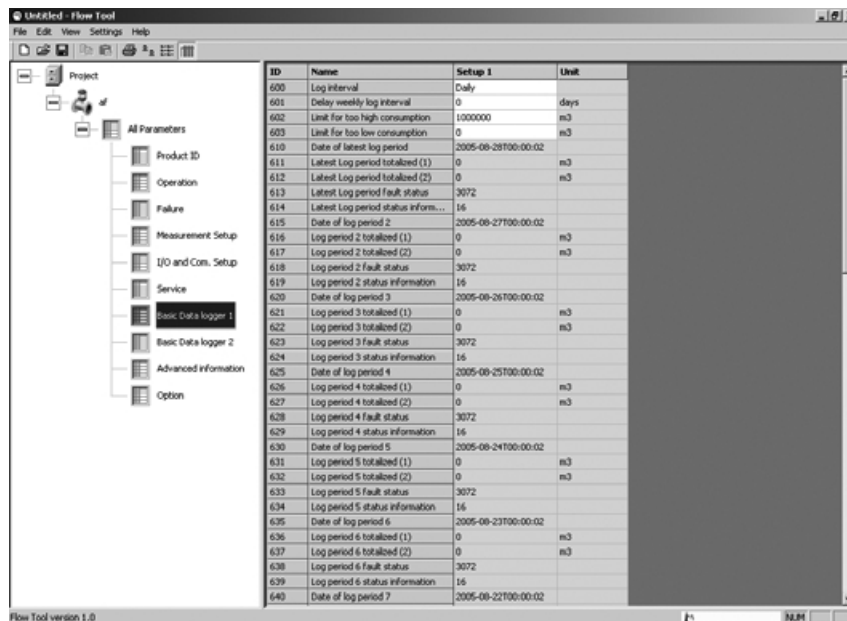
The integrated data logger has 26 logging periods in which data can be stored daily, weekly or monthly. The logger stores the consumption for totalizer 1 and totalizer 2 in the selected period. Forward consumption is stored as a positive value and reverse consumption is stored as a negative value. Alarm and meter status are also stored for the same period to indicate alarms that have been active, or that revenue data has been influenced in the specific period.

| ID | Name | Setup 1 | Unit |
|---|---|---|---|
| 600 | Log interval | Daily | |
| 601 | Delay log interval | 0 | days |
| 602 | High log consumption alarm | 1000000.000000 | m3 |
| 603 | Low log consumption alarm | 0.000000 | m3 |
| 610 | Date of last logging 1 | 2004-05-26T00:00:34 | |
| 611 | Last Log1 Totalizer 1 | 0.000000 | m3 |
| 612 | Last Log1 Totalizer 2 | 0.000000 | m3 |
| 613 | Last Log1 fault status | 1024 | |
| 614 | Last Log1 status information | 153 | |

The logged information has a time and date stamp. The data logger never stops storing data - old data is overwritten following the first in/first out principle, i.e. log 1 is the last stored information which is moved to log 2 when the next logging is made and so on.

The consumption alarm indicates that the actual consumption on totalizer 1 is above or below the consumption limits.

## C.9 Battery configuration

Battery figures (generated as customer parameter list, see section Customer-selected parameter list in chapter Setting the basic parameters show power management information.
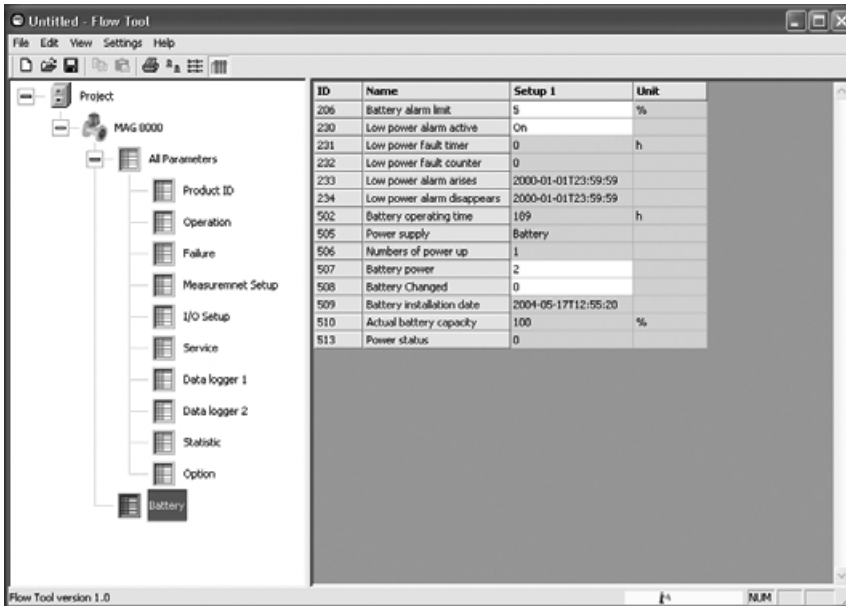


Figure C-5    Battery configuration

At each battery replacement the capacity is reset to 100% (parameters 508 to 510) which is then reduced with the real meter consumption every 4 hours.

The battery limit (parameter 206) is the level at which the low power alarm is activated generating an alarm or call-up (if configured). The power status (parameter 513) follows the battery symbol on the display.

When switching between battery power from internal and external battery packs, "Battery power" (parameter 507) must be adjusted to match the actual number of batteries connected.

# Qualification certificate

<div style="text-align: right; font-size: 2em;">**D**</div>

The qualification certificate is an enhancement of the PDM tool which enables printing of a MAG 8000 status report using the MAG 8000 IrDA communication port and the MODBUS RTU protocol.

---

**Note**

**Scope**

The MAG 8000 Qualification Certificate is a qualification report of device functionality and **NOT** a tool for measurement accuracy verification like the MAG VERIFICATOR (FDK-083F5060 or FDK-083F5061).

---

The MAG 8000 uses two main physical components for communication:

- The IrDA sensor on the MAG 8000
- An IrDA interface cable

## D.1    Commissioning

The qualification certificate is generated from PDM via the following steps:

1. Enabling insulation test
2. Uploading the device data to the PC
3. Generating the qualification certificate

Finally, the service technicians must evaluate the result.

## D.2    Enabling insulation test

The insulation test must be carried out on the advance version of  the MAG 8000 or MAG 8000 CT before generating the Qualification Certificate. The procedures for enabling the insulation test are shown below.

Set "Insulation test enable" to "Yes" if not already enabled.
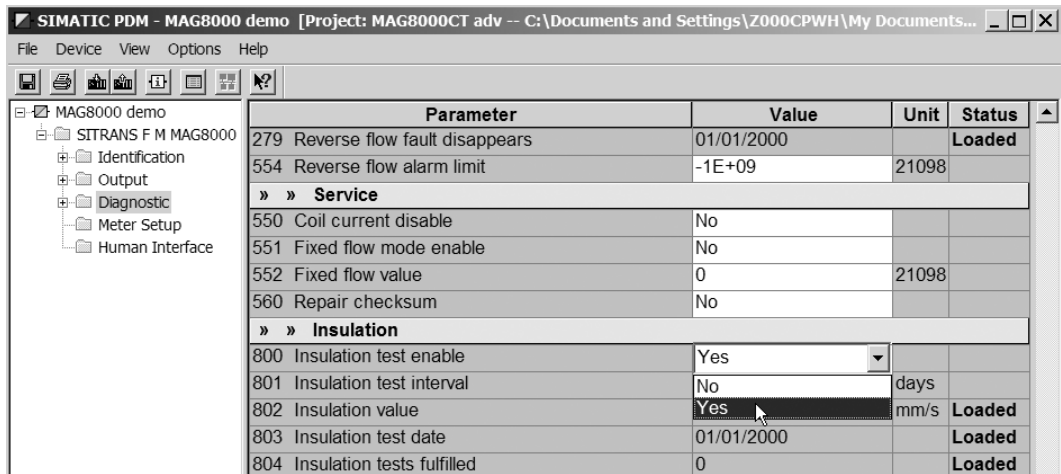


Select "Device" → "Download to Device ..." to download the change to the device.
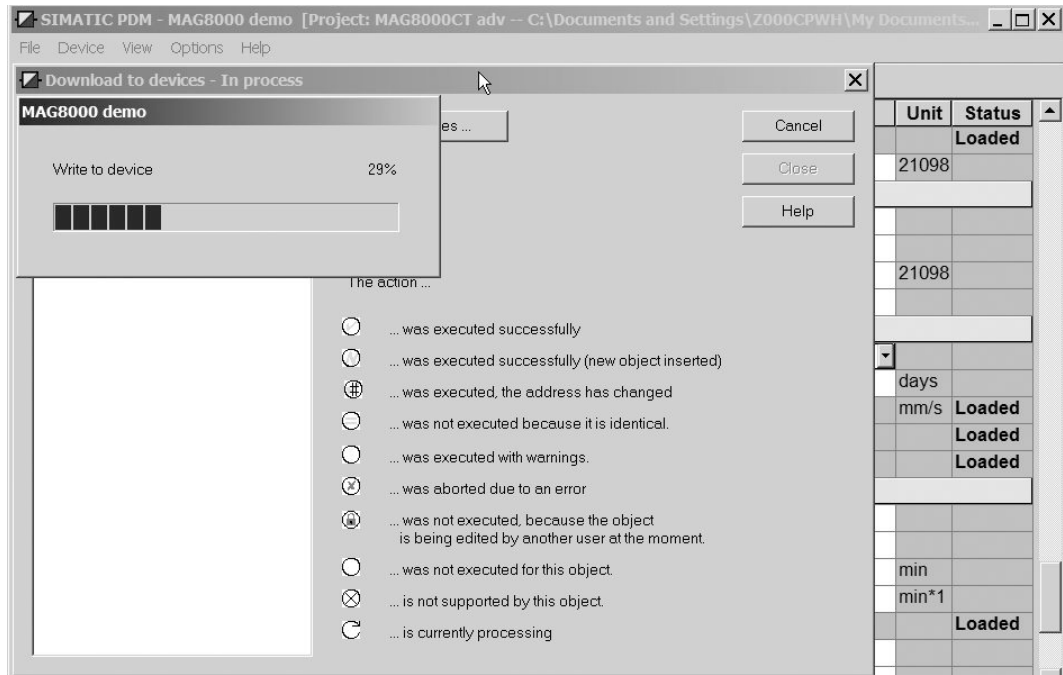
Wait at least three minutes after downloading the change to the device before carrying out the first insulation test. Further details are available in section "Insulation test" in chapter "Built-in functions" (Page 89).

## D.3 Uploading the device data to the pc

Select "Device" → "Upload to PC/PG" to load all device parameters from the device to the pc.
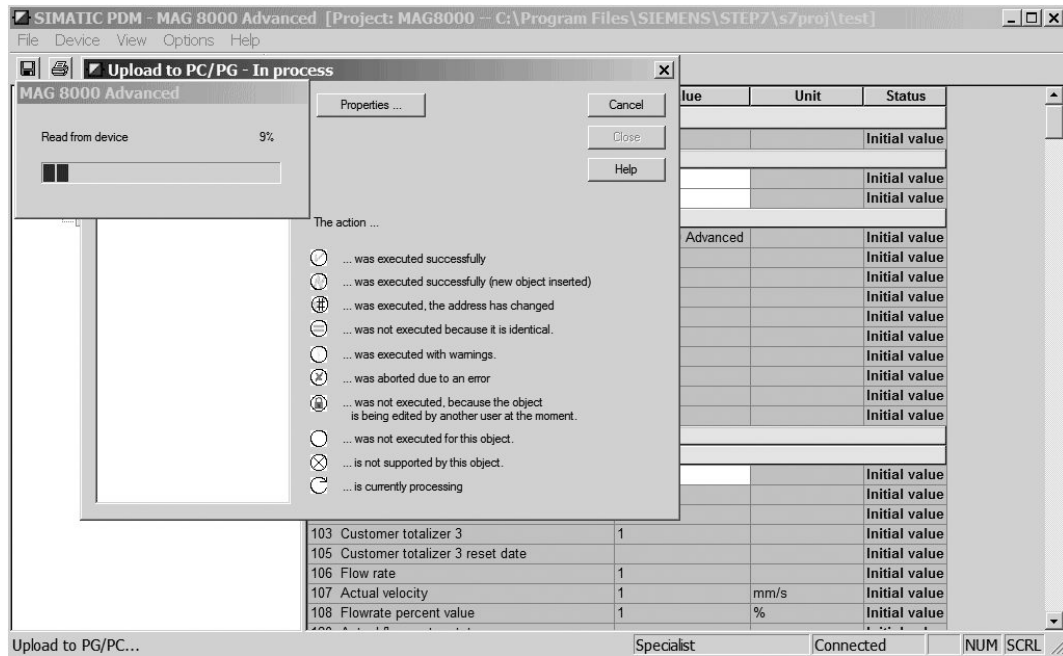
## D.4 Generating the qualification certificate

When the device data is completely read to the pc, select "Device" → "Qualification Certificate".
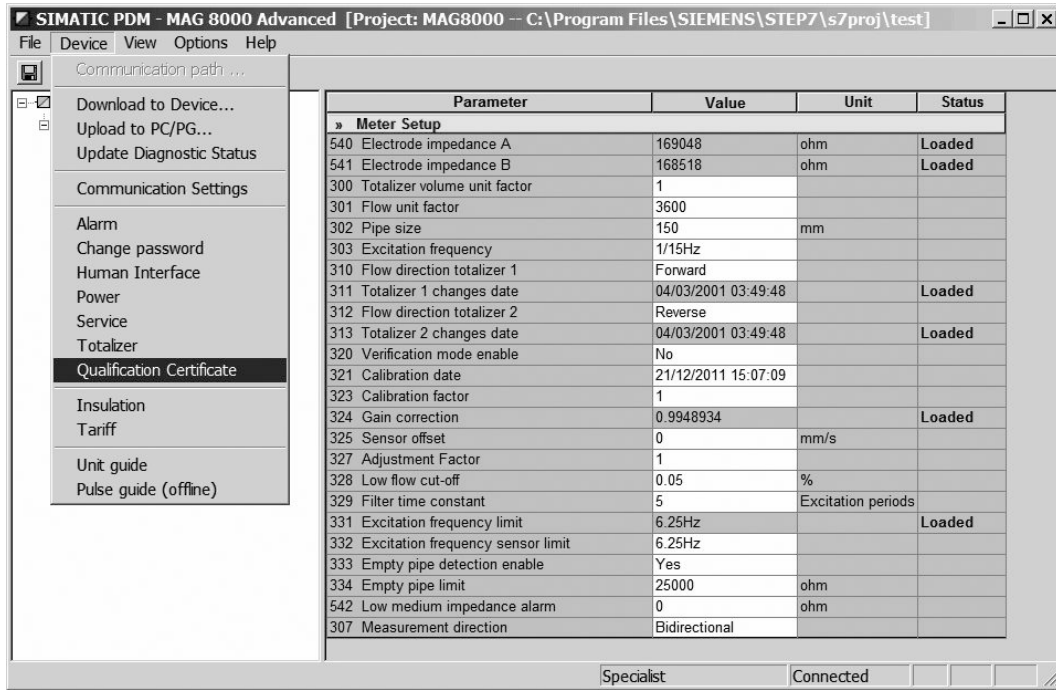


The qualification certificate tool is protected by a service password that is only available for service specialists.
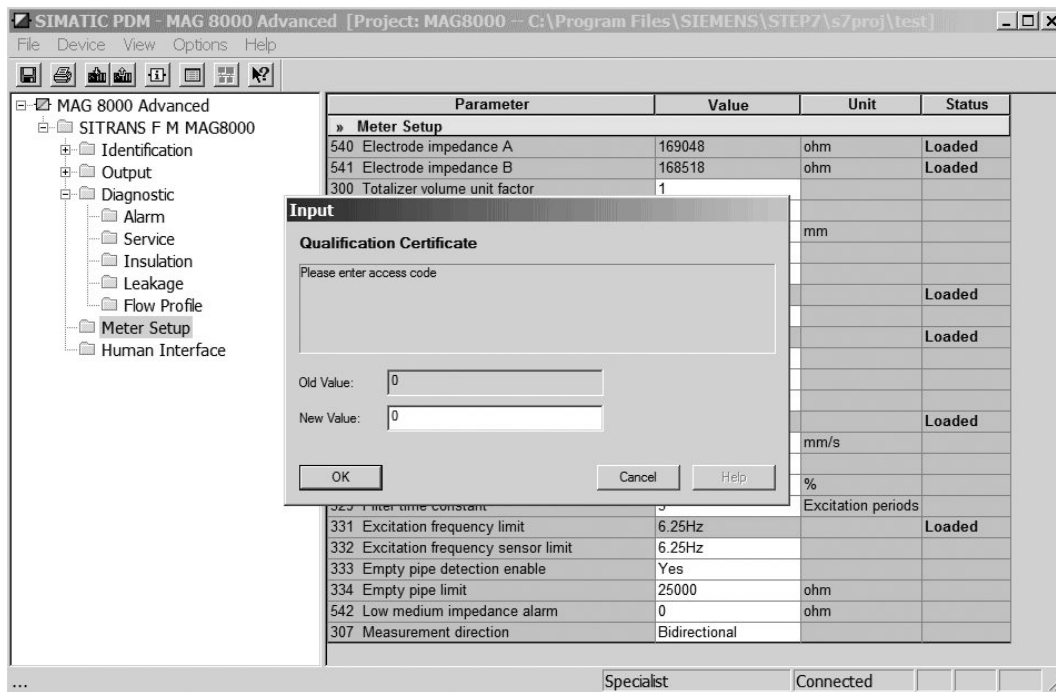
After entering the password, click "OK". Then click "Generate qualification certificate" in the next dialog box. A progress bar shows the percentage of the process.
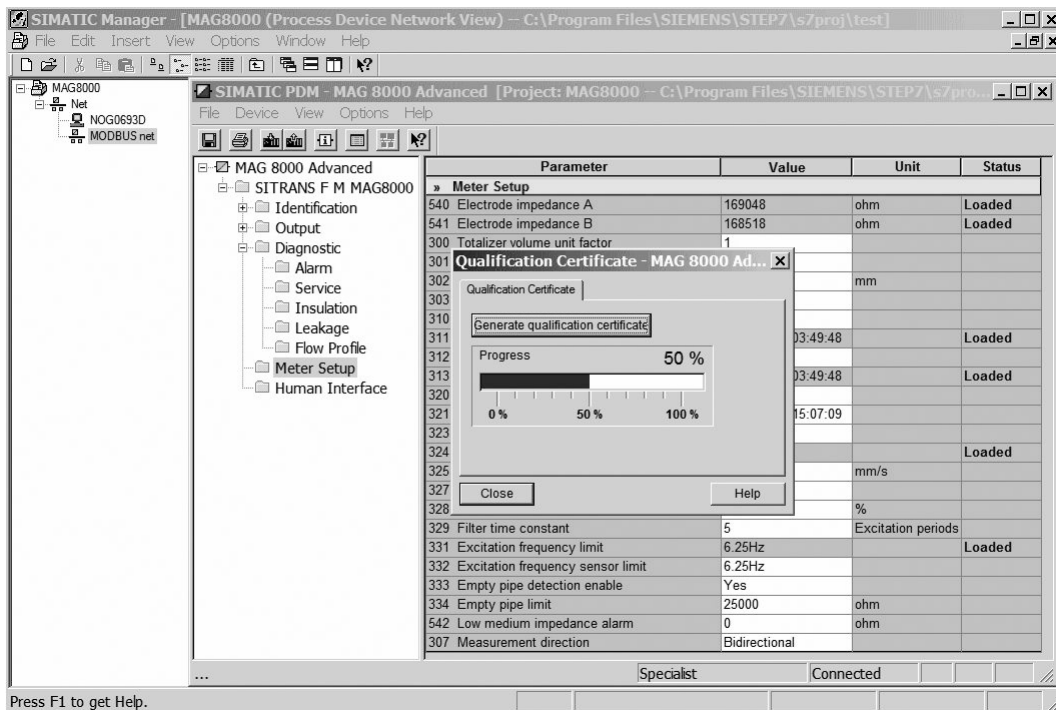
# D.5 Result evaluation

The service technicians shall inspect the device parameters on the report and cross-check with the reference values to evaluate if the device status is of proper quality or not. Reference values are available in the document Qualification Certificate Reference Guideline (https://support.industry.siemens.com/cs/ww/en/view/109750126).

# Unit conversion table

# E

| Totalizer / Volume unit (parameter 8) | Correction factor parameter 300 |
|---|---|
| Default | 1 m³ |
| m³*100 | 0.01 |
| Gallon (US) | 264.1721 |
| G*100 (100*Gallon) | 2.641721 |
| G*1000 (1000*Gallon) | 0.2641721 |
| MG (1000000*Gallon) | 0.0002641721 |
| AI (Acre Inches) | 0.009728558 |
| AF (Acre ft) | 0.0008107132 |
| CF*100 (100*ft³) | 0.3531467 |
| CF*1000 (1000*ft³) | 0.03531467 |
| L*100 (liter) | 10 |
| kL (1000*liter) | 1 |
| ML (Mega liter) | 0.001 |
| BBL42 (US oil barrel) | 6.289810743 |

| Flow rate unit (parameter 9) | Correction factor parameter 301 |
|---|---|
| Default | 1 m³/s |
| m³/min (m³/minute) | 60 |
| m³/h (m³/hour) | 3600 |
| m³/d (m³/day) | 86400 |
| GPS (Gallon/second) | 264.1721 |
| GPM (Gallon/minute) | 15850.32 |
| GPH (Gallon/hour) | 951019.4 |
| GPD (Gallon/day) | 22824465 |
| MGPD (1000000*Gallon/day) | 22.824465 |
| CFS (ft³/second) | 35.31467 |
| CFM (ft³/minute) | 2118.882 |
| CFH (ft³/hour) | 127132.8 |
| L/s (liter/second) | 1000 |
| L/min (liter/minute) | 60000 |
| L/h (liter/hour) | 3600000 |
| ML/d (1000000*liter/day) | 86.4 |
| BBL42/s | 6.289810743 |
| BBL42/min | 377.3886446 |
| BBL42/h | 22643.31867 |
| BBL42/d | 543439.6482 |

# Parameter lists

<div style="text-align: right">**F**</div>

## Parameter lists

MAG 8000 is delivered with factory settings that are not stored as default values. Because defaults values are not present in the meter, an automatic return to factory values is not possible.

The default settings are available at Siemens Industry Online Support ([https://support.industry.siemens.com/cs/products?dtp=Download&mfn=ps&pnid=17328&lc=en-US](https://support.industry.siemens.com/cs/products?dtp=Download&mfn=ps&pnid=17328&lc=en-US)) under the Flow Tool entry. The Flow Tool is required to be able to read the default settings file.

Visible display information is indicated in the table by menu and index number. Remember to enable displayed menus in parameter 130.

The abbreviations used in the display menu table are: Operator menu = O, Meter menu = M, Service menu = Se, Data Logger menu = L, Statistic menu = St, Revenue menu = R.

Factory settings marked in *italic* cannot be edited.

---

**Note**

**Change of units**

If the unit and factor is changed, all unit-related values become invalid.
It is recommended to reset all unit-related values.

---

## F.1    1-99

| Param-eter ID | Meter version | Display view | Parameter/data type | Factory settings | Data range |
|---|---|---|---|---|---|
| | | | | Fixed parameter or meter data that are not changeable | |
| 1 | All | M1 | Application identifier | Identity | Max. 15 characters. **Only numbers are visible in the display (letters are shown as "_")** |
| 2 | All | - | Application location | Location | Max. 16 characters |
| 3 | All | M3 | Module type | MLFB dependent | MAG 8000 Basic MAG 8000 Advanced MAG 8000 CT Basic MAG 8000 CT Advanced MAG 8000 Irrigation |
| 4 | All | M4 | Software version | | x.xx |
| 5 | All | - | Sensor size | Sensor related | Max. 12 characters. DN 25 to 1200 (1" to 48") |
| 6 | All | - | Vendor name | Siemens | Siemens |

| Param-eter ID | Meter version | Display view | Parameter/data type | Factory settings | Data range |
|---|---|---|---|---|---|
| | | | | **Fixed parameter or meter data that are not changeable** | |
| 8 | All | - | Totalizer unit | MLFB dependent | Max. 12 characters |
| 9 | All | - | Flowrate unit | MLFB dependent | Max. 12 characters |
| 10 | All | - | Qn (Q3) | Sensor related | 0 to $1 \times 10^9$ |
| 11 | All | - | Product code number | 7ME6810, 7ME6820 or 7ME6880 | |
| 12 | All | - | Serial number | XXXXXXHXXX | Max. 12 characters |

# F.2   100-199

| Param-eter ID | Meter version | Display view | Parameter/data type | Factory settings | Data range |
|---|---|---|---|---|---|
| | | | | **Fixed parameter or meter data that are not changeable** | |
| 100 | All | M2 | Actual date and time | PS3 production date and time | year-month-day T hours:minutes:seconds |
| 101 | All | O1 | Totalizer 1 | 0 | 0 to $\pm 2 \times 10^9$ |
| 102 | All | O2 | Totalizer 2 | 0 | 0 to $\pm 2 \times 10^9$ |
| 103 | All | O5 | Totalizer 3 | 0 | 0 to $+\pm 2 \times 10^9$ |
| 106 | All | - | Flow rate | | 0 to 1.25 Qn (Q3) |
| 107 | All | - | Actual velocity | Measured value | ±15 m/s |
| 108 | All | - | Flowrate percent value | | 0 to 125% (Q4) |
| 120 | All | - | Actual flow meter status | | 0 to 255, binary presented with information 1 for bit 0 <br><br> 1: Totalizer 1 or 2 changed or reset <br><br> 2: Tariff setting changed or reset, <br><br> 3: Tariff register changed or reset <br><br> 4: Date - time changed <br><br> 5: Alarm have been active <br><br> 6: Fault log has been reset <br><br> 7: Hardware key has been activated <br><br> 8: Meter has been powered up <br><br> If none of the above is active, no flag is set |

| Param-eter ID | Meter version | Display view | Parameter/data type | Factory settings | Data range |
|---|---|---|---|---|---|
| | | | | Fixed parameter or meter data that are not changeable | |
| 130 | All | - | Menu active | 63=all menus active | 0 to 63, binary presented with information |
| | | | | | 1 for bit 0 |
| | | | | | 1: Operator menu |
| | | | | | 2: Meter info menu |
| | | | | | 3: Service menu |
| | | | | | 4: Log menu |
| | | | | | 5: Statistic menu |
| | | | | | 6: Revenue menu |
| | | | | | If none of the above is active, the message is: None active |
| 131 | All | - | Default operator menu index | Totalizer 1 | Totalizer 1, Totalizer 2, Actual Flow rate, Fault codes, Customer Totalizer |

## F.3　　200-299

| Param-eter ID | Meter version | Display view | Parameter/data type | Factory settings | Data range |
|---|---|---|---|---|---|
| | | | | Fixed parameter or meter data that are not changeable | |
| 200 | All | O4 | Fault status | No faults | 0 to 8191, binary presented with information 1 for bit 0 |
| | | | | | 1: Insulation error |
| | | | | | 2: Coil current error |
| | | | | | 3: Amplifier overload |
| | | | | | 4: Database checksum error |
| | | | | | 5: Low power warning |
| | | | | | 6: Flow overflow warning |
| | | | | | 7: Pulse A overload warning |
| | | | | | 9: Consumption interval warning |
| | | | | | 10/L: Leakage warning |
| | | | | | 11/E: Empty pipe warning |
| | | | | | 12/C: Low impedance (high conductivity) warning |
| | | | | | 13/d: High flow limit warning |
| | | | | | 14/A: Reverse flow warning |
| | | | | | If no error/warning is pending, the message is "No faults" |
| 201 | All | - | Alarm configuration list | 254 = Alarm 2 to 8 enabled | 0 to 8191, See 200 |
| | | | | | If no alarm is enabled, the message is "None enabled" |

| Param-eter ID | Meter version | Display view | Parameter/data type | Factory settings | Data range |
|---|---|---|---|---|---|
| | | | | **Fixed parameter or meter data that are not changeable** | |
| 202 | All | - | Date of fault log reset | PS3 production date and time | year-month-day T hours:mi-nutes:seconds |
| 203 | All | O4 | Non optimal measure time, in-cluding the time of device run-ning with insulation test fault, coil current fault, amplifier fault, database checksum fault, flow overload fault, or empty pipe fault. | 0 | |
| 204 | All | - | Reset the fault log and faults | No | Yes / No Value is reset to "No" when up-loading device parameters to pc after command execution |
| 205 | All | - | Call up acknowledge | No | Yes / No Value is reset to "No" when up-loading device parameters to pc after command execution |
| 206 | All | - | Battery alarm level | 10% | 0 to 100% |
| 208 | All | - | Reset leakage fault | No | Yes / No Value is reset to "No" when up-loading device parameters to pc after command execution |
| 209 | All | - | Reset consumption log fault | No | Yes / No Value is reset to "No" when up-loading device parameters to pc after command execution |
| 210 | All | - | **Insulation alarm output ena-ble** | No | Yes / No |
| 211 | All | - | Insulation fault hours | 0 | |
| 212 | All | - | Insulation fault counter | 0 | |
| 213 | All | - | Insulation fault appears | 2000-01-01 T 00:00:00 | |
| 214 | All | - | Insulation fault disappears | 2000-01-01 T 00:00:00 | |
| 215 | All | - | **Coil current alarm output en-able** | Yes | Yes / No |
| 216 | All | - | Coil current fault hours | 0 | |
| 217 | All | - | Coil current fault counter | 0 | |
| 218 | All | - | Coil current fault appears | 2000-01-01 T 00:00:00 | |
| 219 | All | - | Coil current fault disappears | 2000-01-01 T 00:00:00 | |
| 220 | All | - | **Amplifier alarm output ena-ble** | Yes | Yes / No |
| 221 | All | - | Amplifier fault hours | | |
| 222 | All | - | Amplifier fault counter | | |
| 223 | All | - | Amplifier fault appears | 2000-01-01 T 00:00:00 | |
| 224 | All | - | Amplifier fault disappears | 2000-01-01 T 00:00:00 | |
| 225 | All | - | **Database alarm output ena-ble** | Yes | Yes / No |

| Param-eter ID | Meter version | Display view | Parameter/data type | Factory settings | Data range |
|---|---|---|---|---|---|
| | | | | Fixed parameter or meter data that are not changeable | |
| 226 | All | - | Database fault hours | 0 | |
| 227 | All | - | Database fault counter | 0 | |
| 228 | All | - | Database fault appears | 2000-01-01 T 00:00:00 | |
| 229 | All | - | Database fault disappears | 2000-01-01 T 00:00:00 | |
| 230 | All | - | **Low power alarm output enable** | Yes | Yes / No |
| 231 | All | - | Low power fault hours | 0 | |
| 232 | All | - | Low power fault counter | 0 | |
| 233 | All | - | Low power fault appears | 2000-01-01 T 00:00:00 | |
| 234 | All | - | Low power fault disappears | 2000-01-01 T 00:00:00 | |
| 235 | All | - | **Flow overflow alarm output enable** | Yes | Yes / No |
| 236 | All | - | Overflow fault hours | 0 | |
| 237 | All | - | Overflow fault counter | 0 | |
| 238 | All | - | Overflow fault appears | 2000-01-01 T 00:00:00 | |
| 239 | All | - | Overflow fault disappears | 2000-01-01 T 00:00:00 | |
| 240 | All | - | **Pulse A overload alarm output enable** | Yes | Yes / No |
| 241 | All | - | Pulse A overload fault hours | 0 | |
| 242 | All | - | Pulse A overload fault counter | 0 | |
| 243 | All | - | Pulse A overload fault appears | 2000-01-01 T 00:00:00 | |
| 244 | All | - | Pulse A overload fault disappears | 2000-01-01 T 00:00:00 | |
| 245 | All with FW 3.12 and later | - | Pulse B overload alarm output enable | Yes | Yes / No |
| 246 | All with FW 3.12 and later | - | Pulse B overload fault hours | 0 | |
| 247 | All with FW 3.12 and later | - | Pulse B overload fault counter | 0 | |
| 248 | All with FW 3.12 and later | - | Pulse B overload fault appears | 2000-01-01 T 00:00:00 | |
| 249 | All with FW 3.12 and later | - | Pulse B overload fault disappears | 2000-01-01 T 00:00:00 | |
| 250 | All | - | **Consumption alarm output enable** | No | Yes / No |

| Param-eter ID | Meter version | Display view | Parameter/data type | Factory settings | Data range |
|---|---|---|---|---|---|
| | | | | **Fixed parameter or meter data that are not changeable** | |
| 251 | All | - | Consumption fault hours | 0 | |
| 252 | All | - | Consumption fault counter | 0 | |
| 253 | All | - | Consumption fault appears | 2000-01-01 T 00:00:00 | |
| 254 | All | - | Consumption fault disappears | 2000-01-01 T 00:00:00 | |
| 255 | All | - | **Leakage alarm output ena-ble** | No | Yes / No |
| 256 | All | - | Leakage fault hours | 0 | |
| 257 | All | - | Leakage fault counter | 0 | |
| 258 | All | - | Leakage fault appears | 2000-01-01 T 00:00:00 | |
| 259 | All | - | Leakage fault disappears | 2000-01-01 T 00:00:00 | |
| 260 | All | - | **Empty pipe alarm output en-able** | No | Yes / No |
| 261 | All | - | Empty pipe fault timer | 0 | |
| 262 | All | - | Empty pipe fault counter | 0 | |
| 263 | All | - | Empty pipe fault appears | 2000-01-01 T 00:00:00 | |
| 264 | All | - | Empty pipe fault disappears | 2000-01-01 T 00:00:00 | |
| 265 | All | - | **Low impedance alarm out-put enable** | No | Yes / No |
| 266 | All | - | Low impedance fault hours | 0 | |
| 267 | All | - | Low impedance fault counter | 0 | |
| 268 | All | - | Low impedance fault appears | 2000-01-01 T 00:00:00 | |
| 269 | All | - | Low impedance fault disap-pears | 2000-01-01 T 00:00:00 | |
| 270 | All | - | **High flow alarm output ena-ble** | No | Yes / No |
| 271 | All | - | High flow alarm fault timer | 0 | |
| 272 | All | - | High flow alarm fault counter | 0 | |
| 273 | All | - | High flow alarm fault appears | 2000-01-01 T 00:00:00 | |
| 274 | All | - | High flow alarm fault disap-pears | 2000-01-01 T 00:00:00 | |
| 275 | All | - | **Reverse high flow alarm out-put enable** | No | Yes / No |
| 276 | All | - | Reverse high flow alarm fault hours | 0 | |
| 277 | All | - | Reverse high flow alarm fault counter | 0 | |
| 278 | All | - | Reverse high flow appears | 2000-01-01 T 00:00:00 | |
| 279 | All | - | Reverse high flow disappears | 2000-01-01 T 00:00:00 | |

## F.4　　　300-399

| Param-eter ID | Meter version | Display view | Parameter/data type | Factory settings | Data range |
|---|---|---|---|---|---|
| | | | | **Fixed parameter or meter data that are not changeable** | |
| 300 | All | - | Totalizer volume unit factor | MLFB-dependent | 0 to $1*x0^{10}$ |
| 301 | All | - | Flow unit factor | MLFB-dependent | 0 to $1*x0^{10}$ |
| 302 | All | - | Pipe size | Sensor-related | 25 to 1200 |
| 303 | All | - | Meter excitation frequency (in battery power mode) | 1/15 Hz | 1/60 Hz, 1/30 Hz, 1/15 Hz, 1/5 Hz, 1.5625 Hz, 3.125 Hz, 6.25 Hz |
| 304 | All | - | Mains frequency | MLFB-dependent | 50 or 60 Hz mains |
| 305 | All | - | Decimal point | MLFB-dependent | No point, One digit after point, Two digits after point, Three digits after point, Automatic point adjust |
| 306 | All | - | Displayed unit | Use $m^3$ unit | Displayed $m^3$ unit or an arrow indication for a unit label |
| 307 | All | - | Measurement direction | MLFB-dependent | Bidirectional, Forward only, Reverse only |
| 310 | All | - | Flow direction totalizer 1 | Forward | Forward, Reverse or Bi-directional net flow |
| 311 | All | - | Totalizer 1 changes date | PS3 production date and time | |
| 312 | All | - | Flow direction totalizer 2 | MLFB-dependent | Forward, Reverse or Bi-directional net flow |
| 313 | All | - | Totalizer 2 changes date | PS3 production date and time | |
| 320 | All | - | Verification mode enable | No | Yes / No<br>Value is reset to "No" when uploading device parameters to pc after four hours |
| 321 | All | - | Calibration date | Calibration date | year-month-day T hours:minutes:seconds |
| 323 | All | - | Calibration factor | Sensor-related | |
| 324 | All | - | Gain correction | Sensor-related | |
| 325 | All | - | Sensor offset | Sensor-related | |
| 327 | All | - | Adjustment Factor | 1 | -2 to 2 |
| 328 | All | - | Low flow cut-off | MAG 8000 Standard (7ME6810) 0.05 % for FW 3.07 and lower. **For FW 3.09 see table F-1 below.** | 0 to 9.9 % |
| | | | | MAG 8000 CT (7ME6820) 0.25 % for FW 3.07 and lower. **For FW 3.09 see table F-2 below.** | |
| | | | | 15 mm/s for FW 3.11 onwards | 0 to 999 mm/s |
| 329 | All | - | Filter time constant | 5 Tau | 1 to 1000 |

| Param-eter ID | Meter version | Display view | Parameter/data type | Factory settings | Data range |
|---|---|---|---|---|---|
| | | | | **Fixed parameter or meter data that are not changeable** | |
| 331 | All | - | Excitation frequency limit | 6.25 Hz for advanced version and 1/15 Hz for basic version | |
| 332 | All | - | Excitation frequency sensor limit | Sensor-related | 7ME6810 and 7ME6820: 6.25 Hz (DN 25 to 200 (1" to 8")) 3.125 Hz (DN 250 to 600 (10" to 24")) 1.5625 Hz (DN 700 to 1200 (28" to 48")) 7ME6880: 3.125 Hz (DN 25 to 600 (1" to 24")) 1.5625 Hz (DN 700 to 1200 (28" to 48")) |
| 333 | All | - | Empty pipe detection enable | Yes | Yes / No |
| 334 | All | - | Empty pipe limit | 25000 ohm | 0 to $2.15 \times 10^9$ |

Table F-1     **MAG 8000 Standard (7ME6810) parameter 328 FW 3.09**

| Sensor size | Parameter value |
|---|---|
| DN 25 (1") | 0.16 |
| DN 40 (1½") | 0.15 |
| DN 50 (2") | 0.17 |
| DN 65 (2½") | 0.18 |
| DN 80 (3") | 0.17 |
| DN 100 (4") | 0.17 |
| DN 125 (5") | 0.17 |
| DN 150 (6") | 0.15 |
| DN 200 (8") | 0.17 |
| DN 250 (10") | 0.17 |
| DN 300 (12") | 0.15 |
| DN 350 (14") | 0.15 |
| DN 400 (16") | 0.15 |
| DN 450 (18") | 0.15 |
| DN 500 (20") | 0.15 |
| DN 600 (24") | 0.15 |
| DN 700 (27½") | 0.15 |
| DN 750 (29½") | 0.15 |
| DN 800 (31") | 0.15 |
| DN 900 (35") | 0.15 |
| DN 1000 (39") | 0.15 |

| Sensor size | Parameter value |
|---|---|
| DN 1050 (41") | 0.15 |
| DN 1100 (43") | 0.15 |
| DN 1200 (47") | 0.15 |

Table F-2    **MAG 8000 CT (7ME6820) parameter 328 FW 3.09**

| R (Q3/Q1) | no verifi-cation | 63 | 80 | 160 | 200 | 250 | 100 with no verifi-cation | 250 with no verifi-cation |
|---|---|---|---|---|---|---|---|---|
| DN 50 (2") | 0.17 | 0.66 | 0.66 | 0.27 | 0.27 | 0.27 | 0.42 | 0.17 |
| DN 65 (2½") | 0.18 | 0.72 | 0.72 | 0.28 | 0.28 | 0.28 | 0.45 | 0.18 |
| DN 80 (3") | 0.17 | 0.68 | 0.68 | 0.27 | 0.27 | 0.27 | 0.43 | 0.17 |
| DN 100 (4") | 0.17 | 0.67 | 0.67 | 0.27 | 0.27 | 0.27 | 0.42 | 0.17 |
| DN 125 (5") | 0.17 | 0.66 | 0.66 | 0.27 | 0.27 | 0.27 | 0.41 | 0.17 |
| DN 150 (6") | 0.15 | 0.60 | 0.60 | 0.24 | 0.24 | 0.24 | 0.38 | 0.15 |
| DN 200 (5") | 0.17 | 0.68 | 0.68 | 0.27 | 0.27 | 0.27 | 0.42 | 0.17 |
| DN 250 (10") | 0.17 | 0.66 | 0.66 | 0.27 | 0.27 | 0.27 | 0.42 | 0.17 |
| DN 300 (12") | 0.24 | 0.61 | 0.38 | 0.24 | 0.24 | 0.24 | 0.38 | 0.24 |
| DN 350 (14") | 0.21 | 0.52 | 0.32 | 0.32 | 0.32 | 0.32 | 0.52 | 0.21 |
| DN 400 (16") | 0.17 | 0.68 | 0.42 | 0.42 | 0.42 | 0.42 | 0.42 | 0.17 |
| DN 450 (18") | 0.21 | 0.34 | 0.21 | 0.14 | 0.14 | 0.14 | 0.21 | 0.21 |
| DN 500 (20") | 0.17 | 0.42 | 0.27 | 0.17 | 0.17 | 0.17 | 0.27 | 0.17 |
| DN 600 (16") | 0.24 | 0.38 | 0.24 | 0.15 | 0.15 | 0.15 | 0.24 | 0.24 |

Table F-3    Flow rate at low flow cutoff = 15mm/s

| Sensor size | Flow rate (m³/h) |
|---|---|
| DN 25 (1") | 0.027 |
| DN 40 (1½") | 0.068 |
| DN 50 (2") | 0.11 |
| DN 65 (2½") | 0.18 |
| DN 80 (3") | 0.27 |
| DN 100 (4") | 0.42 |
| DN 125 (5") | 0.66 |
| DN 150 (6") | 0.95 |
| DN 200 (8") | 1.70 |
| DN 250 (10") | 2.65 |
| DN 300 (12") | 3.82 |
| DN 350 (14") | 5.20 |
| DN 400 (16") | 6.79 |
| DN 450 (18") | 8.59 |
| DN 500 (20") | 10.60 |

| Sensor size | Flow rate (m³/h) |
|---|---|
| DN 600 (24") | 15.27 |
| DN 700 (27½") | 20.78 |
| DN 750 (29½") | 23.86 |
| DN 800 (31") | 27.14 |
| DN 900 (35") | 34.35 |
| DN 1000 (39") | 42.41 |
| DN 1050 (41") | 46.76 |
| DN 1100 (43") | 51.32 |
| DN 1200 (47") | 61.07 |

## F.5    400-499

| Param-eter ID | Meter version | Display view | Parameter/data type | Factory settings | Data range |
|---|---|---|---|---|---|
| | | | | **Fixed parameter or meter data that are not changeable** | |
| 400* | All | - | Output A enable | MLFB-dependent | Yes / No |
| 401* | All | Se3 | Pulse A direction | Forward | Forward, Reverse, Forward net, Reverse net |
| 402* | All | Se3 | Amount per pulse A | Sensor-related | 0 to 1x10⁹ |
| 403* | All | - | Pulse width for pulse A | 50 ms | 10 ms, 25ms, 50 ms, 100 ms, 500 ms, 5 ms, 0.5 ms |
| 404* | All | - | Output B enable | MLFB-dependent | Yes / No |
| 405* | All | Se4 | Pulse B function | Alarm | Pulse, Alarm, Call-up |
| 406* | All | | Pulse B direction | Reverse | Forward, Reverse, Forward net, Reverse net |
| 407* | All | Se4 | Amount per pulse B | Sensor-related | 0 to 1x10⁹ |
| 408* | All | | Pulse width for pulse B | 50 ms | 10 ms, 50 ms, 100 ms, 500 ms |
| 420 | All | M5 | Device Communication Address | 1 | 1 to 247 |
| 421** | All | M6 | Baud rate | 19 200 | 1200, 2400, 4800, 9600, 19 200, 38 400 |
| 422** | All | M7 | Parity | Even 1 stop | Even 1 stop, Odd 1 stop, None 1 stop, None 2 stop, |
| 423** | All | - | Interframe space | 35 | 35 to 255 |
| 424** | All | - | Response delay | 5 | 1 to 50 ms |
| 425 | All | - | Reset communication driver | No | Yes / No<br><br>This parameter is removed from PDM parameter list. The functionality is implemented via PDM menu "Device" → "Communication Settings" → "Transfer" |

*: The parameter is accessible via PDM menu "Device" →"Pulse guide offline".
**: The parameter is accessible via the PDM menu "Device" → "Communication settings".

$402^*$ data range note: $0 \text{ to } 1\times10^{9}$

## F.6 500-599

| Param-eter ID | Meter version | Display view | Parameter/data type | Factory settings | Data range |
|---|---|---|---|---|---|
| | | | | **Fixed parameter or meter data that are not changeable** | |
| 500 | All | - | Latest service date | PS3 production date and time | year-month-day T hours:minutes:seconds |
| 501 | All | - | Operating hours since power-up | 0 | hours |
| 502 | All | - | Battery operating time | 0 | hours |
| 505 | All | - | Power supply | Power supply level | Battery or mains power |
| 506 | All | - | Numbers of power-up | MLFB-dependent | 1 to 4 batteries |
| 507 | All | - | Battery power | | |
| 508 | All | - | Battery change enable | No | Yes / No |
| 509 | All | Se1 | Battery installation date | PS3 production date and time | year-month-day T hours:minutes:seconds |
| 510 | All | Se2 | Actual battery capacity | 100% | 100 to 0% |
| 511 | All | - | Communication module type | MLFB-dependent | No module, RS 485, RS 232, RS 232 always connected |
| 512 | All | - | Number of excitations since last battery reset | 0 | |
| 513 | All | - | Power status | 0 | Normal operation, 1: Battery alarm. Actual battery capacity is below battery alarm level (% of max capacity) 2: Too low power (enters stand by mode) 3: As value 1 and 2 together 4: External power gone 5: As value 1 and 4 together 6: As value 2 and 4 together 7: As value 1 and 2 and 4 together |
| 514 | All | - | Transmitter temperature | Actual degree celsius | |
| 520 | All with FW 3.12 and later | - | Calibration temperature | Configurable | Ambient temperature during test |
| 521 | All with FW 3.11 and later | - | Temperature offset value | Measured value | -100 °C to +100 °C |
| 522 | All with FW 3.12 and later | - | Temperature calibration start | 0 | Yes / No |
| 540 | All | - | Electrode impedance A | Measured values | 0 to 185 000 ohm |
| 541 | All | - | Electrode impedance B | Measured values | 0 to 185 000 ohm |

| Param-eter ID | Meter version | Display view | Parameter/data type | Factory settings | Data range |
|---|---|---|---|---|---|
| | | | | **Fixed parameter or meter data that are not changeable** | |
| 542 | All | - | Low medium impedance alarm | 0 | 0 to $2.15 \times 10^9$ |
| 550 | All | - | Coil current disable | No | Yes / No |
| 551 | All | - | Fixed flow mode enable | No | Yes / No<br>Value is reset to "No" in 4 hours. |
| 552 | All | - | Fixed flow value | 0 | $-1 \times 10 \times 10^9$ to $1 \times 10 \times 10^9$ |
| 553 | All | - | High flow alarm limit | 1 000 000 000 | 0 to $1 \times 10^9$ |
| 554 | All | - | Reverse flow alarm limit | $-1 \times 10^9$ | $-1 \times 10^9$ to $1 \times 10^9$ |
| 560 | All | - | Repair checksum | No | Yes / No<br>Value is reset to "No" when uploading device parameters to pc after command execution |
| 570 | All | - | Device Product ID | vendor id = 42<br>product id = 27 | Siemens MAG 8000 product ID:<br>vendor id = 42<br>product id = 27 |
| 590 | All with FW 3.07 and later | - | Raw velocity | Measured value | |
| 591 | All with FW 3.11 and later | - | Suppress count | - | |
| 592 | All with FW 3.07 and later | - | Electrode potential | Measured value | within ±1.2V |
| 593 | All with FW 3.12 and later | - | Unfiltered electrode impedance A | Measured value | |
| 594 | All with FW 3.12 and later | - | Unfiltered electrode impedance B | Measured value | |

## F.7 600-799

| Param-eter ID | Meter version | Display view | Parameter/data type | Factory settings | Data range |
|---|---|---|---|---|---|
| | | | | **Fixed parameter or meter data that are not changeable** | |
| 600 | All | - | Log interval | Monthly | Daily, Weekly (7 days), Monthly |
| 601 | All | - | Delay of weekly logging from current day to first day logging at 00:00:00 | 0 | 0 to 30 |
| 602 | All | - | - Limit for too high consumption | 1 000 000 | -1x10⁹ to 1x10⁹ |
| 603 | All | - | Limit for too low consumption | 0 | -1x10⁹ to 1x10⁹ |
| 610* | All | L1 | Date of latest log period | 2000-01-01 T 00:00:00 | year-month-day T hours:minutes:seconds |
| 611* | All | L1 | Latest Log period totalized (1) | | |
| 612* | All | - | Latest Log period totalized (2) | 0 | |
| 613* | All | - | Latest Log period fault status* | No faults | Active faults in log period; 1: Insulation error 2: Coil current error 3: Amplifier overload 4: Database checksum error 5: Low power warning 6: Flow overflow warning 7: Pulse A overload warning 9: Consumption interval warning 10/L: Leakage warning 11/E: Empty pipe warning 12/C: Low impedance/ high conductivity warning 13/d: High flow limit warning 14/15/16: Not used  If none of the errors have been logged, the message is "No faults" |
| 614* | All | - | Latest Log period status information* | | Meter operation conditions in log period 1: Totalizer 1 or 2 changed or reset 2: Tariff setting changed or reset 3: Tariff register changed or reset 4: Date - time changed 5: Alarm active in logged period (See alarm fault log for same period) 6: Fault log has been reset 7: HW lock broken 8: Power Up  If none of the information has been logged, the message is "No Faults" |
| 615* | All | L2 | Date of log period 2 | | |

| Param-eter ID | Meter version | Display view | Parameter/data type | Factory settings | Data range |
|---|---|---|---|---|---|
| | | | | **Fixed parameter or meter data that are not changeable** | |
| 616* | All | L2 | Log period 2 totalized (1) | | |
| 617* | All | - | Log period 2 totalized (2) | | |
| 618* | All | - | Log period 2 fault status | | See 613 |
| 619* | All | - | Log period 2 status information | | See 614 |
| 620* | All | L3 | Date of log period 3 | | |
| 621* | All | L3 | Log period 3 totalized (1) | | |
| 622* | All | - | Log period 3 totalized (2) | | |
| 623* | All | - | Log period 3 fault status | | See 613 |
| 624* | All | - | Log period 3 status information | | See 614 |
| 625* | All | L4 | Date of log period 4 | | |
| 626* | All | L4 | Log period 4 totalized (1) | | |
| 627* | All | - | Log period 4 totalized (2) | | |
| 628* | All | - | Log period 4 fault status | | See 613 |
| 629* | All | - | Log period 4 status information | | See 614 |
| 630* | All | L5 | Date of log period 5 | | |
| 631* | All | L5 | Log period 5 totalized (1) | | |
| 632* | All | - | Log period 5 totalized (2) | | |
| 633* | All | - | Log period 5 fault status | | See 613 |
| 634* | All | - | Log period 5 status information | | See 614 |
| 635* | All | L6 | Date of log period 6 | | |
| 636* | All | L6 | Log period 6 totalized (1) | | |
| 637* | All | - | Log period 6 totalized (2) | | |
| 638* | All | - | Log period 6 fault status | | See 613 |
| 639* | All | - | Log period 6 status information | | See 614 |
| 640' | All | L7 | Date of log period 7 | | |
| 641* | All | L7 | Log period 7 totalized (1) | | |
| 642* | All | - | Log period 7 totalized (2) | | |
| 643* | All | - | Log period 7 fault status | | See 613 |
| 644* | All | - | Log period 7 status information | | See 614 |
| 645* | All | L8 | Date of log period 8 | | |
| 646* | All | L8 | Log period 8 totalized (1) | | |
| 647* | All | - | Log period 8 totalized (2) | | |
| 648* | All | - | Log period 8 fault status | | See 613 |
| 649* | All | - | Log period 8 status information | | See 614 |
| 650* | All | L9 | Date of log period 9 | | |

| Param-eter ID | Meter version | Display view | Parameter/data type | Factory settings | Data range |
|---|---|---|---|---|---|
| | | | | Fixed parameter or meter data that are not changeable | |
| 651* | All | L9 | Log period 9 totalized (1) | | |
| 652* | All | - | Log period 9 totalized (2) | | |
| 653* | All | - | Log period 9 fault status | | See 613 |
| 654* | All | - | Log period 9 status information | | See 614 |
| 655* | All | L10 | Date of log period 10 | | |
| 656* | All | L10 | Log period 10 totalized (1) | | |
| 657* | All | - | Log period 10 totalized (2) | | |
| 658* | All | - | Log period 10 fault status | | See 613 |
| 659* | All | - | Log period 10 status information | | See 614 |
| 660 | All | L11 | Date of log period 11 | | |
| 661* | All | L11 | Log period 11 totalized (1) | | |
| 662* | All | - | Log period 11 totalized (2) | | |
| 663* | All | - | Log period 11 fault status | | See 613 |
| 664* | All | - | Log period 11 status information | | See 614 |
| 665* | All | L12 | Date of log period 12 | | |
| 666* | All | L12 | Log period 12 totalized (1) | | |
| 667* | All | | Log period 12 totalized (2) | | |
| 668* | All | - | Log period 12 fault status | | See 613 |
| 669* | All | - | Log period 12 status information | | See 614 |
| 670* | All | L13 | Date of log period 13 | | |
| 671* | All | L13 | Log period 13 totalized (1) | | |
| 672* | All | - | - Log period 13 totalized (2) | | |
| 673* | All | - | Log period 13 fault status | | See 613 |
| 674* | All | - | Log period 13 status information | | See 614 |
| 675* | All | L14 | Date of log period 14 | | |
| 676* | All | L14 | Log period 14 totalized (1) | | |
| 677* | All | - | Log period 14 totalized (2) | | |
| 678* | All | - | Log period 14 fault status | | See 613 |
| 679* | All | - | Log period 14 status information | | See 614 |
| 680* | All | L15 | Date of log period 15 | | |
| 681* | All | L15 | Log period 15 totalized (1) | | |
| 682* | All | - | Log period 15 totalized (2) | | |
| 683* | All | - | Log period 15 fault status | | See 613 |
| 684* | All | - | Log period 15 status information | | See 614 |
| 685* | All | L16 | Date of log period 16 | | |

| Param-eter ID | Meter version | Display view | Parameter/data type | Factory settings | Data range |
|---|---|---|---|---|---|
| | | | | **Fixed parameter or meter data that are not changeable** | |
| 686* | All | L16 | Log period 16 totalized (1) | | |
| 687* | All | - | Log period 16 totalized (2) | | |
| 688* | All | - | Log period 16 fault status | | See 613 |
| 689* | All | - | Log period 16 status information | | See 614 |
| 690* | All | L17 | Date of log period 17 | | |
| 691* | All | L17 | Log period 17 totalized (1) | | |
| 692* | All | - | Log period 17 totalized (2) | | |
| 693* | All | - | Log period 17 fault status | | See 613 |
| 694* | All | - | Log period 17 status information | | See 614 |
| 695 | All | L18 | Date of log period 18 | | |
| 696* | All | L18 | Log period 18 totalized (1) | | |
| 697* | All | - | Log period 18 totalized (2) | | |
| 698* | All | - | Log period 18 fault status | | See 613 |
| 699* | All | - | Log period 18 status information | | See 614 |
| 700* | All | L19 | Date of log period 19 | | |
| 701* | All | L19 | Log period 19 totalized (1) | | |
| 702* | All | - | Log period 19 totalized (2) | | |
| 703* | All | - | Log period 19 fault status | | See 613 |
| 704* | All | - | Log period 19 status information | | See 614 |
| 705* | All | L20 | Date of log period 20 | | |
| 706* | All | L20 | Log period 20 totalized (1) | | |
| 707* | All | - | Log period 20 totalized (2) | | |
| 708* | All | - | Log period 20 fault status | | See 613 |
| 709* | All | - | Log period 20 status information | | See 614 |
| 710* | All | L21 | Date of log period 21 | | |
| 711* | All | L21 | Log period 21 totalized (1) | | |
| 712* | All | - | Log period 21 totalized (2) | | |
| 713* | All | - | Log period 21 fault status | | See 613 |
| 714* | All | - | Log period 21 status information | | See 614 |
| 715* | All | L22 | Date of log period 22 | | |
| 716* | All | L22 | Log period 22 totalized (1) | | |
| 717* | All | - | Log period 22 totalized (2) | | |
| 718* | All | - | Log period 22 fault status | | See 613 |
| 719* | All | - | Log period 22 status information | | See 614 |
| 720* | All | L23 | Date of log period 23 | | |

| Param-eter ID | Meter version | Display view | Parameter/data type | Factory settings | Data range |
|---|---|---|---|---|---|
| | | | | Fixed parameter or meter data that are not changeable | |
| 721* | All | L23 | Log period 23 totalized (1) | | |
| 722* | All | - | Log period 23 totalized (2) | | |
| 723* | All | - | Log period 23 fault status | | See 613 |
| 724* | All | - | Log period 23 status information | | See 614 |
| 725* | All | L24 | Date of log period 24 | | |
| 726* | All | L24 | Log period 24 totalized (1) | | |
| 727* | All | - | Log period 24 totalized (2) | | |
| 728* | All | - | Log period 24 fault status | | See 613 |
| 729* | All | - | Log period 24 status information | | See 614 |
| 730* | All | L25 | Date of log period 25 | | |
| 731* | All | L25 | Log period 25 totalized (1) | | |
| 732* | All | - | Log period 25 totalized (2) | | |
| 733* | All | - | Log period 25 fault status | | See 613 |
| 734* | All | - | Log period 25 status information | | See 614 |
| 735* | All | L26 | Date of log period 26 | | |
| 736* | All | L26 | Log period 26 totalized (1) | | |
| 737* | All | - | Log period 26 totalized (2) | | |
| 738* | All | - | Log period 26 fault status | | See 613 |
| 739* | All | - | Log period 26 status information | | See 614 |

*: Can be accessed via PDM menu "View" → "Log".

# F.8 800-899

| Param-eter ID | Meter version | Display view | Parameter/data type | Factory settings | Data range |
|---|---|---|---|---|---|
| | | | | Fixed parameter or meter data that are not changeable | |
| 800 | All | - | Insulation test enable | No | Yes / No<br>Value is reset to "No" when the test is finished |
| 801 | All | - | Insulation test interval | 30 | 0 to 65535 |
| 802 | All | - | Insulation value | | |
| 803 | All | - | Insulation test date | 2000-01-01 T00:00 | year-month- day T hours:mi-nutes:seconds |
| 804 | All | - | Insulation tests fulfilled | 0 | |
| 805 | All | - | Insulation test upper limit | 2.5 mm/s | |

| Param-eter ID | Meter version | Display view | Parameter/data type | Factory settings | Data range |
|---|---|---|---|---|---|
| | | | | **Fixed parameter or meter data that are not changeable** | |
| 810 | Advanced | - | Leakage detection mode | Off | Off / fixed limit / lowest + fixed limit |
| 811 | Advanced | - | Leakage source | Flow rate | Flow rate / volume |
| 812 | Advanced | - | Start period for leakage de-tection | 120 min = 2:00 [24:00] | 0 to 1440 detection minutes (0 to 23:50) |
| 813 | Advanced | - | Duration leakage detec-tion | 0 | 0 to 144 (10 to 1440 minutes) |
| 814 | Advanced | - | Leakage value unit | Flow / volume unit | The unit is updated once param-eter 811 change is downloaded to the device and afterwards up-loaded to the pc |
| 815 | Advanced | - | Leakage limit | 1 | 0 to $1 \times 10^9$<br>The unit is updated once param-eter 811 change is downloaded to device and afterwards uploa-ded to pc |
| 816 | Advanced | - | - Leakage excitation fre-quency | 1.5625 Hz | 1/60 Hz, 1/30 Hz, 1/15 Hz, 1/5 Hz, 1.5625 Hz, 3.125 Hz, 6.25 Hz |
| 817 | Advanced | - | Leakage status | No faults | Leakage status:<br>1: Finished successfully<br>2: Leakage detection running<br>3: Leakage detection failed (Sys-temStatus have fatal error)<br>4: Leakage detection failed (Empty-pipe detection disabled)<br>5: Leakage detection failed (Coil current off)<br>6: Leakage detection failed (In-sulation test was active during detection)<br>7: Leakage detection stopped be-cause leakage parameter was changed.<br>If none of the above-mentioned leakage status messages is pend-ing, the message is "No faults" |
| 818 | Advanced | - | Periods with possible leak-age | | |
| 819 | Advanced | - | Leakage periods before alarm | 30 | 0 to 255 |
| 820 | Advanced | - | Reset leakage period infor-mation | No | Yes / No<br>Value is reset to "No" when up-loading device parameters to pc after command execution |
| 821 | Advanced | St1 | Latest leakage period flow-rate | 0 | |
| 822 | Advanced | St1 | Latest leakage period vol-ume | 0 | |

| Param-eter ID | Meter version | Display view | Parameter/data type | Factory settings | Data range |
|---|---|---|---|---|---|
| | | | | | **Fixed parameter or meter data that are not changeable** |
| 823 | Advanced | - | Lowest measured leakage value | 1 000 000 000 | The unit is updated once param-eter 811 change is downloaded to device and afterwards uploa-ded to pc |
| 824 | Advanced | - | Date of lowest leakage val-ue | 2000-01-01 T00:00 | year-month-day T hours:mi-nutes:seconds |
| 825 | Advanced | - | Highest measured leakage value | $-1 \times 10^9$ | The unit is updated once param-eter 811 change is downloaded to device and afterwards uploa-ded to pc |
| 826 | Advanced | - | Date of highest leakage value | 2000-01-01 T00:00 | year-month-day T hours:mi-nutes:seconds |
| 830 | Advanced | R8 | Next settling date | PS3 production date and time | year-month-day T 23:59:59 |
| 831 | Advanced | R9 | Latest settling date | PS3 production date and time | year-month-day T 23:59:59 |
| 832 | Advanced | R9 | Latest totalizer 1 value | 0 | |
| 833 | Advanced | R10 | Previous settling date | PS3 production date and time | year-month-day T hours:mi-nutes:seconds |
| 834 | Advanced | R10 | Previous totalizer 1 value | 0 | |
| 840 | Advanced | | Tariff control mode | Off | Off / time / range / combination |
| 841 | Advanced | R7 | Date of tariff reset | PS3 production date and time | year-month-day T hours:mi-nutes:seconds |
| 842 | Advanced | - | Reset tariff values | No | Yes / No<br>Value is reset to "No" when up-loading device parameters to pc after command execution |
| 843 | Advanced | R1 | Tariff1 volume 1 | 0 | |
| 844 | Advanced | R1 | Tariff1 period time end | 360 min = 6:00 [24:00] | 0 to 1439 minutes (23:59) |
| 845 | Advanced | R1 | Tariff1 upper limit range | 15% | 0 to 100% Qn (Q3) |
| 846 | Advanced | R2 | Tariff2 volume 2 | 0 | |
| 847 | Advanced | R2 | Tariff2 period time end | 540 min = 9:00 [24:00] | 0 to 1439 minutes (23:59) |
| 848 | Advanced | R2 | Tariff2 upper limit range | 30% | 0 to 100% Qn (Q3) |
| 849 | Advanced | R3 | Tariff3 volume 3 | 0 | |
| 850 | Advanced | R3 | Tarif3 period time end | 720 min = 12:00 [24:00] | 0 to 1439 minutes (23:59) |
| 851 | Advanced | R3 | Tariff3 upper limit range | 45% | 0 to 100% Qn (Q3) |
| 852 | Advanced | R4 | Tariff4 volume 4 | 0 | |
| 853 | Advanced | R4 | Tariff4 period time end | 1080min=18:00 [24:00] | 0 to 1439 minutes (23:59) |
| 854 | Advanced | R4 | Tariff4 upper limit range | 60% | 0 to 100% Qn (Q3) |
| 855 | Advanced | R5 | Tariff5 volume 5 | 0 | |
| 856 | Advanced | R5 | Tariff5 period time end | 1260 min = 21:00 [24:00] | 0 to 1439 minutes (23:59) |
| 857 | Advanced | R5 | Tariff5 upper limit range | 80% | 0 to 100% Qn (Q3) |
| 858 | Advanced | R6 | Tariff6 volume 6 | 0 | |

| Param-eter ID | Meter version | Display view | Parameter/data type | Factory settings | Data range |
|---|---|---|---|---|---|
| | | | | **Fixed parameter or meter data that are not changeable** | |
| 860 | Advanced | - | Reset date of statistic inf. | PS3 production date and time | year- month-day T hours:mi-nutes:seconds |
| 861 | Advanced | - | Reset statistic information | No | Yes / No Value is reset to "No" when up-loading device parameters to pc after command execution |
| 862 | Advanced | St2 | Lowest flowrate | 0 | |
| 863 | Advanced | St2 | Date of lowest flowrate | PS3 production date and time | year-month-day T hours:mi-nutes:seconds |
| 864 | Advanced | St3 | Highest flowrate | 0 | |
| 865 | Advanced | St3 | Date of highest flowrate | PS3 production date and time | year-month-day T hours:mi-nutes:seconds |
| 866 | Advanced | St5 | Lowest day consumption | 0 | |
| 867 | Advanced | - | Date of lowest day con-sumption | PS3 production date and time | year-month-day T hours:mi-nutes:seconds |
| 868 | Advanced | St6 | Highest day consumption | 0 | |
| 869 | Advanced | - | Date of highest day con-sumption | PS3 production date and time | year-month-day T hours:mi-nutes:seconds |
| 870 | Advanced | St4 | Day 1 (yesterday) of last week consumption | 0 | |
| 871 | Advanced | - | Day 2 of last week con-sumption | 0 | |
| 872 | Advanced | - | Day 3 of last week con-sumption | 0 | |
| 873 | Advanced | - | Day 4 of last week con-sumption | 0 | |
| 874 | Advanced | - | Day 5 of last week con-sumption | 0 | |
| 875 | Advanced | - | Day 6 of last week con-sumption | 0 | |
| 876 | Advanced | - | Day 7 (7 days ago) of last week consumption | 0 | |
| 877 | Advanced | St7 | Latest week consumption | 0 | |
| 878 | Advanced | St8 | Actual month consump-tion | 0 | |
| 879 | Advanced | St9 | Latest month consump-tion | 0 | |
| 880 | Advanced | - | Reset date of consump-tion profile | PS3 production date and time | year-month-day T hours:mi-nutes:seconds |
| 881 | Advanced | - | Reset consumption profile | No | Yes / No Value is reset to "No" when up-loading device parameters to pc after command execution |
| 882 | Advanced | - | Total time in CP range 1 | 0 | |
| 883 | Advanced | - | Upper limit in CP range 1 | 15% | 0 to 100% Qn (Q3) |

| Param-eter ID | Meter version | Display view | Parameter/data type | Factory settings | Data range |
|---|---|---|---|---|---|
| | | | | **Fixed parameter or meter data that are not changeable** | |
| 884 | Advanced | - | Total time in CP range 2 | 0 | |
| 885 | Advanced | - | Upper limit in CP range 2 | 30% | 0 to 100% Qn (Q3) |
| 886 | Advanced | - | Total time in CP range 3 | 0 | |
| 887 | Advanced | - | Upper limit in CP range 3 | 45% | 0 to 100% Qn (Q3) |
| 888 | Advanced | - | Total time in CP range 4 | 0 | |
| 889 | Advanced | - | Upper limit in CP range 4 | 60% | 0 to 100% Qn (Q3) |
| 890 | Advanced | - | Total time in CP range 5 | 0 | |
| 891 | Advanced | - | Upper limit in CP range 5 | 80% | 0 to 100% Qn (Q3) |
| 892 | Advanced | - | Total time in CP range 6 | 0 | |

# Sizing sensor

# G

## G.1 Sizing table DN 25 to 1200 (1" to 48")

The following table shows the relationship between flow velocity (V), flow quantity (Q) and sensor dimension (DN).
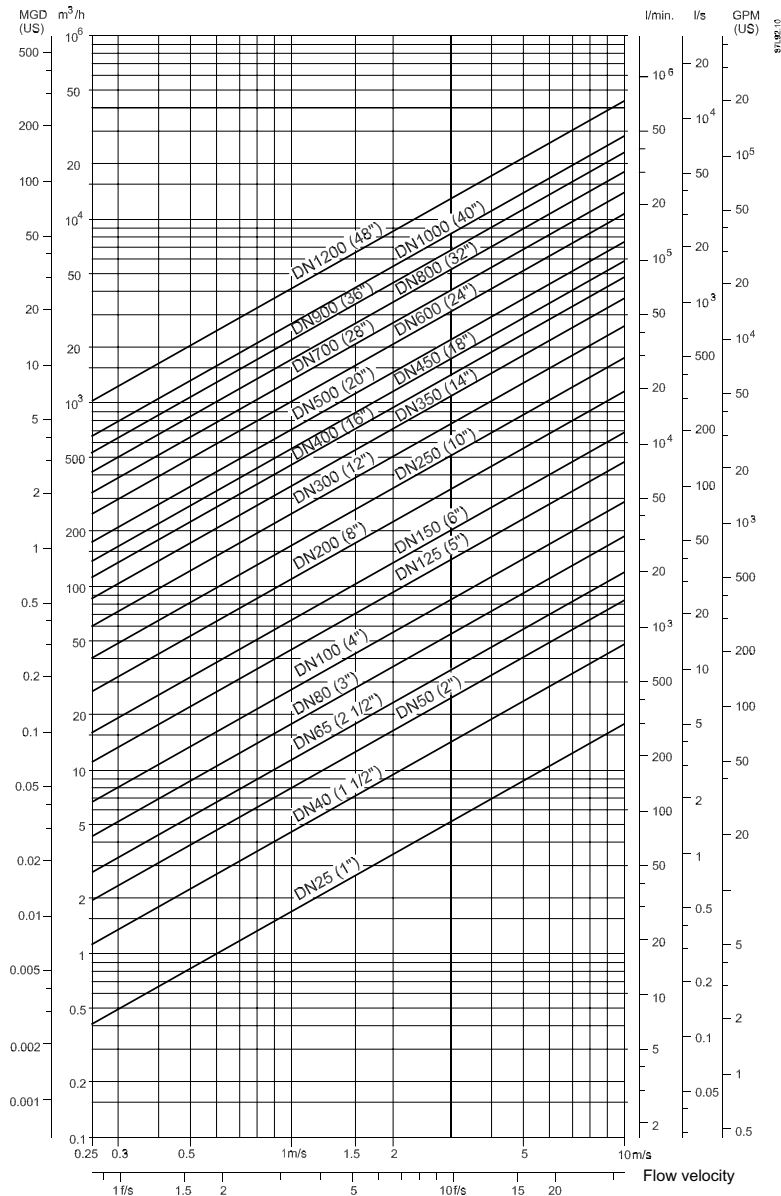


Figure G-1    Sizing table

**Guidelines for selection of sensor**

Normally the sensor is selected so that V lies within the measuring range 1 to 2 m/s (3 to 7 ft/sec.).

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

- Max. measuring range: 0 to 10 m/s (0 to 33 ft/sec.)

**Flow velocity calculation formula**

- Metric measures:
$V = 1273.24 \times Q / Di^2$ (V: [m/s]; Q: [L/s]; Di: [mm])
or
$V = 353.68 \times Q / Di^2$ (V: [m/s]; Q: [m³/h]; Di: [mm])

- Imperial measures:
$V = Q \times 0.408 / (Pipe\ I.D.)^2$ (V: [ft/s]; Q: [GPM]; Pipe I.D.: [inch])
or
$V = Q \times 283.67 / (Pipe\ I.D.)^2$ (V: [ft/s]; Q: [MGD]; Pipe I.D.: [inch])

# Features

<div style="text-align: right"><span style="font-size: 2em; font-weight: bold">H</span></div>

| Feature | MAG 8000 basic | MAG 8000 advanced |
|---|---|---|
| Measurement frequency (battery power) | Max. 1/15 Hz | Max. 6.25 Hz |
| Totalizer | 3 | 3 |
| Pulse output | 2, max. 50 Hz | 2, max. 100 Hz |
| Communication | Add-on | Add-on |
| IrDA | Yes | Yes |
| Time and date | Yes | Yes |
| Data protection | Yes | Yes |
| Data logger | Yes | Yes |
| Application identifier | Yes | Yes |
| Alarm handling | Yes | Yes |
| Meter status | Yes | Yes |
| Diagnostics | Yes | Yes |
| Battery power management | Yes | Yes |
| Insulation test | - | Yes |
| Leakage detection | - | Yes |
| Meter utilization | - | Yes |
| Statistics | - | Yes |
| Tariff | - | Yes |
| Settle date (Revenue) | - | Yes |

## Features

**Application identification** (parameters 1 and 2)

Tag number (visible on display if numbers are selected) and meter location, up to 15 characters per information.

**Time and date** (parameter 100)

Real time clock and date (max. 15 minutes drift per year)

**Totalizer** (parameters 101, 102 and 103)

- 3 totalizers: Forward, reverse, bidirectional netflow calculation and freely selectable start value.

---

**Note**

**CT version**

It is not allowed to reset the totalizer for the CT version.

---

**Measurement** (parameters 300 and 334)

* Freely selectable volume and flow unit, where $m^3$ and $m^3/h$ is default in display. All other units are displayed with a display label.

* Excitation frequency in battery operation (manually selected):

  – Basic, max. selectable excitation frequency of 1/15 Hz

  – Advanced, max. selectable excitation frequency of 6.25 Hz and sensor related

  – MAG 8000 default excitation frequency with 2 D-cell battery pack is selected for typically 6 years of operation for MAG 8000 Standard (7ME6810) and MAG 8000 CT (7ME6820).

| Size | Default excitation frequency |
|---|---|
| | MAG 8000 Standard (7ME6810)<br>MAG 8000 CT (7ME6820) |
| DN 25 to DN 15<br>(1" to 6") | 1/15 Hz |
| DN 200 to DN 600<br>(8" to 24") | 1/30 Hz |
| DN 700 to DN 1200<br>(28" to 48") | 1/60 Hz |

* Excitation frequency with mains power follows maximum sensor excitation frequency

* Filter constant as numbers of excitations

* Low flow cut-off: 15mm/s factory default value[1]

* Empty pipe detection (active symbol on display when active)

* Filter selection for mains power frequency (50/60 Hz)

* Correction factor for change of flow direction or to adjust flow measurement

[1] Siemens warrants the measurement accuracy down to a flow velocity of 15mm/s. For a flow velocity below 15mm/s, we don't warrant the measurement accuracy.

**Data logger** (Parameters 600 to 739)

* Logging of 26 records: selectable as daily, weekly or monthly logging

* Each logging includes:

  – Consumption on totalizer 1

  – Consumption on totalizer 2

  – Alarm in current period (13 alarms)

  – Meter status (8 values)

  – Alarm on high or low consumption for selected logging period

  – Totalizer 1 values for all 26 periods can be read on the display

**Alarm** (parameters 200 to 274)

- Active alarm is indicated on the display
- Monitoring of all alarms with statistic recording on each alarm
  - Total hours an alarm has been active
  - Numbers of time the alarm has been activated
  - First time an alarm appears
  - Last time the alarm disappears
- Fatal faults interrupt the measurement, if active
  - Signal insulation – Flow signal immunity is influenced (Advanced version only)
  - Coil current – Fault in driving magnetic sensor field
  - Amplifier – Fault in signal circuit
  - Check sum – Fault in calculation or handling of data
- Warning faults
  - Low Power – Alarm for customer-selectable battery level or power drop-out
  - Flow overflow – Flow in sensor exceeds Qmax (125 % Qn (Q3, Q4))
  - Pulse overflow on output A and B – Selected pulse volume is too small compared to actual flow rate and max. output pulse rate
  - Consumption – Saved data logger consumption exceeds customer selected limit on high or low consumption
  - Leakage – Leakage detected based on customer settings (Advanced version only)
  - Empty pipe – No water in the pipe/sensor
  - Low impedance – Measured electrode impedance below customer low impedance level
  - Flow limit – Actual flow exceeds selected high flow limited

**Meter status** (parameter 120)

Monitoring of important revenue parameters and data

- Changing totalizers 1 and 2
- Changing tariff totalizer
- Changing tariff settings
- Changing date and time
- Alarm has been active (see alarm log for details)
- Fault log has been reset
- Hardware key has been broken
- Meter has been repowered

**Data protection**

- All data stored in an EEPROM. Totalizers 1 and 2 are backed up every 10 min., statistic every hour and power consumption and temperature measurement every 4 hours.

- Password protection of all parameters and hardware protection of calibration and revenue parameters.

**Battery power management**

- Optimal battery information on remaining capacity.

- Calculated capacity includes all consuming elements and available battery capacity is adjusted related to change in ambient temperature.

**Diagnostic**

- Continuous self test including

  – Coil current to drive the magnetic field

  – Signal input circuit

  – Data calculation, handling and storing

- Features

  – Alarm statistics and logging for fault analyzing

  – Electrode impedance to check actual media contact

  – Flow simulation to check pulse and communication signal chain for correct scaling

  – Number of sensor measurements (excitations)

  – Transmitter temperature (battery capacity calculation)

  – Low impedance alarm for change in media

  – Flow alarm when defined high flow exceeds

  – Insulation test

  – Verification mode for fast measure performance check

- Advanced version includes

  – Leakage detection

  – Consumption profile

  – Flow statistic

**Insulation test**

Test of signal immunity against disturbances and poor installations. Test interval is selectable and measurement is interrupted during the test period of 4 min. The last flow value is used for totalization.

**Leakage detection** (Advanced version only)

Monitoring the lowest flow or volume during selected time window within 24 hours. Leakage is detected over a selectable period during which monitored values exceed the possible leakage level. Min. and max. values are stored with date registration. Last store value visible on the display.

**Consumption profile** (Advanced version only)

6 registers for monitoring total time the meter has operated in different flow intervals. Registered intervals are freely selectable as % of Qn (Q3).

**Tariff** (Advanced version only)

6 tariff registers count the volume delivered within the selected tariff windows, based on time of day, flow rates, or a combination.

Tariff can also be used for consumption profile where consumption is related to different time intervals or flow rates.

Tariff values visible on the display.

**Settling date** (Advanced version only)

At midnight (23:59:59) on a predefined date the totalizer 1 index value is stored. Old values are stored to show the latest two totalized 1 index values. Settling values are visible on the display.

**Statistic** (Advanced version only)

The statistic feature delivers water consumption information to inspect the consumption limits of the installation. The real values are first available after the period is finished. A reset function clears the values and new values are ready after next period. Until the new measured values are available, minimum values are set to maximum value and vice versa, the rest is set to zero.

- Min. flow rate with time and date registration
- Max. flow rate with time and date registration
- Min. daily consumption with date registration
- Max. daily consumption with date registration
- Latest 7 days' total and daily consumption
- Actual month's consumption
- Latest month's consumption

# Index