SIEMENS

Operating Manual
Edition 01/2007 - Revision 08

SITRANS F M

Electromagnetic water meter type MAG 8000

Technical Documentation (handbooks, instructions, manuals etc.) for the complete product range SITRANS F can be found on the internet/intranet via the following link:

English: http://www4.ad.siemens.de/WW/view/en/10806951/133300

Order no.: FDK:521H1193

SFIDK.PS.026.D8.02

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Contents

1. Introduction

For safety reasons it is important that the following points, especially those marked with a warning sign, are read and understood before the system is installed:

- Installation, connection, commissioning and service must be carried out by personnel who are qualified and authorized to do so.
- It is very important that all personnel working with the equipment have read and understand the instructions and directions provided in this manual and that they follow the instructions and directions before taking the equipment into use!
- Only personnel authorized and trained by the owner of the equipment may operate the equipment.
- Installation personnel must ensure that the measuring system is correctly connected in accordance with the connection diagram.
- For applications involving high working pressures or media that can be dangerous to people, surroundings, equipment or other in the event of pipe fracture, Siemens recommends taking precautions such as special placement, shielding or installation of a safety guard or safety valve prior to installation of the sensor.
- Repair and service may be performed by approved Siemens Flow Instruments personnel only.

1.1 User guidelines

MAG 8000 configuration is made via a PC with an IrDA interface and the configuration software program Flow Tool.
Parameters or data are in the following manual identified with an „FT“ in front of the number, where the information is stored.
The Flow Tool program can bee downloaded from the internet www.siemens.com/flow navigate to Tools & downloads or order on a CD rom - see accessories in section 9.1.

1.2 Manufacturer's design and safety statement

- Responsibility for the choice of lining and electrode materials as regards abrasion and corrosion resistance lies with the purchaser; the effect of any change in process medium during the operating of the meter should be taken into account. Incorrect selection of lining and/or electrode materials could lead to a failure of the meter.
- Stresses and loading caused by earthquakes, traffic, high winds and fire damage are **not** taken into account during meter design.
- Do **not** install the meter such that it acts as a focus for pipeline stresses. External loading is **not** taken into account during meter design.
- During operation do **not** exceed the pressure and/or temperature ratings indicated on the data label or in this **Operating Manual**.
- It is recommended that all installations include an appropriate safety valve and adequate means for draining/venting.
- Under the "Pressure Equipment Directive" (PED) this product is a pressure accessory and **not** approved for use as a safety accessory, as defined by the PED.
- Removal of the terminal box except by Siemens Flow Instruments A/S or their approved agents will invalidate the PED conformity of the product.
  In accordance with "Pressure Equipment Directive" (97/23/EC).

Battery operation:

- Pulse output and RS 232/RS 485 add-on modules must be connected to equipment complying with Low Voltage Directive (LVD) in order to be considered safe. The isolation within MAG 8000 pulse output is only a functional isolation.
- Lithium batteries are primary power sources with high energy content. They are designed to meet the highest possible safety standard. They may, however, present a potential hazard if they are abused electrically or mechanically. This is in most circumstances associated with the generation of excessive heat, where increased internal pressure may cause the cell to rupture.

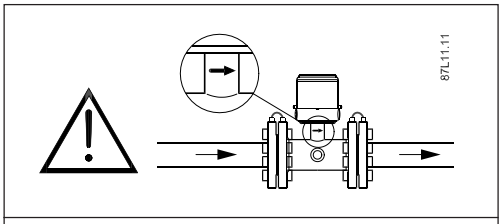
  Thus the following basic precautions should be observed when handling and using lithium batteries:
  - Do not short-circuit, recharge, overcharge or connect with false polarity.
  - Do not expose to temperature beyond the specified temperature range or incinerate the battery.
  - Do not crush, puncture or open cells or disassemble battery packs.
  - Do not weld or solder to the body of the battery.
  - Do not expose contents to water.
- Lithium batteries are regulated under United Nations Model Regulations on Transport of Dangerous goods, UN document ST/SGAC.10-1, 12th revised edition, 2001. UN no. 3091 class 9 covers lithium batteries packed with or inside the equipment. UN no. 3090 class 9 covers transportation of batteries on their own.

  Thus the following basic precautions should be followed when transporting lithium batteries:
  - Transport only in special packaging with special labels and transportation documents.
  - Exercise caution in handling, transportation and packaging in order to prevent short circuiting of the batteries.
  - The gross mass of the package is limited according to the type of transportation. In general, a gross mass below 5 kg is acceptable for all forms of transportation.
- Remove the battery from transmitter before returning the flowmeter to Siemens for service or warranty claim.

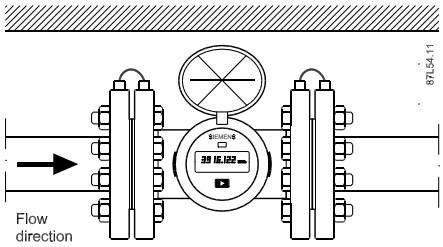
2. Installation

2.1 Mechanical installation

Flow direction

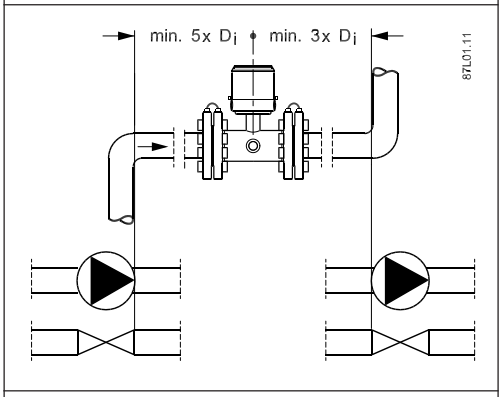


Please note sensor flow direction.



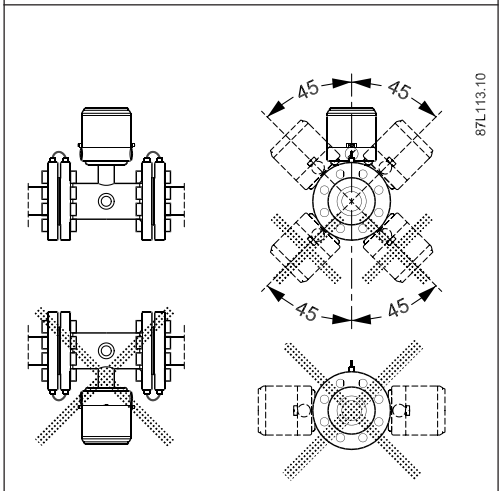
If the process flow direction is opposite of the sensor's flow direction label, forward flow rates can be restored via software parameter FT327, customer adjusting factor to "-1".

Inlet and outlet condition



To achieve most accurate flow measurement it is essential to have minimum straight lengths of the inlet and outlet pipes as shown.
(D_i: sensor diameter).

Horizontal pipes

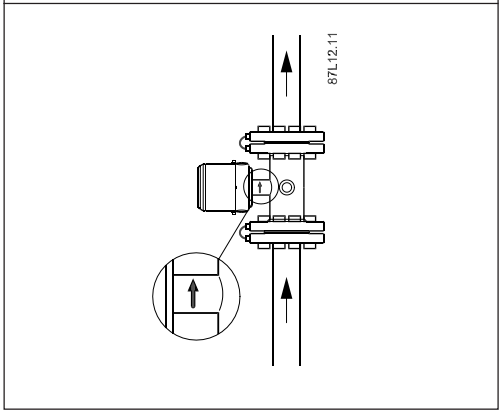


Installation in horizontal pipes.
The sensor must be mounted as shown in the upper figure. Do not mount the sensor as shown in the lower figure. This will position the electrodes at the top where there is possibility for air bubbles and at the bottom where there is possibility for mud, sludge, sand etc.

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

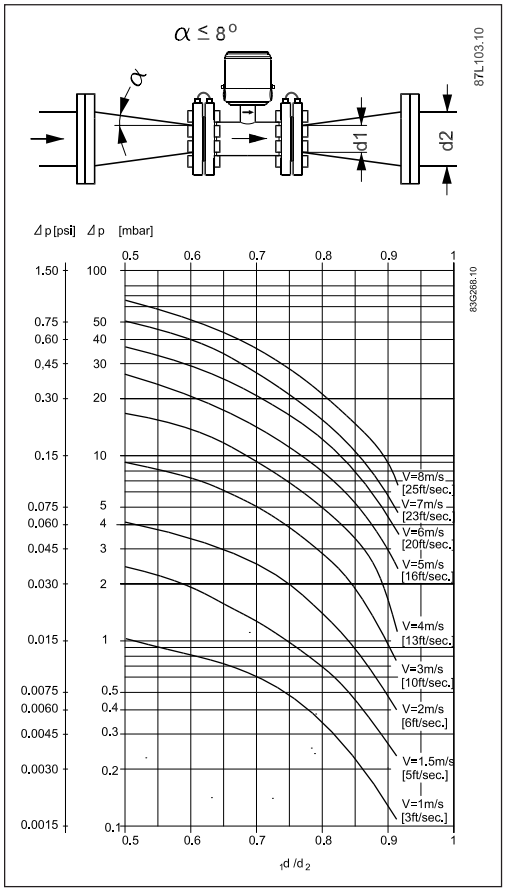
Note
Physical installation of the battery pack may influence the battery capacity. Optimal battery capacity is achieved with the battery pack in an upright position. The marked installation examples with the dotted cross will affect the battery capacity.

Vertical pipes



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

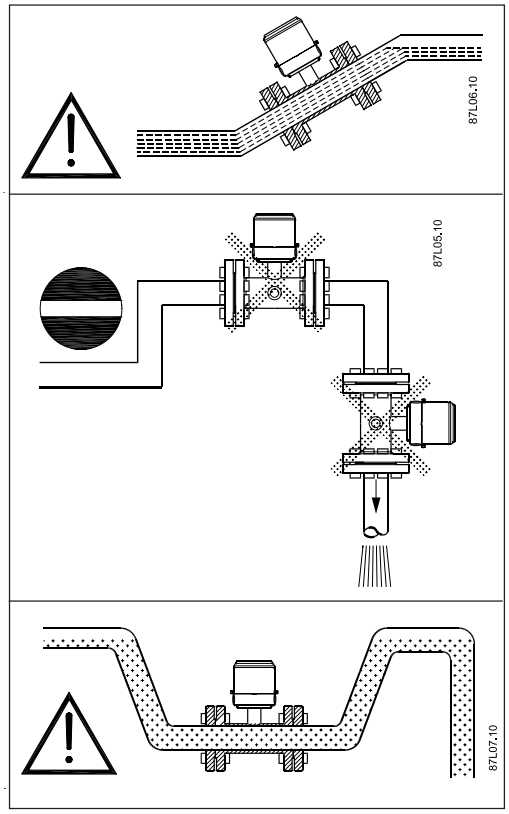
Installation in large pipes



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).

Installation instructions

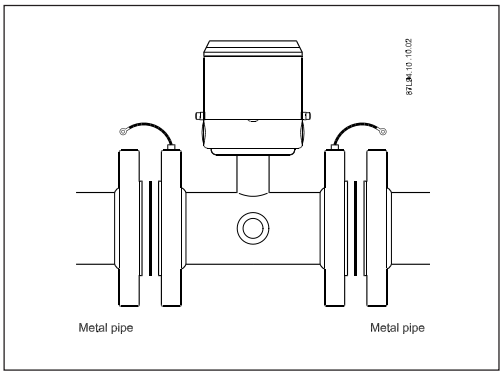


The sensor must always be completely full with liquid.

Therefore avoid:
- Air in the pipe
- Installation at the highest point in the pipe system
- Installation in vertical pipes with free outlet.

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

Installation instructions
(continued)

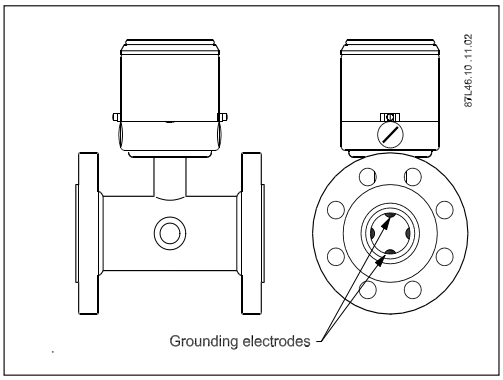


Gaskets are installed and connection flange must have a smooth surface and be in line with the sensor. Gaskets are recommended, but are not included with the flowmeter.

Advice for gasket selection:

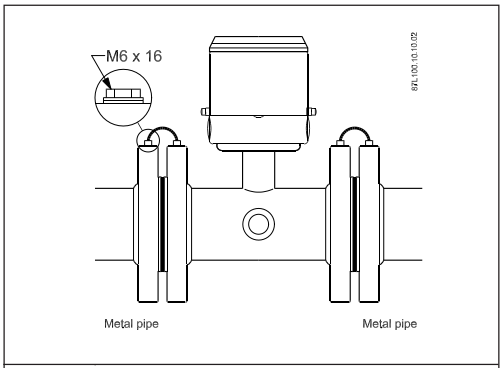
- Only use flat, rubber gaskets.
- Thickness 1...6 mm (0.0...0.02 ft) dependant on gap/tolerance.
- The inner diameter must not protrude into the bore of the flowmeter.
- The material should be compatible with the process fluid.
- The hardness should be maximum Durometer of 75 Shore A.

Potential equalization



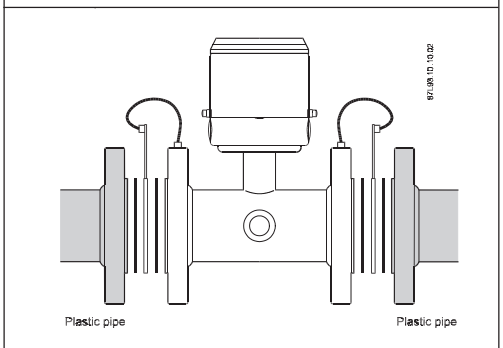
Liquid potential equalization or grounding is accomplished with the built-in grounding electrodes. The electrodes electrically bond the liquid to the meter to provide a stable and accurate measurement.

Bonding & grounding

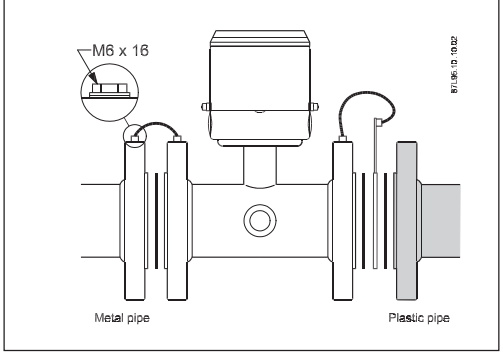


The sensor body must be grounded using grounding/bonding straps and/or grounding rings to protect the flow signal against stray electrical noise and/or lightning. This ensures that the noise is carried through the sensor body and a noise-free measuring area within the sensor body.

Metal pipelines
On metal pipelines, connect the straps to both flanges with 6 mm (1/4") screws. Bonding/ grounding straps are not included with the flowmeter.



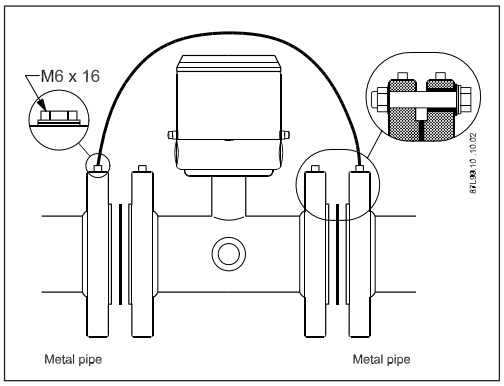
Plastic pipelines
On plastic pipelines and lined metal pipes, optional grounding rings must be used at both ends.
Grounding rings is not included in the delivery.



Combination of metal and plastic pipelines
A combination of metal and plastic requires straps for metal pipeline and grounding rings for plastic pipeline.
Bonding/grounding straps, grounding rings and straps are not included with the sensor.

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

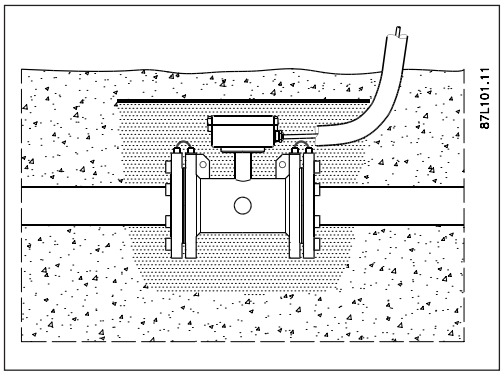
Cathodic protected piping



Special attention for meter installation in cathodic protected pipeline.

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

Suggestions for direct burial of remote sensor

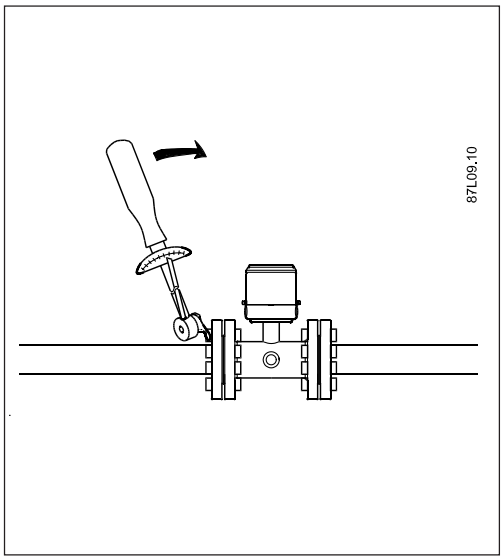


Remote sensor is protected to IP68/NEMA 6P and can be buried.

The use of pea gravel, at least 300 mm (12 inches) all around the sensor, is recommended. This provides some drainage and prevents dirt from solidifying on the sensor.
It also helps locate the sensor should excavation be necessary. Before covering the pea gravel with earth, we suggest using electrical cable identification tape above the gravel.

Remote sensor cable should be run through a plastic conduit of 50 mm (2 inches) minimum.

Maximum allowable torques



Standard bolts must be well lubricated and tightened evenly around the gasket. Leakage/ damage to the flowmeter or piping may arise if bolts are overtightened.

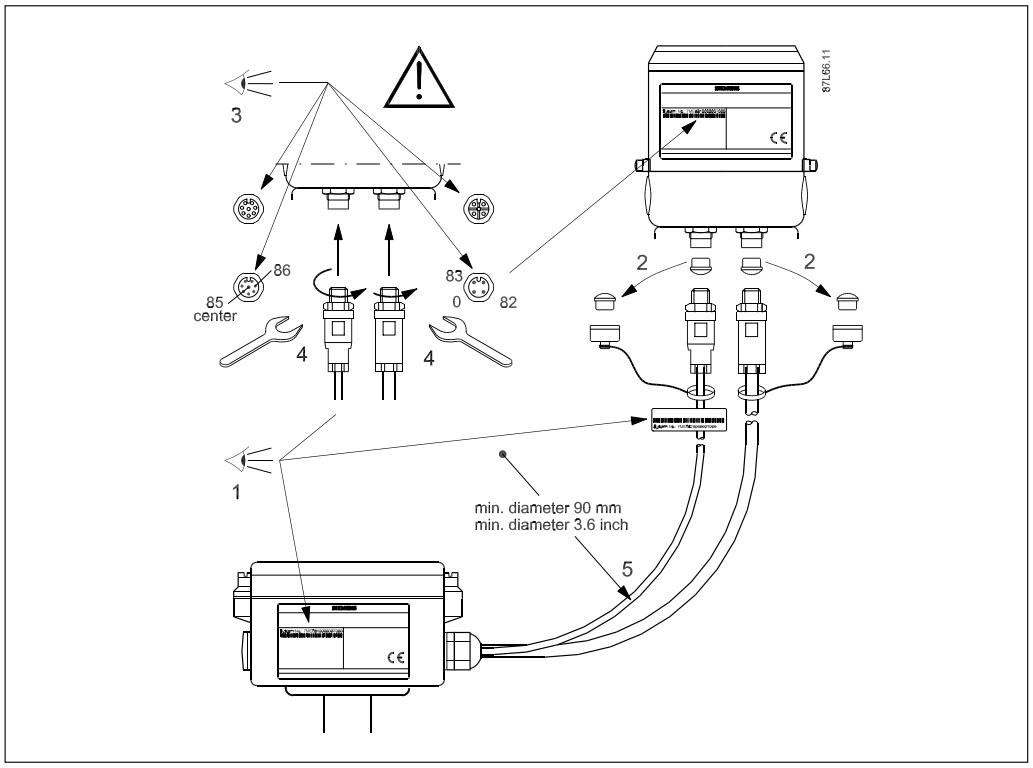
Torque calculations
All values are theoretical and are calculated making the following assumptions:

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

Maximum allowable torques
(continued)

Nominal size		PN 10		PN 16		PN 40		Class 150	
mm	inch	Nm	f/lbs	Nm	f/lbs	Nm	f/lbs	Nm	f/lbs
25	1"	N/A	N/A	N/A	N/A	10	7	7	5
40	1½"	N/A	N/A	N/A	N/A	16	12	9	7
50	2"	N/A	N/A	25	18	N/A	N/A	25	18
65	2½"	N/A	N/A	25	18	N/A	N/A	25	18
80	3"	N/A	N/A	25	18	N/A	N/A	34	25
100	4"	N/A	N/A	25	18	N/A	N/A	26	19
125	5"	N/A	N/A	29	21	N/A	N/A	42	31
150	6"	N/A	N/A	50	37	N/A	N/A	57	42
200	8"	50	37	50	37	N/A	N/A	88	65
250	10"	50	37	82	61	N/A	N/A	99	73
300	12"	57	42	111	82	N/A	N/A	132	97
350	14"	60	44	120	89	N/A	N/A	225	166
400	16"	88	65	170	125	N/A	N/A	210	155
450	18"	92	68	170	125	N/A	N/A	220	162
500	20"	103	76	230	170	N/A	N/A	200	148
600	24"	161	119	350	258	N/A	N/A	280	207

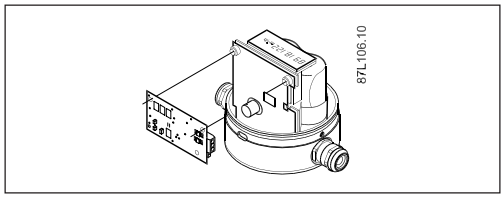
Remote installation



Verify that the model and serial numbers shown on the labels of the sensor and transmitter are matched properly (1). Make sure that the cable is safety installed to avoid damaging of cable and connectors. Please note the different connector types for the coil and electrodes, both having a minimum diameter of 90 mm (3.6 inches). Save the dust covers for future use and protection (2). Make sure the connectors are clean and fastened securely to achieve a good connection and watertight seal (3 & 4).

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

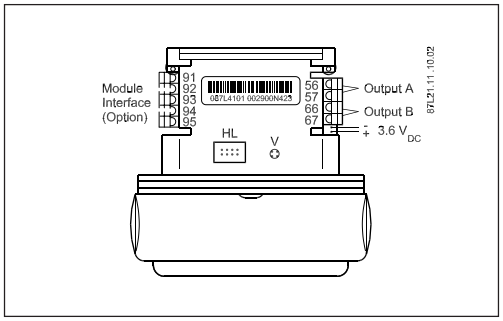
Installation of add-on module



The module must be mounted on the backside of the MAG 8000 electronic.
Use the two 3 mm screws and washers to fix the module to the MAG 8000 electronic, with maximum torque 0.5 Nm.

3.1 Electrical installation

Connection diagram

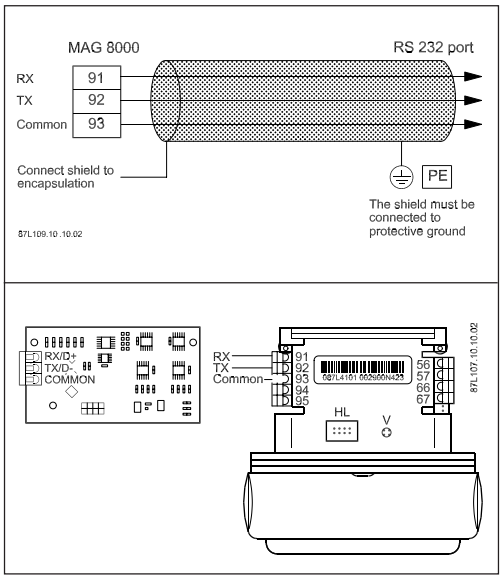


3.6 V DC battery connector - male and pulse connection terminals are placed in the right side of the PCB board - see figure.
Connection for add-on interface modules is placed on the left side.

HL = Hardware lock key connection
V = Push bottom for verification mode

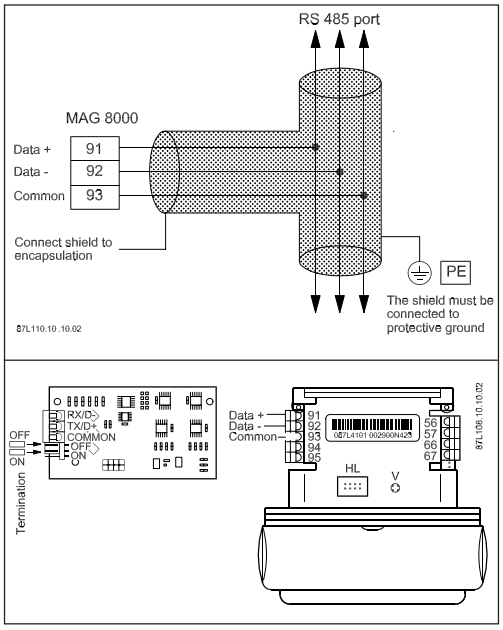
To configure the outputs please see output configuration in Flow Tool (PC-software) ID 400 to 425.

RS 232 connection diagram



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, the shell of the connector is connected to the shield of the cable.

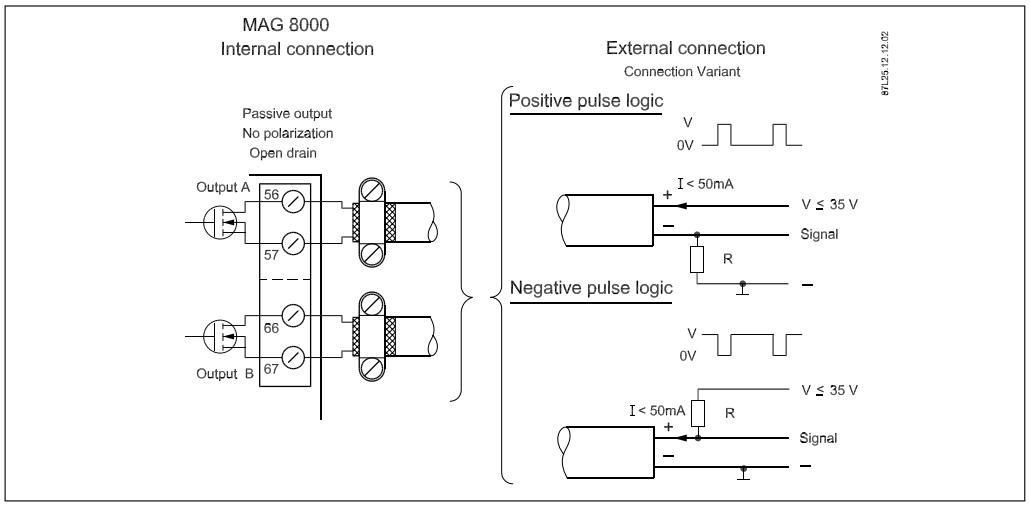
RS 485 connection diagram



A RS 485 - MODBUS must use a balanced pair (for D+ - D–) and a third wire (for the common). For the balanced pair used in a RS 485-system, a characteristic impedance with a value between 100 and 120 ohms must be used.
The shield must always be connected to the MAG 8000 encapsulation using the cable clamp as shown in the figure under cable installation.

Bus termination:
All RS 485 based networks must be terminated correctly to function properly. A termination must be placed at each end of the segment.
The MODBUS RTU module can add a 120 ohm termination by placing the jumper beside the terminals in position "ON".
The termination is set to "ON" from the factory.

Pulse output connection diagram

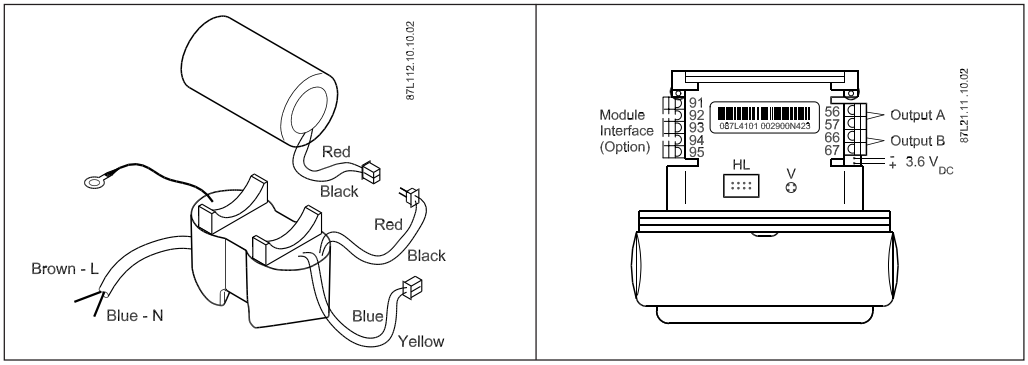


The pulse output can be configured as volume, alarm or call-up, see section 4 “Commissioning”. Pulse output is not polarized and can be connected for positive or negative logic.

R = pull up/down resistor is selected in relation to the V power supply and with at max. current I of 50 mA.

Pulse output must be connected to equipment complying with Low Voltage Directive in order to be considered safe. The isolation within MAG 8000 pulse output is only a functional isolation.

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



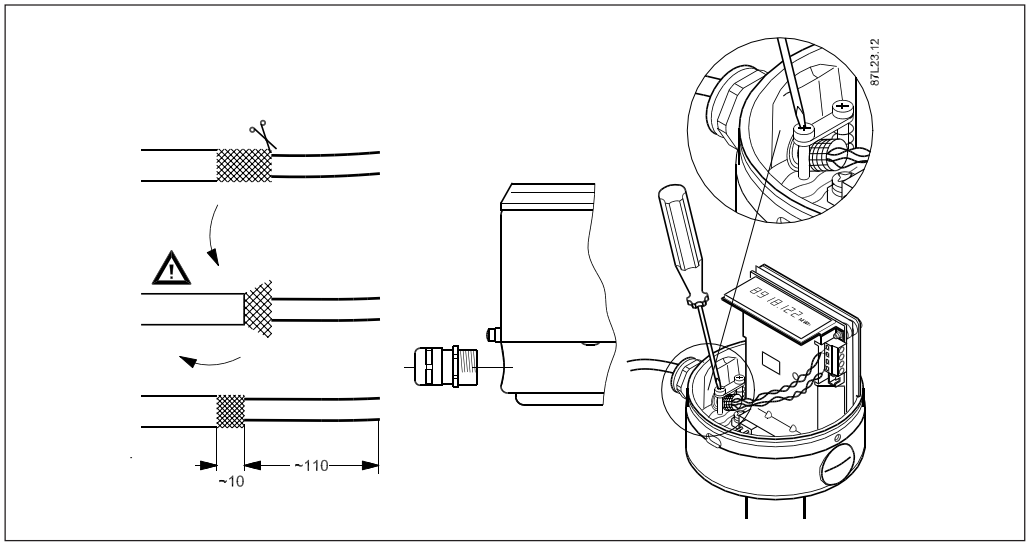
Connection diagram for 115/230 V AC (mains) power supply

Mains power input:	Factory mounted PUR cable with 2 x 1 mm^2 (brown wire, blue wire) cable length = 3 m
Mains power input:	Brown wire - L (line, hot) and blue wire - N (neutral, cold)
Mains power output:	Battery connector - female with blue wire and yellow wire, blue wire is ground. The battery connector - female has to be connected to the male connector 3.6 V DC on the PCB board
Battery backup input:	Battery connector - male with black wire and red wire, black wire is ground. The battery connector - male has to be connected to the female connector on the backup battery
Functional ground:	Black wire with terminal must be connected to MAG 8000 encapsulation with a screw
Mains power supply has to be connected to a switch, near the flowmeter, according to IEC 61010-1 clause 5.4.3.d	

Connection diagram for 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
Line power input:	Brown wire - L (line, hot, positive) and blue wire (neutral, cold, negative)
Line power output:	Battery connector - female with blue wire and yellow wire, blue wire is ground. The battery connector - female has to be connected to the male connector 3.6 V DC on the PCB board
Battery backup input:	Battery connector - male with black wire and red wire, black wire is ground. The battery connector - male has to be connected to the female connector on the backup battery
Functional ground:	Black wire with terminal must be connected to MAG 8000 encapsulation with a screw

Cable installation

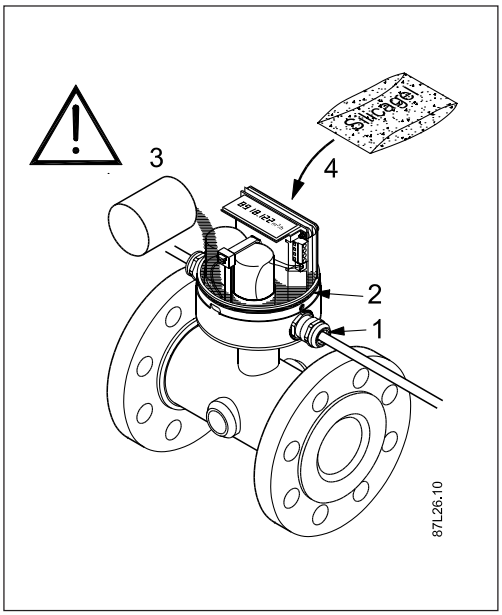


Choose the correct glands for the selected cable type, see section 9.1 „Accessories“ for glands selection. Make sure the shield is mounted under the cable clamps - do **not** make pig tails.

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

3.2 IP enclosure rating

IP68 - IP67 enclosure rating



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

To ensure the IP68/NEMA 6P enclosure rating, follow these steps:

1. Select the proper gland size to fit the installed cable size.
2. O-ring is properly and correctly mounted and greased with gel.
3. Sylgard potting kit is filled in the bottom part of the casing.
4. If nessesary renew the Silicagel bag to prevent condensation within the meter.

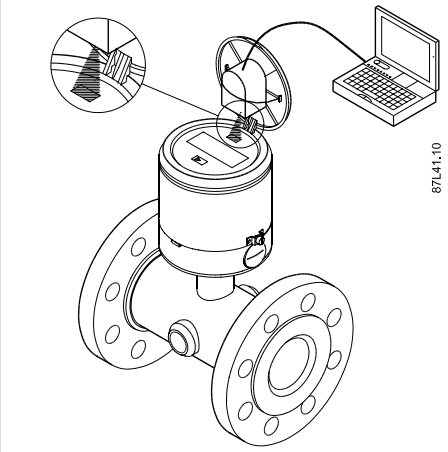
Note
Make sure **not** to fill Sylgard potting kit in the space for the battery pack.

4. Commissioning

The following guidelines are based on an installed **PC Flow Tool** program, and the IrDA communication adaptor (see section 9.1 „Accessories“). Read Flow Tool FAQ and Release Note installed with the Flow Tool software.

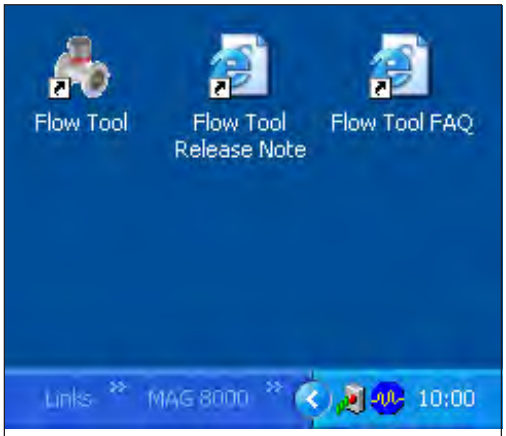
Visit www.siemens.com/flow, navigate to **Tools & Downloads** for newest update and support.

Connecting the PC to the meter



MAG 8000 has a build-in IrDA communication interface on top of the meter.
The IrDA adaptor can be fixed by a rubber band in the lid.

Start Flow Tool software program



Select the Flow Tool icon on the windows desktop.

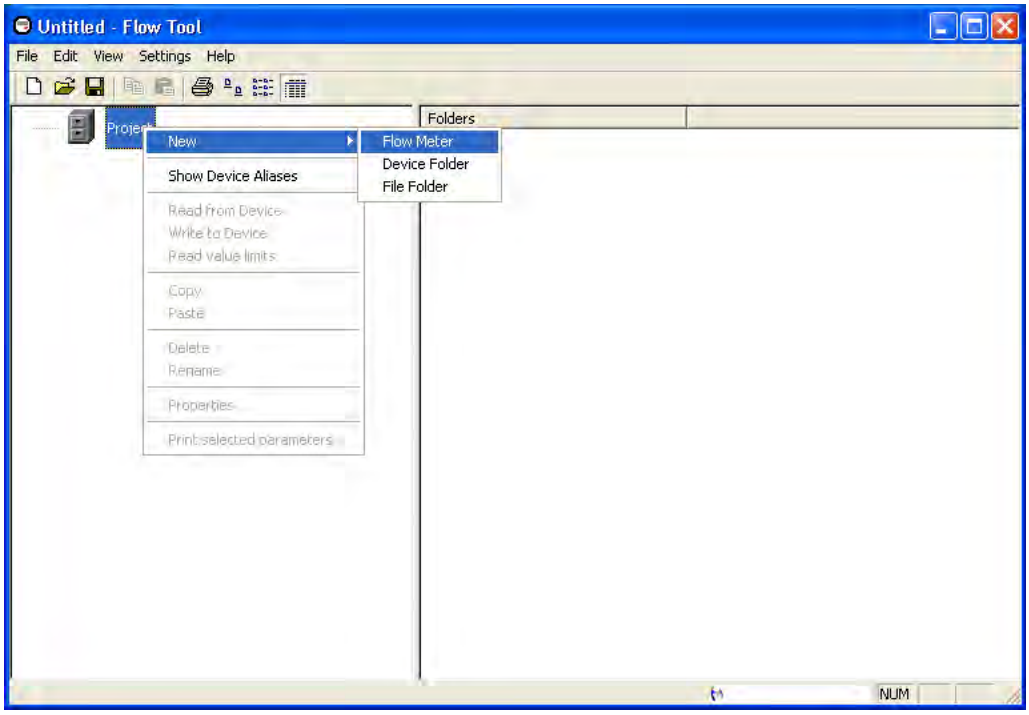
Note

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

Monitor or configure meter data

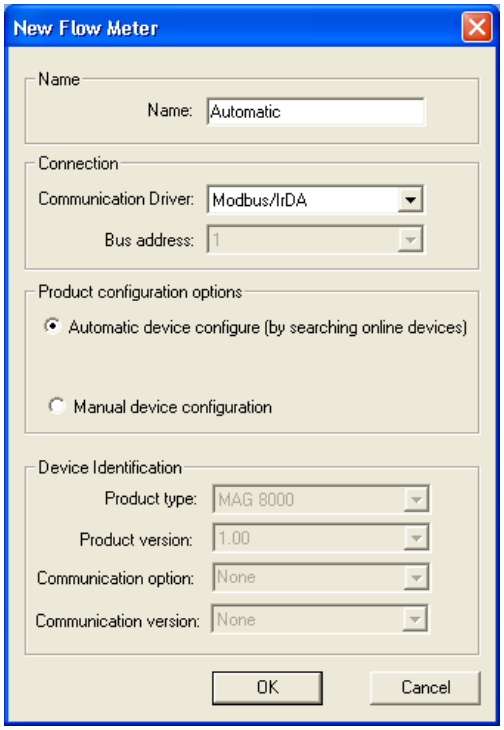
Before communication

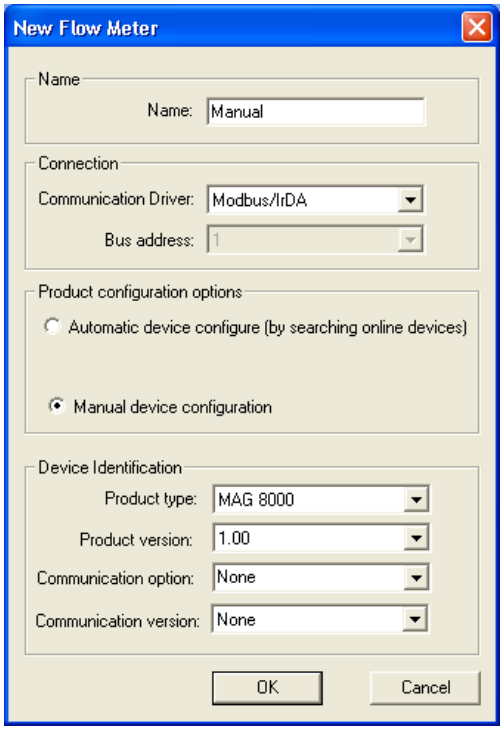
After the program has been started, a meter is selected by using the right mouse button on the project icon.
After giving the meter a name, a selection of “Manual” or “Automatic” configuration mode is selected. “Automatic” is chosen for direct connection to the meter. “Manual” is used when creating a configuration without any connection to a meter, and where the configuration is downloaded later to the meter.



Device driver

The Device Drivers are related to the meter version and is automatic selected in “Automatic” mode. In “Manual” mode, the meter version is manually selected and the version check is automatically made when data is uploaded or downloaded.
New device drivers are included in the latest Flow Tool program available at www.siemens.com/flow under Electromagnetic Flowmeter - Tools & Downloads - SITRANS F M MAG 8000.



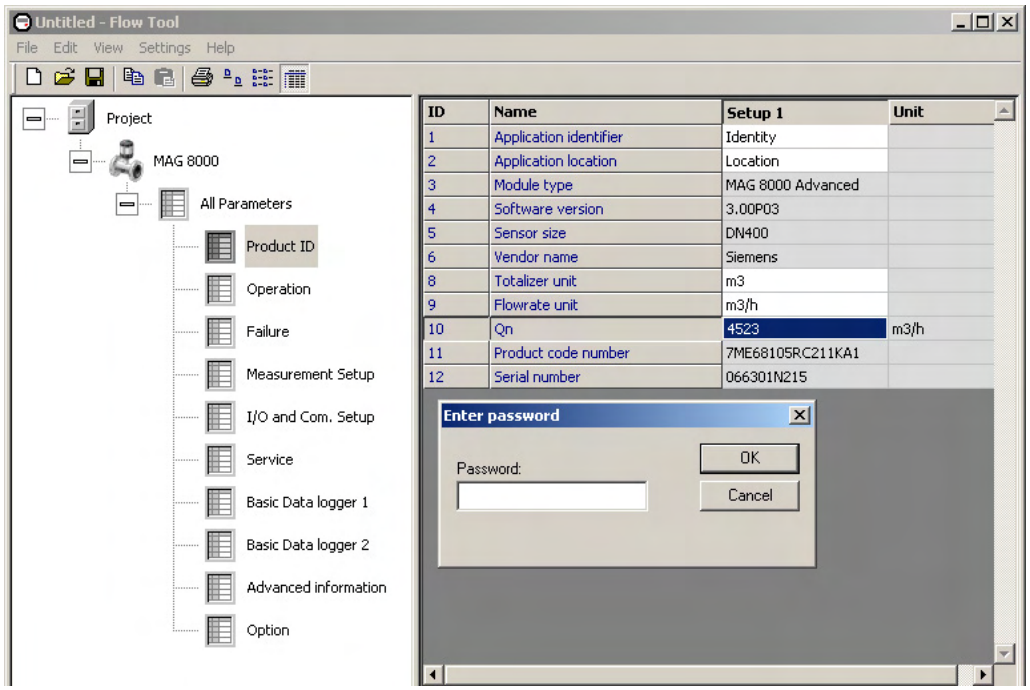


Data backup

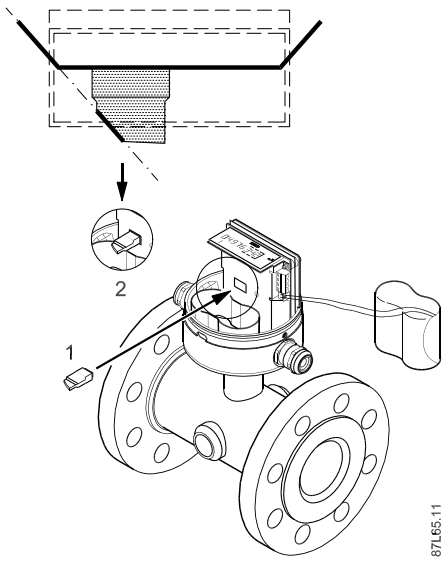
Meter information is stored in a internal data prom, that secure data when the power disappear. Information like the totalizer 1 and 2, date and time, and the statistic data in the Advanced version is stored each 10 minutes. Every 4 hours is the battery consumption calculated and remain battery capacity is updated together with „operation time since first power up“ and „battery operation time“.

Data protection by password

The meter information is software protected by a password. The default factory password is “1000” and can be changed after gaining access to the meter. If the password is lost, it can be reset with a new password using the hardware key.



Data protection by hardware key



A hardware key is installed in the HL hole to change protected parameters. The HL hole is located in the front of the PCB board behind the battery. (FT = Flow Tool parameter number)

Protected parameters are:
New Password
FT5 - Sensor tube diameter
FT7 - Meter No.
FT8 - Totalizer unit
FT9 - Flow unit
FT10 - Q_n (Q_3)
FT300 - Totalizer unit factor
FT301 - Flow unit factor
FT302 - Pipe size
FT321 - Calibration date
FT323 - Calibration factor
FT325 - Sensor offset
FT332 - Max. sensor excitation frequency
Additional protected CT parameters:
FT101 - Totalizer 1
FT102 - Totalizer 2
FT303 - Operation excitation frequency
FT305 - Decimal point place
FT310 - Flow direction totalizer 1
FT312 - Flow direction totalizer 2
FT327 - Adjustment factor
FT328 - Low flow cut off
FT332 - Empty pipe impedance
FT550 - Coil current active
FT551 - Fix flow mode active

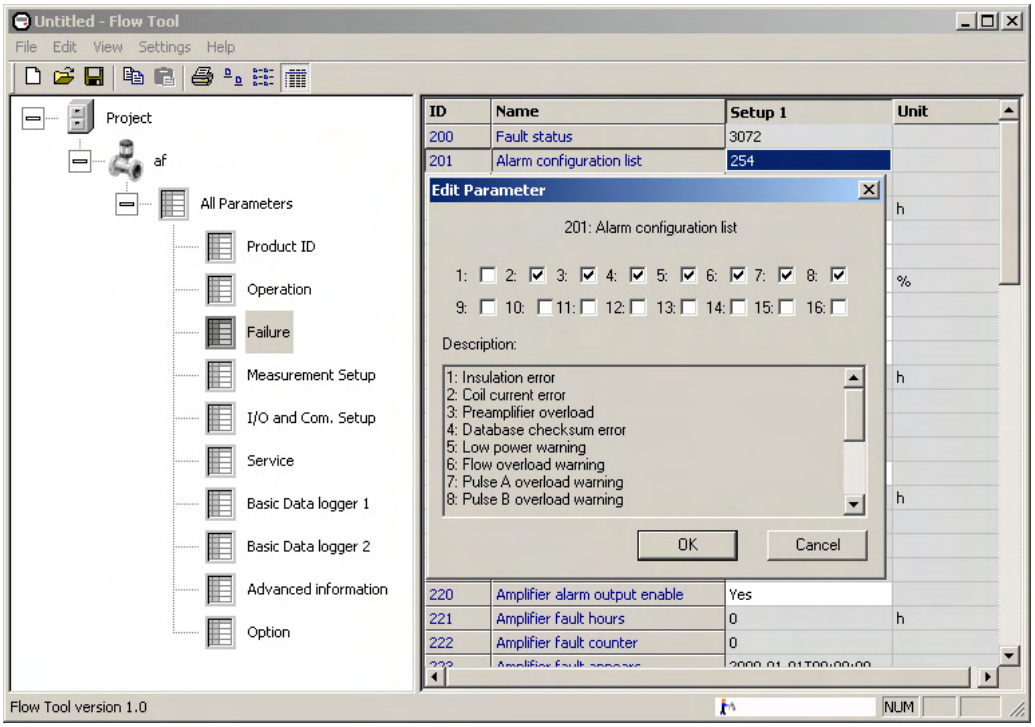
Read - write, print or export the meter data

Select the parameter or group which is to be read, written, printed, or exported to a CSV file by selecting via the right mouse button in left or right window.

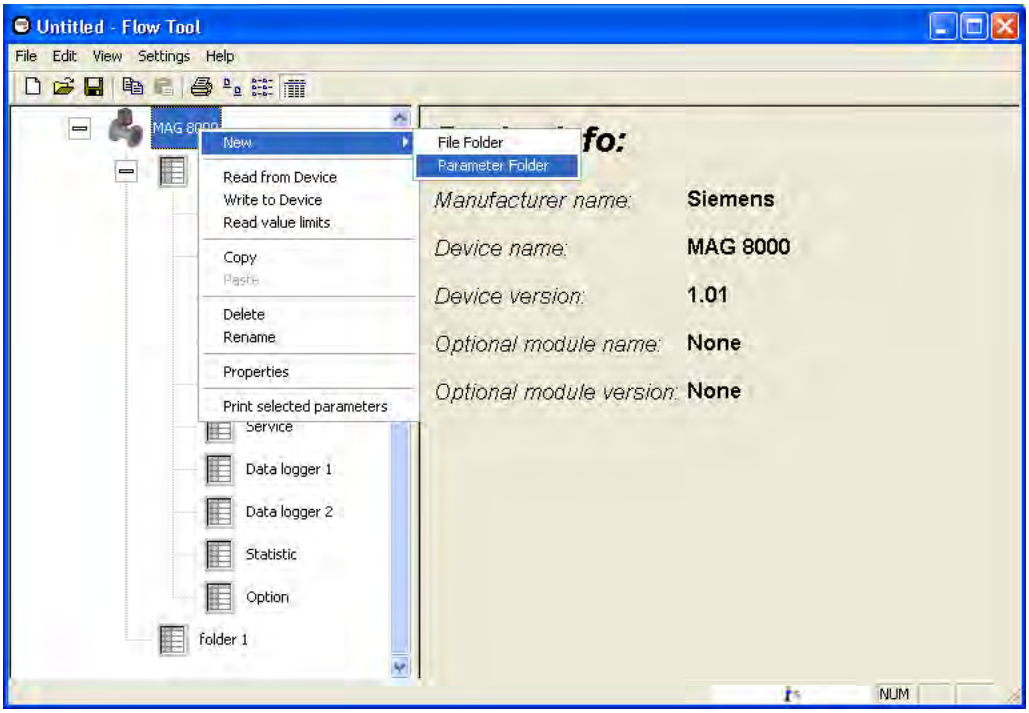
Only data with white background can be changed. Red text indicates off-line data. Black text shows data identical with meter data.

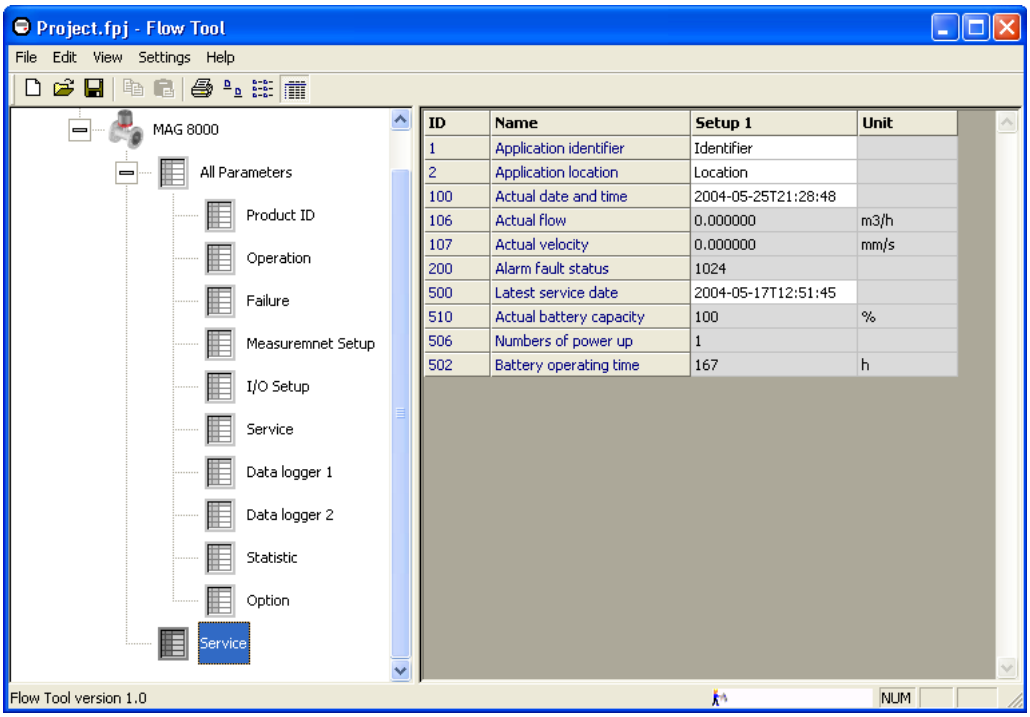
Each parameter has a prompt advising the purpose of the parameter and the setting limitations. Select a parameter, by clicking in the white cell in the right window of the **Flow Tool**.

Depending on the parameter selected, a form or dialog box will open to allow selections or data entry. The figure shows the alarm status, where marked alarms are enabled.



Customer selected parameter list





The default parameter list is divided into functional groups with maximum 99 parameters included.

Your own parameter list can be configured by generating a new parameter list and copying an existing parameter to the new list. The parameters are updated and handled as the existing ones and listed in the same order that they are copied to the parameter list.

There is no limitation on the number of customer-specified parameter lists. By saving the project, the parameter list configuration will be available for use in the future.
Save the file with only the customer parameter list explored so future monitoring and changes of parameters will be easier.

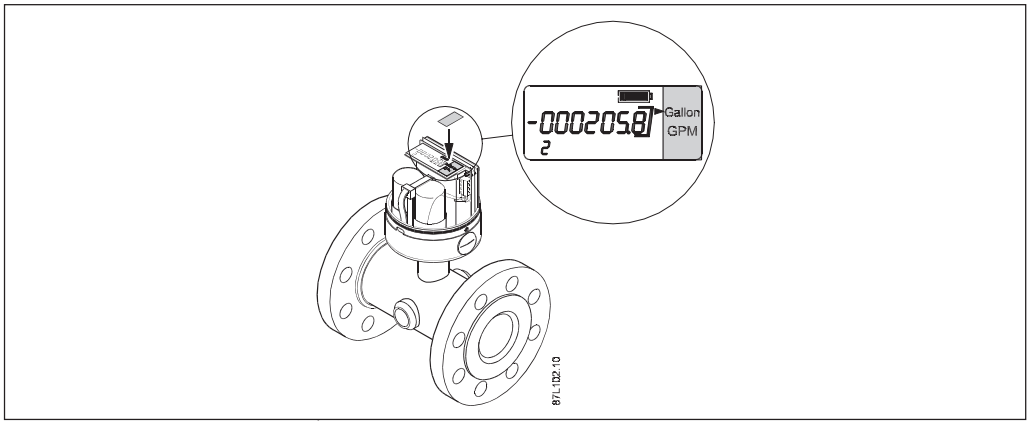
4.1 Unit selection

MAG 8000 have totalizer and flow rate units set as ordered via the MLFB structure. The standard format for each region is:

- Europe - m^3 as totalizer and m^3/h as flow rate
- US - Gallon as totalizer and GPM as flow rate (Gallon per minute)
- Australian - Ml as totalizer and Ml/d as flow rate (Mega Liters)

Additional pre-defined units or combinations can be implemented at the factory by using the -Z option in the MLFB ordering structure:

- Volume = m^3, m^3 × 100, l × 100, Gallon, G × 100, G × 1000, MG, CF × 100, CF × 1000, AF, AI, kl, Ml
- 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



All units of measure are printed on a label and affixed to the display (except the European version) and some meter sizes have a factor included to secure the 8 digit display value will not overrun after short time of operation. A sticker and manual configuration of units also allows selection of new units.

Changing units via PC software program Flow Tool:

- Select service mode and meter version – upload data from the meter
- Open the transmitter, remove the battery (still connected) and attached the hardware lock to the PCB board
- Change units description in parameter FT8 and FT9
- Change units factor in parameter FT300 and FT301
- Change the maximum flow rate Qn (Q3) to the new unit selection FT10
- Select unit display FT306
- Download each parameter to the meter, remove the hardware key and re-assemble the meter.

The **service mode** opens many parameters which, if changed, can seriously affect the meter accuracy and operation. Care must be exercised when writing new parameter values, as the meter has no default setting to return to.

4.1.1 Unit conversion table

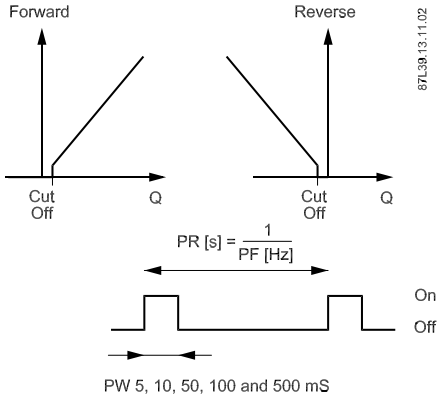
Totalizer / Volume unit (FT8)	Correction factor parameter FT300
Default	1 m^3
m^3*100	0.01
Gallon (US)	264.1721
G*100 (100*Gallon)	2.641721
G*1000 (1000*Gallon)	0.2641721
MG (1000000*Gallon)	0.0002641721
AI (Acre Inches)	0.009728558
AF (Acre ft)	0.0008107132
CF*100 (100*ft^3)	0.3531467
CF*1000 (1000*ft^3)	0.03531467
l*100 (Liter)	10
kl (1000*Liter)	1
Ml (Mega Liter)	0.001

Flow rate unit (FT9)	Correction factor parameter FT301
Default	1 m^3/s
m^3/min (m^3/minute)	60
m^3/h (m^3/hour)	3600
m^3/d (m^3/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 (ft^3/second)	35.31467
CFM (ft^3/minute)	2118.882
CFH (ft^3/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

4.2 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. Other output function and pulse settings may be ordered by selecting the -Z option in the MLFB ordering structure.

Output A and B as pulse volume



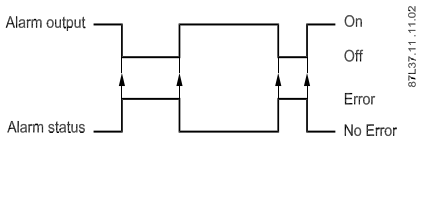
PR = pulse rate, PF = pulse frequency and PW = pulse width

When outputs A or B are configured as volume per pulse, the output delivers a pulse when the preset volume has passed the sensor in the selected direction, and is calculated based on Forward/Reverse or Net Forward/Reverse flow.

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.

If volume per pulse is set too low the limitation of the pulse output rate could cause a pulse overrun alarm.

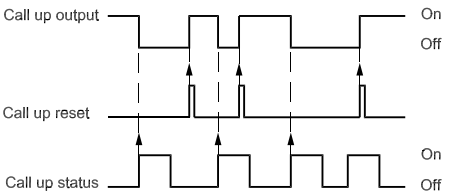
Output B as alarm output



When output B is configured as an „alarm“ output, it will follow the internal alarms that were previously chosen in the Alarm Configuration List.

Note - the alarm output is inverted to a pulse output providing an alarm should power disappear or the cable connection becomes interrupted.

Output B as call-up output



When output B is configured as “call-up”, the output is activated by an alarm condition and remains on until it is reset via the 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 the alarm output, the call-up output inverts to a pulse output providing a call-up should power disappear or the cable connection becomes interrupted.

Factory regional settings

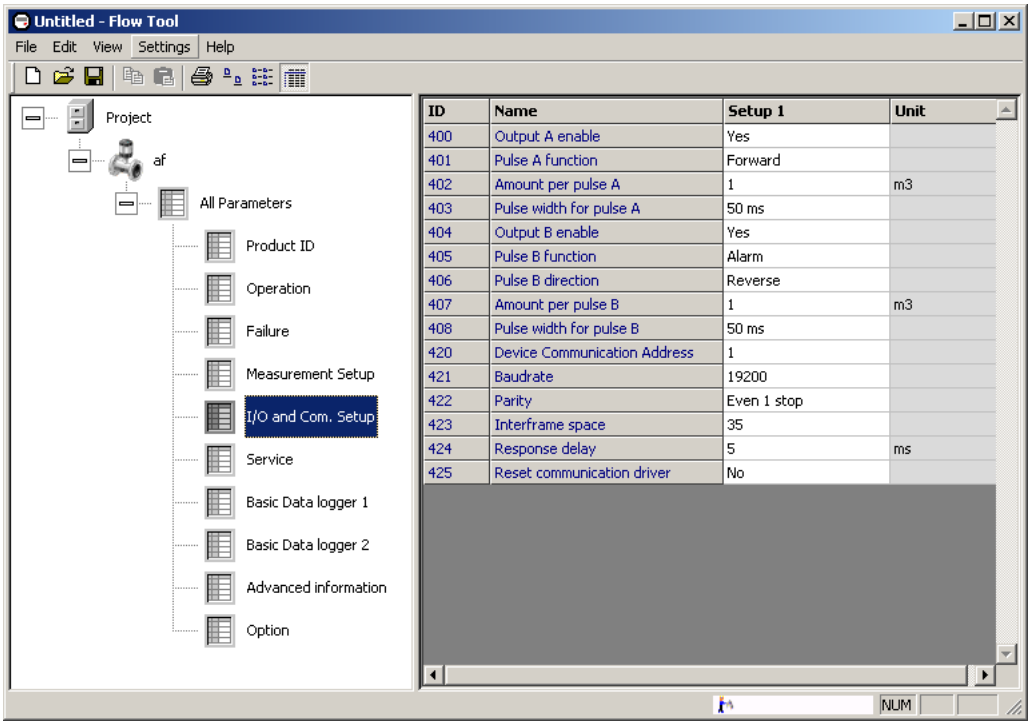
DN mm	size (inch)	Pulse width ms	Europe m^3	USA Gallons	Australian Ml
25	(1")	50	0.01	1	0.001
40	(½")	50	0.01	1	0.001
50	(2")	50	0.01	1	0.001
65	(2½")	50	0.1	10	0.001
80	(3")	50	0.1	10	0.001
100	(4")	50	0.1	10	0.001
125	(5")	50	0.1	10	0.001
150	(6")	50	0.1	10	0.001
200	(8")	50	1	100	0.01
250	(10")	50	1	100	0.01
300	(12")	50	1	100	0.01
350	(14")	50	1	100	0.01
400	(16")	50	1	100	0.01
450	(18")	50	1	100	0.01
500	(20")	50	1	100	0.01
600	(24")	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.

Output configuration in Flow Tool (PC software)

The **Flow Tool** window shows the parameters for output configuration. Each parameter has its own guideline in selecting the correct parameter setting.



Pulse output, volume selection

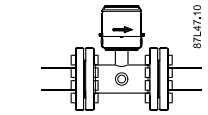
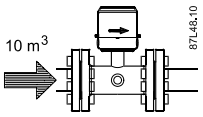
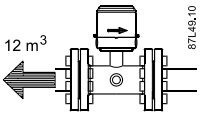
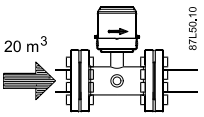
DN (Inches)	Max. flow rate Qn (Q3) m^3	Guidelines for min. volume per pulse at Q_n Volume [m^3] = Q_n [m^3/s] * (2*PW [s])						
		5 ms PW m^3 [50Hz]	10 ms PW m^3 [50Hz]	50 ms PW m^3 [10Hz]	50 ms PW gallon [10Hz]	50 ms PW Ml [10Hz]	100 ms PW m^3 [5Hz]	500 ms PW m^3 [1Hz]
25 (1")	17.67	0.00005	0.0001	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
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

PW = pulse width

Note
Display volume for 5 ms pulse width is based on a basic version with maximum 50 Hz pulse output rate.
For the advanced version, with maximum 100 Hz pulse rate, the pulse volume values can be reduced to half.
The calculated numbers of pulses are an average of the measuring period.

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)	Pulse output forward Uni-directional mode Volume [m^3]		Pulse output net forward Bi-directional mode Volume [m^3]	
	Volume [m^3]	*Internal calculation*	*Delivered volume*	*Internal calculation*	*Delivered volume*
	0	-	0	0	0
	10	-	10	0	10
	–2	-	0	–12	0
	18	-	20	–12+20=	8
Total accounted volume [m^3] **F**orward/**R**everse	18F		30F		18F

4.3 Parameter list

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 www.siemens.com/flow. Navigate to Tools & Downloads under MAG 8000.
Visible display information is indicated in the table by menu and index number. Remember to enable displayed menus FT130.
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.

FT ID number	Meter version	Display view	Parameter/data type	Factory settings	Data range
				Fix parameter or meter data that **not** are **changeable**	
1	All	M1	Application identifier	Indetity	Max. 14 characters. Only numbers are visible on the display
2	All	-	Application location	Location	Max. 14 characters
3	All	M3	Module type	MLFB depended	Basic or Advanced
4	All	M4	Software version		x.xxPxx (x.xxPx.x)
5	All	-	Sensor size	Sensor related	DN 25..600(1"..24")
6	All	-	Vendor name	Siemens	Siemens
8	All	-	Totalizer unit	MLFB depended	Max. 10 characters
9	All	-	Flowrate unit	MLFB depended	Max. 10 characters
10	All	-	Qn (Q3)	Sensor related	0 to 1*10^9
11	All	-	Product code number	7ME6810XXXXXXXXX	
12	All	-	Serial number	XXXXXXNXXX	
100	All	M2	Actual date and time	PI3 production date and time	year-month-day T hours:minutes:seconds
101	All	O1	Totalizer 1	0	0 to +-2*10^9
102	All	O2	Totalizer 2	0	0 to +-2*10^9
103	All	O5	Customer totalizer 3	0	0 to +-2*10^9
104	All	O5	Reset customer totalizer 3	No	Yes/no

FT/PDM number	Meter version	Display view	Parameter/data type	Factory settings	Data range
				Fix parameter or meter data that **not** are **changeable**	
104	All	O5	Reset customer totalizer 3	No	Yes/no
105	All	-	Customer totalizer 3 reset date	PI3 production date and time	year-month-day T hours:minutes:seconds
106	All	-	Flow rate		0 - 1.25 Qn
107	All	-	Actual velocity		0 - 12500
108	All	-	Flowrate percent value		0-125% (Qn)
120	All	-	Actual flow meter status	0	0 to 255, binary presented with information 1 for bit 0 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 have been active, 6: Fault log has been reset, 7: Hardware key has been activated, 8: Meter has been power Up
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
131	All	-	Default operator menu index	Totalizer 1	Totalizer 1, Totalizer 2, Actual Flow rate, Fault codes, Customer Totalizer
200	All	O4	Fault status	0	0 to 8191, binary presented with information 1 for bit 0 1: Insulation error, 2: Coil current error, 3: Preamplifier overload, 4: Database checksum error, 5: Low power warning, 6: Flow overload warning, 7: Pulse A overload warning, 8: Pulse B overload warning, 9: Consumption interval warning, 10/L: Leakage warning, 11/E: Empty pipe warning, 12/C: Low impedance (high conductivity) warning, 13/d: Flow limit warning
201	All	-	Alarm configuration list	254= Alarm 2 to 8 enabled	0 to 8191, See 200
202	All	-	Date of fault log reset	PI3 production date and time	year-month-day T hours:minutes:seconds
203	All	O4	Non optimal measure time	0	
204	All	-	Reset the fault log and faults	2000-01-01 T 00:00:00	
205	All	-	Call up acknowledge	No	Yes/no
206	All	-	Battery alarm level	10%	0-100%
208	All	-	Reset leakage fault	No	Yes / No
209	All	-	Reset consumption log fault	No	Yes / No
210	All	-	**Insulation alarm output enable**	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 enable**	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 enable**	Yes	Yes / No
221	All	-	Amplifier fault hours	0	
222	All	-	Amplifier fault counter	0	

FT/PDM number	Meter version	Display view	Parameter/data type	Factory settings	Data range
				Fix parameter or meter data that **not** are **changeable**	
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 enable**	Yes	Yes / No
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	-	**Pulse B overload alarm output enable**	Yes	Yes / No
246	All	-	Pulse B overload fault hours	0	
247	All	-	Pulse B overload fault counter	0	
248	All	-	Pulse B overload fault appears	2000-01-01 T 00:00:00	
249	All	-	Pulse B overload fault disappears	2000-01-01 T 00:00:00	
250	All	-	**Consumption alarm output enable**	No	Yes / No
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 enable**	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 enable**	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 output enable**	No	Yes / No
266	All	-	Low impedance fault timer	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 disappears	2000-01-01 T 00:00:00	
270	All	-	**High flow alarm output enable**	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 disappears	2000-01-01 T 00:00:00	
300	All	-	Totalizer volume unit factor	MLFB depended	0-1*10^10
301	All	-	Flow unit factor	MLFB depended	0-1*10^10
302	All	-	Pipe size	Sensor related	25 to 1200
303	All	-	Meter excitation frequency (in battery power mode)	1/15Hz	1/15Hz, 1/5Hz, 1.5625Hz, 3.125Hz, 6.25Hz, 1/30Hz, 1/60Hz
304	All	-	Mains frequency	MLFB depended	50 or 60 mains Hz
305	All	-	Decimal point	Automatic point adjustment	No point, One digit after point, Two digits after point, Three digits after point, Automatic point adjust
306	All	-	Displayed unit	MLFB depended	MLFB depended
310	All	-	Flow direction totalizer 1	Forward	forward, reverse or bi-directional net flow
311	All	-	Totalizer 1 changes date	PI3 production date and time	

FT/PDM number	Meter version	Display view	Parameter/data type	Factory settings	Data range
				Fix parameter or meter data that **not** are **changeable**	
312	All	-	Flow direction totalizer 2	Reverse	forward, reverse or bi-directional net flow
313	All	-	Totalizer 2 changes date	PI3 production date and time	
320	All	-	Verification mode enable	No	Yes / No
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	0.05%	0 to 9.9%
329	All	-	Filter time constant	5 Tau	1 to 1000
331	All	-	Excitation frequency limit	6.25Hz for advanced version and 1/15Hz for basic version	1/15Hz, 1/5Hz, 1.5625Hz, 3.125Hz, 6.25Hz, 1/30Hz, 1/60Hz
332	All	-	Excitation frequency sensor limit	Sensor related	6.25 Hz (DN25...DN200 (1"...8")) 3.125 Hz (DN250..DN600 (10"..24"))
333	All	-	Empty pipe detection enable	Yes	Yes / No
334	All	-	Empty pipe limit	25000 ohm = 20uS/cm	0 to 2.15*10^9
400	All	-	Output A enable	Yes	Yes / No
401	All	Se3	Pulse A function	Forward	Forward, Reverse, Forward net, Reverse net
402	All	Se3	Amount per pulse A	Sensor related	0-1*10^10
403	All	-	Pulse width for pulse A	50 ms	5 ms, 10 ms, 50 ms, 100 ms, 500 ms
404	All	-	Output B enable	Yes	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	0-1*10^10
408	All	-	Pulse width for pulse B	Sensor related	5 ms, 10 ms, 50 ms, 100 ms, 500 ms
420	All	M5	Device Communication Address	1	1 to 32
421	All	M6	Baudrate	19200	1200, 2400, 4800, 9600, 19200, 38400
422	All	M7	Parity	Even 1 stop	Even 1 stop, Odd 1 stop, None 2 stop, None 1 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
500	All	-	Latest service date	PI3 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	0	
507	All	-	Battery power	MLFB depended	1 to 4 batteries
508	All	-	Battery change enable	No	Yes / No
509	All	Se1	Battery installation date	PI3 production date and time	year-month-day T hours:minutes:seconds
510	All	Se2	Actual battery capacity	100%	100 to 0%
512	All	-	Excitations no.	0	
513	All	-	Power status	0	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	
540	All	-	Electrode impedance A	Measured values	0-185000 ohm
541	All	-	Electrode impedance B	Measured values	0-185000 ohm
542	All	-	Low medium impedance alarm	0	0 to 2.15*10^9
550	All	-	Coil current disable	No	Yes / No
551	All	-	Fixed flow mode enable	No	Yes / No
552	All	-	Fixed flow value	0	-1*10*10^9 to 1*10*10^9
553	All	-	Flow alarm limit	1000000000	0 to 1*10*9
560	All	-	Repair checksum	No	Yes / No

FT/PDM number	Meter version	Display view	Parameter/data type	Factory settings	Data range
				Fix parameter or meter data that **not** are **changeable**	
570	All	-	Device Product ID	10779	
600	All	-	Log interval	Monthly	Daily, Weekly (7 days), Monthly
601	All	-	Delay weekly log interval	0	0 to 30
602	All	-	Limit for too high consumption	1000000	-1*10^9 to 1*10*9
603	All	-	Limit for too low consumption	0	-1*10^9 to 1*10*9
610	All	L1	Date of latest log period	2000-01-01 T00:00	year-month-day T hours:minutes:seconds
611	All	L1	Latest Log period totalized (1)		
612	All	-	Latest Log period totalized (2)		
613	All	-	Latest Log period fault status	0	Active faults in log period; 1: Insulation error, 2: Coil current error, 3: Preamplifier overload, 4: Database checksum error, 5: Low power warning, 6: Flow overload warning, 7: Pulse A overload warning, 8: Pulse B 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
614	All	-	Latest Log period status information	0	Meter operation conditions in log periode; 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
615	All	L2	Date of log period 2		
616	All	L2	Log period 2 totalized (1)		
617	All	-	Log period 2 totalized (2)		
618	All	-	Log period 2 fault status		See 168
619	All	-	Log period 2 status information		See 169
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 168
624	All	-	Log period 3 status information		See 169
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 168
629	All	-	Log period 4 status information		See 169
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 168
634	All	-	Log period 5 status information		See 169
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 168
639	All	-	Log period 6 status information		See 169
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 168
644	All	-	Log period 7 status information		See 169
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 168
649	All	-	Log period 8 status information		See 169
650	All	L9	Date of log period 9		
651	All	L9	Log period 9 totalized (1)		

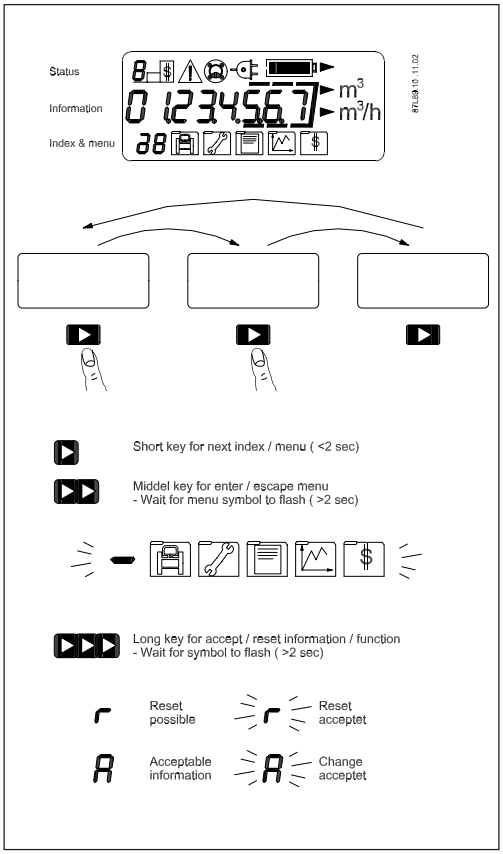
FT/PDM number	Meter version	Display view	Parameter/data type	Factory settings	Data range
				Fix parameter or meter data that **not** are **changeable**	
652	All	-	Log period 9 totalized (2)		
653	All	-	Log period 9 fault status		See 168
654	All	-	Log period 9 status information		See 169
655	All	L10	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 168
659	All	-	Log period 10 status information		See 169
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 168
664	All	-	Log period 11 status information		See 169
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 168
669	All	-	Log period 12 status information		See 169
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 168
674	All	-	Log period 13 status information		See 169
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 168
679	All	-	Log period 14 status information		See 169
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 168
684	All	-	Log period 15 status information		See 169
685	All	L16	Date of log period 16		
686	All	L16	Log period 16 totalized (1)		
687	All	-	Log period 16 totalized (2)		
688	All	-	Log period 16 fault status		See 168
689	All	-	Log period 16 status information		See 169
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 168
694	All	-	Log period 17 status information		See 169
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 168
699	All	-	Log period 18 status information		See 169
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 168
704	All	-	Log period 19 status information		See 169
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 168
709	All	-	Log period 20 status information		See 169
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 168
714	All	-	Log period 21 status information		See 169
715	All	L22	Date of log period 22		
716	All	L22	Log period 22 totalized (1)		

FT/PDM number	Meter version	Display view	Parameter/data type	Factory settings	Data range
				Fix parameter or meter data that **not** are **changeable**	
717	All	-	Log period 22 totalized (2)		
718	All	-	Log period 22 fault status		See 168
719	All	-	Log period 22 status information		See 169
720	All	L23	Date of log period 23		
721	All	L23	Log period 23 totalized (1)		
722	All	-	Log period 23 totalized (2)		
723	All	-	Log period 23 fault status		See 168
724	All	-	Log period 23 status information		See 169
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 168
729	All	-	Log period 24 status information		See 169
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 168
734	All	-	Log period 25 status information		See 169
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 168
739	All	-	Log period 26 status information		See 169
800	Advanced	-	Insulation test enable	No	Yes / No
801	Advanced	-	Insulation test interval	30	0 to 65535
802	Advanced	-	Insulation value		
803	Advanced	-	Insulation test date	2000-01-01 T00:00	year-month- day T hours:minutes:seconds
804	Advanced	-	Insulation tests fulfilled	0	
810	Advanced	-	Leakage detection mode	Off	Off/ fix value/ fix + lowest value
811	Advanced	-	Leakage source	Flow rate	Flow rate / volume
812	Advanced	-	Start period for leakage	120min=2:00 [24:00]	0 to 1430 detection minutes (0-23:50)
813	Advanced	-	Duration leakage detection	120min=2hours	1 to 144 (1440 minutes)
814	Advanced	-	Leakage value unit	Flow / volume unit	
815	Advanced	-	Leakage limit	1	0 to 1*10^9
816	Advanced	-	Leakage excitation frequency	1.5625 Hz	1/15Hz, 1/5Hz, 1.5625Hz, 3.125Hz, 6.25Hz, 1/30Hz, 1/60Hz
817	Advanced	-	Leakage status		Leakage status; 1: Finished successfully, 2: Leakage detection running, 3: Leakage detection failed (SystemStatus have fatal error), 4: Leakage detection failed (Empty-pipe detection disabled), 5: Leakage detection failed (Coil current off), 6: Leakage detection failed (Insulation test was active during detection), 7: Leakage detection stopped because leakage parameter was changed.
818	Advanced	-	Periods with possible leakage		
819	Advanced	-	Leakage periods before alarm	3	0 to 255
820	Advanced	-	Reset leakage period information	No	Yes / No
821	Advanced	St1	Latest leakage period flowrate	0	
822	Advanced	St1	Latest leakage period volume	0	
823	Advanced	-	Lowest measured leakage value	1000000000	
824	Advanced	-	Date of lowest leakage value	2000-01-01 T00:00	year-month-day T hours:minutes:seconds
825	Advanced	-	Highest measured leakage value	0	
826	Advanced	-	Date of highest leakage value	2000-01-01 T00:00	year-month-day T hours:minutes:seconds
830	Advanced	R8	Next settling date	PI3 production date and time	year-month-day T hours:minutes:seconds
831	Advanced	R9	Latest settling date	PI3 production date and time	year-month-day T hours:minutes:seconds
832	Advanced	R9	Latest totalizer 1 value	0	

FT/PDM number	Meter version	Display view	Parameter/data type	Factory settings	Data range
				Fix parameter or meter data that **not** are **changeable**	
833	Advanced	R10	Previous settling date	PI3 production date and time	year-month-day T hours:minutes:seconds
834	Advanced	R10	Previous totalizer 1 value	0	
840	Advanced	-	Tariff control mode	Off	Off / time / flow / combination
841	Advanced	R7	Date of tariff reset	PI3 production date and time	year-month-day T hours:minutes:seconds
842	Advanced	-	Reset tariff values	No	Yes / No
843	Advanced	R1	Tariff1 volume 1	0	
844	Advanced	R1	Tariff1 period time end	360min=6:00 [24:00]	0 to 1439 minutes (23:59)
845	Advanced	R1	Tariff1 upper limit range	15%	0 to 100% Qn
846	Advanced	R2	Tariff2 volume 2	0	
847	Advanced	R2	Tariff2 period time end	540min=9:00 [24:00]	0 to 1439 minutes (23:59)
848	Advanced	R2	Tariff2 upper limit range	30%	0 to 100% Qn
849	Advanced	R3	Tariff3 volume 3	0	
850	Advanced	R3	Tarif3 period time end	720min=12:00 [24:00]	0 to 1439 minutes (23:59)
851	Advanced	R3	Tariff3 upper limit range	45%	0 to 100% Qn
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
855	Advanced	R5	Tariff5 volume 5	0	
856	Advanced	R5	Tariff5 period time end	1260min=21:00 [24:00]	0 to 1439 minutes (23:59)
857	Advanced	R5	Tariff5 upper limit range	80%	0 to 100% Qn
858	Advanced	R6	Tariff6 volume 6	0	
860	Advanced	-	Reset date of statistic inf.	PI3 production date and time	year- month-day T hours:minutes:seconds
861	Advanced	-	Reset statistic information	No	Yes / No
862	Advanced	St2	Lowest flowrate	0	
863	Advanced	St2	Date of lowest flowrate	PI3 production date and time	year-month-day T hours:minutes:seconds
864	Advanced	St3	Highest flowrate	0	
865	Advanced	St3	Date of highest flowrate	PI3 production date and time	year-month-day T hours:minutes:seconds
866	Advanced	St5	Lowest day consumption	0	
867	Advanced	-	Date of lowest day consumption	PI3 production date and time	year-month-day T hours:minutes:seconds
868	Advanced	St6	Highest day consumption	0	
869	Advanced	-	Date of highest day consumption	PI3 production date and time	year-month-day T hours:minutes:seconds
870	Advanced	St4	Day 1 (yesterday) of last week consumption	0	
871	Advanced	-	Day 2 of last week consumption	0	
872	Advanced	-	Day 3 of last week consumption	0	
873	Advanced	-	Day 4 of last week consumption	0	
874	Advanced	-	Day 5 of last week consumption	0	
875	Advanced	-	Day 6 of last week consumption	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 consumption	0	
879	Advanced	St9	Latest month consumption	0	
880	Advanced	-	Reset date of consumptionprofile	PI3 production date and time	year-month-day T hours:minutes:seconds
881	Advanced	-	Reset consumption profile	No	Yes / No
882	Advanced	-	Total time in CP range 1	0	
883	Advanced	-	Upper limit in CP range 1	15%	0 to 100% Qn
884	Advanced	-	Total time in CP range 2	0	
885	Advanced	-	Upper limit in CP range 2	30%	0 to 100% Qn
886	Advanced	-	Total time in CP range 3	0	
887	Advanced	-	Upper limit in CP range 3	45%	0 to 100% Qn
888	Advanced	-	Total time in CP range 4	0	
889	Advanced	-	Upper limit in CP range 4	60%	0 to 100% Qn
890	Advanced	-	Total time in CP range 5	0	
891	Advanced	-	Upper limit in CP range 5	80%	0 to 100% Qn
892	Advanced	-	Total time in CP range 6	0	

5. Operation

5.1.1 Meter operation via key and display

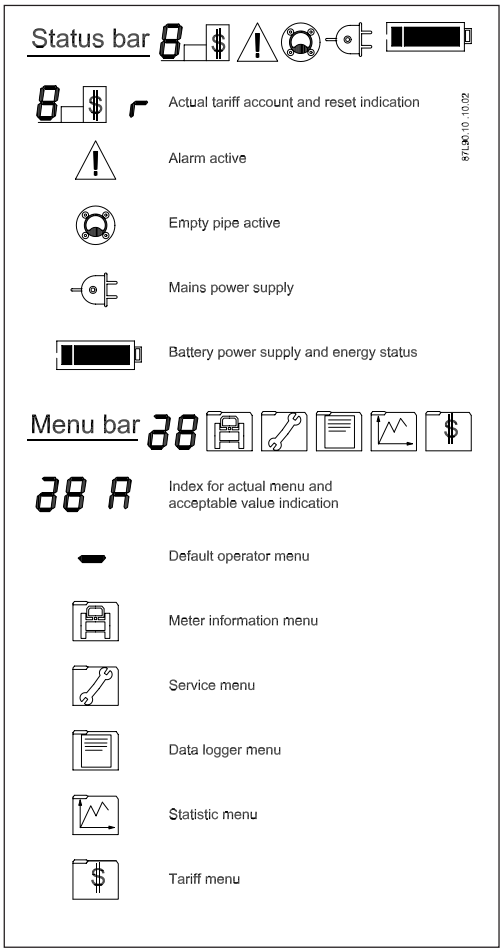


The meter is designed with a single key and a symbolic display for optimal dialog. A PC software program is available on the internet to simulate the display and key operation of MAG 8000.

Display
The display is divided into 3 areas.
Top area with symbols for status information.
Middle area with actual information, and the bottom area with index for actual information and the selected menu. Some of the information has additional information connected and the display will automatically toggle between the information (see display overview). After 10 minutes without pressing the key, the display will time-out and go back to the default configured operator menu.

Key
There are three different ways the interface key will respond to being pressed: Briefly pressing the key for less than 2 seconds will advance the screen to the next index or menu; pressing the key for 2 to 5 seconds will enter a menu or escape the menu selection; pressing the key for longer than 5 seconds while in the (–) operator menu will activate a reset of the selected value (e.g., totalizer or call-up function) indicated by an "r". A flashing "r" indicates activation of reset. Under power up can the time and date be set up and a "A" will indicated a acceptable value has been selected and will be stored when flashing.

5.1.2 Display symbols



The status information symbols show the actual operation of the meter.

The tariff symbol shows the actual accounting tariff. In the operator menu, the tariff value will change to "r" if the information is resetable, like index "5" - customer totalizer 3.

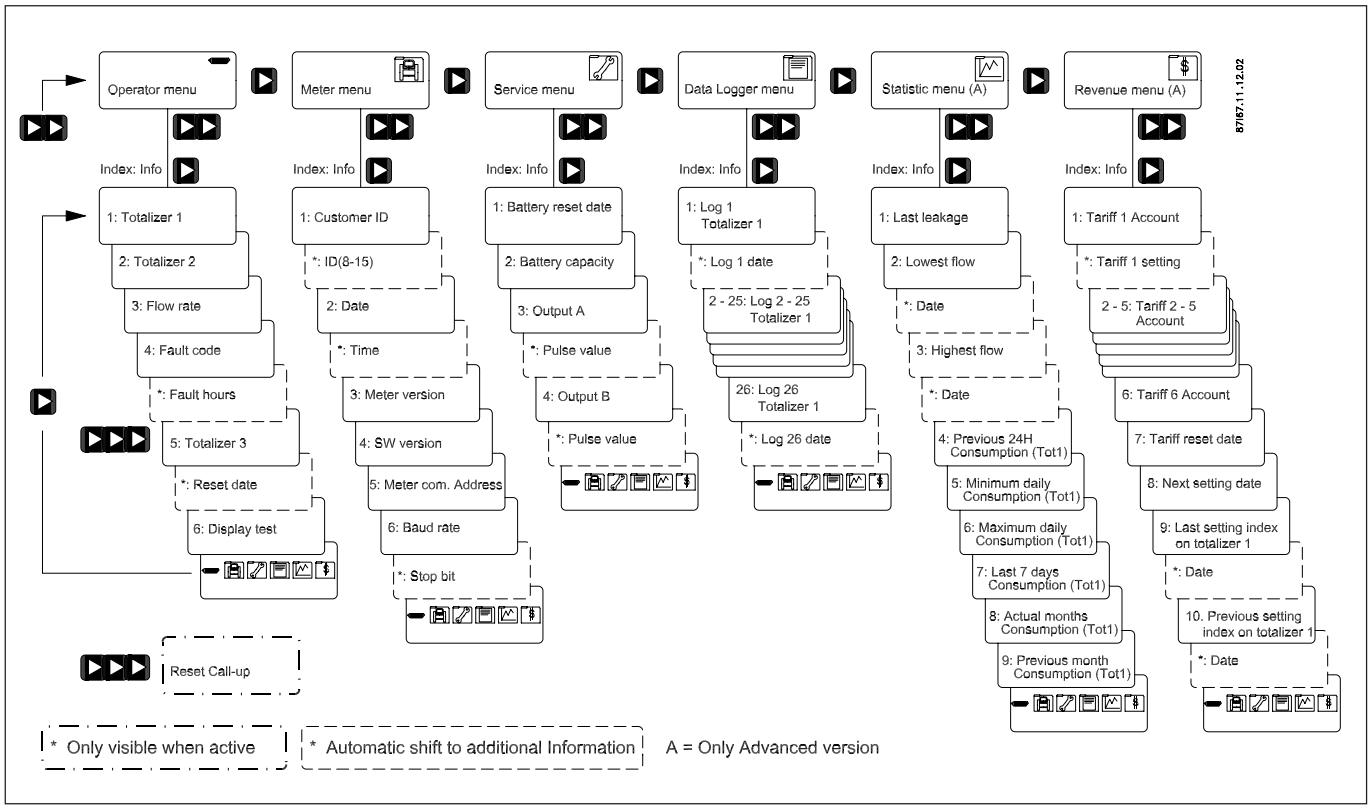
The alarm symbol is active when an alarm is active and independently of the alarm output configuration.

The 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.

The type of power supply is automatically detected by the meter. When mains power is supplied, the plug symbol is shown. When powered by batteries, the battery symbol is shown while also indicates remaining battery capacity - see section 5.2. "Operation menu" index 1 for more information.

The menu bar icons indicate the actual selected menu and the related index for the selected information. The display overview shows relation between menu, index and information.
Only the (–) operator menu has information and functions that can be reset. Under the power up function, battery power can be preset to 100% capacity and time and date can be adjusted - an "A" in the index shows acceptable values. The end of each menu index shows possible menu selections.

5.1.3 Menu overview



5.1.4 Default display information and accessible display menus

Flow tool parameter FT131 defines the 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 - resetable)

Default information is shown after power up and after no key operation for 10 minutes.

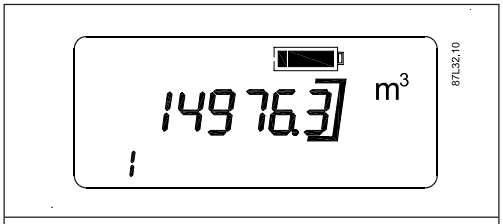
Flow tool parameter FT130 defines the accessible menus on the display with selection off:

- Operator menu
- Meter info menu
- Service menu
- Data logger menu
- Statistic and leakage menu
- Revenue menu

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

5.2 Operator menu

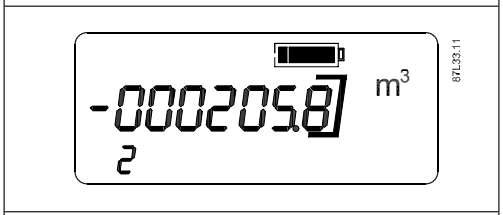
Index 1
Totalizer 1



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

The value of totalizer 1 can be reset to zero or set to any value desired (example - replacing an existing old meter).

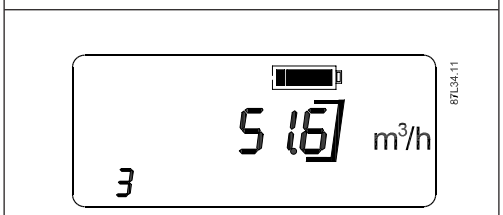
Index 2
Totalizer 2



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

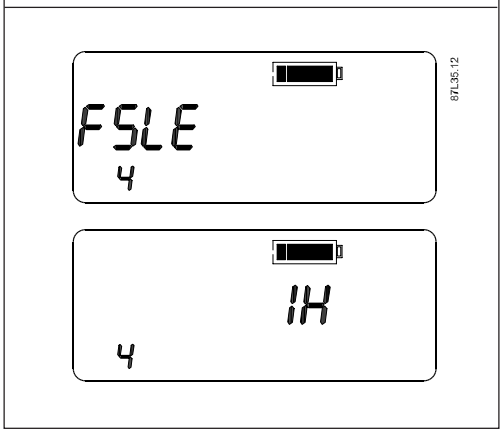
The value of totalizer 2 can be reset to zero or set to any value desired (example - replacing an existing old meter).

Index 3
Flow rate



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

Index 4
Active alarm



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

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

Fault evaluation and service guidelines are made in the service section.

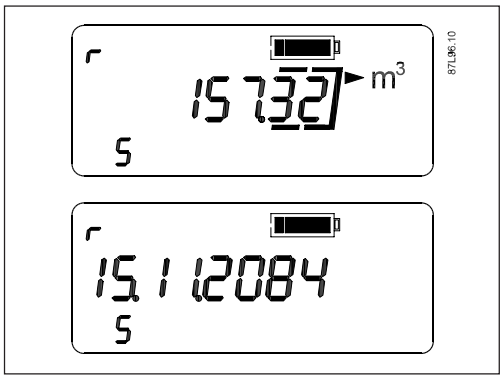
After all faults have disappeared the display show total hours of faults until the meter is reset.

Fault information. Each number indicates a dedicated fault:

1	Insulation fault
2	Coil current fault*)
3	Preamplifier overload fault*)
4	Data base checksum fault
5	Low power warning *(alarm limits are configurable)*
6	Flow overload > $Q_{max.}$ (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)*

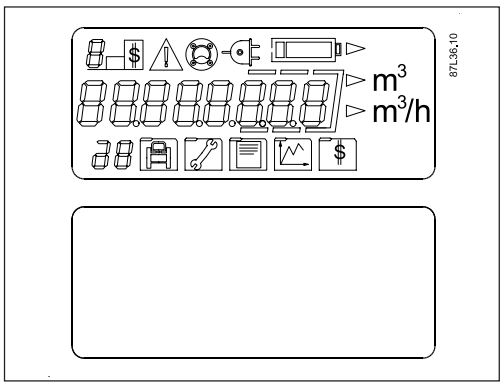
*) Meter disables measurement to reduce power consumption during fatal faults.

Index 5
Customer totalizer



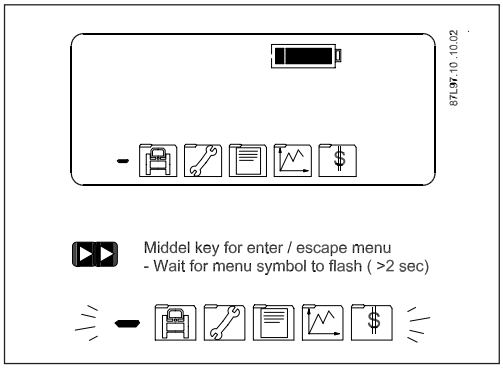
Customer totalizer 3 indicates the totalized volume since it was last reset. The totalized volume follows totalizer 1 and the display “r” indicates that it can be reset by activating a long key function. When pressing the key while the “r” is flashing, the totalizer 3 value will reset to 0 and the actual date and time will be stored permanent in memory. The display information will now alternate between customer volume and the reset date.

Display test



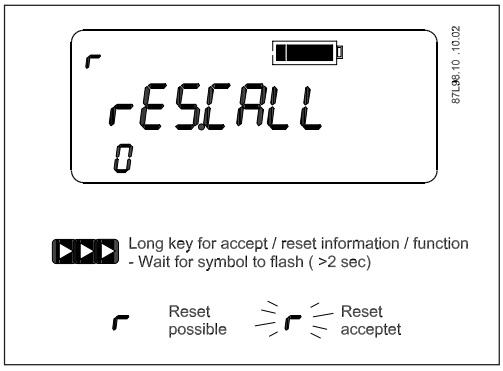
All segments of the display are alternately flashed on and off during this test.

Menu selection



By activating a middle key function, the menu selection will flash indicating that a new selection can be made.
After toggling to the menu of choice, a middle key function will enter the selected menu.

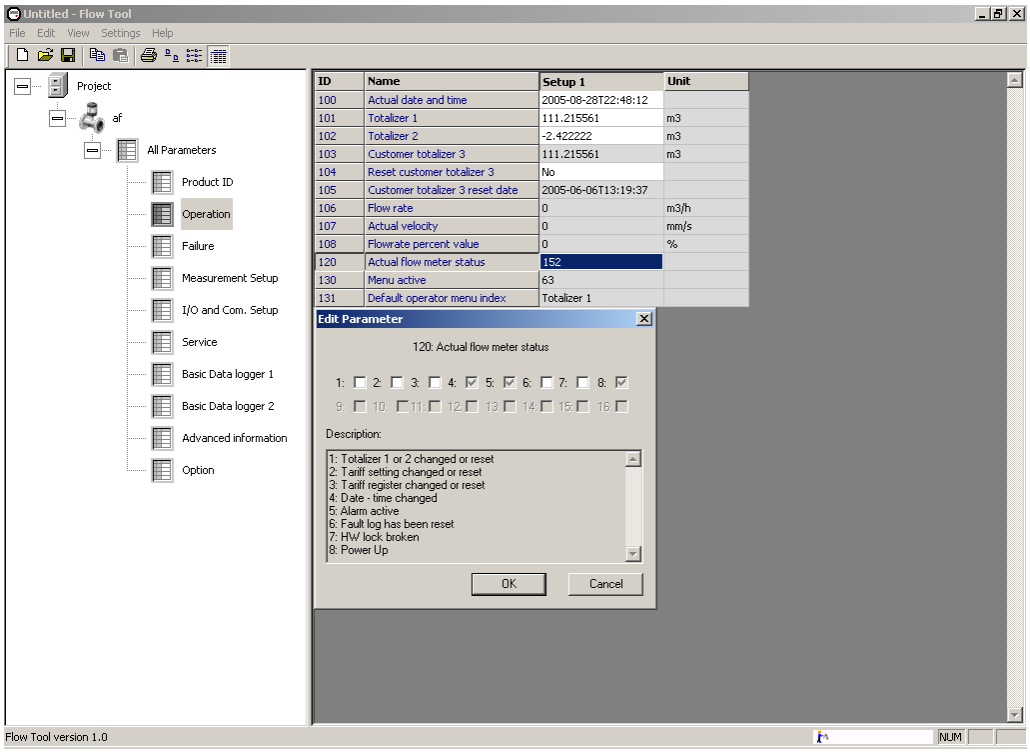
Index 0 (when active)
Call out reset



Call-up reset window (index 0) is only shown when the call-up function is activated. The “r” indicates it can be reset by activating a long key function. When releasing the key while the “r” is flashing, the call-up function will be reset and the window disappears.

5.3 Internal data handling

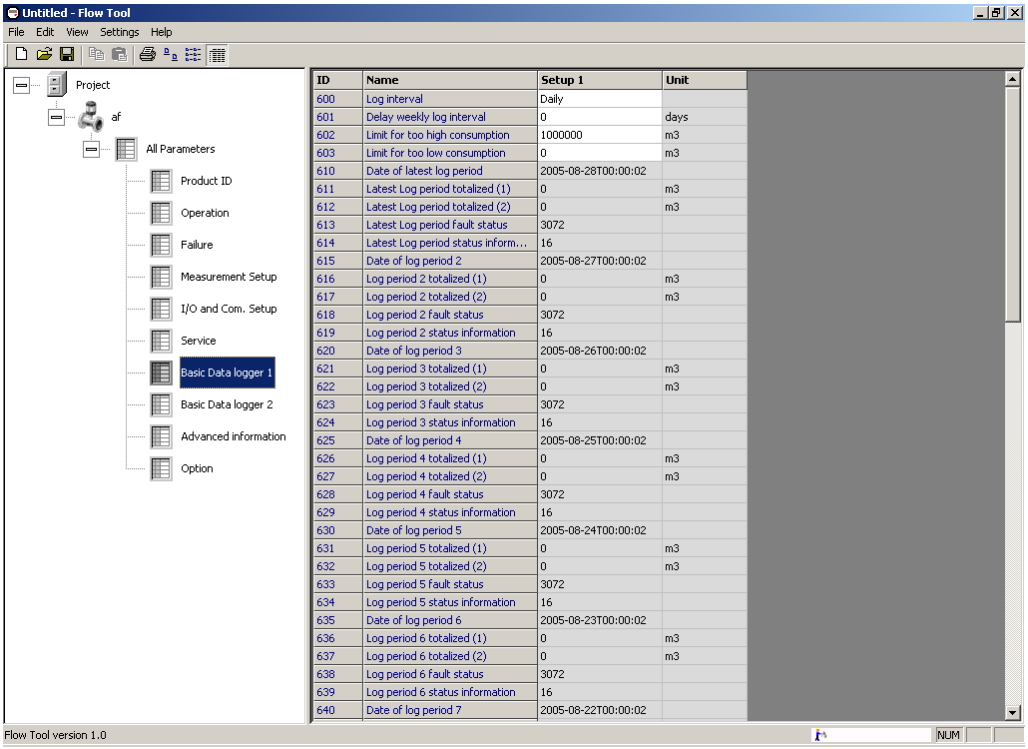
Meter status



The meter status parameter (FT120) gives a fast indication of the reliability of the revenue data. It shows whether important information has been reset or manipulated, for instance if the meter has been powered down.

The status information can only be reset via the Flow Tool service mode while the hardware lock key is attached.

Data logger / Consumption alarm



ID	Name	Setup 1	Unit
600	Log interval	Daily	
601	Delay weekly log interval	0	days
602	Limit for too high consumption	1000000	m3
603	Limit for too low consumption	0	m3
610	Date of latest log period	2005-08-28T00:00:02	
611	Latest Log period totalized (1)	0	m3
612	Latest Log period totalized (2)	0	m3
613	Latest Log period fault status	3072	
614	Latest Log period status inform...	16	
615	Date of log period 2	2005-08-27T00:00:02	
616	Log period 2 totalized (1)	0	m3
617	Log period 2 totalized (2)	0	m3
618	Log period 2 fault status	3072	
619	Log period 2 status information	16	
620	Date of log period 3	2005-08-26T00:00:02	
621	Log period 3 totalized (1)	0	m3
622	Log period 3 totalized (2)	0	m3
623	Log period 3 fault status	3072	
624	Log period 3 status information	16	
625	Date of log period 4	2005-08-25T00:00:02	
626	Log period 4 totalized (1)	0	m3
627	Log period 4 totalized (2)	0	m3
628	Log period 4 fault status	3072	
629	Log period 4 status information	16	
630	Date of log period 5	2005-08-24T00:00:02	
631	Log period 5 totalized (1)	0	m3
632	Log period 5 totalized (2)	0	m3
633	Log period 5 fault status	3072	
634	Log period 5 status information	16	
635	Date of log period 6	2005-08-23T00:00:02	
636	Log period 6 totalized (1)	0	m3
637	Log period 6 totalized (2)	0	m3
638	Log period 6 fault status	3072	
639	Log period 6 status information	16	
640	Date of log period 7	2005-08-22T00:00:02	

The integrated data logger has 26 logging periods where data can be stored daily, weekly or monthly.
The logger stores the real consumption for totalizer 1 and totalizer 2 in the selected period. Forward calculated consumption is stored as positive values and reverse calculated consumption is stored as negative values.
Alarm and meter status are also stored for the same period to indicate the alarm that has been active or 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	

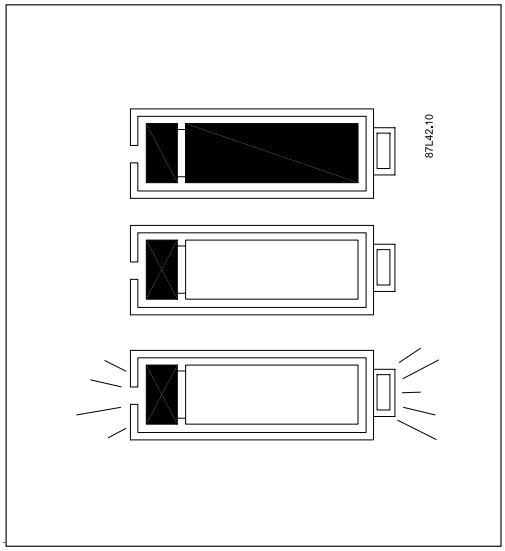
The logged information has a time & date stamp and the data logger never stops storing data - old data is overwritten following the first in/first out principle. Log 1 is the last stored information, that is moved to log 2 when the next logging is made and so on.
The consumption alarm monitors whether the actual consumption on totalizer 1 is above or below the consumption limits.

5.4 Operation on battery power

The MAG 8000 is factory configured for 6 years of typical operation on the internal battery pack. High or low temperature, frequent use of IrDA communication, high pulse output rate, and high excitation frequency in leakage detection mode 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.

5.4.1 Battery indication

Status and alarm

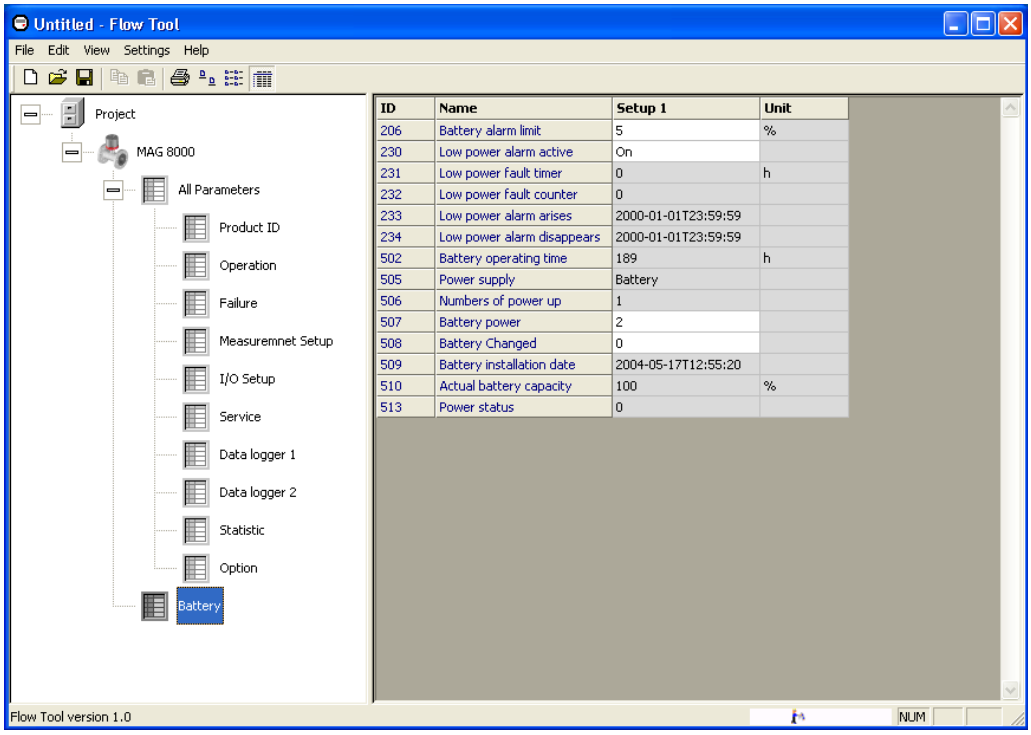


The battery power capacity for operation is indicated in 3 levels.

- Full symbol indicates the battery capacity is above the battery alarm level (% preset parameter FT206).
- Low symbol indicates that the battery should be replaced; however, the measurement will remain active. The level is based on a preset alarm level.
- When the low symbol is flashing the measurement and communication is disabled until the battery pack has been replaced and reset.

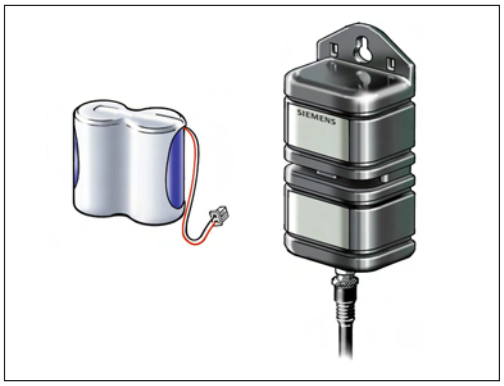
The "**Low battery**" is a selectable % parameter (FT206) of 100% full capacity. The meter calculates the remaining capacity every four hours, including all consuming elements and influence of change in temperature.

Battery configuration



The battery figure (generated as customer parameter list - see section 4 "Commissioning") shows power management information.
At each new battery replacement the capacity is reset to 100% (Flow Tool parameter FT508-FT510) which is then reduced with the real meter consumption each 4 hours.
The battery limit (FT206) is the level where the low power alarm is activated and generates an alarm or call up (if configured).
Power status (FT513) follows the battery symbol on the display.
When changing battery power from internal to external battery packs, or visa versa, "Battery power" (FT507) must be adjusted to match the actual number of batteries connected.

5.4.2 Battery operation time and calculation



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

Excitation frequency (24 hours operation)		**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...200 (1"...8")	8 year	6 year	40 months	8 months	4 months	2 months
	DN 250…600 (10"...24")	6 year	4 year	20 months	4 months	2 months	NA
Four D-Cell battery 66 Ah External battery pack	DN 25...200 (1"...8")	10 year	10 year	80 months	16 months	8 months	4 months
	DN 250…600 (10"..24")	10 year	8 year	40 months	8 months	4 months	NA

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

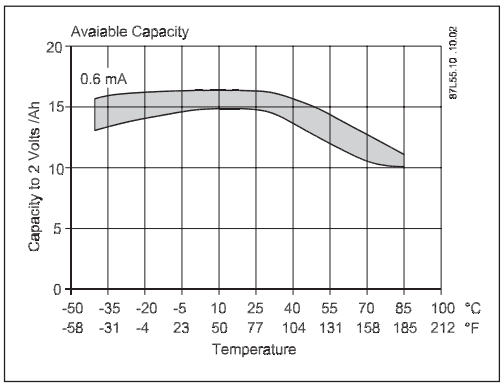
The power consumption calculation includes flow measurement, meter dialog (communication and display) and pulse output.
The temperature is also measured to control and adjust its influence on the battery capacity.

The internal battery pack has a nominal capacity of 33 Ah giving a typical operation time of 6 years in a revenue application. The nominal capacity of external battery packs is 66 Ah and the operation time is limited to the lifetime of the batteries - typically 10 years. Configuration and operation conditions for a typical revenue application is shown in the table.

The typical operation time of 6 years is based on only 80% battery capacity and an operation time/ temperature profile of 5% @ 0 °C/32 °F, 80% @ 15 °C/59 °F and 15% @ 50 °C/122 °F.

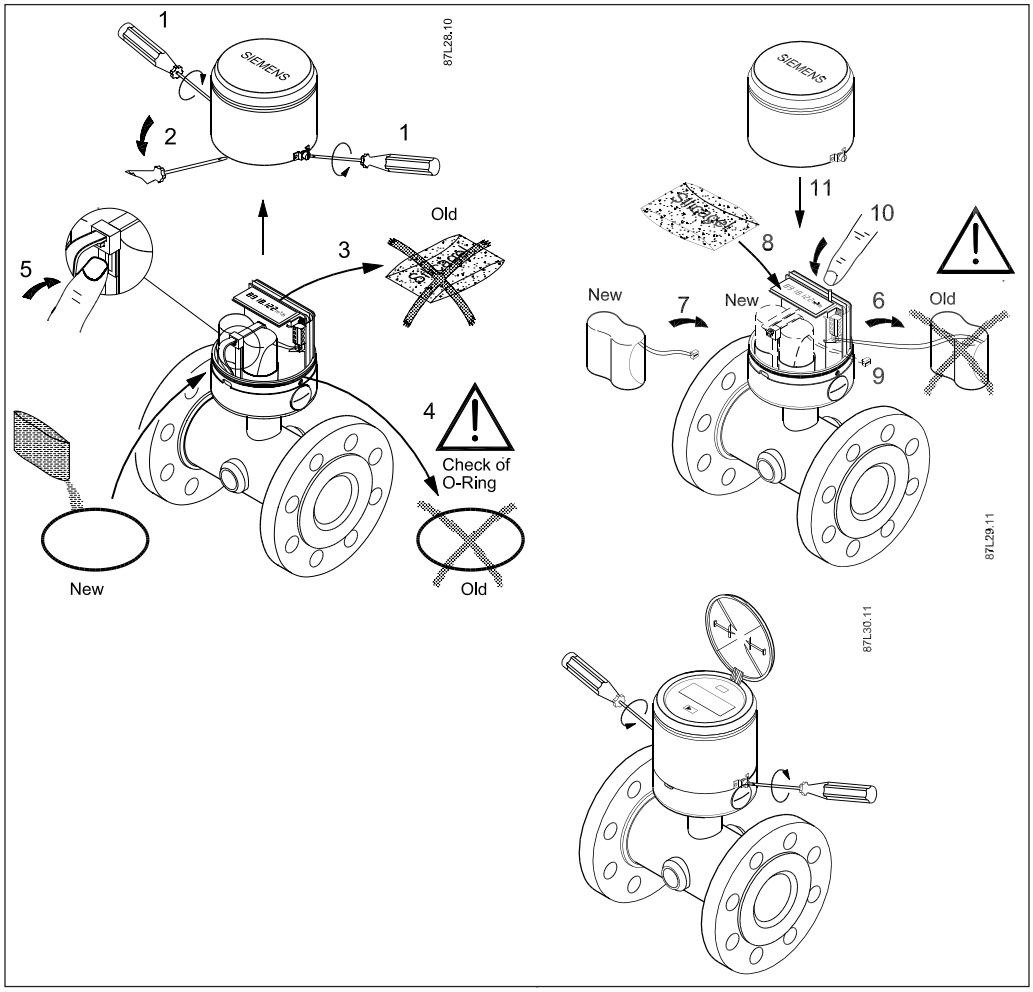
The leakage detection, in the advance version, will affect the battery operation time if a higher excitation frequency is selected during leakage period.

The effect from other temperatures can be seen from the figure.
A variation in temperature from 15 °C to 55 °C (59 °F to 131 °F) reduces the capacity by 17%. (In the table from 15 Ah to 12½ Ah).



Note
Physical installation of the battery pack may influence the battery capacity. Optimal battery capacity is achieved with the battery pack in an upright position.

5.4.3 Installation and replacement of batteries



Position 1-2
Remove the top of the transmitter.

Position 3-4 (only replacement)
Dispose of the silicagel bag. Check the O-ring for damage or deformity. To ensure the continued IP68 enclosure rating replace the O-ring and smear the O-ring with an acid free lubricating gel.

Position 5-8
Remove the battery pack by pushing the locking tab and loosen the strip. Take the battery pack out with power connected, place and secure the new battery pack.
Place the new silicagel pack on top of the battery pack, after removing the plastic bag. The silicagel prevents condensation within the meter.

Position 9-10
Connect the battery pack. After each power up the meter asks if a new battery has been installed and the internal battery calculation has to be reset. As this information will come soon after the power has been connected the wire nail or display key must be activated to reset the battery. The battery **Reset** will reset the operating time calculate and ensure the correct indication of the remaining battery capacity. After resetting the battery capacity can date and time be adjusted - see section 5.2 “Operator menu“ index 4 for more information.

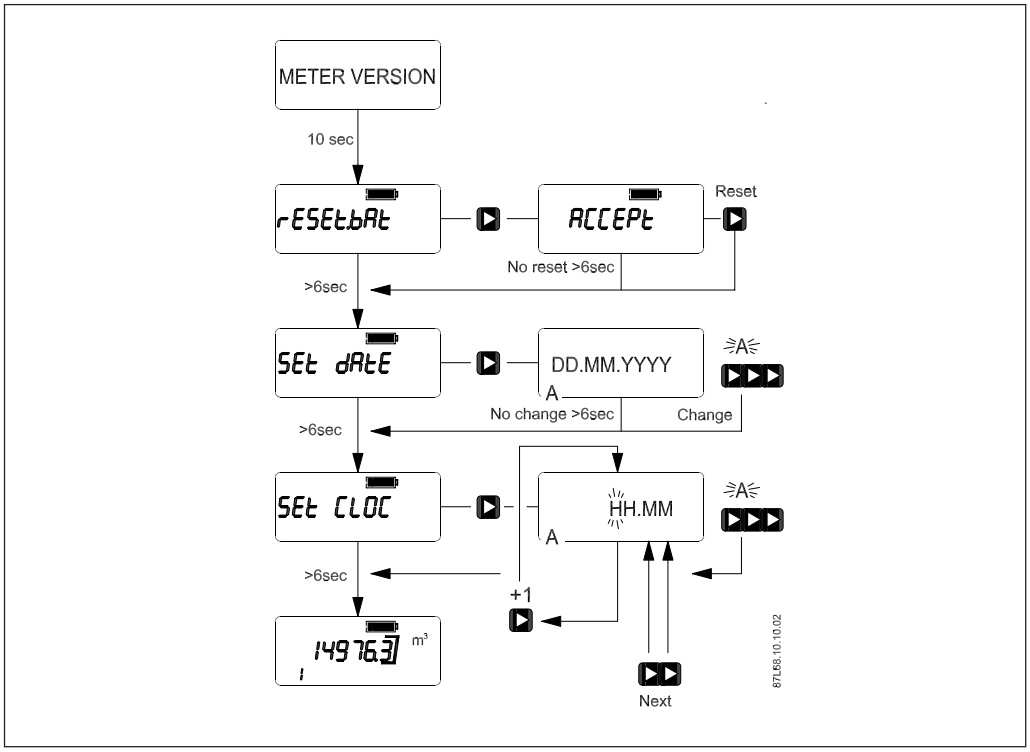
Position 11
Replace the top lid and if necessary, adjust the time and the date via the Flow Tool.

Battery disposal
Disposal of used batteries is regulated under The European Community (EC) two directives, 91/157/EEC and 93/86/EEC. These directives are implemented by each member country of the EC independently and in a different way - please contact Siemens for specific regional rules for disposal of batteries.

For batteries bought from Siemens, a disposal service is offered upon customer request. A Technical Notice with further recommendations is available upon request.

Package containing used batteries shall bear the inscription: **“USED LITHIUM CELLS“**.

5.4.4 Power up with battery reset, date and time set up



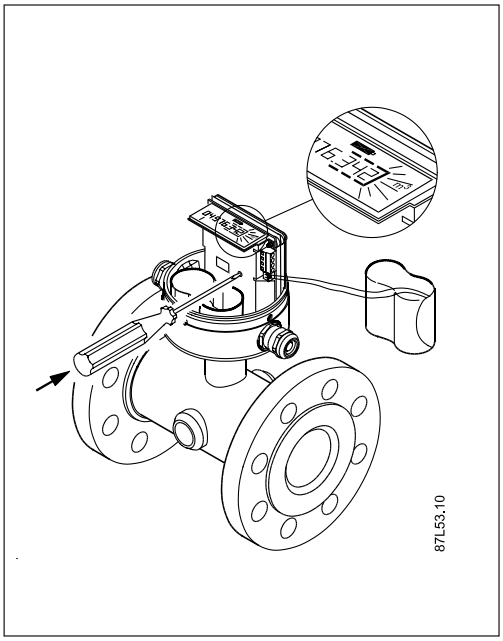
After installing new batteries, the power up procedure will enable a reset of the battery capacity calculation and the setup of date and time. Battery capacity reset, date, and time can also be corrected via functions FT508 and FT200.

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

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

For setting up the date and time, the different key function must be used - see section 5.2 „Operator menu" index 1. An "**A**" indicates an acceptable value and a flashing "**A**" indicates the value is stored when the key if released.

The reset function also sets the actual date as the battery replacement date.



Verification mode increases the measurement frequency to provide maximum measurements per second. This function is especially useful to minimize calibration rig time when validating the flowmeter's accuracy. The frame around the digits will blink slowly to indicate verification mode is enabled. The maximum pulse rate on output A is increased to 1 kHz and the pulse width is set to 1 ms. After the verification mode, the previous pulse setting is restored. Another pulse width than 1 ms can be selected by storing new pulse values. This setting remains after the verification mode is finished.

Verification mode can be activated in two ways:

1) Via the Flow Tool (FT320)
2) By pushing the switch on the transmitter PCB through the hole labeled "V" on the front shield.

Verification mode stops automatically after 4 hours of operation. Verification mode can also be aborted manually via the Flow Tool (FT320).

7.1 MAG 8000 service guidelines

The MAG 8000 electromagnetic water meter is based on a very reliable measurement technology and the advanced alarm monitoring and diagnostics provides 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 the alarm condition is corrected.

7.1.1 Faults codes

Faults codes	Alarm description	Alarm reasons
	Faults	**Measurement is disabled**
1	Insulation (Advanced version only)	"Cross talk" between the coil circuit and the signal circuit, or strong electrical disturbances from outside influencing the flow signal. The alarm is active until a new test period detects no failures. A re-activation of the insulation test will also reset the alarm and start a new insulation test. During the 4 minute insulation test, the measurement is disabled. The function is re-activated via FT800. -> Check cable and wiring installation and disturbing elements in the surrounding.
2	Coil current	Coil circuit is interrupted. The alarm is active until the fault condition is corrected. -> Check cable and wiring installation.
3	Preamplifier overload	The flow input signal is outside of the expected range and the input amplifier circuit can not provide a stable measurement. The alarm is active until the fault condition is corrected. -> Check cable and wiring installation.
4	Data base checksum	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. The alarm is active until the fault condition is corrected. -> Reset checksum repair alarm via FT560 and check the data. If data is wrong or checksum error reoccurs, replace the PCB board.

7.1.1 Faults codes *(continued)*

Warning faults cover operating conditions where settings or monitored values exceed configured limits.
Some of the warnings require a manual reset before they are removed from the alarm list.

Faults codes	Alarm description	Alarm reasons
	Warning	**Indication of wrong setting or application issues**
5	Low power	Battery voltage is below 2 volts or battery capacity is below the low power % limit (set as customer parameter FT206). When low voltage is detected, flow measurement and communication will stop, but the display will remain active as long as some power is available. The alarm remains active until the fault condition is resolved. -> Check the calculated battery capacity (FT510) versus the battery alarm limit (FT206) and replace batteries as necessary.
6	Flow overflow	Flow rate through the meter is 25% above Qn (Q3) and the meter stops counting at 125% flow. The alarm remains active until the fault condition is resolved. -> Check the sizing of the meter for the current installation.
7 & 8	Pulse 1 & 2 overflow	The pulse rate is higher than the pulse output can deliver. Reminder: the **basic version** is limited to 50 Hz maximum; the **advanced version** is limited to 100 Hz maximum. The alarm remains active until the output pulse rate drops below the maximum pulse rate. -> Change volume per pulse to a higher value - see section 8 “Technical data“ for pulse selection.
9	Consumption warning	The data logged consumption on totalizer 1 has exceed the too low or too high consumption limit. The alarm remains active until it is manually reset by FT209. -> Check data logger values and consumption limit.
L	Leakage (Advanced version only)	The lowest flow rate or volume during leakage period has exceeded the leakage detection settings. The alarm is active until it is manually reset by FT208. An alarm reset (similar to leakage period reset FT820) will reset information for the selected function. -> Check setting and pipe installation.
E	Empty pipe	The measured electrode impedance is above the empty pipe level (FT540 & FT541 & FT334). The alarm remains active until the fault condition is resolved. -> Make sure the sensor is filled with water.
C	High conductivity	The electrode impedance is below the low media impedance (FT542) - meaning the water has a high conductivity. The alarm is active until the resistance in the water is above the low media alarm limit.
d	High flow rate	The flow rate is greater than the flow alarm limit (FT553). The alarm remains active until the flow rate drops below the flow alarm limit.

Note
A reset of the fault log (FT204) also resets all alarms. Once reset, only active alarms become visible again.

7.2 Flow simulation

The MAG 8000 has a built-in flow simulator (FT551 & FT552) to verify and adjust the pulse output to any connected device or system.

Warning
Totalized values are changed during the simulation and actual flow is **NOT** measured. Simulation continues until manually turned off (normal operation restored).

7.3 Replace a transmitter or PCB board

Since the MAG 8000 does not have a removable SENSORPROM (EEprom), special care must be taken when replacing a damaged or defective transmitter or PCB board to ensure proper operation and continued accuracy. There are three ways to achieve an easy and successful replacement:

1) Order a complete transmitter as a spare part, which comes configured the same way as the original meter left the factory. The system serial number of the original meter must be provided when ordering the replacement.

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 order a an **advanced version** and only with default settings. When making the configuration on site, the service mode must be selected in the Flow Tool and the Hardware key **must** be attached to the PCB board to change important parameters.

8. Technical data

8.1 MAG 8000

Description		Specification
Meter		
Accuracy		
	Standard calibration	±0.4% of rate ±2mm/s
	Extended calibration	±0.2% of rate ±2mm/s
Media conductivity		Clean water > 20 µs/cm
Temperature		
	Ambient	–20...+60°C (–4...+140°F)
	Media	0...70°C (32...+158°F)
	Storage	–40...+70°C (–22...+158°F)
Enclosure		IP68/NEMA6P rating; Cable glands mounting requires Sylgard potting kit to remain IP68/ NEMA6P, otherwise IP67/NEMA4 rating is obtained; Factory mounted cable provides IP68/NEMA6P rating
Approvals		Drinking water approval - NSF 61 (cold water) USA (is pending) - WRAS (BS 6920 cold water) UK - ACS Listed France - KTW D1 & D2 and DVGW W270 Germany drinking water approval - OIML R49 pattern approval including PTB
Conformity		PED: 97/23EC
		EMC: EN 61000-6-3, EN 61000-6-2, EN 61326-1
Sensor		
Size, flange and pressure range		
	EN 1092-1 (DIN 2501)	DN 25 and DN 40: PN 40
		DN 50…150: PN 16
		DN 200…600: PN 10 or PN 16
	ANSI 16.5 Class 150 lb	1”…2”: 580 psi
		2”…6”: 230 psi
		8”…24”: 145 or 230 psi
	AS 4087	DN 50…600: PN 16
Max. excitation frequency (The transmitter decides the excitation frequency)		6.25 Hz for sensor size DN 25...DN 200 (1”...8”)
		3.125 Hz for sensor size DN 250…DN 600 (10”…24”)
Liner		EPDM
Electrode and grounding electrodes		Hastelloy C276
Transmitter		
Installation		Integral (compact) or remote with factory mounted sensor cable in 5 m (16.4 ft), 10 m (32.8 ft), 20 m (65.6 ft), 30 m (98.4 ft) lengths with IP68/NEMA 6P connectors. Connection is made at the bottom of the transmitter
Enclosure		Stainless steel top housing (AISI 316) and coated brass bottom. Remote wall mount bracket in stainless steel (AISI 304)
Cable entries		2 x M20 (one gland for one cable of size 6…8 mm (0.02...0.026 ft) is included in the standard delivery)
Display and key		Display with 8 digits for main information. Index, menu and symbol icons for dedicated information
		Key for toggling through the function, as set up of date and time under power up and reset customer totalizer and call-up function
		Selectable default display information from the operator menu and the accessible menus. Displayed information includes: - Operator - Meter - Service - Data Logger - Statistics and leakage (Advanced version only) - Revenue and tariffs (Advanced version only)
		Totalized information can be displayed with 1, 2, 3 decimals or automatic adjustment for maximum resolution

(continued)

Flow unit Europe standard	Volume in m^3 and flow rate in m^3/h
US standard	Volume in Gallon and flow rate in GPM
Australian standard	Volume in Ml and flow rate as Ml/d
	Other defined 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
	Flow: m^3/min, m3/d, l/s, l/min, GPS, GPH, GPD, MGD, CFS, CFM, CFH
	Other units are selectable from factory via MLFB ordering number system or manually configured on-site by sticking a label on the display and changing the unit scaling factor. Manual configuration allows selection of new units
Digital output	2 passive outputs (MOS), individual galvanically isolated
	Maximum load ± 35 V DC, 50 mA short circuit protected
	Output A function Programmable as pulse volume – forward – reverse – forward/net – reverse/net
	Output B function Programmable as pulse volume (like output A), alarm or call-up
	Output Max. pulse rate of 50 Hz (Basic version) and 100 Hz (Advanced version), pulse width of 5, 10, 50, 100, 500 ms
Communication	IrDA: Standard integrated infrared communication interface with MODBUS RTU protocol
Battery power supply[1)]	Auto detection of power source with displayed symbol for remaining power. In battery mode, excitation frequency is manually selected
	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 AC/DC)
	Power consumption during line: 2 VA
	Isolation: Class II
	Fuse: 1000 mA T - Not replaceable
	Short circuit protection: Module is protected from short circuit on the output connector. Both during mains and backup supply
	Complies with standards: IEC 61010-1, OIML R49-1, EN 61000-6-3, EN 610000-6-2
115/230 V AC mains power supply	Input voltage range: 115/230 V AC, +15% to –20%, 50-60 Hz
	Power consumption during mains: 2 VA
	Isolation: Class II
	Fuse: 250 mA T - Not replaceable
	Short circuit protection: Module is protected from short circuit on the output connector. Both during mains and backup supply
	Complies with standards: IEC 61010-1, OIML R49-1, EN 61000-6-3, EN 610000-6-2
Input cable for 12-24 V AC/DC and 115/230 V AC power supply	Factory mounted PUR cable with 2 x 1 mm^2 (brown, blue), length = 3 m
	Resistant to sunlight and water
	Outer diameter 7 mm
	Rated voltage (V AC) 300/500 V AC
	Testing voltage (V AC) 2000 V AC
	Temperature range (°C): Fixed laying –40 to +90 °C Flexible application –30 to +80 °C
	Minumum bending radius 28 mm, (fixed installation)
	Maximum pulling force 200 N
	Output: As battery connector - female
	Backup battery: As battery connector - male

1) Lithium batteries are subject to special transportation regulations accord-ing to United Nations "Regulation of Dangerous Goods, UN 3090 and UN 3091". Special transport documentation is required to observe these regu-lations. This may influence both transport time and costs.

(continued)

Siemens Flow Instruments	Modbus RTU specification for add-on modules
Device type	Slave
Baud rates	1200, 2400, 4800, 9600, 19200, 38400 bits/sec.
Number of stations	Recommended: max. 31 per segment without repeaters
Device address range	1-247
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 (@38400 bits/sec.)
Standard	Modbus over serial line v1.0
Certified	No
Device profile	None
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 add-on MODBUS module is only functional isolation.

8.2 Features/Version

Features/Version	MAG 8000 basic	MAG 8000 advanced
Measurering 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 (FT1 & FT2)
Tag number (visible on display if numbers are selected) and meter location, up to 15 characters per information.

Time and date (FT100)
Real time clock and date (max. 15 min. change per year)

Totalizer (FT101 & FT102 & FT103)
- 2 totalizer: Forward, reverse, bidirectional netflow calculation and free selectable start value.
- 1 customer totalizer, following totalizer 1 setting and resetable via display key or software with logging of date and time.

Measurement (FT300...FT334)
- Free 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
  - Default excitation frequency is selected for typically 6 years operation in a revenue application; 1/15 Hz for DN 25 … 200 (1“ … 8“)
    1/30 Hz for DN 250 … 600 (10“ … 24“)
- Excitation frequency with mains power follow maximum sensor excitation frequency
- Filter constant as numbers of excitations
- Low flow cut off, % of Qn (Q3)
- 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

Data logger (FT600...FT739)
- 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 (FT200...FT274)
- 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 – Customer-selectable battery alarm level or power drop-out
  - Flow overflow – Flow in sensor exceeds Qmax (125% Qn (Q3))
  - 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 (FT120)
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 hour.
- 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
  - Verification mode for fast measure performance check
- Advanced version includes
  - Insulation “Cross-Talk” test
  - Meter utilization
  - Consumption profile
  - Statistical flow and consumption data

Insulation test (Advanced version only)
Test of signal immunity against disturbances and poor installations. Test interval is selectable and measurement is interrupted during the test period of 4 min.

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 where monitored value exceed the possible leakage level. Min. and max. values are stored with date registration. Last store value visible on the display.

Meter Utilization (Advanced version only)
6 registers for monitoring total time the meter has operated in different flow intervals. Registered intervals are free 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)
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.

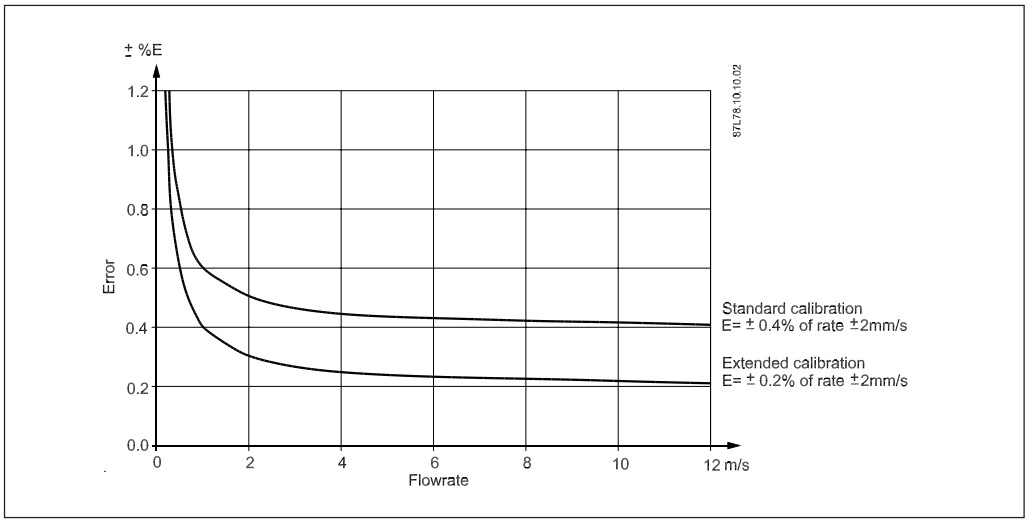
Statistic (Advanced version only)
- Min. flow rate with time and date registration
- Max. flow rate with time and date registration
- Min. daily consumption with date registration
- Max. daily consumption with date registration
- Latest 7 days total and daily consumption
- Actual month consumption
- Latest month consumption

8.3 Meter uncertainty

To ensure continuously accurate measurements, water meters must be periodically calibrated. Calibration is performed at Siemens flow facilities, which are accredited according to ISO/IEC 17025 by DANAK and UKAS.

The accreditation bodies, DANAK and UKAS, have signed the ILAC MRA agreement (International Laboratory Accreditation Cooperation - Mutual Recognition Arrangement). This accreditation ensures international traceability and recognition of the test results in 39 countries world-wide, including **NIST** traceability in the United States.

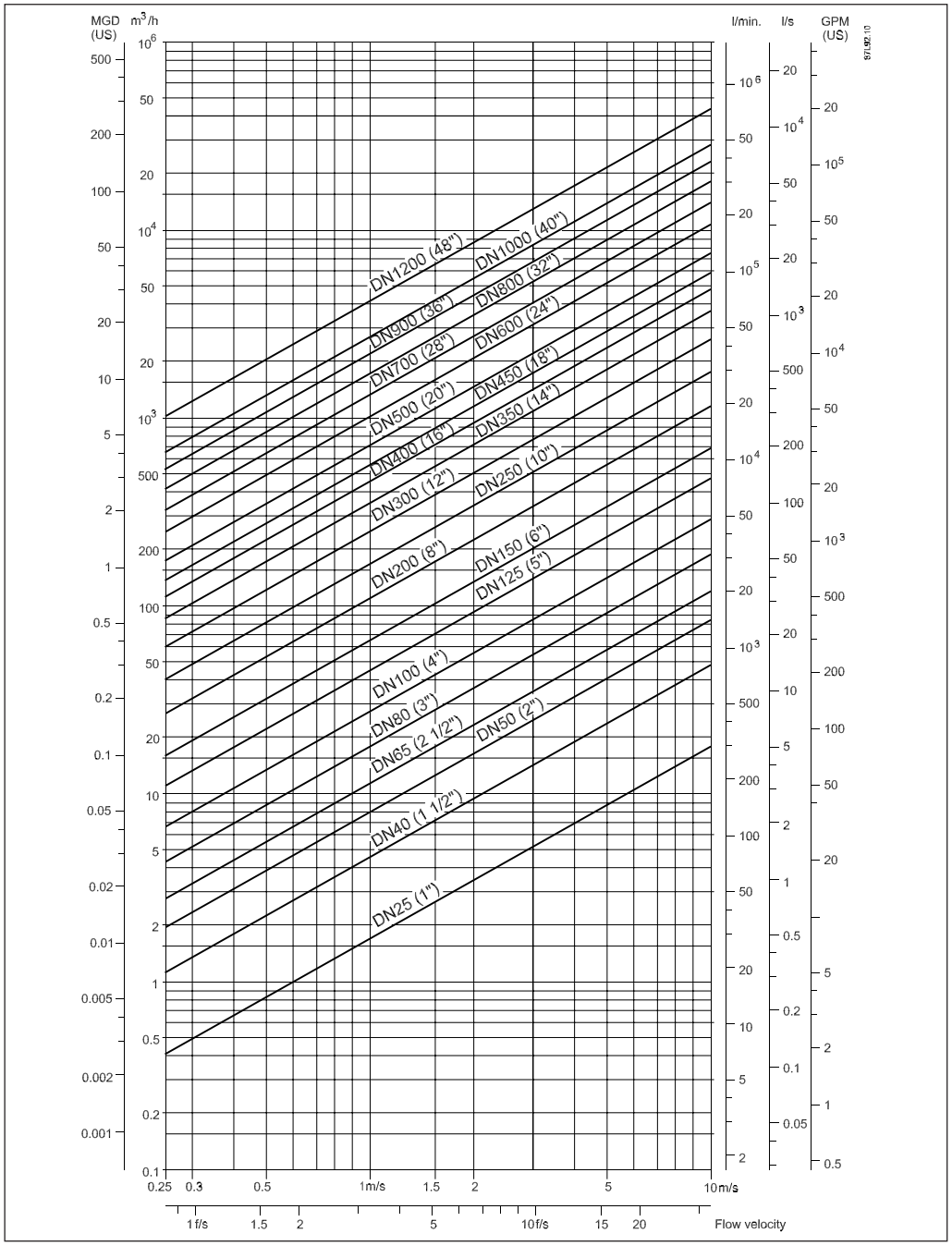
The selected calibration determines the accuracy of the water meter. A standard calibration results in max. ±0.4% of rate ±0.2 mm/s uncertainty and an extended calibration results in a max. ±0.2% of rate ±0.2 mm/s (pending). A calibration certificate is included with every sensor and calibration data is stored within the meter.



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

8.4 Sizing table DN 25...DN 1200 (1"...48")



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

Guidelines for selection of sensor
Min. measuring range: 0-0.25 m/s (0-0.8 ft/sec.)
Max. measuring range: 0-10 m/s (0-33 ft/sec.)
Normally the sensor is selected so that V lies within the measuring range 1-2 m/s (3-7 ft/sec.).

Flow velocity calculation formula:

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

Flow velocity calculation formula:
GPM = (Pipe I.D. inches)^2 x velocity (ft/sec.) x 2.448

$$V = \frac{GPM \times 0.408}{(\text{Pipe I.D. inches})^2} \quad \text{or} \quad V = \frac{MGD \times 283.67}{(\text{Pipe I.D. inches})^2}$$

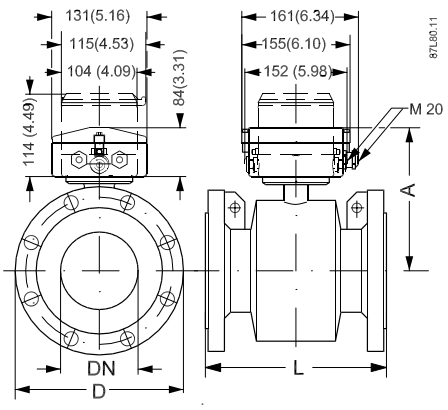
8.5 The effect of temperature on working pressure

Metric (Pressures in bar)					
Sizes 25 mm, 40 mm & > 300 mm					
Flange spec.	**Flange rating**	**Temperature °C**			
		0	10	50	70
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

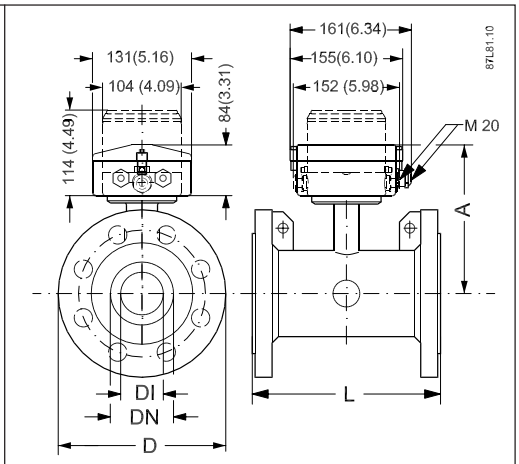
Imperial (Pressures in Psi)					
Sizes 1", 1½", & > 12"					
Flange spec.	**Flange rating**	**Temperature °F**			
		32	50	122	158
EN 1092-1	PN 10	145	145	141	136
	PN 16	232	232	225	219
	PN 40	580	580	561	547
ANSI 16.5	150 lb	286	286	280	261
Sizes 2" to 12"					
EN 1092-1	PN 10	145	145	145	119
	PN 16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

8.6 "Physical" dimension

Dimension mm [inch]



DN 25 + 40 (1" + 1½") & DN 350 - DN 1200 (14" - 48")



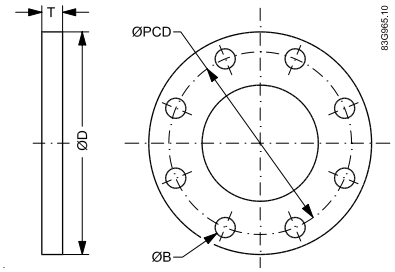
DN 50 - 300 (2" - 12")

(Nominal DN	A size)	L, lenghts					D, diameter		Weight[1] DO	
		EN 1092-1				ANSI 16.5 Cl. 150	AS 4087 PN 16	DI		
			PN 10	PN 16	PN 40					
mm (inch)	mm (inch)	mm	mm	mm	inch	mm	mm (inch)	mm (inch)	kg	lbs
25 (1)	194 (7.7)	-	-	200	7.9	200	25 (0.98)	See flange table	6	13
40 (1½)	204 (8.1)	-	-	200	7.9	200	40 (1.57)	See flange table	9	20
50 (2)	195 (7.7)	-	200	-	7.9	200	42 (1.65)	See flange table	11	25
65 (2½)	201 (8)	-	200	-	7.9	200	55 (2.17)	See flange table	13	29
80 (3)	207 (8.2)	-	200	-	7.9	200	67 (2.64)	See flange table	15	34
100 (4)	214 (8.5)	-	250	-	9.8	250	81 (3.19)	See flange table	17	38
125 (5)	224 (8.9)	-	250	-	9.8	250	101 (3.98)	See flange table	22	50
150 (6)	239 (9.5)	-	300	-	11.8	300	131 (5.16)	See flange table	28	63
200 (8)	264 (10.5)	350	350	-	13.8	350	169 (6.65)	See flange table	50	113
250 (10)	291 (11.5)	450	450	-	17.7	450	212 (8.35)	See flange table	71	160
300 (12)	317 (12.6)	500	500	-	19.7	500	265 (10.43)	See flange table	88	198
350 (14)	369 (14.6)	550	550	-	21.7	550	350 (13.78)	See flange table	111	250
400 (16)	394 (15.6)	600	600	-	23.6	600	400 (15.75)	See flange table	126	284
450 (18)	425 (16.8)	600	600	-	23.6	600	450 (17.72)	See flange table	175	394
500 (20)	450 (17.8)	600	600	-	26.8	600	500 (19.68)	See flange table	225	507
600 (24)	501 (19.8)	600	600	-	32.3	600	600 (23.62)	See flange table	299	649

[1] for remote version the sensor weight is reduced with 2 kg (4.5 lb)

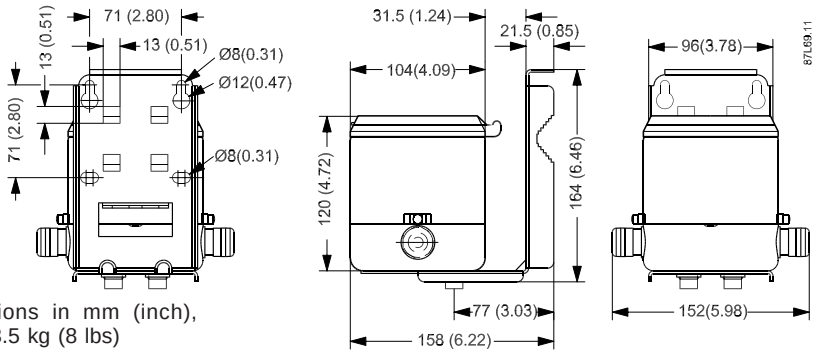
8.7 Flange mating dimensions (Metric)

	Dimensions mm				Bolting	
mm	OD	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
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
PN 40						
25	115	85	16	14	4	M12
40	150	110	18	18	4	M16



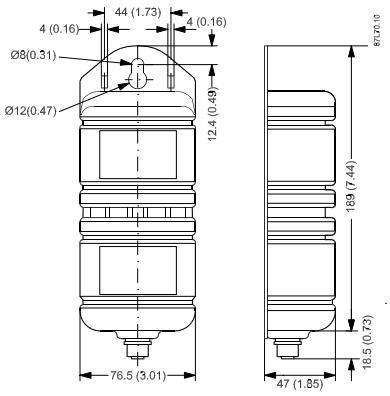
	Dimensions inches				Bolting	
inch	OD	PCD	T	B	Holes	Bolts
ANSI Class 150						
1"	4.25	3.12	0.56	0.62	4	9/16"
1 ½"	5	3.88	0.68	0.62	4	9/16"
2"	6	4.75	0.75	0.75	4	5/8"
2 ½"	7	5.5	0.88	0.75	4	5/8"
3"	7.5	6	0.94	0.75	4	5/8"
4"	9	7.5	0.94	0.75	8	5/8"
5"	10	8.5	0.94	0.88	8	3/4"
6"	11	9.5	1	0.88	8	3/4"
8"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

Remote version



Dimensions in mm (inch),
weight 3.5 kg (8 lbs)

External battery pack

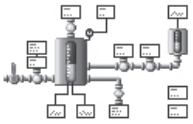


Dimensions in mm (inch),
weight 2.0 kg (4.5 lbs)

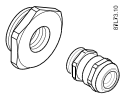
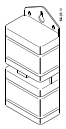
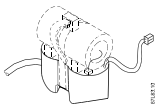
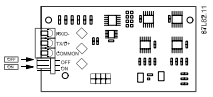
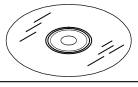
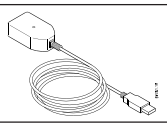
Note
Physical installation of the battery pack may influence the battery capacity.
Optimal battery capacity is achieved with the battery pack in an upright position as shown.

9. Ordering

Please refer to Siemens homepage **http://www.siemens.com/flow** under “Product Selector”.

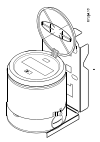
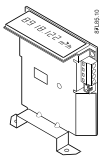
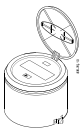
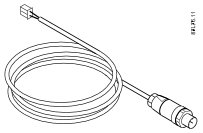
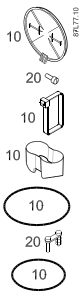
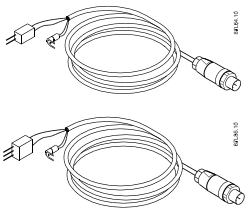


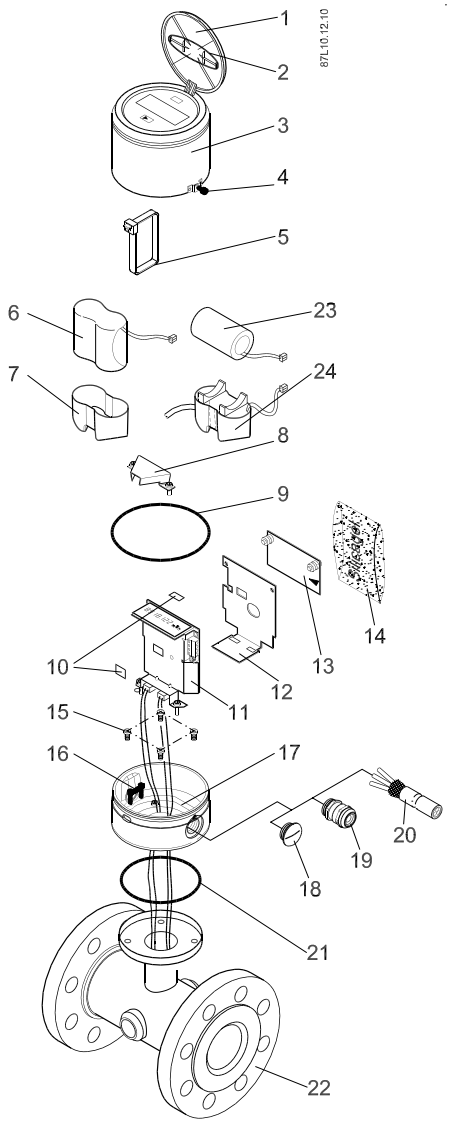
9.1 Accessories

Description	Order No.	Symbol
One cable entry 6...8 mm (0.02...0.026 ft) M20 brass glands package (1 pc)	**FDK:087L4196**	
One cable entry 3.5...5 mm (0.011...0.016 ft) M12 brass glands with M20 reduction. Package of 10 pcs	**FDK:087L4154**	
One cable entry 6...8 mm (0.02...0.026 ft) M20 brass glands package (10 pcs)	**FDK:087L4155**	
One cable entry 8...11 mm (0.026...0.036 ft) M20 brass glands package (10 pcs)	**FDK:087L4156**	
One cable entry 11...15 mm (0.036...0.049 ft) M20 brass glands package (10 pcs)	**FDK:087L4157**	
Two cable entries 3.5...5 mm (0.011...0.016 ft) M20 brass glands package (10 pcs)	**FDK:087L4158**	
Two cable entries 5.5...7.5 mm (0.018...0.024 ft) M20 brass glands package (10 pcs)	**FDK:087L4159**	
Battery backup for mains power supply, one pc. D-cell (3.6 V, 16.5 Ah) Attention on note 1)	**FDK:087L4201**	
Internal battery pack, one set D-cell (3.6 V 33 Ah) and replacement accessories; silicagel, O-ring and gel Attention on note [1)]	**FDK:087L4150**	
External battery pack IP68/NEMA6P with connector, four D-cell (3.6 V 66 Ah) Attention on note [1)]	**FDK:087L4151**	
Line power supply 12 ... 24 V AC/DC with battery backup and 3 m (9.8 ft) power cable for external connection (no battery included)	**FDK:087L4210**	
Mains power supply 115 ... 230 V AC with battery backup up and 3 m (9.8 ft) power cable for external connection (no battery included)	**FDK:087L4211**	
RS 232 add-on module, point to point communication interface with MODBUS RTU protocol	**FDK:087L4212**	
RS 485 add-on module, multidrop communication interface with MODBUS RTU protocol	**FDK:087L4213**	
PC Flow Tool on CD (Download for free from www.siemens.com/flow)	**FDK:087L6001**	
IrDA infrared interface adapter with USB for data acquisition with 1.2 m (3.9 ft) cable	**FDK:087L4163**	
MAG 8000 Hardware key to access protected parameters	**FDK:087L4165**	

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

9.2 Spare parts

Description	Order No.	Symbol
MAG 8000 compact transmitter (Basic version) replacement kit with system configuration specified by ordering. No battery included	**FDK:087L4166**	
MAG 8000 remote transmitter (Basic version) replacement kit with system configuration specified by ordering. No battery included	**FDK:087L4202**	
MAG 8000 advanced compact transmitter replacement kit with default configuration and blank product label. No battery included	**FDK:087L4203**	
MAG 8000 advanced remote transmitter replacement kit and blank product label. No battery included.	**FDK:087L4204**	
MAG 8000 advanced transmitter PCB replacement kit with default settings	**FDK:087L4168**	
Enclosure top including plastic lid, screws and blank product label	**FDK:087L4167**	
Cable for external battery pack, 1.5 m (4.92 ft) with IP68/NEMA 6P connector	**FDK:087L4152**	
Service tool kit package with various component for service and replacement *(Drawing indicates quantity in the package)*	**FDK: 087L4162**	
Remote cable set 5 m (16.4 ft) with IP68/NEMA6P plugs	**FDK: 087L4108**	
Remote cable set 10 m (32.8 ft) with IP68/NEMA6P plugs	**FDK: 087L4109**	
Remote cable set 20 m (65.6 ft) with IP68/NEMA6P plugs	**FDK: 087L4110**	
Remote cable set 30 m (98.4 ft) with IP68/NEMA6P plugs	**FDK: 087L4111**	



Item	Description
1	Transmitter Lid
2	Rubber band for holding down IrDA
3	Transmitter cover
4	Hold-down screws
5	Battery pack tie-down
6	Internal battery pack
7	Battery holder
8	Battery holder plate
9	O-ring for transmitter cover
10	Unit label and hardware lock protection
11	Transmitter PCB
12	PCB shield
13	Communication module (optional)
14	Silicagel bag
15	Screws
16	Cable shield connection
17	Brass transmitter base
18	Threaded conduit plug
19	M20 Cable glands
16	M20 glands
20	Cable
21	O-ring sensor*)
22	Sensor
23	Backup battery
24	Main power supply

*) Sensor o-ring, is available in two versions. To secure the IP ratings it is important to choose the right sensor o-ring to the sensor, when changing it.

Siemens has checked the contents of this manual for agreement with the hardware and software described. Since deviations cannot be precluded entirely, Siemens cannot guarantee full agreement. However, the data in this manual are reviewed regularly and any necessary corrections included in subsequent editions. Suggestions for improvement are always welcome.

Technical data subject to change without prior notice.

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Order no.: FDK:521H1193-08
Printed in: Denmark