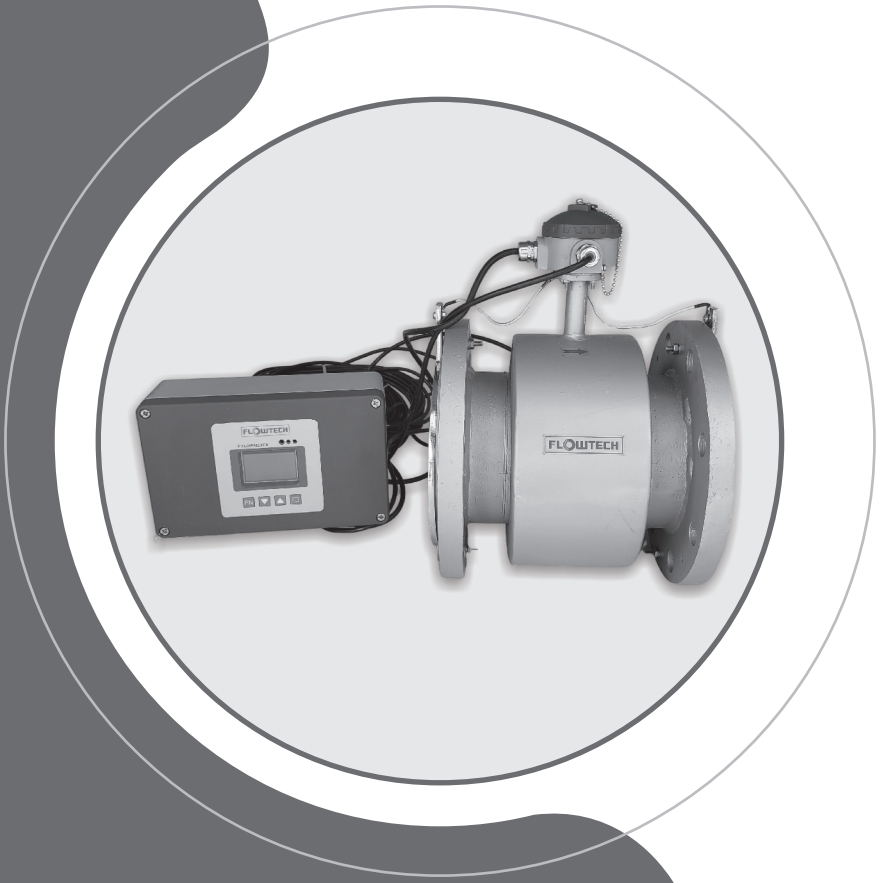
FLOWTECH



Flowtech Aqua 999

Battery Operated Electromagnetic Flowmeter Product Installation Guide & User Manual

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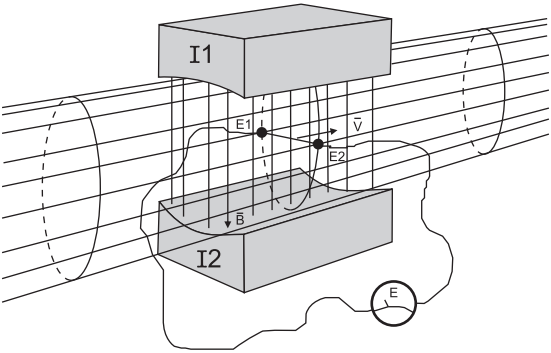
1. Operating Principle

The electromagnetic flow meter is an instrument for measuring the flow of conductive fluid using Faraday's electromagnetic induction law, and consequently the fluid must be electrically conductive.

As illustrated below a magnetic field with density B - perpendicular to the direction of flow - stretches across a fluid flowing within an electrically isolated pipe.

The magnetic flux will induce a voltage difference (E) that can be measured between two electrodes arranged perpendicular to the direction of flow and the magnetic field. The voltage is proportional to the velocity (V) of the fluid.



1) **$E = B \times D \times V \times k$ [Volt]** where

E is the voltage that is induced between the two electrodes

B is the magnetic flux density

D is the distance between the two electrodes

V is the fluid velocity

k is a dimensionless constant

The flow of the fluid Q (m3/s) is given by the following formula:

2) **$Q = \pi \times D2 \times V / 4 \Rightarrow V = 4 / (\pi \times D2)$** where

π : is the constant pi (= 22/7)

D : is the internal diameter

V : is the fluid velocity

The combination of above formulas 1) and 2) gives the following formula:

$$E = K \times B \times D \times Q \times 4 / (\pi \times D \times D) = 4 K \times B \times Q / (\pi \times D)$$

Evidently the voltage E is proportional to the actual flow.

2. Safety, Repair and Product Identification

2.1 Safety Instruction

- Read this manual carefully.
- Pay attention to the environment on the installation site.
- Wear necessary protective equipment and follow all current safety regulations.
- The FLOWTECH® can invoke a start signal for dangerous machinery. Always ensure that connected machinery and other equipment are effectively put out of service (that is to remove the main fuses and lock main and security switches in off-position) before commencing configuration, fault finding, servicing, maintenance work, etc.

- WARNING: There is a risk of lethal, electrical shock from "Mains supply" terminals N and L. Be careful not to touch these terminals while the FLOWTECH® is being serviced.

2.2 Physical Mounting

The FLOWTECH flow converter/flow meter must not be mounted in explosion hazardous areas!

2.3 Repair.

The FLOWTECH flow converter/flow meter must not be mounted in explosion hazardous areas!

3. Flow Sensor

The following conditions must be satisfied to get the full benefit of the MagFlux® flow sensor:

3.1 Minimum conductivity

- The conductivity of the media must be greater than 5 μS/cm.

3.2 Liner selection

- Use hard rubber lining for drinking water and waste water
- Use soft rubber lining for water with abrasive particles

3.3 Electrode selection

- Steel 316 L for general purpose, sewage, water and district heating systems

3.4 Mounting location

- To obtain a stable and accurate flow measurement, it is very important that the flow sensor is mounted correctly in the pipe system
- There must be no flow fluctuations and Pipe must be completely filled.
- Avoid locations where vacuum can occur; especially for flow sensors with Teflon™ linings
- Avoid locations with vibrations from for example pumps
- Avoid locations with extensive temperature changes
- Avoid corrosive environments and locations with a great risk of condensation, or consult factory for special builds for these locations
- Take care that condensate and water cannot enter the connector box on the flow sensor
- There must be sufficient free space around the flow sensor
- Proper grounding is mandatory.

4. Accuracy

According to the type and size of the flow sensor, the measuring accuracy will be better than 1.0 %, provided that the flow sensor has the correct dimension.

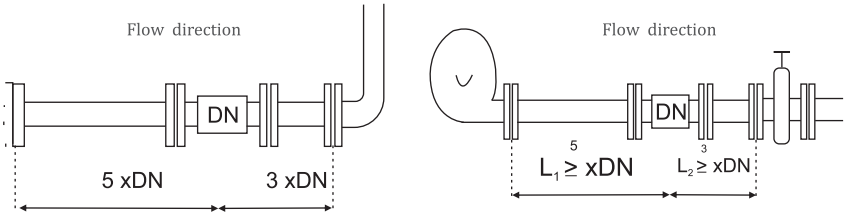
5. Sizing

The flow sensor should be selected so the flow velocity through the sensor will be between 0.5 - 5 m/s. FLOWTECH recommends that flow velocities in tubes are kept between 3 m/s for reliable and safe operation. See also the dimensioning table below and the dimensioning chart on the following page.

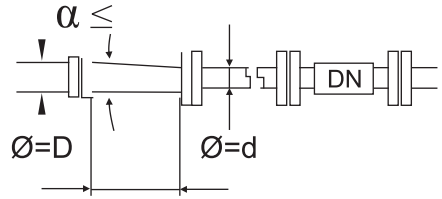
LINE SIZE	LPM		M^3/HR	
	Min Fluid Velocity @0.5m/sec	Max. Fluid Velocity @ 5m/sec	Min Fluid Velocity @0.5m/sec	Max. Fluid Velocity @ 5m/sec
15 mm (1/2")	5	50	0.30	3.0
25 mm (1")	15	150	0.90	9.0
40 mm (1 ½")	37	370	2.20	22.0
50 mm (2")	60	600	3.53	35.6
65 mm (2 ½")	100	1000	6.00	60.0
80 mm (3")	150	1500	9.00	90.0
100 mm (4")	235	2350	14.10	141.0
125 mm (5")	368	3676	22.07	220.0
150 mm (6")	530	5300	31.80	318.0
200 mm (8")	942	9420	56.52	565.2
250 mm (10")	1471	14710	88.31	883.1
300 mm (12")	2119	21190	127.17	1271.7
350 mm (14")	2884	28840	173.09	1730.9
400 mm (16")	3766	37660	226.08	2260.8

6. Pipe System

- The flow sensor must be mounted in a location which is free from interfering elements like valves, TS, bends, pumps, etc. to ensure a laminar flow without turbulence upstream of the flow sensor. For that reason, the flow sensor must be mounted in a straight pipe at a distance from interfering elements of minimum 5 x DN upstream and minimum 3 x DN downstream.



- If it becomes necessary to use reducers, the inner angle must not exceed 7.5°



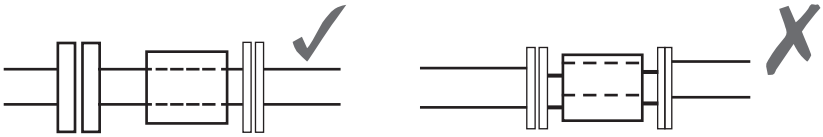
The minimum length to keep the angle below 7.5° can be checked by means of the formula below:

L = (D - d) x 7.63

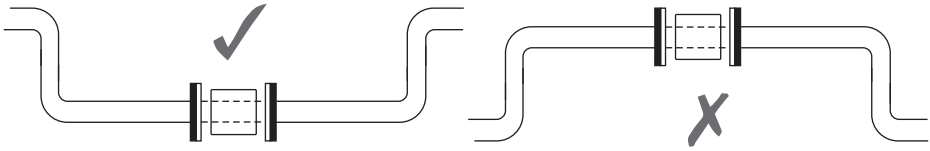
(where "D" is the large diameter and "d" the small diameter of the reducer)

Example: If a flow sensor in dimension DN 80 is mounted downstream of a 100 mm pipe, the reducer must then have a length of minimum 152.6 mm in order to keep the inner angle below 7.5°.

- Flange connections must be assembled concentrically on both the upstream and the downstream side. Measuring accuracy will be affected by turbulence in the liquid from poorly made connections.



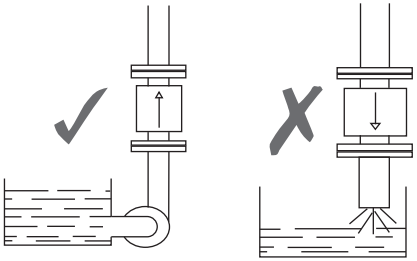
- The Flow sensor should always be filled with liquid. For that reason, the flow sensor must not be mounted at the highest point of the pipe system or in free outlets where gravity could empty or partially empty the pipe.



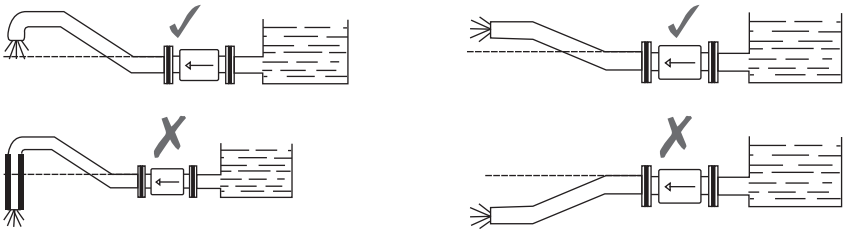
- The flow sensor can be mounted vertically or horizontally. If the flow sensor is mounted vertically, the flow direction should always be upwards.

  In that way the effect from possible bubbles in the liquid will be significantly reduced, just as it will ensure that the flow sensor is always filled with liquid.

  In case the liquid is carrying particles, for example when measuring sludge, sewage, etc., the flow sensor must be mounted vertically.



- When mounting horizontally in pipes with free downstream outlet, the flow sensor should be mounted such that it will always be filled with liquid, for example in a bend situated lower than the height of the outlet. In case the liquid is carrying particles, e.g. when measuring sludge, sewage etc. the flow sensor must be mounted vertically.



7. Electrical and Grounding

- No external power wiring required
- Grounding rings or grounding electrodes must be installed
- Do not share grounding with heavy electrical equipment
- Improper grounding may cause unstable readings

8. Display and Keypad Operation

8.1 Display Information

- Instantaneous flow rate
- Cumulative total flow
- Battery status indicator
- Error or alarm messages

8.2 Key Functions

- MENU: Enter setup mode
- UP / DOWN: Scroll through parameters
- ENTER: Confirm selection

9. Parameter Settings

Common configurable parameters include:

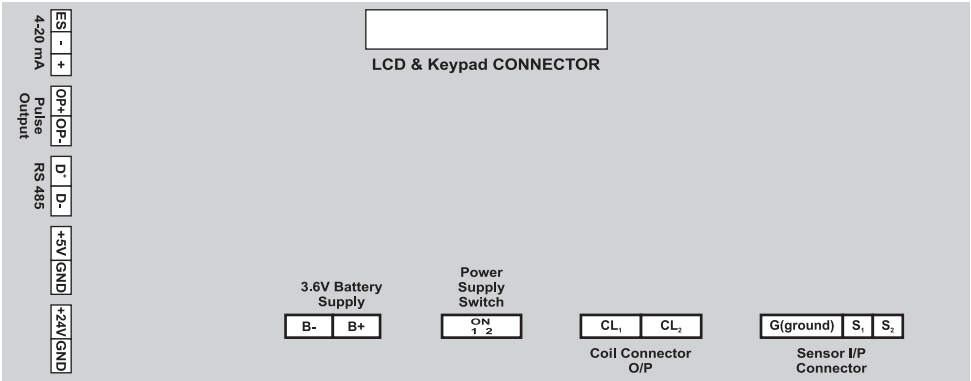
- Pipe diameter
- Flow unit selection (m^3/h, L/s, etc.)Totalizer reset
- Sampling interval
- Communication parameters (if applicable)

Note: Factory calibration parameters must not be modified without authorization.

10. Hardware

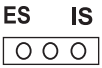
10.1 Hardware View

(A) CONNECTION DIAGRAM FOR BATTERY OPERATED PCB (3.6 V)



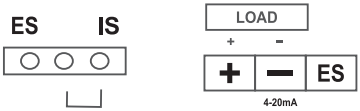
10.2 Hardware Connection

- 4-20mA Connection

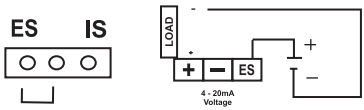


a) Hardware has two source options. (Internal & External)

b) Default connection is internal Source (IS), which uses supply current from hardware itself

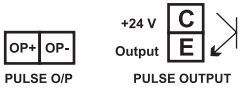


c) To change supply from PLC/ External source, place jumper on ES side

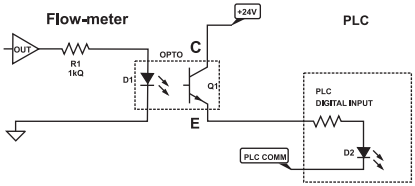


- RS- 485 Connection
  Connect D+ & D- Wire from Master device to flow-meter

- Pulse Output Connection



Connecting Flow-meter with Sinking Output to a PLC Controller Sourcing Input



11. Software

11.1

- Switch - 1 Enter Function Key
- Switch - 2 Backward Key
- Switch - 3 Forward Key
- Switch - 4 Esc Key
- 11.2 Password Setting
- Password: Press one Time FN key should Displayed Password.
- Basic Configuration
- Password - 0001

•Press Enter 0001 Password

11.3

- Unit Select - Press FN key & Press Down or Forward key for dipper unit selection.
- After selecting of unit Press last Esc (R) key for main flow display.
- In 0001 Password
- Many Function Below

1. Unit Select, 2. Flow Direction, 3. Warning Display, 4. Set Pulse Unit, 5. Set Pulse Count, 6. Cut Off Set, 7. Average Time, 8. Modbus Device ID, 9. Flow At 4mA, 10. Flow At 20mA, 11. Comn Mode
12. Contrast

- m 0009 Password

13. Calibration Setting
1. Pipe size, 2. Coil freq, 3. Set flow zero, 4. CAL Comn, 5. CAL 1 Factor, 6. CAL 1 Range, 7. CAL 2 Factor, 8. CAL 2 Range, 9. CAL 3 Factor, 10. CAL 3 Range

12. Modbus Setting

- Output Format: Float
- Data Size: 8
- Parity: None
- Stop bit: 1

12.1 Set Device ID

- After Enter in the **"MODBUS"** press **Enter** Key to **"SET DEVICE ID"**
- Use the Switch (SW-2) to **shift** and Switch (SW-3) for **Increment**

12.2 SET BAUD RATE

- After pressing Enter in the "MODBUS" Setting press Shift Key to "SET BAUD RATE"
- In BAUD RATE, Use Increment key (SW-3) to set Different Baud Rate

Transmission mode	: Standard RTU
Slave response time out	: 2000 ms
Delay between polls	: 250 ms
Default Device ID	: 1
Default Data	: Float: Most significant register first
Starting Address	: 0001 (30001)
Length	: 6
Register	: Input Register (Modbus Function Code FC = 4).

Data Format as Float (Not Swapped Float)

Address Map:

30001: Flow (Unit Will be same as Display)
30003: Positive Totalizer1(Unit will be same as Displayed)
30005: Positive Totalizer2(Unit will be same as Displayed)
30007: Positive Totalizer(Unit will be same as Displayed)
Positive Totalizer = (65535 x Positive Totalizer1) + Positive Totalizer2

13. Passwords For Aqua 999

Password	
Basic Config	: 0001
Calibration	: 0009
Flow count/ADC count	: 2023
O/p Calibration	: 2024
Edit Totalizer	: 5432
Reset totalizer	: 1998
Reset config	: 1975
Factory Reset	: 1986
Gain Setting	: 2345

14. Maintenance

- No routine maintenance required
- Periodic inspection recommended:
- Sealing and enclosure integrity
- Grounding connections
- Display condition
- Clean electrodes only if heavy scaling or deposits occur

15. Battery Replacement

- Replace battery only with approved type
- Switch off device before replacement
- Reset battery life indicator after replacement
- Dispose used batteries according to local regulations

16. Troubleshooting

- No Power: Check Fuse, Power cord, Mains supply across L&N
- No Flow Indication: Check voltage across CL1 & CI2
- a) Without coil connected: 22-24 Volt pulsating DC
- b) With coil connected: 10-12 Volt pulsating DC
- c) Check Sensor Connection S1, S2, G & PE
- Wrong Flow: Check Switch position (Default 1-ON, 2,3,4-OFF), Set Calibration Factor
- No RS-485 Data: Check D+ & D- connection, Device ID & Output Format
- No 4-20mA: Check I+ & I- connection, count setting for 4ma & 20mA
- Minor flow indication at No flow: Set Cut off Span Proper (PIZ Reduce cut off value)
- (For further information, kindly contact Flowtech Measuring Instruments)

17. Safety Precautions

- Do not open electronics in hazardous areas
- Do not install on empty or partially filled pipes
- Follow all local electrical and safety regulations

18. Standard Tests

Each finished product is thoroughly checked to establish the product completeness and compliance with the manufacturer's quality assurance standards. Subsequently the product functions are tested according to specifications of the approved test directions and subject to at least 24-hour burn-in operation cycle.

19. Calibration and Verification Tests

All flowmeters from FLOWTECH are calibrated in our testing facility and then supplied.

20. Changes

As our products are developed continuously, we reserve the right to make any alterations without prior notice.

FLOWTECH

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