Electromagnetic Flowmeter

Battery Operated

Wafer Type

Inline Type

Flowtech

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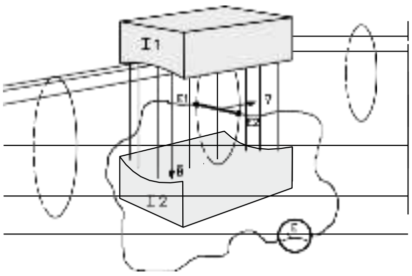
1. Product Description

The **Electromagnetic Flowmeter** or **Mag Meters** are suitable for flow measurement in all kinds of conductive fluids, and it is especially suited for flow measurement of Water, Waste Water, Sludge and other fluids containing particles. The flow meter is easy to install and put to service.

2. 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 x D x V x 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 (M^3/Sec.) is given by the following formula:

(2) $Q = \pi \times D^2 \times V / 4 \Rightarrow V = 4 / (\pi \times D^2)$ 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.

3. Measurement

Electromagnetic flow meters may have either Direct Current (DC) or Alternating Current (AC) excitation. When systems are AC excited, electrostatic and/or electromagnetic noise may influence the measurements. A DC excited system however, is less sensitive to noise produced by electromagnetic induction, simply because the voltage induced over the electrodes will be a DC voltage. The drawbacks are measurement errors due to electro-chemical polarization between the electrodes and the fluid.
The Electromagnetic Flow Meters are excited by a 2.5 Hz square wave and thereby eliminate the drawbacks of both DC and AC systems.
A microprocessor receives and measures the amplitude of the pulse with a 16 - bit resolution, and converts and displays the result on the display unit.

4. Flow Sensor

The following conditions must be satisfied:

5.1 Minimum conductivity

The conductivity of the media must be greater than 20 µS/cm.

5.2 Liner selection

- Use PTFE lining for chemicals and food industries
- Use hard rubber lining for drinking water and waste water
- Use PFA/FEP lining suitable under vacuum line

5.3 Electrode selection

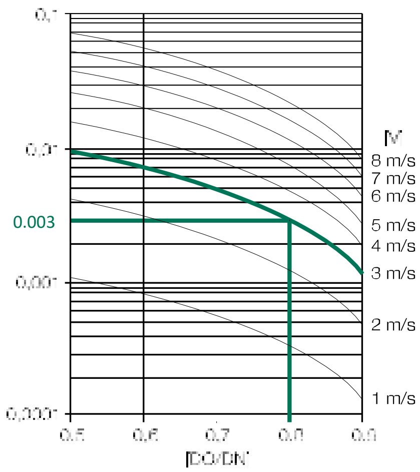
- S.S. 316 / S.S. 316L for general purpose, sewage, water and district heating systems
- Hastelloy ‘C’ for sea water
- Tantalum / Titanium / Platinum for chlorine and other aggressive chemicals

5.4 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.
- Avoid locations where vacuum can occur; especially for flow sensors with PTFE 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.

5. Pressure Loss

The pressure loss can easily be determined, if the nominal pipe diameter is greater than the **Flowtech** flow sensor. See the diagram below.

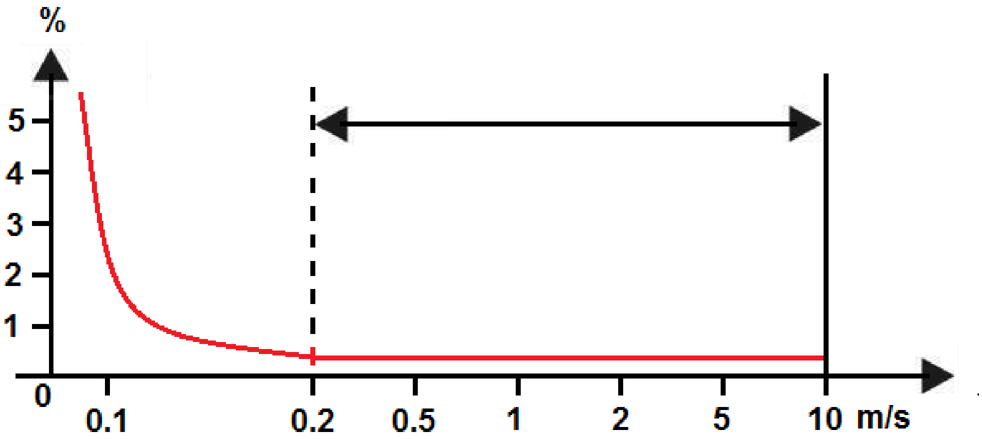


Pressure loss graph

The diagram illustrates that decreasing the internal diameter from 100 mm (DN) to 80 mm (DO) will cause a pressure loss of 0.003 Bar @3 m/s.

6. Accuracy

According to the type and size of the flow sensor, the measuring accuracy will be better than ± 0.5%, provided that the flow sensor has the correct dimension.



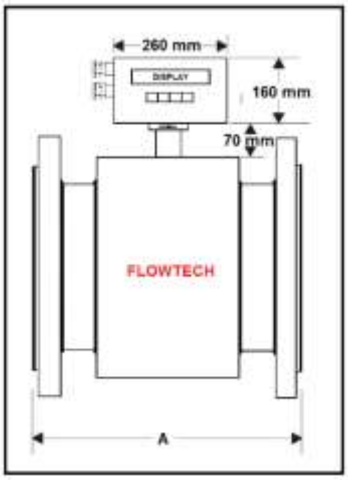
7. Sizing of Flow Sensor

The flow sensor should be selected so the flow velocity through the sensor will be between 0.5 to 5.0 m/s. **Flowtech** recommends that flow velocities in tubes are kept between 1 – 3 m/s for reliable and safe operation.

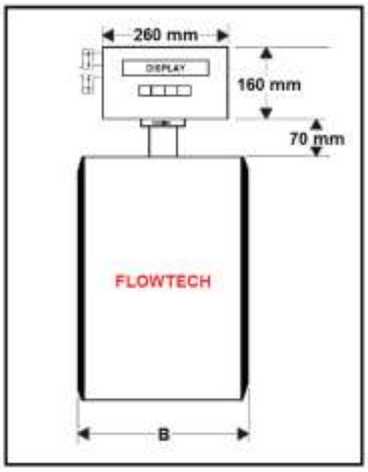
8. Flow Capacity Table

LINE SIZE	Dimension Flanged Type A	Dimension Wafer Type B	LPM Min Fluid Velocity @ 0.5m/sec	LPM Max. Fluid Velocity @ 5m/sec	M^3/HR Min Fluid Velocity @0.5m/sec	M^3/HR Max. Fluid Velocity @ 5m/sec
15 mm (1/2")	142 mm	N.A.	5	50	0.30	3.0
25 mm (1")	142 mm	N.A.	15	150	0.90	9.0
40 mm(1 ½")	200 mm	N.A.	37	370	2.20	22.0
50 mm(2")	200 mm	115 mm	60	600	3.53	35.6
65 mm(2 ½")	200 mm	125 mm	100	1000	6.00	60.0
80 mm (3")	250 mm	135 mm	150	1500	9.00	90.0
100 mm (4")	250 mm	145 mm	235	2350	14.10	141.0
125 mm (5")	250 mm	150 mm	368	3676	22.07	220.0
150 mm (6")	300 mm	150 mm	530	5300	31.80	318.0
200 mm (8")	350 mm	180 mm	942	9420	56.52	565.2
250 mm (10")	400 mm	200 mm	1471	14710	88.31	883.1
300 mm (12")	500 mm	220 mm	2119	21190	127.17	1271.7
350 mm (14")	500 mm	N.A.	2884	28840	173.09	1730.9
400 mm (16")	600 mm	N.A.	3766	37660	226.08	2260.8
450 mm (18")	635 mm	N.A.	4769	47690	286.14	2861.4
500 mm (20")	700 mm	N.A.	5888	58880	353.25	3532.5
550 mm (22")	750 mm	N.A.	7124	71240	427.5	4275
600 mm (24")	815 mm	N.A.	8478	84780	508.68	5086.8

9. GA Drawings of Types of Electromagnetic Flowmeter



Integral
Flanged Type



Integral
Wafer Type

ALL THE SPECIFICATIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE

10. EMF Type Guidelines

- Integral Type : Suitable for ground level and upto 5 feet above ground level or vertical lines upto 10 feet
- Remote Type : Suitable for overhead lines or limitations of vertical space
- Wafer Type : Suitable for bigger size lines as well as limitations of pipe length
- TC Joint : Suitable for food industries

11. Data Logger

A Data Logger is an electronic Instrument that records measurements at set intervals over a period of time. Depending on a particular Data Logger, measurements can include: Water Flowmeter relative Humidity, Differential Pressure, Temperature, Water Level and many more.

All the Data from the Instrument is taken to the desk top by RS 485 communication ports. These data can be interpreted in many graphical formats by the higher layer user interactive software.

We can provide Single, Eight & Sixteen channels data logger & software.

12. Batch Controller

Flowtech can provide Batch Controller unit through which we can transfer exact volume of liquid. Our Batch Controller requires 230 V AC & 5 Amps. input & it gives 2 relay output.

13. Applications

- Chemical Industry
- Fertilizer Industry
- Petroleum Industry
- Sugar Industry
- Food Industry
- Distillery Industry
- Power Plants
- Pharmaceutical Industry
- Dyes and Intermediate Industry
- Steel Industry
- Mining Industry
- State Water and Sewage Industry

14. Model De-codification

FMIPL	EMFM	F	C	PL	EL1	AC1	I		

Connection Type	
Description	**Code**
Flange ANSI	F
Wafer	W
Tri Clover JT	T
Others	O

Connection Material	
Description	**Code**
CS	C
SS 304	S1
SS316	S2
Others	OT

Lining Material	
Description	**Code**
Rubber	RL
PTFE	PL
PFA	PA

Electrode Material	
Description	**Code**
SS 316	EL 1
SS 316L	EL 2
Hastalloy 'C'	EL 3
Tantalam	EL 4

Line Size	
Description	**Code**
1/2"	015
3/4"	020
1"	025
1 1/2"	040
2"	050
2 1/2"	065
3"	080
4"	100
5"	125
6"	150
8"	200
10"	250
12"	300
14"	350
16"	400
18"	450
20"	500
22"	550
24"	600

Transmitter	
Description	**Code**
Integral	I
Remote	RE

Power Supply	
Description	**Code**
230 VAC	AC 1
110 VAC	AC 2
24 VDC	DC
Battery	BS

Output	
Description	**Code**
4 20 mA	M
RS 485	CR
Pulse Output	P