User's Manual

Electromagnetic Flow Meter

Micro – Megha

Manufactured By:

Major Instruments

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GENERAL INFORMATION

The **Electromagnetic flow meter** are flanged or insertion type electromagnetic flow meters used for pipe 1/2” to above in municipal or industrial water, wastewater and chemical application where propeller meters have typically been used in the past. Because the **Electromagnetic flow meter** has no moving parts and has electrodes designed to discourage fouling, this magmeter performs well and requires much less frequent maintenance in applications where debris or sand would impede propeller meters. There is no rotor to stop turning or bearings to wear out. Minimal straight pipe requirements allow Electromagnetic flow meters to be used in piping configurations where there is little space between the meter and an elbow. Rate and total indications are standard on both models. Flow measurement units are customer-selected and factory set and can only be changed in the field by an authorized Major Instruments.

Measuring Principle:

The measurement is based on Faraday’s law of Electromagnetic Induction according to which, when a conductor is moved in a magnetic field, a voltage is induced in the conductor. The voltage induced, in the case of an electromagnetic flow meter is:

U=K. B. V. D.

K=Instrument constant

B=Strength of magnetic field

V=Average Velocity

D=Pipe diameter.

SPECIFICATIONS:

Pipe size	DN10 to DN2000 (for higher sizes consult factory)	
Flanges	Carbon Steel / SS 316 / SS 316L / SS 304 / ANSI / PN/ DIN / BS / SMS / Tri-clamp.	
Pressure	Up to DN 80: PN 40, DN 100 to DN 200: PN 16, DN 250 to DN 350: PN 10	
Temperature	PFA Liner 0-200°C max, PTFE Liner 0-150°C max, Rubber Liner 0-90°C max, (Ambient Temperature Range 0-50°C).	
Accuracy	±0.5% of reading [at ref. conditions] between 100% to 10% of calibrated range ±0.7% of reading for flow rate between 10% to 5%[refer accuracy graph]	
Materials Body Liner Electrode Electronics Housing	Stainless steel / M.S. Soft and Hard Rubber / PTFE / PFA/ Neoprene. S.S.316, Hastelloy 'C' & 'B' Titanium IP65 Die cast Aluminum	
Display Digits	Flow Rate	Sub Total
	04	09
Units	Gallons/Minute Liters/Second Liters/Minute M^3 /Hr	Gallons x 1000 Liters Liters M^3
Power	230VAC/110VAC, 50Hz/24VDC.	
Pulse output Signal output Frequency output	With adjustable count rate from 1count/Hr to 10^5 Counts/Hr.(Open collector with 100 mA/24V dc Capacity) 4-20 mA dc isolated in max. 600 ohms. 0-10KHz prop. To 100% Flow rate (oper collector with10 mA /24Vdc max)	
Flow range	0.1 m/s to 10m/s	

INSTALLATION AND GROUNDING

INSTALLATION :

POSITIONING THE METER:

These meters can be installed horizontally, vertically, and radial position.

STRAIGHT PIPE RECOMMENDATION:

As with most flow meters, the **Micro-Megha** requires some straight pipe before and/or after the meter for best accuracy. However, the ability of electromagnetic meters to average the flow across the entire pipe allows for shorter straight pipe recommendations than most mechanical meters.

FULL PIPE RECOMMENDATION:

All magmeter require a method for determining that the pipe is empty, to prevent false reading. This meter is designed to go to zero reading if one or more electrodes are exposed. For highest accuracy, install the meter so that the pipe will be full when there is flow. If air bubbles may be present in the pipe or sludge accumulation is an issue, rotate the meter by one flange hole to position the control housing at 45° angle.

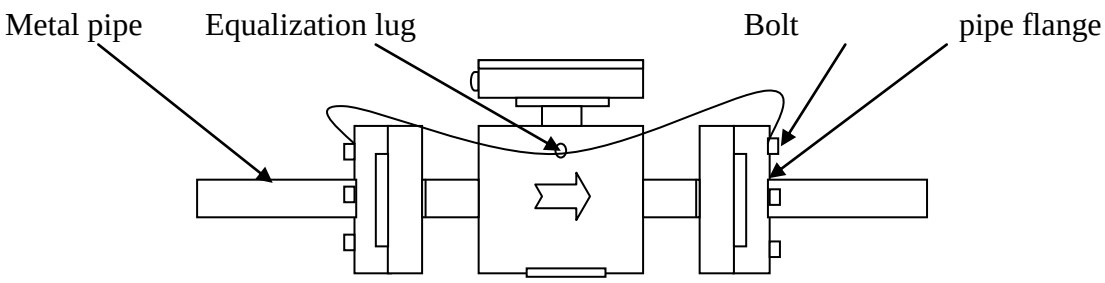
FITTING:

The **Micro-Megha** flanges have standard ANSI 150lb, and mate with any other flanges.

CALIBRATION: The **Micro-Megha** flow meters are factory calibrated and will not require any form of field calibration.

EQUALIZATION AND GROUNDING

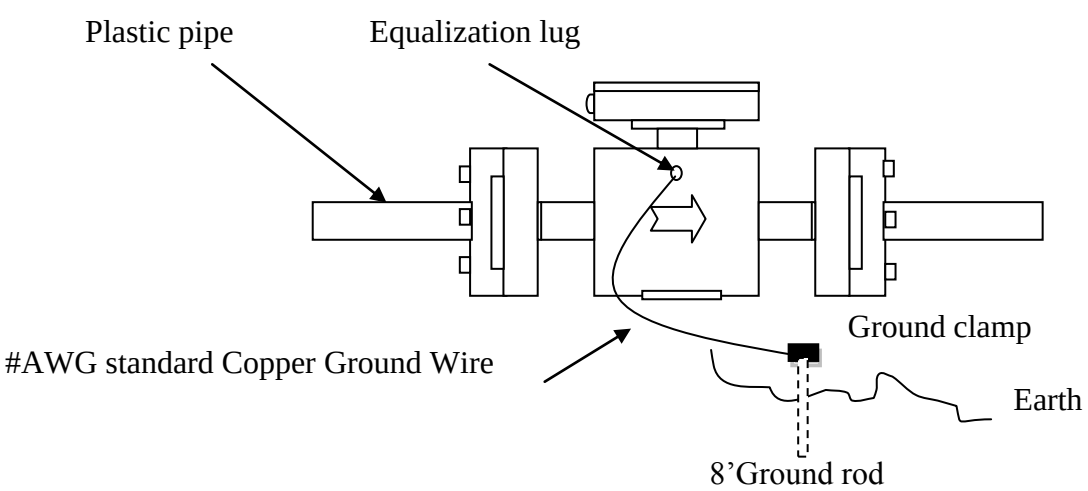
Metal pipe Installation: To equalize the electrical potential of the fluid, the **Micro-Megha** G meter, and the surrounding pipe secure the flange plates (factory installed on the equalization lug) to both pipe flange at one of the bolt holes, as shown below. Be sure the lock washer fits between the pipe flange and the flange plate.



EQUALIZATION DIAGRAM

Run wire from equalization lug to both pipe flanges;
Secure flange plates under bolt heads as shown.

Plastic pipe Installation: When the **Micro-Megha** is installed in the plastic piping system, it is not necessary to use the equalization straps, but very important to ground the meter to avoid electrical shock hazard and electrostatic interference with meter function.

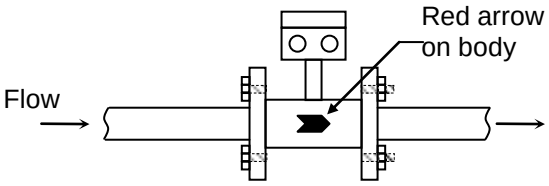


GROUNDING DIAGRAM

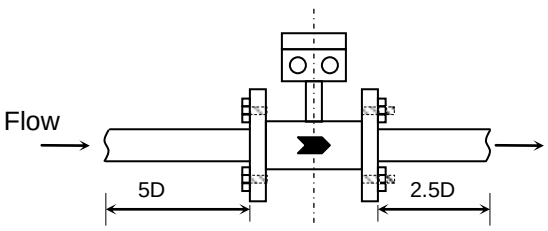
Commissioning of Primary Flow Meter

The Primary Flow Tube can be installed at any point in the pipe run either horizontal or vertical provided the following conditions are met:

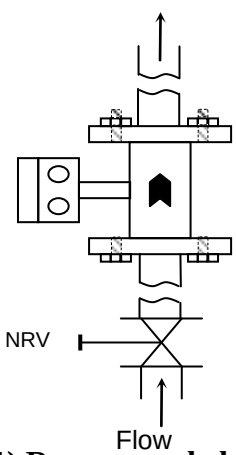
1. The **direction of flow** through the pipe is same as indicated on the primary flow tube by a red arrow.



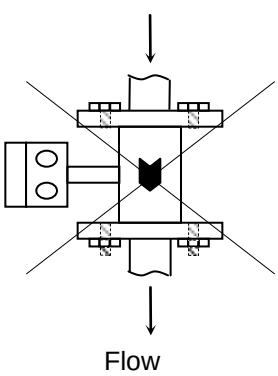
2. **Straight lengths** of maximum 5D on upstream and minimum 2.5D on down-stream as shown. If disturbances like cork screwing or vortex flow conditions are present straight lengths should be increased or flow straightners should be used. Flaps, slidegates, valves etc should be arranged at a distance of at least 5D downstream of primary flow tube.



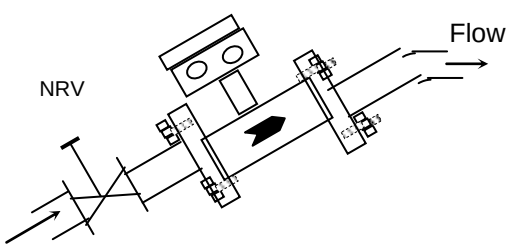
Ensure that primary **flow tube remains completely filled** by the fluid under measurement even under no flow condition. This ensures trouble free and reliable operation of the Flow Meter. Select a location on the pipe, which will always run full of liquid. For vertical installations the direction of flow against Gravity ensures full pipe. Some of the recommended installations are as under -



1) Recommended



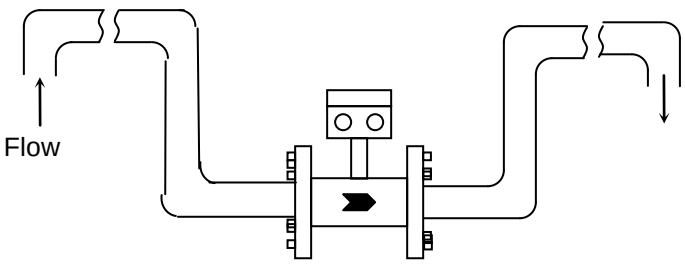
2) Not Recommend



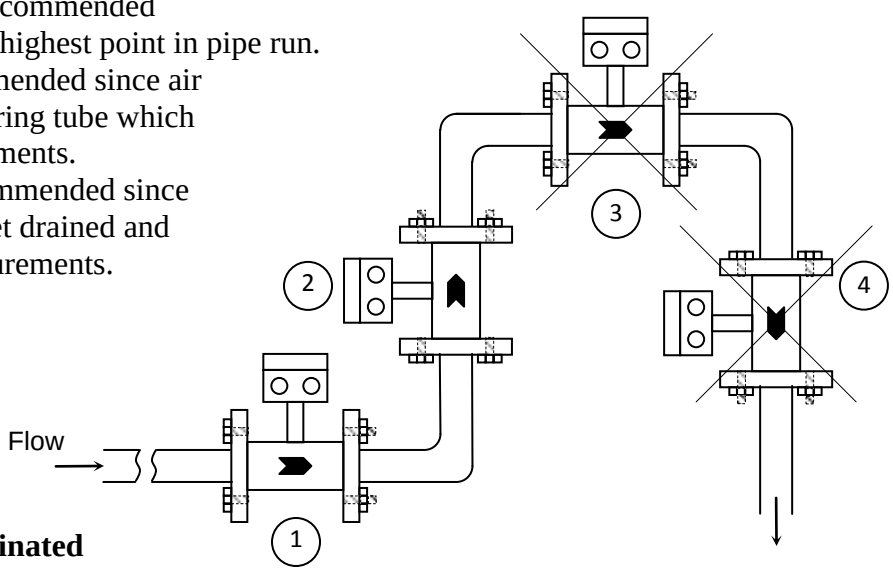
3) Recommended

Open Feed or Open Discharge

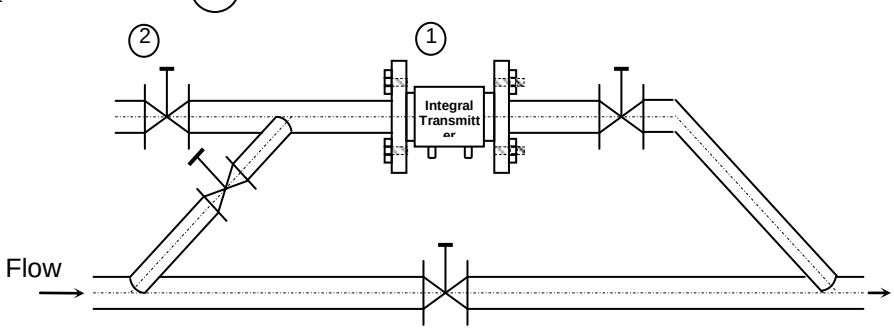
Provide sluice underpass if Full pipe cannot be assured. This ensures full pipe under No flow condition.



5. Locations 1 and 2 are recommended locations, Location 3 is the highest point in pipe run. This location is not recommended since air bubbles collect in the metering tube which will lead to faulty measurements. Location 4 is also not recommended since at zero flow the line will get drained and hence will give false measurements.

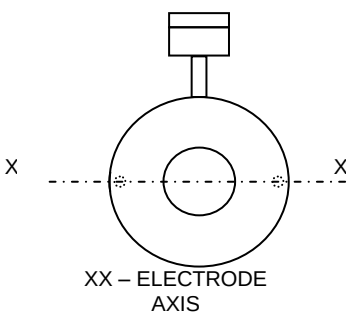


6. In case of **heavily contaminated Fluids**, the primary flow tube should be installed with a Bypass pipeline and isolation valves so that it can be removed for cleaning without interrupting operation.

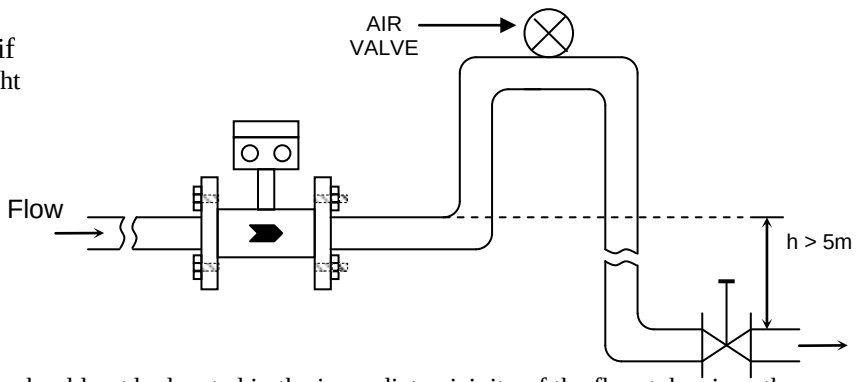


1. Primary Flow tube
2. Isolation valve and pipeline For Draining and Cleaning

7. For **Horizontal installations** the measuring electrode axis should always lie in horizontal plane to prevent contamination on electrodes and avoid loss of contact of electrodes with fluid because of gas bubbles, if present.



8. Fit **Air valve** as shown if
The down pipe is at a height
Greater than 5 meters to
Remove vacuum.



a. **Strong Electromagnetic fields** should not be located in the immediate vicinity of the flow tube since these could affect the field generated by the coils in flow tube and hence disturb the reading stability and accuracy. Ensure that **no magnetic material** other than the pipe and connecting flanges should come in contact with the flow tube.

b. Ensure that the **minimum conductivity** of the fluid under measurement is **greater than 5 µseimens / cm** is maintained. Ensure that the fluid under measurement **does not contain magnetic particles** in it otherwise it will lead to measurement errors.

c. **Reducers -**
Reducers should be flanged and generally
Shall reduce by one size nominal bore otherwise
The pressure loss will be high.
The table given below is a general guideline
Dimensions for reducers

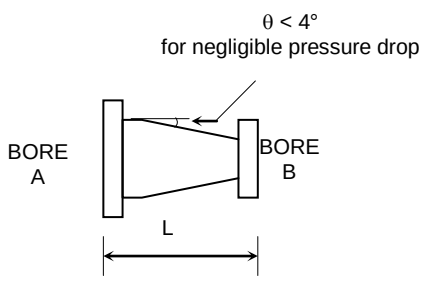
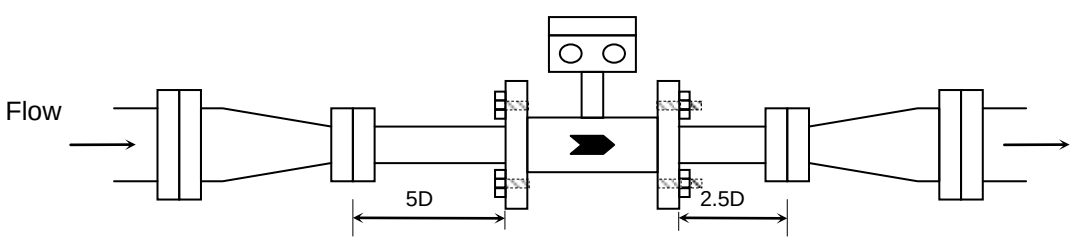
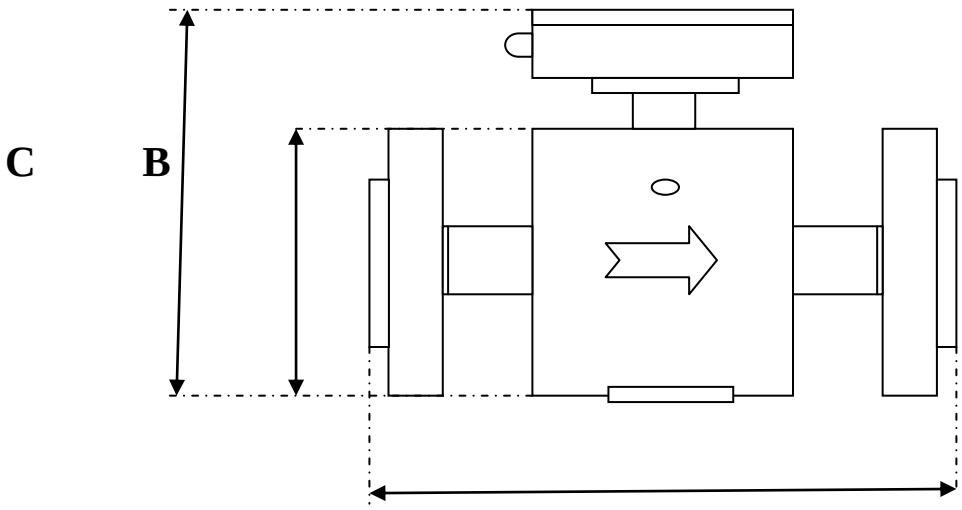


Table:

Nominal Bore A (in mm)	Nominal Bore B (in mm)	Length L (in mm)
40	25	150
50	40	200
65	50	200
80	65	200
100	80	250
150	100	300
200	150	300



DIMENSIONAL DETAILS OF MAGNETIC FLOW METER ASSEMBLY



METER SIZE					
DN	A (mm)	B (mm)	C (mm)	Weight Kg	Weight ±
15	180	89	290	6.0	1.0
20	180	99	290	6.5	1.0
25	180	108	295	7.5	1.0
32	180	118	295	8.5	1.0
40	180	127	285	9.0	1.5
50	180	155	310	11.0	1.5
65	180	178	335	14.5	1.5
80	180	190	350	16.5	1.5
100	230	229	385	22.0	1.5
125	230	254	410	26.0	1.5
150	230	280	435	29.0	2.0
200	300	343	500	43.0	2.0
250	350	407	560	57.0	2.0
300	400	483	640	77.0	2.0

RANGE CHANGES

The **Micro-Megha** is supplied for a fixed full scale range. The name plate contains the following information:

Full scale range in m3/hr, Ltr/min or Ltr/sec etc
Primary Constant
Note the following when using options.

Conversion of range changes

In order to affect a range changes. The full scale range (m3/hr) for a given meter size (DN in mm or inches) must be converted into the exact flow velocity (v) in m/s or ft/sec. in accordance with the details given in the following table.

Flow Table:

DN	V=0.5m/s (min) m^3/hr	V= 5m/s(max) m^3/hr
15	0.318	3.18
25	0.883	8.83
40	2.26	22.6
50	3.53	35.3
65	5.97	59.7
80	9.04	90.4
100	14.13	141.3
125	22.07	220.7
150	31.8	318.0
200	56.52	565.2
250	88.312	883.01
300	127.17	1271.7

The Optimum flow velocity should be 2-3 m/s or 6-9 ft/s.
For products with solid contents it should be between 3 and 5 m/s or 9-15 ft/s.
The exact flow velocity can be determined from the columns in the tables.
For V= 12m/s as shown in the following example.

Example for m3/h:

Meter size: DN80

Desired measuring range: $55M^3/hr$

From the table 1 obtain for V = 5m/s the flow rate of 220.7 M^3/h at DN80.

$$v = \frac{55m^3/hr}{220.7m^3/hr} \times 5\,m/s\,; \quad V = 1.24\,m/s\,.$$

1. Product Function Specification

1.1 Base Function

Suitable to Size of the Sensor (mm）:

1，2，3、6、8，10、15、20、25、32、40、50、65、80、100、125、150、200、250、300

Power Supply

Power supply ：**85VAC --- 265VAC**

The Velocity Range:

0.2 - 15 m / s, velocity resolution: 0.5 mm / sec

Empty-Pipe Check And Full-Pipe Check

Automatic & continuous measure the condition of liquid and diplay the empty pipe and full pipe message. do not need the full -pipe calibration and Avoid false alarm

Output Signal (AC and DC power supply type)

Current output: 4 to 20mA,load;resistance：0～750Ω,Base deviation：0.1%±10μA。

Frequency output: Frequency range is 100～5000Hz；Photoelectric isolation, isolation voltage：> 1000VDC；

Pulse equivalent output: user defined pulse width,automatic conversion to square wave at high requency ;Photoelectric isolation, isolation voltage：> 1000VDC；

Alarm Output

Alarm output contact：**H-ALM** and **L-ALM ;** Photoelectric isolation, isolation voltage：> 1000VDC；Output driver：Maximum withstand voltage 36VDC, maximum load current 30mA.

Communcation

Communication ：RS485 (standard)、HART (option)

MODBUS interface：RTU format，Physical interface：RS-485，Electrical isolation：1000V；

HART interface：Support standard HART protocol

Language And LCD Dispaly

English ,With LCD,display flow rate , total flow , velocity etc

Nonlinear Correction Function：Multi segment linear correction,suitable to variety of sensors **Automatic Zero Calibration Function**

Quick Response, Response time of 0.3 seconds

Electrode Self-Cleaning Function

Protection

with lightning protection circuit design. High efficiency anti interference circuit, suitable for all kinds of harsh . Grade of Protection: IP65 or IP68

1.2 Working conditions

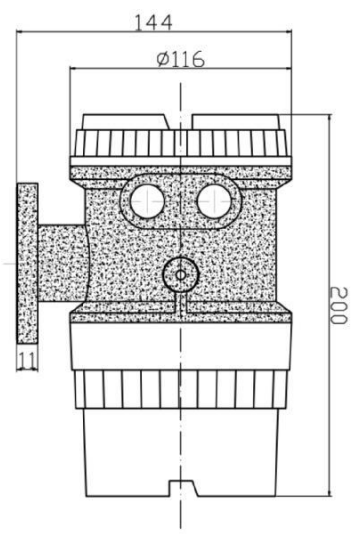
Ambient temperature：–20～+65℃；Relative humidity：5%～90%；Power: less than 10W (after connecting the sensor).

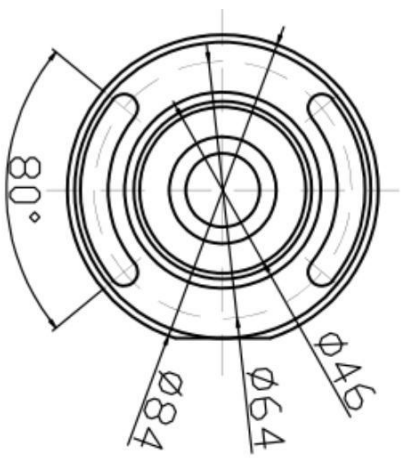
1.3 Connection type with sensor

Integral type and Separate type

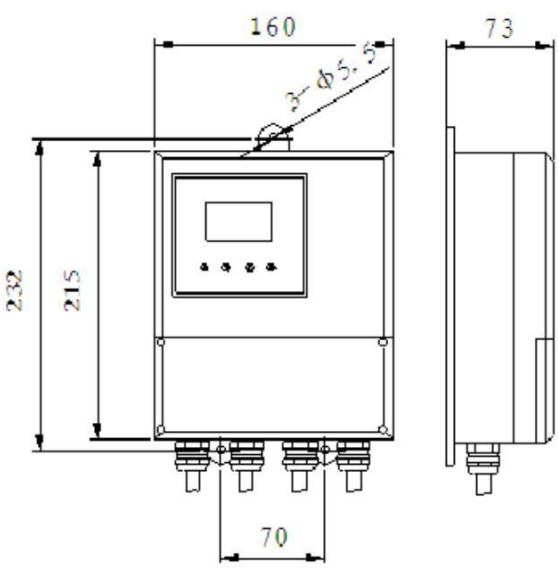
1.4 Transmitter outline dimension and type

Integral type





Separate type



. Transmitter Operation And Parameter Setting

2.1 Keyboard Definition and Display

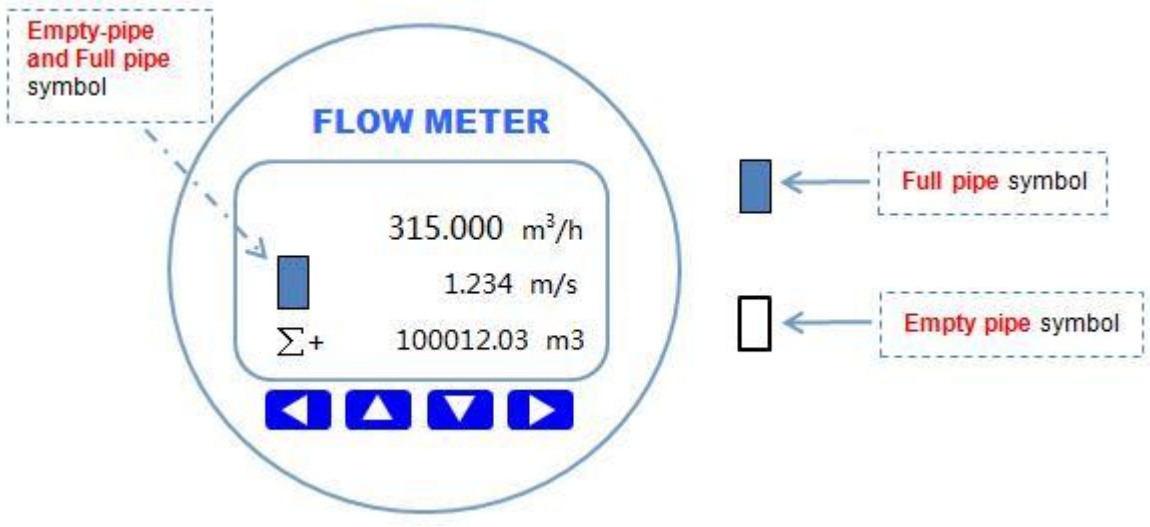


Figure A

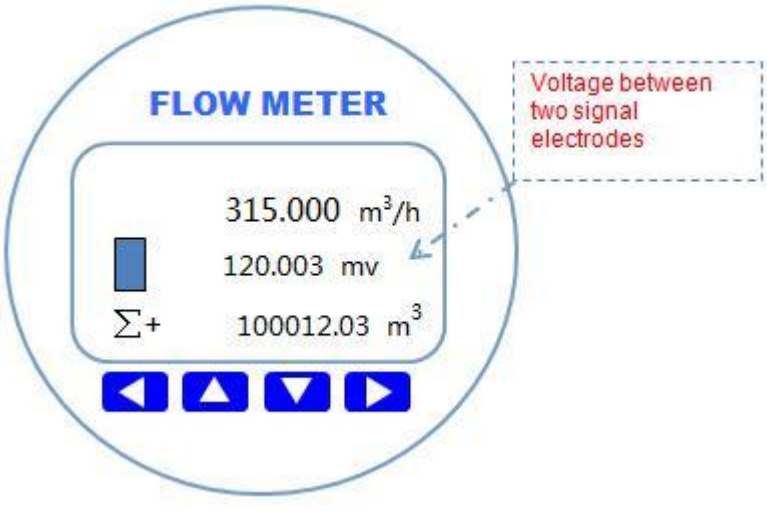


Figure B

Left shift, parameter setting confirmation key and exit sub directory key

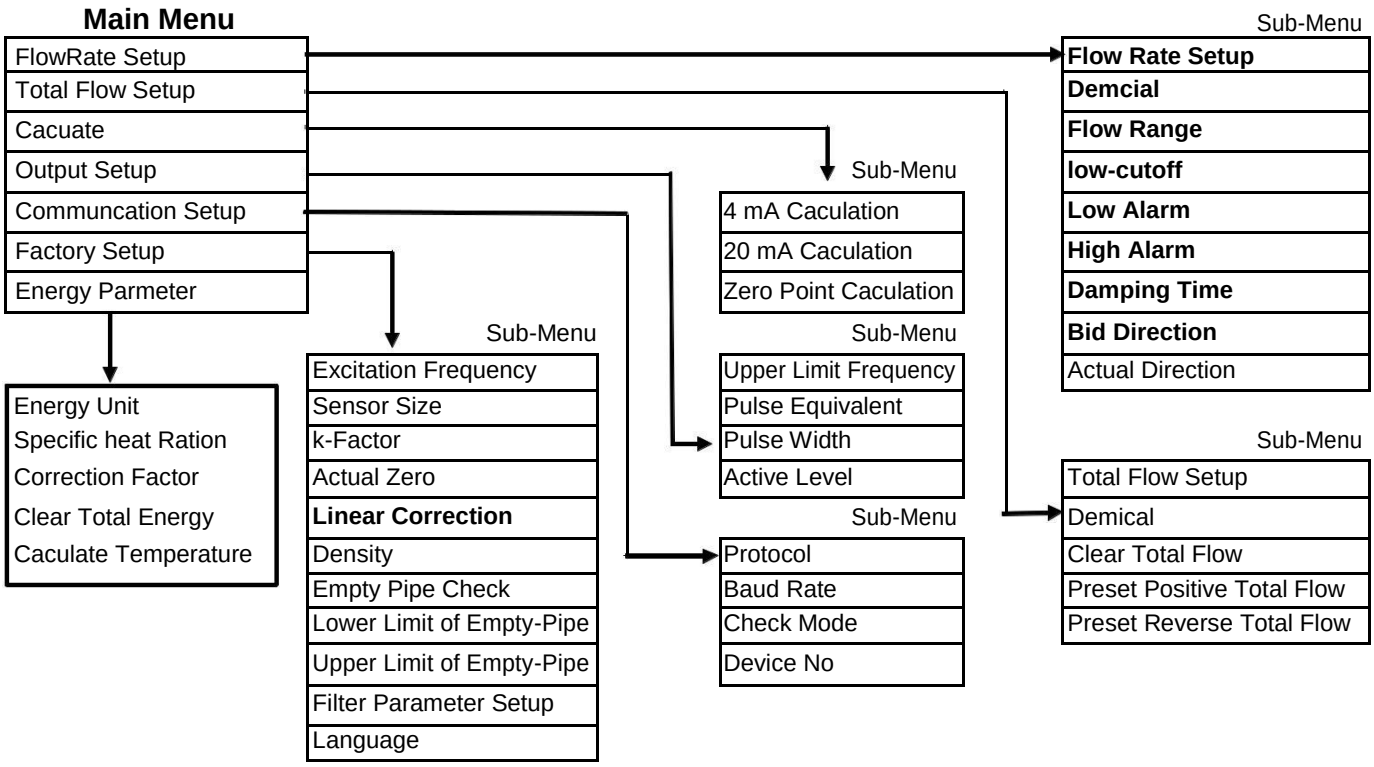
fast descending button to go to <factory setup>, digital up key ◦

move up and down keys

move right, enter the parameter setting and exit key

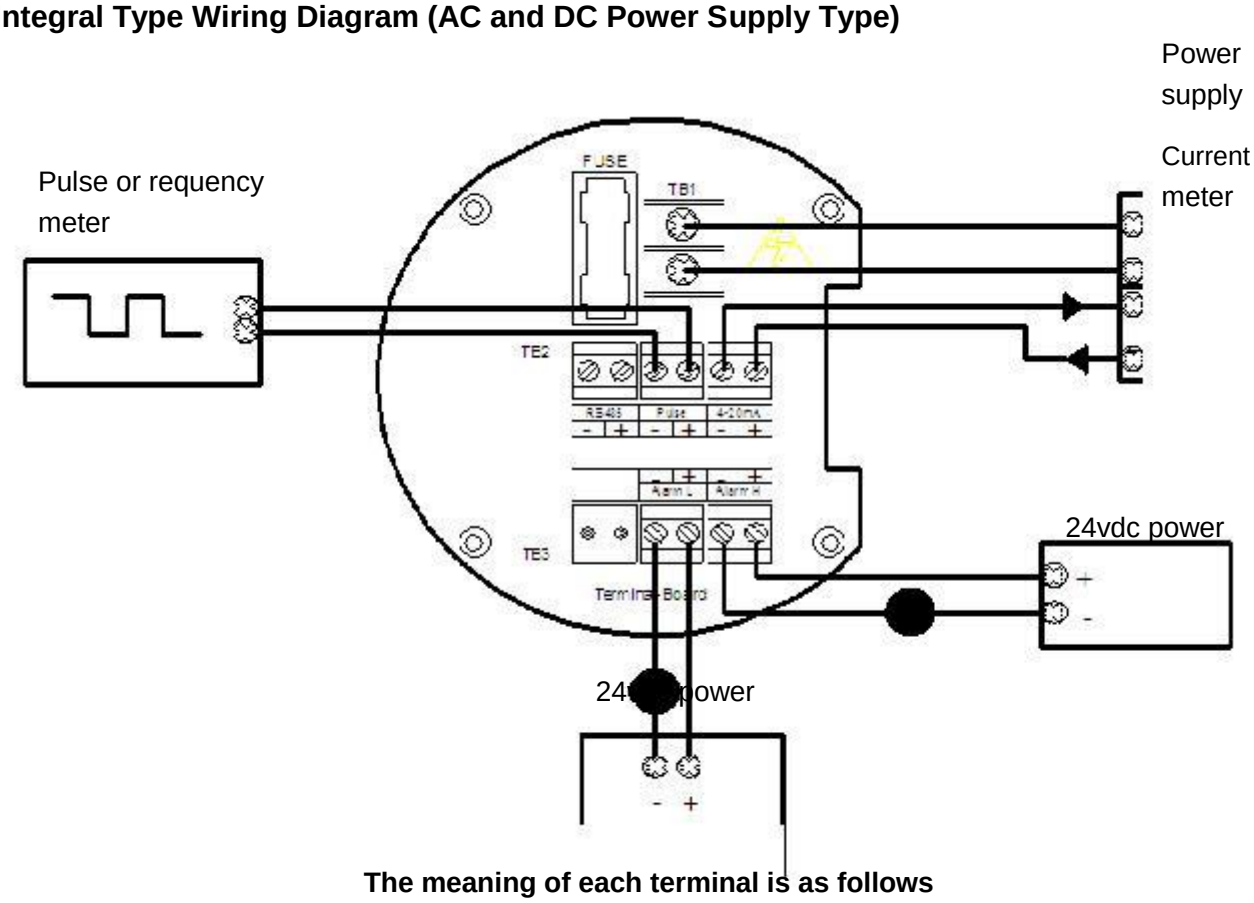
Press or , you can Switch between figure A and figure B

2.2 Transmitter Menu Structure



3. Wiring Diagram And Output Define

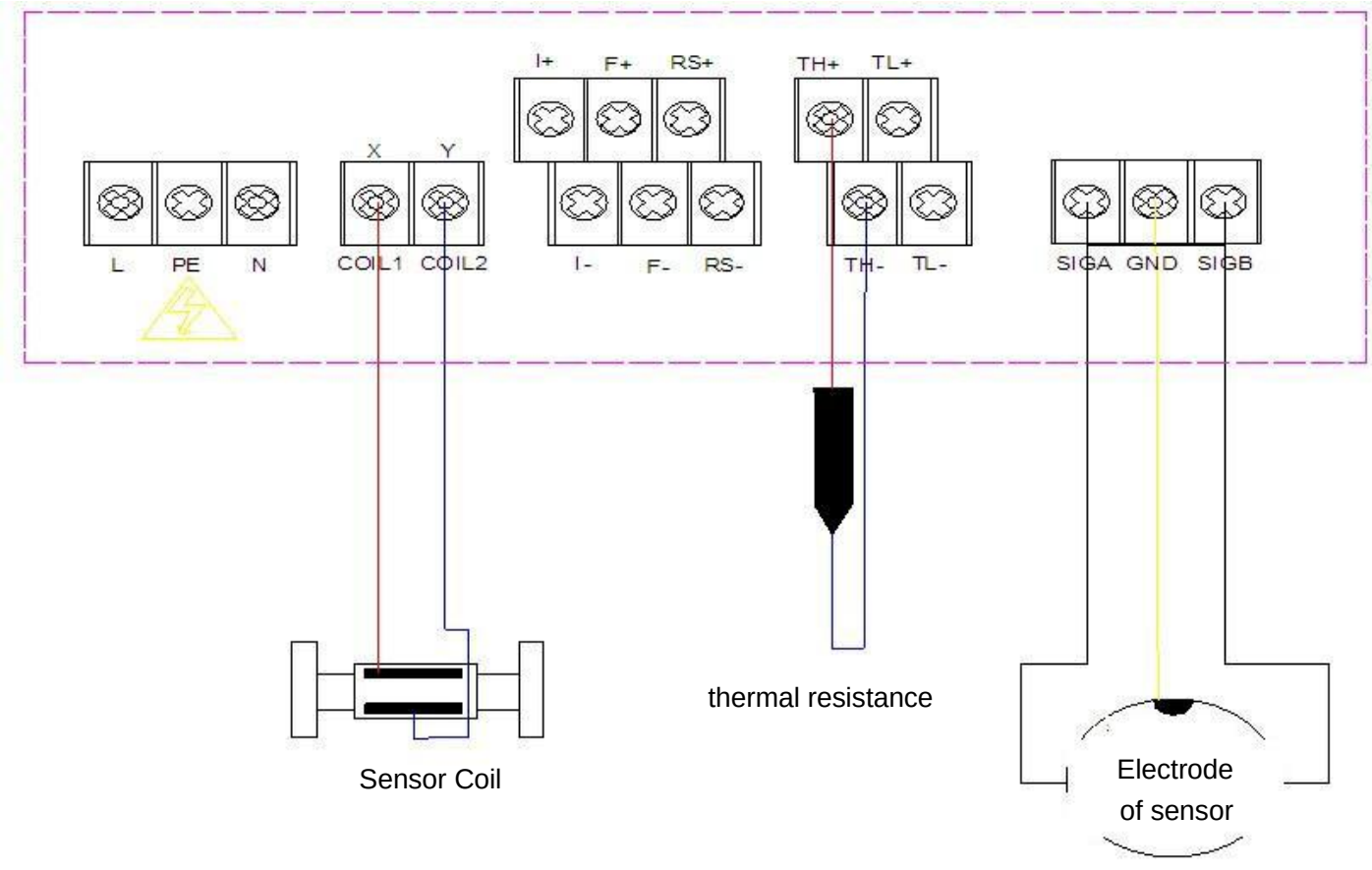
3.1 Integral Type Wiring Diagram (AC and DC Power Supply Type)



The meaning of each terminal is as follows

Identification		Funcation	Remarks
L		AC 85 - 265V	L : AC220V power supply (fire line)
N		AC 85 - 265V	N : AC220V power supply (Zero line)
24V		DC 18 - 36V **+**	Power supply 24V+
COM		DC 18~36v **-**	Power supply 24V-
4-20mA	**+**	4~20Ma **+**	The load resistance is less than or equal to 500.ohm
	-	4~20mA **-**	
Pulse	**+**	Frequency & pulse output **+**	
	-	Frequency & pulse output **-**	
RS485	**+**	RS485 **+**	RS485 output
	-	RS485 **-**	
Alarm H	**+**	High alarm output **+**	Suggest use 24VDC intermediate relay，Load current ≤ 30mA
	-	High alarm output **-**	
Alarm L	**+**	Low alarm output **+**	
	-	low alarm output **-**	

3.2 Separate Type Wiring Diagram (AC and DC Power Supply Type)



Identification	Funcation	Remarks
L	AC 85~265V	L: AC 86-220V fire line
PE		
N	AC 85~265V	N : AC 86-220V zero line
24V	DC 16~36V **+**	24VDC+ power supply
com	DC 16~36V **-**	24VDC- power supply
I**+**	4~20mA output	The load resistance is less than or equal to 500.ohm
I **-**	4~20mAoutput	
F**+**	Frequency&pulse output **+**	
F **-**	Frequency&pulse output **-**	
RS+	RS485 **+**	RS485 output terminal
RS-	RS485 **-**	
TH **+**	Pt100 or Pt1000	Connect to inlet temperature sensor
TH **-**		
TL**+**	Pt100 or Pt1000	Connect to outlet temperature senssor
TL **-**		
coil1 (X)	connecting to excitation coil of sensor ◦	
coil2 (Y)		
SIGA	electrode A	Connect to signal electrode A
GND	Signal ground	Connect to the grounding electrode
SIGB	electrode B	Connect to Signal electrode B

TROUBLESHOOTING

Trouble Shooting of Flow Meter MFM:

Problem	Possible Fault	Remedy
Instrument is completely Dead	1 Fuse Blown on Power Supply Board	Replace the fuse a] 500 mA for 230 V ac b] 500 mA for 110 V ac c] 2 A for 24 V dc
	2 Mains Supply connection Not proper.	Make proper connections
	3 Mains Supply is not available or is not proper	Apply proper mains supply (Refer label pasted on meter.)
Fuse blows very often in Operation	1 Fluctuation in mains supply	Constant Voltage Transformer (CVT) with 30 VA rating is Recommended.
The Flow meter shows Negative readings.	1 Installation of flow meter is Reversed.	Install the flow meter with the direction of flow as indicated by the Red arrow on flow Meter body. (Refer Installation Page 06 of this Manual.)
Flow Meter Reading is Fluctuating.	1 Loose connection at terminals 8, 9 and 10 of TS1 connector.	Tighten the connections.
	2 Gasket ID is less than Specified.	Ensure gasket ID as per Table (Refer Installation page 06, Subsection VII of this Manual.)
	3 Fluctuating Mains Supply	Ensure stable Mains Supply.
	4 Line is empty or partially Filled with the liquid.	Ensure line is full with liquid. (Refer Installation page 06 Subsection III of this Manual.)
	5 Air Bubbles are present in Line or leakage on Inlet side	Refer Installation page06 Of this Manual.
The Flow meter permanently shows Zero Reading.	1 Terminals 8, 9 & 10 of TS1 are short circuited Externally	Check the connections and Remove the short circuit.
Flow meter shows wrong Readings.	1 Trim pots are disturbed.	Contact to factory.

Trouble Shooting of Flow Transmitter (Continued)

Problem		Possible Fault	Remedy
	2	Flow tube is partially filled	Ensure Full pipe Flow.
Flow Meter shows ½ readings then actual	1	Connection/Cable to TS1-8 & 9 terminals externally Short circuited.	Check / Remove short circuit. (Contact Factory)
	2	Connection/Cable to TS1-8 & 10 terminals externally Short circuited.	Check / Remove short circuit. (Contact Factory)
Counter or Open Collector Output shows Wrong Tantalization or is Not Working.	1	Trim pots are disturbed on Counter board.	Contact to factory.
	2	2 pin Relimate connector cable of Counter may be open	Check / repair the Connector/ connections. Connector / connections.
Display shows correct Readings but current Output (4 – 20 mA) Is zero.	1	Terminals 4 & 5 of TS1 Connector may be Short circuited externally.	Check / repair the short circuit.
	2	Connections made to Terminals 4 & 5 of TS1 Connector may be open.	Check / connect properly.
	3	Fuse inside the DMM under use is Blown	Check / Replace
Current output (4 – 20 mA) is less Than the desired output.	1	Trim pots disturbed	Contact to factory.
	2	The current output (4 – 20 mA) is getting Loaded.	Verify the load connected Across the output terminals 4 & 5 of TS1. It should be Less than 600Ω.

If the above given steps fail to correct the problem call factory or send Flow Meter back to factory. Please have the following information available when you call:

a) Meter Serial Number
b) Detailed description of the problem.
c) When does the problem occur or repeat?
d) What is the meter size, Full scale flow rate, meter constant, service liquid of the flow meter?
e) What is the output load on the meter, grounding technique used?