Ema Precision Electronics (Suzhou) Corp

Flow meter

CE RoHS

www.ema-electronic.com

1. Shape and installing size

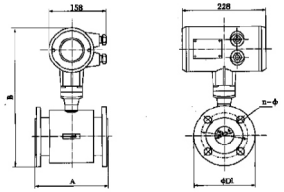


Figure 1. PE One-piece formation shape and installing size

Order number	Rated Pressure (MPa)	A	B	ΦD1	ΦD2	Φd	n-Φ	Weight of sensor (kg)
FE0015	4.0	200	335	95	65	15	4-Φ14	8
FE0020		200	335	105	75	20	4-Φ14	8
FE0025		200	335	115	85	25	4-Φ14	9
FE0032		200	335	140	100	32	4-Φ18	9
FE0040		200	335	150	110	40	4-Φ18	12
FE0050		200	335	165	125	50	4-Φ18	13
FE0065	1.6	200	390	185	145	65	4-Φ18	15
FE0080		200	390	200	160	80	8-Φ18	18
FE0100		250	410	220	180	100	8-Φ18	22
FE0125		250	410	250	210	125	8-Φ18	23
FE0150		300	469	285	240	150	8-Φ22	33
FE0200	1.0	350	527	340	295	200	8-Φ22	42

The polyurethane rubber liner is adjustable it depends on liner thickness

2. Application and function

2.1 Electronic-magnetic flow meter is capable to detect conducting liquid , also suitable for measuring volume flow of electronic -conductive liquid and solid. It`s commonly used in flow detecting of chemical industry, mining industry, drainage, sewage disposal, food industry ,papermaking industry, sugar industry and harbor scour project .

2.2 Advantages of one-piece-formation-electronic-magnetic flow meter:

Whole welding structure makes great airtight ability.
Firm, simple and reliable structure, without any moveable component, makes no pressure loss.
High accuracy ignores the adverse effect which comes from material pressure, temperature, density and viscosity.
It can detect the resistance of material and recognize the empty status and circumstance of electrode.
Using 16 embedded microprocessors, high calculate aped and high accuracy.
Two-way detecting function, it is able to display counter and straight flow, percentage and flow speed.
There are integrators inside, they display total of counter and straight flow and differential integrated leaf amount.
RS485 and RS232C digital-communication output you may choose Modbus or HART (Supporrt ROSRMOUNT 275).
Reliable digital calculating ability and anti-jamming ability
It has smart and high sensitivity with wide detecting range.
Ultra-low-EMI power supply is suitable for various changing voltage range and it is good at against EMC.
It is easy to operate and very user-friendly.
Automatically diagnosis and handle breakdown or error.

3. Order number, Specification and Technical data

3.1 Order number

Table 2.Order number and Specification form

Order number	Diameter	Max flow (m^3/h)										
FE0015	15	0.6	0.8	1	1.2	1.6	2	2.5	3	4	5	6
FE0020	20	1.2	1.6	2	2.5	3	4	5	6	8	10	12
FE0025	25	1.6	2	2.5	3	4	5	6	8	10	12	16
FE0032	32	2.5	3	4	5	6	8	10	12	16	20	25
FE0040	40	4	5	6	8	10	12	16	20	25	30	40
FE0050	50	6	8	10	12	16	20	25	30	40	50	60
FE0065	65	12	16	20	25	30	40	50	60	80	100	120
FE0080	80	16	20	25	30	40	50	60	80	100	120	160
FE0100	100	25	30	40	50	60	80	100	120	160	200	250
FE0125	125	40	50	60	80	100	120	160	200	250	300	400
FE0150	150	50	60	80	100	120	160	200	250	300	400	500
FE0200	200	100	120	160	200	250	300	400	500	600	800	1000

3.2 Technical data

Material electronic conductivity: >20 μ s/cm
Accuracy: Diameter φ15~φ200, ±0.5%(Flow speed >1m/s)
or ±0.005m/s (Flow speed<1m/s)
Current output: 0~10mA DC, Load resistance 0~1.5KΩ
4~20mA DC, Load resistance 0~750Ω
Frequency output: Without electronic Power,1~5kHz
Pulse output: Without electronic Power, 5000CP/S(Max)

Operating temperature limitation
One-piece-type: 70℃
Separate-type
Polytetrafluoroethylene liner: 100℃
Polychloroprene rubber liner: 80℃

Polyurethane rubber liner: 80℃
polypropyleneliner: 100℃
PFA: 100℃

Max. operation pressure
Diameter Φ15~Φ50 4.0MPa
Diameter Φ65~Φ150 1.6MPa
Diameter Φ200 1.0MPa

Protecting Classification
Power supply: 85~265V AC or 24V DC
Flange: International standard GB/T 9119-2000 or customize
Power consuming: Necessary power consuming < 20VA

Material
Main material: measuring tube\Acidproof steel\Housing shell\ A3 steel(other option: stain less)
Liner material: Diameter Φ15~Φ25\Polytetrafluoroethylene\ Diameter Φ32~Φ200\Polytetrafluoroethylene,F46, PFA,chloroprene, Polyurethane rubber
Electrode material: Acid-proof steel1(Cr18Ni9Ti) , molybdenum- Including, stainless steel (0Cr18Ni12Mo2Ti), Hastelloy alloy B,Hastelloy alloy C, Titanium, Tantalum, Platinum or customize
Ground connection material: Acid-proof steel(Cr18Ni9Ti) , Molybdenum- containing stainless steel (0Cr18Ni12Mo2Ti)
For character and application of common liner material, material of common electrode, ground connection inoxidizability, please see appendix 2 and appendix 3.

4. Mechanism and Structure
4.1 Mechanism
The mechanism is based on faraday electromagnetic induction principle. See picture 2

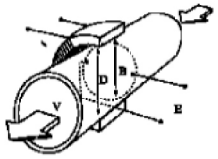


Figure 2. Mechanism

When the conductive liquid flows along the measuring tube, into the vertical direction, in an alternating magnetic field and the magnetic field lines, the conductive liquid cutting magnetic field lines generated EMF. Installing a pair of detection electrodes on the wall of the measuring tube which is vertical with the measuring tube axis and magnetic field lines, the EMF is detected.
When the electromotive force is E, that is the formula:

$$E=B\bar{V}D \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

B- Magnetic induction intensity;
D-Distance between electrodes, it equals to the inter diameter of measuring tube.
$\bar{V}$ -Average flow speed of target liquid which cross the lateral section in the measuring tube.
Formula (1)," B" and " D" are constants; that is, E and V are in direct proportion.
Concern of instant volume flow which cross lateral section "Q" and flow speed "V" :

Use (1) into (2) may:

K- Meter constant
See from formula (3), if "K" is fixed, E and Q are in direct proportion. E is usually referred to as traffic signals, inputting the traffic signal into converter and processing it, you can choose "0 ~ 10mA DC or 4 ~ 20mA DC signal" or "1 ~ 5000Hz frequency pulse signal" , both

of them are in direction proportion with flow speed ;what`s more, both of these two signals can do traffic display, record, totalize , regulation and so on.

4.2 Structure

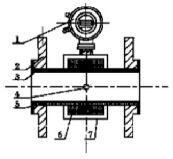


Figure 3. Structure

1-Convertor, 2-Flange, 3-Insulation liner, 4-Electrode
5-Measuring tube, 6- Magnetic excitation system, 7- Housing shell

Component description:
(1)Measuring tube: Target liquid flows in it. The tube is made by acid-proof steel, which is non-magnetic-conductive and welding with flange. It has insulation liner as well.
(2)Liner: An insulating-anti-corrosive coating on liner and the packing surface of flange, it may provide signal short circuit.
(3)Magnetic excitation system: There is coil on the upper side and lower side of measuring tube, which produce magnetic field.
(4)Electrode: Installing a pair of detection electrodes on the wall of the measuring tube which is vertical with the magnetic line, the EMF (flow signal) is detected. The material of electrode depends on corrosiveness of target liquid.
(5) Housing shell- Protecting the meter and seal it as a chamber.
(6) Convertor: Providing stable exciting magnetic current for the sensor, meanwhile, strengthen the EMF and convert it into a current signal or frequency signal which indicate the flow, control and adjust.

5. Installing introduction

See figure 4, please install the flow meter in hoisting way.

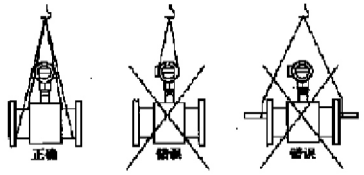


Figure 4.Hoisting installation

- Make sure the spiral hole of the measuring tube and flange are aligning and screw them tight together.
- Make sure the central of flow meter and measuring tube are the same and done ground connection; otherwise, it may cause error.
- To avoid the error from attached gas or liner damage from vacuum, please see Picture 5 before installation.

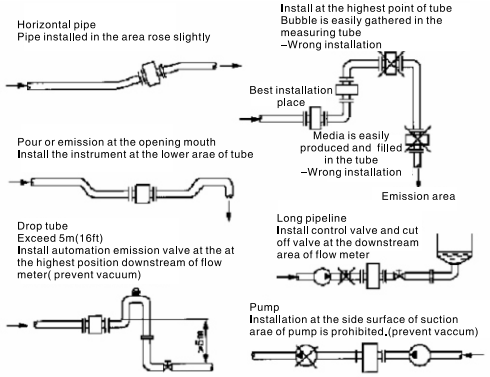


Figure 5.Installation location

5.2 Environment selection
According to the work of instrument characteristics and technical performance, the choice of instrument installation environment should pay attention to:

(1) Meter should be installed in dry and ventilated place
(2) Instrument should avoid the sun and rain. Outdoor installation,should be sheltered from rain water facilities;
(3) Avoid strong shock while installation site as possible.
(4) Try to avoid a strong electromagnetic field equipment, such as large motors, large transformers, etc.
(5) Choose easy maintenance, more convenient place.

5.3 The choice of installation location
Install the sensor in the pipeline, should note the following:

(1) The direction of the flow sensor is the same as the media flow.
(2) Must ensure that the sensor tube is always full of measured media
(3) There should be 5 times straight distance of tube diameter upstream The position for installing must be 3 times of conduit diameter in the front and 5 times of conduit diameter in the back.
(4) When the pipe diameter is inconsistent with the sensor, install the divergent tapered tube or pipe at the both ends of flow meter, and then connect to pipe. The cone angle of diverging, converging tube should be greater than 2θ 15°. When using 15° cone angle of diverging, converging tube,you can see Head loss resulting from the curve in Figure 6 investigation.
(5) Horizontal installation, the electrode should be installed in a horizontal position. Thus, once the media containing bubbles or precipitate substance, air bubbles will not adsorbed on the electrode, cause the disconnect of the signal converter. Sediment will not cover the electrode which may cause Zero drift.
(6) For the liquid–solid two–phase medium, vertically installation is more favorable. First it can prevent the separation of measured media, second sensors can wear more evenly lining. Vertical installation, medium flow direction should be bottom–up, this will ensure that the sensor tube is always full of media measurement.

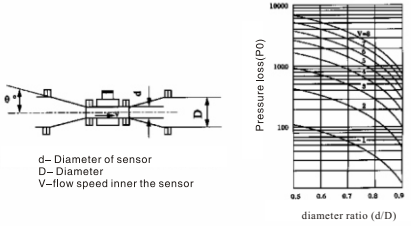


Figure 6. Loss from installing
the divergent tapered tube or pipe

5.4 Ground connection
The signal produced by sensor is very weak, only few mV even in full detecting range. See picture 7~9 as reference to make sure the ground connection is well.
Ground electromagnetic flow meter is based on two aspects:

(1) The action principle from the electromagnetic flow meter and flow sensor signal current of the loop analysis, ground must be measured media the same potential.
(2) The earth is zero potential, reduce the external interference. Under normal circumstances, process pipes are metal pipe, an they are all ground–connected. However, in the case of larger external electromagnetic interference, Electromagnetic flow meter grounding device should be set. Grounding line is greater than 4mm2 , which total cross section using multi–strand copper wire.

Sensor ground wire must not be connected to the motor or other devices in public places online, grounding resistance should be less than 10Ω.
Sensors is installed in the metal pipe, insulating coating of metal pipes when the wall is not grounded in Figure 7.

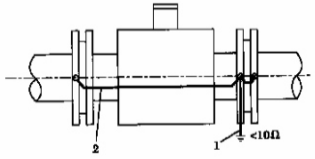


Figure 7. Sensors installed in
the metal pipe grounding diagram

1.Grounding line (large disturbance installation)
2.Instrument ground wire (meter factory with)
Installing the sensor on the plastic pipe or pipe with insulation liner, Should has grounding ring or ground flange or Short tube with a ground electrode at both ends of the sensor. See Figure 8.

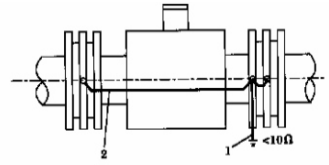


Figure 8.Installing the sensor on
the plastic pipe or pipe with insulation liner

1.Grounding line(installed when the interference is serious)
2.Ground wire (one of original accessory)
3.Ground or ground ring flange
Sensors installed in the pipeline cathodic protection must be carefully installed in the ground at both ends of the sensor ring (or ground flange), see picture 9

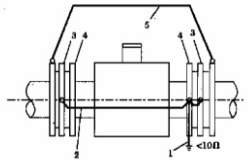


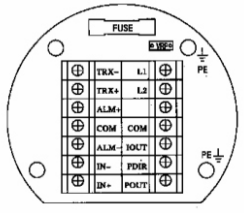
Figure 9.Diagram for installing
Pipeline cathodic protection in the ground

1.Grounding line(installed when the interference is serious)
2.Ground wire(factory has)
3.Ground or ground ring flangeThe flange connecting pipe must be insulated
4.Bolt (flange should be installed and insulated from each other
5.Connecting wire, copper cross–sectional area of 16 mm^2, separation between the cathodic protection potential and the sensor

6.Electrical connection

All output wires owned by the user, please note that the load current requirements to meet.
Sealed structure applied for power outside of the outlet holes, it should be compressed tightly for the wiring outlet hole gasket after connecting the wire, threaded fittings tightened to prevent the erosion of moisture and corrosive gases.

6.1 Terminals as shown in Figure 10



TRX– RS485 Communication input–
TRX– RS485 Communication input+
ALM Limit alarm output
Alarm/Frequency/pulse output
ALM –Lower limit alarm outputl

In– Input nod

In+ Input node

L1 220V(24V)Power input
L2 220V(24V)power input
COM Current output
Iout power output
N– Reverse flow frequency (pulse) output
pout:flow frequency (pulse)output

6.2 Power cable as shown in Figure 11
Power cord can be two soft rubber insulated cable core, the proposed model YHZ–2 x1mm2

For DC power converters should be noted that wire resistance and supply voltage, generally in the 24V power cable resistance should not exceed 10Ω. Resistance of the power cord from the wire length and cross section determined.

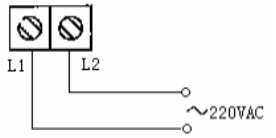


Figure 12. Power line wiring diagram

6.3 Analog output shown in Figure 12
Divided into two analog output signal system: 0 ~ 10mA, and 4 ~ 20mA signal system. When used, the user preferences in the two signals of the system can select one
Analog current output for the 24V internal power supply, the 4 ~ 20mA signal system, capable of driving 750Ω load resistor
0 ~ 10mA signal for the system, the current zero "0", 4 ~ 20mA signal for the system, the current zero to 4mA. Therefore, in order to improve the resolution of the output analog current, the user should select the appropriate flowmeter range. Range of the converter can be selected automatically adjust to meet this requirement
Ultra–scale current output of approximately 22mA maximum
The manufacturer has analog output of each parameter calibrated When the flow meter at the factory. Under normal circumstances, no further adjustment of the user. If unusual circumstances, require the user to calibrate the analog output, simply enter the current zero point correction and the current full–scale amendment to the menu, the following operational procedures carried out without external signal source.

(a) Instrument calibration
Termination of 0.1% in the current output level ammeter (or connected 100Ω resistor and 0.1% standard digital voltmeter into 0.4 ~ 2V voltage measurement). Power meter run for 15 minutes so that the internal instruments to achieve thermal stability, and ready to adjust the current output range of zero coefficients and coefficients.
(b) Current "0" point correction
The converter set to the parameter setting state, choose the "current zero correction" item, entering, adjusting the correction coefficient, the ammeter indicates exactly 4mA (± 0.004mA). Press the Enter key. Press the Enter key.
(c) Current full–scale correction
Select the "current range correction" parameter, enter, adjust the correction factor converter, the current meter just indicates 20mA (±0.004mA)
Adjust the current "0" point and full scale value, the converter will be able to guarantee the achievement of the current function of accuracy. Current output of the converter linearity within 0.1%.

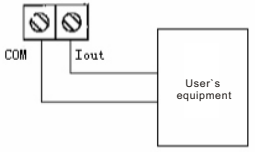


Figure 12. Analog output

6.4 Digital ouput as picture13

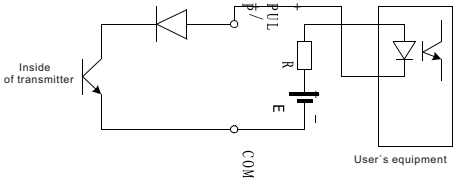


Figure 13(a).Optical digital
output coupler connected (eg, PLC, etc.)

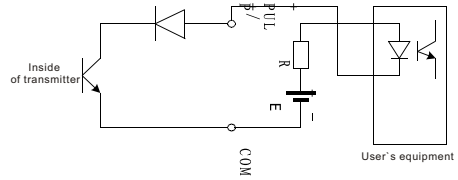


Figure 13(b).Optical digital
output coupler connected (eg, PLC, etc.)

Users around the optocoupler to be 10mA current, so,
E / R = 10mA or so, E = 5 ~ 24V. Therefore, R = 0.5 ~ 2.5kΩ

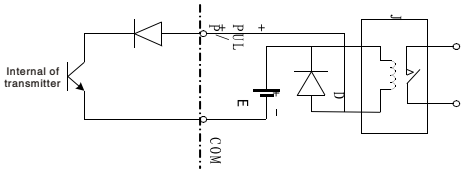
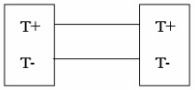


Figure 13(c). Relay digital output

Note: General E relays need to 12V or 24V. Freewheeling diode D is currently in the middle of most of the diode inside the relay. If the relay itself does not contain the diode, the user should be outside after another.

6.5 RS484/RS232 communication as picture14
S484/RS232 communication, connected by two equipments to communication



Picture 14 RS484/RS232 communication

6.6 Figure 15 Input nodes
External control contact input (IN, IN–) by a switch or relay contacts ON / OFF control, shown in Figure 4.8. Note that the resistance between contacts should be less than 5Ω.

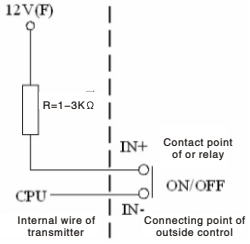


Figure 15. Connecting point

7. Instrument parameters

7.1 the definition of instrument and display panel see picture 16

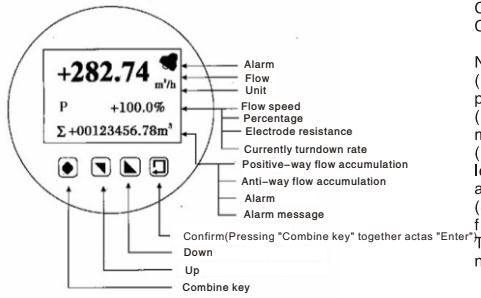


Figure 16. Display

7.2 key function
There are two kinds of status running: Automatic measurement of the state; Parameter setting.
Power meter, automatically enter measurement state. In automatic measurement mode, the measurement instrument and automatically display the corresponding test data. In the parameter setting state, the user keys four panels to complete the instrument parameter settings. Instrument parameter settings in the English table in Appendix 2
・Key features automatic measurement
The following key: Cycle through the second line of the display screen
The upper key: Cycle through the third line of the display screen
Composite key+ Confirmation key: Enter the parameter setting state

・Key function under the status of parameter setting
The following key: Reduction 1 at the area of cursor
The upper key: Add 1 at the area of cursor
Composite key+ following key: Left shift the cursor
Composite key+ upper key: Right shift the cursor
Confirmation key: Entry / Exit sub–menu
Confirmation key: In any state, continuous press for two seconds, return to the automatic measurement of the state
Note:
(1) Press the upper key or the following key at the same time after pressing the composite key when composite key is used.
(2) In the parameter setting state, there is no key operation within 3 minutes, the meter automatically returns measuring state.
(3) Flow of zero correction options, you can move the cursor to the left of + the – using "the upper key" or "the following key" so that the actual flows in the opposite.
(4) Flow unit selection can move the cursor to "flow range settings: flow units that menu display.
Then use the "upper key" or "under the key" to switch to meet the needs of

7.3 The operation of parameter setting
In test mode, press the "composite key +confirm key" appear state transition occurs password (0000), enter the appropriate password, then press "Enter key" , you will enter the parameter setting state

7.4 instrument password
Either level password, users can look at the instrument parameters
Password level 0 (fixed value 0521): Users can look at all the parameters, but can not be modified.
Level 1 password (default 7206): Users can change parameters 1 to 25 meters;
level 2 password (default 3110): Users can change parameters 1 to 29 meters;
Level 3 password (fixed 2901): Users can change parameters 1 to 38 meters;
Level 4 password (fixed value): the user can change the parameters of all the parameters and initialization, a manufacturer factory master.

7.5 Parameter setting menu
Electromagnetic flow converter total of 44 parameters (here only to users 38 parameters). Converter parameter setting menu shown in Table 3

	Paremeter	Setting	Password	Parameter range
1	Sensor Size	Select	1	3~3000
2	Flow Range	Select	1	0~99999
3	Auto Rng Chg	Select	1	Off/1:2,1:4,1:8
4	Damping	Setting	1	0~100s
5	Flow Dir	Select	1	Fwd,Rev
6	Flow Zero	Setting	1	–9.999~+9.999
7	L.F.Cutoff	Setting	1	0~99%
8	Cutoff Enbl	Select		On/Off
9	Rate–of–Chng	Setting	1	0~30%
10	Limit Time	Setting	1	0~20s
11	Total Unit	Select	1	0.001L, 1.0m³
12	Flow Density	Setting	1	0.0000~3.9999
13	Current Type	Select	1	4~20mA/0~10mA
14	Pulse Output	Select	1	Pls/Frq
15	Pulse Factor	Select	1	0000~9999 P/m³(L)
16	Freq.Max	Select	1	1–5999Hz
17	Comm Address	Setting	1	0~99
18	Baudrate	Select	1	600~14400
19	Emp Pipe Det	Select	1	On/Off
20	Emp Pipe Alm	Setting	1	999.9 KΩ
21	Hi Alm Enbl	Select	1	On/Off
22	Hi Alm Limit	Setting	1	000.0~199.9%
23	Lo Alm Enbl	Select	1	On/Off
24	Lo Alm Limit	Setting	1	000.0~199.9%
25	Rev.Meas.Enbl	Select	1	On/Off
26	Sensor S/N	Setting	2	0000000000~9999999999
27	Sensor Fact	Setting	2	0.0000~3.9999
28	Field Mode	Select	2	Mode 1,2,3
29	Multiplying	Setting	2	01~10
30	F.Total Set	Setting	3	0000000000~9999999999
31	R.Total Set	Setting	3	0000000000~9999999999
32	Input Control		3	Disabled/Stop Tot/Reset Tot
33	Clr Totalizr	Password	3	00000~59999
34	Clr Tot.Key	Password	3	00000~59999
35	Date–y/m/d	Setting	3	99/12/31
36	Time–h/m/s	Setting	3	23/59/59
37	Password L1	Setting	3	0000~9999
38	Password L2	Setting	3	0000~9999

Note: 1. No. 35 and 36 for the power–down time of the record, no power–down function converter, this parameter is invalid.
2. The total is set to 36,666 factory password is cleared

7.6 instrument parameter discription
According to the manufacturer set the actual size of the sensor, the sensor works diameter size range of 15 ~ 200mm

・Sensor Size
Note: This set according to user needs, the user can not be changed

・Flow Range
Range of the instrument is the maximum traffic flow measurement value (full scale). Maximum flow value is displayed for the output signal and in terms of percentage. It limits the output current and frequency (pulse) output and 100% upper limit corresponds to the displayed value. Also associated with the small percentage of flows that resection and limit alarm signal. The converter displays the flow velocity is not within the provisions displayed in the limited flow range. Setting parameters in the selected range of the instrument flow display units, flow meter display unit, volume flow units: L / s, L / min, L / h, m3 / s, m3/min, m3 / h and the mass flow units: kg / s, kg / m, kg / h, t / s, t / m, t / h, the user can process requirements and usage, selected an appropriate flow of display units
Notic:Instrument display with 5 digits flow values, the values behind the bottom of the unit showed flow

・Auto Rng Chg

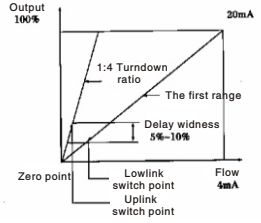


Figure 17. Tow ratetransmittance

Converter with optional automatic switching of the two ranges can be easily used for a large range day and night flow measurement system of automatic control. In the "flow range settings" menu to set the range value of the first range (high range). In the "automatic range switching" menu option 1:2,1:4 or 1:8 as the second range (low range), the second range is the first scale value of 1 / 2,1/4 or 1/8.
Figure 11 is a ratio of 1:4 scale automatic range switching curve.
To switch the safe, reliable, automated set of 5% to 10% of the hysteresis

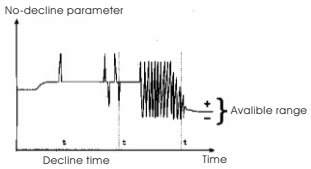
・Damping
・Flow Dir
Long damping time can improve the measurement of flow meter shows the output signal stability and the stability of the situation for use with flow control; a short measurement time can speed up the measurements reflect the damping rate, the cumulative total for the pulse flow measurement. Damping time measurement set selection method used, the user can select a damping value
If you think that debugging is positive when the flow direction, while the instrument display is negative, then set the reverse flow direction, and vice versa

・Flow Zero
Electromagnetic flow sensor in the measuring tube filled with conductive fluid, and the fluid does not flow at rest, the converter has been done on the flow meter zero intelligence processing. If the sensor with zero out of range of converter you need for intelligent processing flow of zero correction. Flow velocity of zero is expressed in units of m / s
Zero flow correction converter is shown below
Display: Uplink "baseline" represents the zero point measurement instrument, revised downward the value of the display is zero flow. When the "reference" display is not "0",the correction value should be adjusted so that baseline=0
Note: If changing the downward correction value, "base" value increases, the value need to be changed down the positive and negative so that the "base"value will be 0

Amendment must be zero flow sensor electromagnetic flow measuring tube filled with conductive fluid, and The fluid does not flow at rest under the condition
Correction value is zero flow sensor calibration constant value, the record shall be credited to a single sensor and signs. Sensor zero value is recorded Pops contain symbols "m / s" as the unit of velocity values

・L.F.Cutoff(Removal of small signal point
Cut point of the small signal range setting is expressed in percentage of flow. Choose to allow removal of small signal, When the flow velocity is lower than this value will be removed when the flow rate, flow rate and percentage of the display and the signal output; if you choose stop, it will not to make any cut

・Rate–of–Chng & Limit Time
Rate of changing and limi time is used Used to eliminate some of the increase in damping can not remove the noise. It can be a real flow signal from the judge due to a step signal noise and noise–like slurry tip. This identification is based on the rate of change and duration of restrictions based. Figure 18 shows the rate of change limit for the use of technology to remove the principle that gross errors.
If the current sample of flow data above or below this limit, and in more than or less than the changes within the time limit is that such changes caused by the noise, the system shall be removed; and when more than or less changes in this limit is not sensitive to the set hours, then that the change is caused by changes in the real flow, the system is to measure the flow rate changes approved. Change rate setting range from 0 to 30% within the selected time is not sensitive to the choice in the 0 ~ 20s. When the rate of change is not sensitive to the time limit and any value between 0, this function will be turned off



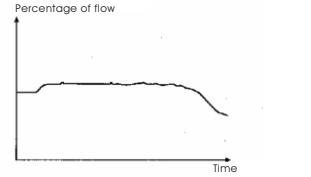


Figure 18. The rate of change limits use
of technology to eliminate gross error noise

・Total Unit (Flow units)
Converter is 10–bit display monitor, the maximum allowable count is 999999999. Totalizer units using the L, m3, and kg, t. And have to 0.001,0.01,0.1,1.0 the rate of the units display. Period of time can be easily read out the accumulated flow. Converter used to automatically determine the flow rate totalizer units and whether the overflow
Converter with a mass flow measurement function. Users to set the density of different media, values range from 0.0000 ~ 3.9999, The value is actual medium density and water density, the This value is the actual medium density and water density, the relative value

・Current Type
Users can select the current output type 0 ~ 10mA or 4 ~ 20mA analog current output
Notic: When the user specified in the order which current output, the factory set according to user requirements, user changes invalid.

・Pulse Output
Pulse output frequency output and pulse output are both available. Continuous square wave frequency output, pulse output for the rectangular pulse train; frequency output are used for instantaneous flow measurement and the number of total short–term accumulation of impulse equivalent pulse output by choice, read out the value of the cumulative volume of flow, used for a long time cumulative total volume of units directly.
Frequency output and pulse output gate output is generally the form of OC. Therefore, should an external DC power supply and load. Pls see figure 6

・Pulse Factor
Pulse equivalent definition: mass per unit volume or unit number of pulses gene rated
In the same flow rate, pulse equivalent high, the output pulse frequency is high, the cumulative flow for electronic counter; pulse equivalent low, low frequency pulse output, suitable for high frequency up to 25 times / sec mechanical electromagnetic counter.

・Freq.Max
Meter frequency output range corresponding to the upper limit of flow measurement, the percentage of traffic that is 100%. Frequency output upper limit can be 1 ~ 5999Hz range arbitrarily set.

・Emp Pipe Alm
With empty pipe detection instrument, if the user chooses to allow the air flow control alarm, when the instrument detects air flow control state, about instrument analog output, digital output signals set to zero, and will show zero flow meter.

・Emp Pipe Alm
Empty Tube alarms and alarm electrode current source method is

measured by the sensor electrode resistance, do the smart judge. Resistaneced by formula of electromagnetic flow meter signal.

$$R \approx 1/d\sigma$$

Where d–diameter of the electrode, σ – electrical conductivity of the fluid, the electrode resistance is generally 5 ~ 50KΩ. Resistance and fluid conductivity measurement, the electrode diameter relationship. Measuring Resistance to reflect the electrode surface contamination, adhesion, and polarization by the impact of different electrolyte fluid situation. Fluid can not be filled, the electrode sensor can not correctly detect the signal. Electrode resistance measurement to provide status information to the system, a system to make air traffic control and the electrode to determine abnormal, the user accordingly to make the appropriate electrode maintenance. The converter to the preliminary test based on the value of electrode resistance, electrode resistance to select the appropriate threshold (generally the initial test electrode resistance parameter reference value of 3 times the threshold). Resistor current source means the measurement from the length of the cable to make the operation more convenient, more reliable detection.

・Hi Alm Enbl
Users choose to allow or prohibit

・Hi Alm Limit
Alarm value upper percentage range, the numerical parameters set up, the user between 0% and 199.9% to set a value. Meter run, when the flow rate is greater than the percentage of the value, the instrument will output alarm signal

・Lo Alm Enbl
Users choose to allow or prohibit

・Lo Alm Limit
Lower limit alarm value to range in percentage terms, the numerical parameters set up, the user between 0% and 199.9% to set a value. Meter run, when the flow rate is less than the percentage of the value, the instrument will output alarm signal

・Rev.Meas.Enbl
Reverse measurements allow you to set the "allowed" state, when the reverse flow of fluid when the converter output pulse by the value of the reverse flow and current, reverse a cumulative total. Reverse measurements allow to set in the "prohibited" state, when the reverse flow of fluid when the converter output pulse zero bit, current output signal is zero (4mA or 0mA), but the reverse is still a cumulative total

・Clr Tot.Key
In the parameter setting, the user into "total Totalizer clear" the password, confirm the password is correct instrument, the amount automatically cleared Totalizer. At the same time clearing The three integrator zero value, restart the cumulative
Integrating the total clearing "the password can open the 3 password, in the" clear totalizer volume password "menu you wish to set into the" total Totalizer clear "password, modify the original" total Totalizer clear "password
Note: Please write down your "total Totalizer clear" password

・Sensor Fact
Instrument supporting the factory calibration of sensors on a single or a product label marked "sensor coefficient" should be consistent with the values into the menu

・Field Mode
Converter can provide three types of excitation to the sensor
Note： Factory set according to user situation, the user can not be changed

・Meter Factor
The coefficient is the coefficient of artificial, the converter when the internal calculation of the total traffic flow is measured by multiplying the coefficient. For example, the sensor used in open channels with the simulation of electromagnetic flowmeter measurements or field diving on the instrument after calibration correction

・F.Total Set & F.Total Set
Forward and reverse the total amount pre–pre–converter is reserved for the replacement of the original value of the cumulative flow totalizer values to maintain a continuous cumulative total of successive

・Input Contro
The converter has a contact input controls, mainly for remote cumulative volume cleared, the cumulative amount of simultaneous display and volume control input
Select "prohibited", the function is canceled
Select "prohibited", the function is canceledSelect the "cumulative stop", the use of synchronization with the steering switch, the converter can flow totalizer and other standard containers or standard Flow Totalizer countsynchronization, the synchronization stops
Select the "Remote cleared", you can dry the flow of integrating totalizer value

・Date–y/m/d & Time–h/m/s
4 user password to enter, you can change the time of year, month, day, hour, minute, second.

・Password L1 & Password L2(User password 1~2)
Using level 3 and level 4 password to access ,user can modify this password

8. Maintenance and Troubleshooting

8.1 Preparation
Check the connection and installation seriously according to the manual before operation.
The flow meter is already adjusted well during the producing process, please read the manual before operation and adjusting any parameter for it; otherwise, it may cause damage.

8.2 Maintenance
Electromagnetic flow meter generally do not need regular and frequent maintenance.That is necessary to clean those parts which material attached on, such as electrodes. Notice that not to damage the liner or electrodes.

8.3 Troubleshooting
8.3.1 Common troubleshooting:
For researching, there are three parts needs analization
(1) The flow of the pipeline (or less full control tubes), medium character(scaling, etc.) and the ambient may effects measurement.
(2) Failure of the sensor itself;
(3) Converter failure.
Then analyze the causes of production, troubleshooting.
Table 7. Common Troubleshooting Methods

Failure	Cause	Inspection methods
There was liquid flow through the instrument but no instruction	1. Moisture or damage of signal line cause ground short circuit. 2.. Signal short circuit 3. Excited circuit opens. 4.convertor failure	Check the insulation of signal cable with a multimeter . Check the signal pathway with a multimeter. Check sensor circuit is intact or not with a multimeter Fuse breakdown or other reasons.
Ultra–flow changes, but full–scale instrumented	1. A signal line is short circuit to ground connection or open circuit. 2. Sensor tube is not full of measured media. 3.Poor ground connection	Check the signal of line–to–ground resistance.When material fills the tube, use multimeter to detect the ground resistance of electrode. Generally, it is 1000 ~10000 Ohm. Check the signal cable is with a multimeter access, improved installation. Check the signal and ground shield resistance and re–install the grounding device.
nconsistent with the actual flow meter indicates	1. Measurement error due to changes in zero. 2. Range of the instrument calibration factor is incorrect. 3. Measuring tube is not fully measured media. 4.Scales attached on electrodes or inner walls . 5. It is use for display the real inherent error.	Bad or contaminated ground electrode, excluded it and the recovery of the original zero. Re–adjusted by the index values range calibration . Improved installation Clean the scale. Compared with the standard flow meter.

8.3.2 Convertor failure processing
The printed circuit boards of electromagnetic flow converter are made via surface mount technology, Therefore, the user can not open the converter shell.
Intelligent converter with self–diagnosis function, in addition to alarm for power and hardware failures, generally it alarms appropriately.
This information prompted the top right of the display a "!"
Exclamation point or alarm bell symbol. In test mode, the next key to flip through to show failures as follows:
Flow works well
Excited alarm
Electrodes works well
Electrodes exception
Empty alarm

Failure processing
No display on the monitor
a) Check whether the power is switched on.
b) Check the power fuse is intact.
c) Check the power supply is appropriate.
d) Check whether the monitor can adjust the contrast adjustment and whether the adjustment is appropriate.
e) If a)、b)、c) all work well, there is no way to figure it out on your own, please return the convertor to manufactor for repairmen.
Excited magnetic alarm
a) Check whether the EX1 and EX2 are open or not.
b) Check the resistance of excited magnetic coil of sensor is lower than 150Ω or not.
c) If a)and b) are normal, that means the convertor as failed.
Empty and electrodes alarm
a) Check if target liquid has filled the measuring tube yet.
b) Input short circuit signal of SIG1,SIG2 and SIGGND into convertor. Meanwhile, if it prompt to revoke “empty alarm” and “electrode exception” , that means the convertor works normally.The error may come from low conductive liquid or the electrodes are covered by gas.
c) Check the signal connection is corrector not
d) Electrode exception

Fluid filled in the sensor case, use 500 analog multimeter, Resistance ×1KΩfile, check the sensor electrode resistance.
Connect the red terminal of multimeter with electrodes and connect black terminal with wetted electrode (wetted ring or metal pipe), the pointer of multimeter swing from left to right, indicate to about 3 ~ 50KΩ, and discharge from right to left; if the two electrodes swing range is less than 20%,that is, the electrodes are not conta minated.
Use digital multimeter to detect the direct current between wetted connecting point of DS1 and DS2 such as wetted electrode, then the liquid ring, metal pipes. The direct current should be lower than 1 V, the direct voltage difference should lower than 50 mV .
Otherwise, the electrode of flow meter is non–polarized
Upper limit alarmrging the detecting range will revoke the alarm.
Lower limit alarm
Lower limit alarm, the output current and output frequency (or pulse) are overrun. Lowing down the detecting range will revoke the alarm.
The system will automatically recognize the flow range , Flow totalizer units and pulse equivalent set.It is easy to adjust.
When the system automatically alarm, please return the convertor to manufactor for repairmen.
When the detection of flow is incorrect,
a) Check whether the target liquid full the measuring tube.
b) Check the connection is working or not.
c) Check the sensor module and whether the zero point is same as shown on the label.
Appendix 1. English menu list

Number	Parameter
1	Diameter of measuring tube
2	Flow detecting range
3	Auto detecting ranges
4	Damping time
5	Flow Direction
6	Flow Zero Calculation
7	L.F. Cutoff
8	Cutoff permission
9	Rate–of–Change
10	Limit Time
11	Total Unit
12	Flow Density
13	Current Type
14	Pulse Output
15	Pulse Factor
16	Max Frequency
17	Common Address
18	Baudrate
19	Empty Pipe Detection
20	Empty Pipe Alarm
21	High Alarm permission
22	High Alarm Limit
23	Low Alarm Permission
24	Lo Alarm Limit
25	Reverse Measuring permission
26	Sensor Series Number
27	Sensor Fact
28	Field Mode
29	Multiplying
30	F.Total Set
31	R.Total Set
32	Input Control
33	Clear Totalize
34	Clear Tot.Key
35	Date–y/m/d
36	Time–h/m/s
37	Password L1
38	Password L2

Material	corrosion resistance
Acid–proof steel 1Cr18Ni9Ti	Great corrosion resistance to nitric acid, phosphoric acid and other inorganic acids, a variety of salt and alkali solutions, organic acids, seawater. No corrosion resistance of Sulfuric acid, hydrochloric acid, hydrofluoric acid, and boiling formic acid, oxalic acid, industrial chromic acid, as well as sodium and chlorine, bromine, iodine and other media, poor chemical stability.
Molybdenum–containing stainless steel Cr18Ni12Mo2Ti	Stronger corrosion resistance to 50% nitric acid, 5% of sulfuric acid at room temperature, alkali solution, boiling phosphoric acid, formic acid, sulfurous acid under certain pressure, seawater, acetic acid, and other media. Intolerance to hydrofluoric acid, hydrochloric acid, chlorine, bromine, iodine and other media.
Hastelloy B	Resistance to sulfuric acid, phosphoric acid, hydrofluoric acid, organic acids and other non–oxidizing acid, alkali, salt solution of non oxidative corrosion. Oxidation of nitric acid does not apply.
Hastelloy C	Resistance to oxidizing acids, such as nitric acid. Also resistant to oxidative corrosion of salts such as Fe^{+3}. On the seawater corrosion resistance is very good. Hydrochloric acid reduction does not apply.
Ti	Capability of sea water, various oxides and hypochlorite, oxidizing acids (including fuming nitric acid), organic acids, alkali, corrosion and the reduction of pure impatience acid (such as sulfuric acid, hydrochloric acid) and corrosion. However, if the acid contains oxidants (such as nitric acid, Fe, Cu) when the corrosion is substantially reduced.

Ta	With excellent corrosion resistance and it is very similar to glass. In addition to hydrofluoric acid, fuming nitric acid, alkali, it has capability to resistant almost of the corrosion all chemical media (including the boiling point of hydrochloric acid, nitric acid and sulfuric acid below 175 ℃) n. It is not corrosion in the sodium hydroxide base.
Pt	Various acids are very good corrosion resistance, alkali and salt corrosion of various types, but the impatience to aqua regia corrosion.

Liner material	Function	Operation temperature	Application
polytetrafluoroethylene PTFE	PTFE is the most stable chemical material of plastics, it is capable to resistant boiling hydrochloric acid, sulfuric acid, nitric acid and aqua regia. It is able to resistant concentrated alkali, and various organic solvents.	–25~180℃	Pressure pipe measuring acid, alkali and salt, and other high wear medium, not be used for vacuum pipe.
PFA	Poor wear resistance and poor adhesion. The corrosive resistance is similar to PTFE and it is able to resistant strong acid alkali, salt solution and various organic solvents. Poor wear resistance	–25~180℃	Acid, alkali and salt and other strong corrosive wear of non–strong media,vacuum pipe.
FEP(F46)	F46 is a modification of PTFE materials with chemical resistance similar to PTFE, the wear resistance is poor.	–25~180℃	Acid, alkali and salt and other strong corrosive wear of non–strong media
Neoprene	It has excellent flexibility, high extension, good wear resistance. It resistant general low concentration of acid, alkali and salt corrosion media. Intolerant of oxidative corrosion medium	≤80℃	General water, sewage, mud, slurry.
Polyurethane	It has an excellent wear resistance, (the equivalent of ten times the natural rubber), Poor anti–acid and anti–alkali ability.	≤45℃	Strong wear neutral slurry, coal slurry, mud.