

# USER MANUAL

## ELECTROMAGNETIC FLOWMETER



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## 1. SUMMARY

### 1.1 Features

- Measurement is not affected by the variation of flow density, viscosity, temperature, pressure and conductivity. High accuracy measurement is guaranteed according to the linear measurement principle.
- No obstacle in the pipe, no pressure-loss and lower requirement for straight pipeline.
- DN 6 to DN2000 covers a wide range of pipe size. A variety of liners and electrodes are available to satisfy different flow characteristic.
- Programmable low frequency square wave field excitation, improving measurement stability and reducing power consumption.
- Implementing 16 bits MCU, providing high integration and accuracy; Full-digital processing, high noise resistance and reliable measurement; Flow measurement range up to 1500:1.
- High definition LCD display with backlight.
- RS485 or RS232 interface supports digital communication.
- Intelligent empty pipe detection and electrodes resistance measurement diagnosing empty pipe and electrodes contamination accurately.
- SMD component and surface mount technology (SMT) are implemented to improve the reliability.

### 1.2 Main Applications

WELTER electromagnetic flowmeter can be used to measure the volume flow of conductive fluid in a closed pipeline. It is widely applied in the flow measurement and control in the fields of chemical and petroleum industry, metallurgy industry, water and waste water, agriculture and irrigation, paper making, food and beverage industry and pharmaceutical industry.

### 1.3 Ambient Conditions

Ambient temperature:

sensor:  $-25^{\circ}\text{C}$  to  $+60^{\circ}\text{C}$ ;

converter:  $-25^{\circ}\text{C}$  to  $+60^{\circ}\text{C}$ .

Relative humidity: 5% to 90%;

### 1.4 Working Conditions

Maximum fluid temperature:

Compact type:  $60^{\circ}\text{C}$

Remote type: Teflon  $150^{\circ}\text{C}$

Neoprene  $80^{\circ}\text{C}; 120^{\circ}\text{C}$

Polyurethane  $70^{\circ}\text{C}$

Fluid conductivity:  $\geq 5\mu\text{S}/\text{cm}$

## 2. WORKING PRINCIPLES

### 2.1 Measuring Principles

The measuring principle of electromagnetic flowmeter is based on the



electromagnetic induction law of Faraday. The sensor is mainly composed of measuring tube with isolate lining, a pair of electrodes installed by penetration of the measuring tube wall, a pair of coils and iron core to produce working magnetic field. When the conductive fluid flows through the measuring tube of the sensor, the voltage signal in direct proportion to the average flow velocity of the fluid will be induced on the electrodes. The signal is amplified and treated by the transmitter to realize various display functions.

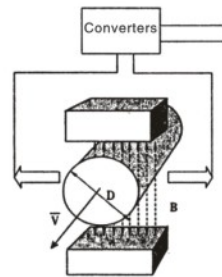


FIG. 1 : The electromagnetic flowmeter Working principle of the

## 2.2 Converter Circuit Schematic

The converters supplies a stable exciting current to the coil in the sensor of electromagnetic flowmeters to get B constant and amplifies the electromotive force and convert it into standard signals of current or frequency so that the signals can be used for displaying, controlling and processing. The schematic of converter circuit is shown in Fig. 2.

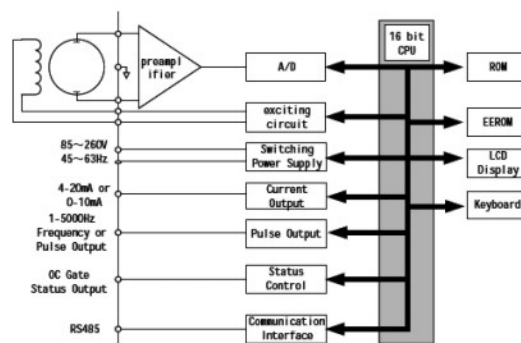


Fig. 2 Schematic of converter circuit

## 3.PRODUCT CLASSIFICATION

### 3.1 Product components

Electromagnetic flowmeter is composed of sensor and converter. The remote-type also needs a special double-layer shielded cable to connect the converter and the sensor.

### 3.2 Product models

WELTER electromagnetic flowmeter has two forms: compact-type and remote-type. There are seven kinds of electrode materials and four kinds of lining

Materials available for sensor.

## 4.TECHNICAL SPECIFICATION

**4.1 The flowmeter is compliant to Standard “JB/T 9248-1999 Electromagnetic Flow Meter” .**

**4.2 Maximum flow speed:** 15m/s

**4.3 DN size:** 3, 6, 10, 15, 20, 25, 32, 40, 50, 65, 80, 100, 150, 200, 250, 300, 350, 400, 450, 500, 600, 700, 800, 900, 1000, 1200, 1400, 1600, 1800, 2000

**4.4 Accuracy:** 0.5%, 0.2%

**4.5 Nominal Pressure:** 4.0MPa(DN0-150)

1.6MPa(DN200-600)

1.0MPa(DN700-1200)

0.6MPa(DN1400-2000)

Or other specified by order

## 4.6 Materials

Electrode Forms and Materials:

Electrode design has four forms: standard form, scraper form, detachable form and grounding electrode.

Electrode material is selectable from stainless steel containing Mo, stainless steel coated with carbonized tungsten, Hastelloy B, Hastelloy C, Titanium, Tantalum and platinum-iridium alloy.

Flange material: carbon steel

Grounding ring: stainless steel

Inlet protection ring: carbon steel, stainless steel

## 4.7 Enclosure

Ip65:

IP68: only available for remote-type sensor with neoprene or polyurethane liner, not including flameproof model.

## 4.8 Flameproof Standard

DN15-DN600 compact-type: md II Bt4

DN15-DN1600 remote-type: sensor and converter both installed in dangerous area: md II BT4.

DN15-DN1600 remote-type: sensor installed in dangerous area and converter installed in safe area: md II BT4

## 4.9 Connection Cable

Special cable is needed to connect the sensor and the converter for remote-type flowmeter.

The cable length should not exceed 100 meters. A 10-meter cable is supplied free of charge and the rest is to be ordered.

## 4.10 General Specification of Converter

●Power supply:AC 85-265V, 45-63Hz, ≤20W; DC 11-40V



- Converter display and operation: four keys are available to set all parameters. External handheld or PC can be used to do the configuration. High resolution LCD display with backlight, empty pipe detection and self-diagnostic function are equipped in the converter.

- Digital communication: RS485, RS232, MODBUS, REMOTE

- Output Signals:

- Current output: fully-isolated, 4–20mA/0–10mA

load resistance: 0–10mA: 0–1.5K $\Omega$ ; 4–20mA: 0–750 $\Omega$ .

- Frequency output: bidirectional flow output. Frequency output is proportional to the flow percentage of the full range. The converter provides fully isolated transistor open collector frequency output ranged from 1 to 5000 Hz. The external DC power supply should not exceed 35V and maximum collector current is 250mA.

- Pulse output: bidirectional flow output. The converter can output up to 5000cp/s pulse series, which is dedicated to external totalization. Pulse factor is defined as volume or mass per pulse. It can be set to 0.001L/p, 0.01L/p, 0.1L/p, 1L/p, 2L/p, 5L/p, 10L/p, 100L/p, 1m<sup>3</sup>/p, 10 m<sup>3</sup>/p, 100 m<sup>3</sup>/p or 1000 m<sup>3</sup>/p. Pulse width is selectable from auto, 10ms, 20ms, 50ms, 100ms, 150ms, 200ms, 250ms, 300ms, 350ms and 400ms. Photo-coupler isolated transistor open collector circuit is used for pulse output. The external DC power supply should not exceed 35V and maximum collector current is 250mA.

- Flow direction indication: The converter is capable of measuring both forward and reverse flow and recognizing its direction. The converter outputs 0V low level for forward flow, while +12V high level for reverse flow.

- Alarm output: Two channels of photo-coupler isolated open collector circuit are used for alarm signal output. There are two alarm outputs: high limit alarm and low limit alarm. The external DC power supply should not exceed 35V and maximum collector current is 250mA.

- Damping constant: Damping time is selectable from 0.2 to 100s.

## 5 .CONVERTER SIZE AND INSTALLATION SIZE

### 5.1 Converter Size

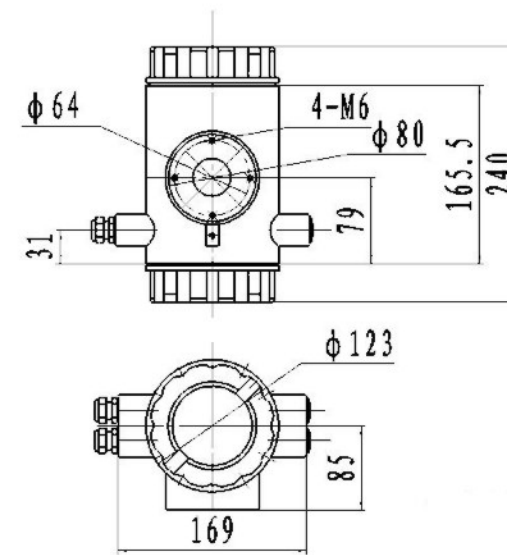


Fig 3(a) 411 series

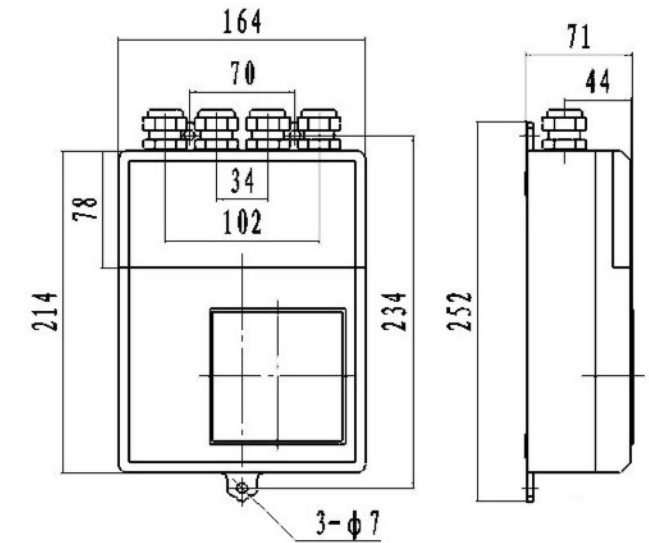


Fig 3(C) 211 series

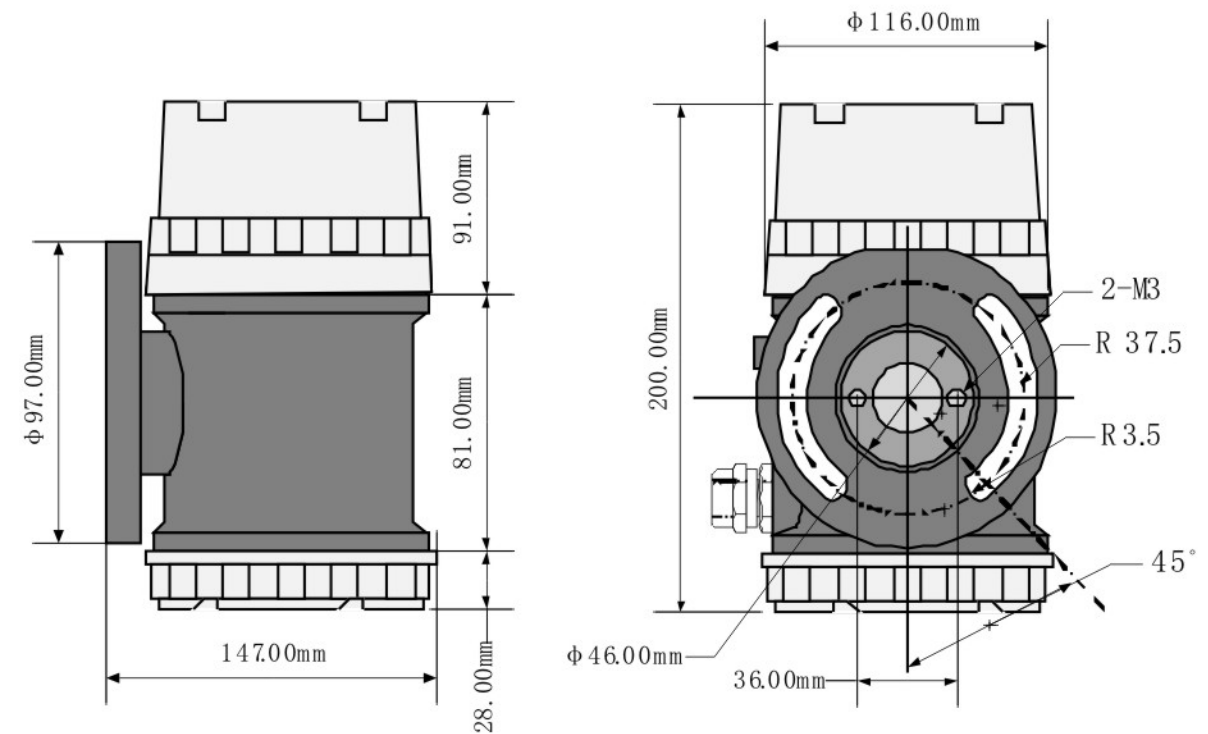
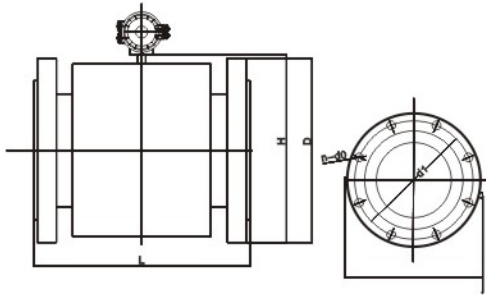


Fig 3(b) 511 series

## 5.2 Installation Size

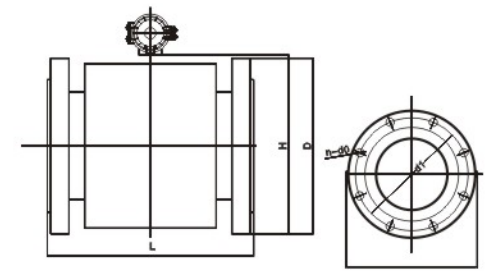
### ◆DN15~DN150, 1.6、2.5MPa Sensors and a body shape



#### ◆Dimensions and weight

Size DN	L	H	weight (kg)	Size DN	1.6MPa					2.5MPa					
					D	d <sub>1</sub>	d <sub>2</sub>	n	b	D	d <sub>1</sub>	d <sub>2</sub>	n	b	
15	200	147	10	7	15	95	65	14	4	16	95	65	14	4	16
20	200	154	12	9	20	105	75	14	4	18	105	75	14	4	18
25	200	156	14	11	25	115	85	14	4	18	115	85	14	4	18
32	200	166	15	12	32	135	100	18	4	18	135	100	18	4	20
40	200	172	16	13	40	145	110	18	4	20	145	110	18	4	22
50	200	191	17	14	50	160	125	18	4	22	160	125	18	4	24
65	250	200	25	22	65	180	145	18	4	24	180	145	18	8	24
80	250	218	29	26	80	195	160	18	8	24	195	160	18	8	26
100	250	242	31	28	100	215	180	18	8	26	230	190	23	8	28
125	250	277	36	33	125	245	210	18	8	28	270	220	26	8	30
150	300	302	41	38	150	280	240	23	8	28	300	250	26	8	30

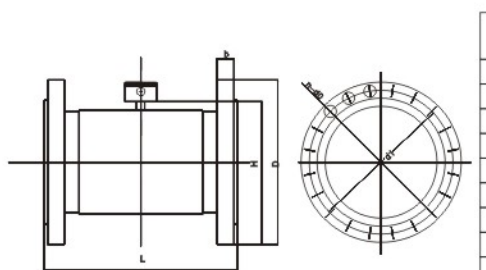
### ◆DN200~DN600, 1.0、1.6MPa Sensors and a body shape



#### ◆Dimensions and weight

Size DN	L	H φ-	weight (kg)	Size DN	1.6MPa					1.0MPa				
					D	d <sub>1</sub>	d <sub>2</sub>	n	b	D	d <sub>1</sub>	d <sub>2</sub>	n	b
200	350	362	45	200	335	295	23	12	30	335	295	23	8	24
250	450	412	50	250	405	355	26	12	32	390	350	23	12	26
300	500	472	60	300	460	410	26	12	32	440	400	23	12	28
350	500	522	145	350	520	470	26	16	34	500	460	23	16	28
400	500	572	180	400	580	525	30	16	38	565	515	26	16	30
450	550	626	215	450	640	585	30	20	42	615	565	26	20	30
500	550	676	245	500	705	650	34	20	45	670	620	26	20	32
600	600	776	335	600	840	770	41	20	50	780	725	30	20	36

### ◆DN700~DN2000, 0.6、1.0MPa Sensor profile



#### ◆Dimensions and weight

Size DN	L	H φ-	weight (kg)	Size DN	pressure MPa	D	d <sub>1</sub>	d <sub>2</sub>	n	b
800	800	966	545	800	1010	950	34	24	38	
900	900	1076	655	900	1110	1050	34	28	42	
1000	1000	1200	810	1000	1220	1160	36	28	44	
1200	1200	1406	875	700	0.6	860	810	25	24	32
1400	1400	1632	1235	800		975	920	30	24	32
1600	1600	1832	1555	900		1075	1020	30	24	34
1800	1800	2036	2085	1000		1175	1120	30	28	36
2000	2000	2236	2610	1200		1400	1340	34	32	36
				1400		1620	1560	34	36	40
				1600		1820	1760	34	40	45
				1800		2045	1970	41	44	45
				2000	2265	2180	48	48	50	

## 6. CONVERTER OPERATION MENU AND PARAMETER SETTING

### 6.1 Key and Display

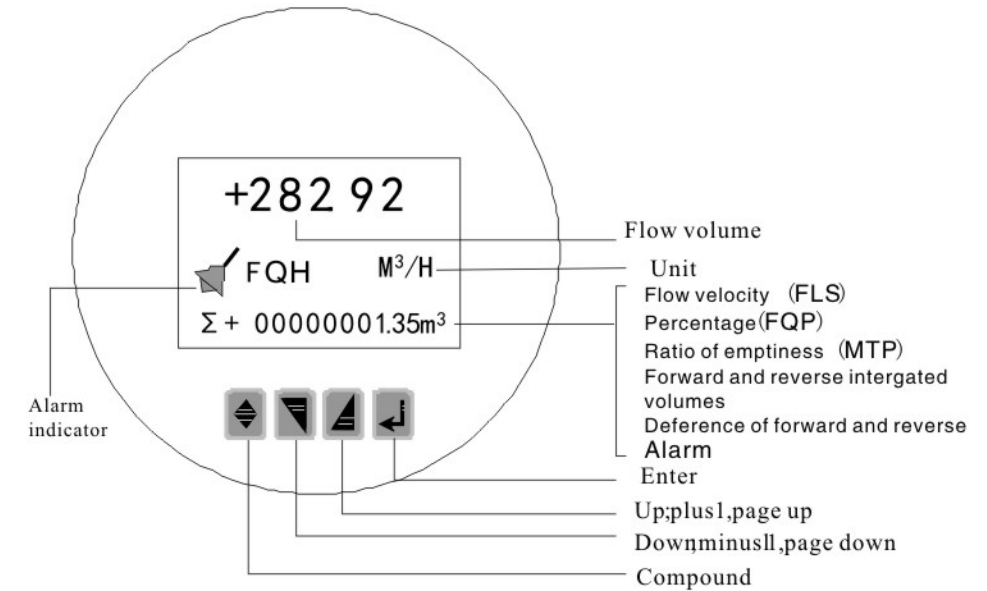


Fig 5

### 6.2 Key Description

Note: When measuring, pushing down “Compound Key + Enter” will appear password of changing state, base on distinction of secrecy, and change the password as we provide. Then pushing “Compound Key + Enter” again, and you can enter the state of setting parameter. If want to return to the running state, push “Enter” for several seconds.

### 6.3 Parameter Configuration and Operation Password

Parameters of converters can decide the running status, process and output ways as well as state of output. Correct option and setting of parameters can keep the converters running optimally and get higher accuracies of output both in display and in measurement.

There are 6 grades of passwords for setting parameters function. Grades 1 to grade 5 of passwords are for users and grade 6 of password is for manufacturer. Users can reset their passwords of grades 1~4 in grade 5.

Users can check converters parameters in any grade of password. However, if users want to change parameters of converters, different grade of parameters have to be used by the users.

Grade 1 of password (set by manufacturer as 00521): users can only read parameter.

Grade 2 of password (set by manufacturer as 03210): users can change 1~25



parameters.

Grade 3 of password (set by manufacturer as 06108): users can change 1~26parameters.

Grade 4 of password (set by manufacturer as 07206): users can change 1~39parameters.

Grade 5 of password (Fixed): users can change 1~53 parameters.

Password Grade 5 can be set by skilled users. Grade 4 is mainly used for resetting total volume in password. Grades 1~3 can be set by any one who can be chosen by users.

#### 6.4 Setting Parameters in Menu

There are 55parameters of L\_MagB, user can set every parameter. The List of Parameters is shown below:

Setting Parameters in Menu

Code	Parameter words	Setting Way	Range	Grades
1	Language	Select	English	2
2	Comm Adres	Set count	0 ~ 99	2
3	Baud Rate	Select	300 ~ 38400	2
4	Snsr Size	Select	3 ~ 3000	2
5	Flow Unit	Select	L/h, L/m, L/s, m <sup>3</sup> /h, m <sup>3</sup> /m, m <sup>3</sup> /s, T/h, T/m, T/s	2
6	Flow Range	Set count	0 ~ 99999	2
7	Flow Rspns	Select	1 ~ 50	2
8	Flow Direct	Select	Plus/ Reverse	2
9	Flow Zero	Set count	0 ~ ± 9999	2
10	Flow Cutoff	Set count	0 ~ 599.99%	2
11	Cutoff Ena	Select	Enable/Disable	2
12	Total Unit	Select	0.001m <sup>3</sup> ~ 1m <sup>3</sup> , 0.001L ~ 1L, 0.001T ~ 1T	2
13	Density	Set count	0~3.999T/m <sup>3</sup>	2
14	SegmaN Ena	Select	Enable/Disable	2
15	Analog Type	Select	0 ~ 10mA /4 ~ 20mA	2
16	Pulse Type	Select	Freque / Pulse	2
17	Pulse Fact	Select	0.001m <sup>3</sup> ~ 1m <sup>3</sup> , 0.001L ~ 1L, 0.001T ~ 1T	2

Code	Parameter words	Setting Way	Range	Grades
18	Freque Max	Select	1 ~ 5999 Hz	2
19	Mtsnsr Ena	Select	Enable/Disable	2
20	Mtsnsr Trip	Set count	59999 %	2
21	Alm Hi Ena	Select	Enable/Disable	2
22	Alm Hi Val	Set count	000.0 ~ 599.99 %	2
23	Alm Lo Ena	Select	Enable/Disable	2
24	Alm Lo Val	Set count	000.0 ~ 599.99 %	2
25	Sys Alm Ena	Select	Enable/Disable	2
26	Clr Sum Key	Set count	0~99999	3
27	Snsr Code1	User set	Finished Y M	4
28	Snsr Code2	User set	Product number	4
29	Field Type	Select	Type1,2,3	4
30	Sensor Fact	Set count	0.0000 ~ 5.9999	4
31	Line CRC Ena	Select	Enable/Disable	2
32	Lineary CRC1	User set	Set Velocity	4
33	Lineary Fact 1	User set	0.0000 ~ 1.9999	4
34	Lineary CRC2	User set	Set Velocity	4
35	Lineary Fact 2	User set	0.0000 ~ 1.9999	4
36	Lineary CRC3	User set	Set Velocity	4
37	Lineary Fact 3	User set	0.0000 ~ 1.9999	4
38	Lineary CRC4	User set	Set Velocity	4
39	Lineary Fact4	User set	0.0000 ~ 1.9999	4
40	FwdTotal Lo	Correctable	00000 ~ 99999	5
41	FwdTotal Hi	Correctable	0000 ~ 9999	5
42	RevTotal Lo	Correctable	00000 ~ 99999	5
43	RevTotal Hi	Correctable	0000 ~ 9999	5
44	PlsntLmtEna	Select	Enable/Disable	3
45	PlsntLmtVal	Select	0.010 ~ 0.800m/s	3
46	Plsnt Delay	Select	400 ~ 2500ms	3

Code	Parameter words	Setting Way	Range	Grades
47	Pass Word 1	User correct	00000 ~ 99999	5
48	Pass Word 2	User correct	00000 ~ 99999	5
49	Pass Word 3	User correct	00000 ~ 99999	5
50	Pass Word 4	User correct	00000 ~ 99999	5
51	Analog Zero	Set count	0.0000 ~ 1.9999	5
52	Anlg Range	Set count	0.0000 ~ 3.9999	5
53	Meter Fact	Set count	0.0000 ~ 5.9999	5
54	MeterCode 1	Factory set	Finished Y/M	6
55	MeterCode 2	Factory set	Product Serial No	6

## 6.5 Parameter Setting Explanation

### 6.5.1 Sensor Size

The converter supports sensor diameter ranging from 3 to 3000mm, which can be chosen by pressing UP or DOWN key.

### 6.5.2 Flow Range

Flow range refers to the upper range value (URV) of flow rate. The URV is relative to flow percentage and output signal. At the analog output the amount of the measured values in the range 0 up to URV is displayed linear to the current range 4 to 20mA, at the frequency output to the frequency range 0 to the end frequency. The low flow cutoff and flow limit alarm relates to flow range as well. The maximum measurable flow rate, however, is not limited to the flow range as long as the flow speed does not exceed 15m/s.

In this menu item, user can also choose unit of flow rate. For volume flow, L/s, L/min, L/h, m<sup>3</sup>/s, m<sup>3</sup>/min and m<sup>3</sup>/h are available; while for mass flow, kg/s, kg/m, kg/h, t/s, t/m, t/h can be selected from. It is up to the habits and application requirements to pickup a proper unit.

### 6.5.3 Auto Rng Chg

The converter has a function called Auto-Range-Change that is usually used for control system with wide flow range variation. The primary flow range is the value given by menu item 'Flow Range'. The second flow range (lower range) is obtained by selecting range ratio 1:2, 1:4 or 1:8 of primary one.

Fig 6 illustrates how the flow range is changed automatically. To safely change range and avoid vibration of display and output, a 5% to 10% hysteresis is added at the change point.

### 6.5.4 Damping

Long damping constant can improve the stability of display and output and is

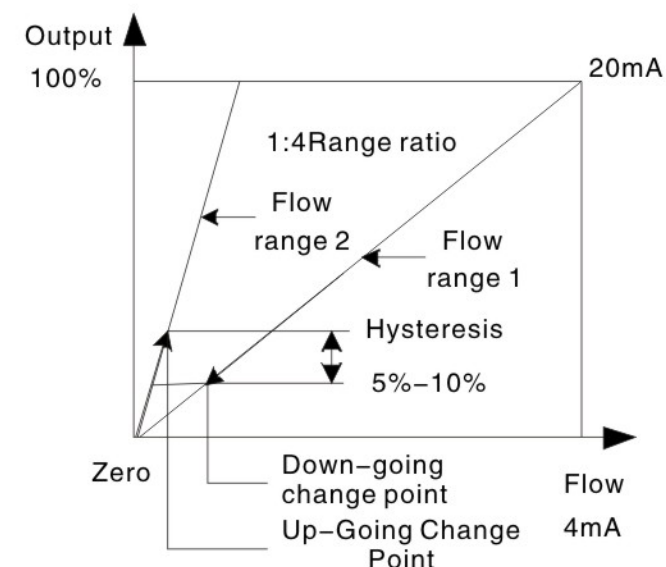


Fig. 6 Illustration of Auto-Range-Change

Suitable to flow control application; while short damping constant has short Response time and is suitable to the totalization of pulse flow. Damping time is selectable from 0.2s to 100s.

### 6.5.5 Flow Dir.

If the displayed direction sign is not agreed to the actual flow direction, change this item to the opposite option.

### 6.5.6 Flow Zero

To conduct zero adjustment, the fluid in the sensor pipe must be held still. The flow zero is displayed by flow speed and the unit is m/s. The display of flow zero is shown below:

```

FS=○○.○○○m/s
±○○○○○

```

On the LCD, the top line displays the measured zero point while the bottom line shows the adjustment value. If the FS is not equal to 00.000m/s, adjust the sign and value on bottom line until FS back to nil. Remind again: to adjust the flow zero, the sensor pipe must be filled and the fluid must be kept still. The flow zero adjustment value is an important constant of the meter and should be printed on the calibration sheet and label. The value should include the sign and amount by unit of m/s.

### 6.5.7 L.F. Cutoff and Cutoff Enable

Low flow cutoff is set in percentage relative to flow range. If Cutoff is enabled and flow is lower than the set value, the display of flow rate, speed and percentage



and signal outputs are forced to nil. If the item is disabled, no action is taken.

#### 6.5.8 Rate-Of-Chng and Limit Time

‘Rate-of-change’ limit technique is used to eliminate application-related high electrical noise contained in the process flow signal.

To check electrical noise, two parameters are defined: ‘Rate-of-change’ limit and ‘Control limit time’. If the sampled flow value exceeds the set rate-of-change limit value based on the averaged flow rate value up until the sampled time, the system will reject that sampled value and instead the averaged value including the rate-of-change limit value in place of the rejected sampled value will be output. However, if the limit-exceeding sampled value continues for the same flow direction for more than the preset control limit time, that data will be used as output signal. Fig 7 illustrates the effect of noise-suppressing by rate-of-change limit.

The value of rate-of-change limit can be set from 0 to 30% of flow range and limit time ranges from 0 to 20 seconds. If either of the two parameters is set to nil, the function is disabled.

The rate-of-change limit function is not suitable for short period measurement and flow meter calibration.

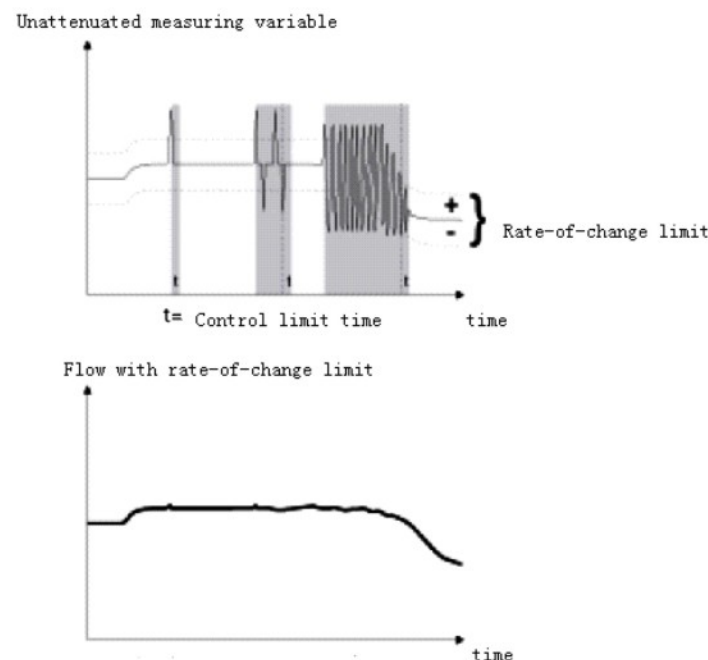


Fig.7 Example for the effect of rate-of-change limit

#### 6.5.9 Total Unit

The converter has three 10-digit counters and the maximum counts are 9999999999. The total flow unit can be L, m<sup>3</sup>, kg or t (metric ton) with a multiplying factor of 0.001, 0.01, 0.1, 1, 10, 100 or 1000.

#### 6.5.10 Flow Density

The converter is capable of measuring mass flow if fluid density is set. The density can be set from 0.0001 to 3.9999 and the mass unit is determined automatically by flow unit. The density should be set to 1.0000 (default value) if not used. Otherwise, measurement data will be forced to nil.

#### 6.5.11 Current Type

Current output type is selectable from 4–20mA to 0–10mA.

#### 6.5.12 Pulse Output

Two types of pulse output are available to choose from: frequency output mode and pulse output mode. The meter outputs continuous square wave pulse under frequency mode, while pulse series under pulse mode. Frequency output is usually used for flow rate measurement and short period of time totalization. Pulse output can be connected to an external counter directly and is often used for long period of time totalization.

As mentioned hereinbefore, transistor open collector circuit is used for frequency and pulse output. Therefore, the external DC power supply and load are necessary. Pulse Factor

6.5.13 Pulse factor is defined as: volume or mass per pulse. It can be set to 0.001L/p, 0.01L/p, 0.1L/p, 1L/p, 2L/p, 5L/p, 10L/p, 100L/p, 1m<sup>3</sup>/p, 10 m<sup>3</sup>/p, 100 m<sup>3</sup>/p or 1000 m<sup>3</sup>/p. Pulse width is selectable from auto, 10ms, 20ms, 50ms, 100ms, 150ms, 200ms, 250ms, 300ms, 350ms and 400ms.

#### 6.5.14 Freq Max

Frequency range corresponds to the upper range value of flow rate, or 100% of flow percentage in other word. Maximum frequency is selectable from 1 to 5999Hz.

#### 6.5.15 Comm Address and Baudrate

Substation address is needed when using RS485 communication. The address can be set from 01 to 99. Baud rate is the transmission speed between main and sub station. It is selectable from 600, 1200, 2400, 4800, 9600, 14400bps. Remind: the baud rate must be the same as that of the main computer.

#### 6.5.16 EmpPipe Det.

This item is used to enable or disable the empty-pipe detector. If enabled, the meter will force the display value, analog output and digital output to nil when the sensor pipe is not full.

#### 6.5.17 EmpPipe Alm.

This item is to set the electrode alarm trip value. Constant current source method is employed to measure the resistance between two electrodes. The Variation of the resistance is checked by CPU and CPU recognizes if the pipe is empty or the electrodes are contaminated. The resistance is calculated as following:

$$R \approx \frac{1}{d \sigma}$$



Where,  $d$  = electrode radius

$\sigma$  = Fluid conductivity

The electrodes resistance is usually between 5 to 50k $\Omega$ . The variation of the resistance relates to the surface status of electrodes and variation of fluid characteristic. If the sensor is filled with fluid, abnormal resistance signal is detected and empty pipe alarm is output.

The electrode alarm trip value is determined based on the first-time measured electrode resistance. After the installation of the flowmeter, measure the resistance between the electrodes when the sensor pipe is filled. Record the resistance value and take it as a basis. Usually, set the trip value as 3 times of the original resistance recorded.

#### 6.5.18 Hi ALM Enble

User can enable or disable the high limit alarm.

#### 6.5.19 Hi Alm Limit

High alarm limit value is set in percentage of the upper range of flow rate. The parameter ranges from 0% to 199.9%. The meter outputs alarm signal when the flow percentage is higher than this value.

#### 6.5.20 Lo Alm Enble

User can enable or disable the low limit alarm.

#### 6.5.21 Lo Alm Limit

Low alarm limit value is set in percentage of the upper range of flow rate. The parameter ranges from 0% to 199.9%. The meter outputs alarm signal when the flow percentage is lower than this value.

#### 6.5.22 Sensor S/N

Sensor serial number records the information of the sensor equipped with the converter and ensure them match up when installing.

#### 6.5.23 Sensor Fact.

The sensor factor is set according to the calibration sheet supplied by the manufacturer. Usually this factor has been set up by the manufacturer before shipping. It is an important value that determines the accuracy of measurement. Do not change it without calibration.

#### 6.5.24 Field Mode

The converter offers three field exciting modes based on the exciting frequency. Mode 1 is the most-commonly used one and suitable for most cases. Mode 2 and 3 are low-frequency exciting modes and are better for large size meter to measure water. The calibration should be taken under the same exciting mode as that used for measurement.

#### 6.5.25 RevMeas.Enbl: Reverse Measurement Enable

If RevMeas.Enbl is set to ON, the converter displays flow and outputs signals when flow direction is reversed. If OFF, the converter displays no flow and does not output signals when reversing.

#### 6.5.26 Multiplying

This item is a multiplying factor selectable from 0.0000 to 3.9999. When calculating the flow rate and total, this factor is taken into account. It is often used to measure the flow in the open channel. If not applied, set the value to 1.0000.

#### 6.5.27 F. Total Set and R. Total Set

Presetting of forward and reverse total counter is designed to start counting from the existing reading when replacing a converter or flowmeter. It provides a continuous total flow read which is convenient for management.

#### 6.5.28 Input Control

This menu item is set to select the function of contact input. There are three options to be chosen from: 'input disabled', 'stop totalizer' and 'reset totalizer'. The converter disables the contact input if 'input disabled' is selected. The contact input is used to start/stop totalizer controlled by ON/OFF switch signal if 'stop totalizer' function is active. If 'reset totalizer' function is enabled, ON (close) contact signal will clear the three internal total flow counters.

6.5.29 Clr Totalizr Enter the 'Totalizer Reset Password' in this menu item and press ENTER to confirm. The converter clears the three internal counter and restart counting if password matched.

#### 6.5.30 Clr Tot. Key

The 'Totalizer Reset Password' is changeable in this menu item if Level-3 password is entered. Remind: keep the new password in a safe place.

#### 6.5.31 Date -y/m/d and Time-h/m/s

These items are used to change the internal real time clock if equipped.

#### 6.5.32 Password L1 ,Password L2 and Password L3

To change the Level-1 to Level-3 passwords, use Level-4 or higher level password to enter and change these two items.

#### 6.5.33 Current Zero and Current Max

Adjust the current output zero point and upper range value. It is not suggested that user make any adjustment since it has been setup to the best condition by the manufacturer.

#### 6.5.34 Meter Factor

This factor is used by the manufacturer to normalize the excitation current and amplifier signal of the converter. DO NOT change it.

#### 6.5.35 Convtr S/N

This serial number records the manufacturing date and code of converter. DO NOT change it.

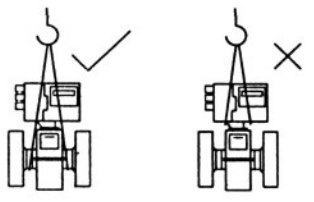
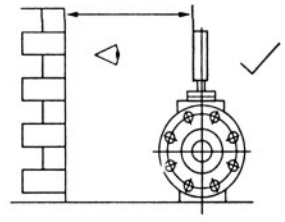
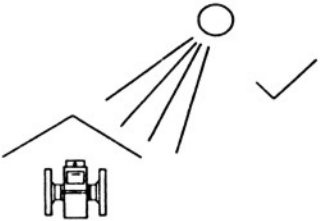
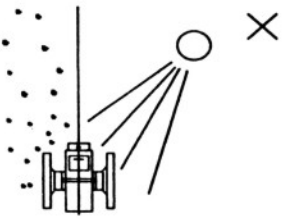
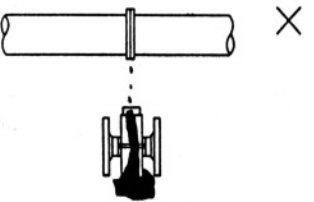
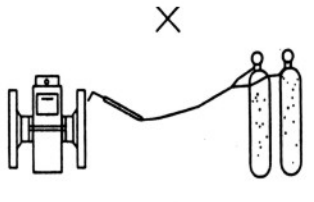
#### 6.5.36 Sys Reset

This item is reserved for the manufacturer to re-initialize the converter. After system resetting, all settings are set to default values automatically.

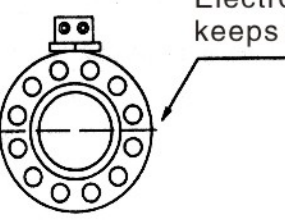
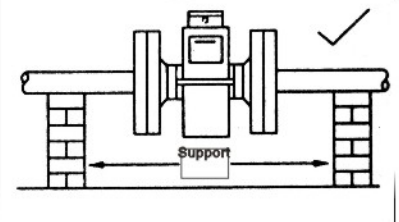
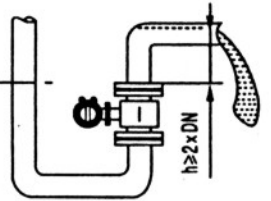
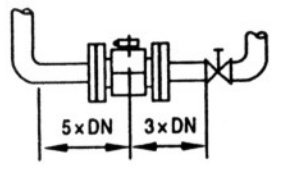
## 7.INSTALLATION

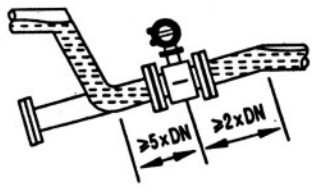
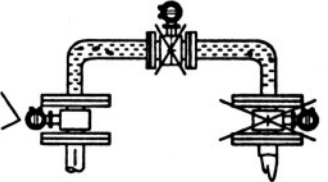
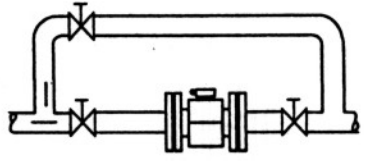
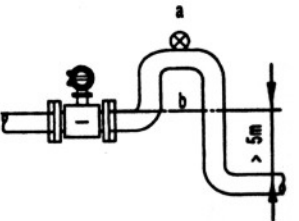
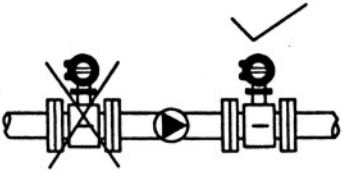
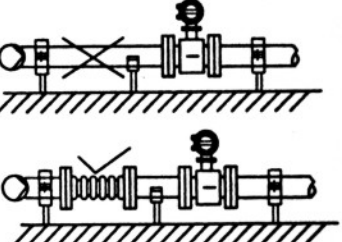
The installation of flowmeter is shown as Fig. 8.



 <p>Appropriate Overhang</p>	 <p>Convenient For Reading</p>
 <p>Strong Sunshine Prevention</p>	 <p>Create Temperature Difference Avoidance</p>
 <p>Keeping Away From Leaking</p>	 <p>Keeping Far Away From Fire</p>

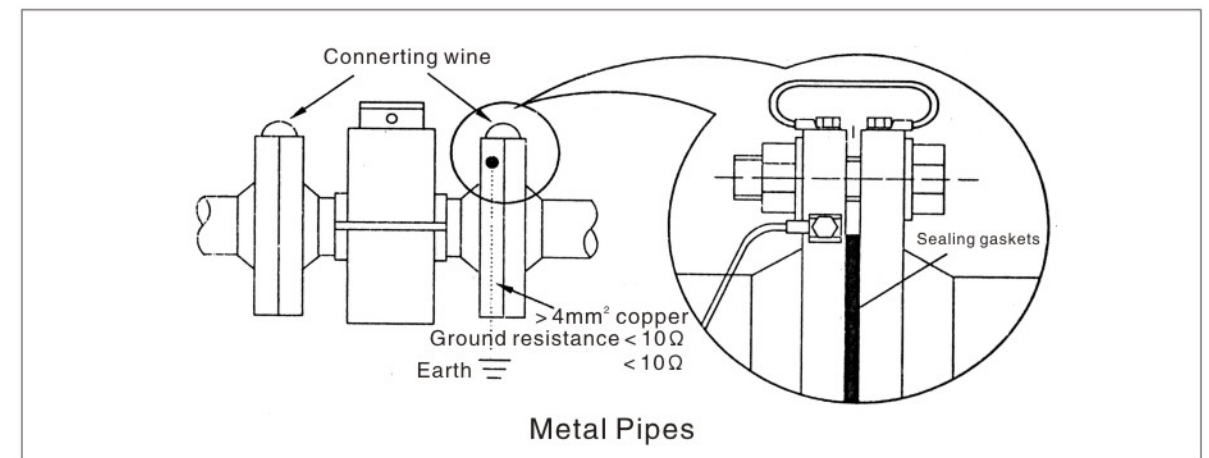
The correct installation flowmeter

 <p>Electrode axial keeps horizontal</p> <p>Level Installation</p>	 <p>Reasonable support</p>
 <p>Full Of Pipe</p>	 <p>Ensure the requirement of the straight pipe section</p>

 <p>Measurement Of The Precipitable</p>	 <p>Bubble Avoidance</p>
 <p>Easy To Maintenance And Clean-up</p>	 <p>Negative pressure and non-filled pipe avoidance</p>
 <p>Not Installed In Front Of The Inlet Of Pump</p>	 <p>Strong Shake Avoidance</p>

## 8. WIRING

### 8.1 GROUING



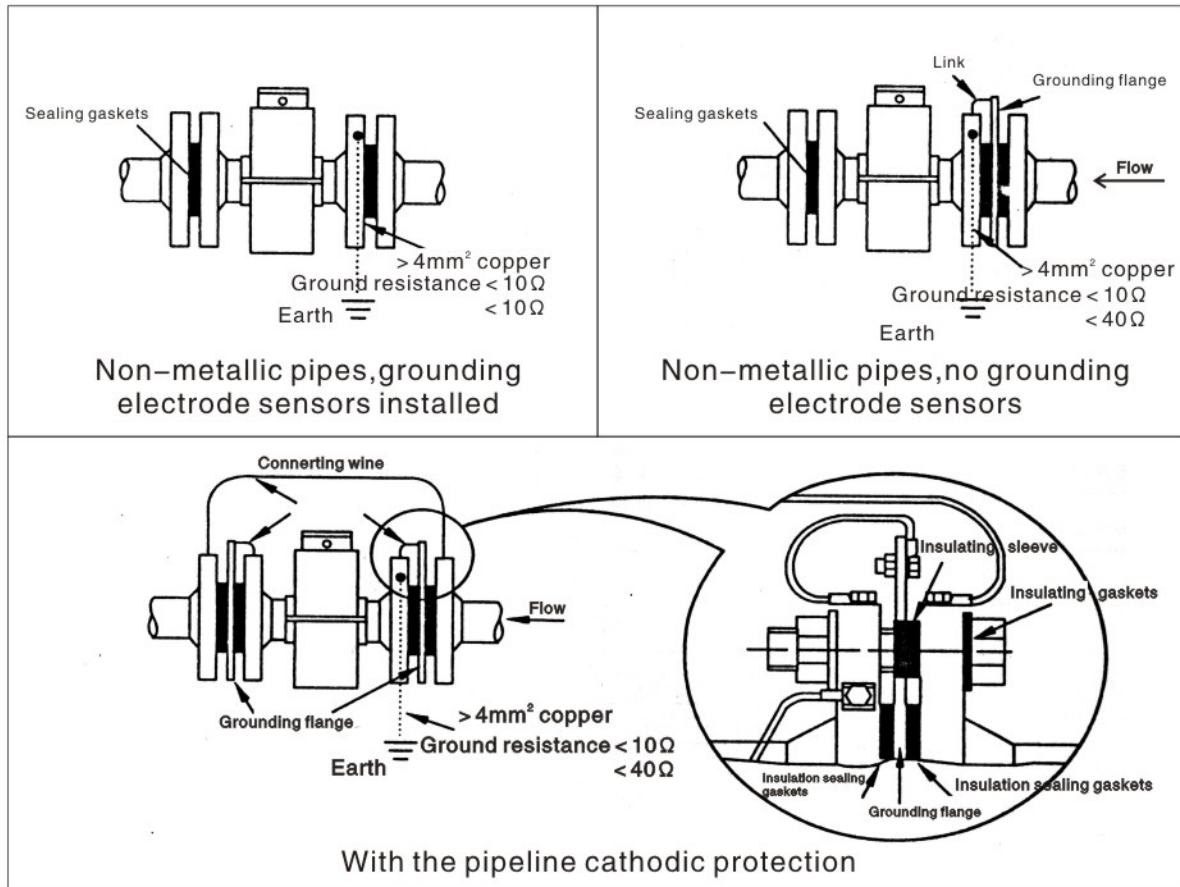


Fig. 9 Grounding of Flowmeter and Pipe

## 8.2 Converter Terminals and Definition

411 series terminal instructions

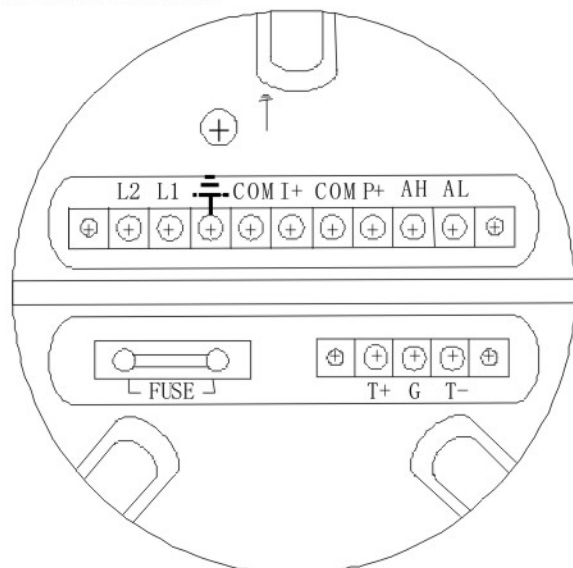


Fig.10 411 series

Circular table for the definition of the connection terminal

I+:	Discharge current output
COM:	Current output
P+:	Bidirectional flow frequency (pulse) output
COM:	Frequency (pulse) output
AL:	Lower limit alarm output
AH:	Upper limit alarm output
COM:	Alarm output
FUSE:	Input power fuse
T+:	Communication input (RS485-A)
T-:	Communication input (RS485-B)
G:	RS232 Communications
L1:	220V ( 24V ) power input
L2:	220V ( 24V ) power input

511 series terminal instructions

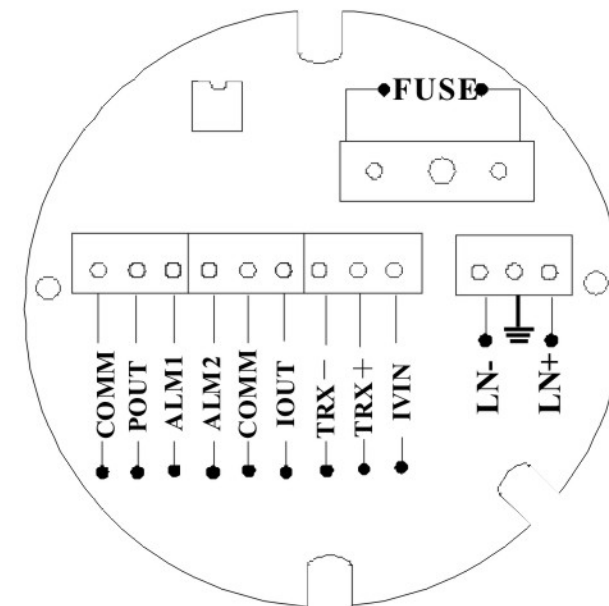


Fig.11 511 series



Labels of connectors in squared model

POUT:	Frequency(Pulse) Output for Bi-directional Flow
ALM1:	Alarm Output for Upper Limit
ALM2:	Alarm Output for Low Limit
COMM:	Frequency, Pulse and Current Common (GND)
COMM:	Frequency, Pulse and Current Common (GND)
IOUT:	Current Output of Flux (Two Routes Out)
IVIN	Two Routes 24V Power Supply
TRX+	+Communication Signal Input
TRX-:	-Communication Signal Input
LN+:	220V Power Supply
LN-:	220V Power Supply

211 series terminal instructions

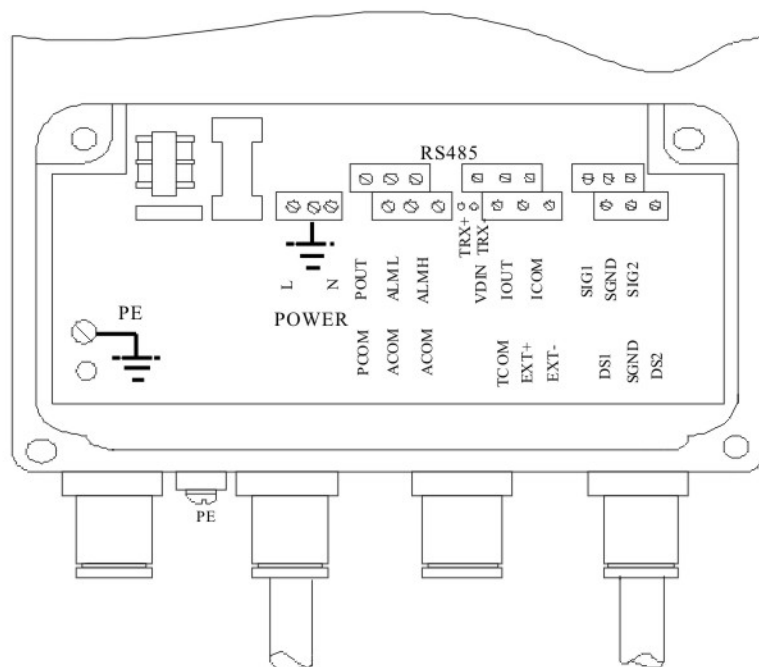


Fig.12 211 series

Labels of connectors in squared model

SIG1	Signal 1	} To Separate Model Sensor
SGND	Signal Ground	
SIG2	Signal 2	
DS1	Shielded Exciting 1	
DS2	Shielded Exciting 2	
EXT+	Exciting Current +	
EXT-	Exciting Current -	
VDIN	Current Two lines 24V Spots	} Analog Current Output
ICOUT	Analog Current Output	
ICCOM	Analog Current Output Ground	
POUT	Flow Frequency(Pulse)Output	} Frequency(Pulse) Output
PCOM	Frequency(Pulse)Output Ground	
ALMH	Upper Limit Alarm Output	} Two Alarm Outputs
ALML	Low Limit Alarm Output	
ALCOM	Alarm Output Ground	
TRX+	Communication Input	} Communication Input
TRX-	Communication Input	
TCOM	232 Communication Ground	

8.3 Remote-type Wiring

8.3.1 Terminal Block in Sensor

Fig. 11 Marks of Terminal Block

SIG1: Signal 1 (Connecting to white coax wire of STT3200 cable)

SIG2: Signal 2 (Connecting to black coax wire of STT3200 cable)

DS1: Signal 1 shield drive (Connecting to inner shield layer of white coax wire of STT3200 cable)

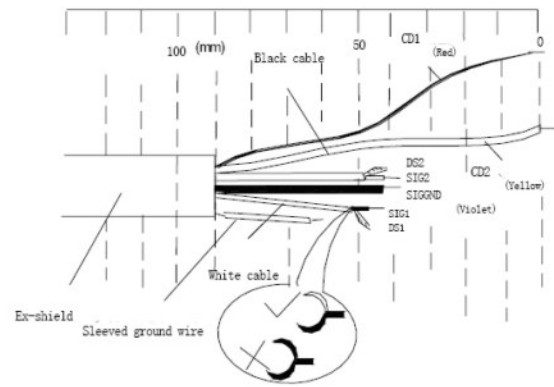
DS2: Signal 2 shield drive (Connecting to inner shield layer of black coax wire of STT3200 cable)

SIG GND: Signal ground (Connecting to Ex-shield of STT3200 cable)

EXT+: Coil 1 (Connecting to red cable)

EXT-: Coil 2 (Connecting to yellow cable)

8.3.2 Connection of STT3200 Cable



STT3200 Schematic Diag for Cable Preparation

Fig. 12 Schematic Diag for STT3200 Cable Preparation

### 8.4 Output Signal Wiring

The dip switch SW1 is set to ON to supply +12V power to pulse output. A 1KΩ resistor is connected to the +12V power to provide a pull-up. If external power is used, turn the switch to OFF.

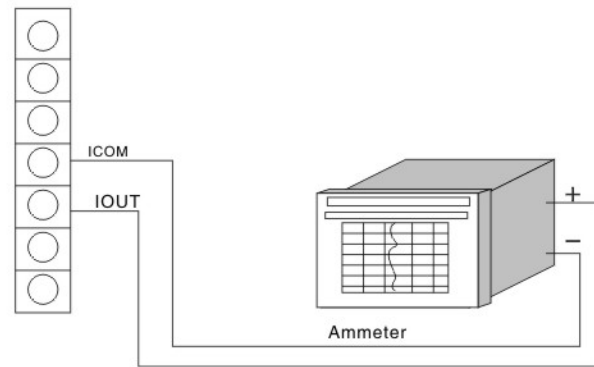


Fig. 13(a) Wiring of current output

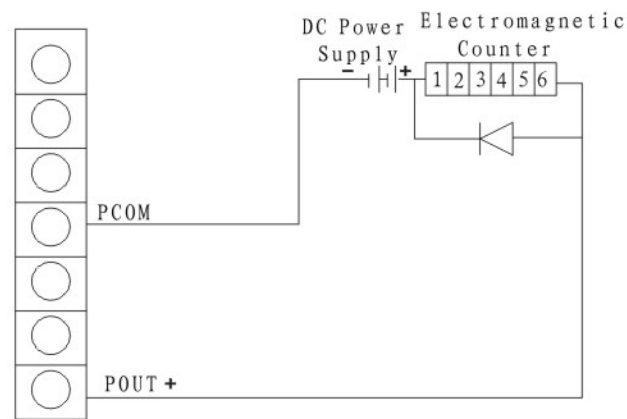


Fig.13 (b) Example of electromagnetic counter connection

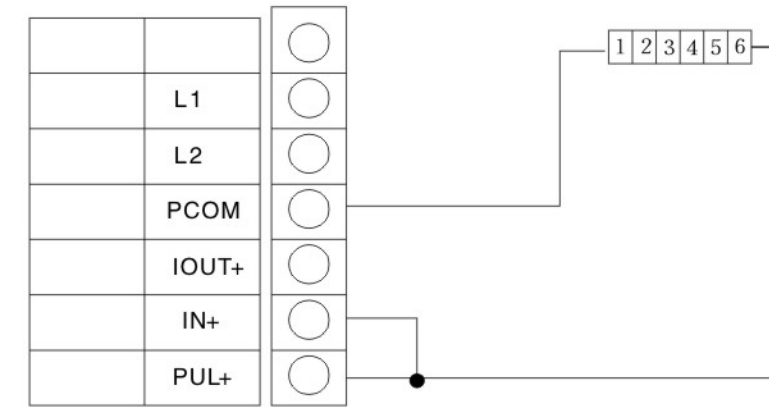


Fig. 13(c) Example of electrical counter connection

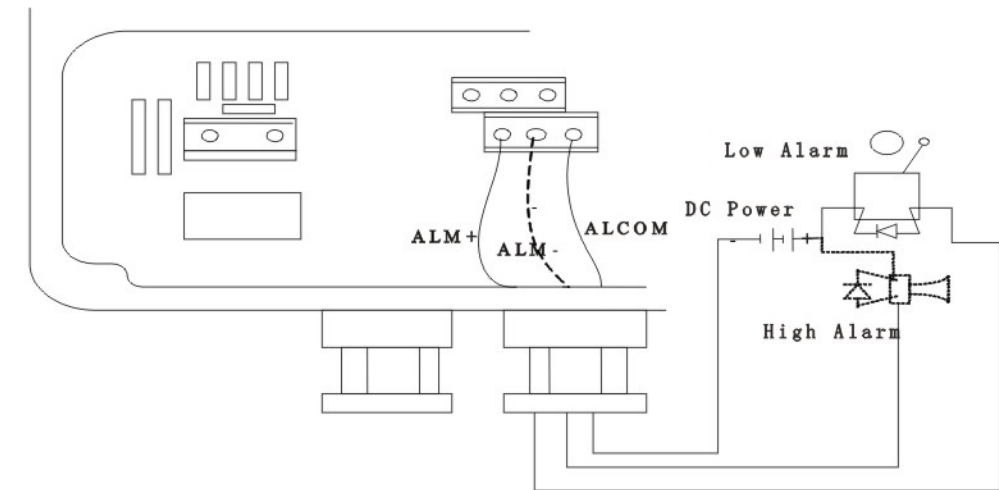


Fig. 13(d) Digital Output Direct Connection

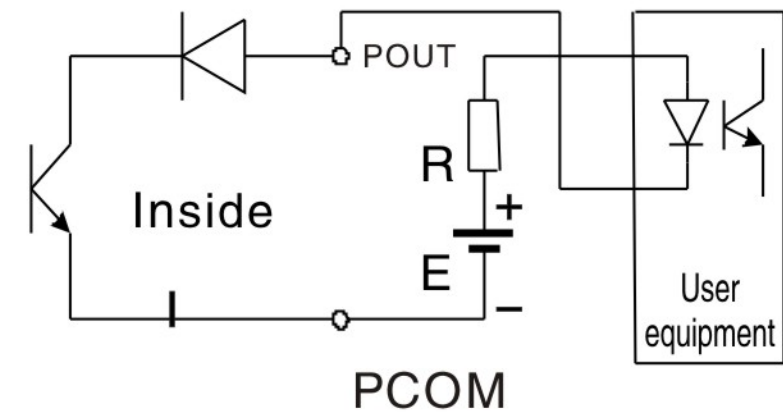


Fig. 13(e) Connection with photo-coupler (e.g. PLC)



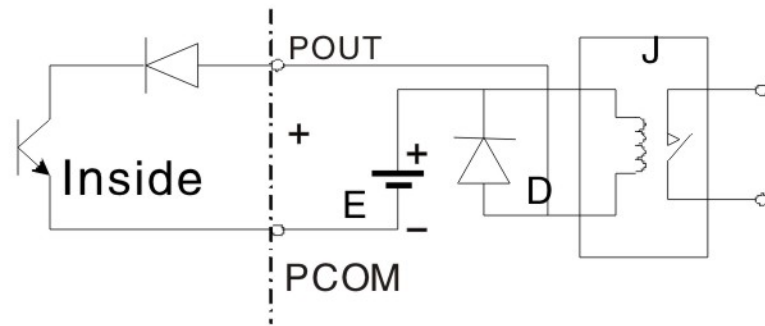


Fig.13 (f) Connection with relay (e.g. PLC)

Generally, the intermediate relay needs 12V or 24V power supply E. D is a surge-absorbing diode, which is usually embedded in the relay. If not, an external one is necessary.

### 9. Self-diagnostic and Troubleshooting

The converter is made by surface mount technology and is not repairable for user. Do not open the converter case.

The self-diagnosis function of the converter is capable of displaying alarm information except power supply or hardware failures. A '!' symbol is displayed on the right corner of LCD top-line and malfunction information can be read from the bottom-line by pressing DOWN key. User may check the flowmeter according to the alarm information. Some examples of alarms are given below:

- Coil Alm**
- Elctrd Alm**
- EpPipe Alm**
- Low Alarm**
- High Alarm**

Troubleshooting information is given below:

#### 9.1 No display

- Check the connection of power supply;
- Check fuse;
- Check the voltage of power supply;
- Check if the LCD contrast can be adjusted. Adjust it if possible;
- Return to base, if a) to d) are OK.

#### 9.2 Coil Alarm

- a) Check if terminal EXT+ and EXT- are open;
- b) Check if coil resistance is less than 150Ω;
- c) Replace converter if a) and b) are OK.

#### 9.3 Empty Pipe Alarm and Electrodes Alarm

- a) Check if the sensor pipe is filled with fluid;
- b) Check the connection of signal wiring;
- c) Connect the terminal SIG1, SIG2 and SIG GND. If the alarm display disappears, it is confirmed the converter is normal. The alarm may be caused by the bubble in the fluid;
- D) For electrodes alarm, measure the resistance between two electrodes with a multimeter. The read should be between 3 to 50kΩ. Otherwise, the electrodes are contaminated or covered.

#### 9.4 High Alarm

Increase the flow range.

#### 9.5 Low Alarm

Reduce the flow range.

#### 9.6 Inaccurate Measurement

- a) Check if the sensor pipe is filled with the fluid to be measured.
- b) Check the wiring;
- c) Check if the sensor factor and flow zero are the same as those on the calibration sheet.

### 10. PACKAGING

The package includes:

- The electromagnetic flowmeter ordered;
- Instruction Manual;

### 11. TRANSPORTATION AND STORAGE

To prevent the flowmeter from damage in the transportation, the package should be kept in unopened status before reaching installation site. The storage room should be satisfied with the following conditions:

- a. Rain-proof, humidity-proof;
- b. Strong Vibration and Shake Avoidance
- c. Temperature between -20 to +60°C, relative humidity less than 80%

### 12. OPERATION

Before operation, the following inspection should be done to check if:

- a. There is any damage caused by transportation or installation;
- b. The power used is same as the label on the flowmeter;
- c. The wiring is correct.

After inspection, turn the valve on to fill the pipe up and make sure there is no leakage and the gas inside the pipe is eliminated. Switch on the power supply and the flowmeter is ready to use after 10 minutes warm-up.

If there is any problem, please refer to the Section 9 for troubleshooting. If still not working properly, contact the manufacturer immediately.