



BEIJING GALLOP HIGH&NEW TECH.CO.,LTD.

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# Electrometric Flow meter Converter Instruction Manual

## 1. The product function introduction

### 1.1 Basic function

- Low-frequency square-wave exciting, exciting frequency: 1/16 power frequency、1/20power frequency、1/25 power frequency;
- High-frequency square-wave exciting, exciting frequency: 1/2 power frequency (for grouting liquid measure) ;
- Exciting current can be selected for 125mA、187.5mA、250mA、500 mA;
- No need to add empty pipeline measurement, and can measure continuously, alarm by fixed value;
- Current speed range: 0.1 --- 15m/s, current speed resolution: 0.5mm/s;
- AC high-frequency switching power, range of voltage: 85VAC --- 250VAC;
- DC 24V switching power, range of voltage: 20VDC --- 36VDC;
- Network function: MODBUS、GPRS、PROFIBUS 、HARTcommunication interface (choose) ;
- Chinese or English displaying mode, (other languages can be set);
- Three integrator gross inside, respective register: Forward gross, reverse gross and minus value gross.

### 1.2 Especial function

- Recording time when power turn-off, to record power broken time of instrument system automatically and recruit to count the missing flux ;
- Recording function of hour gross, to record the flux gross by hour, fit for timed measure;
- Infrared handing telecontrol keyboard, all the functions of far-untouched controlling converter.

### 1.3 Normal operating conditions

Ambient Temperature Ranges: fission  $-10\sim+60^{\circ}\text{C}$ ;

Relative Humidity:  $5\%\sim90\%$ ;

Power Supply:  $85\sim250\text{V}$ ,  $45\sim63\text{Hz}$  ( single-phase AC).

Dissipation Power:  $<20\text{W}$  ( After connecting sensor) .

### 1.4 Type of connecting with sensors

- The integrated circinal shells: circinal shells, shells connect with the flange directly, explosion-proof;
- The integrated squared shells: squared shells, shells connect with the flange directly;
- The split squared shells: squared shells (hang on the wall), Signal converters connect with cable of sensor;

### 1.5 Plot of installing measure

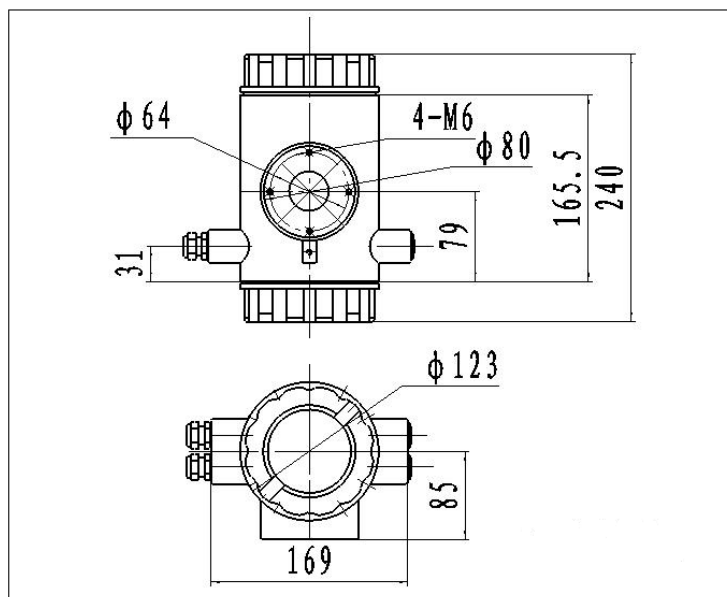


Fig.1 Exterior size of the integrated circinal shells

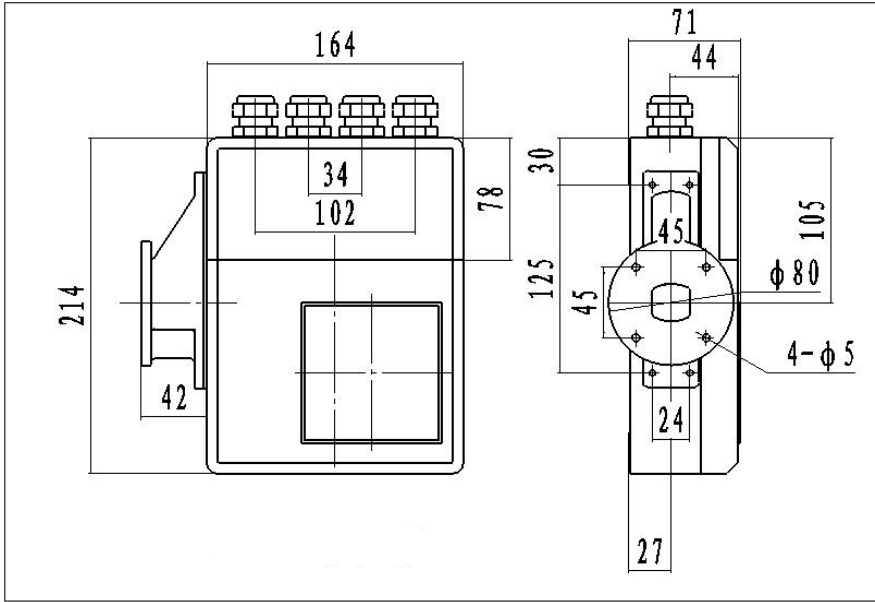


Fig.2 Exterior size of the integrated squared shells

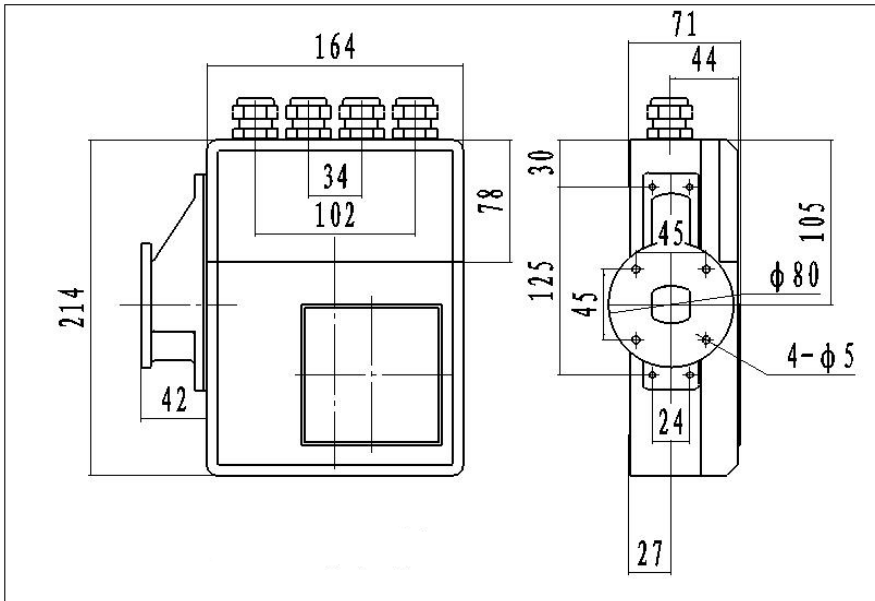


Fig.3 Exterior size of the split squared shells

## 2. Basic circuit of converter

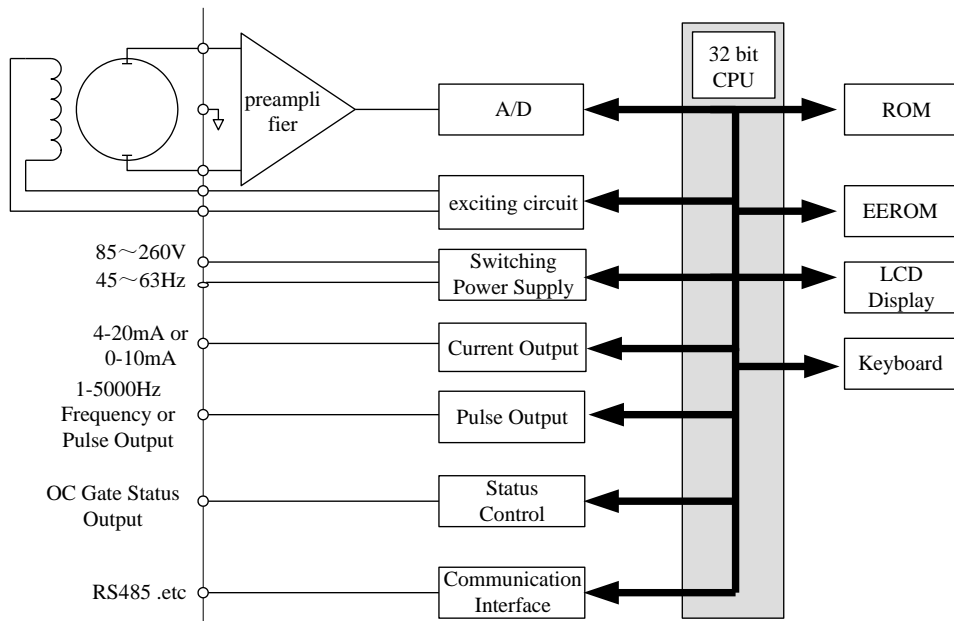


Fig.2. 1 Structure Of Converter's Circuit

The converter can supply exciting current to the coil in the sensor of electronic flowmeters, the head amplifier amplifies the electromotive force from the sensor and converts it into standard signals of current or frequency so that the signals can be used for displaying, controlling and processing. See structure of converter circuit shown in Fig.2.1.

### 3. Index of technical performance

#### 3.1 Standard of implement

The design, production and instrument of **L\_MagB** Electromagnetic Flowmeter Converter implement 《JJG-1033-2007 Electromagnetic Flowmeters》。

#### 3.2 Basic parameters and performance index

##### 3.2.1 Pipe's inside diameter of relative sensor (mm):

3、 6、 10、 15、 20、 25、 32、 40、 50、 65、 80、 100、 125、 150、 200、 250、 300、 350、 400、 450、 500、 600、 700、 800、 900、 1000、 1200、 1400、 1600、 1800、 2000、 2200、 2400、 2500、 2600、 2800、 3000;

##### 3.2.2 Request of relative sensor

Sensitivity of sensor signal: under 1m/s, output 150 $\mu$ V ~200 $\mu$ V;

For L\_MagB electromagnetic flowmeter signal converters, there are two currents of 125mA in exciting loop, which make up of 250mA, and every 125mA is controlled by one 10 $\Omega$  exact resistance. So user can choose different exciting current by changing the number of exact resistance.

The current will be 250mA when the signal converters leave factory, as such, if there are three 20 $\Omega$  exact resistance or one 20 $\Omega$  and one 10 $\Omega$  exact resistance, the current will be 187.5 mA; if two 20 $\Omega$ , 125mA.

Resistance of sensor exciting coil:

500mA exciting current: 20 ~ 30 $\Omega$ ;

250mA exciting current: 50 ~ 60 $\Omega$ ;

187mA exciting current: 60 ~ 80 $\Omega$ ;

125mA exciting current: 100 ~ 120 $\Omega$ ;

### 3.2.3 Measure precision for assembly

Table 3.1  $V_S$ : Setting measurement range (m/s)

Diameter(mm)	Range(m/s)	Accuracy
3 ~ 20	$\leq 0.3$	$\pm 0.25\%FS$
	0.3~1	$\pm 1.0R$
	1~15	$\pm 0.5\%R$
25 ~ 600	0.1~0.3	$\pm 0.25\%FS$
	0.3~1	$\pm 0.5\%R$
	1~15	$\pm 0.3\%R$
700~3000	$\leq 0.3$	$\pm 0.25\%FS$
	0.3~1	$\pm 1.0\%R$
	1~15	$\pm 0.5\%R$
%FS: for relative ranges;		
%R: for relative value of measurement		

### 3.2.4 Simulated current output

Load resistor: 0~1.5k $\Omega$  (0~10mA); 0~750 $\Omega$  (4~20mA).

Basic Errors: 0.1% $\pm 10\mu A$ .

### 3.2.5 Digital frequency output

Frequency output range: 1~5000Hz;

Output electric isolate: Photoelectric isolate. Isolate voltage: > 1000VDC;

Frequency output drive: output by field-effect transistors, the highest subjected voltage is 36VDC, maximum of output current is 250 mA.

### 3.2.6 Digital pulse output

Pulse output range: 0 ~ 100 pulse/s. (When higher than upper limit, pulse will lose);

Pulse output value: 0.001~1.000 m<sup>3</sup>/cp 0.001~1.000 Ltr / cp



Pulse output width: 50ms,

Pulse output isolate: photo electricity isolate. Isolate voltage: > 1000VDC;

Pulse output drive: output by field-effect transistors, the highest subjected voltage is 36VDC, maximum of output current is 250 mA.

### 3.2.7 Alarm output

Alarm output junction: ALMH--- upper limit; ALML--- lower limit;

Output isolate: photo electricity isolate. Isolate voltage: > 1000VDC;

Alarm output drive: output by Darlington pipe, the highest subjected voltage is 36VDC, maximum of output current is 250 mA.

### 3.2.8 Digital communication port and protocol

MODBUS interface: format of RTU.

HART interface: designed by standard of HART , if you choose our hand held unit , you can display the measure value on line, and setting the parameters.

### 3.2.9 Electric isolate

Insulated voltage between simulated input and simulated output should be higher than 500V;

Insulated voltage between simulated input and alarm power supply should be higher than 500V;

Insulated voltage between simulated input and AC power supply should be higher than 500V;

Insulated voltage between simulated output and AC power supply should be higher than 500V;

Insulated voltage between simulated output and earth should be higher than 500V;

Insulated voltage between pulse output and AC power supply should be higher than 500V;

Insulated voltage between pulse output and earth should be higher than 500V;

Insulated voltage between alarm output and AC power supply should be higher than 500V;

Insulated voltage between alarm output and earth should be higher than 500V;

## 4. Operation converter

### 4.1 Key and display

#### 4.1.1 L\_Mag\_3Keys and display

##### 4.1.1.1 Squared define keys and LCD screen display

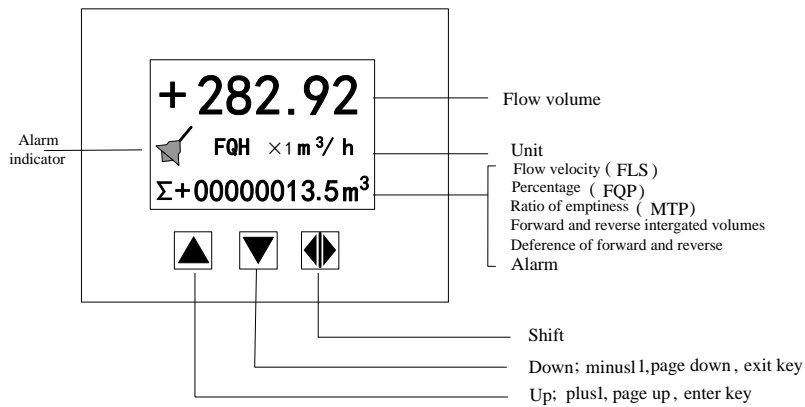


Fig. 4.1 (a) Keys on squared panel and large LCD display:

##### 4.1.1.2 Rotundity define keys and LCD screen display

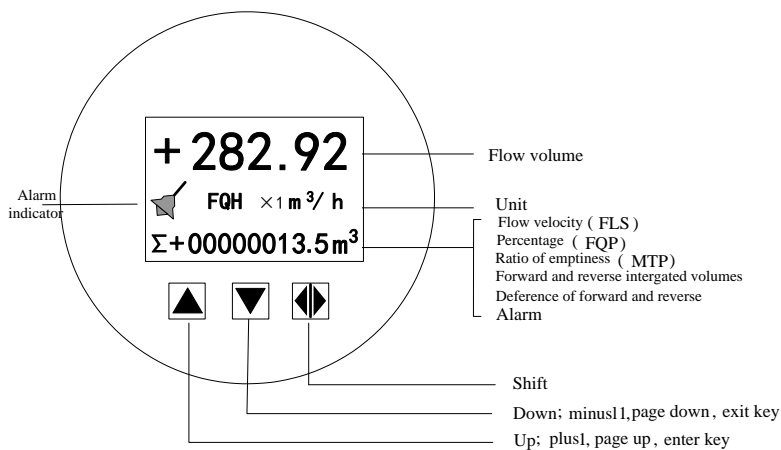


Fig. 4.1 (b) Keys on circinal panel and big LCD display

Note: Press enter key, the instrument enter into the setting parameters of select

function. Move the cursor under the enter key. Press it. and then input password when password status“00000” can be seen. Movie the cursor under the enter key again. Press it. And then input settings into selected item of operating manus .Please push “▼”key down for several seconds for returning to running status.

## 4.1.2L\_Mag\_4Keys and display

### 4.1.2.1Squared define keys and LCD screen display

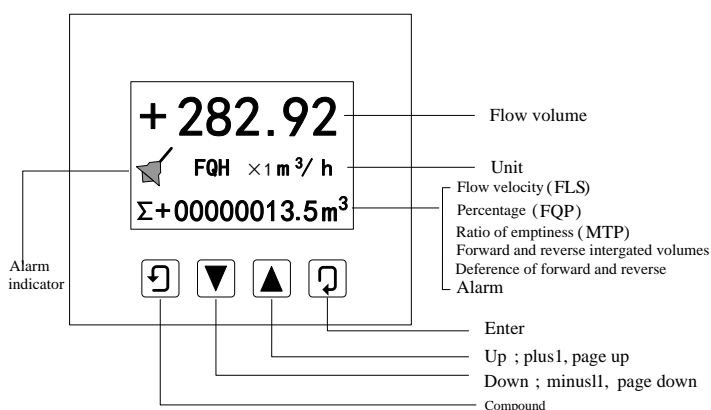


Fig. 4.1 (c) Keys on squared panel and large LCD display:

### 4.1.2.2Rotundity define keys and LCD screen display

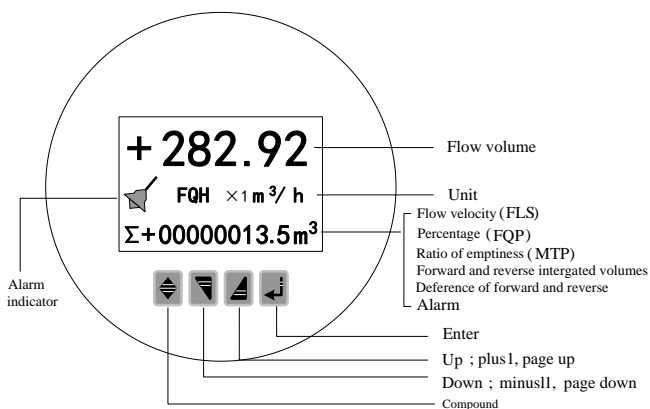


Fig. 4.1(d) Keys on circinal panel and big LCD display

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.

## 4.2 Section picture of conversion

### 4.2.1 L\_Mag\_3 Keys Series



Fig.4.2 (a) L\_Mag211B-3 Key



Fig.4.2(b) L\_Mag411B-3 Key

### 4.2.2 L\_Mag\_4 Keys Series



Fig.4.2 (c) L\_Mag211B-4 Key

Fig.4.2 (d) L\_Mag411B-4 Key

### 4.3 Connections of sensor

#### 4.3.1 Connectors and labels for the squared

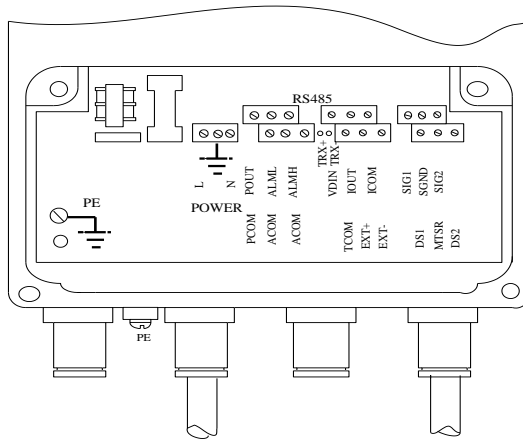


Fig.4.3 (a) Connectors for 211B

Labels of connectors in squared model

SIG 1	Signal 1	}	To Separate Model Sensor
SGND	Signal Ground		
SIG 2	Signal 2		
DS1	Shielded Exciting 1		
DS2	Shielded Exciting 2		
EXT +	Exciting Current +		
EXT -	Exciting Current -		
VDIN	Current Two lines 24 V 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 (RS485-A)	}	Communication Input
TRX -	Communication Input (RS485-B)		
TCOM	232 Communication Ground		

### 4.3.2 Signal lines and labels in squared model

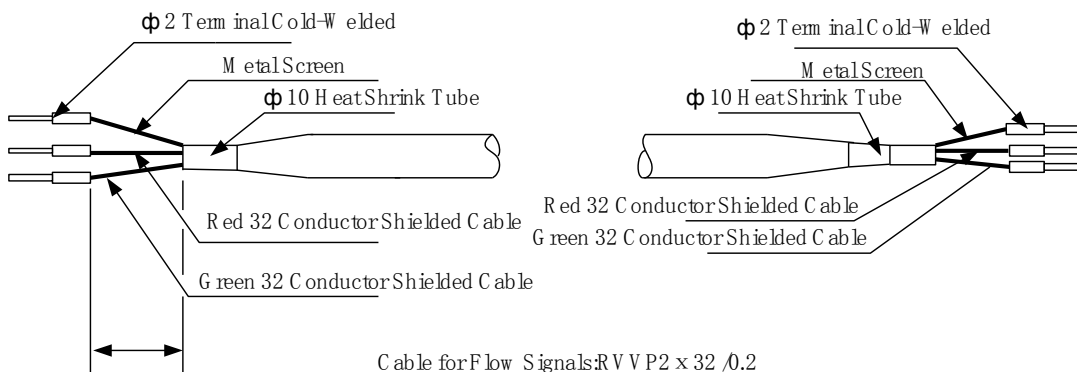


Fig.4.3 (b) Connection and labels of signal lines in squad model

### 4.3.3 Links and labels of connectors in Circinal Model

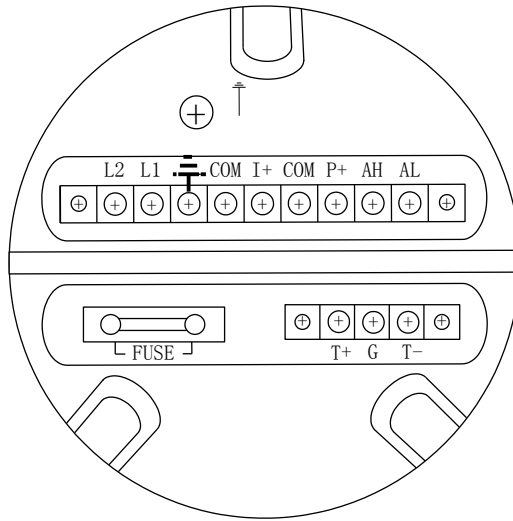


Fig.4.3(c) Connectors in circinal model

#### Symbols and Description of Connectors in Circinal Pane

I+:	Output Current for Flow Measurement
COM:	Output Current (Ground) for Flow Measurement
P+:	Frequency(Pulse) Output for Bi-directional Flow
COM:	Frequency (Pulse) Output (Ground)
AL:	Alarm Output for Low Limit
AH:	Alarm Output for Upper Limit
COM:	Alarm Output (Ground)
FUSE:	Fuse for Power Supply
T+:	+Communication Input Signal(RS485-A)
T-:	-Communication Input Signal(RS485-B)
G	RS232 Communication Ground
L <sub>1</sub> :	220V (24V) Power Supply
L <sub>2</sub> :	220V (24V) Power Supply

#### 4.3.4 Labels and connection of signal lines in circinal model

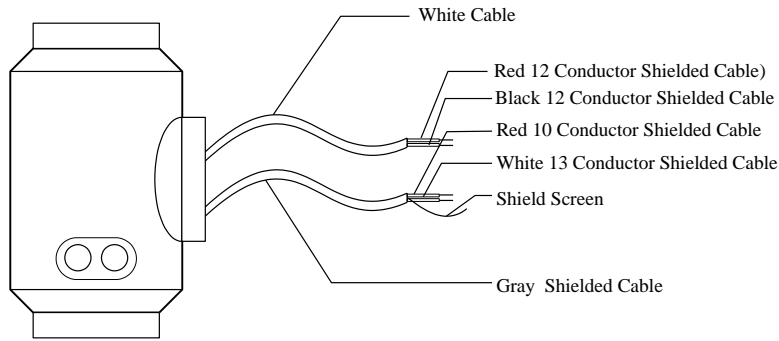


Fig.4.3 (d) Labels and connection of signal lines in circinal model

Signal lines labels in circinal model:

White twisted-pair cable (for exciting current): 12 Conductors (Red)

12 Conductors (Black)

Gray shielded twisted-pair cable: 10 Conductors (Red) connected to “Signals 1”

13 Conductors (White) connected to “Signals 2”

Shielded Conductor connected to “Signal Ground”

## 4.4 Characteristic and connection of cable

### 4.4.1 Flux signal line

When separated models of converters are assembled with sensors for measuring flow of fluid which conductivity is larger than  $50\mu\text{S}/\text{cm}$ , PVVP  $2*0.2\text{ mm}^2$  model cable ( metal shielded signal cable covered with PVC) can be used as communication cable for flow signals. The length of signal cable should be less than 100 m. Signal cables have to be connected to sensors that were assembled by producers. Connections of signal cables are shown in Fig.4.3(b) for squire-shaped models and Fig.4.3(d) for circle-shaped models, respectively.

The converter can output equivalent level of shielded exciting signal voltage so that interference to flow measurement signals can reduced by means of lowering the distributed capacitance of communication cable. When measured conductivity is less than  $50\mu\text{S}/\text{cm}$  or signals are transferred in remote distances, double-conductor and double-shielded signal



cable at equivalent level of voltage can be used. For example, special STT3200 cable or BTS model signal cable (triple-shielded) can be used for signal communication.

#### 4.4.2 Exciting current cable

Two conductor and insulating rubber- covered cables can be used as exciting current cables. Suggested model is RVVP2\*0.3mm<sup>2</sup>. Length of exciting current cable should be equal to that of signal cable. When the model STT3200 cables are used for exciting current and signals, two cables can be put together as one cable.

#### 4.4.3 Output and power line

All cables for signals transferring and power supply have to be prepared by users. However, it should be careful to choose the cables that meet the upper limit load of consuming current.

Note: When DIP switch next to terminal is set to ON places, the converter from its inside can provide +28V power supply and up-pull 10k $\Omega$  resistance to output Frequencies (PUL) to isolated OC gate, Alarm Output (ALMH.ALML), and Status Control (INSW). Therefore, when converter has frequency output and works with sensor together, DIP switch can be set as ON getting frequency signals from POUT and PCOM terminals.

Pulse current output, alarm current output and external power supply can be seen in Fig.4.4(a). When inductive load is connected to converter, diode should be used as in Fig.4.4(b).

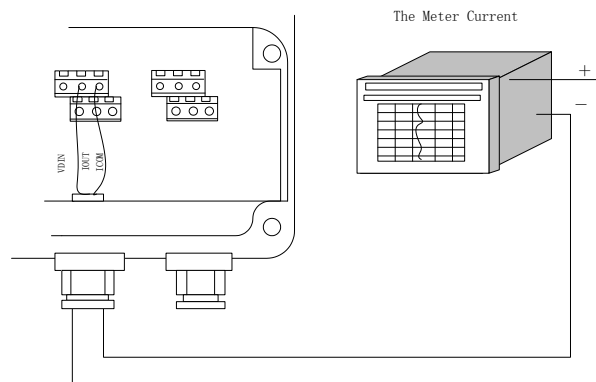


Fig.4.4 (a) Output current circuit

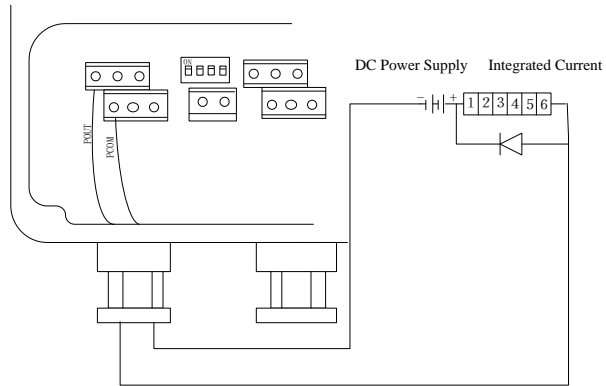


Fig.4.4 (b) Connection of electro-magnet counter

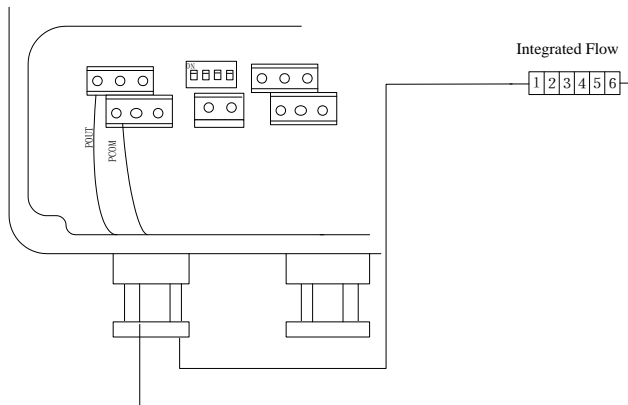


Fig.4.4 (c) Connection of electronic counter

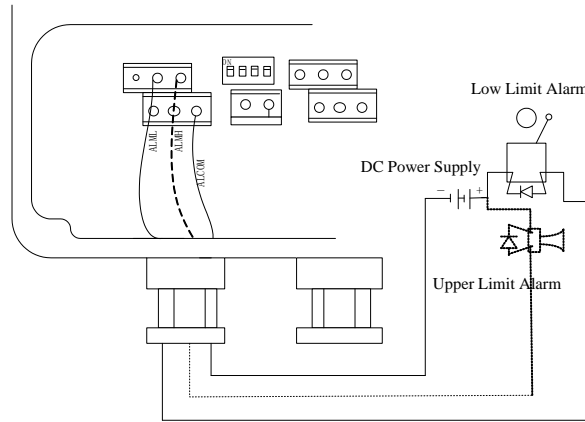


Fig.4.4 (d) Connection of alarm output

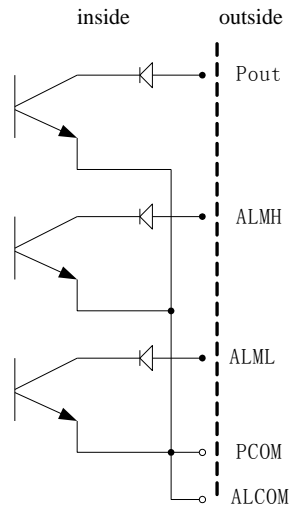


Fig.4.4 (e) Connection of OC gate

#### 4.4.4 Grounding

Contact area of copper Connector PE on Converter Cabinet for grounding should be larger than  $1.6\text{mm}^2$ . Contact resistance should be less than  $10\Omega$ .

### 4.5 Digital output and calculate

Digital output means frequency output and pulse output, and both of them use the same output point, so user can choose only one type of them but not both.

#### 4.5.1 Frequency output

Frequency output range is 0~5000HZ, and corresponding the percent of flux.

$$F = \frac{\text{Measure value}}{\text{Full scale value}} \bullet \text{ frequency range}$$

The up limit of frequency output can be adjusted. It can be chosen from 0 ~ 5000HZ, and also can be chosen low frequency: such as 0 ~ 1000HZ or 0 ~ 5000HZ.

Frequency output mode general can be used in control application, because it responses the percent flux. Users can choose pulse output when the equipment is applied to count.

#### 4.5.2 Pulse output mode:

Pulse output mainly applies in count mode. A pulse output delegates a unit flux, such as 1L or 1M<sup>3</sup> etc. Pulse output unit divide into 0.001L, 0.01L, 0.1L, 1L, 0.001M<sup>3</sup>, 0.01M<sup>3</sup>, 0.1M<sup>3</sup>, 1 M<sup>3</sup> .When users choose the pulse unit, they should notice the match of the flux range of flowmeter and pulse unit. For volume flux, count formula as follows:

$$Q_L = 0.0007854 \times D^2 \times V \text{ (L/S)}$$

$$\text{Or } Q_M = 0.0007854 \times D^2 \times V \times 10^{-3} \text{ (M}^3\text{/S)}$$

Note: D-nozzle (mm)

V-velocity of flow (m/s)

The oversize flux and too small pulse unit will be made the pulse output over the up limit. Generally, pulse output should be controlled below 3000P/S. However, the too small flux and too large pulse unit will be made the instrument exports a pulse long time.

Otherwise, pulse output is different from frequency output. When pulse output cumulates a pulse unit, it exports a pulse. Therefore, pulse output is not equality. Generally, measure pulse output should chooseto count instrument, but not frequent instrument.

#### 4.5.3 The connection of digital output

Digital output has tow connected points: digital output connected point, digital ground point, and symbol as follows:

POUT ----- digital output point;

PCOM ----- digital ground point;

POUT is collector plough output, user may refer to next circuit to connect.

#### 4.5.4 The connection of digital voltage output

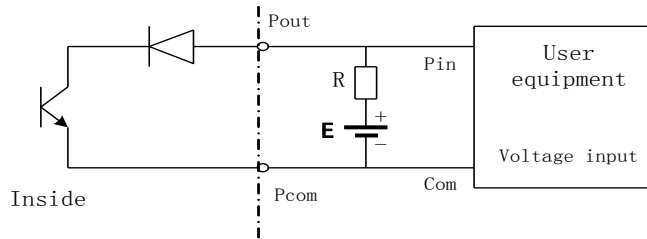


Fig.4.5(a) The connection of digital voltage output

#### 4.5.5 Digital output connect photoelectricity coupling (PLC etc.)

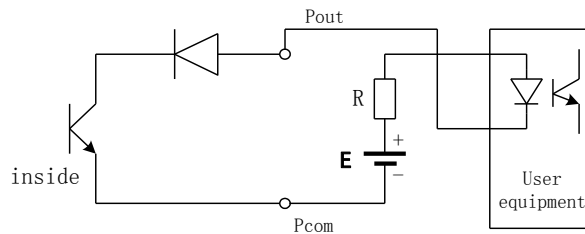


Fig.4.5(b) Digital output connect photoelectricity coupling

Commonly user's photoelectricity coupling current is about 10mA, so about  $E/R=10\text{mA}$ ,  $E=5\sim 24\text{V}$ .

#### 4.5.6 Digital output connect relay

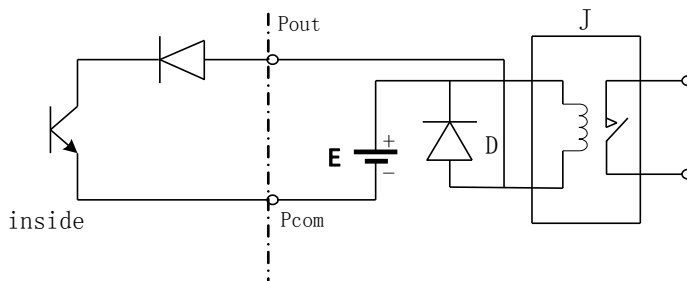


Fig.4.5 (c) Digital output connect relay

Commonly relay needs E as 12V or 24V. D is extend diode, now most middle relays

has this diode inside. If not have, user can connect one outside.

Table of digital output parameter:

POUT

Parameter	Test condition	Mini	Typical	Max	Unit
Volatge	IC=100 mA	3	24	36	V
Current	Vol≤1.4V	0	300	350	mA
Frequency	IC=100mA Vcc=24V	0	5000	7500	HZ
High voltage	IC=100mA	Vcc	Vcc	Vcc	V
Low voltage	IC=100mA	0.9	1.0	1.4	V

## 4.6 Simulation signal output and calculate

### 4.6.1 Simulation signal output

There are two signal system: 0~10mA and 4~20mA, user can select from parameter setting.

Simulation signal output inner is 24V under 0~20mA, it can drive 750Ω resistance.

The percent flux of simulation signal output:

$$I_0 = \frac{\text{Measure value}}{\text{Full scale value}} \bullet \text{the scale of current} + \text{the zero point of current}$$

The current zero is 0 when 0~10mA, and the current zero is 4mA when 4~20mA.

It can be advanced simulation signal output distinguish. User can select the range of measure.

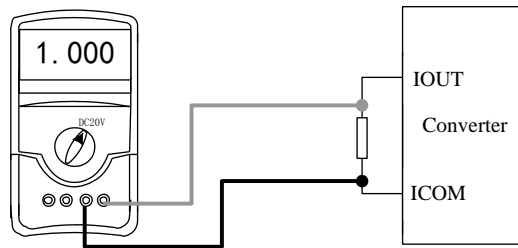
The manufacture's parameter have been adjusted, it can't need adjust. If have abnormity, it can consult 4.6.2.

### 4.6.2 Simulation Signal Output Adjust

(1)The Converter adjust preparative

When the converter is running 15 minutes, the inner of converter becomes

stabilization. Preparative 0.1% amperemeter or 250Ω、 0.1% voltage instrument.



(2)Current zero correct

When the converter getting into parameter setting, selecting to “Analog Zero” and enter to it. The standard of signal fountain getting to “0”.Adjust parameter make amperemeter is 4mA(±0.004mA).

(3)The full scale current correct

To select “Anlg Range” to enter.Adjust the converter parameter make amperemeter is 20mA(±0.004mA)

Adjust the current zero and the full range, the current function of the converter reached exactness.The line degree of current output of conversion should be controlled within the scope of 0.1%

(4) Current line degree checking

You can place the standard signal source in 75%、50%、25%,and check the line degree of current output.

4.6.3 L\_magB electromagnetic flowmeter converter’s connection of current output:

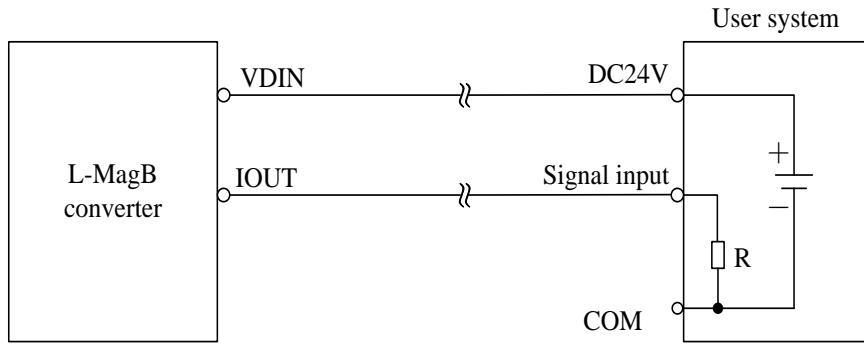


Fig.4.6 (a) L\_MagB two connection

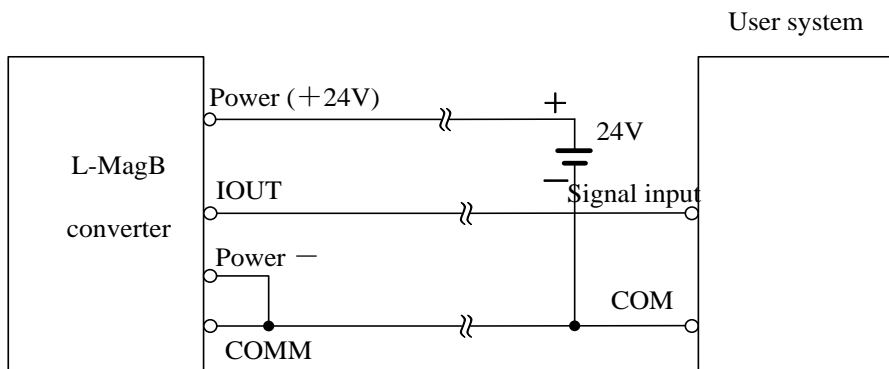


Fig.4.6 (b) L\_MagB three connection( power supply and current output are not insulated)

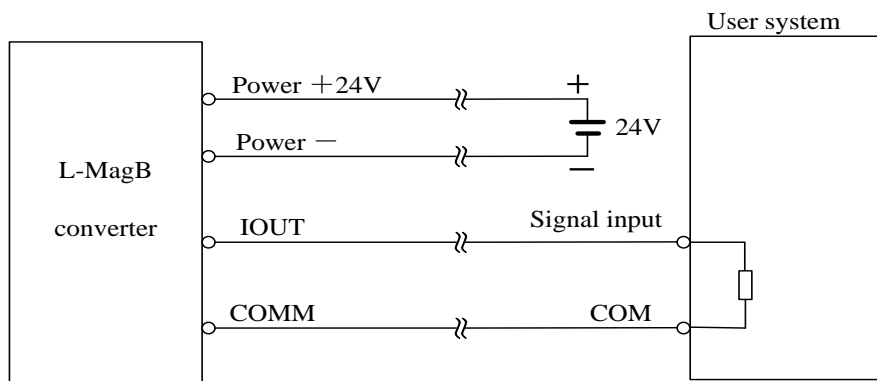


Fig.4.6 (c) L\_MagB four connection( power supply and current output are insulated)



## 5. Setting parameters

After L\_MagB electromagnetic flowmeter converter and sensor connect to the pipe (no matter demarcate or use), may do the next work first:

- Connect the pipe fore-and-aft the sensors tighten.
- Make sure the sensor connects the earth.
- Make sure the liquid stillness when regulating zero of the instrument.
- Make sure the oxidation velum of sensor makes steadily (electrode and liquid contact continuously about 48 hours).

### 5.1 L\_MagB\_3 key parameters and setting

When electrify, the instrument comes into measure way automatically, and under this way it can do all the functions and display data. Under the parameter setting way, user can set the parameter by the three keys.

#### 5.1.1 Keys function

##### a) Keys' function in self- testing way

“Down” key: Selecting displayed data on lower line in turn;

“Enter” key: Press it to come into the interface of select function.

“Shift” key: Press it to move the cursor.

Under the measure, adjust of the LCD contract: push “Down” Key and “Shift” key or “Down” Key and “Enter” key.

##### b) Function keys for parameters setting

“Down” key: Subtract 1 from the number at cursor area;

“Up” key: Plus 1 to the number at cursor area;

Push “Shift” key to move the cursor to “Up” key, push “Up” key to the submenu;

Push “Shift” key to move the cursor to “Down” key, push “Down” key return to the father menu.

## 5.1.2 Function keys for setting parameters

To set or correct working parameters, the converter should be running in parameters setting way instead of measuring status. In measuring status, push “Enter” key getting to the select of parameter and transfer password (0000), and then correct the password with one of the new passwords that are provided by manufacturer. Finally, push the “Enter” key to work in Parameters Setting Way.

Basis to the level of secrecy, amend according to the passwords we give. Then push “Enter” key to the interface needed.

There are 6 Passwords in design and among them 4 for deferent operators in secret and 2 are fixed passwords for system operation.

## 5.1.3. Functions select menu

Push “Enter” key to the functions select menu, push “Enter” key to select, there are three functions:

Code	Functions	Notes
1	Parameters Set	Select this function; It can be entering the picture of parameter.
2	Clr Total Rec	Select this function , It can be gross reset operation.
3	Fact Modif Rec	Select this function, It can be check the factor ‘s modif Record

### 5.1.3.1 Parameters setting

Press “Enter” key, it displays “Parameters Set” function. Input password. Press “Shift” key, Movie cursor on the “Enter” key, Press it getting to Parameters Setting status.

### 5.1.3.2 Clr Total Rec

To push “Enter” key getting to the select of parameter, then push “Up” key to “Clr Total Rec”, input the passwords. When the passwords becomes “00000”, this function is done, the gross is 0 in the instrument.

## 5.1.4 Setting Parameters in Menu

There are 54 parameters of L\_MagB, user can set every parameter. The List of

Parameters is shown below: Setting Parameters in Menu

Code	Parameter words	Setting Way	Grades	Range
1	Language	Select	2	English
2	Comm Address	Set count	2	0~99
3	Baud Rate	Select	2	300~38400
4	Snsr Size	Select	2	3~3000
5	Flow Unit	Select	2	L/h、L/m、L/s、m <sup>3</sup> /h、 m <sup>3</sup> /m、m <sup>3</sup> /s
6	Flow Range	Set count	2	0~99999
7	Flow Rspns	Select	2	1~50
8	Flow Direct	Select	2	Plus/ Reverse
9	Flow Zero	Set count	2	0~±9999
10	Flow Cutoff	Set count	2	0~599.99%
11	Cutoff Ena	Select	2	Enable/Disable
12	Total Unit	Select	2	0.001m <sup>3</sup> ~1m <sup>3</sup> 、 0.001L~1L、
13	SegmaN Ena	Select	2	Enable/Disable
14	Analog Type	Select	2	0~10mA/4~20mA
15	Pulse Type	Select	2	Freque / Pulse
16	Pulse Fact	Select	2	0.001m <sup>3</sup> ~1m <sup>3</sup> 、 0.001L~1L、
17	Freque Max	Select	2	1~ 5999 HZ
18	Mtsnsr Ena	Select	2	Enable/Disable
19	Mtsnsr Trip	Set count	2	59999 %
20	Alm Hi Ena	Select	2	Enable/Disable
21	Alm Hi Val	Set count	2	000.0~ 599.99 %
22	Alm Lo Ena	Select	2	Enable/Disable
23	Alm Lo Val	Set count	2	000.0~599.99 %
24	Sys Alm Ena	Select	2	Enable/Disable
25	Clr Sum Key	Set count	3	0~99999
26	Snsr Code1	User set	4	Finished Y M
27	Snsr Code2	User set	4	Product number
28	Field Type	Select	4	Type1,2,3
29	Sensor Fact	Set count	4	0.0000~5.9999
30	Line CRC Ena	Select	2	Enable/Disable

31	Lineary CRC1	User set	4	Set Velocity
32	Lineary Fact 1	User set	4	0.0000~1.9999
33	Lineary CRC2	User set	4	Set Velocity
34	Lineary Fact 2	User set	4	0.0000~1.9999
35	Lineary CRC3	User set	4	Set Velocity
36	Lineary Fact 3	User set	4	0.0000~1.9999
37	Lineary CRC4	User set	4	Set Velocity
38	Lineary Fact4	User set	4	0.0000~1.9999
39	FwdTotal Lo	Correctable	5	00000~99999
40	FwdTotal Hi	Correctable	5	00000~9999
41	RevTotal Lo	Correctable	5	00000~99999
42	RevTotal Hi	Correctable	5	00000~9999
43	PlsntLmtEna	Select	3	Enable/Disable
44	PlsntLmtVal	Select	3	0.010~0.800m/s
45	Plsnt Delay	Select	3	400~2500ms
46	Pass Word 1	User correct	5	00000~99999
47	Pass Word 2	User correct	5	00000~99999
48	Pass Word 3	User correct	5	00000~99999
49	Pass Word 4	User correct	5	00000~99999
50	Analog Zero	Set count	5	0.0000~1.9999
51	Anlg Range	Set count	5	0.0000~3.9999
52	Meter Fact	Set count	5	0.0000~5.9999
53	MeterCode 1	Factory set	6	Finished Y/M
54	MeterCode 2	Factory set	6	Product Serial No

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 1~24 parameters.

Grade 3 of password (set by manufacturer as 06108): users can change 1~25 parameters.

Grade 4 of password (set by manufacturer as 07206): users can change 1~38 parameters.

Grade 5 of password (Fixed): users can change 1~52 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.

## **5.2 L\_MagB\_4 key parameters and setting**

When electrify, the instrument comes into measure way automatically, and under this way it can do all the functions and display data. Under the parameter setting way, user can set the parameter by the four keys.

### **5.2.1 Keys function**

#### **a) Keys' function in self- testing way**

“Down” key: Selecting displayed data on lower line in turn;

“Up” key: Selecting displayed data on higher line in turn;

“Compound” key + “Enter” key: Come into parameter setting

“Enter” key: Press it to come into the picture of select function.

Under the measure, adjust of the LCD contract is used “Compound” key + “Up” key or “Compound” key + “Down” key for several seconds;

#### **b) Function keys for parameters setting**

“Down” key: Subtract 1 from the number at cursor area;

“Up” key: Plus 1 to the number at cursor area;

“Compound” key + “Down” key: Cursor turns left;

“Compound” key + “Up” key: Cursor turns right; “Enter” key: In/Out submenu;

“Enter” key: Press for two seconds under any state and will return to automate measure way.

Note: (1) When use “Compound” key, you should press “Compound” key and “Up” or “Down” both;

(2) It will return to the measure way automatically after 3 minutes when under the parameter setting way;

(3) Direct select of zero correction about the flow, you can move the cursor to the left + or - , and use “Down” or “Up” to switch;

### 5.2.2 Function keys for setting parameters

To set or correct working parameters, the converter should be running in parameters setting way instead of measuring status. In measuring status, push “Compound”+“Enter” keys getting to the select of parameter and transfer password (0000), and then correct the password with one of the new passwords that are provided by manufacturer. Finally, push the “Compound”+“Enter” keys to work in Parameters Setting Way.

There are 6 Passwords in design and among them 4 for deferent operators in secret and 2 are fixed passwords for system operation.

### 5.2.3. Functions select menu

Push “Compound”+“Enter” keys to the functions select menu, push “Up” or “Down” keys to select, there are three functions:

Code	Functions	Notes
1	Parameters Set	Select this function; It can enter the picture of parameter.
2	Clr Total Rec	Select this function, It can be gross reset operation.
3	Fact Modif Rec	Select this function, It can be check the factor ‘s modif Record

#### 5.2.3.1 Parameters Set

Press “Compound”+“Enter” key, it displays “Parameters Set” function. Input password. Press “Compound”+“Enter” key, it getting to Parameters Setting status.

### 5.2.3.2 Clr Total Rec

To push “Compound”+“Enter” keys getting to the select of parameter, then push “Up” key to “Clr Total Rec”, input the passwords. When the passwords becomes “00000”, this function is done, the gross is 0 in the instrument.

### 5.2.3.3 Fact Modif Rec

To push “Compound”+“Enter” keys getting to the select of parameter, then push “Up” key to “Fact Modif Rec”(Detail consult the AppendixFive)

## 5.2.4 Setting Parameters in Menu

There are 54 parameters of L\_MagB, user can set every parameter. The List of Parameters is shown below:

Setting Parameters in Menu

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

15	Pulse Type	Select	2	Freque / Pulse
16	Pulse Fact	Select	2	0.001m <sup>3</sup> ~1m <sup>3</sup> 、 0.001L~1L、
17	Freque Max	Select	2	1~ 5999 HZ
18	Mtsnsr Ena	Select	2	Enable/Disable
19	Mtsnsr Trip	Set count	2	59999 %
20	Alm Hi Ena	Select	2	Enable/Disable
21	Alm Hi Val	Set count	2	000.0~ 599.99 %
22	Alm Lo Ena	Select	2	Enable/Disable
23	Alm Lo Val	Set count	2	000.0~599.99 %
24	Sys Alm Ena	Select	2	Enable/Disable
25	Clr Sum Key	Set count	3	0~99999
26	Snsr Code1	User set	4	Finished Y M
27	Snsr Code2	User set	4	Product number
28	Field Type	Select	4	Type1,2,3
29	Sensor Fact	Set count	4	0.0000~5.9999
30	Line CRC Ena	Select	2	Enable/Disable
31	Lineary CRC1	User set	4	Set Velocity
32	Lineary Fact 1	User set	4	0.0000~1.9999
33	Lineary CRC2	User set	4	Set Velocity
34	Lineary Fact 2	User set	4	0.0000~1.9999
35	Lineary CRC3	User set	4	Set Velocity
36	Lineary Fact 3	User set	4	0.0000~1.9999
37	Lineary CRC4	User set	4	Set Velocity
38	Lineary Fact4	User set	4	0.0000~1.9999
39	FwdTotal Lo	Correctable	5	00000~99999
40	FwdTotal Hi	Correctable	5	00000~9999
41	RevTotal Lo	Correctable	5	00000~99999
42	RevTotal Hi	Correctable	5	00000~9999
43	PlsntLmtEna	Select	3	Enable/Disable
44	PlsntLmtVal	Select	3	0.010~0.800m/s
45	Plsnt Delay	Select	3	400~2500ms
46	Pass Word 1	User correct	5	00000~99999
47	Pass Word 2	User correct	5	00000~99999
48	Pass Word 3	User correct	5	00000~99999
49	Pass Word 4	User correct	5	00000~99999



50	Analog Zero	Set count	5	0.0000~1.9999
51	Anlg Range	Set count	5	0.0000~3.9999
52	Meter Fact	Set count	5	0.0000~5.9999
53	MeterCode 1	Factory set	6	Finished Y/M
54	MeterCode 2	Factory set	6	Product Serial No

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.

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Grade 3 of password (set by manufacturer as 06108): users can change 1~25 parameters.

Grade 4 of password (set by manufacturer as 07206): users can change 1~38 parameters.

Grade 5 of password (Fixed): users can change 1~52 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.

## 5.3 Details Parameters

### 5.3.1 Language

There are 2 languages for L\_MagB converter operation. They can be set by users according to the users needs.

### 5.3.2 Comm Address

It means this instrument's address when communicates with many, and has 01~99, holding the 0.

### 5.3.3 Baud Rate

300, 1200, 2400, 4800, 9600, 38400, baud rate.

### 5.3.4 Snsr Size

L\_MagB converters can be equipped with some deferent sensors that have deferent diameter of measuring pipes. The pipes in deferent diameters from 3mm to 3000mm can be chosen in relative table.

### 5.3.5 Flow unit

The flow unit can choose form the parameters (L/s、L/m、L/h、m<sup>3</sup>/s、m<sup>3</sup>/m、m<sup>3</sup>/h),and the user can choose the proper unit according to the technological requirement and using habit.

### 5.2.6 Flow Range

Flow range means upper limit value, and lower limit value is set "0" automatically. So, it makes the range, and makes the relation of percent display, frequency output and current output with flow:

percent display = ( flow measure / measure range) \* 100 %;

frequency output = ( flow measure / measure range) \* frequency full;

current output = ( flow measure / measure range) \* current full + base point;

pulse output will not affect.

### 5.3.7 Flow Rspns

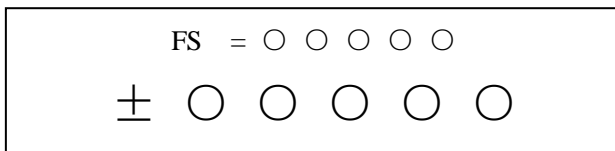
It means time of filter measure value. The long one can enhance the stability of flow display and output digital, and fits for gross add up of pulse flow; the short one means fast respond rate, and fits for production control. It is set by select.

### 5.3.8 Flow Direct

If users think the direct and design are differ, just change the direct parameter is OK, but not change exciting or signal.

### 5.3.9 Flow zero

Make sure the sensor is full of flow, and the flow is stillness. Flow zero is shown as velocity of flow, mm/s.



Converter's zero-flow correction displays like this:

Upper small words: FS means measure value of zero;

Lower large words: correction value of zero.

When FS is not "0", make FS = 0. Note: if change the value on next line and FS increases, please change the "+, -" to correct FS to zero.

Flow zero is the compound value of the sensor, and should be recorded in sensor list and band. The unit will be mm/s, and the sign will be opposite with correction value.

### 5.3.10 Flow cutoff

Flow cutoff is set in percentage of Upper Limit Range of flow, and users can delete all Negligible Small Signals of flow volume, velocity and percentage out of displaying and outputting them. Sometimes user can delete output of current output signal and frequency (pulse) output signal only to have flow, velocity and percentage being displayed.

### 5.3.11 Total Unit

Converter display is counter with 9 bits, and the max is 999999999.

Integrator units are L, m<sup>3</sup> (liter, stere,).

Flow integrator value: 0.001L、 0.010L、 0.100L、 1.000L  
0.001m<sup>3</sup>、 0.010m<sup>3</sup>、 0.100m<sup>3</sup>、 1.000m<sup>3</sup>;

### 5.3.12 SegmaN Ena

When “SegmaN Ena” is “enable”, if the flow flows, the sensor will export pulse and current. When it is “disable”, the sensor will export pulse as “0” and current as “0”(4mA or 0mA) for the flow flows reversals.

### 5.3.13 Output currents

Output current types can be chosen by users as 1~10mA or 4~20mA practically.

### 5.3.14 Pulse Type

Two kinds of Pulse Outputs are can be chosen: Frequency Output and Pulse Output. Frequency Output is continuous square waveform and Pulse output is a serial wave of square wave. Frequency output is mainly used for instant flow and total integrated flow in short time measurement. Frequency output can be chosen in equivalent frequency unit and volume of integrated flow can be displayed. Frequency Output can be used in long time measurement for total integrated flow with volume units.

Frequency output and pulse output are usually from OC gates so that DC power supplies and load resistors have to be required (See Part 4.5).

### 5.3.15 Pulse Fact

Equivalent pulse Unit is referred to one pulse for value of flow. The range of pulse equivalent can be chosen:

Pulse	Flow	Pulse	Flow
-------	------	-------	------

Equivalent		Equivalent	
1	0.001L/cp	5	0.001m <sup>3</sup> /cp
2	0.01L/cp	6	0.01m <sup>3</sup> /cp
3	0.1L/cp	7	0.1m <sup>3</sup> /cp
4	1.0L/cp	8	1.0m <sup>3</sup> /cp

Under the same flow, the smaller pulse, the higher frequency output, and the smaller error will be. The highest pulse output is 100cp/s, and mechanism electromagnetic counter can get 25 frequency/s.

#### 5.3.16 Freque Max

Frequency output range is as the upper limit of flow measure, just the percent flow 100%. Frequency output upper limit can be selected between 1~5000Hz.

The state of empty pipe can be detected with the function of converter. In the case of Empty Pipe Alarm, if the pipe was empty, the signals of analog output and digital output would be zero and displayed flow would be zero, too.

#### 5.3.17 Mtsnsr Ena

The state of empty pipe can be detected with the function of converter. In the case of Empty Pipe Alarm, if the pipe was empty, the signals of analog output and digital output would be zero and displayed flow would be zero, too.

#### 5.3.18 Mtsnsr Trip

When the pipe is full of liquid (whether flowing or not), the parameter of “Mtsnsr” could be modified more easily. The parameter displayed upper line is real MTP, and the parameter displayed bellow is the “Mtsnsr trip” that should be set. When setting “Mtsnsr trip”, you could be according to the real MTP, the value that should be set is usually three to five times of real MTP.

#### 5.3.19 Alm Hi Ena

Users can choose “Enable” or “Disable”.

#### 5.3.20 Alm Hi Val

The parameter of upper limit alarm is percentage of flow range and can be set in the way of setting one numerical value between 0%~199.9%.When the value of flow percentage is larger than the value of setting value, the converter outputs the alarm signal.

#### 5.3.21 Alm Lo Val

The same as upper limit alarm.

#### 5.3.22 Sys Alm Ena

Selecting Enable will have the function, and selecting Disable will cancel the function.

#### 5.3.23 Clr Sum Key

User use more than 3 byte code to enter ,Then set this password in Clr Total Rec.

#### 5.3.24 Snsr Code

It is referred to the produced date of sensor and the serial number of product that can keep the sensors coefficient right and accurate.

#### 5.3.25 Sensor Fact

“Sensor Coefficient” is printed on the Label of the sensor when it is made in factory. The “sensor coefficient” has to be set into Sensor Coefficient Parameter when it runs with converter.

#### 5.3.26 Field Type

L\_MagB affords three exciting frequency types: 1/16 frequency (type 1), 1/20frequency (type 2), 1/25 frequency (type 3)。 The small-bore one should use 1/16 frequency, and large-bore one should use 1/20 or 1/25 frequency. When using, please select type 1 first, if the zero of velocity is too high, select the type 2 or type 3.

Note: Demarcate on which exciting type, working on it only.

#### 5.3.27 FwdTotal Lo、 hi

Positive total volume high byte and low byte can change forthcoming and reverse total value, and be used to maintenance and instead.

User use 5 byte code to enter, and can modify the positive accumulating volume ( $\Sigma+$ ). Usually, it is unsuitable to exceed the maximum the counter set (99999999) .

#### 5.3.28 RevTotal Lo、 hi

User use 5 byte code to enter, and can modify the negative accumulating volume ( $\Sigma-$ ). Usually, it is unsuitable to exceed the minimum the counter set (99999999) .

#### 5.3.29 PlsntLmtEn

For paper pulp, slurry and other serosity, the flow measure will have "cuspidal disturb", because the solid grain friction or concussion the measure electrode. L\_MagB converters use variation restrain arithmetic to conquer the disturbing by designing three parameters to select disturb character.

Set it "enable", start variation restrain arithmetic; set it "disable", close variation restrain arithmetic.

#### 5.3.30PlsntLmtV1

This coefficient can disturb the variation of cuspidal disturb, and calculate as percent of flow velocity, thus ten grades: 0.010m/s, 0.020m/s, 0.030m/s, 0.050m/s, 0.080m/s, 0.100m/s, 0.200m/s, 0.300m/s, 0.500m/s, 0.800m/s, and the smaller percent, the higher delicacy of cuspidal restrain.

Note: when using it, must test for select by the fact, and sometimes it is not the higher delicacy is good.

#### 5.3.31 PlsntDelay

This coefficient can select the width of time of restrain cuspidal disturb and the unit is ms. If the duration is shorter than flow change in some time, L\_MagB will think it is cuspidal disturb, and if it is longer, L\_MagB will think it is natural. It also needs to select parameter in fact.

#### 5.3.32User's password 1~4

Users can use 5 grades of passwords to correct these passwords.

### 5.3.33 Analog Zero

When the converters are made in the factory, output current has been calibrated to zero scale, that is, accurate 0mA or 4mA output.

### 5.3.34 Anlg Range

When the converters is made in the factory, output current have been calibrated to full scale, that is, accurate 10mA or 20mA output.

### 5.3.35Meter Fact

This fact is the special one of sensor-made-factory and the factory use this fact to unite L\_MagB electromagnetic flowmeters converters to make sure all the instruments can interchange by 0.1%.

### 5.3.36 MeterCode 1 and 2

Converter code records the date of manufacturing and serial number of converter.

## 6. Infrared telecontrol function keys

The operation of the infrared-hand-remote control keyboard is the same with the operation of the instrument. When use it, please keep the infrared transmitter of the infrared-hand-remote control keyboard and the receiver of the instrument parallel, with the distance of about one meter.

Concrete operation referring to the figure:

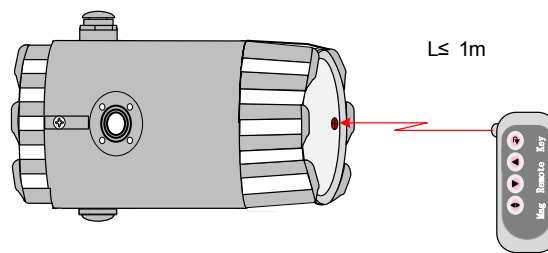



Fig6.1: The communication figure of the infrared-hand-remote control keyboard and the instrument




## 7. Alarm information

PCB of electromagnetic flowmeters converters uses SMT, so for user, it is unable to service, and cannot open the shell of converter.

**L\_Mag-B-3** key series Intelligent converters have self-diagnose function. Without trouble of power and hardware circuit, the normal trouble can be alarmed correctly. This information displays  on the left of LCD. The trouble is like this:

FQH ---- Flow high limit alarm;      FQL ---- Flow low limit alarm;  
FGP ---- Flow empty pipe alarm;      SYS ---- System exciting alarm.

**L\_Mag-B-4**series Intelligent converters have self-diagnose function. Without trouble of power and hardware circuit, the normal trouble can be alarmed correctly. This information displays  on the left of LCD. The trouble is like this:

FQH ---- Flow high limit alarm;      FQL ---- Flow low limit alarm;  
FGP ---- Flow empty pipe alarm;      SYS ---- System exciting alarm.  
UPPER ALARM ---- Flow high limit alarm;  
LOWER ALARM ---- Flow empty pipe alarm;  
LIQUID ALARM ---- Flow empty pipe alarm;  
SYSTEM ALARM ---- System exciting alarm.

## 8. Troubleshooting

### 8.1 No display:

- a) Check the power supply connection;
- b) Check the power fuse to see for OK;
- c) Check the contrast of LCD and regulate it to working state;

### 8.2 Exciting alarm

- a) Check if the exciting cables EX1 and EX2 did not connected;

- b) Check if the total resistance of sensor's exciting coil resistances less than 150Ω;
- c) If a) and b) are OK, the converter is failed.

### 8.3 Empty pipe alarm

- \* If measured fluid full of testing pipe of sensor;
- \* When shorting circuit three connectors SIG 1, SIG 2, SGND of converter, and no "Empty Alarm" displayed then the converter works OK. In this case, it is possible that conductivity of measured fluid may be small or empty threshold of empty pipe and range of empty pipe are set wrongly.
- \* Check if the signal cable is OK;
- \* Check if the electro-poles are OK or not.

Let the flow is zero, then the displayed conductivity should be less than 100%.

Resistances of SIG1 to SGND and SIG2 to SGND are all less than 50kΩ (conductivity of water) during measurement operation. (It is better to test the resistances by means of multimeter with pointer to see the charging process well.)

- \* The DC voltage should be less than 1V between DS1 and DS2 testing the voltage by means of multimeter. If DC voltage is larger than 1V, the electro poles of sensor were polluted that have to be cleaned.

### 8.4 Measure flow disallow

- \* If measured fluid full of testing pipe of sensor;
- \* Check if the signal cable is OK;
- \* Check the sensor modulus and sensor zero whether set as the sensor escutcheon or leave factory checkout.

## 9. L\_MagB encasement and reserve

### 9.1 L\_MagB encasement

L\_MagB electromagnetic flowmeter converter is packed as vacuum, and can insulate wet. The bag is L\_MagB's appropriate one, if the bag is open, it will not product of original factory.

Installation Manual, Certificate of Product and Packing List are all with the L\_MagB converter.

### 9.2 Shipping and storage

To prevent the product from damage during shipping, keep the original package of manufacturer. The products should be stored in storehouse that meets following conditions:

- a) Keep off raining and moisture;
- b) Keep off heavy vibration, and strike;
- c) Ambient temperature  $-20\sim+60^{\circ}\text{C}$ ;
- d) Humidity less than 80%.

Draw on june 2011

## Appendix One: Selection of exciting frequency (re.)

L\_MagB afford three exciting frequency types: 1/16 frequency (type 1), 1/20 frequency (type 2), 1/25 frequency (type 3). The small-bore one should use 1/16 frequency, and large-bore one should use 1/20 or 1/25 frequency. When using, please select type 1 first, if the zero of velocity is too high, select the type 2 or type 3.

In the user's sensor that L\_MagB gives, often the sensor is not fit for the L\_MagB converters, at this time can do like this:

### (1) Small exciting loop resist

If the exciting loop resist is smaller than the sensor's request, can series resist to get the total value. The series resist's power should be more than one time of fact, for example, series  $10\Omega$  on 250mA current, the power will be 3W.

### (2) Large exciting loop resist (change exciting current)

If the exciting loop resist is larger than the sensor's request, can change the exciting current, for example, if exciting loop resist is  $70\Omega$ , for 250mA this is larger, so can change the current to 187mA.

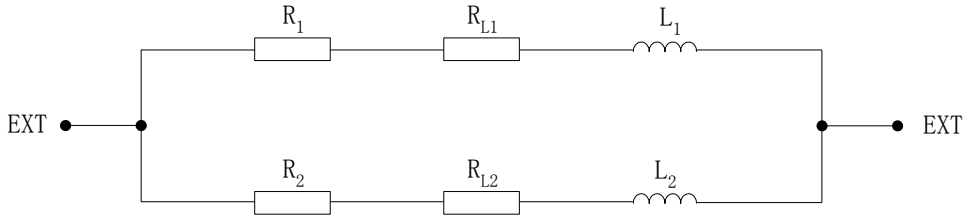
### (3) Large exciting loop resist (change loop connect)

If the exciting loop resist is larger than the sensor's request, can change the connect of loop, for example, if exciting loop resist is  $200\Omega$ , every exciting loop resist is  $100\Omega$ , parallel connection the upper and lower loop is OK.

According the analysis, change the connect of exciting loop, measure from either head of exciting loop,

$$\text{Total resist} = (R_1 + R_{L1}) \text{ parallel connection } (R_2 + R_{L2}) \leq 120\Omega;$$

(As the Fig.  $R_1, R_2$ ----addition resists;  $R_{L1}, R_{L2}$ ----exciting resists)



Total resist =  $(R_1 + R_{L1})$  parallel connection  $(R_2 + R_{L2}) \leq 120\Omega$ ;

( as the Fig.  $R_1, R_2$ ----addition resists;  $R_{L1}, R_{L2}$ ----exciting resists)

(4) Sensor exciting current steady time so long (inductance is too large)

For this question, firstly changing exciting type, select 1/16 or 1/25 frequency.

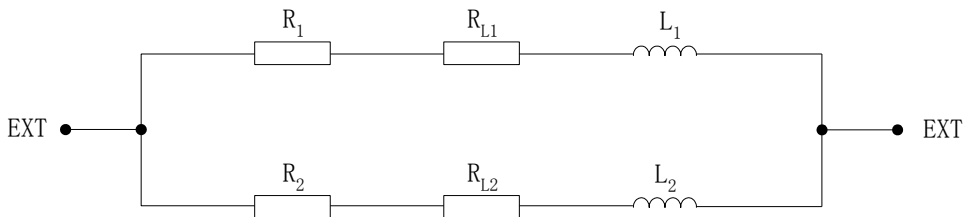
If cannot content, change connect of exciting loop.

$$\text{Exciting current transition time } \tau = L / R$$

L ---- Exciting loop inductance; R ---- exciting loop resist.

So decrease L and increase R both can decrease  $\tau$ .

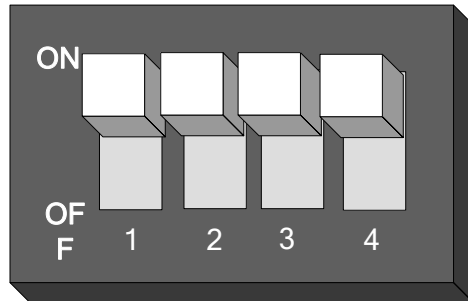
According the analysis, change the connect of exciting loop, measure from either head of exciting loop,



Total resist =  $(R1 + R_{L1})$  parallel connection  $(R2 + R_{L2}) \leq 120\Omega$ ;

(As the Fig.  $R_1, R_2$ ----addition resists;  $R_{L1}, R_{L2}$ ----exciting resists)

## Appendix Two ON/OFF Switch Diagram



**Key 1:** ON: Supply up power (24V) for ALML output.

OFF: No connection.

**Key 2:** ON: Pulse output to OC gate when flow verification was taken. Connect pull -up resistor.

OFF: No connection.

**Key 3:** ON: Supply up power (24V) for ALMH output.

OFF: No connection.

**Key 4:** ON: Connected to RS485 terminal resistor for communication

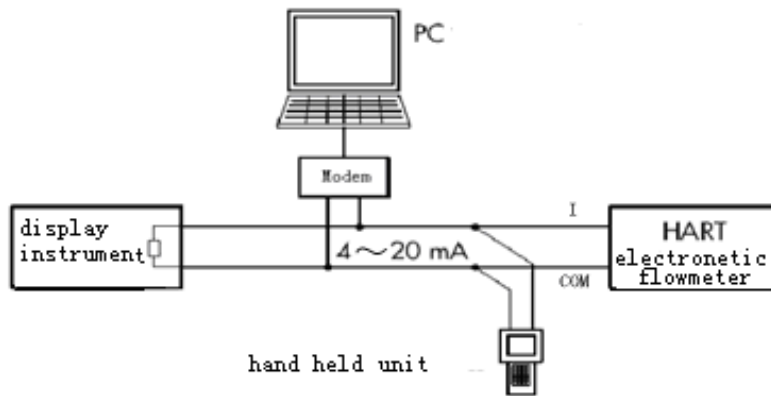
OFF: No connection.

**Note:** Terminal used for far communication only.

## Appendix Three:HART function explanation

### 1. HART Bus network fig

HART Bus transfers data-signal through signal line which value is from 4 to 20mA.For this reason,it can save local data communication line and implement data communication.Its adaptive for local using.The local network fig composed by HART Bus is as follows:



### 2. Instruction for setting of the converter

1. If you use the handset of our company, you need to set the meter address to 1 and set the baud rate to 4800;
2. If you use other handset such as 375 or 275, you need to set the meter address to 2 and set the baud rate to 4800;
- 3 If the communication mode, the address or the baud rate of the meter is not set correctly, the handset can't set the parameters.

### 3.Matters need attention of HART using function meter

- 1) Load which is parallel connection between electrical flowmeter and Hand held unit and HARTMODEM is on polarity.
- 2) Resistance of circuit should be greater than 200Ω,less than 500Ω.
- 3) Hand held unit and HARTMODEM shouldn't be connection in series in current circuit.

## **Appendix Four: 211B series with nonlinear amendment function Additional Instruction**

Nonlinear amendment function, in principle is used for line regulation of low flow which under 0.3m/s. The function is designed to four amendments, and divided into four flow velocity points and four correction factors.

Nonlinear amendment coefficient works on the basis of the original transducer calibration coefficient, so please close nonlinear amendment function before calibrating the transducer coefficient, and open the function to realize nonlinear amendment after calibrating. Set correction points and correction factors according to the nonlinear segment of transducer, if be the appropriate settings, do not have to recalibration.

As a rule, the flow velocity which calculated form transducer coefficient is called original flow velocity, and the other which gained from non-linear amendment is called correction flow velocity. The relationship between them is shown as following:

- a. Correction point 1 > Original flow velocity  $\geq$  Correction point 2:

Correction flow velocity = Correction coefficient 1  $\times$  Original flow velocity

- b. Correction point 2 > Original flow velocity  $\geq$  Correction point 3:

Correction flow velocity = Correction coefficient 2  $\times$  Original flow velocity

- c. Correction point 3 > Original flow velocity  $\geq$  Correction point 4:

Correction flow velocity = Correction coefficient 3  $\times$  Original flow velocity

- d. Correction point 4 > Original flow velocity  $\geq$  0:



Correction flow velocity = Correction coefficient 4 × Original flow velocity

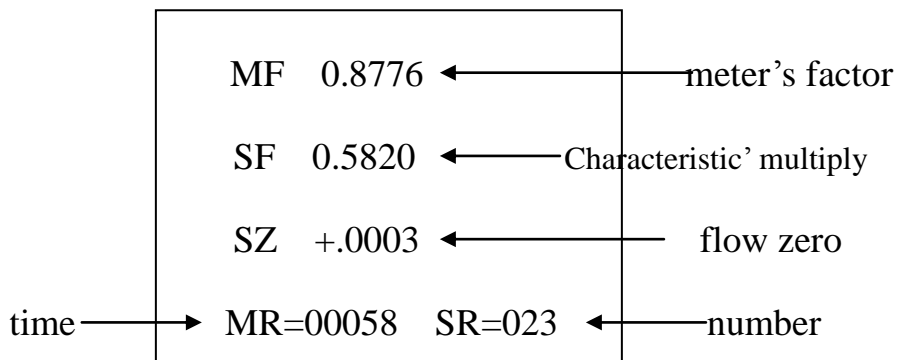
Notice: Correction points must satisfy the following relationship:

Correction point 1 > Correction point 2 > Correction point 3 > Correction point 4

The intermediate value of correction coefficient is 1.0000, when bigger than it is considered as positive coefficient (increase), and smaller is considered as negative coefficient (decrease).

## Appendix Five: The function of protecting the Characteristic Flow Factor

L-Mag-B converter has a function of protecting the Characteristic Flow Factor. The key content is that the factor could not be modified easily. L\_MagB converter increases a new function to record the modified procedure and modified times of flow zero, sensor factor, and meter factor, any change of these three factors could be recorded. The sensor factor and modifying times could be recorded in Test Report, and when next time testing the factor in Test Report and factor in the convertor are compared to check whether the Characteristic Flow Factor has been changed. The detail about the Characteristic Flow Factor protection function can be found in the appendix.

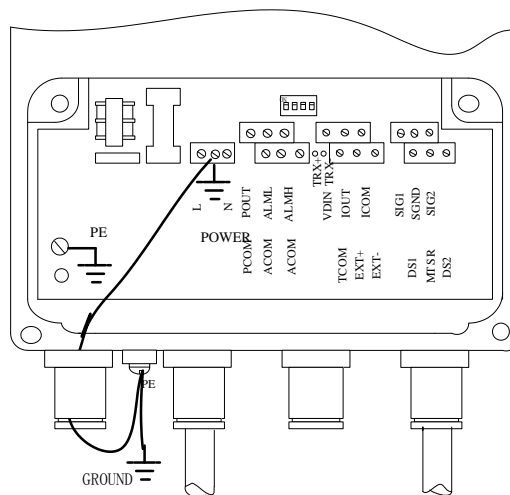
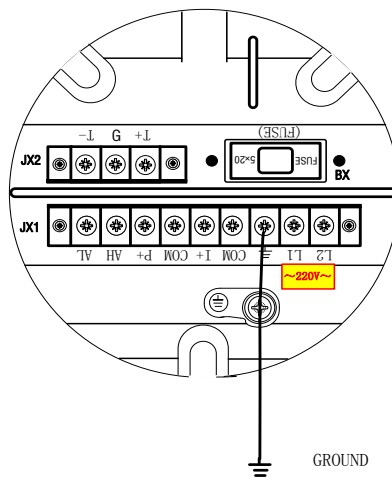


### Attention !

The last record is displayed when this item is first entered, if you want to browse the history records press “down key”, and could search for the last record to the thirty-two record ahead. Finally the times of record modified (MR) should be written down on the paper before next time test.

## Appendix six Lightning protection notes

When installing, users must connect the converter's earthing terminal with the shell, and then earthing them reliably, because the electrical current can be put into the earth through the shell by the gas discharger of lightning protection. If the shell has not been earthing reliably, once lightning, it may cause a personal accident when there is somebody operating the converter. The specific details, you can see the connection diagram.



## Flange connection type external structure and installation dimension

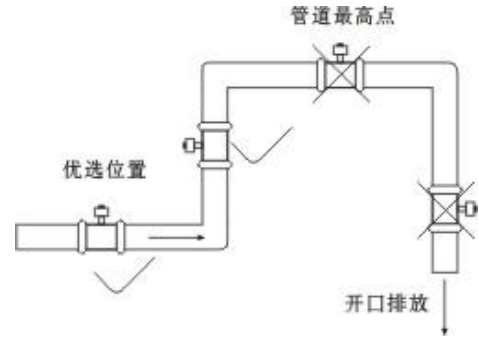
Common size:

DN	a	D	Do	n*A
10	230	90	60	4*14
15	230	95	65	4*14
20	230	105	75	4*14
25	230	115	85	4*14
32	230	140	100	4*18
40	230	150	110	4*18
50	200	165	125	4*18
65	200	175	145	4*18
80	250	200	160	8*18
100	250	220	180	8*18
125	280	250	210	8*18
150	280	285	240	8*22
200	310	340	295	8*22
250	360	395	350	12*22
300	460	445	400	12*22
350	460	505	460	16*22
400	460	565	515	16*26
450	460	615	565	20*26
500	600	670	620	20*26
600	600	780	725	20*30
700	700	895	840	24*33
800	800	1015	950	24*33
900	900	1115	1050	28*33
1000	1000	1230	1160	28*36
1200	1200	1405	1340	32*33
1400	1400	1630	1560	36*36
1600	1600	1830	1760	40*36
1800	1800	2045	1970	44*39
2000	2000	2265	2180	48*42
2200	2200	2405	2315	52*45

### 7. Instrument installation

The key to correct use electromagnetic flowmeter is Choose the correct installation

location and the correct installation method, if installed error, it will not only affect the measurement the result, but also can affect the measurement accuracy, and more will affect the working life of the flowmeter, even damaging the flowmeter



### 1. The installation site selection

In order to make the sensor reliable and steady work, please pay attention to the following requirements when choose the installation location:

- (1) try to avoid magnetic objects and has strong phenolic water factory equipment (such as big motor, big transformer, etc), in order to lest affect the work magnetic field of sensors and flow signal.
- (2) it should be possible installed in dry and ventilated place, not installed in damp, easy seeper place.
- (3)it should try to avoid exposed to the sun and rain, avoid the environment temperature more than 60 °C and relative humidity is more than 95%
- (4)it choose to easy to maintenance, and activity convenient place
- (5) the flowmeter should be installed in the water pump back end, not installation the suction side; The valve should be installed in downstream side of the flow

### 2. Installation requirements

In order to let you can correct measuring, please be pay attention to the following requirements when choosing the line position

- (1)the sensor not only installed in the straight pipe, but also can be installation the in level or tilted pipe,but the required of the center of two electrode attachment on the horizontal state
- (2) the medium in the installation position should be full pipe flow, avoid not full pipe and gas attached to the electrode.
- (3) For liquid-solid two-phase flow,it better choose the perpendicular installation,it make the liner material of the sensor attrition uniform,and prolong working life.
- (4)when the flow meter installation position with not full medium, it can raise the end pipeline of the flowmeter, and make its full tube, forbidden in peak and outlet pipe installation flowmeter
- (5) Modify piping installation method: when the medium velocity out of requires,it should choose a small caliber flow meter, and should use different caliber taper pipe or modify the sections of pipe, make its same caliber with sensor, but before and after straight pipe section at least requirment the before straight pipe section  $\geq 10$  DN, after straight pipe section  $\geq 5$  DN (DN for pipe diameter)
- (6) Before and after straight pipe section for the flowmeter ,before pipe section  $\geq 10$  DN, after pipe section  $\geq 5$  DN

### 3. The instrument connection

- ★ If choose the signal of remote version connected,the cable must be use the customized special cables.and the cable shorter the better
- ★Excitation cable can choose Yz medium rubber cable ,and the length same as signal cable
- ★Signal cable must be strictly separate with others power supply,and can not laying in the same pipe inside.
- ★Signal cable and excitation cable should choose the shorter as soon as possible,and it can't coil together with the redundant cables,it should cut off the redundant cables,then rewelding the connector
- ★when cable mediate sensor interface, in port place to make U, it will prevent the rain penetration to the sensor.

## 8.Electromagnetic flowmeter electrode material selection

The electrode material corrosion resistant performance (for reference only)

Material	corrosion resistant performance
Containing molybdenum stainless steel (0Cr18N12MO2Ti)	Applicable in water, sewage and corrosive mediums. Widely used in industries of petrol,chemistry,carbamide,etc
Hastelloy B(HB)	Having strong resistance to hydrochloric acid of any consistence which is below boiling point. Also resistable against vitriol, phosphate, hydrofluoric acid organic acid etc which are oxidable acid, alkali and non-oxidable salt
Hastelloy C(HC)	Be resistant to oxidable acid such as nitric acid mixed acid as well as oxidable salt such as Fe <sup>+++</sup> , Cu <sup>++</sup> and sea water
Titanium	Applicable in seawater, and kinds of chloride, hypochlorite salt, oxidable acid( including <a href="#">fuming nitric acid</a> ) organic acid alkali etc. Not resistant to a pure reducing acid (such as sulphuric acid, hydrochloric acid) corrosion. But if acid contains antioxidant (such as Fe <sup>+++</sup> , Cu <sup>++</sup> ) is greatly reduce corrosion
Tantalum	Having strong resistance to corrosive mediums that is similar with glass. Almost applicable in all chemical mediums except for hydrofluoric acid.oleum and alkali
Platinum	Almost be applicable in all chemical mediums except for aqua fortis, ammonium salt

Note: due to the medium variety, its corrosive affect by temperature, concentration, velocity, such complex factors and change, this form is for reference only, the users should according to the actual situation of yourself to make a choice. For general medium, it can consult relevant anti-corrosion manual. The composition such as to mixed acid complex medium, it should choose to do the corrosion experiment for Simulation of select material.

Scraper electrode is appropriate for contains serious pollutant medium, electromagnetic flowmeter in long-term operation process, the electrode surface will form a layer of the non-conductive dirt and influence electrode signal. Using scraper type electrode can

Sweep away the electrode dirt: open the lid, rotate knob, turn the scraper, and it will scrape the dirt on the surface of the electrode.it also Can clear the dirt when the electromagnetic flowmeter during operation, after clean up the blade should spin the direction to the fluid flow direction

### 9.Electromagnetic flowmeter lining material selection

It should according to the measured medium abrasiveness,corrosion resistance,and temperature to choose lining materials

Material	Main performances	Applications
Polyurethane	1. Be of good abrasion resistibility (equal to 10 times of caoutchouc) 2. Not be perfect in acid/alkali resistance.3.Can't be used for water mixed with organic impregnants	<45℃ Applicable in mineral serosity, slurry and coal slurry of high abrasion.
Natural rubber (soft rubber)	Be of good elasticity, and abrasion resistance.2.Be resistant to low acid	<80℃ Measuring the water ,sewage
Acidproof rubber (hard rubber)	1. Under normal temperature, of hydrochloric acid, Be resistant to acetic acid, oxalic acid, ammonia water, Phosphoric acid and 50% of sulfuric acid, sodium hydroxide (k) corrosion 2. Not resistant to corrosion of strong oxidizer	-25℃ ~+90℃ Measuring the the general of acid, alkali, salt solution
Neoprene	1.Be of good elasticity, retractility and abrasion resistance.2.Be resistant to low acid, alkali and salt but not for oxidation mediums	<80℃ Measuring Water, sewage and slurry, mineral serosity of low abrasion
Fluorine	Teflon F-4	The most steadiest material in plastics which -40℃ ~+180℃ Measuring Strong

plastic	(PTFE)	is resistant to boiling hydrochloric acid, vitriol aqua fortis as well as strong alkali and organic impregnates .2.Not be perfect in abrasion resistance	corrosive mediums such as strong acid and alkali
	F-46 (PTFE)	1.Having the same abrasion resistance with PTFE.2.Resistable for low abrasion. 3.Having strong resistance load pressure	1.The same as PTFE.2.Applicable in mediums of low abrasion.
	(PFA)	Having the same abrasion resistance with PTFE. Having strong ability of load pressure resistance	Applicable in state of load pressure

### Electromagnetic flowmeter measuring range choice list

Caliber(mm)	Measuring range (m <sup>3</sup> /h)		
10	0. 02827-0. 25	0. 3-1. 6	2. 0-3. 3924
15	0. 0636-0. 6	0. 8-3. 0	4. 0-7. 632
20	0. 131-1. 0	1. 2-5. 0	6. 0-13. 6
25	0. 176-1. 6	2. 0-8. 0	10-21
32	0. 2895-2. 5	3. 0-12	16-35
40	0. 4524-4. 0	5. 0-20	25-45
50	0. 707-6. 0	8. 0-40	50-85
65	1. 195-10	12-60	80-143
80	1. 81-16	20-120	160-217
100	2. 83-25	30-160	200-339
125	4. 42-40	50-250	300-530
150	6. 36-60	80-400	500-763
200	11. 3-100	120-600	800-1357
250	17. 7-160	200-800	1000-2120
300	25. 45-250	300-1200	1600-3054
350	34. 6-300	400-1600	2000-4157
400	45. 2-400	500-2000	2500-5429
450	57. 3-500	600-2500	3000-6871
500	70. 7-600	800-3000	4000-84823
600	102-800	1000-4000	5000-12216
700	139-1200	1600-5000	6000-16620
800	181-1600	2000-6000	8000-21720



900	229-1600	2000-8000	10000-27480
1000	283-2000	2500-10000	12000-33924
1200	407-2500	3000-12000	16000-48833
1400	554-3000	4000-16000	20000-66468
1600	723-4000	5000-20000	27000-86815

The whole range of optional range, the data for flow the full-scale value of the Lord recommended.

Note: velocity and flow of the conversion relation

$$V=Q/S$$

$$S=\pi D^2/4$$

In Formula: V — Average velocity(m/s)

Q —Rate of flow (m3/h)

S —Pipeline cross-sectional area (m2)

D —Caliber (m)

Flow unit cubic meters and litres conversion relation: 1m3/h=1000L/h

#### 十一、 Electromagnetic flowmeter flow velocity compare table

	0.1	0.2	0.4	0.5	1	10	12	15
DN10	0.1282 7	0.56 5	0.113 1	0.141 4	0.282 7	2.82 7	3.39	4.24
DN15	0.0636	0.12 7	0.25	0.318	0.636	6.36 2	7.632	9.54
DN20	0.131	0.22 6	0.45	0.566	1.313	11.3 1	13.572	16.965
DN25	0.176	0.35	0.71	0.883 5	1.767	17.6 7	21.204	26.505
DN32	0.2895	0.58	1.16	1.448	2.895	28.9 5	34.74	43.425
DN40	0.4525	0.90	1.81	2.62	4.524	45.2 4	54.208	67.86
DN50	0.707	1.41 4	2.83	3.535	7.069	70.6 9	84.38	106
DN65	1.195	2.39	2.78	5.973	11.94	119.	143.35	179.2

					6	5		
DN80	1. 81	3. 62	7. 24	9. 048	18. 1	181	217. 2	271. 5
DN100	2. 83	5. 65	11. 31	14. 14	28. 27	282. 7	339. 24	424. 05
DN125	4. 42	8. 84	17. 67	22. 09	44. 18	441. 8	530. 16	662. 7
DN150	6. 36	12. 7	25. 5	31. 81	63. 62	636. 2	763. 44	954. 3
DN200	11. 3	22. 6	45. 2	45. 55	113. 1	1131	1357. 2	1696. 5
DN250	17. 7	35. 4	70. 7	88. 36	176. 7	1767	2110. 4	2650. 5
DN300	25. 45	51	102	127. 24	254. 5	2545	3054	3878. 5
DN350	34. 64	69	139	173. 2	356. 4	3464	41563. 8	5196
DN400	45. 24	90	181	226. 2	452. 4	4524	5428. 8	6786
DN450	57. 3	114	229	286. 3	572. 6	5726	6871. 2	8589
<b>DN500</b>	70. 7	141	283	353. 4	706. 69	7069	8484. 8	10603. 5
DN600	102	203	407	508. 9	1018	10179	12216	15270
DN700	139	277	554	692. 7	1385	13854	16620	20775
DN800	181. 0	362	723	905	1810	18096	21720	27150
DN900	229. 0	458	916	1145	2290	22902	27480	34350
DN1000	283	565	1131	1414	2827	28274	33924	42405
DN1200	407	814	1628	2034. 7	4069. 4	40694	48832. 8	61041
DN1400	554	1108	2216	2769. 5	5539. 4	55390	66428	83085
DN1600	723	1447	2894	3617. 3	7234. 6	72346	86815. 2	105819