Operation Manual

SINIER

■ Precision Manufacturing   Accurate Measurement

ELECTROMAGNETIC FLOW METER
SE11/12/13

HART
FIELD COMMUNICATIONS PROTOCOL

PROFI BUS
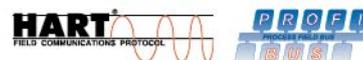
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SINIER

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■Sino British joint venture

1.1 Basic Safety Requirement

Instruments Safety Standard

Our instruments conform Pressure Equipments Standard and the latest Technical Safety Requirements. All the instruments are tested in safety operation conditions before Shipping from our factory. To ensure the instruments are still meeting the safety standard in use, our requirements in the manual book need to be complied.

Our instruments meet Electromagnetic Compatibility (Emc) Requirements in EN 61326/NAMU NE21.

All the instruments parameters are stored in the Instruments Memory after power off, and after restored power, the instruments continue to work.

1.2 Usage

Our instruments apply to:

Transmit and measure the flow, volumetric flow of conductive liquid, slurry.,ect.

Specified Usage Method:

Installed within technical specifications

Abide by the information in the manual book

Abide by the information attached in the manual book (specifications, drawings and signs)

Forbidden:

Using as elastic compensating parts, For example to compensate pipe deviation ,pipe vibration and pipe expansions.

Using as a support to climb, for example: using as assembly purpose.

Using as an external load support, For example: to support pipeline.

Drawing on our name plate or welded other parts into our instruments

Remove some material, for example, drilling in the instruments housing

Repair , alteration ,and expanding and using spare parts are only processed according to the manual book .

Other operations must be allowed from our factory. Or carrying out these operations in the place where is authorized from our factory.

Any problem raised from operations without our factory authorization will not bear by the manufacture, All the operation and maintenance requirement

In the manual book need to be applied. Manufacture will not bear any responsibility for any damage from not proper handing and operation.

1.3 Specification limitation

When the instruments are in use, the specifications in the name plate and manual book shouldn't be exceeded. Following limitations should be conformed :

Allowing Pressure (PS) and Allowing Temperature (TS) shouldn't exceed those listed in the manual book (P/T Rated Value)

Max and min temperature shouldn't be exceeded

Allowing environment temperature shouldn't be exceeded.

Enclosure Protection should accord to EN 60529 IP65 or IP68

Graphite Gaskets are not allowed to use.

Flow meters should avoid some place where there are pumps, transformers nearby.

1.4 Allowing Medium

Medium is measured only confirmed by the latest technology or customer suing experience; also the anti-chemical and anti- physical ability of wetted parts (signal electrodes, grounding electrodes, liners, process connections, grounding plate or protection plate) should be affected negatively.

Medium with unknown properties need to applied with routine and proper testing procedures before measuring, also the safety conditions of the instruments need to be ensured.

1.5 Safety signs, symbols, types, Name plates

All the safety signs, symbols, name plates should be kept readable, damage or lost are not allowable, following summary need to paid attention:

STOP	Warning!	Risk or dangerous information are existing, may lead to severe or deadly injuries.
⚠	Caution!	Dangerous information may exist, if not correcting, products or nearby materials may be damaged.
i	Information!	Use prompts, or including very important information, if ignored, may lead to complicated operations or affecting functions of instruments.

1.6 Models and Name Plate

Silver Name plate specifications

Name plates are in the housing of converters.

1.7 Personal Qualifications

The personnel who is responsible for the instruments electrical installation, starting, maintenance need to authorized by the system operators and special training are also needed. The personnel also need to read and understand the manual book and abide by the manual book.

1.8 Personnel Responsibility

Before measuring corrosive or abrasive medium, the operator needs to evaluate the wetted parts anti-corrosive ability. The manufacture is willing to provide evaluation help but not take any responsibility.

Meeting Chinese National Standard (using in testing electrical instruments operating, repair and maintenances).

1.9 Risk in instruments delivery

When delivering the instruments to field , please note:

Gravity may shift

The protecting board of PTFE /PFA liners is only to be permitted removed just before installing.

Do not lift the flange type instruments with converters or connecting box.

1.10 Risk in mechanical installation

Before installing, please ensure:

Flow direction should match the arrow in the instruments

Do not exceed the max torque rating of flanges bolts

1.11 Risk in electrical installation

Electrical installation and wiring according to the wiring diagram need to be performed by the personnel who is authorized and trained.

Please pay special attention to the electrical connection in the manual book, otherwise electrical protection type may be affected negatively.

The flow meters should be systematically grounded.

⚠ **Caution!**

EMC Protections and Personnel Protections are not available after the protection housings are removed.

Circuits are existing in the housing and it is dangerous to contact, hence, electricity need to be cut before opening the housing protection cover.

Only trained personnel are allowed to perform installation and repair task.

Before removing the flow meters, verifying that whether there is any dangerous medium measured, hazardous residue may exist in the flow meters and will flow out in dismounting.

02   03

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1.12 Risk in Operation

When high temperature medium is been measured, touching the surface of flow meters converters may be burnt.
Aggressive medium may lead to corrosion and abrasion.
Medium with pressure may lead to leakage

1.13 Risk in inspecting Process

When the instruments are in use, we inspect and maintain:
Before dismantling the instruments, please ensure that the instruments and nearby pipelines or tanks are pressure released.
Before dismantling the instruments, inspect whether the flow meters are applied to measure hazardous medium. Hazardous medium residue may exist in the instruments, and will leak when dismantling the converters.
When there is vibration in the pipelines, please fasten the flanges bolts and nuts.

Users should perform regular instruments inspections. Including:
Pressure, including pressure equipment surface and liners.
Measuring functions are normal
Sealing is good
Abrasives situation (corrosive)

1.14 Return Repair and Inspecting

If returning the flow meters to the manufacture to repair or re-calibrate is necessary , please using the previous packing material or proper protective packing material, and mark out the returning reason.

i Information！ **EU- Hazardous Material Regulations**

The owner of special waste should take responsibility of removal of pollutants, also following requirement need to meet before delivery:

Any Hazardous substance (Acid, Alkali, solvent) need to be removed from the flow meter sensor and converters before returning the flow meters to manufacture to repair. It also includes flushing and cleaning the hazardous material in the gap between the measuring tube and housing.
If users can not clean the hazardous substance, please attach proper documents to claim this situation with flow meters. In repair, users need to bear the cost of cleaning the hazardous substance from the manufacture.

2. Operation Principles, Sensors & Converters
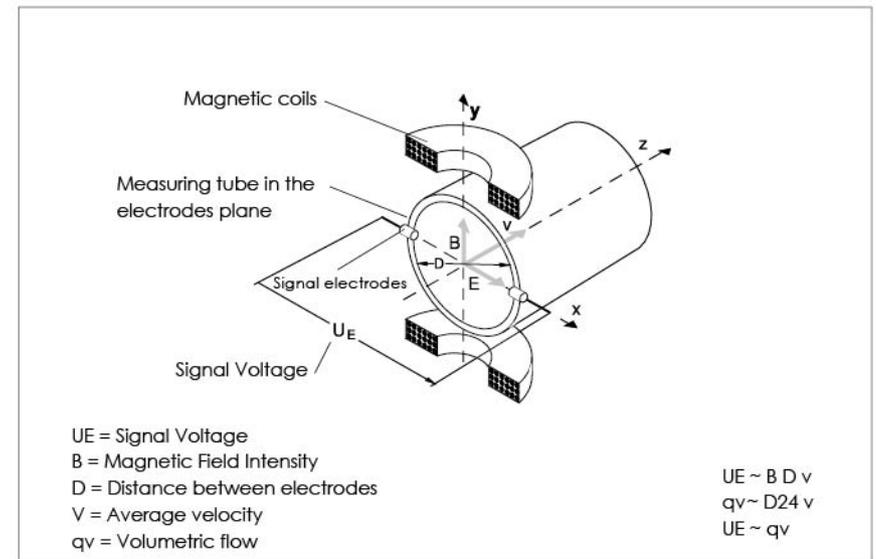
2.1 Operation Principles

Silver Electromagnetic Flow meter is perfect to measure low-conductive liquid, grout and slurry.
This Flow meter is accurate measuring, no pressure loss and no moving or extruding parts, wear and corrosive resistance, can be installed in any pipelines.
Can be used in Chemical, Pharmacy and cosmetic fields, Municipal water supply, swage plant, food and paper factory.

2.2 Measuring Principles

Electromagnetic Flow meter applies Faraday's Low of Magnetic Induction Law that is when the inductive fluids flow the instrument pipe which is perpendicular to the magnetic direction, Electromotive force is generated, refer to the diaphragm.
$UE \sim B \cdot D \cdot V$
Signal Voltage is measured by the symmetrically distributed two electrodes, Signal Voltage UE and magnetic field intensity B, Electrodes distance D and average velocity V are directly proportional, Magnetic Field Intensity B and Electrodes distance D is constant, it means that signal Voltage UE and average velocity V is inversely proportional. From the volumetric flow calculation formula to see UE~ qv, that is signal voltage is proportional to volumetric flow.

UE = Signal Voltage
B = Magnetic Field Intensity
D = Distance between electrodes
V = Average velocity
qv = Volumetric flow

$UE \sim B\,D\,v$
$qv \sim D24\,v$
$UE \sim qv$

Electromagnetic Flow meter Diagram

2.3 Flow meter Design

Electromagnetic Flow meter measuring system consists of a converter and a sensor, sensor is installed in the required pipeline, while converter can be installed in the field or other place (that is remote Version)

If it is compact design, sensor and converter integrally constructed.

2.4 Sensor and Converter

Compact	Remote
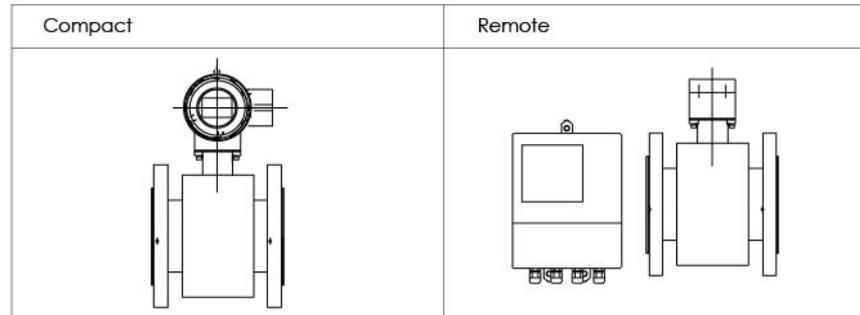
3. Technical Specifications and Technical Parameters

3.1 Standard Technical Specifications

3.1.1 Normal Operating Conditions

Environment temperature:-25 ℃~ + 60 ℃；
Relative Humility: 5% ~90%
Power supply: 85VAC~250VAC; 16VDC~36VDC
Consumed power: less than 20W

3.1.2 Measuring Accuracy

Standard SE11/ Sanitary SE13: ± 0.5%;   High Accuracy SE12: ± 0.25% Inserted type SE 14: ± 1.5%
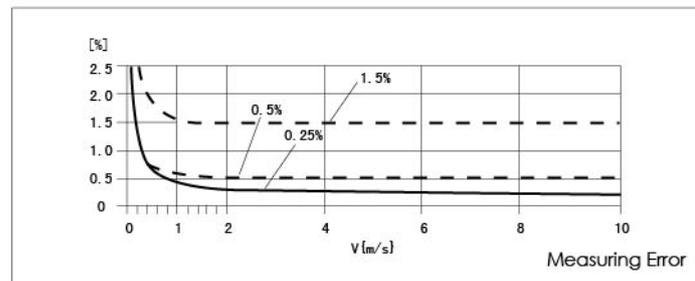
Measuring Error

3.1.3 Measuring Accuracy

3.1.3.1 Analog Current Output

Load Resistance :0mA~10mA ,0 k Ω~1.5 K Ω
Load Resistance :4mA~20mA ,0 k Ω~750 Ω
Intrinsic Error: o.1&% ± 10μA

3.1.3.2 Digital Frequency Output

Frequency Output Range: 1 Hz ~ 5000 Hz
Output Electrical Isolation: Optoelectronic Isolation, Isolation Voltage: > 1000VDC
Frequency Output Driver: Field-Effect Tube Output, Max bearing Voltage 36VDC, Max load Current 250mA

3.1.3.3 Digital Pulse Output

Output Pulse Range: 0 pulse/second ~ 100 pulses /second. (Higher than 100 pulses/second, pulse can be lost)
Output Pulse Equivlent: 0.001 m3/cp~1.000 m3/cp; 0.001 LTR/cp ~1.000 LRT/cp
Output Electrical Isolation: Optoelectronic Isolation, Isolation Voltage: > 1000VDC
Frequency Output Driver: Field-Effect Tube Output, Max bearing Voltage 36VDC, Max load Current 250mA

3.1.3.4 Alarm Output

Alarm Output Point: ALH –Upper limit Alarm, ALML—lower limit Alarm
Output Electrical Isolation: Optoelectronic Isolation, Isolation Voltage: > 1000VDC
Frequency Output Driver: Field-Effect Tube Output, Max bearing Voltage 36VDC, Max load Current 250mA

3.1.3.5 Digital Communication

MODBUS Interface: RTU Format, Physical Interface RS-485, Electrical Isolation 1000VH
Hart Interface : Standard Hart Protocol, configure HART Communicator, can display the measuring valve on line and modify the instruments parameters.

3.2 Main Technical Parameters

Main Technical Parameters of Electromagnetic Flow meter

06   07

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	SE11	SE12	SE13	SE14
Medium	Conductivity Fluids			
Accuracy	± 0.5%	± 0.25%	± 0.5%	± 1.5%
Repeatability	± 0.25%	± 0.125%	± 0.25%	±0.75%
Fluid Temperature	-25℃～130℃	-25℃～130℃	-25℃～130℃	-25℃～130℃
Conductivity	≥5μs/cm (soft water should be ≥20 μs/cm)			
Size	3mm～2200mm	3mm～2200mm	3mm～2200 mm	3mm～2200mm
Operation Pressure	0.6Mpa/1.0Mpa/1.6Mpa/2.5Mpa/4.0Mpa/Others			
Velocity	0.5 m/s～10 m/s			
Flow Direction	Forward / Reversed			
Electrodes Material	316L/Hastelloy C2,B4/Tantalum/Titanium/Platinoiridita/others			
Liner Material	Rubber/PTFE/PFA		PFA	PTFE
Electrodes Type	Standard			
Qty of Electrodes	2pairs(one pair for measuring,one pair for grounding)			1pair(for measuring)
Measuring tube Material	304 Stainless Steel			
Flange Material	Carbon steel/304 Stainless steel		304 Stainless steel	304 Stainless steel
Installation Type	Wafer/flange		Tri-clamp/screw	Flange/plug-in
Protection level	IP65/P68 (Remote Version)			
Power	220VAC±20% 60HZ/24 VDC			
Signal Output	4～20mA			
Communication	Hart/Modbus/Profibus			
Electrical connection	2 * M20 * 1.5			
Explosive-Proof	Exdemib II BT3~T6			
Construction Type	Compact/Remote			
Operation Environment	Environment temperature:-25℃～+60℃； Relative Humility:5%～90%			

4. Assembly & Installation

4.1 Open- Package Inspections

Before mounting the flow meters, Inspection whether the instruments is physical damage due to incorrect operations. Report to the Manufacture if there is any.

4.2 Delivery of the Instruments

Please note that when delivering the instruments to the mounting field:

Please use elevator belt when delivering flange type flow meter (≤DN 450 ［18"］) and fix position with the two flanges. Chains are forbidden due to abrading the housings.

STOP **Warning!**

The gravity center of the instrument may be higher than the lifting points of elevator belt. If the instrument slides, it will cause injuries! Please ensure that sliding and spinning will not appear during delivering
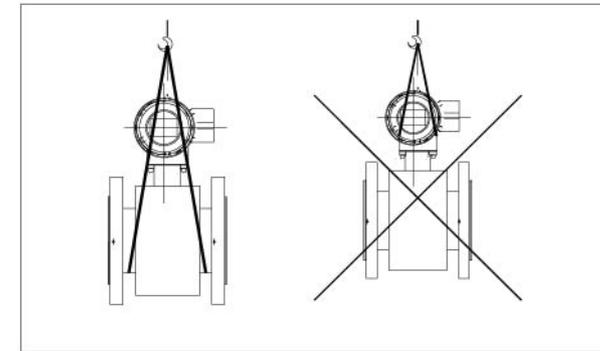

Figure 1: Size ≤DN 450 ［18"］ Flange type Flow meter delivering

4.2.1 Size ＞ 450 ［18"］ Flange type flow meter delivering

Connection box can not be used to lift the flow meter, using lift rings on the flow meters, and orient the flow meter into the pipelines.

⚠ Caution!

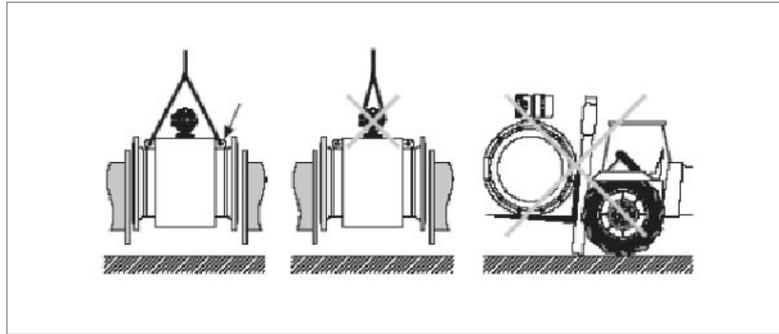Do not move the flow meter using Fork lift, it can crush the housing and damage the internal coils.

Figure 2 : Size > 450 ［18"］ Flange type Flow meter delivering

4.2.2 Size > 450 ［18"］ Flow meter Base and Support

Flow meter should be put on the Base or Support

⚠️ **Caution!**
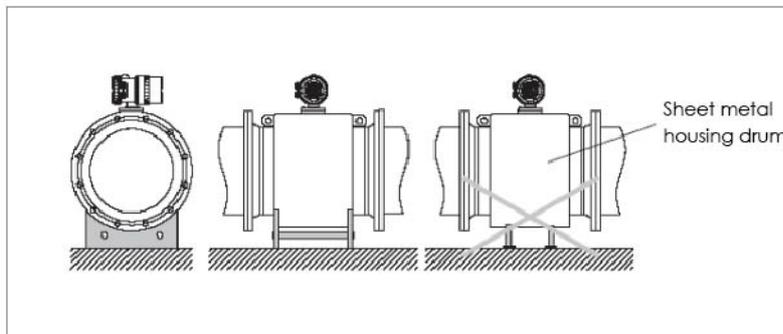Flow meter can not orient by the housing, otherwise it will cause damage to the internal coils.

Sheet metal housing drum

Figure 3 : Size > 450 ［18"］ Flange type Flow meter Base & Support

4.3 Mounting Requirements

Please ensure the following points when mounting:
The flow direction should match the arrow direction on the flow meter (if existing)
The flange bolts have been fasted to the max torque rating.
Mechanical stress (twist, bent) shouldn't exist when mounting, mating flanges keep axial symmetrical and parallel, proper gaskets should be used.
Gaskets shouldn't be extended to the flow area, otherwise whirlpool generated and affecting accuracy of the flow meter.
Any force and moment from the pipe shouldn't affect the flow meter.
The display of the flow meter should face the users
Protecting plug of the cable entries are only allowed to be removed when wiring.
Remote type converter should be mounted on some place where is free from vibration.
Converter of the flow meter should be free from direct sun shine. (Shade is required)

4.4 Flow meter Mounting
4.4.1 Choosing the mounting place
Choosing the place where negative pressure in the pipe is avoided.
Choosing the place where no motors, no transformers are nearby, powerful electromagnetic ware may generate electrical interference.
When measuring mixed-phase medium, the flow meters shouldn't be mounted on some place where the mixed –phase is separating.
When the environment temperature is between -25 ℃~ + 60 ℃, direct sun shine is better to be avoided.
Mounting the place where is free from vibration or little vibration, if strong vibration is existed, fix support is required before and after of the flow meter.
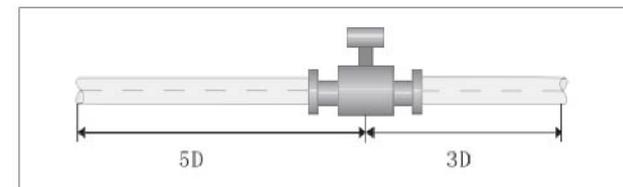Temperature humidity should be within 5% ~9%
Direct raining and immersion is avoided.

4.4.2 Requirement for the straight pipe: (D is the inner diameter of the flow meter)
Electromagnetic flow meters have low requirement for the straight pipe before and after the flow meters, Flow resistance fittings such as 90° elbow ,T Fittings, reducers, full-open valve,etc should have the 5D distance from the axis of the electrodes (not plane of the sensors) ; 10D distance in the upstream is required if there is different opening valves(for example adjusting opening valve). Normally 3D straight pipe is required in the downstream of the flow meter.

See following figure:

5D   3D

10   11

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When measuring mixed medium, mixed points should have 30D distance from the flow meter, see following picture
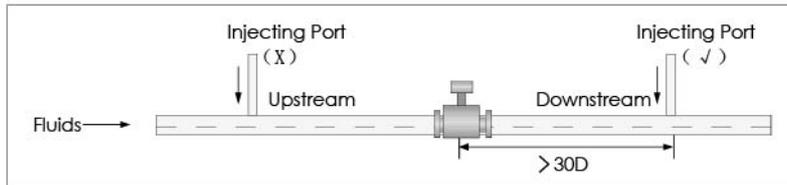


4.4.3 Mounting place and Fluids Direction

The Electromagnetic Flow meter can be horizontal, Vertical or slide mounted.
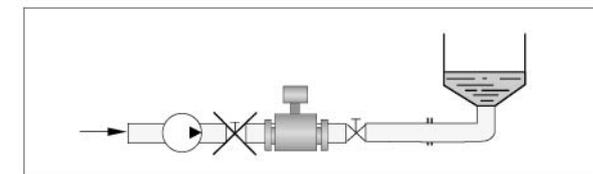
When horizontal mounting, the axis of the electrodes must be horizontal to avoid electrodes short time insulation generated from the bubble in the liquid, also avoid sediments covering electrodes. The sensor shouldn't be mounted in the highest point to avoid air accumulation in the pipe.
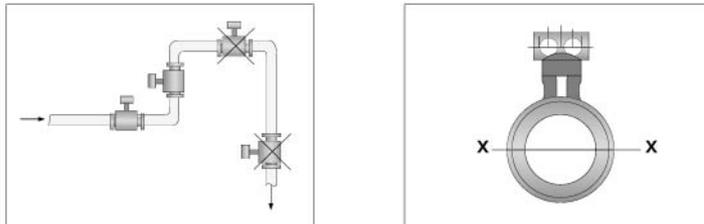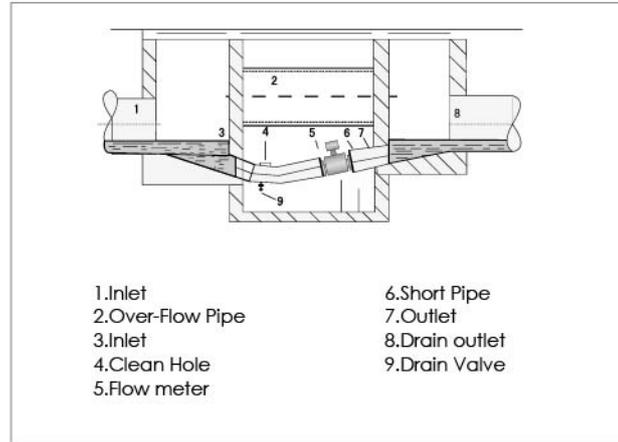

When the flow meter is vertically mounted, the flow direction should be upwards, it can have following merits. When there is no flow or small flow , the heavy solids in the fluids are down and the fatty substances are up to be away from the electromagnetic flow meter electrodes area. When measuring particle-liquid two phase fluids, such as slurry, pulp , vertical mounting can avoid uneven abrasion from the sediments. As the picture shows. The measuring pipe should be filled with liquid and back pressure should be existed. To avoid negative pressure (damaging the liners), the electromagnetic flow meter shouldn't mount in the inlet of the pump, outlet is recommended. When sliding mounting the flow meter, the flow meter should be mounted in the going-up pipe; When mounting the flow meter in the open discharging pipe, the meter should be mounted in lower place.
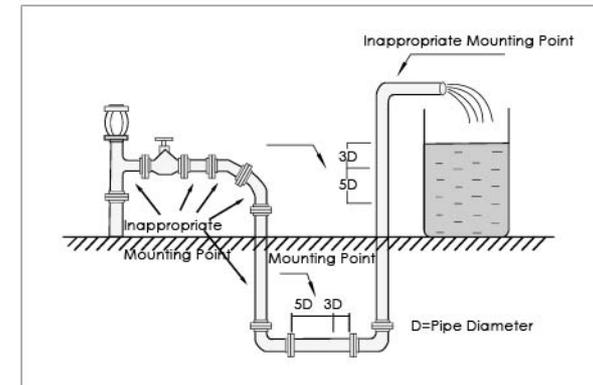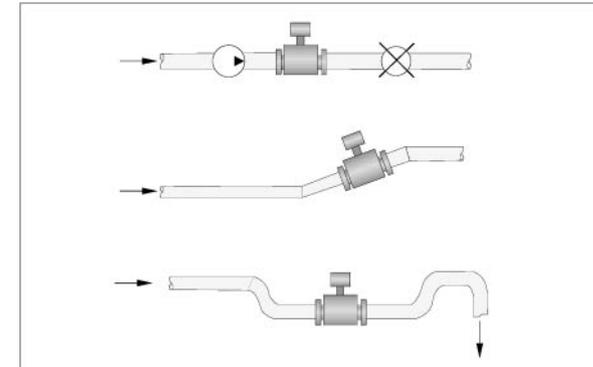
Control Valves and Stop Valves in the downstream (instead of upstream) of the sensors are recommends

Method of mounting the flow meter in the well

1.Inlet
2.Over-Flow Pipe
3.Inlet
4.Clean Hole
5.Flow meter
6.Short Pipe
7.Outlet
8.Drain outlet
9.Drain Valve

5. Electrical Wiring & Grounding

5.1 Grounding Requirement of the Flow meter

Flow meter, Medium and pipeline should be in the same electrical potential which is grounding. Proper grounding is individually grounding in the sensor side, remote version converter connect in the same point. Grounding Resistance <10Ω, grounding wire is BRV-16. Improper grounding can result in abnormal performance.

When the Flow meter is mounted in the metal pipe and the pipe without any liners, see following picture of the grounding.

Compact Version   Remote Version
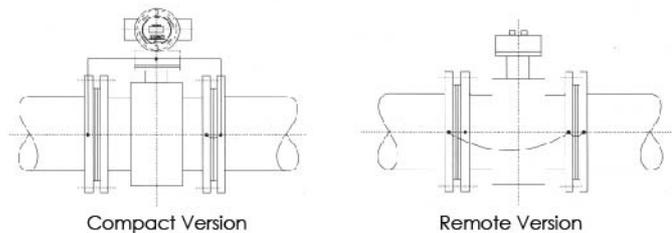
When the sensor is mounted in PVC Pipes, or lined metal tube, see following grounding picture

Compact Version   Remote Version
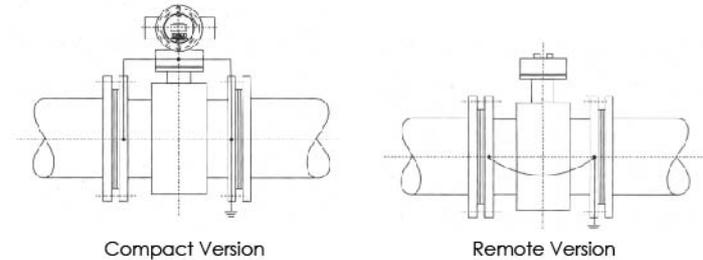
When mounting the sensor in the Cathodic Protecion Pipe , see following picture of grounding:


Compact Version   Remote Version
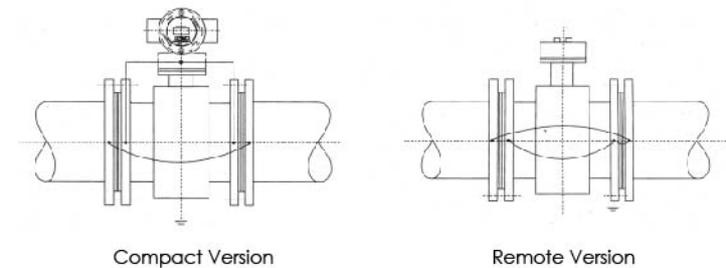
When mounting the flow meter in Cathodic Protecion Pipe, grounding wires should by pass the sensor and bridge joint the two flanges and isolate the cathodic protection current and sensor.

5.2 Flow meter Wiring

If mounted remotely, connection signal cables should be dedicated cables, the shorter, the better.

Excitation cables can be Y2 Type Rubber cable, the length should be the same as signal cable.

Signal cables should separate from power cable, can not be laid in the same tube, can not be laid parallel or twisted laid. They should be laid in dedicated metal tubes.

Signal cables and excitation cables should be as short as possible, redundant cable shouldn't be rolled together, they should be cut down and re-welded, when the cable connect into the sensor electrical interface, the interface can be made into U Type to avoid raining into the sensor.

14   15

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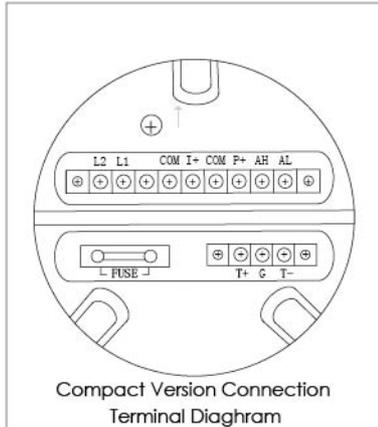
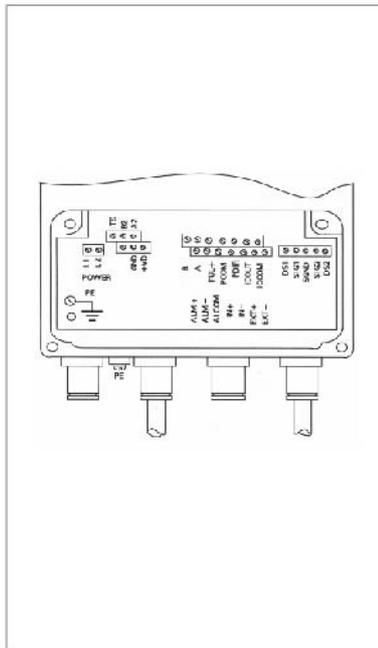| I+	Flow Current Output
COM	Current Output
P+	Bi-directional frequency(Pulse) Output
COM	Frequency(Pulse) Output Ground
AL	Lower limit Alarm Output
AH	Upper limit Alarm Output
COM	Alarm Output Ground
FUSE	Input Power Fuse
T+	Communication input
T-	Communication input
G	RS232 Communication Ground
L1	220V(24V) Power supply
L2	220V(24V) Power supply

Compact Version Connection Terminal Diaghram

SIG1	Signal 1	
SGND	Signal Ground	
SIG2	Signal 2	
DS1	Shielded Exciting 1	1
DS2	Shielded Exciting 2	
EXT+	Exciting Current +	
EXT-	Exciting Current -	
VDIN	Current two-wire 24V Connection Point	
IOUT	Analog Current Output	2
ICOM	Analog Current Output Ground	
POUT	Flow Frequency(Pulse) Output	
PCOM	Frequency(Pulse) Output Ground	3
ALMH	Upper limit Alarm Output	
ALML	Lower limit Alarm Output	4
ACOM	Alarm Output Ground	
TRX+	Communication Input	
TRX-	Communication Input	5
TCOM232	Communication Input Ground	

1、Connect Remote Type sensor 2、Analog Current Output
3、Frequency or Pulse Output 4、TWO-Way Alarm Output
5、Communication Input

Remote Type Converter Wiring Diagram

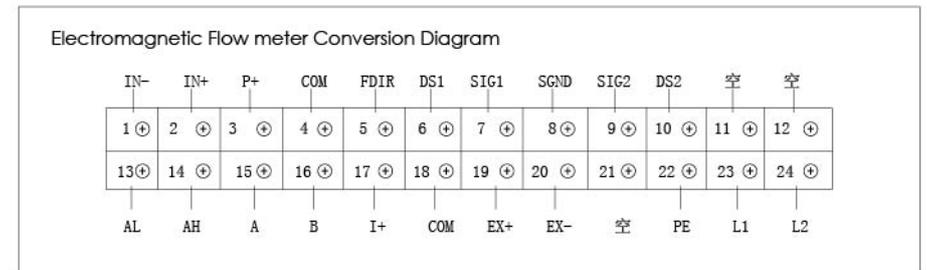| AH	Upper limit Alarm
T+,T-RS485	Communication +.-
I+,COM	4~20mA Current Output
SIG1,SGND,SIG2	Signal 1, Signal Ground, Signal2
L1,L2	Power 220VAC or 24V DC
IN+	Contact Input
P+,COM	Pulse/Frequency, Communication and Alarm shared
AL	Lower limit Alarm
EXT+,EXT-	Exciting Current output+,-

Explosive-Proof Terminal Connection

Electromagnetic Flow meter Conversion Diagram

Explosive-proof

Remote Version Electromagnetic Flow meter Terminal Connection

DS1	Shielded Exciting 1	FDIR	Flow Direction Status +
SIG1	Signal 1	AL	Upper limit Alarm Output +
SGND	Signal Ground	AH	Lower Limit Alarm Output -
SIG2	Signal 2		
DS2	Shielded Exciting 2	A	RS 485 Output +
EXT+	Exciting Current +	B	RS 485 Output -
EXT-	Exciting Current -		
IN+	Contact Input +	L1	AC Power Phase Line: DC Current +
IN-	Contact Input -	L2	AC Power zero Line: DC Current -
P+	Frequency(Pulse) Output +	PE	Protection Ground
COM	Frequency(Pulse) Ounput Ground, shared with FDIR,AL,AH		

6. Specification

6.1 Electromagnetic Flow meter Outlines& Dimensions
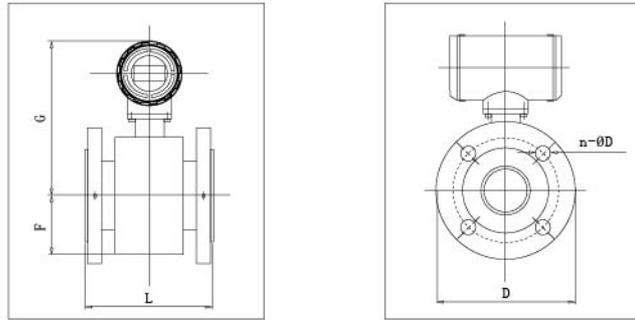
| DN	Rated Pressure（Mpa）	Instruments Outline Dimensions（mm）				
		L	F	G	D	n-ΦD
15	4.0	160	50	245	95	4-Φ14
20			50	245	105	4-Φ14
25			55	240	115	4-Φ14
32			60	255	140	4-Φ18
40			65	260	150	4-Φ18
50		210	76	264	165	4-Φ18
65			85	275	185	8-Φ18
80			90	285	200	8-Φ18
100	1.6	260	100	295	220	8-Φ18
125			116	310	250	8-Φ18
150		310	126	324	285	8-Φ22
200		360	154	361	340	8-Φ22
250	1.0	410	179	386	395	12-Φ22
300		510	204	411	445	12-Φ22
350			229	441	505	16-Φ22
400		610	260	465	565	16-Φ22
450			285	495	615	20-Φ26
500			395	510	670	20-Φ26
600	0.6		445	559	780	20-Φ30
700		710	552	606	895	24-Φ30
800		810	602	656	1010	24-Φ34
900		910	652	706	1110	28-Φ34
1000		1010	702	756	1230	28-Φ36
1200		1210	804	866	1405	32-Φ33
1400		1410	904	966	1630	36Φ36
1600		1610	1024	1056	1830	40-Φ36
1800		1810	1106	1194	2045	44-Φ39
2000		2010	1226	1274	2265	48-Φ42

6.2 Remote Type Flow meter Converter Dimensions
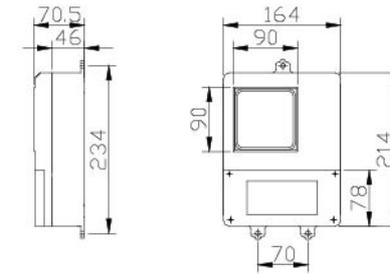
Converter Outline Dimensions: 165mm * 215mm *70mm (width*height*thickness)

7. Start

7.1 How to use menus, Screen and keys

7.1.1 Menus

Silver Operation is all-English menu, there are two main menus which is measuring display menu and parameter setting menu.
Enter into Display Menu:
1.After power on, it will enter into display menu automatically;
2.In setting status, no 2 second pressing-key operation In 3 minutes, the instruments will return to display status automatically;
3.In any status, press enter key 3 second, it will enter into display status
4.Enter into Parameter setting Menu: In display status, press compound key and enter key together, then enter password, it will enter into parameter setting menu.

7.1.2 Screen

Silver Screen is high definition back-lit LCD Display, there are three-lines in the display, as following picture:

18   19

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The first line indicates the instaneous Flow rate, in the left of the second line, it indicates the alarm hint, the third line can indicate instaneous flow rate, percentage of instaneous flow rate, Ratio of Emptiness, emptiness alarm, flow alarm, system alarm, Forward totalized flow, reverse totalized flow, net totalized flow.,etc. they are optional.

Screen contrast can be adjusted by "compound" key +"up" key or "Down" key , that is in display status, press "Compound" key + "up" key several seconds, screen contrast is increasing, otherwise, "compound" key + "Down" Key, screen contrast is decreasing.

7.1.3 Press Key

Four keys are: ⬥ ▼ ◢ ↵

⬥ Compound key: can not be used individually, need to use with other keys, first press "Compound" Key, then press other keys

▼ Down Key: in Display status, press this key, screen can display the content circularly in the third line; in parameter setting status, press this key can decrease the numbers; press "compound" key first then press this "Down" Key, the cursor will shift to the left; press this key repeatedly, you can select the setting content downward.

◢ Up key: In display status, press this key, screen can display the content circularly in the third line; in parameter setting status, press this key can decrease the numbers; press "compound" key first then press this "Up" Key, the cursor will shift to the right; press this key repeatedly, you can select the setting content downward.

↵ Enter Key: In display status, press "Compound" key then press this key, you can enter into parameter setting status; in parameter setting status, press this key into submenu, press this key for five seconds, it can exit the submenu.

7.2 View the displaying content

Press ◢ key repeatedly, the third line can show the following content:

FLS000.00m/s	It displays the instaneous flow rate
FQP000.00%	It displays the percentage of instaneous flow rate
MTP000.00%	It displays percentage of empty pipe
LIQUID NORMAL	It displays empty pipe is normal
FLUX NORMAL	It displays the flow rate is normal
SYSTEM ALARM	System Alarm
Σ+0000000000.m³	Forward totalized flow
Σ-0000000000.m³	Reverse totalized flow
ΣD0000000000.m³	The difference between the forward and reverse totalized flow

8.Converter Programming & Parameters entering

8.1Parameter setting Menu Table

8.1.1Basic Parameter Setting Menu Table

Parameter No.	Parameter Content	Setting method	Parameter range
1	Snsr Size	Select	3mm-3000mm
2	Flow Unit	Select	L/h,L/m,L/s, m^3/h,m^3/m, m^3/s
3	Flow Range	Data-setting	0-99999
4	Flow Direct	Select	Forward/reverse
5	Total Unit	Select	0.001 m^3-1 $m^3$0.00LI~1L
6	Flow Rspns	Select	150
7	Flow Cutoff	Data-setting	0% ~599.99%
8	Cutoff Ena	Select	Enable/Disable
9	Comm Addres	Data-setting	0~99
10	Baud Rate	Select	300 ~ 38400
11	Pulse Type	Select	Freque / Pulse
12	Pulse Fact	Select	0.01 m^3-1 $m^3$0.00LI~1L 0.001UKG~1UKG,0.001USG~1USG
13	Clr Sum Key	Data-setting	0~99999
14	Analog Type	Select	0~10mA /4 ~20mA
15	Freque Max	Select	1~ 5999 HZ
16	Flow Zero	Data-setting	0~±9999

20   21

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8.1.2Advanced Parameter setting Table

Parameter No.	Parameter Content	Setting method	Parameter range
1	Analog Zero	Data-setting	0-9999
2	Mtsnsr Ena	Select	Enable/Disable
3	Mtsnsr Trip	Data-setting	599.99%
4	Alm Hi Ena	Select	Enable/Disable
5	Alm Hi Val	Data-setting	000.0% ~599.99%
6	Alm Lo Ena	Select	Enable/Disable
7	Alm Lo Val	Data-setting	000.0% ~599.99%
8	SegmaN Ena	Select	Enable/Disable
9	Sys Alm Ena	Select	Enable/Disable
10	Snsr Code1	User setting	Factoryyear.month(0~99999)
11	Snsr Code2	User setting	Product codes(0~99999)
12	Field Type	Select	Mode1,2,3
13	Sensor Fact	Data-setting	0.0000~5.9999
14	Analog Zero	Data-setting	0.0000~1.9999
15	Anlg Range	Data-setting	0.0000~3.9999
16	Meter Fact	Data-setting	0.0000~5.9999
17	MeterCode 1	Factory-setting	Factoryyear. month(0~99999)
18	MeterCode 2	Factory-setting	Product codes(0~99999)
19	FwdTotal Lo	Can modify	00000~99999
20	FwdTotal Hi	Can modify	0000~9999
21	RevTotal Lo	Can modify	00000~99999
22	RevTotal Hi	Can modify	0000~9999
23	Language	Select	Chiese,English
24	Pass Word 1	User can change	00000~99999
25	Pass Word 2	User can change	00000~99999
26	Pass Word 3	User can change	00000~99999

8.2Parameter setting

Press ⬥ and , ↵ ,it shows Parameter setting, press ↵ ,it shows 00000, the display needs passwords. Explanation: Factory basic password is 02871,press ◢ ,the number +1. Press ⬥ and ◢ Together, cursor shift left, Press ◢ and ◥ key, the cursor shift right, ⬥ , after finishing input the passwords, Press ⬥ and ↵ ,enter into basic parameter settings mode, using ◢ and ◥ , upward or downward circularly to choose the setting menu. Press ↵ enter into menu settings, after one menu is finished setting, press ↵ to confirm and return back. Then Press ◢ or ◥ ,to choose the next menu, if the password is wrong, it return to display mode, menu setting or modifying is finished, press ↵ 3 seconds then back to setting mode.

8.2.1 Basic Parameter Function Introduce

Snsr Size ◥ ◢	It shows the size of the measuring pipe Explanation: Press ↵ enter into setting, press ◢ or ◥ ,you can select circularly 3,6,10,15,20,25,32,40,50,65,80,100,725,150,200,250,300,400,450,500,600,700,800,900,1000,1200,1400,1600,1800,2000,2200,2400,2500,2600,2800,3000,then press ↵ return.
Flow Unit ◥ ◢	It shows the settable flow. Explanation: when selecting the flow unit in the flow range parameter setting, there are L/s,L/m,L/h,m3/s, m3/m, m3/h,press ◢ or ◥ to choose the flow unit, user can choose the proper flow unit according to process requirement and using experience.
Flow Range ◥ ◢	It shows the max output signal (20mA) corresponding flow value. Explanation: Press ↵ enter into setting, input setting data, press ↵ and return, Flow range means the upper-limit flow value (full range).Upper flow value is against output signal and percentage, It is corresponding current output upper limit and frequency(pulse) upper limit and 100% displaying value. It is also related to small flow cut shown as percentage and exceeding limit alarm

Note:

Flow value is using 5 significant digits, and flow unit is in the end of the value. When inappropriate flow unit is chose by the operator, the flow meter will prompt the operator the problem of "overflow" and "underflow". For example, choosing L/h unit for 200mm Size Flow sensor, when the velocity is 1m/s, flow is 11309 L/h, exceeding 5 digits and it is overflow, so m3/s ,m3/min or m3/h should be chose. While choosing m3/s as the flow unit for m size flow sensor,when the velocity is 1m/s, the flow rate is 0.00000707 m3/s, under 5 digits, and unable to show the significant digits, it is "underflow", the unit should be L/s, L/min or L/h.

Flow Direct	It shows the optional flow direction.
	Explanation: Press ⏎ enter into setting, press ▣ or ▣ ,you can select forward or reverse flow direction, Then press ⏎ return. If the flow direction is forward, while the flow direction in the display is reverse, set the flow direction in the converter.
Total Unit	It shows the optional totalized flow unit.
	Explanation: Press ⏎ enter into setting, press ▣ or ▣ select $1m^3$,$0.1 m^3$,$0.001 m^3$ or 0.1L,0.001L,0.001L,Then press ⏎ confirm and return. This setting will affect the numbers after decimal point of total flow value. The totalized flow value can be 10 digits.
Flow Rspns	It shows the measuring damping time (second) setting.
	Explanation: Press ⏎ enter into setting, press ▣ or ▣ ,circularly select 1,2,3,4,6,8,10,15,30,50,then press ⏎ confirm and return. The increasing damping time can increase the flow meter stability and signal stability.
Flow Cutoff	it can set small flow cut off point(%)
	Explanation: Press ⏎ enter into setting, input the setting data (the signal below this setting data will be cut off), press ⏎ confirm and return. Small flow rate cut -off is expressed by flow percentage, when choosing the small flow cut -off, the flow ,flow rate and percentage can also be cut -off. Users can also only choose current output signals, frequency (pulse) signals cut off and keep flow, flow rate and percentage display.
Cutoff Ena	It displays the permission of small flow cut - off.
	Explanation: Press ⏎ enter into setting, press ▣ or ▣ circularly choose enable or unable. Press ⏎ confirm and return.

Comm Addres	It displays RS485 Communication Address
	Explanation: Press ⏎ enter into setting, input the address, random number between 0 -99,press ⏎ confirm and return.
Baud Rate	it can set the communication speed of RS-485
	Explanation: Press ⏎ enter into setting, Press ▣ or ▣ circula rly choose 300,1200,2400,4800,9600,19200,38400 confirm and return.
P ulse Type	It displays pulse output modes
	Explanation: Press ⏎ enter into setting, Press ▣ or ▣ circularly choose frequency, pulse then press ⏎ confirm and return. There are frequency and p ulse output optional. Frequency output is continuous square wave, pulse output is square wave and pulse train. Frequency output is normally used for measuring instaneous flow or short time totalized flow. Pulse output is used to measure volume unit directl y or total flow for a long time by choosing pulse unit equivalent .
Pulse Fact	It can choose pulse unit equivalent (each pulse stands for the flow value)
	Explanation: Press ⏎ enter into setting, Press ▣ or ▣ circularly choose 1m ^{3},$0.1 m^3$,$0.001 m^3$ or 0.1L,0.0 01L,0.001L,Then press ⏎ confirm and return.
Clr Sum Key	It can set the total flow clearing password (00000)
	Explanation: Press ⏎ enter into setting, press total flow clearing password, then press ⏎ confirm and return. This password is used to clear the to tal flow ,please remember this password.

Analog Type	It can set the current output type.
	Explanation: Press ↵ enter into setting, Press ◢ or ◥ circularly choose 0~10mA,4~20mA,press ↵ confirm and return. In the same flow , when the pulse equivalent is small, then output pulse frequency is high, the max pulse frequency is 5000 CP/S, the max width of the pulse output is 20ms, it will automatically change into square ware when high frequency.
Freque Max	It can set and input the frequency range(corresponding the max instaneous flow frequency)
	Explanation: Press ↵ enter into setting, input the setting value, press ↵ confirm and return. The frequency output corresponding the max flow range (100% of the flow), the upper limit of the frequency can choose random between 1-5000HZ.
Flow Zero	It can amend the flow zero.
	Explanation: Press ↵ enter into setting, input the setting data when the fluids is static, and the first line of the screen will display FS=+00000,Press ↵ confirm and return. The measuring tube of the flow meter should be full and static; the instaneous flow is near zero in the screen. Otherwise, zero adjustment is necessary. The zero adjustment should be operated when the measuring pipe is full of conductive liquid and static.

8.2.2 Advanced Parameter Setting Introduce

Mtsnsr Ena	It shows whether Empty Pipe Alarm is allowable
	Explanation: Press ↵ enter into setting, Press ◢ or ◥ circularly choose enable or unable, press ↵ confirm and return. If users choose empty pipe alarm is enable, when it is empty pipe status, the instruments analog digital output is zero, and the display also showing zero flow value.

| Mtsnsr Trip	It can set the empty pipe alarm threshold.(%)
	Explanation: Press ↵ enter into setting, input the setting data , Press ↵ confirm and return. Empty Pipe Detection is realized by Constant Flow Source Method to measure the electrodes resistance, then judge intelligently, resistance, fluids conductivity, electrodes diameters, measuring resistance values reports to CPU about electrodes situation, then CPU makes judgment about empty pipe , setting range 0-59999%.
Alm Hi Ena	It can set whether to be upper-limit alarm.
	Explanation: Press ↵ enter into setting, Press ◢ or ◥ circularly choose enable or unable, press ↵ confirm and return.
Alm Hi Val	It can set upper-limit alarm value, the range can be 0%-599.99%
	Explanation: Press ↵ enter into setting, input the setting value, press ↵ confirm and return.
Alm Lo Ena	It can set whether to be lower-limit alarm.
	Explanation: Press ↵ enter into setting, Press ◢ or ◥ circularly choose enable or unable, press ↵ confirm and return.
Alm Lo Val	It can set lower-limit alarm value, the range can be 0%~599.99%
	Explanation: Press ↵ enter into setting, input the setting value, press ↵ confirm and return. Lower-limit alarm value is calculated by range percentage, this parameter is value setting, set between 0%~599.9%. when the flow meter is working, the flow percentage is less than the setting value, it will send out alarm.
SegmaN Ena	It can choose whether to be reverse output.
	Explanation: Press ↵ enter into setting, Press ◢ or ◥ circularly choose enable or unable, press ↵ confirm and return.

26   27

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Sys Alm Ena	It can set whether to be Excitation alarm
	Explanation: Press ⏎ enter into setting, Press 🔽 or 🔼 circularly choose enable or unable, press ⏎ confirm and return.

Snsr Code1	It can set Sensor code 1(00000)
	Explanation: Users set by themselves.

Snsr Code2	It can set Sensor code 2(00000)
	Explanation: Users set by themselves.

Field Type	It can select excitation way.
	Explanation: Press ⏎ enter into setting, Excitation way is optional, factory has set according to the diameters , press ⏎ return.

Sensor Fact	It can set the sensor factor value.
	Explanation: Press ⏎ enter into setting, input the sensor factor value, press ⏎ confirm and return. Sensor factor is set in factory calibration, the normal value is 1.000.

Analog Zero	It can adjust analog zero value.
	Explanation: Press ⏎ enter into setting, adjust analog zero output value. The standard analog output is 0mA or 4mA, pres s ⏎ confirm and return.

Anlg Range	It can set analog full value.
	Explanation: Press ⏎ enter into setting, adjust analog full value, the standard analog output is 10mA OR 20mA, press ⏎ confirm and return.

Meter Fac	It can set factory coefficient(users can not change by themselves)
	Explanation: Press ⏎ enter into setting, input flow calibration coefficient, press ⏎ confirm and return. The coefficient is obtained from standard calibration equipment, this coefficient can make all the converters consistant.

MeterCode1	It can set instrument code 1(00000)
	Explanation: set in factory

MeterCode 2	It can set instrument code 2(00000)
	Explanation: set in factory

FwdTotal Lo	It shows the forward total flow low
	Explanation: Press ⏎ enter into setting, input for ward total flow low value, press ⏎ confirm and return. Total flow low setting can change the low numerical of the forward total flow, it is mainly used for instruments repair and replace Users can change the value according to situation.(0~99999)

FwdTotal Hi	It shows the forward total flow high
	Explanation: Press ⏎ enter into setting, input forward total flow high value, press ⏎ confirm and return. Total flow low setting can change the high numerical of the forward total flow, it is mainly used for instrum ents repair and replace. Users can change the value according to situation.(0~99999)

28   29

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|	
RevTotal Lo	It shows the reverse total flow low Explanation: Press ⏎ enter into setting, input reverse total flow low value, press ⏎ confirm and return. Total flow low setting can change the low numerical of the reverse total flow, it is mainly used for instruments repair and replace Users can change the value according to situation.(0~99999)
RevTotal Hi	It shows the reverse total flow low Explanation: Press ⏎ enter into setting, input reverse total flow low value, press ⏎ confirm and return. Total flow low setting can change the low numerical of the reverse total flow, it is mainly used for instruments repair and replace Users can change the value according to situation.(0~99999)
Language	It can select language Explanation: Press ⏎ enter into setting. Press ◢ or ◣ circularly choose Chinese or English. Then press ⏎ confirm and return.
Pass Word 1	It shows the password 1. Explanation: Press ⏎ enter into setting. Input password, press ⏎ confirm and return.
Pass Word 2	It shows the password 2. Explanation: Press ⏎ enter into setting. Input password, press ⏎ confirm and return.
Pass Word 3	It shows the password 3. Explanation: Press ⏎ enter into setting. Input password, press ⏎ confirm and return.

8.3Infrared Handheld Remote Control

Flow meter infrared Handheld Remote control Operation is the same as the converter keys operation. When operation, the infrared handheld sending terminal should be parallel to receiving terminal, the distance is 1 meters. See following picture.
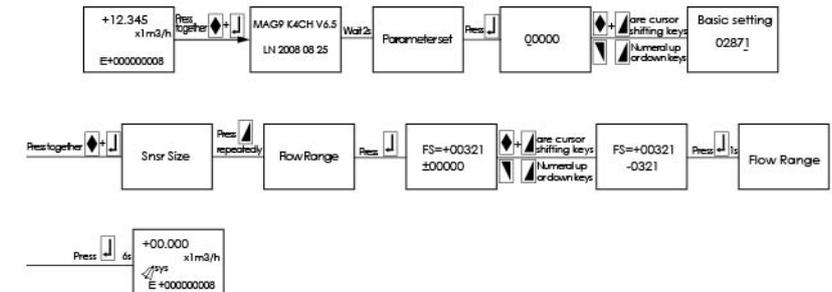
Remote Distance ≤1m
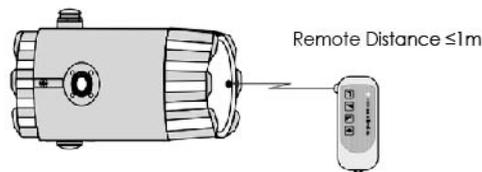
9.Useful Converter Operation

9.1Change the flow range
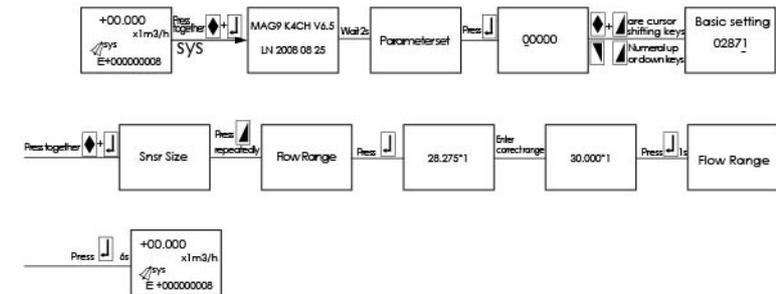
Press ◆ and ⏍ together, display parameter set, press ⏍ ,input password 02871 (press ◆ and ◣ is cursor shifting keys), the screen displays basic Parameter setting, press ⏍ ,it will display Snsr Size, press three times ◣ ,it will display Flow Range, press ⏍ ,enter and input the needed value. Press ⏍ shortly ,save and exit. Long press ,it will return to measuring mode, we finish change flow range.
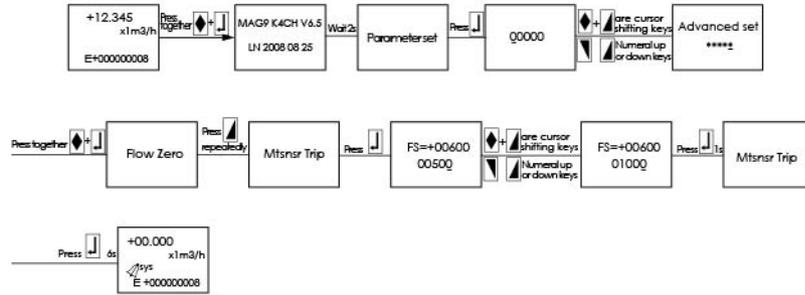
9.2Changing zero

Press ◆ and ⏍ together, display parameter set, press ⏍ ,input password 02871 (press ◆ and ◣ is cursor shifting keys), the screen displays basic Parameter setting, press ⏍ ,it will display Snsr Size, press 16 times ◣ ,it will display Flow Zero, press ⏍ , change the middle value, let the screen first line shows FS=0000, Press shortly ⏍ ,save and exit. Long press ⏍ ,it will return to measuring mode, we finish change flow zero.

Note: When changing the flow zero, the measuring tube should be filled with fluids, and should be static.

30   31

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9.3 Changing Mtsnsr Trip

Press ◆ and ⌐ together, display parameter set, press ⌐ ,input advanced parameter setting password (contact Manufacture) ,in the first line of the screen, it will show advanced set. press ⌐ , it will show Flow Zero, press ◥ 2 times, it will display Mtsnsr Trip , press ⌐ enter, press ◥ or ◢ choose enable, Press shortly ⌐ ,save and exit. Press ◥ , the screen will display empty pipe alarm value. Press ⌐ enter, input the corresponding value, Press shortly ⌐ ,save and exit. Long press ⌐ ,it will return to measuring mode, we finish change Mtsnsr Trip

Note: Factory default Mtsnsr Trip Value is 1000. if need any changing , contact manufacture.

9.4 Total Flow zero
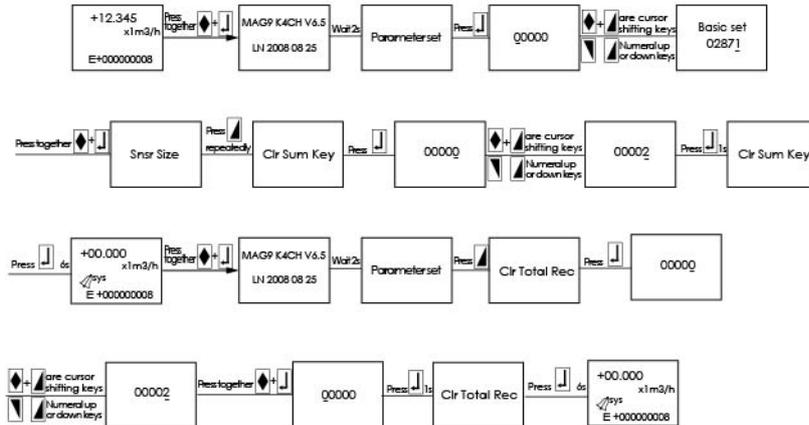
Press ◆ and ⌐ together, display parameter set, press ⌐ ,input password 02871 (press ◆ and ◥ is cursor shifting keys), the screen displays basic Parameter setting, press ⌐ ,it will display Snsr Size, press 13 times◥ ,it will display Flow Zero, press ⌐ ,input the user-defined passwords(please remember it), Press shortly ⌐ ,then Long press ⌐ , it will return to measuring mode. Press ◆ and ⌐ together, display parameter set, press ◢ or ◥ , it will display Flow zero, press ⌐ ,input the customer-defined password, press ◆ and ⌐ ,and it will display 00000. We finish flow zero procedure.

Note: Customer-defined password can only be used only one time; it will be invalid after using. If you need to continue to clear the flow, please define the new password.

10.Switch Instructions
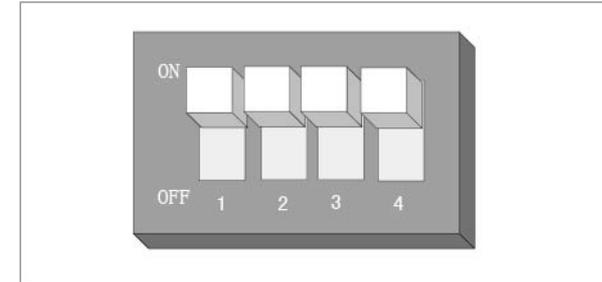
Switch 1 Definition:

On : For Pulse output when calibration, connect pull-up resistance(10KΩ)

Off: not connect

Switch 2 Definition:

On: to provide pull-up power for Alarm(24V)

Off: not connect

Switch 3 Definition:

On: to provide pull-up power for ALMH(24V)

Off: not connect

Switch 4 Definition:

On: to connect RS485 terminal resistance (standard resistance:120Ω)

Off: not connect

Note: Terminal Resistance is for long distance communication, not for short distance.

11.Communication

32

33

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11.1Hart Overview

Hart is a Data communication Bus applied in field equipments, it is abbreviation of "Highway Addressable Remote Transducer." It adds a current FM Signal on 4~20 mA, 1200Hz stands for Logic "1",2200Hz stands for "0", Baud rate 1200 bps. The signal wave is just like following:

INPUT
(IRXA)

OUTPUT
(ORXD)   1   1   0   1   1

1/1200s
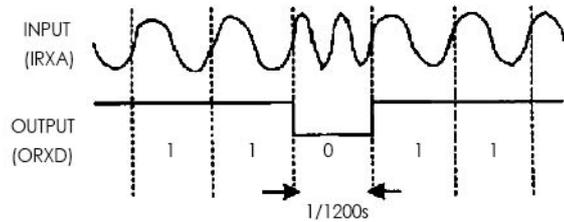
11.2Hart Field Network Map

Hart is using 4~20mA transmission cable to transfer the signals. It is very suited to be used in the field to save the communication cable. See following picture of HART Network Map:

PC

Moden   Hart Modem

Display instruments

4~20mA

COM

Hart Electromagnetic flow meter
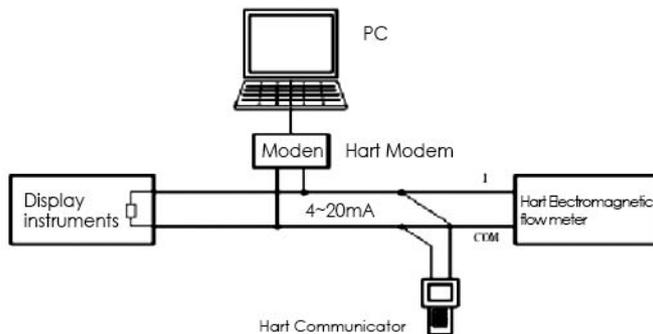
Hart Communicator

Precautions to use Hart

Hart Communicator and Hart Modem should be parallel to Electromagnetic Flow meter output, no polarities on load ends.
Resistance should be more than 200Ω and less than 500Ω.
Hart Communicator , Hart Modem can not connect in current loop in series.
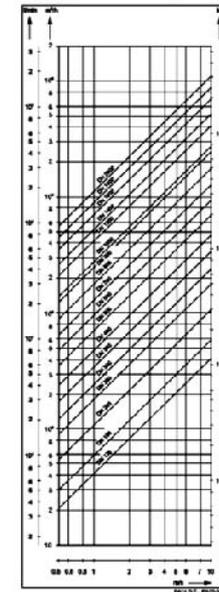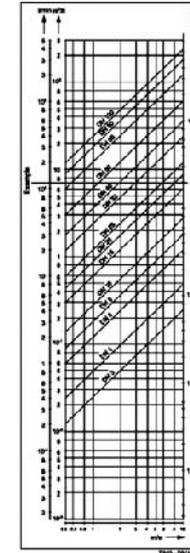
Cautions:

Hart Communicator and Hart modem can set the electromagnetic flow meter parameters, the communication address is non-zero value, and baud rate is 4800.
If the communication, address, baud rate is not correct, Hart Communicator and Hart Modem can not be used to set the parameters of the flow meter.

12. Appendix

(1) Electromagnetic Flow meter Instaneous Flow Chart

For Example:
The instaneous flow =7 m3/h(max value is the range limit). The velocity is between 0.5-10 m/s, proper sensor diameter is DN20-DN65.

34   35

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(2) Configuration Chart

Customer Name		Date:	
Conact		Department:	
Tel		Fax	
Product Model		Tag No.	
Medium : ☐ Liquid (any particles in the medium ☐YES ☐ NO)			
Conductivity: more than 5 μs ☐ YES ☐ NO			
Flow range	Max:	Normal:	Min:
Operation Pressure	Max:	Normal:	Min:
Fluid Temperature	Max:	Normal:	Min:
Pipe Size			
Flange Material	☐ Carbon steel	☐Stainless steel	
Converter	☐ Compact	☐ Remote (cable length)	
Power Supply	☐ 220V AC	☐24VDC	
Protection	☐ IP65	☐IP68	
Explosive Demand	☐ YES	☐NO	
Output	☐ Pulse	☐ 4~20mA Electrics	
	☐ HART	☐ Modbus	☐ Profibus

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