HANSUNG

HS1000

User Manual

Greentech Innovation Co., Ltd.


HANSUNG
Electromagnetic

CONTENTS

1. Profile

HS1000 series electromagnetic water meter follow the Faraday law of electromagnetic induction. They can be used to accurately measure the flow rate of liquids which are electrical conducting, caustic, and mixed with liquids and solids. They are widely used throughout industries of petroleum, chemical engineering, pharmacology, papermaking, electric power, environmental protection and so forth.

Features：

- No Moving Parts, Virtually No Pressure Loss;
- Corrosion protection, abrasion resistant;
- High accuracy, Stable performance;
- High level of anti-vibration and anti-jamming, wide measuring dimensions.
- Multi-Output Interface：4~20mA, Pulse, Alarm Outputs, RS-485 (Modbus)Communication.

2. Structure and Operation Principle

2.1. Structure

HS1000 series electromagnetic water meter are made up of sensor and transducer, together with LCD screen, current and pulse output, alarm signal and RS-485 communication.

2.2 Operating Principle

Faradays Laws of Induction form the basis for the electromagnetic water meter It states that a voltage is induced in a conductor as it moves through amagnetic field.

This principle is applied to a conductive fluid which flows through a magnetic field generated perpendicular to the flow direction (see Schematic).

The voltage induced in the fluid is measured at two electrodes, installed diametrically opposed. This signal voltage U_E is proportional to the magnetic induction B, the electrode spacing D and the average flow velocity v. Noting that the magnetic induction B and the electrode spacing D are constants, proportionality exists between the signal voltage UE and the average flow velocity v. The equation for the volume flow shows that the signal voltage UE is linear and proportional to the volume flowrate. The induced signal voltage is processed in the converter into scaled, analog and digital signals.

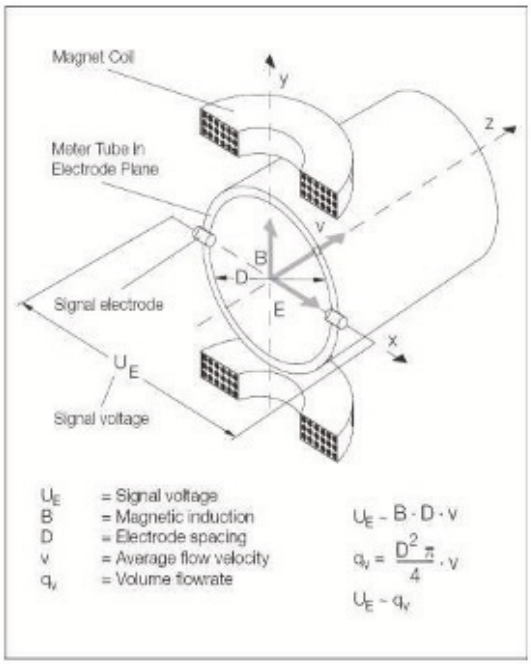

Fig. 1: Schematic

3. Specifications

- **Nominal Meter Size**
  10 to 2200mm (3/8 to 79 inch)
- **Liquid Pressure**
  DN10-150 (1.6-4.0MPa) , DN200-500 (1.0-1.6MPa)
  DN600-1200(0.6-1.0MPa),DN1400-2200(1.0-1.6MPa)
  DN10-150 (CL150-300) , DN200-500(CL125-150)
  DN600-1200(CL125),DN1400-2200(CL125)
  DN10-150 (10K-30K) , DN200-500 (10K-20K)
  DN600-1200(10K),DN1400-2200(10K)
- **Accuracy**
  Class 2
- **Minimum Conductivity**
  ＞5μs/cm
- **Electrode Material**
  SS316L (standard), Hastelloy, Tantalun, Titanium
- **Fluid Temperature**
  T50
- **Liner**
  FEP
- **Relative Humidity**
  ≤85%
- **Ambient Temperature**
  -10 to 60℃ (14 to 140℉)
- **Current Output**
  0 to 10mA or 4 to 20mA

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- **Frequency Output**
  0 to 5000Hz with photoelectric isolation
- **Pulse Output**
  Adjustable from 0.001 to 1000 Ltr/Pulse
- **Alarm Output (opt.)**
  Upper Alarm-ALMH, Lower Alarm-ALML
  with photoelectric isolation
  Upper Alarm-ALMH, Lower Alarm-ALML
  with photoelectric isolation
- **Communications**
  RS-485 with galvanic isolation,
  MODBUS.
- **Supply Power**
  85 to 250VAC (45 to 63Hz) or
  20 to 36VDC
- **Power**
  S < 20W

Technical features

Flow tube material	AISI 304, AISI 316 (opzional)
Flanges material	Carbon steel (S235JR - 1.0037), AISI 304 optional, AISI 316 optional
Available electrodes	FEP (standard), Hastelloy B, Titanium, Tantalum, Platinum
Internal lining	Ebonite
Liquid temperature	T50
Standard flanged connections	EN1092-1 PN 16,
Flanged connections on request	AS 2129 (Table D, E, F), AS 4087 (PN 16, 21), KS10K, others on request
Standard operation pressure	16 bar
Pressure drop class	ΔP25 (< 0,25 bar)
Installation requirements/conditions	0D
Protection Degree	IP65 permanent submersion at 1,5 m (EN 60529)
Convertes compatibility	MC608A/B/R/P, MC406
Electrical connections	Cableglands M20 x 1.5 + terminal box + sealing resin
Accuracy class	2

Flow table

Model	Sensor diameter	FLOW (m3/h)				Ratio Q3/Q1
		Overl. Q4	Perm. Q3	Trans Q2.	Min. Q1	
HS1000-40	**DN40**	50.0	40.0	1.600	1.000	40
HS1000-50	**DN50**	78.7	63.0	2.520	1.575	40
HS1000-65	**DN65**	125.0	100.0	4.000	2.500	40
HS1000-80	**DN80**	200.0	160.0	6.400	4.000	40
HS1000-100	**DN100**	312.5	250.0	10.000	6.250	40
HS1000-125	**DN125**	500.0	400.0	16.000	10.000	40
HS1000-150	**DN150**	78705	630.0	25.200	15.750	40
HS1000-200	**DN200**	1250.0	1000.0	40.000	25.000	40
HS1000-250	**DN250**	2000.0	1600.0	64.000	40.000	40
HS1000-300	**DN300**	3125.0	2500.0	100.000	62.500	40

- Measure of potable or reflow water
- Distribution, municipal water
- Industrial waste water
- Over night applications with very low flow rate

4. Model and Sufix Code

Suffix Code																	Description
DC	-50	L	N	F	F	-G1.6	A	L	A	-M	A	U	-C	P	S	0	Model format
DN	-XXX																Nominal size DN10-2200 mm
Electrodes material		L															316L (No corrosive liquid)
		H															Hastelloy C (anti-corrosion better than 316L)
		M															Monel （Good anti-corrosion)
		V															Titanium(Salty water, sea water)
		T															Tantalum (Good for aqua regia, not for soda and HF)
		C															Tungsten Carbide (Good for solid liquid)
		P															Platinum-Iridium (nearly all liquids except aqua regia and ammonium salt)
Grounding elecrodes material			N														No grounding electrode
			L														L : 316L ; H : Hastelloy ; M : Monel ; V : Titanium; T: Tantalum; C: Tungsten Carbide
Ling material				C													Chloroprene Rubber (DN65-2200mm)
				F													FEP / F46 (DN10-500mm)
				P													PU (DN10-500mm)
Process connection					F												Carbon steel flange
					S												SUS304 flange
Working pressure						-G1.6											DN10-150 (1.6-4.0MPa) , DN200-500 (1.0-1.6MPa), DN600-1200 (0.6-1.0MPa), DN1400-2200 (0.6-1.0MPa)
						-A150											DN10-150 (CL150-300) , DN200-500(CL125-150), DN600-1200 (CL125), DN1400-2200 (CL125)
						-J10											DN10-150 (10K-30K) , DN200-500 (10K-20K), DN600-2200 (10K), DN1400-2200 (10K)
Flow sensor housing material							A										Cast aluminum (DN10-100)
							C										Carbon steel (DN125-2200)
							S										SUS304 with painting (DN125-2200)
Liquid temperature								L									<80℃ (FEP lining); <60℃ (CR lining, PU lining)
								T									<120℃ (Compact with cooling fin, FEP lining only)
								E									<180℃ (Compact with cooling fin, FEP lining only)
								S									<120℃ (Remote, FEP lining only)
								H									<180℃ (Remote, FEP lining only)
Flow sensor protection Class									A								IP65 (Compact or remote)
									C								IP68 (Remote)
									S								IP67 (Compact)
Construction										-M							Compact
										-D							Remote (D: Aluminum terminal box)
Power supply											A						85VAC-240VAC
											B						20-36VDC
											C						Lithium battery (Pulse output only for calibration)
Transmiter type												U					Standard type (U: MT101HC-AL. housing)
												W					Wall mounting (MT101)
												S					S: MT206 (Slurry type) ; T : MT106 (Slurry, wall mounting)
												N					MT130 (Process control, No display, only signal output)
Output signal 1													-C				C : 4-20mA ; D : 0-10mA ; N : No output
Output signal 2														P			P : Pulse output ; F : Frequency output ; J : Batterysupply pulse output; N: No pulse output
Communication (only choose one)															S		S: RS485 (MODBUS)-Std. B: RS485 (MODBUS)-Battery type F: PROFIBUS; H: HART; G: GPRS; A: CDMA;
Cables length																-0	0: No cable (Compact type) 1: 5m of signal and exciting cables (Remote type default) 2: 10m; 3: 15m; 4: 20m; 5: 25m; 6: 50m; 7: 80m; 8: 100m

Note 1: Users must consider the characteristics of selected wetted parts material and the influence of process fluids. The use of inappropriate materials can result in the leakage of corrosive process fluids and cause injury to personnel and/or damage to plant facilities. It is also possible that the instrument itself can be damaged and that fragments from the instrument can contaminate the user's process fluids. Be very careful with highly corrosive process fluids such as hydrochloric acid, sulfuric acid, hydrogen sulfide, sodium hypochlorite, and high-temperature steam (150°C [302°F] or above). Contact us for detailed information of the wetted parts material.

5. Material Selection

Several liner types, electrode materials, and electrode types are available on HS1000 Serials Electromagnetic water meter to ensure compatibility with virtually any application. See Table.2 for information on liner types, Table.3 for information on electrode materials.

Lining Material	General Characteristics
FEP	Highly chemical-resistant Excellent high temperature capabilities
CR	Anti-corrosion of low concentrated acid, alkaline or salt medium, not resistant to oxidizing medium corrosion

Table.2: Lining Material

Electrode Material	General Characteristics
316L Stainless Steel	Good corrosion resistance Good abrasion resistance Not recommended for sulfuric or hydrochloric acids
Hastelloy	Better corrosion resistance High strength Good in slurry applications Effective in oxidizing fluids
Tantalum	Better chemical resistance Not recommended for fluosilic acid, hydrofluoric acid, or sodium hydroxide
Titanium	Better chemical resistance Better abrasion resistance Good for sea water applications Not recommended for hydrofluoric or sulfuric acid

Table.3: Electrode Material

6. Dimensions

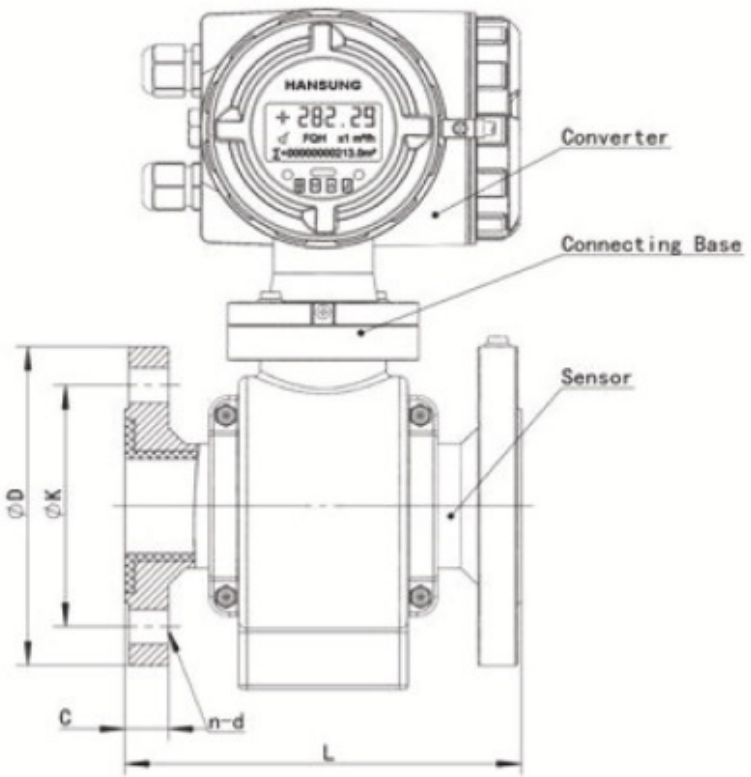

Fig. 3: Dimensions

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Meter Size DN		Liquid Pressure	Dimensions (mm)			
mm	inch		D	K	L	n-d
10	3/8	DIN PN(10-40)	90	60	200	4-Φ14
		JIS 10K	90	65		4-Φ15
		ANSI CL150	89	60.5		4-Φ15.7
15	1/2	DIN PN(10-40)	95	65	200	4-Φ14
		JIS 10K	95	70		4-Φ15
		ANSI CL150	89	60.5		4-Φ15.7
20	3/4	DIN PN(10-40)	105	75	200	4-Φ14
		JIS 10K	100	75		4-Φ15
		ANSI CL150	98	70		4-Φ15.7
25	1	DIN PN(10-40)	115	85	200	4-Φ14
		JIS 10K	125	90		4-Φ19
		ANSI CL150	108	79.5		4-Φ15.7
32	1 1/4	DIN PN(10-40)	140	100	200	4-Φ18
		JIS 10K	135	100		4-Φ19
		ANSI CL150	117	89		4-Φ15.7
40	1 1/2	DIN PN(10-40)	150	110	200	4-Φ18
		JIS 10K	140	105		4-Φ19
		ANSI CL150	127	98.5		4-Φ15.7
50	2	DIN PN(10-40)	165	125	200	4-Φ18
		JIS 10K	155	120		4-Φ19
		ANSI CL150	152	120.5		4-Φ19
65	2 1/2	DIN PN(10-16)	185	145	200	4-Φ18
		DIN PN(25-40)	185	145		8-Φ18
		JIS 10K	175	140		4-Φ19
		ANSI CL150	178	139.5		4-Φ19
80	3	DIN PN(10-16)	200	160	250	8-Φ18
		DIN PN(25-40)	200	160		8-Φ18
		JIS 10K	185	150		8-Φ19
		ANSI CL150	190	152.5		4-Φ19
100	4	DIN PN(10-16)	220	180	250	8-Φ18
		DIN PN(25-40)	235	190		8-Φ22
		JIS 10K	210	175		8-Φ19
		ANSI CL150	228	190.5		8-Φ19
125	5	DIN PN(10-16)	250	210	250	8-Φ18
		DIN PN(25-40)	270	220		8-Φ26
		JIS 10K	250	210		8-Φ23
		ANSI CL150	254	216		8-Φ22.4

Meter Size DN		Liquid Pressure	Dimensions (mm)			
mm	inch		D	K	L	n-d
150	6	DIN PN(10-16)	285	240	300	8-Φ22
		DIN PN(25-40)	300	250		8-Φ26
		JIS 10K	280	240		8-Φ23
		ANSI CL150	279	241.5		8-Φ22.4
200	8	DIN PN10	340	295	350	8-Φ22
		DIN PN16	340	295		12-Φ22
		DIN PN25	360	310		12-Φ26
		DIN PN40	375	320		12-Φ30
		JIS 10K	330	290		12-Φ23
		ANSI CL150	343	298.5		8-Φ22.4
250	10	DIN PN10	395	350	400	12-Φ22
		DIN PN16	405	355		12-Φ26
		JIS 10K	400	355		12-Φ25
		ANSI CL150	406	362		12-Φ25.4
300	12	DIN PN10	445	400	400	12-Φ22
		DIN PN16	460	410		12-Φ26
		JIS 10K	445	400		16-Φ25
		ANSI CL150	482	432		12-Φ25.4
350	14	DIN PN10	505	460	400	16-Φ22
		DIN PN16	520	470		16-Φ26
		JIS 10K	490	445		16-Φ25
		ANSI CL150	533	476		12-Φ28.4
400	16	DIN PN10	565	515	450	16-Φ26
		DIN PN16	580	525		16-Φ30
		JIS 10K	560	510		16-Φ27
		ANSI CL150	597	540		16-Φ28.4
450	18	DIN PN10	615	565	450	20-Φ26
		DIN PN16	640	585		20-Φ30
		JIS 10K	620	565		20-Φ27
		ANSI CL150	635	578		16-Φ31.8
500	20	DIN PN10	670	620	450	20-Φ26
		DIN PN16	715	650		20-Φ33
		JIS 10K	675	620		20-Φ27
		ANSI CL150	698	635		20-Φ31.8

7. Connection and Operation of Converter

7.1 Keys and Display (MT200)

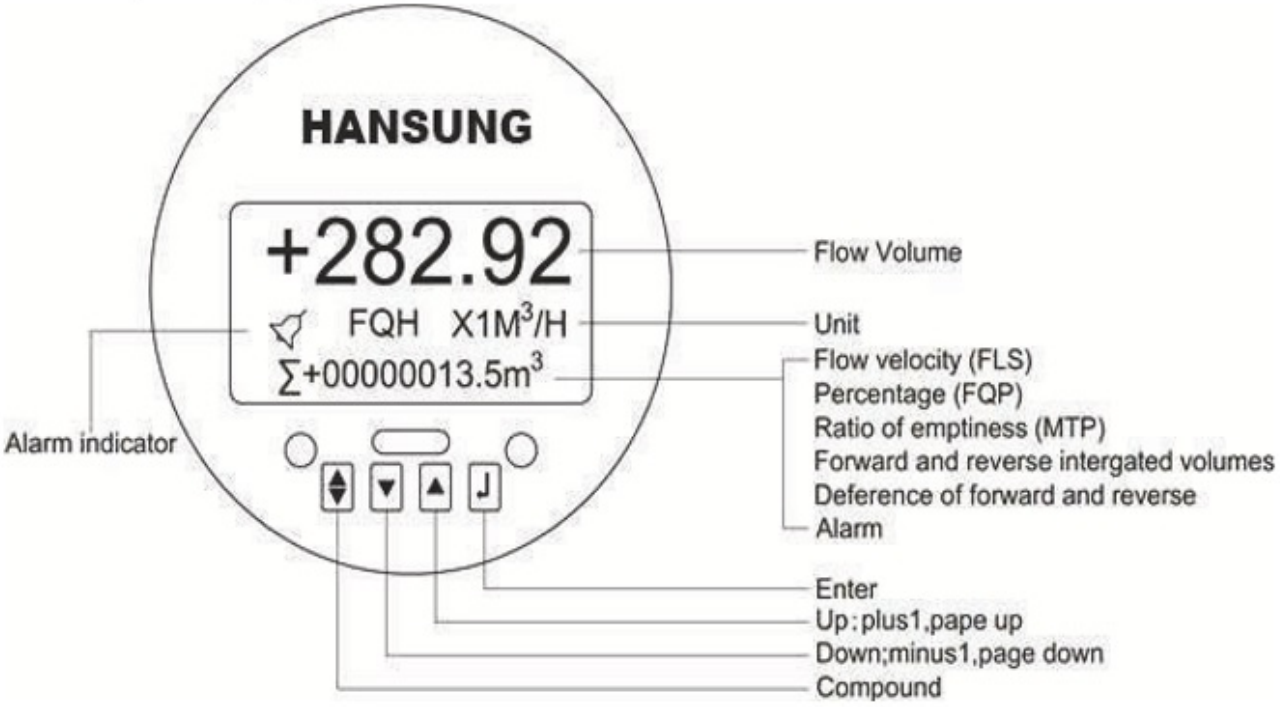


Fig. 4: Define Keys and LCD screen display

Instruction: When measuring, press "Compound Key + Enter" will appear password of changing state, based on distinction of secrecy, and you could change the password as we provide (initial password is 19818). Then press "Compound + Enter" Key again, and you can enter the state of setting parameter. If you want to return to the running state, push "Enter" for several seconds.

7.2 Connection of Converter (HS200)

7.2.1 Links and Labels of Connector in Model

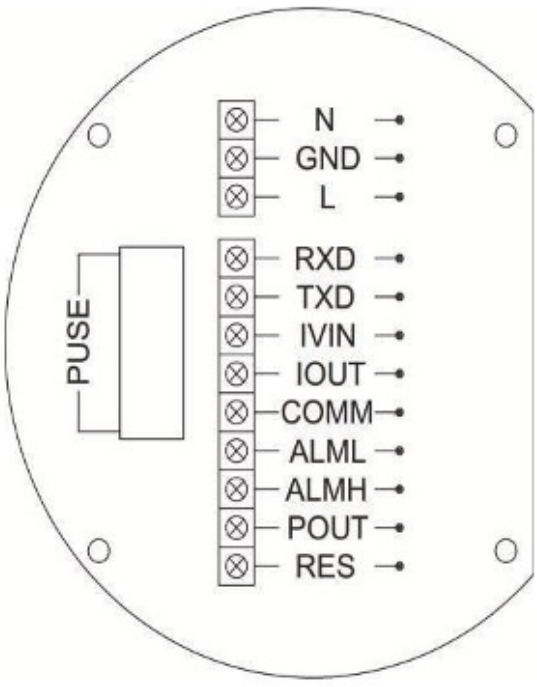


Fig. 5: Labels of connector in Model

7.2.2 Symbols and Description of Connectors in Model

Table. 4: Description Of Connectors

N:	85-250VAC Power Supply
L:	85-250VAC or DC Power Supply
RXD:	-Communication Input Signal
TXD:	+Communication Input Signal
IVIN	24VDC Input for 2-wire output current
IOUT:	Output Current (Output Current for 2-wire)
COMM:	Frequency, Pulse and Current Output Ground
ALML:	Alarm Output for Low Limit
ALMH:	Alarm Output for Upper Limit
POUT:	Frequency(Pulse) Output for Bi-directional Flow
RES:	Connect pull Resistance

7.2.3 Output and Power Supply Cables

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

Pulse current output, alarm current output and external power supply can be seen in Fig. 6. When inductive load is connected to converter, diode should be used as in Fig. 6.

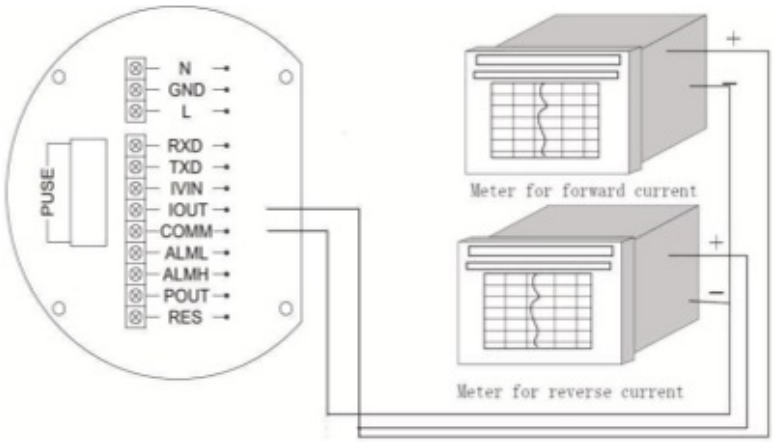


Fig. 6: (a) Connection of Current Output

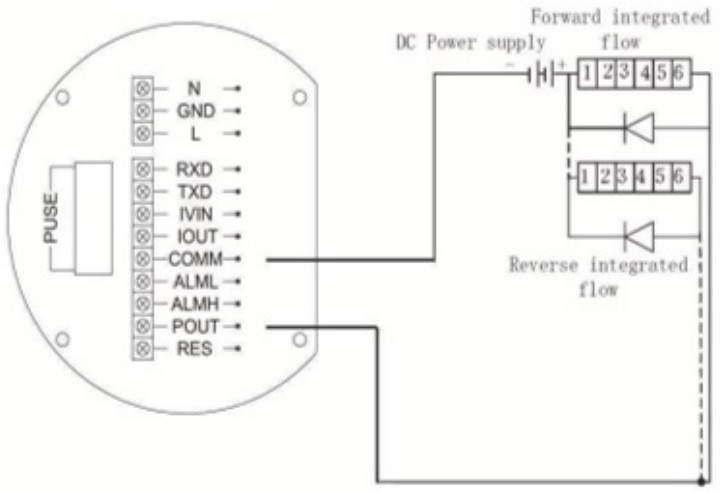


Fig. 6: (b) Connection of Electro-Magnet Counter

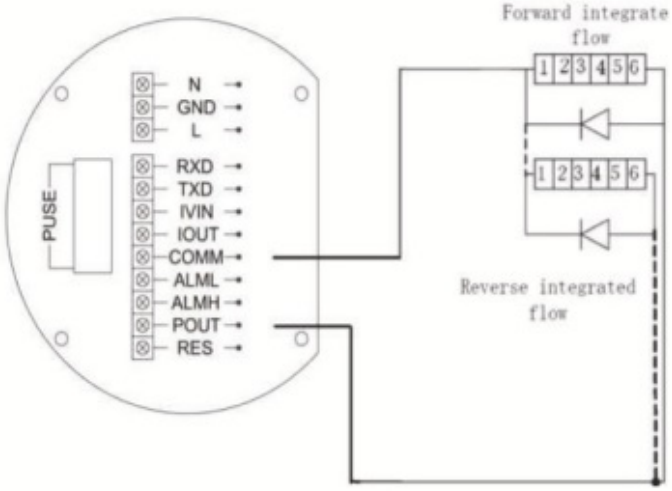


Fig. 6: (c) Connection of Electronic Counter

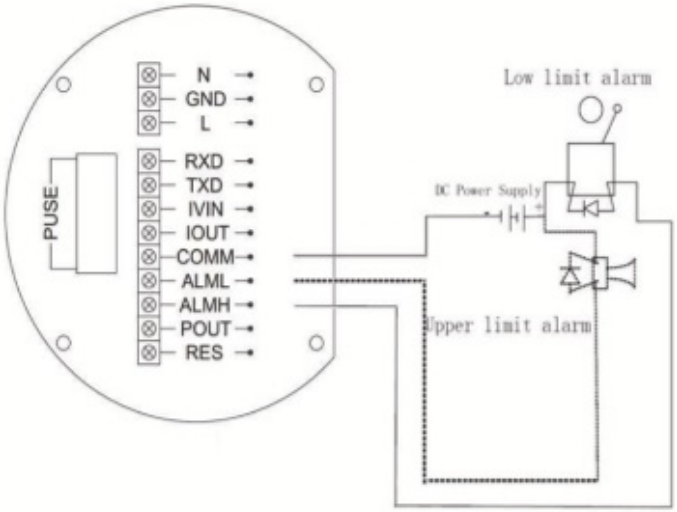


Fig. 6: (d) Connection of Alarm Output

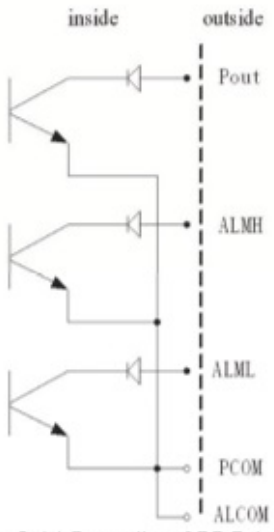


Fig. 6: (e) Connection of OC Gate

7.3 Digital Data Output and Count

Digital output is frequency output and pulse output. Frequency output and pulse output use the same connection output point, therefore, users can only choice one of frequency output and pulse output at the same time.

7.3.1 Frequency Output:

The range of frequency output is 0 ~ 5000HZ and frequency output opposes percent flux.

F= (Measure value / Full scale value) · the range of frequency

The up limit of frequency output can be adjusted. It can be choice from 0 ~ 5000HZ, and also can be choice 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 choice pulse output when the equipment is applied to count.

7.3.2 Pulse Output Mode:

Pulse output mainly applies in count mode. Pulse output delegates a unit flux, such as 1L or $1m^3$ etc. Pulse output unit divide into 0.001L, 0.01L, 0.1L, 1L, 0.001m^3, 0.01m^3, 0.1m^3, 1m^3, 0.001UKG, 0.01UKG, 0.1UKG, 1UKG, 0.001USG, 0.01USG, 0.1USG, 1USG. When users choice the pulse unit, they should notice the match of the flux range of flowmeter and pulse unit:

$Q_L=0.0007854\times D^2\times V(L/s)$

Or $Q_M=0.0007854\times D^2\times V\times 10^{-3}$ (m^3/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 2000P/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 choice count instrument, but not frequent instrument.

7.3.3 The Connection of Digital Output

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

POUT ----- digital output point; PCOM digital ground point;

POUT is collector cut-off circuit output. Connect the line diagram as follows:

7.3.4 Digital Voltage Connect Mode

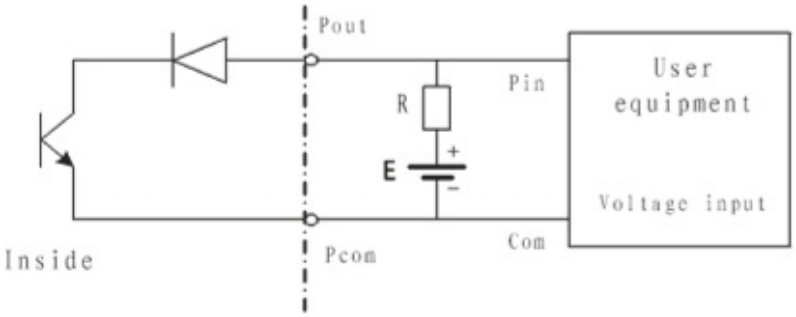


Fig. 7: (a) The connection of digital voltage output

7.3.5 Digital Output Connect Photoelectricity Coupling (PLC etc.)

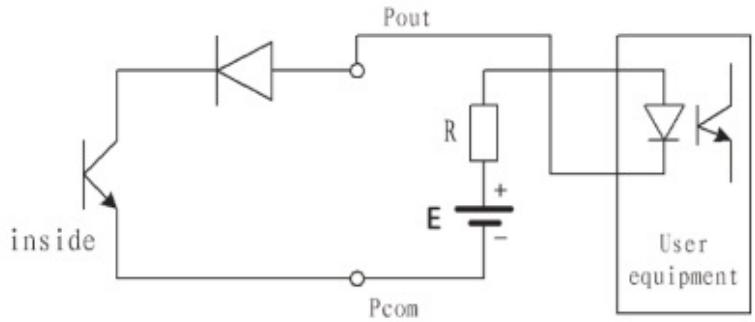


Fig. 7: (b) Digital output connect photoelectricity coupling

Commonly user"s photoelectricity coupling current is about 10mA, so about E/R=10mA, E=5～24V.

7.3.6 Digital Output Connect Relay

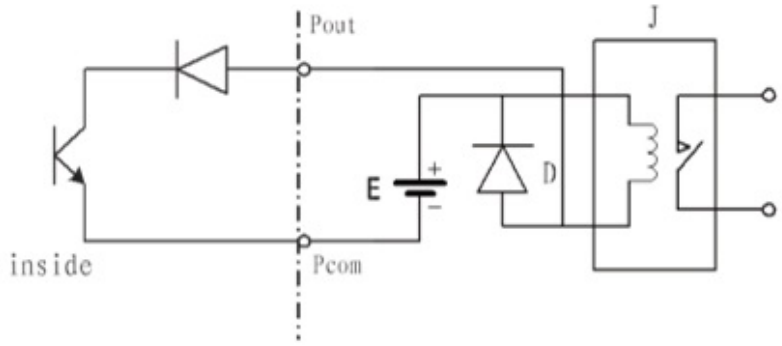


Fig. 7: (c) Digital output connect relay

Commonly relay needs E as 12V or 24V. D is an extend diode, now most middle relays has this diode inside. If not have, user can connect one outside.

Table.5: DS output parameter

Parameter	Testing condition	Minimum	Type	maximal	Unit
Working voltage	IC=100 mA	3	24	36	V
Working current	Vol1.4V	0	300	350	mA
Working 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

7.4 Simulated Data Output and Count

7.4.1 Simulation Signal Output

Simulation signal output can be separated into two signals: 0~10mA, 4~20mA.User can select one when 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 = (Measure value / Full scale value) × the scale of current + the zero point of current

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

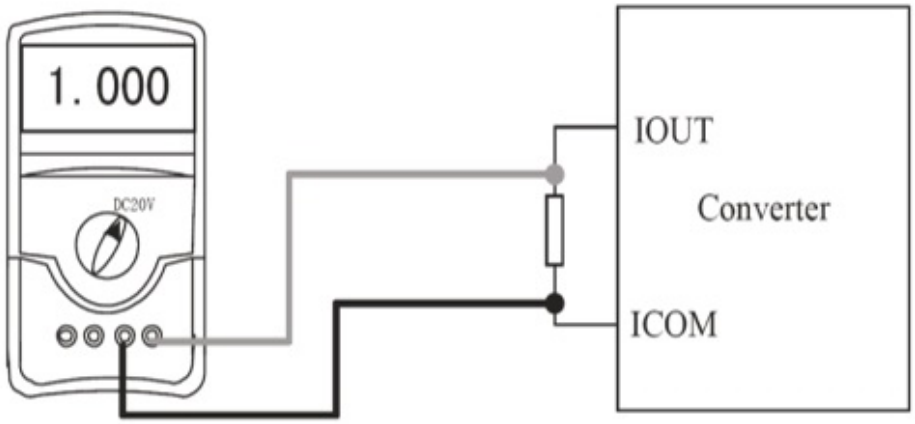
It can be advanced simulation signal output distinguish. User can select the range of measure.

The manufacture's parameter have been adjusted, it cant need to adjust.

7.4.2 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 "Current zero correct" 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 "current correct" 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 of0.1%

(4) Current line degree checking

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

8. Setting Parameters

Converters can be operated in two ways:

1. Self-testing way;
2. Parameters setting way.

As soon as turning on the converter, it works in self-testing way doing all testing functions and displaying test data automatically. However, when it works in parameters testing way, parameters should be input by operators through keying four keys on its panel.

8.1 Function Keys

8.1.1 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.

8.1.2 Keys' Function 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.

8.2 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 (00000), and then correct the password with one of the new passwords that are provided by manufacturer (Initial password is 19818). Finally, push the "Compound"+"Enter" keys to work in Parameters Setting Way.

8.2.1 Functions Select Menu

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

Parameter code	Function content	Explain
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 Modify Rec	Select this function, It can be check the factor „s modify Record

8.2.2 Parameters Setting

Press "Compound"+"Enter" key, it displays "Parameters Set" function. Input password (Initial password is 19818). Press "Compound"+"Enter" key, it getting to Parameters Setting status.

8.2.3 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.

8.2.4 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 Appendix Five)

8.3 Setting Parameters in Menu

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

Table.9: Setting Parameters in Menu

No.	Parameters and Words to be Set	Setting Way	Limits of Parameters	Grades
1	Language	Select	English	2
2	Comm Addres	Set count	00~99	2
3	Baud Rate	Select	300~38400	2
4	Snsr Size	Select	3~3000 mm	2
5	Flow Unit	Select	L/h, L/m, L/s, m³/h, m³/m, m³/s, UKG, USG	2
6	Flow Range	Set count	0.0000~99999	2
7	Flow Rspns	Select	01~64 SEC	2
8	Flow Direct	Select	Forward/Reverse	2
9	Flow Zero	Set count	0000~±9999	2
10	Flow Cutoff	Set count	000.00~599.99%	2
11	Cutoff Ena	Select	Enable/Disable	2

12	Total Unit	Select	0.001L-1L, 0.001m³-1m³, 0.001UKG-1UKG, 0.001USG-1USG	2
13	SegmaN Ena	Select	Enable/Disable	2
14	Analog Type	Select	0~10mA /4~20mA	2
15	Pulse Type	Select	Frequency/Pulse	2
16	Pulse Fact	Select	0.001L-1L, 0.001m³-1m³, 0.001UKG-1UKG, 0.001USG-1USG	2
17	Freque Max	Select	0000~9999	2
18	Mtsnsr Ena	Select	Enable/Disable	2
19	Mtsnsr Trip	Set count	00000~59999%	2
20	Alm Hi Ena	Select	Enable/Disable	2
21	Alm Hi Val	Set count	000.00 ~ 599.99 %	2
22	Alm Lo Ena	Select	Enable/Disable	2
23	Alm Lo Val	Set count	000.00 ~ 599.99 %	2
24	Sys Alm Ena	Select	Disable/Enable	2
25	ClrSum Key	Set count	00000~99999	3
26	Snsr Code1	User set	Finished Y M (0~99999)	4
27	Snsr Code2	User set	Product Serial No.(0~99999)	4
28	Field Type	Select	Type 1,2,3	4
29	Sensor Fact	Set count	0.0000 ~ 5.9999	4
30	Line Crc Ena	Select	Enable/Disable	2
31	Lineary CRC1	User set	00.000-19.999m/s	4
32	Lineary Fact1	User set	0.0000-1.9999	4
33	Lineary CRC2	User set	00.000-19.999m/s	4
34	Lineary Fact2	User set	0.0000-1.9999	4
35	Lineary CRC3	User set	00.000-19.999m/s	4
36	Lineary Fact3	User set	0.0000-1.9999	4
37	Lineary CRC4	User set	00.000-19.999m/s	4
38	Lineary Fact4	User set	0.0000-1.9999	4
39	FwdTotal Lo	Correctable	00000~99999	5
40	FwdTotal Hi	Correctable	0000~9999	5
41	RevTotal Lo	Correctable	00000~99999	5
42	RevTotal Hi	Correctable	0000~9999	5
43	PlsntLmtEna	Select	Enable/Disable	3
44	PlsntLmtVal	Select	0.010-0.800m/s	3
45	Plsnt Delay	Select	0400-2500m/s	3
46	PassWord 1	User correct	00000~99999	5
47	PassWord 2	User correct	00000~99999	5
48	PassWord 3	User correct	00000~99999	5
49	PassWord 4	User correct	00000~99999	5
50	Analog Zero	Set count	0.0000 ~ 1.9999	5
51	Anlg Range	Set count	0.0000 ~ 3.9999	5

52	Meter Fact	Set count	0.0000 ~ 5.9999	5
53	MeterCode 1	Factory set	Finished Y M (0~99999)	6
54	MeterCode 2	Factory set	Product Serial No. (0~99999)	6

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 bother 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 pf converters, deferent 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 1~25parameters.

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

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 anyone who can be chosen by users.

8.6 Details Parameters

8.6.1 Language

There are 2 languages for MT200 converter operation. They can be set by users according to the users needs.

8.6.2 Comm Addres

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

8.6.3 Baud Rate

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

8.6.4 Snsr Size

MT200 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.

8.6.5 Flow Unit

The flow unit can choose from the parameters (L/s、L/m、L/h、m3/s、m3/m、m3/h),and the user can choose the proper unit according to the technological requirement and using habit.

8.6.6 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.

8.6.7 Flow Rspns

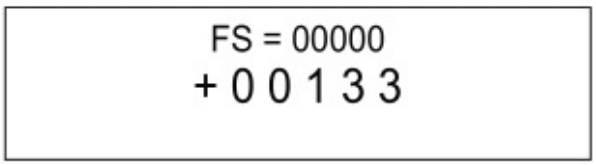
It means time of filter measure value. The long one can enhance the stability of flow display and output digital, and fits for gross add up of pulse flow; the short one means fast respond rate, and fits for production control. It is set by select.

8.6.8 Flow Direct

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

8.6.9 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.



Converters 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.

8.6.10 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 and percentage out of displaying and outputting them.

8.6.11 Total Unit

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

Integrator units are L, m3 (liter, stere,).

Flow integrator value: 0.001L、 0.010L、 0.100L、 1.000L;
0.001m³ 、 0.010m³、 0.100m³、 1.000m³;
0.001 UKG、 0.010 UKG、 0.100 UKG、 1.000 UKG；
0.001 USG、 0.010 USG、 0.100 USG、 1.000 USG；

8.6.12 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.

8.6.13 Analog Type

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

8.6.14 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 7.2).

8.6.15 Pulse Fact

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

Table.9: range of pulse equivalent

Pulse Equivalent	Flow	Pulse Equivalent	Flow
1	0.001L/cp	9	0.001UKG/cp
2	0.01L/cp	10	0.01 UKG/cp
3	0.1L/cp	11	0.1 UKG/cp
4	1.0L/cp	12	1.0 UKG/cp
5	0.001m³/cp	13	0.001USG/cp
6	0.01 m³/cp	14	0.01 USG/cp
7	0.1 m³/cp	15	0.1 USG/cp
8	1.0 m³/cp	16	1.0 USG/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 25frequency/s.

8.6.16 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.

8.6.17 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.

8.6.18 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.

8.6.19 Alm Hi Ena

Users can choose “Enable” or “Disable”.

8.6.20 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.

8.6.21 Alm Lo Val

The same as upper limit alarm.

8.6.22 Sys Alm Ena

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

8.6.23 Clr Sum Key

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

8.6.24 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.

8.6.25 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.

8.6.26 Field Type

MT200 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.

8.6.27 Fwd Total 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 (∑+). Usually, it is unsuitable to exceed the maximum the counter set（999999999）.

8.6.28 Rev Total Lo、hi

User use 5byte code to enter, and can modify the negative accumulating volume (∑-). Usually, it is unsuitable to exceed the minimum the counter set（999999999）.

8.6.29 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. MT200 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.

8.6.30 PlsntLmtVl

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, 0030m/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.

8.6.31 Plsnt Delay

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, MT200 will think it is cuspidal disturb, and if it is longer, MT200 will think it is natural. It also needs to select parameter in fact.

8.6.32 Users password 1~4

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

8.6.33 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.

8.6.34 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.

8.6.35 Meter Fact

This fact is the special one of sensor-made-factory and the factory use this fact to unite MT200 electromagnetic flowmeters converters to make sure all the instruments can interchange by 0.1%.

8.6.36 MeterCode 1 and 2

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

9. Alarm Information

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

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.

10. Installation

This section covers the steps required to physically install the flowtube. Instructions and procedures in this section may require special precautions to ensure the safety of the personnel performing the operations. Please refer to the following safety messages before performing any operation in this section.

! WARNING

Failure to follow these installation guidelines could result in death or serious injury: Installation and servicing instructions are for use by qualified personnel only. Performing any servicing other than that contained in this manual may result in death or serious injury. Do not perform any servicing other than that contained in the operating instructions, unless qualified.

! CAUTION

The flowtube liner is vulnerable to handling damage. Never place anything through the flowtube for the purpose of lifting or gaining leverage. Liner damage can render the flowtube useless.

! CAUTION

To avoid possible damage to the flowtube liner ends, do not use metallic or spiral-wound gaskets. If frequent removal is anticipated, take precautions to protect the liner ends. Short spool pieces attached to the flowtube ends are often used for protection.

! CAUTION

Correct flange bolt tightening is crucial for proper flowtube operation and life. All bolts must be tightened in the proper sequence to the specified torque limits. Failure to observe these instructions could result in severe damage to the flowtube lining and possible flowtube replacement.

10.1 Upstream and Downstream Piping

To ensure specification accuracy over widely varying process conditions, install the flowtube a minimum of five straight pipe diameters upstream and two pipe diameters downstream from the electrode plane (see Fig. 8).

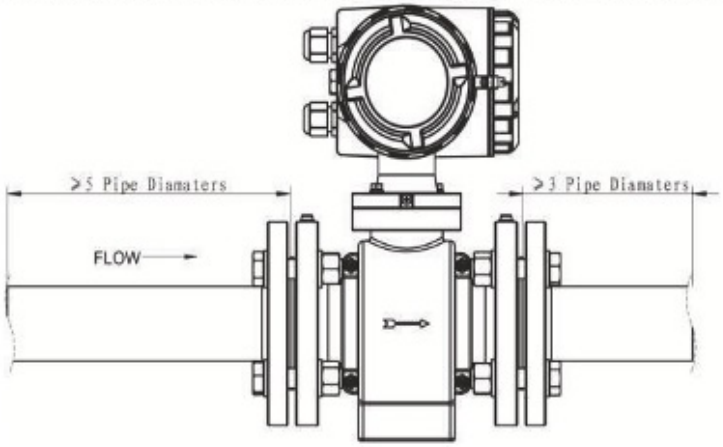


Fig. 8 Upstream and Downstream Straight Pipe Diameters

10.2 Flowtube Orientation

The flowtube should be installed in a position that ensures the flowtube remains full during operation. Horizontal or inclined positions are preferred. Fig.9, Fig.10, and Fig.11 show the proper flowtube orientation for the most common installations. The following orientations ensure that the electrodes are in the optimum plane to minimize the effects of entrapped gas. As illustrated in Fig. 10B and Fig. 11B, avoid downward flows where back pressure does not ensure that the flowtube remains full at all times.

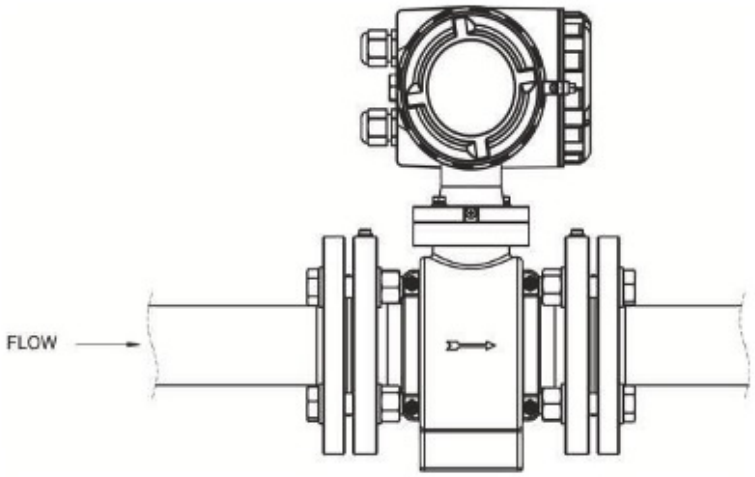


Fig. 9 Horizontal Flowtube Orientation

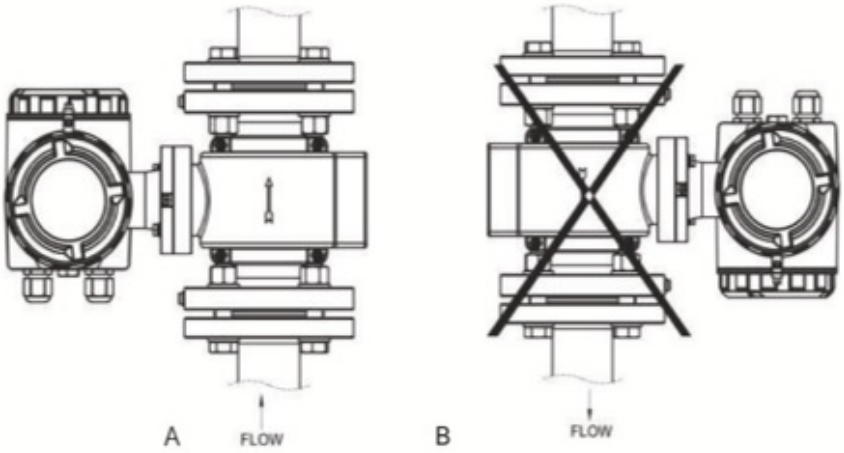


Fig. 10 Vertical Flowtube Orientation

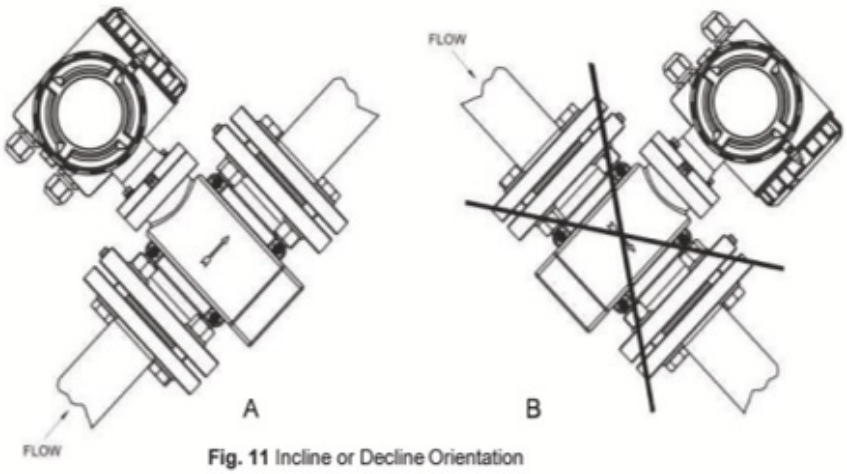


Fig. 11 Incline or Decline Orientation

10.3 Grounding

Grounding the flowtube is one of the most important details of flowtube installation. Proper grounding ensures that only the voltage induced in the magnetic field of the flowtube is measured. Use 1)/ 2) to determine which grounding option to follow for proper installation. Attached grounding rings should be grounded equivalently to non-attached grounding rings.

The flowtube case should always be grounded in accordance with national and local electrical codes. Failure to do so may impair the protection provided by the equipment. The most effective grounding method is direct connection to earth ground with minimal impedance.

1) Conductive Unlined Pipe

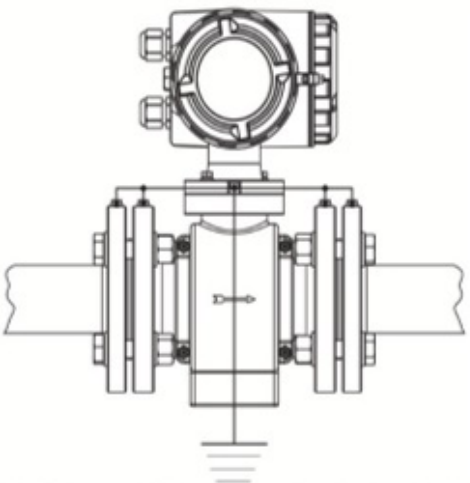


Fig. 12: No Grounding Options or Grounding Electrode in Lined Pipe

2) Conductive Lined Pipe Or Non-Conductive Pipe

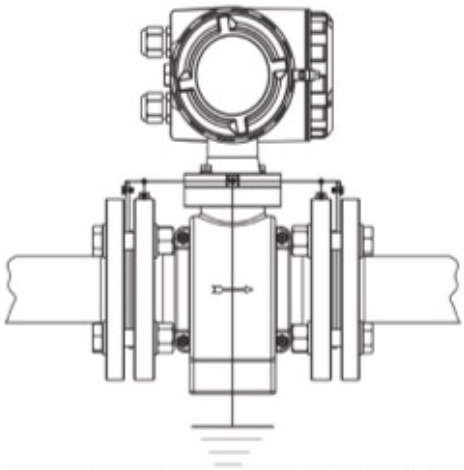


Fig. 13: Grounding with Grounding Rings or Lining Protectors

11. Fault handling and cause analysis

No	Fault Phenomenon	Reason	Solution
1	No flow signals	1. Power fault, such as power-off； 2. Connection cable (excitation circuit or signal circuit) system fault； 3. Liquid flow fault； 4. Fault caused by damaged sensor parts or the attachment layer of measuring inner wall； 5. Fault caused by damaged transmitter parts.	1. Check the connection of power； 2. Check the connection cable (excitation circuit or signal circuit)； 3. Check the flow range to find out if the conductivity is satisfied 4. Clean measuring electrodes 5. Check and repair transmitter
2	Output fluctuation	1. The flow itself is fluctuating or pulsating； 2. The pipeline is not full or the liquid contains bubbles； 3. Interference of external magnetic field ； 4. Physical properties of flow liquid（such as uniform conductivity or the liquid is slurry with much fiber or grain）； 5. unmatched electrode material to liquid	1. Prohibit working under the condition that the pipeline isnt full ; remove the bubbles of the medium in the sensor pipeline； 2. Check the grounding of sensor. To eliminate or be far away from electromagnetic interference. 3. Improve the conditions of liquid medium； 4. Choose the sensor electrode properly.
3	Flow Zero instability Flow Zero shift	1. The pipeline is not full or the liquid contains bubbles； 2. It is thought to be no flow of the liquid, but in fact the liquid flows slightly in the pipeline. There's actually nothing wrong with the electromagnetic flowmeter, in contrast, it truthfully reflect the status of the flow. 3. It doesnt make a perfect grounding for the sensor so that there's still interference from external stray current. 4. Reasons for liquid（such as uniform conductivity ,electrode contamination, etc.） 5. Signal circuit insulation degradation	1. Prohibit working under the condition that the pipeline isnt full ; remove the bubbles of the medium in the sensor pipeline 2. Check the grounding of sensor. To eliminate or be far away from electromagnetic interference. 3. Improve the conditions of liquid medium; clean the sensor measuring pipe and the electrodes. 4. Improve flowmeter installation environment and make sure the signal circuit insulation performance reach the standard.

4	Inaccurate measurement value	1. The transmitter's set value is incorrect； 2. Improper installation position of transmitter; the pipeline is not full or the liquid contains bubbles ； 3. The signal cable isnt well handed or the cable insulation performance degrades during use. 4. Resistance variation between electrodes of the sensor or electrode insulation degradation； 5. There exists inflow or outflow of branch pipes which are not included in measured selenium.。	1. Set properly； 2. Change installation position； 3. Improve flowmeter installation environment and make sure the signal circuit insulation performance reach the standard 4. Check or discharge branch pipe inflow or outflow
5	Output signal over full-scale value	1. For sensor：no liquid connection between electrodes, introduction of electrical interference from liquid； 2. For connecting cable：cable disconnection, incorrect wiring； 3. For transmitter：unmatched sensor; incorrect setting ； 4. For post position meter：no electrical isolation; incorrect setting.	1. Check the conductivity of the medium and clean the electrodes. 2. Check the connecting cable and make correct wiring.； 3. Choose matched sensor and set correctly. 4. Make electrical isolation for post position meter and set correctly.。

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