

Kaifeng Shengda Watermeter Limited Company

**SHENGDA**

**Magnetic flowmeter**

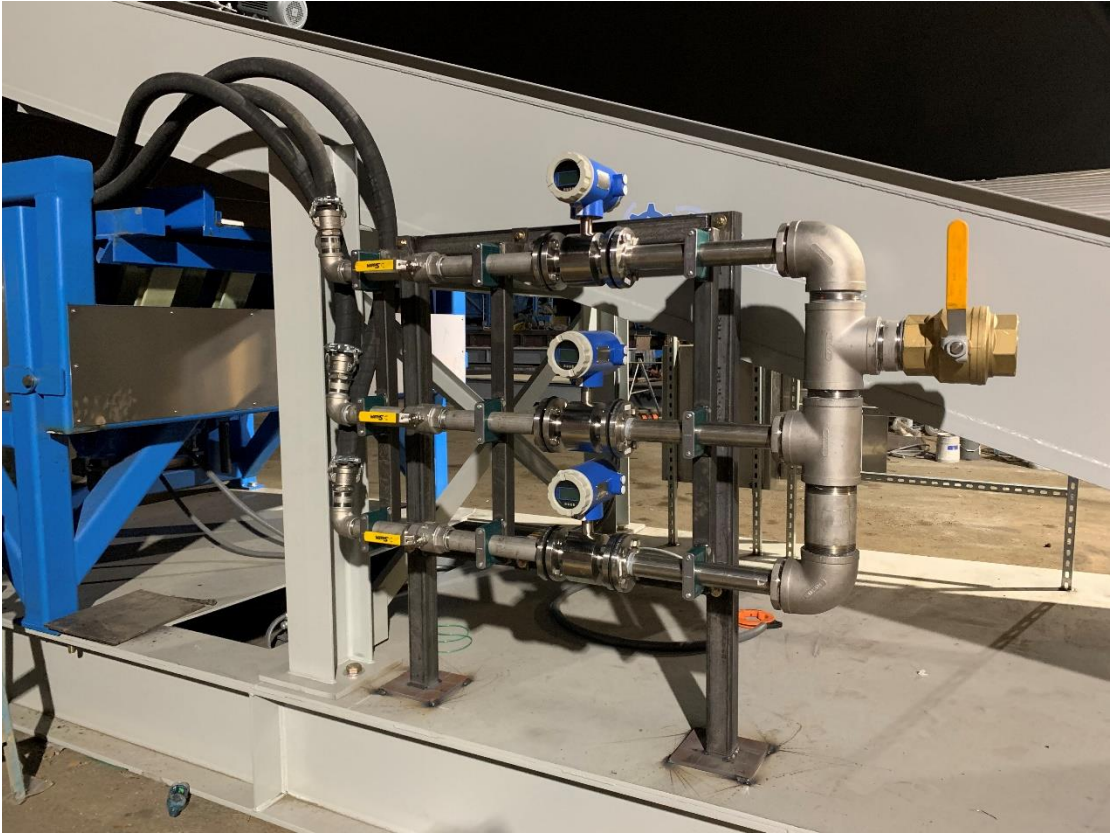
**User manual**

Manufacturer since 1995

+ Item photos



Applications



## Features

Low-frequency square-wave excitation, excitation frequencies: 1/16 power frequency, 1/20 power frequency, 1/25 power frequency.

High-frequency square-wave excitation, excitation frequency: 1/2 power frequency

Excitation current may be selected for the following currents: 125mA, 187.5mA, 250mA, or 500 mA.

Velocity range: 0.1 to 15m/s, velocity resolution: 0.5mm/s.

AC high-frequency switching power, AC voltage range: 85VAC to 250VAC.

DC 24V switching power, DC voltage range: 20VDC to 36VDC.

Communication Protocol: MODBUS RTU.

Three totalizers: Forward total, reverse total, and negative total.

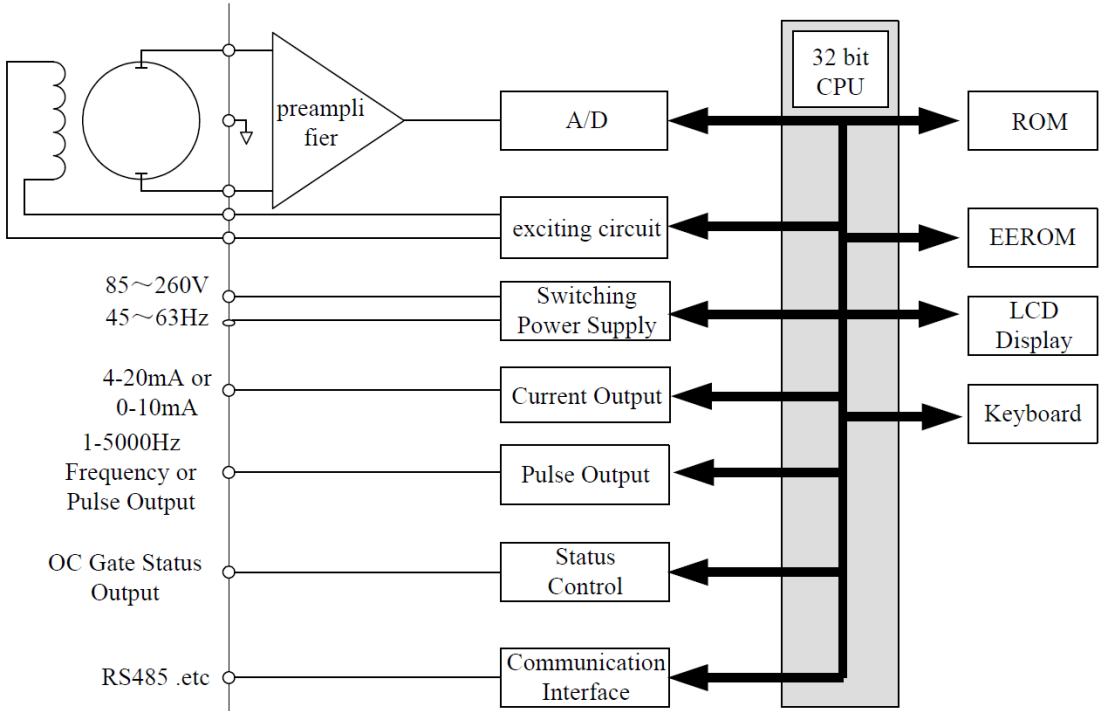
DC Power Model 20VDC to 36VDC, Power consumption < 20 W

Normal operating conditions

Ambient Temperature Range: -10 to +60 °C.

Relative Humidity: 5% to 90%.

### Circuit Overview



## Range and Accuracy

Vs: Velocity range, meters/second (m/s)

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

4-20 mA Input Load resistor: 0 to 750 $\Omega$  (4~20mA).

Basic measurement errors: 0.1% $\pm$ 10 $\mu$ A.

## Digital frequency output

Frequency output range: 1 to 5000Hz.

Output electric isolation: Photoelectric isolation. Isolation voltage: > 1000VDC.

Frequency output drive: output using field-effect transistors, the maximum voltage is 36VDC, maximum output current is 250 mA.

## Digital pulse output

Pulse output range: 0 to 100 pulse/s.

Pulse output value: 0.001 to 1.000 m<sup>3</sup>/cp, 0.001 to 1.000 Ltr/cp.

0.001 to 1.000 USG/cp, 0.001 to 1.000 UKG/cp.

## Alarm output

Alarm output junction: ALMH--- upper limit, ALML--- lower limit.

Output isolation: photoelectric isolation.

Isolation voltage: > 1000VDC.

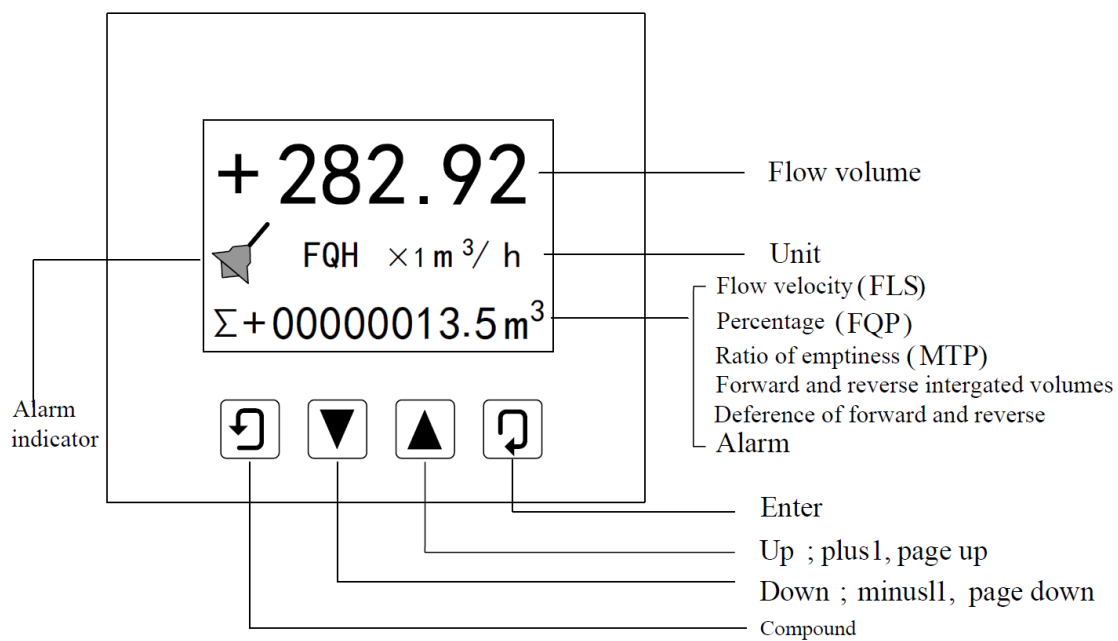
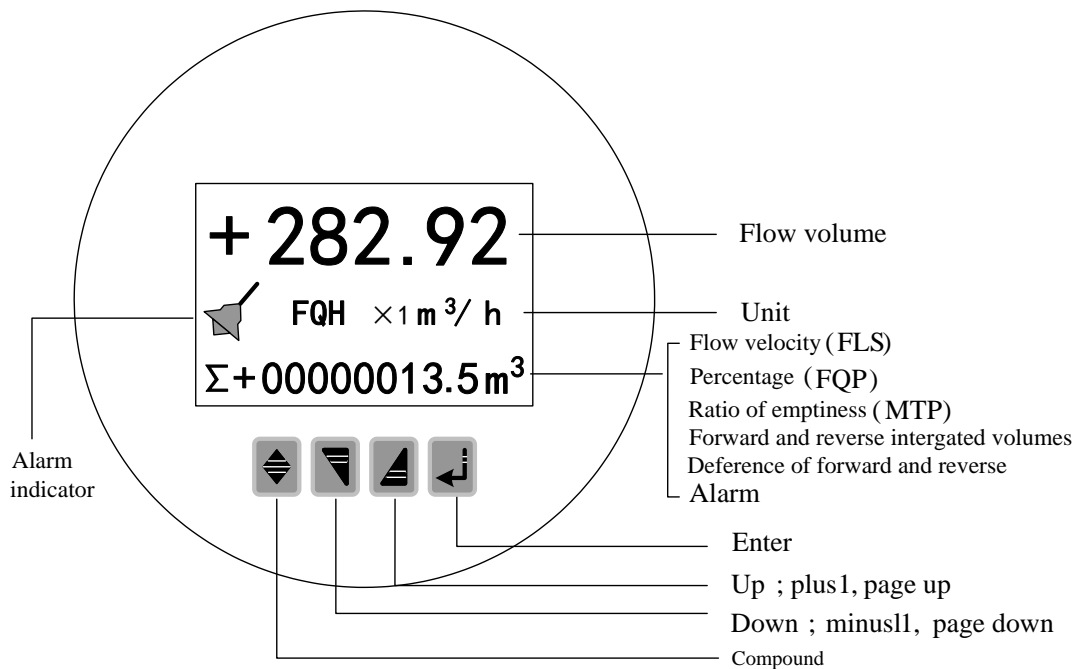
Alarm output drive: output using Darlington Pair Transistor, maximum voltage:

36VDC, maximum current: 250 mA.

## Digital communication port and protocol

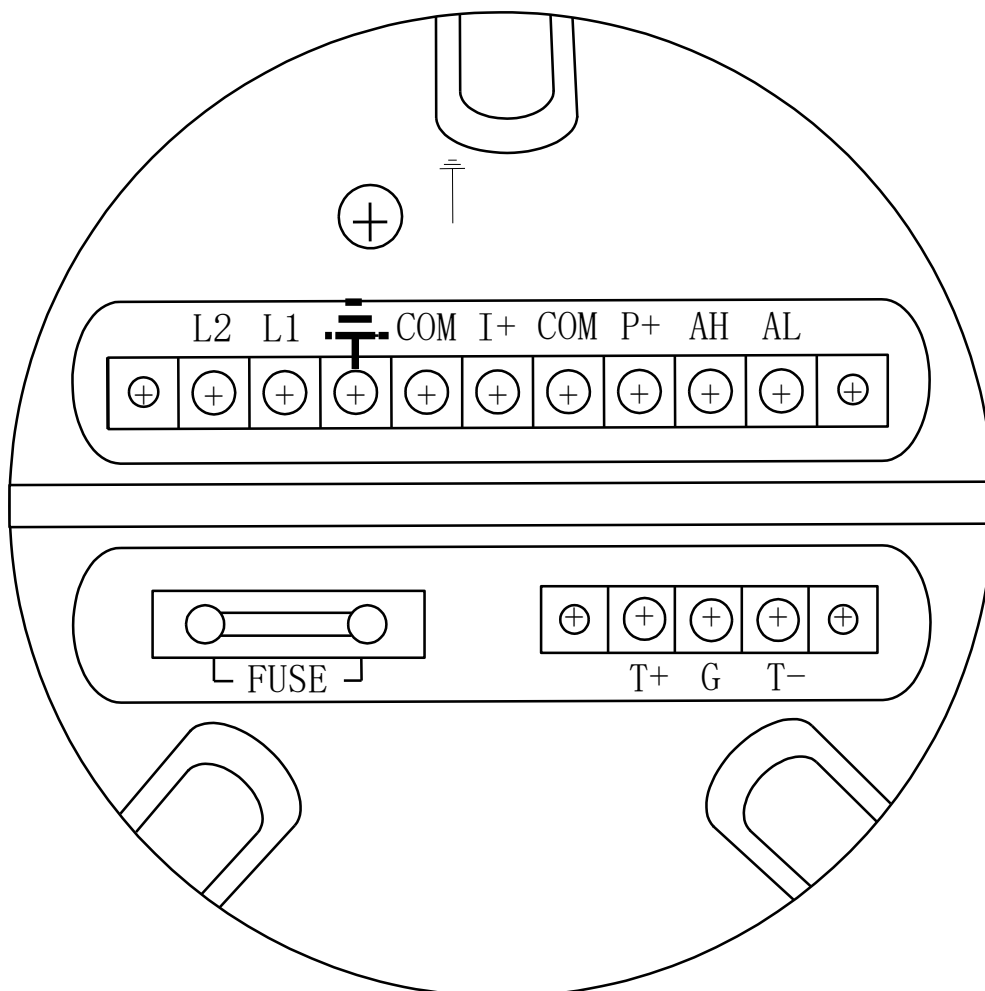
MODBUS RTU

 Display keys and LCD screen display

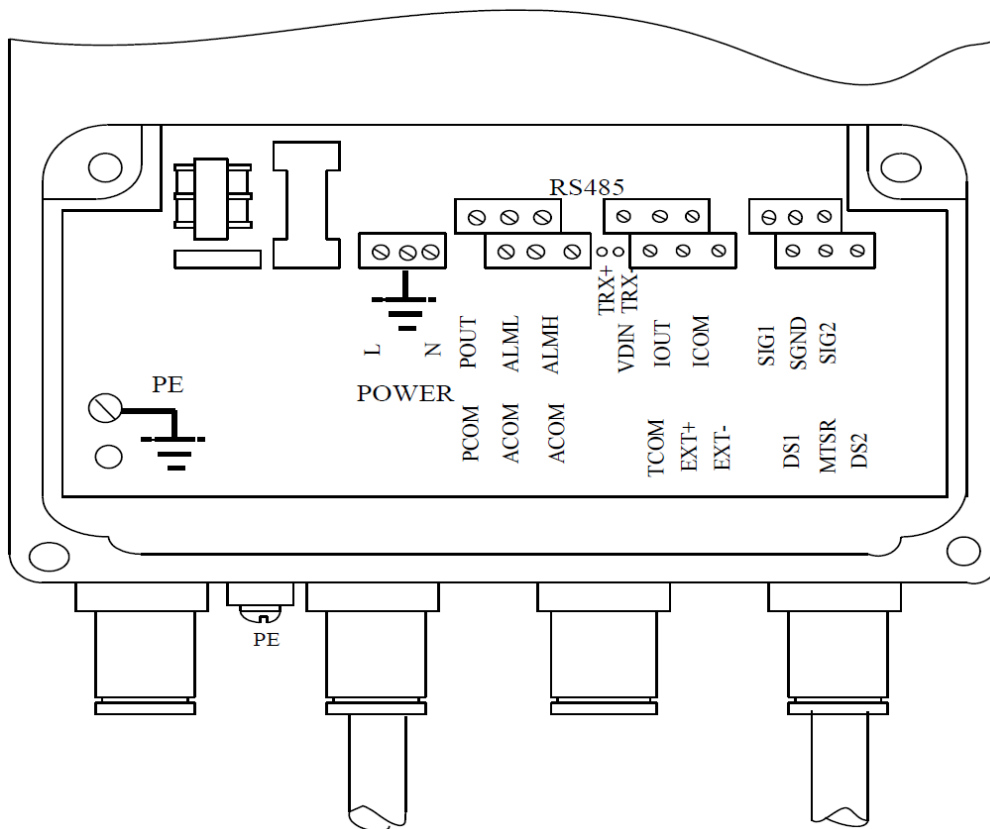




## Wiring Diagram

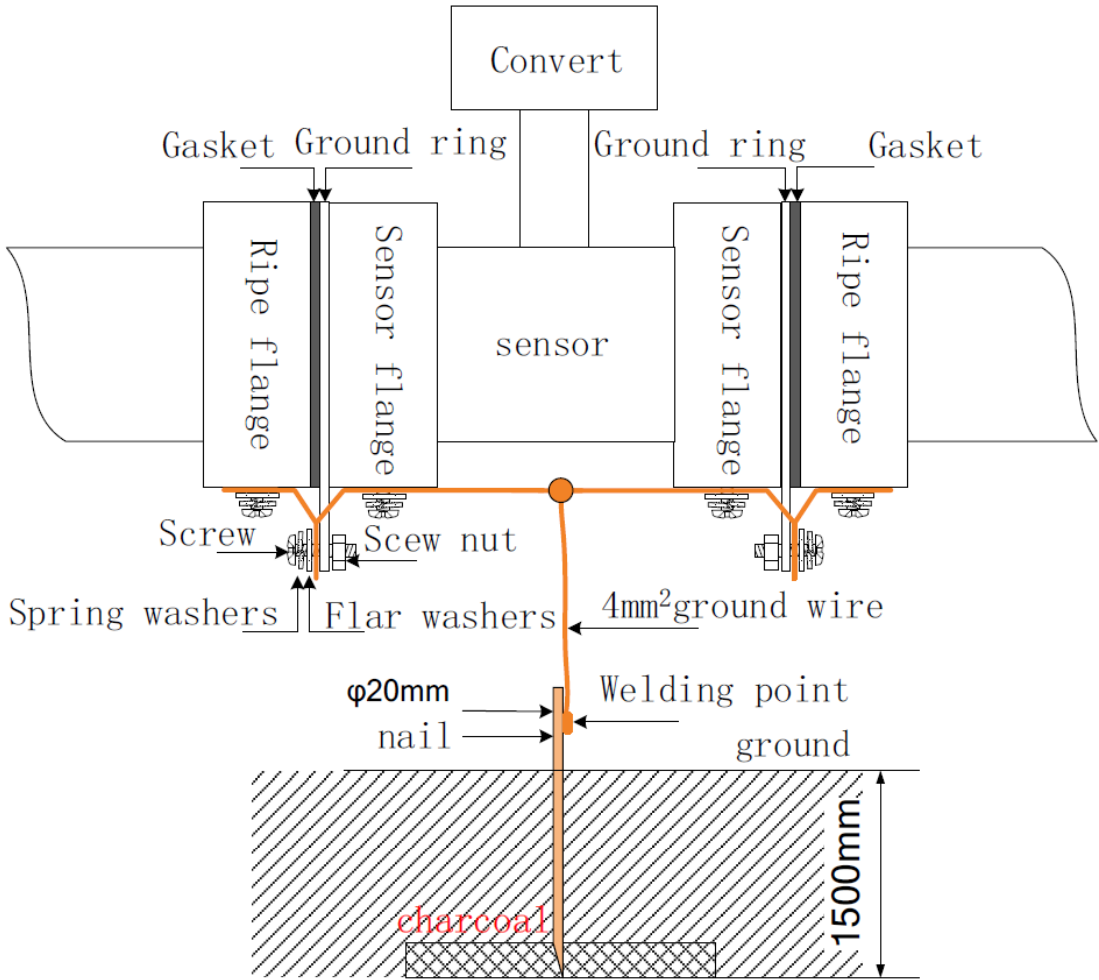


I+:	Output Current for Flow Measurement
COM:	Output Current (Ground) for Flow Measurement
P+:	Frequency(Pulse) Output for Bi-directional Flow
COM:	Frequency (Pulse) Output (Ground)
AL:	Alarm Output for Low Limit
AH:	Alarm Output for Upper Limit
COM:	Alarm Output (Ground)
FUSE:	Fuse for Power Supply
T+:	+Communication Input Signal(RS485-A)
T-:	-Communication Input Signal(RS485-B)
G	RS232 Communication Ground
L1:	220V (24V) Power Supply
L2:	220V (24V) Power Supply



SIG 1	Signal 1	} —————	To Separate Model Sensor
SGND	Signal Ground		
SIG 2	Signal 2		
DS 1	Shielded Exciting 1		
DS 2	Shielded Exciting 2		
EXT +	Exciting Current +		
EXT -	Exciting Current -		
VDIN	Current Two lines 24 V Spots	} —————	Analog Current Output
ICOUT	Analog Current Output		
ICCOM	Analog Current Output Ground		
POUT	Flow Frequency ( Pulse ) Output	} —————	Frequency (Pulse) Output
PCOM	Frequency (Pulse) Output Ground		
ALMH	Upper Limit Alarm Output	} —————	Two Alarm Outputs
ALML	Low Limit Alarm Output		
ALCOM	Alarm Output Ground		
TRX +	Communication Input(RS485-A)	} —————	Communication Input
TRX -	Communication Input(RS485-B)		
TCOM	232 Communication Ground		

**⚡ Grounding Requirements VERY IMPORTANT**



MAG meter must be properly grounded for a stable reading. Note the orange wires connect the inlet to the outlet on the customer side.

## Digital output

Digital output can be set to either frequency or pulse output.

Frequency output: Frequency output range is 0 to 5000HZ, and corresponding the percent of full scale.

$$\text{Frequency Output} = \frac{\text{Measured value}}{\text{Full scale value}} \cdot \text{frequency range}$$

The upper limit of frequency output can be 1 - 5000HZ.

Frequency output mode is normally used in control application, because it responses the percent Full Scale. Users can choose pulse output when the equipment is connected to a totalizer counter or the like.

Pulse output mode: Pulse output mainly applies in count mode. A pulse output delegates a unit flow value, such as 1L or 1M<sup>3</sup> etc. Pulse output unit can be divided into 0.001L, 0.01L, 0.1L, 1L, 0.001m<sup>3</sup>, 0.01m<sup>3</sup>, 0.1m<sup>3</sup>, 1 m<sup>3</sup>, 0.001UKG, 0.01UKG, 0.1UKG, 1UKG, 0.001USG, 0.01USG, 0.1USG, or 1USG. When choosing the pulse unit you will want to match the Full Scale range of flow meter and pulse unit. For volume flow, the count formula is as follows:

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

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

Note: D-nozzle (mm)

V-velocity of flow (m/s)

The values must be chosen to not over range the pulse output units. Generally, pulse output should be below 3000 P/S. Typical maximum is 1000 P/S for most electronic totalizer counters.

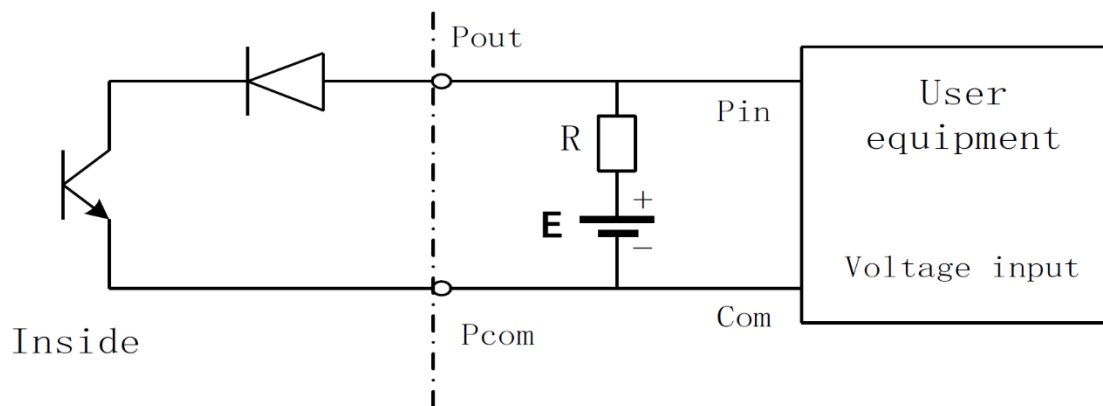
## ✚ Digital output connection

Digital output has two terminals:

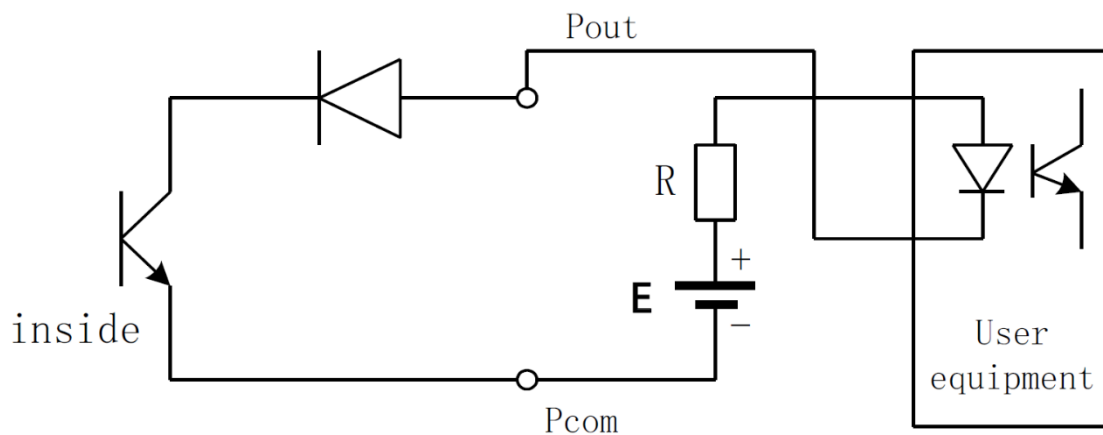
P+ ----- digital output point;

PCOM ----- digital ground point;

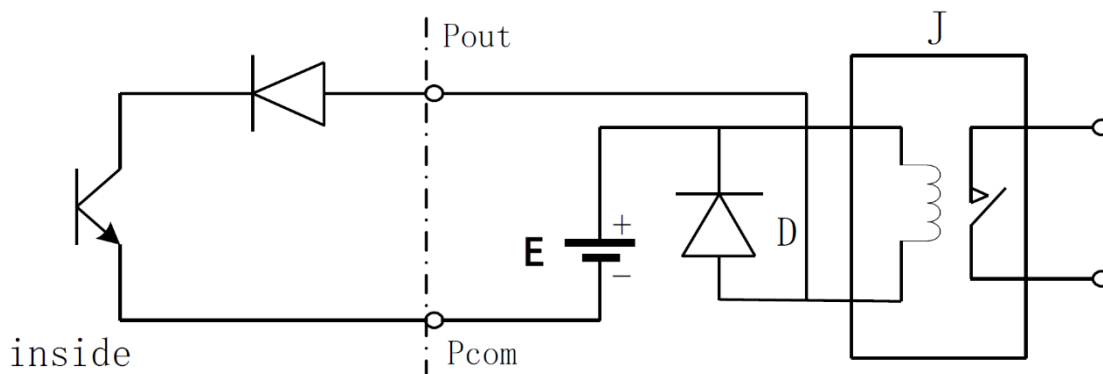
P+ is an open collector output, see below.



Digital output connection using a galvanic coupling such as a PLC etc, see below.



Digital output relay, see below.



Commonly relay needs E as 12V or 24V. D is an external diode if the relay does not have the diode built in. This is required to protect the circuit from back emf when the coil collapses.

## Key functions

### Key Names

“Down” key: Selects displayed data on lower line.

“Up” key: Selects displayed data on upper line.

“Compound” key + “Enter” key: Enters parameter settings.

“Enter” key: Press to select the function.

Under the measure, you may adjust the LCD contrast with “Compound” key + “Up” key or “Compound” key + “Down” key for several seconds to adjust the contrast to the desired level.

### Function keys for adjusting parameters

“Down” key: Subtracts 1 from the number in cursor area.

“Up” key: Adds 1 to the number in cursor area.

“Compound” key + “Down” key: Cursor moves left.

“Compound” key + “Up” key: Cursor moves right. “Enter” key: In/Out submenu.

“Enter” key: Press for two seconds under any state and the meter will return to normal flow measuring mode.

### Note:

(1) When using the “Compound” key, you will press “Compound” key and “Up” or “Down” at the same time.

(2) The Flow Meter will automatically resume the measurement mode after 3

minutes if you abandon any parameter settings;

(3) Direct selection of the zero flow correction is available when you move the cursor to the left + or - and use "Down" or "Up" to switch.



## Parameter Functions

To set parameters, the electronics will be in the parameter setting mode instead of the normal flow measuring mode. In the measuring mode, push “Compound” + “Enter” keys to select the default password of (0000), and, if necessary, enter the password with the password level provided by manager. Finally, push the “Compound” + “Enter” keys to adjust Parameter Settings.

There are 6 Passwords with 4 for different operator levels and 2 fixed passwords for system operation.

## Functions selection menu

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

Code	Functions	Notes
1	Set Parameters	Allows user to enter the desired parameter.
2	Clr Total Rec	Allows user to gross reset totalizers.
3	Fact Modif Rec	Select this function to check the factory modification Records

### Set Parameters

Press "Compound"+"Enter" key, it displays "Parameter Set" function. Input password. Press "Compound"+"Enter" key, it getting to Parameter Setting status.

### Clr Total Rec

To push the "Compound"+"Enter" keys getting to the select of parameter, then push "Up" key to "Clr Total Rec", input the appropriate password level. The totalizer may be reset with the password "0000" .

### Fact Modif Rec

To push the "Compound"+"Enter" keys getting to the select of parameter, then push "Up" key to "Fact Modif Rec".

## Parameter Setting Codes

Setting Parameters in Menu: password 19818

Code	Parameter	Method	Password Level	Range
1	Language	Select	2	English
2	Comm Slave Address	Set count	2	0 to 99
3	Baud Rate	Select	2	300 to 38400
4	Snsr Size	Select	2	3 to 3000
5	Flow Unit	Select	2	L/h、L/m、L/s、m <sup>3</sup> /h、m <sup>3</sup> /m、m <sup>3</sup> /s、UKG、USG
6	Flow Range	Set count	2	0 to 99999
7	Flow Rspns	Select	2	1 to 50
8	Flow Direct	Select	2	Plus/ Reverse
9	Flow Zero	Set count	2	0 to ±9999
10	Flow Cutoff	Set count	2	0 to 599.99%
11	Cutoff Ena	Select	2	Enable/Disable
12	Total Unit	Select	2	0.001m <sup>3</sup> to 1m <sup>3</sup> 、0.001L to 1L、0.001UKG to 1UKG, 0.001USG to 1USG,
13	SegmaN Ena	Select	2	Enable/Disable
14	Analog Type	Select	2	4 to 20mA/4mA
15	Pulse Type	Select	2	Frequency / Pulse
16	Pulse Fact	Select	2	0.001m <sup>3</sup> to 1m <sup>3</sup> 、0.001L to 1L、0.001UKG to 1UKG, 0.001USG to 1USG,
17	Freque Max	Select	2	1 to 5999 HZ
18	Mtsnsr Ena	Select	2	Enable/Disable
19	Mtsnsr Trip	Set count	2	59999 %

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

49	Pass Word 4	User correct	5	00000 to 99999
50	Analog Zero	Set count	5	0.0000 to 1.9999
51	Anlg Range	Set count	5	0.0000 to 3.9999
52	Meter Fact	Set count	5	0.0000 to 5.9999
53	Meter Code 1	Factory set	6	Finished Y /M
54	Meter Code 2	Factory set	6	Product Serial No
55	Check Mode	Select	2	No Parity/Odd Parity/Even Parity

## Parameter Details

Comm Address: 01 to 99.

Baud Rate: 300, 1200, 2400, 4800, 9600, and 38400, BAUD.

Parity CheckMode: The standard MODBUS communication for L-magB is 8 bit No Parity; users can choose 8 bit odd parity or 8 bit even parity.

Sensor Size: L-magB converters can be equipped with different sensors for different pipe diameters from 0.125" to 124" (10') and are entered in mm for highest resolution.

Flow units: Available flow units: (L/h、L/m、L/s、m<sup>3</sup>/h、m<sup>3</sup>/m、m<sup>3</sup>/s、UKG、USG)

Flow Range: Lower limit value is set to "0" by default. The range for percent display, frequency output, and current outputs are as follows:

percent display = (measured flow / measured range)\*100 %.

frequency output = (measured flow / measure range)\*frequency full Scale.

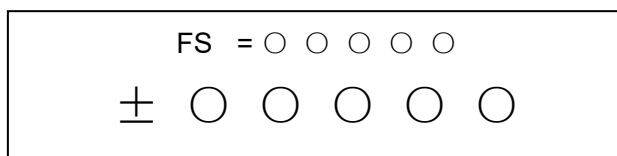
current output = (measured flow / measure range) \* current full Scale + base point.

Note: pulse output has no range adjustment.

Flow Filter: Long filter times are good for installations that have "noisy" flow and short filter times are good when the user wishes to study the flow over very short periods of time.

Flow Direction: Select the flow direction if the flow reverses from the original installation.

Zero Flow: Make sure the sensor is full of fluid, and the flow is at ZERO. Flow zero is shown as a ZERO velocity for flow, mm/s.



Zero-flow correction display

Top Line: FS indicates the CURRENT measurement for the value at zero flow.

Bottom Line: This is where you enter the OPPOSITE sign of the value in the Top Line to REMOVE any undesirable ZERO indication.

Low Flow cutoff: Flow cutoff is set in percentage of Full Scale that will be used to indicate a Zero flow for any value BELOW the Low Flow Cutoff value. This value applies to the 4-20 mA current output signal, velocity, percentage, and the frequency (pulse) output.

Totalizer Units: Converter display uses a 9-bit counter, max is 999999999.

Integrator units are L, m3 (liter, cubic meters,).

Flow integrator scaling values: 0.001L, 0.010L, 0.100L, 1.000L, 0.001m3, 0.010m3, 0.100m3, 1.000m3, 0.001UKG, 0.010UKG, 0.100UKG, 1.000UKG, 0.001USG, 0.010USG, 0.100USG, 1.000USG.

SegmaN Ena: When "SegmaN Ena" is "enabled", the sensor will output pulse and current. When it is in the "disable" setting, the sensor will output a pulse as "0" and current as "0"(4mA or 0mA) when the flow reverses.

Analog Output: 4~20mA.

Pulse Output: The meter can have either a Frequency Output or a Pulse Output.

Frequency Output is a continuous square waveform and Pulse output is a serial square wave. Frequency output is mainly used for flow RATE indication and the total integrated flow for short periods of time. The Frequency output is usually chosen when the equivalent frequency unit and volume of integrated flow is to be collected. Frequency Output can be used for long time measurement for total integrated flow with volume units.

Frequency output and pulse output are usually from Open Collector transistors so that DC power supplies so load resistors are required for proper operation.

Pulse Output Factors: Equivalent pulse Unit is referred to one pulse for ONE unit of flow. The range of pulse equivalents can be chosen as shown below:

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

Under the same flow, the smaller the pulse is, the higher the frequency output is, resulting in the smallest error. The highest pulse output is 100cp/s, Note: most mechanical electromagnetic counters can attain a maximum of 100 pulses/sec.

Under the same flow, the smaller the pulse is, the higher the frequency output is, resulting in the smallest error. The highest pulse output is 100cp/s, Note: most mechanical electromagnetic counters can attain a maximum of 100 pulses/sec.

Freque Max, Frequency Maximum: Frequency output range is as the upper limit



of the measured flow, or the percentage of the flow. Frequency output can be selected from 1 to 5000Hz.

Mtsnsr Ena: If the flow meter has no fluid in it there is an Empty Pipe Alarm, where the analog and digital outputs will be driven zero as well as displayed on the LCD.

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 below 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.

Alm Hi Ena: Users can choose "Enable" or "Disable".

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.

Alm Lo Val: Same as upper limit alarm.

Sys Alm Ena: Selecting Enable will have the function, and selecting Disable will cancel the function.

Clr Sum Key: Use more than level 3-password code to enter, then set this password in Clr Total Rec.

Snsr Code: It is referred to the production date of sensor and the serial number of meter that ensures the sensor coefficient is accurate.

Sensor Fact: "Sensor Coefficient" is printed on the Label of the sensor. The "sensor

coefficient" must be set into Sensor Coefficient Parameter to operate properly and is entered at the factory.

Field Type: L-magB affords three excitation frequency types: 1/16 frequency (type 1), 1/20 frequency (type 2), 1/25 frequency (type 3). The small-bore meters use 1/16 frequency, and large-bore meters use 1/20 or 1/25 frequency. These values are set at the factory and should not be altered. When adjusting, select type 1 first, if the zero velocity is too high, select the type 2 or type 3.

FwdTotal Lo, hi: Positive total volume high byte and low byte can change forthcoming and reverse total value, and be used to maintenance and instead. User use 5 byte code to enter, and can modify the positive accumulating volume ( $\Sigma +$ ). Usually, it is unsuitable to exceed the maximum the counter set (999999999).

RevTotal Lo, hi: User use 5 byte code to enter, and can modify the negative accumulating volume ( $\Sigma -$ ). Usually, it is unsuitable to exceed the minimum the counter set (999999999).


User's password 1-4: Users have 5 grades of passwords for the highest level of security.

Analog Zero: Output current ZERO is set to either 0 or 4 mA with 4 mA being the standard for 0 flow.

Angle Range: The full-scale range of the mA output can be either 10 or 20 mA.

Meter Fact: This factor is factory set to allow sensor interchange within 0.1%.

MeterCode 1 and 2: Electronics code indicates the manufacture date and the meter serial number.

**Self-Diagnostics:** All meters feature a self-diagnostic function. Normal operation displays this:  on the left of LCD. Errors are shown as follows:

FQH ----- Flow high limit alarm

FQL ----- Flow low limit alarm

FGP ----- Flow empty pipe alarm

SYS ----- System exciting alarm

UPPER ALARM ----- Flow high limit alarm

LOWER ALARM ----- Flow empty pipe alarm

LIQUID ALARM ----- Flow empty pipe alarm

SYSTEM ALARM ----- System exciting alarm

## Troubleshooting Guide

No LCD display:

- a) Check the power supply connection
- b) Check the power fuse
- c) Check the contrast of LCD and adjust if necessary

Alarms indicating an alarm condition

- a) Check if the excitation cables EX1 and EX2 are connected;
- b) Check if the total resistance of sensor's excitation coils resistances less than 150Ω
- c) If a) and b) are OK, the electronics may have failed or a connection has failed

No Fluid in flow body alarm

- a) Ensure flow body if full of fluid with no air bubbles
- b) If you can short circuit the three connectors SIG 1, SIG 2, SGND of converter, and no "Empty Alarm" is displayed then the electronics is OK. If this is the case, it is possible that conductivity of fluid is too low or the empty threshold of empty flow body and range of empty flow body are set too low or too high.
- c) Check if the signal cables are OK
- d) Check if the sensor connections are OK
- e) Create the ZERO FLOW condition and the displayed flow should indicate less than 100%.
- f) Ensure resistances of SIG1 to SGND and SIG2 to SGND are all less than 50kΩ (conductivity of water) during measurement operation.

- g) The DC sensor voltage should be less than 1Volt between DS1 and DS2. If the DC voltage is greater than 1V, the sensor connections should be cleaned and reset.