English
Rev.1.2
06/2021

FaraMag™ FM750

Mag Meter

IMPORTANT NOTE: For the most up-to-date version of this manual, please visit www.h2flow.net/product-literature

Operating Manual (EN)

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1. general information

This manual will assist you in installing, using and maintaining your flow meter. It is your responsibility to make sure that all operators have access to adequate instructions about safe operating and maintenance procedures.

⚠ WARNING ⚠

PLEASE BE AWARE THAN AN INDUCTION FLOW METER IS AN ELECTRONIC DEVICE; THE FOLLOWING STEPS SHOULD BE PERFORMED BY A QUALIFIED ELECTRICIAN!

For your safety, please review the major warnings and cautions below before operating your equipment.

1. Use only fluids that are compatible with the housing material and wetted components of your meter.
2. When measuring flammable liquids, observe precautions against fire or explosion.
3. When handling hazardous liquids, always follow the fluids manufacturer's safety precautions.
4. When working in hazardous environments, always exercise appropriate safety precautions.
5. During meter removal, fluids may spill. Follow the fluids manufacturer's safety precautions for clean up minor spills.
6. When tightening the meter, use a wrench only on the wrench flats.
7. For best results, calibrate the meter at least 1 time per year.

1.1 Description

The FaraMag FM750 utilizes the electromagnetic principle to measure the flow volume of conductive liquids and slurry in a closed pipe. This technology is widely used in power, oil and gas, chemical and petrochemical, coal, metallurgy, mineral, paper, water, wastewater, food and beverage, pharmaceutical and other industries.

The FM750 is characterized by it's high degree of accuracy and reliability. Setting of flow meter parameters is performed using the keypad and intuitive display menu or using service software via a communication port.

The FM750 comprises of two basic components: 1) the Sensor, which includes the flow tube, isolating liner and measuring electrodes, and 2) the Converter, which is the electronic device responsible for signal processing, flow calculation, display and output signals.

The materials of construction of the wetted parts (liner and electrodes) should be appropriate for the specifications on the intended type of service. Review of the compatibles consistent with the specifications is recommended.

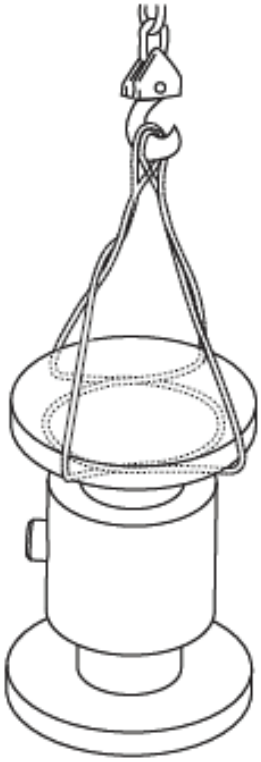
All FaraMag™ FM750 electromagnetic flow meters are factory tested and calibrated. A calibration certificate is included in the shipment of each meter.

1.2 Unpacking and Inspection

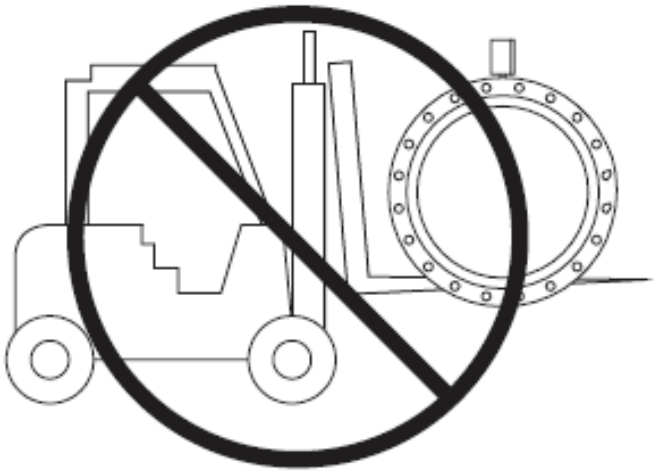
Upon receipt, examine your meter for any visible damage. The meter is a precision measuring instrument and should be handled with care. Remove the protective plugs and caps for a thorough inspection. If any items are damaged or missing, please contact us immediately.

Make sure the flow meter model meets your specific needs. For your future reference, it might be useful to record the information found on the nameplate in the manual, in case it becomes unreadable on the meter.

Do not lift the Sensor from the Converter housing, the junction box, or the connecting cable. It is recommended that larger size units are lifted using lifting lugs. Very large meter sizes are packed and crated with the meter laying on its side for shipping safety and stability reasons. In order to lift the meter in a vertical position, it is recommended that a sling rigged method is used - as shown below.

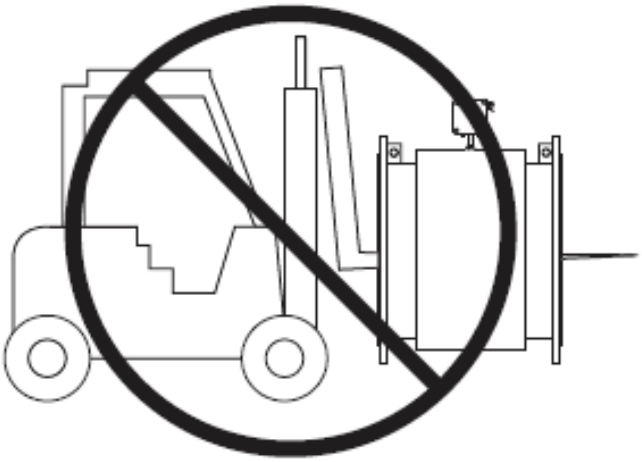


If using a forklift, do not lift the detector from its body between the flanges. The housing could be accidentally dented and permanent damage could be caused to the internal coil assemblies.



⚠ WARNING

Warning: NEVER introduce the forklift, chains, wire slings or any other sharp object inside the flow tube for lifting or handling purposes. This could permanently damage the isolating liner and could render the meter inoperable. Handling the meter in this manner will VOID the product warranty.



2. technical data

This manual will assist you in installing, using and maintaining your flow meter. It is your responsibility to make sure that all operators have access to adequate instructions about safe operating and maintenance procedures.

Main Power	120-240VAC 50Hz - 60Hz / 24-36VDC		
Power Consumption	<15W (and set with sensor supporting power consumption)		
Display and Push Buttons	English and Chinese display can display the instantaneous flow, total flow and percentage of flow as well as alarm display, four soft-touch buttons, which are used for data set.		
Accumulator	Forward total quantity, reverse total quantity		
Output Signal	Analog output	Bi-directional, isolation 0-10mA / 4-20mA	
	Frequency output	Forward and reverse flow output with frequency range set between 1 - 5000Hz. The external voltage must be lower than 35V and the max output current is 50mA when the transistor is turned on.	
	Alarm output	Two outputs from the collectors of photoelectric isolate transistors are for alarm signals. The external voltage must be lower than 35V and the max output current is 250mA when the transistor is turned on. Alarm status: Activates when the measured pipes are empty, the excitation circuits are broken, or the volume of flow rate exceeds the value designed limits.	
	Pulse output	For pulse output in forward and reverse flow measurement, upper frequency of pulse output can be up to 5000 CP/S relevant value of pulse is from 0.0001 to 1.0 M3/P. The width of pulse can be set to 20ms or squired wave form automatically. The collector of transistor with photoelectric is open circuited. The external voltage must be lower than 35V and maximum output current is 250mA when the transistor is turned on.	
Accuracy	±0.5% of the value displayed		
Damping Time Constant	Continuous variable from 0-100 s (90%) can be selected by group		
Communication	RS232, RS485 or HART Communication are optional, with lightning resistance		
Power Failure	An anti-failure clock is designed in the flow meter which can save the power failure records for 16 times (10 years)		
Protection Grade	NEMA 4 / IP65		
Nominal Diameter	0.5" - 120" (DN15 - DN3000)		
Nominal Pressure	0.6 - 4.0MPa		
Output Signal	Analog output, Frequency output, Alarm output, Pulse output		
Liner Material	Neoprene, Urethane Rubber, Polysilicone Rubber, PTFE, F46, PFA		
Electrode Type	General Type, scraper type, replaceable type		
Electrode Material	SUS316, Hastelloy B, Hastelloy C, Titanium, Tantalum, Platinum-iridium alloy, Stainless Steel covered with Tungsten Carbide		
Medium Temperature	Integrated Type	-4°F - +158°F (-20°C - +70°C)	
	Remote Type	Neoprene & Polyurethane Liner	-4°F - +140°F (-20°C - +60°C)
		PTFE Liner / PFA Liner / F46 Liner	-40°F - +356°F (-40°C - +180°C)
Ambient Temperature	-13°F - +140°F (-25°C - +60°C)		
Ambient Humidity	5 - 100% RH (relative humidity)		
Medium Electrical Conductivity	≥20us/cm		
Measuring Range	1500:1, flow rate <15m/s		
Structure Type	Integral Type, Remote Type, Submersible Type, ex-proof Type		
Connection Type	Flange Type / Clamp Type (optional on certain models)		
Protection Grade	NEMA4 (IP65), NEMA 6 (IP67), NEMA 6P (IP68)		
Product Standard	JB/T 9248-1999 Electromagnetic Flowmeter		

3. measurable flow rate ranges

Flow rate Unit: Gal/m (U.S.)	
Min.	Max.
0.0281	42.0147
0.0497	74.6928
0.0779	116.7076
1.9900	298.7714
0.3112	466.8306
0.5261	788.9435
0.7969	1195.0859
1.2446	1867.3217
2.8011	4201.4742
4.9796	7469.2871
7.7803	11670.7614
11.2039	16805.8966
15.2497	22874.6926
19.9181	29877.1491
25.2090	37813.2670
31.1221	46683.0457
44.8158	67223.5859
60.9990	91498.7697
79.6725	119508.5972
100.8353	151253.0686
124.4879	186732.1832
179.2627	268894.3440
243.9967	365995.0791
318.6896	478034.3891
403.3413	605012.2739
497.9523	746928.7331
602.5226	903546.0122
717.0517	1075577.3760
841.5388	1262308.0460
AVAILABLE UPON REQUEST	

Inch	DN mm
0.5	15
0.75	20
1	25
1.5	40
2	50
2.5	65
3	80
4	100
6	150
8	200
10	250
12	300
14	350
16	400
18	450
20	500
24	600
28	700
32	800
36	900
40	1000
48	1200
56	1400
64	1600
72	1800
80	2000
88	2200
96	2400
104	2600
112	2800
120	3000

Flow rate Unit: m3/h	
Min.	Max.
0.0064	9.5426
0.0113	16.9646
0.0177	26.5072
0.4520	67.8584
0.0707	106.0288
0.1195	179.1886
0.1810	271.4336
0.2827	424.1150
0.6362	954.2588
1.1310	1696.4600
1.7671	2650.7188
2.5447	3817.0351
3.4636	5195.4089
4.5239	6785.8401
5.7256	8588.3289
7.0686	10602.8752
10.1788	15268.1403
13.8544	20781.6354
18.0956	27143.3605
22.9022	34353.3157
28.2743	42411.5008
40.7150	61072.5612
55.4177	83126.5416
72.3823	108573.4421
91.6088	137413.2627
113.0973	169646.0033
136.8478	205217.6640
162.8602	244290.2448
191.1343	286701.4020
AVAILABLE UPON REQUEST	

4. model selection

Model	Ordering Code									Description
FM750	A	B	C	D	E	F	G	H	I	
										Sensor Material
	CS									Carbon Steel
	SS									316 Stainless Steel
										Diameter:
		A0005								Minimum ANSI diameter (0.5")...
		A1200								Maximum ANSI diameter (120")
		D0015								Minimum DN diameter (DN15)...
		D3000								Maximum DN diameter (DN3000)
										Liner Material: *(see section 11.1 of Technical Spec.)*
			1							PTFE (F4); 0.5" - 40"
			2							Neoprene; 2" - 120"
			3							Polyurethane; 0.5" - 24"
			4							F46; 0.5" - 12"
			5							PFA; 0.5" - 10"
										Electrode Material: *(see section 11.2 of Technical Spec.)*
				1						Stainless Steel (316L)
				2						HB (Hastelloy B)
				3						HC Hastelloy C)
				4						Ti (Titanium)
				5						Platinum iridium
				6						Ta
				7						Stainless Steel Tungsten Carbide
										Housing Protection:
					1					NEMA 4 / IP65
					2					NEMA 6P / IP68 + NEMA 4 / IP65 (Sensor NEMA 6P / IP68 + Converter NEMA 4 / IP65)
										Mounting Accessories:
						0				None
						1				Grounding Rings (qty. 2)
						2				Scraper Electrode
										Structure:
							ER			Remote Type
							EC			Compact Type
							*Standard cable length is 10 meters for remote type. Cable length is customizable.			
										Power Supply:
								1		120VAC-230VAC
								2		11-40VDC
								3		11-40VDC with 120VAC-230VAC converter (UL listed)
								4		3.6V Lithium Battery
										Converter Model:
									MA	Pulse+4-20mA, RS485
									MB	Pulse+4-20mA, RS485, HART
									MC	Pulse+4-20mA, RS485, Profibus DP
									MD	Pulse+4-20mA, RS232
									ME	GPRS Wireless Communication

5. installation considerations

5.1 Mounting Positions

- Pipes must be fully filled with liquid. It is essential that pipes remain fully filled at all times, otherwise flow rate indications may be affected and measurement errors may occur.

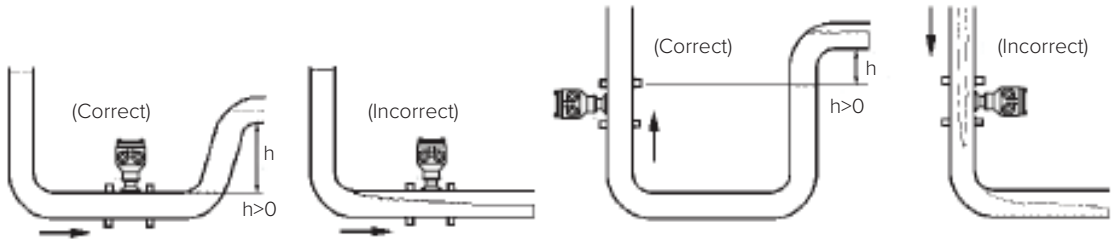


Fig. 5.1 Mounting Positions

- Avoid air bubbles. If air bubbles enter a measurement pipe, flow rate indications may be affected and measurement errors may be caused.

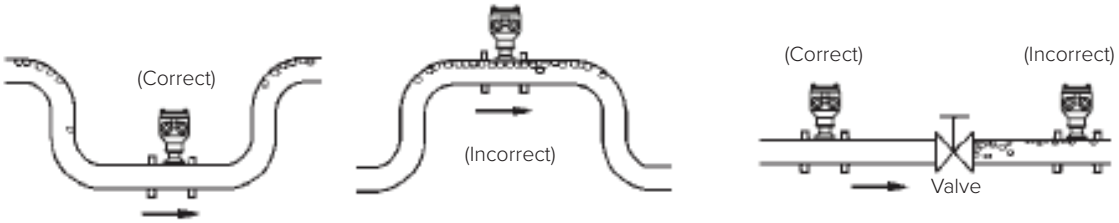


Fig. 5.2 Avoiding Air Bubbles

- If the electrodes are vertical to the ground, air bubbles near the top or precipitates at the bottom may cause measurement error. Ensure that the terminal box is mounted above the piping to prevent water from entering them.

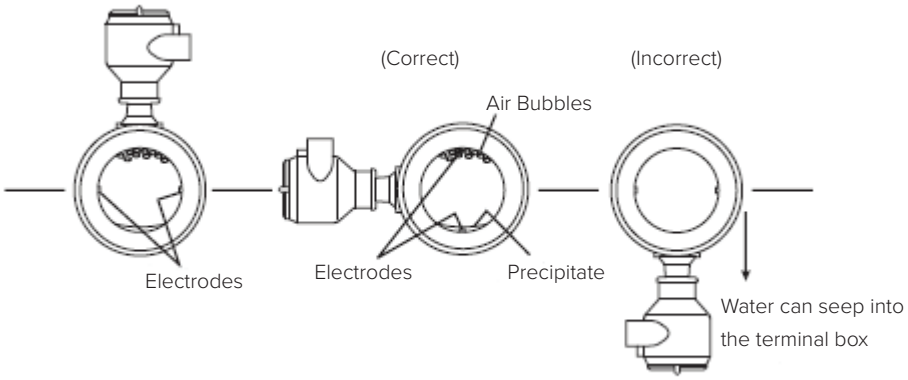


Fig. 5.3 Mounting Orientation

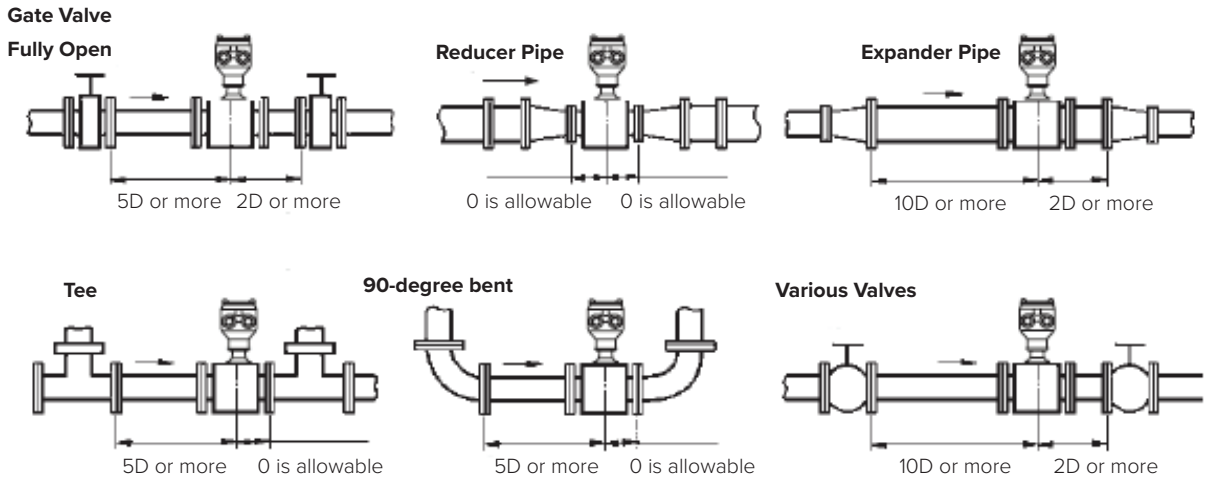
- Avoid all pipe locations where the flow is pulsating, such as in the outlet side of piston or diaphragm pumps.
- Avoid locations near equipment producing electrical interference , such as electric motors, transformers, variable frequency drives, etc.

- Install the meter with enough room for future access for maintenance purposes.
- The magnetic meter isolating liner, whether it is PTFE or Rubber, is not intended to be used as gasket material. Standard gaskets (not provided) should be installed to ensure a proper hydraulic seal. When installing the gaskets, make sure they are properly centered to avoid flow restriction or turbulence. Do not use graphite or any electrically conductive sealing compound to hold the gaskets in place during installation, as this could affect the reading accuracy of the measuring signal.

⚠ WARNING **Precaution for direct sunshine and rain when the meter is installed outside:**

5.2 Required Lengths of Straight Runs

For optimum accuracy and performance, it is required that sufficient inlet and outlet straight pipe runs are provided. An equivalent to 3 diameters of straight pipe is required on the inlet side, and 2 diameters on the outlet side. There are no special requirements for standard concentric pipe reducers. See Fig.5.4 for required straight runs when there is an altering device.



D = Flowtube Size

Fig. 5.4 Required Straight Runs

⚠ SPECIAL NOTICE

When the meter contains removable cover plates, leave them installed unless accessory modules specify removal. Don't remove the cover plates when the meter is powered, or electrical shock and explosion hazard may occur.

5.3 Grounding

In this section, the term “grounding” will be defined as: the arrangement of process wetted metal materials (piping, ground rings, ground electrodes), cabling (ground straps, ground wires), and connections to stable references (often, but not always earth ground) required to achieve satisfactory operation of a magnetic flow meter. As such, it applies to the instrumentation aspect of grounding, rather than to “safety grounding”.

Proper installation and grounding of the magnetic flow meter is important for accurate and reliable measurement performance. Stray AC or DC currents through the fluid or instrument can produce noise signals that may in turn interfere with the relatively low flow signals generated in today’s modern pulsed DC mag meter.

H2flow Controls provides a variety of elements (ground straps, ground electrodes, ground rings) and directions for the standard grounding of the mag meter.

Applications exist in which the user cannot or should not make use of the traditional grounding connection to adjacent piping and to earth ground. These flow measurement applications are frequently encountered in electrolytic processes. In this case, the fluid passing through the mag meter flow tube may potentially be at significantly higher or lower than earth ground, and a connection to earth ground may be detrimental to the performance and even the reliability of the mag meter. These applications are typically compounded by the use of non-conductive or lined pipe and may feature acid or caustic flows which may necessitate the use of expensive wetted electrodes and grounding materials such as titanium, platinum, or tantalum.

5.4 Connections

Use a gasket between the meter flange and mating flange. Determine the material of the gasket based on the operating conditions and type of fluid.

Note: Do not over tighten the flange bolts. This may cause the gasket to be compressed into the flow stream and may decrease the accuracy of the meter.

Installation Dimensions: Refer to the following Figures and Tables.

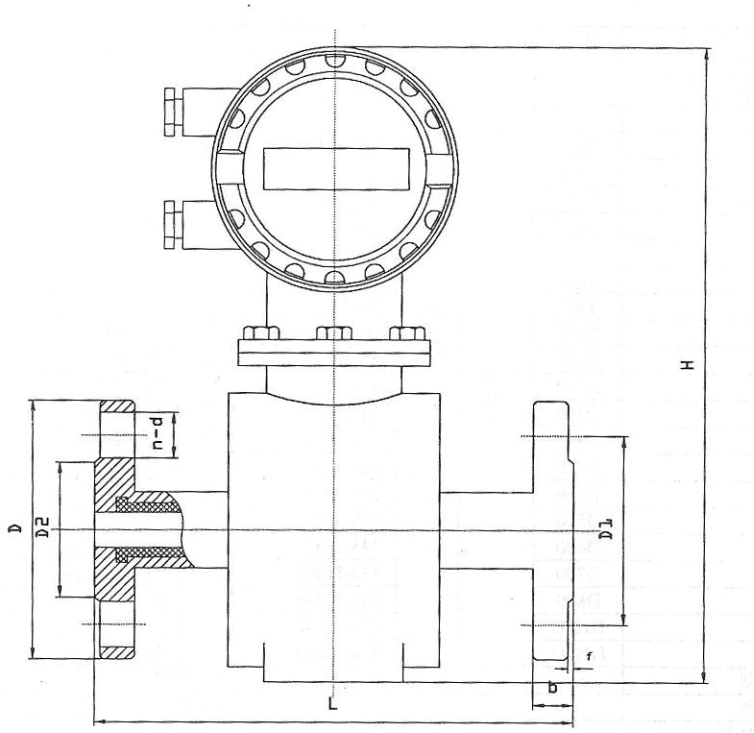


Fig. 5.5 Drawings for Integrated Electromagnetic Flow Meter

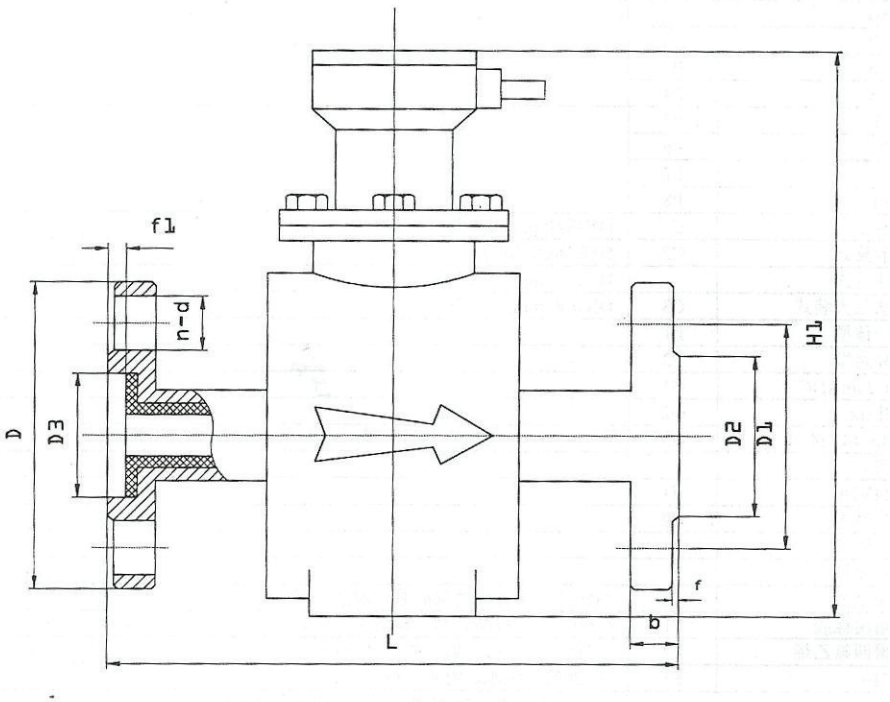


Fig. 5.6 Drawings for Remote Electromagnetic Flow Meter

Flange: DIN PN16							
Diameter DN	L	H	H1	D	D1	D2	n x Φ d
10	160	360	220	90	60	41	4 x 14
15	160	360	220	95	65	45	4 x 14
20	165	360	220	105	75	58	4 x 14
25	200	360	220	115	85	68	4 x 14
32	200	370	235	140	100	78	4 x 18
40	200	370	235	150	110	88	4 x 18
50	200	358	242	165	125	102	4 x 18
65	250	400	256	185	145	122	4 x 18
80	250	415	275	200	160	138	8 x 18
100	250	435	295	220	180	158	8 x 18
125	250	465	325	250	210	188	8 x 18
150	300	497	355	285	240	212	8 x 22
200	350	550	410	340	295	268	12 x 22
250	450	610	488	405	355	320	12 x 22
300	500	660	520	460	410	375	12 x 22

Flange: JIS 10K							
Diameter DN	L	H	H1	D	D1	D2	n x Φ d
10	160	360	220	90	64	46	4 x 15
15	160	360	220	95	70	52	4 x 15
20	165	360	220	100	75	58	4 x 15
25	200	360	220	125	90	70	4 x 19
32	200	370	235	135	100	76	4 x 19
40	200	370	235	140	105	85	4 x 19
50	200	358	242	155	120	100	4 x 19
65	250	400	256	175	140	120	4 x 19
80	250	415	275	185	150	130	8 x 19
100	250	435	295	210	175	155	8 x 19
125	250	465	325	250	210	185	8 x 23
150	300	497	355	280	240	215	8 x 23
200	350	550	410	330	290	265	12 x 23
250	450	610	488	400	355	325	12 x 25
300	500	660	520	415	400	370	16 x 25

Flange: ANSI 150#							
Diameter (inches)	L	H	H1	D	D1	D2	n x Φ d
0.5	160	360	220	90	60	40	4 x 15
0.75	165	360	220	98	70	43	4 x 15
1	200	360	220	108	79.5	51	4 x 15
1.5	200	370	235	127	98.5	73	4 x 15
2	200	385	242	152	120.5	92	4 x 19
2.5	250	400	256	178	139.5	105	4 x 19
3	250	415	275	190	152.5	127	4 x 19
4	250	435	295	229	190.5	157	8 x 19
5	250	465	325	254	216	186	8 x 23
6	300	497	355	279	241.5	216	8 x 23
8	350	550	410	343	298.5	270	8 x 23
10	450	610	488	406	362	324	12 x 25
12	500	660	520	483	432	381	12 x 25

6. converter connection

6.1 Terminal Wiring and Marking (Compact Type)

TERMINAL BLOCK	
Terminal	Description
DOUT -	Alarm Output Ground
DOUT +	Alarm Output Positive
POUT -	Pulse/Frequency Output negative
POUT +	Pulse/Frequency Output positive
4-20mA +	4-20mA positive
4-20mA -	4-20mA negative
RS485 +	Communication input (RS485A)
RS485 -	Communication input (RS485B)
N	220VAC (24VDC negative) power input
L	220VAC (24VDC positive) power input

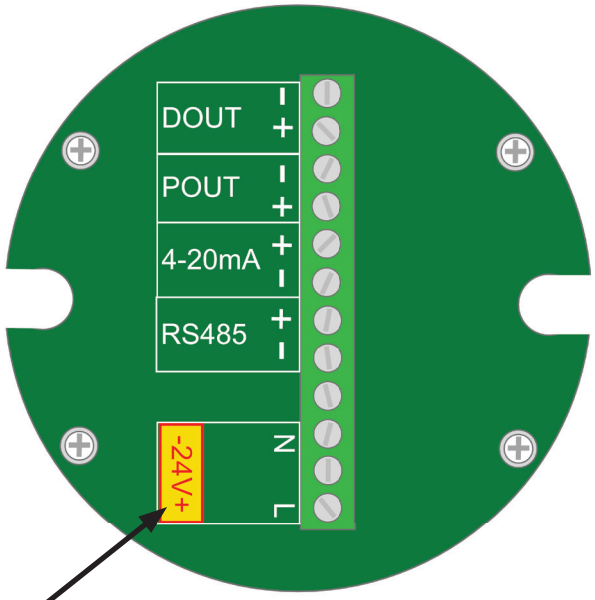


Fig.6.1 Compact-Type Terminal Diagram

NOTE: May be supplied as either 220VAC or 24VDC depending on customer order

6.2 Terminal Wiring and Marking (Remote Type)

TERMINAL BLOCKS	
Terminal	Description
LN+	Power Input
LN-	Power Input
F/P-	Pulse/Frequency Output Ground
F/P+	Pulse/Frequency Output Positive
DOA- (DO-)	Alarm Output Ground
DOA+ (DO+)	Alarm Output Ground
DOB-	Reservation
DOB+	Reservation
DIN-	Reservation
DIN+	Reservation
TRX+	Communication Input (RS485-A)
TRX-	Communication Input (RS485-B)
IOUT-(IO-)	Current Output Ground
IOUT+(IO+)	Current Output Positive
EXT+	Excitation Current Positive
EXT-	Excitation Current Negative
SIG+	Signal 1
SGND	Signal Ground
SIG-	Signal 2
DRS+	Excitation Shield Positive
MTDR	Excitation Shield Ground
DRS-	Excitation Shield Negative

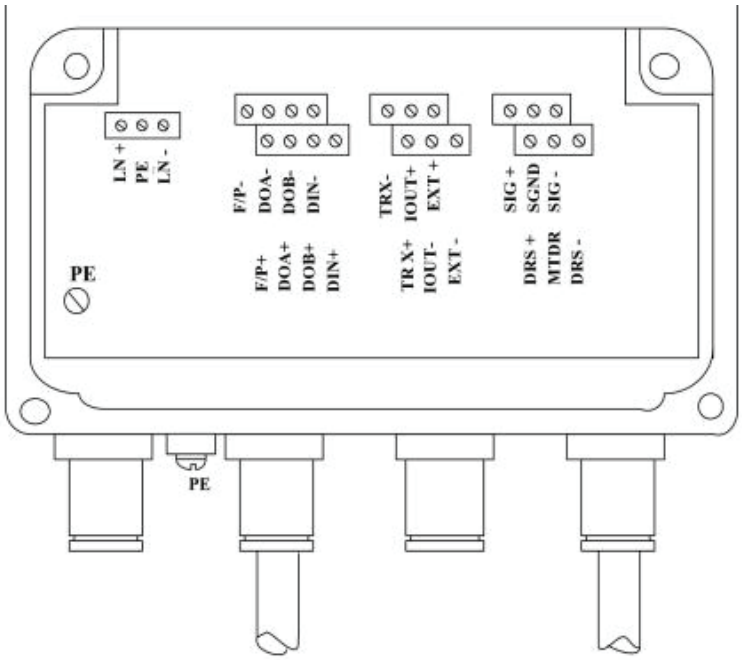


Fig.6.2 Remote-Type Terminal Diagram

6.3 Connection Wire and Cable Characteristics and Connection Requirements

6.3.1 Flow Signal Wire

This converter provides equipotential excitation shielding signal output voltage to reduce the influence of the distributed capacitance of the cable transmission on the current signal measurement. When the measured conductivity is less than μ or long-distance transmission, dual-core, dual-shielded signal cables with equipotential shielding can be used. For example, STT3200 dedicated cable or BTS type triple shielded signal cable.

6.3.2 Excitation Current Wire

The excitation current line adopts a two-core insulated rubber flexible cable, and the recommended model is RVVP2*0.3mm^2. The length of the excitation current line is the same as the length of the signal cable. When using STT3200 dedicated cable, the excitation cable and signal cable are combined into one.

6.3.3 Grounding Requirements for Converter Installation

The ground terminal of the converter housing should be connected to the earth with a grounding copper wire not less than 1.6mm^2. The grounding resistance from the converter case to the ground should be less than 10Ω.

First cut the Φ20 copper tube into a length of 1700mm (it can be lengthened as needed) to make ground nail buried 1500mm (NOTE: when burying the ground nail, sprinkle a layer of broken wood carbon at the tip of the ground nail, then pour salt water). Next, weld the 4mm^2 purple copper wire to the ground nail, and finally connect the ground wire to the sensor flange, ground ring, and pipe flange, as shown in Fig.6.3.

NOTE: Stainless Steel materials are required to fix the ground screw, spring washer, and flat washer.

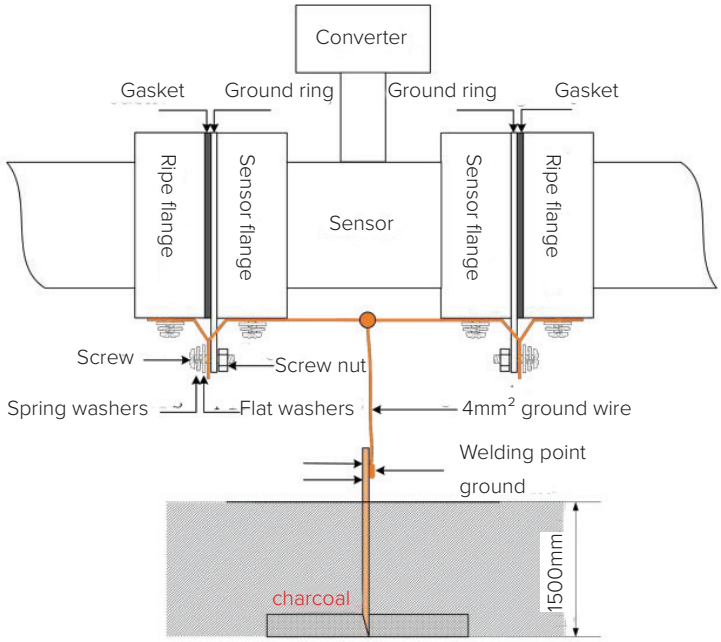


Fig.6.3 Converter grounding diagram

6.4 Output and Power Cord

All output and power cables are prepared by the user according to the actual situation. Please pay attention to meet the requirements of the load current. The external power supply and load for pulse, current and alarm output are shown in Figure 6.4.1 through 6.4.3. When using an inductive load, a freewheeling diode should be added as shown in the diagram.

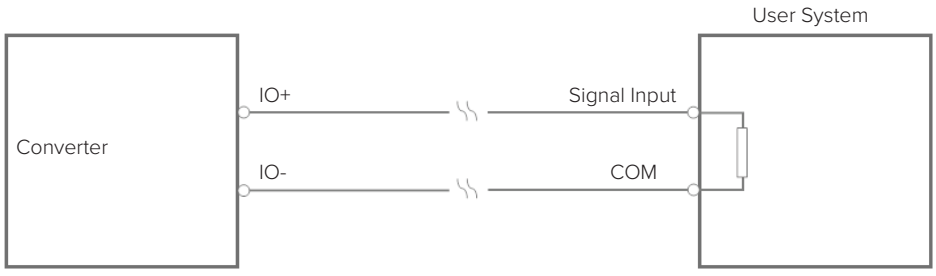


Fig.6.4.1 Power supply within 4-20mA (current and pulse are not isolated)

6.4.1 Pulse Output Wiring

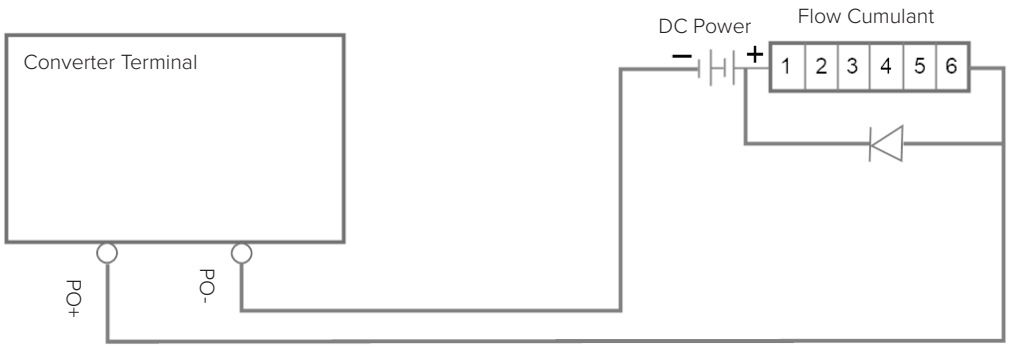


Fig.6.4.2a Power Supply connected to electronic counter (Compact Type)

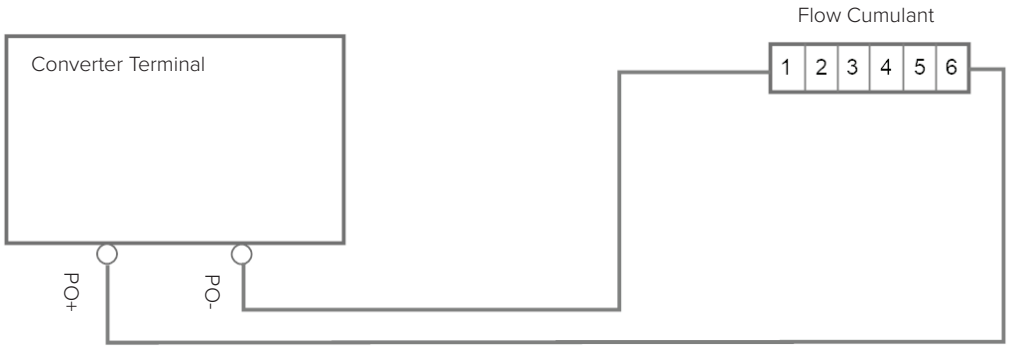


Fig.6.4.2b Inner Power Supply connected to electric counter (Compact Type)

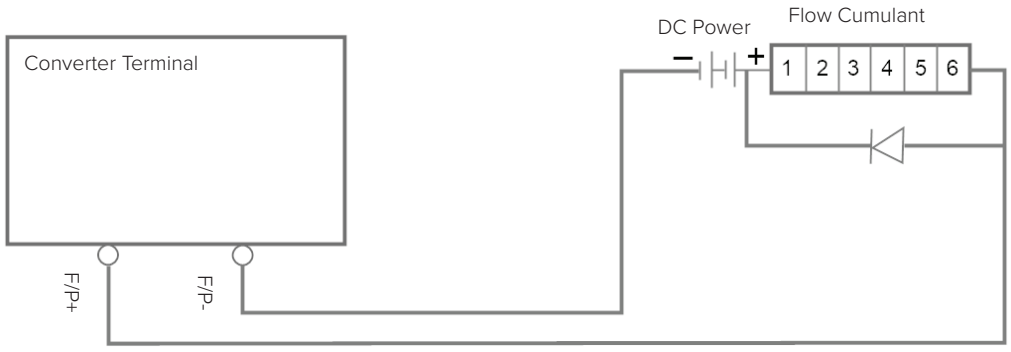


Fig.6.4.2c Power Supply connected to electronic counter (Remote Type)

6.4.3 Alarm Output Wiring

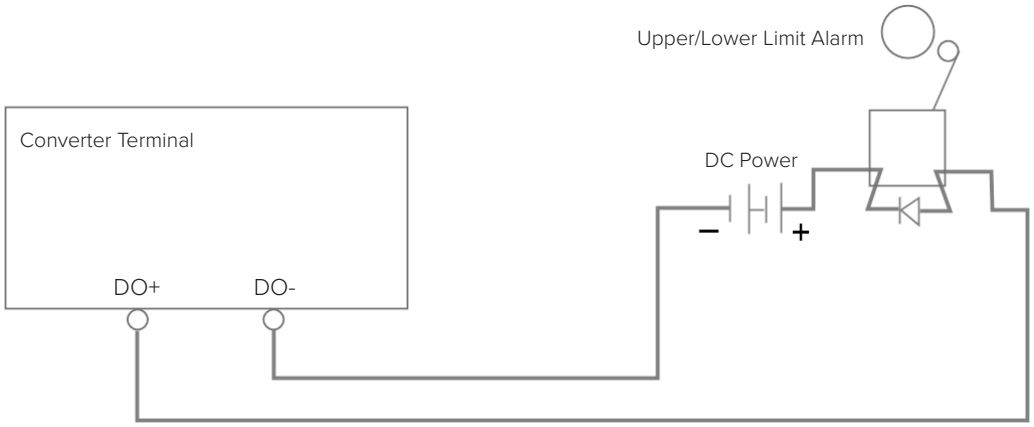


Fig.6.4.3 Alarm output wiring

6.4.4 Connection of OC Gate

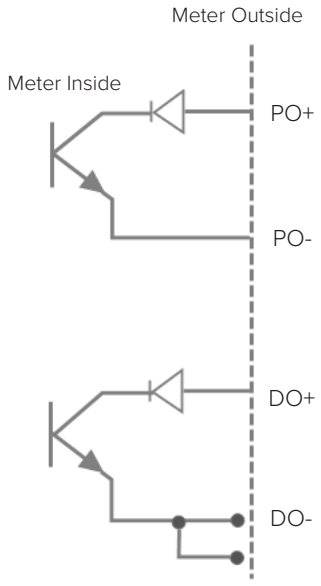


Fig.6.4.4 Connection of OC Gate (Compact-Type)

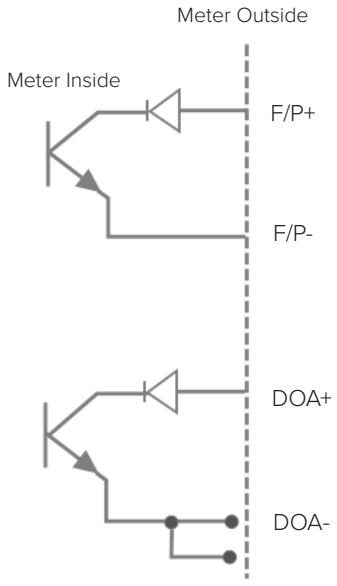


Fig.6.4.4 Connection of OC Gate (Remote-Type)

7.1 Flow Setup

7.1.1 Flow Units

Select the desired unit of measurement in the parameters. Choose from the following available options: L/s, L/m, L/h, m3/s, m3/m, m3/h, uk/s, uk/m, uk/h, us/s, us/m, us/h, kg/s, kg/m, kg/h, t/s, t/m, t/h. The user can select an appropriate flow display according to the process requirements or usage habits.

7.1.2 Flow Accumulation Unit

The converter display is a 9-digit counter, and the maximum allowable count value is 999999999. The total unit used is L, m3, ukg, usg, kg, t (liters, cubic meters, British gallons, US gallons, kilograms, tons). This unit is automatically set to be consistent with the flow unit. When the flow unit is L/h, L/m, L/s, the integration unit is L. When the flow unit is m^3/h, m^3/m, m^3/s, the integration unit is m^3. When the flow unit is uk/s, uk/m, uk/h, the integration unit is kg/s. When the flow unit is kg/s, kg/m, kg/h, the integration unit is kg. When the flow unit is t/s, t/m, t/h, the integration unit is t.

Flow Accumulation Equivalent: 0.001 L, 0.010 L, 0.100 L, 1.000 L
0.001m, 0.010 m, 0.100 m, 1.000 m^3
0.001 ukg, 0.010 ukg, 0.100 ukg, 1.000 ukg
0.001 usg, 0.010 usg, 0.100 usg, 1.000 usg
0.001kg, 0.010 kg, 0.100kg, 1.000kg
0.001t, 0.010t, 0.100t, 1.000t

7.1.3 Reverse Output Allow

When the reverse output permission parameter is set in the “prohibited” state, as long as the fluid flows, the converter will output pulses and currents according to the flow value, and the terminals DO+ and DO- output high levels.

When the reverse output allowable parameter is set to “Allow”, if the fluid flows in the reverse direction, the converter flow rate is displayed normally, the output pulse is “0”, the current output is signal “0” (4mA), the instantaneous flow rate is displayed as 0, and the terminal DO+ and DO- output high level.

When the reverse output allowable parameter is set to “allowed output”, if the fluid flows in the reverse direction, the converter flow rate is displayed normally, the output pulse is “0”, the current output is signal “0” (4mA), and the instantaneous flow rate is displayed as 0. Terminal DO+ and DO- output low level Vil.

7.1.4 Reverse Output Allow

The “Meter Measure Range” setting is used to determine the upper limit flow value. The lower limit flow value of the meter is automatically set to “0”.

Therefore, the meter range setting determines the meter measure range, and also determines the corresponding relationship between the meter percentage display, meter frequency output, meter current output and flow rate:

- Percentage display value of the meter = (measured flow value / measure range of the meter) * 100%;
- Instrument frequency output value = (measured flow value / measure range of the meter) * frequency full range value;
- Instrument current output value = (measured flow value / measure range of the meter) * current full-scale value + zero point;

The pulse output value of the instrument is not affected by the instrument measure range setting.

7.1.5 Measuring Damping Time

Filtering time, or long measurement damping time can improve the stability of the meter flow display and the stability of the output signal, which is suitable for the total accumulated pulsating flow measurement. The short measurement damping time represents a quick measurement response speed, which is suitable for production process control. The measurement damping time is divided into 1S, 2S, 3S, 4S, 6S, 8S, 10S, 15S, 30S, 60S, and can choose the setting mode.

7.1.6 Analog Output Damping

The current filtering time, or long analog output damping can improve the stability of the 4-20mA output signal. The short analog output damping is manifested in the fast measurement of the response speed of 4-20 mA. Analog output damping: 5S, 10S, 20S, 50S, 80S, 150S, 250S, and can choose the setting mode.

7.1.7 Peak Suppression Allow

For pulp, mud and other slurry flow measurement, solid particles in the fluid friction or impact measurement electrode, will cause a “peak pseudo-signal “. To overcome such pseudo-signal, the converter design has a peak suppression function. User set peak fluctuation flow value and peak width time. The converter will suppress the peak pseudo-signal in accordance with the set value to minimize the flow fluctuation.

The parameter “peak suppression permission” has two functions :1) the parameter is set to “allow” to start the peak suppression function. 2) the parameter is set to “Not-allowed “. Turn off the peak suppression function and turn on the noise sensitivity test.

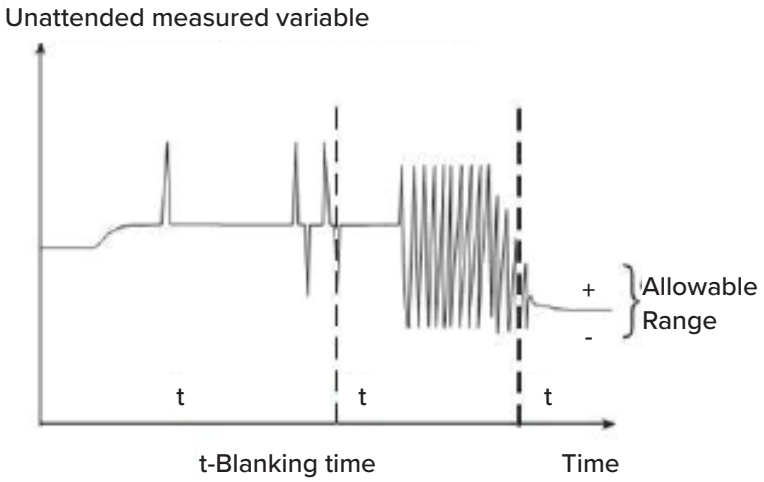
7.1.8 Peak Suppression Range

This parameter has two functions:

1. When the “peak suppression allowed” parameter is set to allow, the value confirms the peak suppression start value, which is used to set the velocity fluctuation value to suppress the peak pseudo signal. If the current velocity fluctuation is higher than the starting value, it is considered that the change is caused by the peak pseudo signal, and the system cuts and displays the **PSM** alarm. When the velocity fluctuation is lower than the initial value, it is considered that the change is caused by the real velocity change, and the system recognizes that the velocity change is measured.
2. When the “peak suppression allowed” parameter is set to forbidden, the value determines the sensitivity test for noise. If the “FST” display appears frequently, it is recommended to increase the peak suppression range.

7.1.9 Peak Suppression Time

This parameter selects the peak width time to suppress peak pseudo-signal. This is displayed in units of seconds.



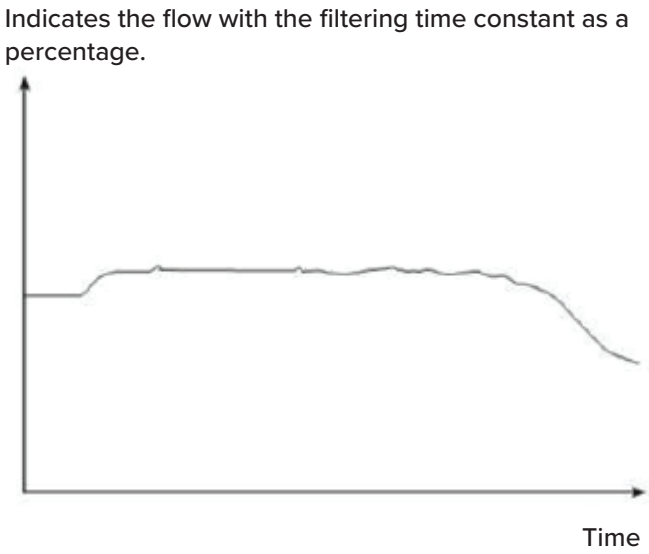


Fig.7.1.6 Eliminate gross error noise with peak suppression range technology

For abnormal conditions, such as bubbles in the water, in order to prevent the flow from returning to “zero”, the converter has an abnormal suppression function in the software and hardware. When the converter detects an abnormal condition, the converter will display an **ABN** abnormal alarm for abnormalities within a period of time. The flow rate is suppressed to prevent the flow rate from returning to “zero” and suppress flow fluctuations to a minimum. This parameter is used for the length of abnormal suppression time, which can be selected from 0 to 99s. When 0s is selected, this function will be canceled.

7.1.10 Flow Direction Options

If user believes that the fluid direction during commissioning is inconsistent with the design, the connection of the excitation wire or signal wire does not need to be changed. Simply adjust the flow direction setting within the parameters.

7.1.11 Signal Resection Allow

When the signal cut-off allowable parameter is set to “Allow” and the fluid flow rate is lower than the flow rate set by the small signal cut-off point, the converter’s instantaneous flow and flow rate display normally, the converter displays the small signal cut (CUT), and the output pulse is “0”. The current output signal is “0” (4mA), and terminals DO+ and DO- output high level.

When the signal cut-off allowable parameter is set to “prohibited” and the fluid flow rate is lower than the flow rate set by the small signal cut-off point, the converter flow rate is displayed normally, the converter displays the small signal cut (CUT), the output pulse is “0”, and the current output signal is “0” (4mA), the instantaneous flow rate is displayed as “0”, and terminals DO+ and DO- output high level.

When the signal cut-off allowable parameter is set to “Allowed output”, when the fluid flow rate is lower than the flow rate set by the small signal cut-off point, the converter’s instantaneous flow and flow rate display normal, the converter displays the small signal cut (CUT), and the output pulse is “ 0”, the current output signal is “0” (4mA), terminals DO+ and DO- output low level.

7.1.12 Small Signal Removal Point

The small signal resection point setting is expressed by flow rate. This parameter can be used with signal resection allow.

7.1.13 Fluid Density

The unit of this parameter is automatically selected. When the mass units kg/s, kg/m, kg/h, t/s, t/m, or t/h is selected in “Flow Unit”, this parameter is an available feature. The density unit is automatically set to kg/L when the flow unit is set to kg/s, kg/m, or kg/h. The density unit is automatically set to t/m^3 when the flow unit is set to t/s, t/m, or t/h.

7.1.14 Flow Zero Point Correction

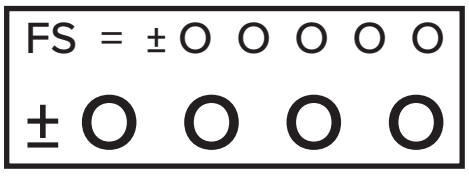
When correcting the zero point, make sure that the sensor tube is filled with fluid and the fluid is in a static state. The zero point of flow quantity is expressed in terms of flow speed, in mm/s. The zero-point correction of the converter flow is displayed as follows:

The converter flow zero correction shows the following:

The upper row small characters display: FS represents the zero-point measurement value of the meter; The second-row large characters display: flow rate zero correction value.

When the FS display is not “0”, the correction value should be adjusted so that FS=0. **NOTE:** If the downstream correction value is changed, the FS value will increase. Need to change the positive and negative signs of the downstream value so that FS can be corrected to zero.

The correction value of the flow zero point is the matching constant value of the sensor, which should be recorded in the record sheet of the sensor and the sensor label. When recording, the sensor zero value is the flow velocity value in mm/s, and its signs is opposite to the sign of the correction value.



7.1.15 Meter Factor

The Meter Factor parameter is a value used to ensure all FM750 mag meters can interchange by 0.1%.

WARNING: This parameter has been preprogrammed into your FM750 mag meter and should not be adjusted. Altering this value will effect the accuracy of the flow reading of your meter.

7.1.16 Total Flow Reset Password

Users can set the password with a password above the third level; and then set the password within the total flow reset (see Appendix II of this manual for information relating to password settings).

7.2 Alarm Setup

7.2.1 Upper LImit Alarm Allow

When the upper limit alarm permission parameter is set to “prohibited”, the upper limit alarm function is cancelled. When the upper limit alarm allowable parameter is set to “allow”, if the fluid flow reaches the upper limit alarm value, the converter displays the upper limit alarm (HIG), and the terminals DO+ and DO- output high levels. When the upper limit alarm allowable parameter is set to “allow output”, if the fluid flow reaches the upper limit alarm value, the converter displays the upper limit alarm (HIG), and the terminals DO+ and DO- output low level.

7.2.2 Upper Limit Alarm Value

The upper limit alarm value is calculated based on the flow rate. This parameter adopts a numerical setting method. User sets an appropriate flow rate value in this parameter. When the instantaneous flow rate during the operation of the instrument is higher than this value, it will output and display the corresponding upper limit alarm parameters.

7.2.3 Lower Limit Alarm

Same as Upper Limit Alarm.

7.2.4 Excitation Alarm

When the excitation alarm parameter is set to “prohibited”, the excitation alarm function is canceled.

When the excitation alarm parameter is set to “allow”, if the excitation coil fails, the converter displays **SYS**, and the terminals DO+ and DO- output high levels.

When the excitation alarm parameter is set to “allow output” , if the excitation coil fails, the converter displays **SYS**, and terminals DO+ and DO- output low levels.

7.2.5 Empty Pipe Alarm Allowed

FM750 has an empty tube detection function which requires no additional electrodes. If the user selects the empty pipe alarm permission parameter as “prohibited”, the empty pipe alarm function will be canceled.

If the user selects the empty pipe alarm allow parameter to “allow”, the empty pipe alarm function is provided. When the fluid in the pipeline is lower than the measuring electrode, the meter can detect an empty pipe situation, the converter displays MTP, and the output pulse is “0”, the current output is the signal “0” (4mA), the instantaneous flow and flow rate are displayed as 0, and the terminals DO+ and DO- output high levels.

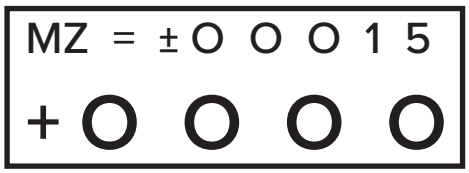
If user selects the empty pipe alarm allow parameter as “Allow Output”, with empty pipe alarm function, when the fluid in the pipeline is lower than the measuring electrode, the meter can detect an empty pipe situation, the converter displays MTP, and the output pulse is “0”, the current output is signal “0” (4mA), the instantaneous flow and flow rate are displayed as 0, and the terminals DO+ and DO- output low level.

7.2.6 Empty Pipe Alarm Threshold

In the case of fluid filled pipe (with or without flow rate), the upper line of the empty pipe alarm threshold parameter displays the measured conductivity, and the lower line sets the empty pipe alarm threshold. When setting the empty pipe alarm threshold, it can be carried out according to the measured conductivity. Set it to 3 to 5 times the measured conductivity.

7.2.7 Empty Pipe Zero Point Correction

When the on-site full pipe value is large, the user can perform the empty pipe zero-point correction. Make sure that the sensor tube is filled with fluid during the empty pipe zero-point correction. The display should appear as follows:

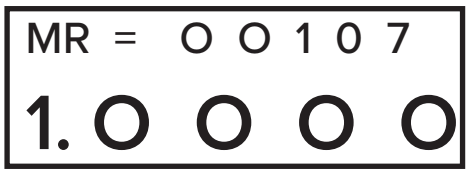


- Upper-row display: MZ stands for the measured value of the empty pipe.
- Second-row display: Empty pipe zero-point correction value.

First, according to the measured conductivity MT value, adjust the correction value so that MZ = about 5-10 (NOTE: if the user increases the downlink correction value, the MZ value will decrease).

7.2.8 Empty Pipe Flow Range Correction

When the MT value of the empty tube conductivity measured by the meter is too small, user can correct the empty tube range. When correcting the empty tube range, make sure that there is no fluid in the sensor tube. The empty tube range correction display is as follows.



- Upper-row display: MZ stands for the measured value of the empty pipe.
- Second-row display: Empty pipe zero-point correction value.

When increasing the down row correction value, the MR value increases, and when decreasing the downlink correction value, the MR value decreases. User can adjust MR to an appropriate value according to actual needs (it is recommended to adjust to MR=500), and the conductivity value of the actual empty tube is basically the actual corrected MR value.

7.2.9 Damping Time of Empty Pipe

Long empty pipe damping time, slow response speed of empty pipe alarm. Short measurement damping time empty pipe alarm response speed is faster, and the empty pipe damping time: 10 SEC, 15 SEC, 20 SEC, 25 SEC, 30 SEC, 35 SEC, 40 SEC, 45 SEC, 50 SEC, 60 SEC and can choose the setting mode.

7.3 Output Setup

7.3.1 Pulse Output Mode

The pulse output mode has two options: frequency output and pulse output:

PO frequency output mode: The frequency output is a continuous square wave, and the frequency value corresponds to the flow percentage.

Frequency output value = (measurement value of flow value / instrument flow range) * frequency range + frequency lower limit.

Pulse output mode: The pulse output is a rectangular wave pulse train. Each pulse represents a flow equivalent in the pipeline. The pulse equivalent is set by the following two parameters “Pulse Equivalent Unit” and “Pulse Equivalent”. The pulse output method is mostly used for total accumulation, and is generally connected with an accumulation meter.

There are two types of pulse output: PO pulse output, DO pulse output:

PO pulse output: this mode is if active pulse.

DO pulse output: This mode is passive pulse output, isolated from 4-20mA output ground, and the upper limit of pulse output is 500P/S (When this mode is selected, the alarm is only displayed and not output).

Frequency and pulse output are generally in the form of OC Gate; therefore, an external DC power supply and load should be connected. See sections 9.14 for details.

7.3.2 Pulse Equivalent

Pulse equivalent refers to the flow value represented by one pulse. The pulse equivalent of the instrument needs to be set by the two parameters of “Pulse Equivalent Unit” and “Pulse Equivalent”. The range is 0.001 - 59.999m^3, 0.001 - 59.999L, 0.001 - 59.999ukg, 0.001 -59.999usg, 0.001 - 59.999kg, 0.001 - 59.999t.

Under the same flow rate, if the pulse equivalent is small, the output pulse frequency is high and the accumulated flow error is small.

7.3.4 Pulse Width

Pulse output is active low, pulse width 0.5 - 1999ms

Pulse Width - Maximum Output Pulse Number Correspondence (Table 2)		
Serial Number	Pulse Width (ms)	Maximum Output Pulse per hour (p/h)
1	0.5	3600000
1	1	180000
2	5	360000
3	10	180000
4	50	36000
5	100	18000
6	500	3600
7	999	1800
8	9999	180

7.3.5 Frequency Output Lower Limit

The frequency output range of the meter corresponds to the zero point of flow measurement.

7.3.6 Frequency Output Range

The frequency output range of the meter corresponds to the upper limit of flow measurement.

7.3.7 Current Output Mode

Currently, user can only select 4-20mA current output.

7.3.8 Current Zero Correction

Before leaving the factory, the converter current output zero adjustment makes the current output accurate as 4mA.

7.3.9 Current Full Scale Correction

Before leaving the factory, the converter current output full scale adjustment makes the current output accurate as 20mA.

7.3.10 Output Current Test

After adjusting the zero and full-scale current outputs, the user can test the output current linearity of the converter with this parameter. Users can set up 0, 20.00, 50.00, 70.00, 99.99 to check the linearity of output current.

7.4 Sensor Setup

7.4.1 Sensor Sizes / Pipe Diameters

FM750 electromagnetic flow meter converter matching sensor diameter range: 0.5” - 120” / DN15 - DN3000:

- 0.5”, 0.75”, 1”, 1.25”, 1.5”, 2”, 2.5”, 3”, 4”, 5”, 6”, 8”, 10”, 12”, 14”, 16”, 18”, 20”, 24”, 28”, 32”, 36”, 40”, 44”, 48”, 52”, 56”, 60”, 64”, 68”, 72”, 76”, 80”, 88”, 92”, 96”, 100”, 104”, 108”, 112”, 116”, 120”
- DN15, DN20, DN25, DN32, DN40, DN50, DN65, DN80, DN100, DN150, DN200, DN250, DN300, DN350, DN400, DN450, DN500, DN600, DN700. DN800, DN900, DN1000, DN1100, DN1200, DN1300, DN1400, DN1500, DN1600, DN1700, DN1800, DN1900, DN2000, DN2100, DN2200, DN2300, DN2400, DN2500, DN2600, DN2700, DN2800, DN2900, DN3000

7.4.2 Excitation Frequency Selection

The FM750 converter provides 6 modes of excitation frequency selection (the default setting of the instrument is a 50Hz power supply mode, excitation frequency 6.25Hz). However, the user can choose from the following according to the actual situation:

- 50Hz power supply mode: 3.125Hz, 4.167Hz, 6.250Hz;
- 60Hz power supply mode: 1.667Hz, 2.500Hz, 5.000Hz;

Small diameter sensor excitation system has a small inductance and high excitation frequency. Large diameter sensor excitation system has large inductance; users can only choose low excitation frequency. During use process, first select the low excitation frequency. If the zero point of the flow velocity of the meter is too high, then select the low excitation frequency in turn. NOTE: The meter must be capable of operating in the excitation frequency setting to which the unit has been calibrated. If high frequency excitation is used, please order a high frequency excitation converter and select the appropriate excitation frequency value according to this principle.

7.4.3 Sensor Factor

The Sensor Factor is the electromagnetic flow meter calibration factor. This factor is obtained from the actual calibration of the meter, and is stenciled onto the sensor plate. Users can input this factor into the FM750 converter parameter table.

WARNING: This parameter has been preprogrammed into your FM750 mag meter and should not be adjusted. Altering this value will effect the accuracy of the flow reading of your meter.

7.4.4 Flow Rate Correction

See Appendix I for details.

7.4.5 Sensor Code

The sensor code can be used to mark the factory time and number of the matching sensor to coordinate with the setting of the sensor coefficient.

7.5 Communication Setup

7.5.1 Instrument Communication Mode

The instrument provides three (3) communication modes: MODBUS, current loop communication, and PROFIBUS. The corresponding communication mode should be set when the instrument is equipped with different communication modes.

7.5.2 Instrument Communication Address

It means communication address of this meter when data communication, optional range:

- address 01 - 250, address 0 is reserved

7.5.3 Instrument Communication Speed

Instrument communication baud rate selection range: 300, 600, 1200, 2400, 4800, 9600, 19200, 38400.

7.5.4 Instrument Calibration Mode

The standard configuration of the converter is standard MODBUS communication. One stop bit 8-bit no parity mode, users can choose one stop bit 8-bit odd parity, one stop bit 8-bit even parity mode, and two stop bits 8-bit no parity mode, two stop bits 8-bit odd parity, and two stop bits 8-bit odd parity.

7.6 Parameter Modification Tag

7.6.1 User Password 1 - 4

Using the level 5 password allows the user to modify the passwords for all levels. Please contact your local representative or H2flow Controls in order to obtain this password.

7.6.2 Instrument Codes 1 and 2

The converter code records the time and serial number of the converter.

7.6.3 Positive Total High & Low

The total high and low setting can change the value of the forward cumulative total and the reverse cumulative total, which is mainly used for instrument maintenance and instrument replacement.

User uses a 5-level password to enter, and can modify the positive cumulative amount (Σ+). Generally, the cumulative amount cannot exceed the maximum value (999999999) counted by the counter.

7.6.4 Reverse Total High & Low

User uses a 5-level password to enter, and can modify the reverse cumulative amount (Σ-). Generally, the cumulative amount cannot exceed the maximum value (999999999) counted by the counter.

Keyboard Definition and LCD Display (Compact Type)

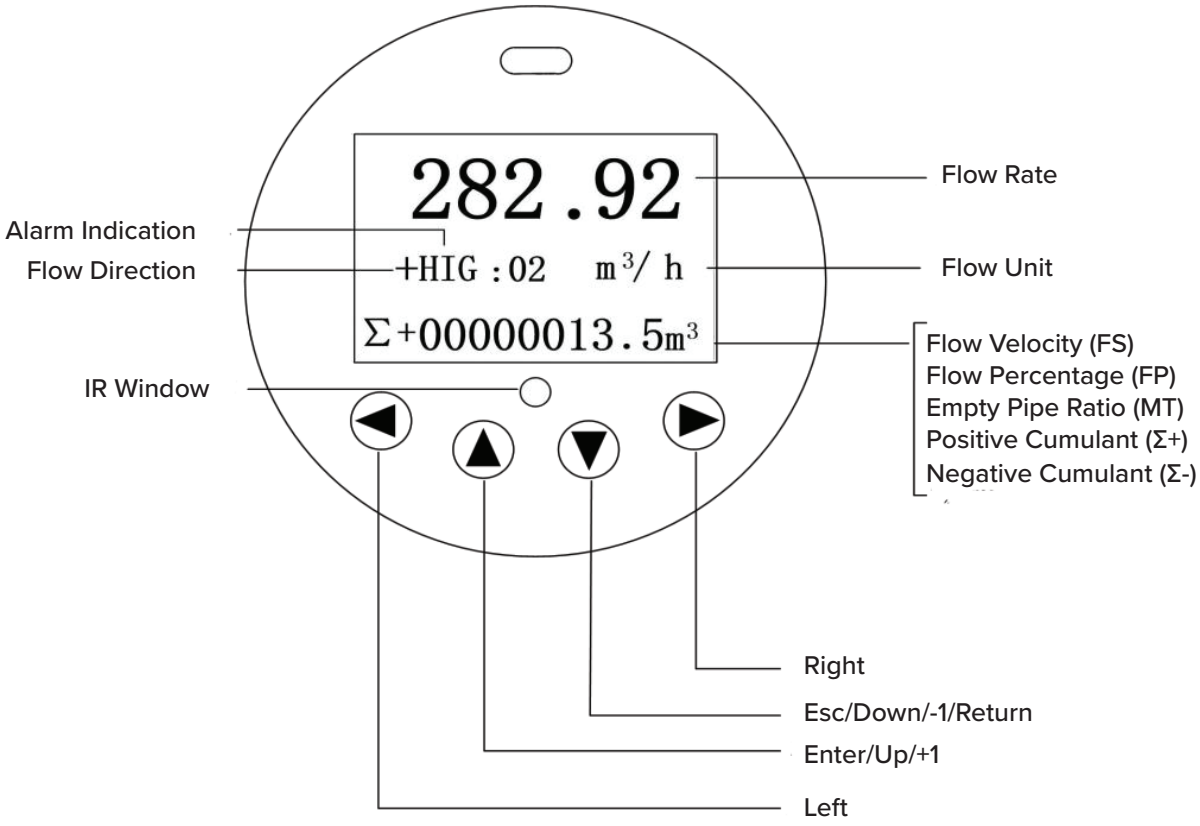


Fig.8.0a Compact-Type Display

When the instrument is powered on, it automatically enters the measurement state. In the automatic measurement state, the instrument automatically completes each measurement function and displays the corresponding measurement data. To set or modify the instrument parameters, the instrument must enter the parameter setting state from the measurement state. In the parameter setting state, user uses the panel keys to complete the instrument parameter setting.

8.1 Key Function and Remote Control Function (Compact Type)

8.1.1 Key Function in Automatic Measurement State

Down button: Cyclically select the content displayed on the bottom of the screen;

Right button: Press the right button once, the instrument will enter the password screen, and enter the parameter setting state after typing the password.

8.1.2 Function of Each Button in Parameter Setting State

Down button: subtract 1 from the number at the cursor, advance to the next page/screen;

Up button: add 1 to the number at the cursor, return to the previous page/screen;

Right button: move the cursor clockwise;

Left button: move the cursor counterclockwise

Keyboard Definition and LCD Display (Remote Type)

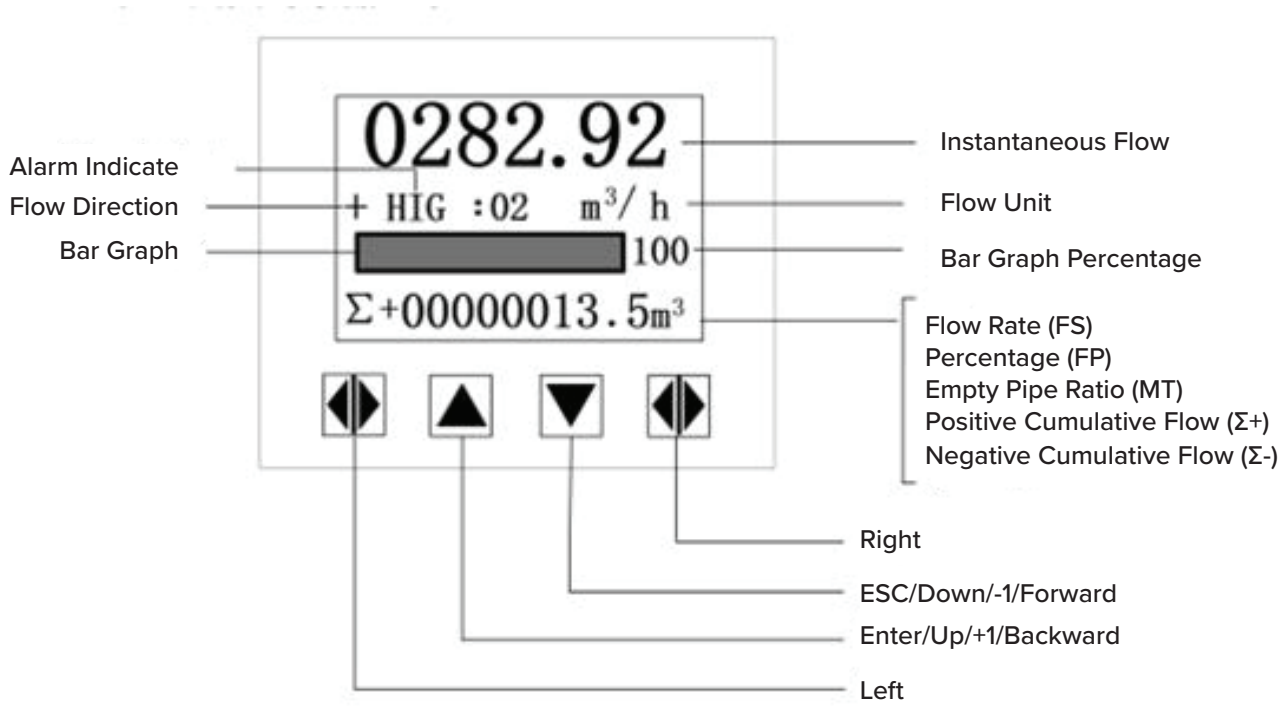


Fig.8.0b Remote-Type Display

When the instrument is powered on, it automatically enters the measurement state. In the automatic measurement state, the instrument automatically completes each measurement function and displays the corresponding measurement data. To set or modify the instrument parameters, the instrument must enter the parameter setting state from the measurement state. In the parameter setting state, user uses the panel keys to complete the instrument parameter setting.

8.2 Key Function and Remote Control Function (Remote Type)

8.2.1 Key Function in Automatic Measurement State

Down button: Cyclically select the content displayed on the bottom of the screen;

Right button: Press the right button once, the instrument will enter the password screen, and enter the parameter setting state after typing the password.

8.2.2 Function of Each Button in Parameter Setting State

Down button: subtract 1 from the number at the cursor, advance to the next page/screen;

Up button: add 1 to the number at the cursor, return to the previous page/screen;

Press the Right button to move the cursor clockwise, and press the Left button to move the cursor counterclockwise;

When the cursor moves below the Down button, press the button to return to the previous menu.

When the cursor moves below the up button, press the up button to enter the submenu. When the cursor moves below the down button, press the down button to return to the previous menu.

8.1.3 Remote Control Operation

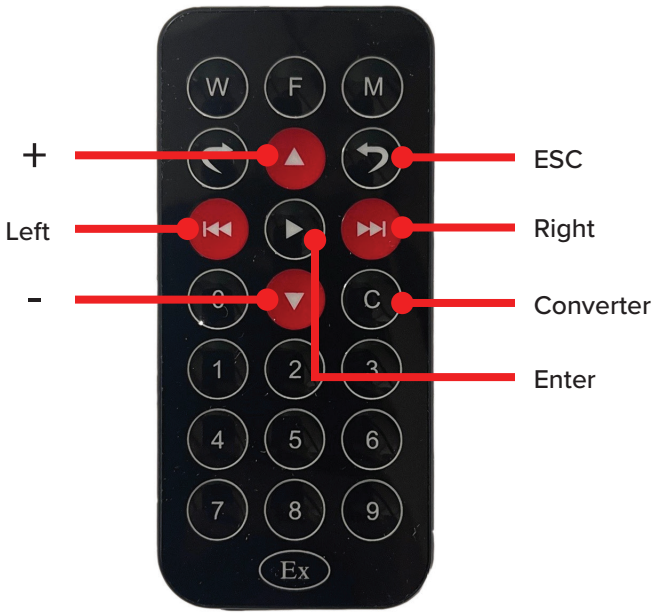


Fig.8.1.3 Definition and operation of infrared remote control buttons

Enter key: (Measurement state) Press this key instrument to enter password screen, type in password can enter parameter setting state; press this key to enter all levels menu when set the parameter;
Return key: return to the previous menu when set the parameter;
Left key: Measurement state contrast dim, parameter setting state cursor left shift;
Right key: Measurement state contrast gradually bright, parameter setting state cursor right shift;
Add Key (+): measure state, loop display screen downlink content, parameter setting state cursor number plus 1, back page;
Minus Key (-): parameter setting state cursor number minus 1, forward page;
Digits key: cursor digital input.

NOTE: The Infrared remote control requires a 3V type: CR2025 battery for operation. This item is not supplied with the purchase of the remote control.

8.3 Function Selection Screen and Parameter Setting Operation

Parameter Number	Functional Content	Description
1	Parameter Settings	Select this function to enter the parameter setting screen
2	Total Reset	Select this function to reset the total amount of the meter

Table 8

8.2.1 Parameter Settings

Press the “right shift key”, the instrument enters the state of entering the password “00000”, after typing the password, move the cursor under the “enter key”, press the “enter key”, the function selection screen “parameter setting” appears, and then press the shift key again to move the cursor under the “enter key”, press the “enter key” once to enter the main menu for parameter setting.

8.2.2 Total Reset

Press the “right shift button”. The meter enters the state of entering the password “00000”, after typing the corresponding password, move the cursor under the “enter button”, press the “enter button”. The function selection screen “parameter setting” appears, and then press the “up button” or “down button” to turn the page to “total reset”. Enter the total reset password (this password needs to be set in the parameter menu “total reset password”). Press the “shift button” to move the cursor under the “enter button”, an press the “enter button”. When the total reset password automatically becomes “00000”, the reset function of the meter is completed, and the total amount inside the meter is 0.

9. product performance and indicators

9.1 Basic Functions

Low frequency square wave excitation and high frequency excitation are optional:

50Hz power supply mode: 3.125Hz, 4.167Hz, 6.250Hz
60Hz power supply mode: 1.667Hz, 2.500Hz, 5.000Hz

- Excitation current is 125mA (must be selected for high frequency excitation), 187mA, and 250mA;
- Empty pipe measurement function without additional electrodes, continuous measurement, fixed value alarm;
- Velocity measurement range: 0.1 - 15 m/s, velocity resolution: 0.5 mm/s;
- AC high frequency switching power supply, voltage applicable range: 85VAC - 250VAC
- 24VDC switching power supply, voltage application range: 20VDC - 36VDC;
- Network function (optional): MODBUS, Current loop communication, GPRS, PROFIBUS
- English, Chinese display mode (can customize other languages)
- There are two totalizer totals which can record separately: forward total and reverse total

9.2 Special Functions

Infrared remote-control operation keyboard, long-distance non-contact operation of all functions of the converter.

9.3 Normal Working Conditions

Ambient Temperature:	Split Type +14 - +140°F (-10 - +60°C)
Humidity:	5% - 90%
Power Supply:	Single-Phase AC85 - 250VAC, 45 - 63Hz
Power Dissipation:	less than 20W (after connecting the sensor)

9.4 Connection Method with Sensor

Integrated round case: round case, the case is directly connected to the sensor flange.

9.5 Sensor Matching Requirements

Sensor signal sensitivity: at a flow rate of 1 m/s, the sensor outputs 150μV - 200μV;

For the FaraMag FM750 electromagnetic flow meter converter, four (4) 62.5mA currents are used in the excitation circuit to form 250mA. Each 62.5mA current is controlled by a 20Ω precision resistor. Therefore, the user can choose a different magnitude of the excitation current by changing the number of precision resistors.

The converter is set to 250mA current when it leaves the factory. Similarly, if there are three (3) precision resistors, it corresponds to 187.5mA; and if it has two (2) precision resistors, it corresponds to 125mA.

Sensor excitation coil resistance: 250mA excitation current: 50 - 60Ω
187mA excitation current: 60 - 80Ω
125mA excitation current: 100 - 120Ω

9.6 Installation Dimension Drawing

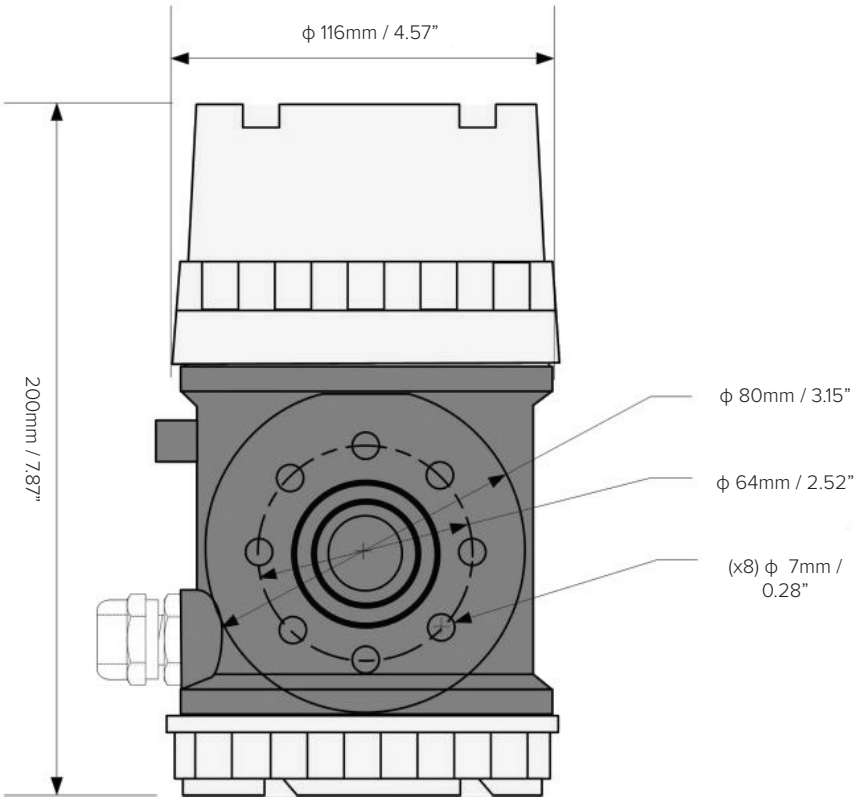


Figure 9.6a: FM750 Compact Type Shell Dimensions

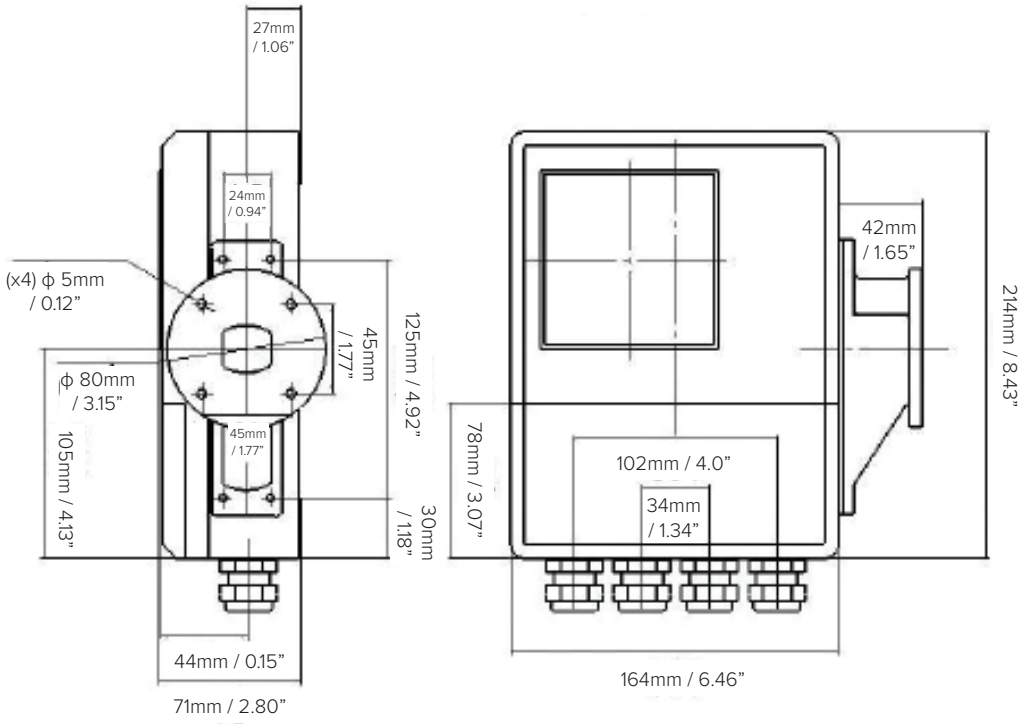


Figure 9.6b: FM750 Square Integrated Shell Dimensions

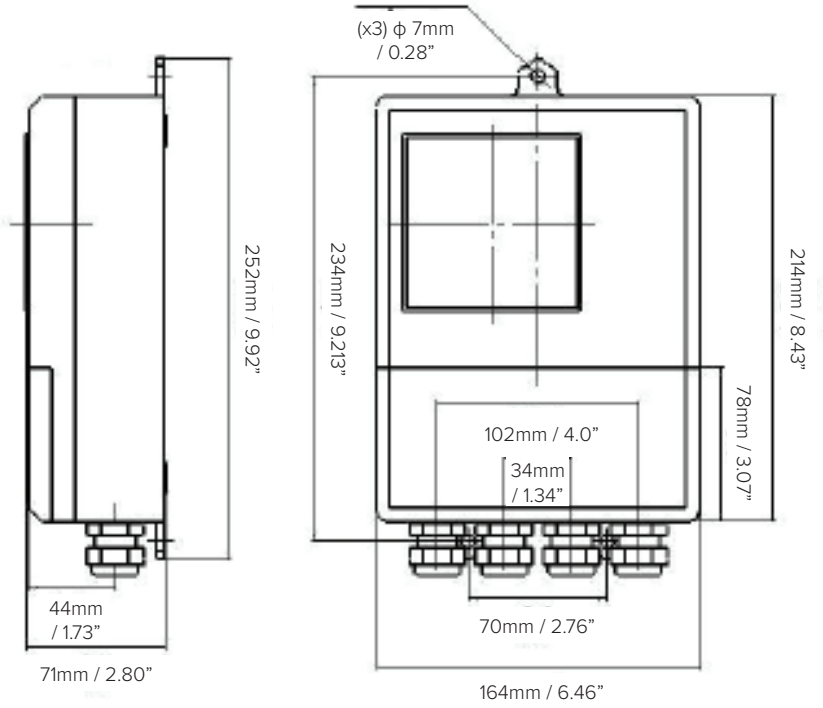


Figure 9.6c: FM750 Square Split Type Shell Dimensions

9.7 Measuring Accuracy

Diameter Inches (DN)	Range GPM / m/s	Accuracy
0.5 - 0.75” (DN15 - DN20)	< 4,755 GPM; (< 0.3 m/s)	±0.25% FS
	4,755 - 15,850 GPM; (0.3 - 1 m/s)	±1.0% R
	15,850 - 237,754 GPM; (1 - 15 m/s)	±0.5% R
1” - 24” (DN25 - DN600)	< 4,755 GPM; (< 0.3 m/s)	±0.25% FS
	4,755 - 15,850 GPM; (0.3 - 1 m/s)	±0.5% R
	15,850 - 237,754 GPM; (1 - 15 m/s)	±0.3% R
28” - 120” (DN700 - DN3000)	< 4,755 GPM; (< 0.3 m/s)	±0.25% FS
	4,755 - 15,850 GPM; (0.3 - 1 m/s)	±1.0% R
	15,850 - 237,754 GPM; (1 - 15 m/s)	±0.5% R

% FS: Relative Range
% R: Relative Measurement

9.8 Analog Current Output

Load Resistance:	0 - 750Ω
Basic Error:	0.1 ±10μA

9.9 Digital Frequency Output

Frequency Output Range:	1 - 500Hz
Output Electrical Isolation:	Photoelectric Isolation. Isolation Voltage: >1000VDC
Frequency Output Drive:	Field effect tube output, highest withstandable voltage: 36VDC
Maximum load current:	250mA

9.10 Digital Pulse Output

Output pulse equivalent:	0.001 - 59.999 m^3 / cp, 0.001 - 59.999Ltr / cp; 0.001 - 59.999 ukg / cp; 0.001 - 59.999 usg / cp; 0.001 - 59.999 kg / cp; 0.001 - 59.999 t / cp
Output pulse width:	0.5 - 1999ms adjustable
Output electrical isolation:	photoelectric isolation, isolation voltage: >1000VDC
Pulse output drive:	field effect tube output, the highest withstandable voltage: 36VDC
Maximum load current:	250mA

9.11 Alarm Output

Alarm output contact: DO+. The common output point of an upper limit alarm and a lower limit alarm; when there is an alarm and the output is allowed, the low level is an output between DO+ and DO- and high level when there is no alarm or allowed.

Output electrical isolation: photoelectric isolation. Isolation voltage: >1000VDC. Alarm output drive: Darlington tube output, the maximum withstandable voltage is 36VDC, and the maximum load current is 250mA.

9.12 Digital Communication Interface and Communication Protocol

MODBUS interface: RTU format, physical interface RS485, electrical isolation 1000V; current loop communication interface: support standard current loop communication protocol, configure current loop communication handheld device, can display the measure value online, and modify the instrument parameters.

9.13 Electrical Isolation

- The insulation voltage between analog input and analog output is not less than 500V;
- The insulation voltage between analog input and alarm power supply is not less than 500V;
- The insulation voltage between analog input and AC power supply is not less than 500V;
- The insulation voltage between analog output and AC power supply is not less than 500V;
- The insulation voltage between the analog output and the ground is not less than 500V;
- The insulation voltage between pulse output and AC power supply is not less than 500V;
- The insulation voltage between the pulse output and the earth is not less than 500V;
- The insulation voltage between the alarm output and the AC power supply is not less than 500V;
- The insulation voltage between the alarm output and the earth is not less than 500V.

9.14 Digital Output and Calculation

Digital output refers to frequency output and pulse output. The frequency output and pulse output use the same output use the same output point on the wiring. Therefore, the use cannot select the frequency output and the pulse output at the same time, but can only choose one of them.

9.14.1 Frequency Output

The range of frequency output is 0 - 5000Hz, and the frequency output corresponds to the percentage of flow.

$$F = \frac{\text{Measurements}}{\text{Full Scale Value}} \bullet \text{Output Range} + \text{Output Lower Limit}$$

The frequency output range is adjustable. Users can choose from 0 - 5000Hz, or a lower frequency, 200 - 1000Hz, etc.

The frequency output mode is generally used for control applications, because it reflects the percentage of flow. If the user uses it for metering applications, the pulse output mode should be selected.

9.14.2 Pulse Output Mode

The pulse output method is mainly used in the measurement method. It outputs a pulse, which represents and equivalent amount of fluid flowing through the pipeline, such as a pulse representing 1L or $1m^3$.

The pulse equivalent can be set to 0.001 - 59.999. When selecting the pulse equivalent, the user should pay attention to the matching of the flow rate range of the flowmeter and the pulse equivalent. For volume flow, the calculation formula is as follows:

Example: $Q_L = 0.0007854 \times D^2 \times V$ (L/S)

$Q_M = 0.0007854 \times D^2 \times V \times 10^{-3}$ (m^3/s)

Here: D- diameter (mm); V- velocity (m^3/s)

If the pipeline flow is too large and the pulse equivalent is selected too small, it will cause the pulse output to exceed the upper limit. Therefore, the pulse output frequency should be limited below 500Hz (when the pulse width is 1ms). If the pipeline flow is small and the pulse equivalent is selected too large, it will take a long time for the instrument to output a pulse. For specific settings, please refer to the “Pulse Width—Maximum Output Pulse Number Correspondence Table”

In addition, it must be noted that the pulse output is different from the frequency output. The pulse output can output one pulse after accumulating one pulse equivalent. Therefore, the pulse output is not very uniform. Generally, counter instruments should be used to measure pulse output, not frequency meters.

9.14.3 Digital Output Wiring

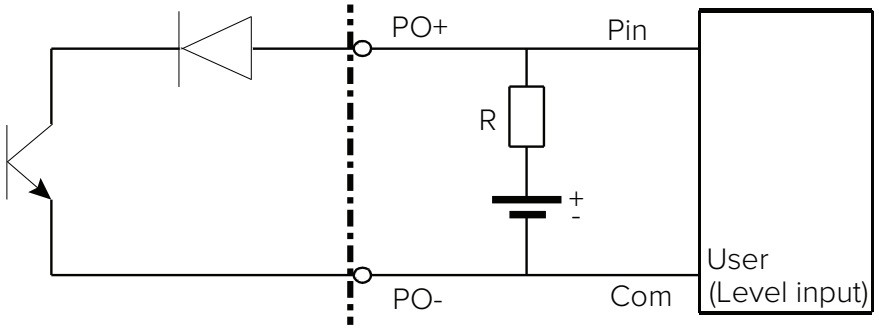
The digital output has two contacts: digital output contact and digital ground contact. The symbols are as follows:

PO+ ---------- Digital Output Contacts;

PO- ---------- Digital Ground Wire Contacts;

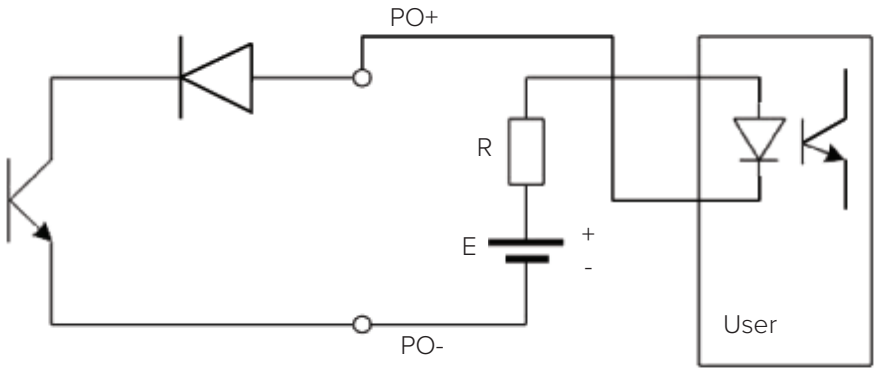
The digital output is an open collector output, the user can refer to the following circuit when wiring:

9.14.4 Digital Level Output Connection



Inner Side of Converter

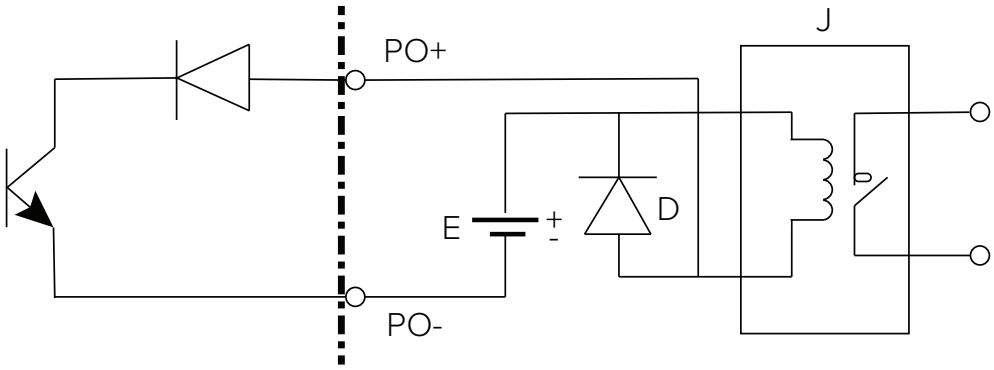
9.14.5 Digital Output Connected to Photocoupler (e.g. PLC)



Inner Side of Converter

Generally, the user optocoupler needs about 10mA current, therefore, E/R = about 10mA. E = 5 - 24V.

9.14.6 Digital Output Relay



Inner Side of Converter

Generally, the E required by the intermediate relay is 12V or 24V. D is a freewheeling diode, and most intermediate relays currently have this diode. If the intermediate relay does not contain this diode, the user should connect one externally.

Refer to the below Digital Output Parameter Table:

POUT Parameters	
Parameters	Test Conditions
Working Voltage	IC = 100mA
Working Current	Vol ≤ 1.4
Working Frequency	IC = 100mA Vcc = 24V
High Level	IC = 100mA
Low Level	IC = 100mA

9.15 Analog Output and Calculation

9.15.1 Analog Output

The analog output refers to the 4-20mA signal system.

The analog current output is internallyo supplied with 24V and can drive a load resistance of 750Ω.

The analog quantity current output corresponds to the percentage of the flow, i.e.,:

IO = Measured Value / Full Scale Value * Current Range + Current Zero Point

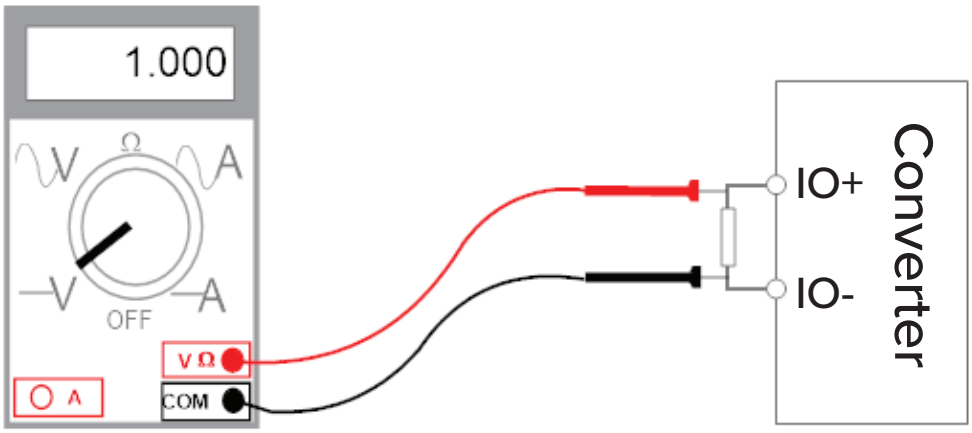
For the 4-20mA signal system, the current zero point is 4mA.

Therefore, in order to improve the resolution of the output analog current, the user should select the flow meter's range appropriately.

When the flow meter leaves the factory, the manufacturer has calibrated the parameters of the analog output. Under normal circumstances, no further adjustments are required by the user. If an abnormal situation occurs and the user needs to calibrate the analog output, the following operating procedures can be followed.

9.15.2 Analog Output Adjustment

1. Instrument adjustment preparation:
   - Turn on the instrument for 15 minutes to make the inside of the instrument thermally stable.
   - Prepare a 0.1% grade ammeter, or 250Ω resistance and 0.1% voltmeter, and connect them as shown in the figure below:



2. Current Zero-Point Correction:
   - Set the converter to the parameter setting state.
   - Select “current zero-point correction” and hit enter.
   - Set the standard signal source to “0”.
   - Adjust the coefficient value so that the ammeter indicates exactly 4mA (±0.004mA).

3. Current Full Correction:
   - Select the “Current Full-Scale Correction” parameter and hit enter.
   - Set the standard signal source to the full-scale range.
   - Adjust the converter correction coefficient so that the ammeter indicates exactly 20mA (±0.004mA).
   - After adjusting the “0” point and full-scale value of the current, the current function of the converter can ensure accuracy. The current output linearity of the converter is within 0.1%.

4. Current Linearity Check:
   - Set the standard signal source to 75%, 50%, 25%, and check the linearity of the output current.
   - After the FM750 electromagnetic flow meter converter and sensor are connected to the fluid pipeline (either for calibration or use), the following work should be performed:
     - Connect the pipes before and after the sensor with copper wires, ensuring a tight fit
     - Properly connect the sensor to Ground
     - When adjusting the zero point of the instrument, ensure that the fluid in the pipeline is still
     - Ensure the stable formation of the oxide film of the sensor electrode (the electrode is in continuous contact with the fluid for 48 hours

10. alarm information

PCB of electromagnetic flow meter converters uses SMT, so the user cannot service or open the shell of the converter.

FM750 Intelligent converters have a self-diagnose function. Without impacting the power and hardware circuitry, the unit will raise an alarm when any issue arises. This information is indicated on the left side of the display as follows:

SYS -- System Excitation Alarm

HIG -- Flow Upper Limit Alarm

REV -- Reverse Flow Removal Alarm

ABN -- Abnormal Suppression Alarm

FST -- Noise Sensitivity Alarm

CUT -- Small Signal Excision Alarm

MTP -- Fluid Empty Pipe Alarm

LOW -- Flow Lower Limit Alarm

PSM -- Peak Suppression Alarm

11. troubleshooting

Symptom	Probable Cause	Solution
Measurement is not accurate	1. Parameter is incorrect	Check the parameters (Transmitter, K-factor and size)
	2. Pipe is not fully filled	Check if meter is fully filled
Flow rate indication is unstable	1. Grounding issue	(1) Make sure the meter is properly grounded to earth (2) Please use a Ground Ring when the pipe is not conductive, such as with PVC or other types of plastic pipe
	2. Air	Make sure fluid does not contain air bubbles
	3. Converter location - outside electrical interference	Make sure the converter is not too close to sources of electrical interference
No display	1. No power	Apply correct power
	2. Incorrect power	Check the power value
	3. Wiring connections	Check power input / output connections
	4. Fuse blown	Replace fuse
	5. Contrast of LCD is too low	Increase the contrast
Empty Pipe Alarm	1. The pipe is not filled with fluid	Increase the flow rate
	2. Electrode was polluted	Clean the electrode if voltage of DS1 and DS2 > 1V
	3. Fluid's conductivity is not high enough	If connecting terminals SIG 1, SIG 2, and SIGGND results in the alarm stopping, then the fluid's conductivity is not high enough for this flow meter.

12. storage

During storage, the storage location of the meter should be indoors with the following conditions:

- Keep away from rain and moisture;
- Keep away from heavy vibration;
- Ambient temperature -4 - +140°F (-20 - +60°C);
- Humidity less than 80%

Appendix I. non-linear correction function description

The electromagnetic converter updates the non-linear correction calculation method: The new calculation method is convenient, easy to understand, and the correction result is accurate.

The basic concept of nonlinear correction algorithm: In a velocity interval, the measured velocity value (correction point) is corrected to the expected velocity value (target value).

Parameter Definition:

Qpn -- Select the real standard velocity value of the correction point (correction point: Qp 1--Qp 5)

Qcn -- Expect the corrected flow velocity value at this point (Correction: Qc 1--Qc 5)

The electromagnetic converter is designed with 5 velocity correction points and 4 velocity correction numbers. The fifth velocity correction point is also the fifth velocity correction number. Their corresponding relationship is:

Velocity correction point 1------ Velocity correction number 1

Velocity correction point 2------ Velocity correction number 2

Velocity correction point 3------ Velocity correction number 3

Velocity correction point 4------ Velocity correction number 4

Linear correction end point (flow rate correction point 5) ------ flow rate correction number 5

The user must follow the principle of setting the correction point from small flow rate to large flow rate. if the setting is correct, the word “OK” will be displayed on the top of the screen in the menu, and the non-linear correction function will work at this time. However, if the setting is wrong, it will prompt “BUG” and the non-linear function will not work:

Correction point 5 > Correction point 4 > Correction point 3 > Correction point 2 > Correction point 1 > 0.
Correction point 5 (number 5) > correction number 4 > correction number 3 > correction number 2 > correction number 1 > 0

Velocity correction formula:

$$Q_{ex} = Q_{e1} + \left[\frac{Q_{c2} - Q_{c1}}{Q_{p2} - Q_{p1}} \right] x (Q_x - Q_{p1})$$

Qcx: Modified flow rate
Qx: Flow rate before correction

Example 1: Parameter setting using all correction points

Point Number	Actual Velocity (Correction) Point	Expect Velocity at this Point	Correction Value Action Range
1	0.100m/s	0.110m/s	Zero velocity -0.100m/s
2	0.150m/s	0.160m/s	0.100m/s - 0.150m/s
3	0.200m/s	0.220m/s	0.150m/s - 0.200m/s
4	0.250m/s	0.270m/s	0.200m/s - 0.250m/s
End	0.300m/s	-	0.250m/s - 0.300m/s

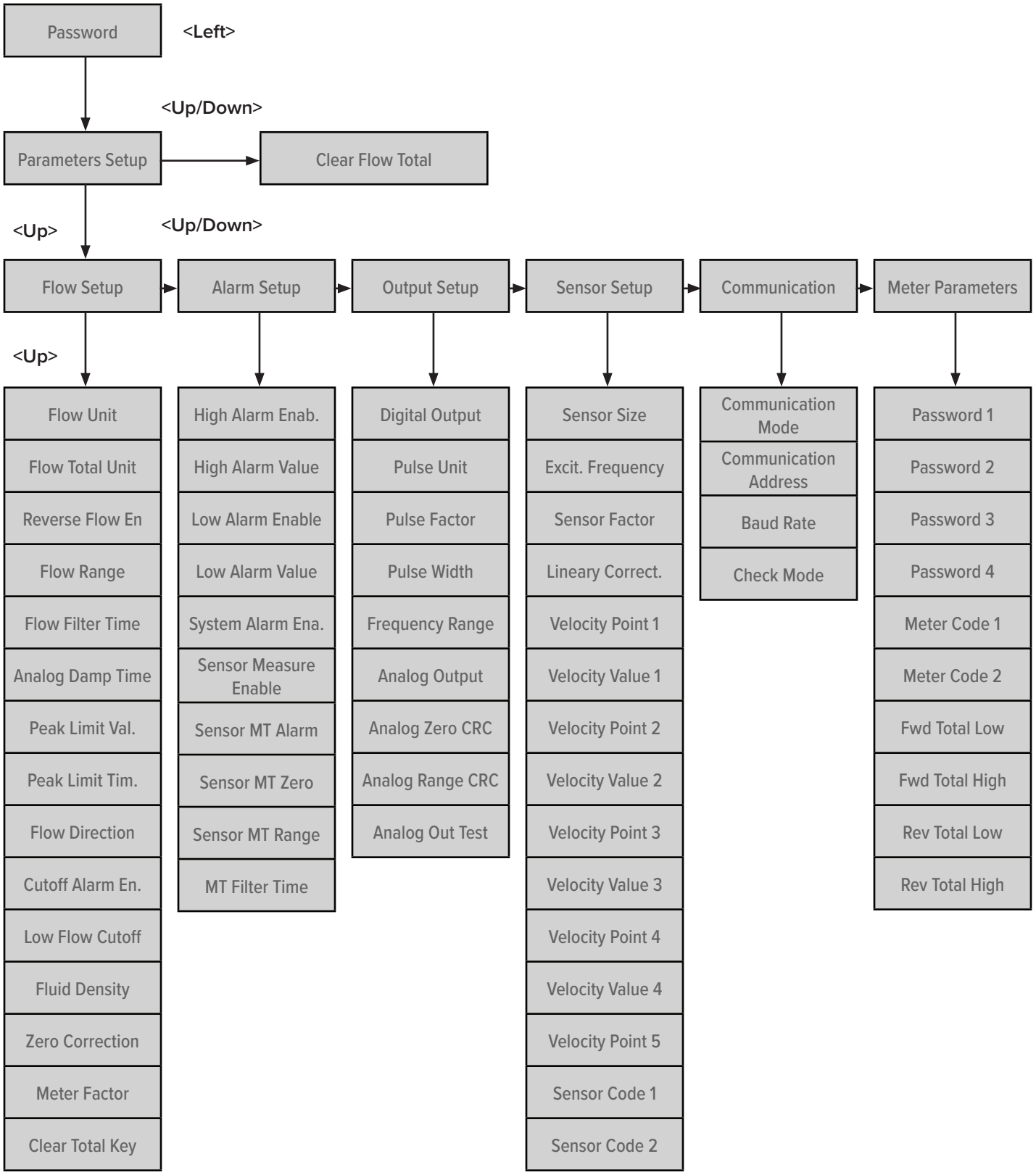
Example 2: Parameter setting using partial correction points

Point Number	Actual Velocity (Correction) Point	Expect Velocity at this Point	Correction Value Action Range
1	0.100m/s	0.110m/s	Zero velocity -0.100m/s
2	0.150m/s	0.160m/s	0.100m/s - 0.150m/s
3	0.161m/s	0.161m/s	No correction
4	0.162m/s	0.162m/s	No correction
End	0.163m/s	-	No correction

NOTE: When using non-linear correction, users need to set all correction points and correction numbers according to the setting principle.

If no set correction point or correction number provided, the screen will prompt “BUG”, and the non-linear function will not work.

Appendix II. *list of instrument menus*



No	Parameters	Settings	Content	Password Level
I	**Flow Setup**	**Select**		
1	Flow Unit	Select	L/h, L/m, L/s, m3/h, m3/m, m3/s, UK/h, UK/m, UK/s, US/h, US/m, US/s, kg/h, kg/m, kg/s, t/h, t/m, t/s	2
2	Flow Total Unit	Select	0.001 m^3 - 1m^3, 0.001 L - 1 L, 0.001 UKG - 1 UKG, 0.001USG - 1 USG, 0.001 kg - 1 kg, 0.001t - 1 t	2
3	Reverse Flow En.	Select	Enable, Disable, Enable & Output	2
4	Flow Range	Set Count	0 - 99999	2
5	Flow Filter Time	Selected	1 - 60 S	2
6	Analog Damp Time	Selected	0 - 150 S	2
7	Peak Limit Ena.	Select	Enable, Disable	2
8	Peak Limit Valu.	Set Count	0% - 30%	3
9	Peak Limit Time	Set Count	0s - 20s	3
10	Flow Direction	Select	Forward, Reverse	2
11	Cutoff Alarm En.	Set Count	Enable, Disable	2
12	Low Flow Cutoff	Set Count	According to Flow	2
13	Fluid Density	Set Count	0 - 1.999	2
14	Zero Correction	Set Count	0 - ±9999	2
15	Meter Factor	Set Count	0.0000 - 5.9999	5
16	Clear Total Key	User Set	0 - 99999	2
II	**Alarm Setup**	**Select**		
1	High Alarm Enab.	Select	Enable, Disable, Enable & Output	2
2	High Alarm Value	Set Count	According to Flow	2
3	Low Alarm Enable	Select	Enable, Disable, Enable & Output	2
4	Low Alarm Value	Set Count	According to Flow	2
5	System Alarm Ena.	Select	Enable, Disable, Enable & Output	2
6	Sensor Measure Ena.	Select	Enable, Disable, Enable & Output	2
7	Sensor MT Alarm	Set Count	0 - 59999	2
8	Sensor MT Zero	Set Count	0 - 59999	5
9	Sensor MT Range	Set Count	0 - 5.9999	5
10	MT Filter Time	Selected	2 - 60 SEC	2
III	**Output Setup**			
1	Digital Output	Select	PO: Freq. output / PO Pulse output / DO: Pulse output	2
2	Pulse Unit	Select	m3, Ltr, UKG, USG, kg, t	2
3	Pulse Factor	Set Count	00.001 - 59.999	2
4	Pulse Width	Select	1 - 9999ms	2
5	Frequency Lower		0 - 5000 Hz	2
6	Frequency Range	Set Count	1 - 5000 Hz	2
7	Analog Output	Select	4-20mA / 4mA	2
8	Analog Zero CRC	Set Count	0.0000 - 1.9999	5
9	Analog Range CRC	Set Count	0.0000 - 3.9999	5
10	Analog Out. Test	Set Count	00.00 - 99.99	2

No	Parameters	Settings	Content	Password Level
IV	**Sensor Setup**			
1	Sensor Size	Select	3 - 3000	2
2	Excit. Frequency	Select	For 50Hz: 6.25Hz, 5.55Hz, 5.00Hz, 4.54Hz For 60Hz: 6.25Hz, 5.55Hz, 5.00Hz, 4.54Hz	4
3	Sensor Factor	Set Count	0.0000 - 5.9999	4
4	Lineary Correct	Select	Enable, Disable	2
5	Velocity Point 1	User Set	According to Flow	4
6	Velocity Value 1	User Set	According to Flow	4
7	Velocity Point 2	User Set	According to Flow	4
8	Velocity Value 2	User Set	According to Flow	4
9	Velocity Point 3	User Set	According to Flow	4
10	Velocity Value 3	User Set	According to Flow	4
11	Velocity Point 4	User Set	According to Flow	4
12	Velcoity Value 4	User Set	According to Flow	4
13	Velocity Point 5	User Set	According to Flow	4
14	Sensor Code 1	User Set	Year, Month (0 - 99999)	4
15	Sensor Code 2	User Setting	Product No. (0 - 99999)	4
V	**Communication**			
1	Communication Mode	Select	MODBUS, HART, PROFIBUS	2
2	Communication Address	Set Count	0 - 250	2
3	Baud Rate	Select	300 - 38400	2
4	Check Mode	Select	No Parity, 1 Stop, Odd Parity, 1 St, Even Parity, 1 S, No Parity, 2 Stop, Odd Parity, 2 St, Even Parity, 1 S.	2
VI	**Meter Parameters**			
1	Password 1	User Set	0 - 59999	5
2	Password 2	User Set	0 - 59999	5
3	Password 3	User Set	0 - 59999	5
4	Password 4	User Set	0 - 59999	5
5	Meter Code 1	Factory Set	Year, Month (0 - 99999)	5
6	Meter Code 2	Factory Set	Year, Month (0 - 99999)	5
7	Fwd. Total Low	User Set	0 - 99999	5
8	Fwd. Total High	User Set	0 - 99999	5
9	Rev. Total Low	User Set	0 - 99999	5
10	Rev. Total High	User Set	0 - 99999	5

Appendix III. passwords

The parameter setting function has five (5) password levels. Among them, levels 1 to 4 are user passwords, and level 5 is the manufacturer password. Users can use the 5th level password to reset the 1st to 4th level passwords.

No matter which level of password is used, the user can check the instrument parameters. However, if the user wants to change the instrument parameters, different levels of passwords must be used. Passwords are as follows:

Password Level	Factory Default Password
Level 1	00522
Level 2	03210
Level 3	06108
Level 4	07206
Level 5	Please consult your local representative or H2flow Controls

The password level and changeable parameters range is shown in the tables in the preceding section.

Exclusions

This warranty shall not apply to any defect, failure or damage caused by improper use or improper or inadequate care. H2flow Controls Inc. shall not be obligated to provide service under this warranty if:

a) damage has been caused by a failure to make a full and proper inspection of the product (as described by the documentation enclosed with the product at the time of shipment) on initial receipt of the product following shipment;

b) damage has been caused by the attempts of individuals, other than H2flow Controls Inc. staff to repair or service the product;

c) damage has been caused by the improper use of the product, including but not limited to, breakage or damage to the instrument sensors or cracking of the instrument display, the splicing or cutting of cables or wires unless explicitly instructed to do so during the installation process. General misuse of the product.

Charges

Under cover of this warranty, H2flow Controls Inc. will pay the carriage and insurance charges for the shipment of defective product back to H2flow Controls Inc. and for its return to the client's original site of dispatch except when:

a) H2flow Controls Inc's product return policy has not been followed.

b) product failure is caused by any of the exclusions described above, when the customer will be liable for the full cost of the repair (parts and labor) plus all carriage and insurance costs to and from H2flow Controls Inc's premises.

c) the product is damaged in transit and a contributory cause is inadequate packaging. It is the customer's responsibility to ensure that the packaging used to return equipment to H2flow Controls Inc. is the same, or has equivalent protective qualities, to that used to ship the product to the customer in the first instance. Any damage resulting from the use of inadequate packaging will nullify H2flow Controls Inc's obligations under this warranty.

Should the customer's product be damaged in transit following a repair at H2flow Controls Inc's site, a full photographic record of the damage must be obtained (packaging and the product) to support any claim for recompense. Failure to present this evidence may limit H2flow Controls Inc's obligations under this warranty.

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