



# BMF Mag Flow Meter

## Electromagnetic Flow Meter

### Electromagnetic Flow Meter Operation Manual



**VuFlow**  
metering technology

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## HARDWARE

### 1. GENERAL INFORMATION

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



#### Warning

**For your safety, 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 Electromagnetic Flow Meter.
2. When handling hazardous liquids, always exercise appropriate safety precautions.
3. When measuring flammable liquids, observe precautions against fire or explosion.
4. When working in hazardous environments, always exercise appropriate safety precautions.
5. Handle the sensor carefully. Even small scratches or nicks can affect accuracy.
6. For best results, calibrate the meter at least 1 time per year.
7. Do not purge the flow meter with compressed air.
8. During Electromagnetic Flow Meter removal, liquid may spill. Follow the manufacturer's safety precautions for clean up of minor spills.

#### 1.1 Product Description

Electromagnetic flow meters are intended for fluid measurement in most industries including water, wastewater, food and beverage, pharmaceutical and chemical.

There are two basic components of electromagnetic flow meter: 1) The Detector, 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 compatibilities consistent with the specifications is recommended.

Our's 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 visible damage. The meter is a precision measuring instrument and handled carefully. Remove the protective plugs and caps for a thorough inspection. If any items are damaged or missing, contact us.

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

#### Transportation and Handling

Do not lift the detector from the Converter housing, the junction box or the connecting cable. Use lifting lugs for larger sizes is recommended. 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 vertical position, it's recommended to use a sling rigged method as shown below.



**Warning: NEVER introduce the forklift, chains, wire slings or any other sharp object inside the flow tube for lifting or handling purpose. This could permanently damage the isolating liner and could render the meter inoperable.**

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.



## 2. TECHNICAL DATA

### Measuring System

<b>Measuring Principle</b>	Faraday's Law
Application range	Electrically conductive fluids
<b>Measured Value</b>	
Primary measured value	Flow velocity
Secondary measured value	Volume flow

### Design

<b>Ingress Protection</b>	IP65
<b>Features</b>	Fully welded maintenance-free sensor
	Flange version with full bore flow tube
	Standard as well as higher pressure ratings
	Large diameter range from DN25...3000 with rugged liners approved for drinking water
	Industry specific insertion lengths
<b>Modular Construction</b>	The measurement system consists of a flow sensor and a signal converter. It is available as compact and as remote version.
<b>Compact Version</b>	With 511B converter: 110-240V AC Power
	With 521B converter: 18-36V DC Power
	With W800L/W800W: Battery Power
<b>Remote Version</b>	In wall mount version with 211B converter (110-240V AC) or 221B converter (18-36V DC)
	With W800F converter: Battery Power
<b>Measurement Range</b>	0.3...+10 m/s

### Measuring Conditions

<b>Reference Conditions</b>	Flow conditions similar to EN 29104
	Medium: Water
	Electrical conductivity: $\geq 20 \mu\text{s/cm}$
	Temperature: +10...+50°C (+50°F. . . +120°F)
	Inlet section: $\geq 5\text{DN}$
	Operating pressure: 1 bar( 14.5 psig)
<b>Flow Meter Accuracy</b>	Standard: $\pm 0.5\%$ of rate
	Optional: $\pm 0.2\%$ of rate

### Operating Conditions

<b>Temperature</b>	
Process Temperature	Hard rubber liner: -5...+60°C or 90°C
	Polypropylene liner: -5...+90°C
	PTFE liner: -5...+120°C; PFA: 180°C
Ambient Temperature (all versions)	Standard (with aluminum converter housing)
	-20...+60°C (Protect electronics against self-heating with ambient temperatures above 55)
Storage Temperature	-20...+70°C
<b>Pressure</b>	
EN 1092-1	DN2200...DN3000: PN2.5
	DN1200...DN2000: PN 6
	DN200...DN1000: PN10
	DN65...DN150: PN 16
	DN10...DN50: PN 40
	Other pressures on request
ASME B16.5	1/2"...8": 150 lb RF
	Other pressures on request
JIS	1/2"...8": 10 K
	Other pressures on request
Pressure Drop	Negligible

Fluid	
Physical condition	Conductive liquids
Electrical conductivity	$\geq 20 \mu\text{s/cm}$
Permissible gas content (volume)	$\leq 5\%$
Permissible solid content (volume)	$\leq 30\%$

### Installation Conditions

Installation	Take care that flow sensor is always fully filled
	For detailed information see chapter "Cautions for Installation"
Flow Direction	Forward and reverse
	Arrow on flow sensor indicates positive flow direction
Inlet Run	$\geq 5 \text{ DN}$
Outlet Run	$\geq 2 \text{ DN}$

### Materials

Sensor Housing	Sheet steel, Polyurethane coated
	Other materials on request
Measuring Tube	Austenitic stainless steel
Flanges	Carbon steel; Polyurethane coated
	Other materials on request
Liner	Standard
	DN10...40 : PTFE
	DN50 ...300: PTFE or Hard Rubber
	DN 300 ...2200 : Hard Rubber or PTFE Option
Connection Box (only remote versions)	Standard : Polyurethane coated die-cast aluminum
Measuring Electrodes	Standard : Stainless steel 316L
	Option: Hastelloy C, Titanium, Tantalum
	Other materials on request
Grounding Rings	Standard: Stainless steel
Grounding Electrodes (option)	Same material as measuring electrodes

### Process Connections

Flange	
EN 1092-1	DN4...300 in PN6...40
ASME	1/6"...120" in 150 lb RF
JIS	10...1000 in 10...20K
Design of gasket surface	RF
	Other sizes or pressure ratings on request

## Flow Range

Diameter		Flow Rate (m <sup>3</sup> /h)		
		V=0.3m/s	V=6m/s	V=10m/s
(mm)	(Inch)	(Min)	(Calibrated)	(Max)
6	1/4"	0.0306	0.611	1.018
10	3/8"	0.0849	1.696	2.827
15	1/2"	0.1909	3.817	6.362
20	3/4"	0.3393	6.786	11.31
25	1"	0.5301	10.60	17.67
32	1-1/4"	0.8686	17.37	28.95
40	1-1/2"	1.357	27.14	45.24
50	2"	2.121	42.14	70.69
65	2-1/2"	3.584	71.68	119.5
80	3"	5.429	108.6	181.0
100	4"	8.482	169.6	282.7
125	5"	13.25	265.1	441.8
150	6"	19.09	381.7	636.2
200	8"	33.93	678.6	1131
250	10"	53.01	1060	1767
300	12"	76.34	1527	2545
350	14"	103.9	2078	3465
400	16"	135.7	2714	4524
450	18"	171.8	3435	5726
500	20"	212.1	4241	7069
600	24"	305.4	6107	10179
700	28"	415.6	8310	13850
800	32"	542.9	10860	18100
900	36"	662.8	13740	22900
1000	40"	848.2	16962	28270

## 3. MODEL AND SELECTION

### 3.1 Flange Type

BMF series



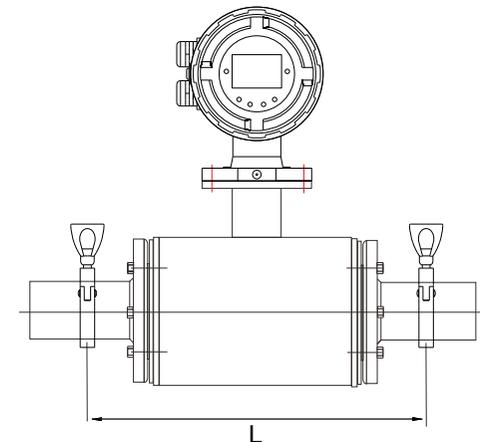
T series



### Model Selection

Model	Suffix Code	Description
BMF-		<b>Electromagnetic Flowmeter</b>
Type	H (Special Code)	H Type Hygienic ( DN15- DN100 only)
	T (Special Code)	T type( DN15- DN100 only)
Diameter	XXXX	Stands for diameter 0004: DN4; 0015: DN15 0100: DN100; 2200: DN2200
Structure	S	Compact Type with local display
	L	Remote Type; 10 meters cable default
Electrode Material	M	SS316L
	T	Titanium
	D	Tantalum
	H	Hastelloy Alloy C
Signal Output	P	Platinum-Iridium
	0	No Output
	1	4-20mA / Pulse
Liner Material	X	Hard Rubber
	P	Propylene Oxide
	F	PTFE
	A	PFA
Power Supply	-0	110-240V AC
	-1	24V DC (20-36V DC)
	-2	Battery Power Supply
Communication	0	No Communication
	1	Modbus RS485
	2	HART
	3	GPRS
	4	Profibus DP
Sensor Grounding	0	No Grounding
	1	Grounding Ring
	2	Grounding Electrode
Connection	DXX	D16: DIN PN16 Flange ; D25: DIN PN25 Flange...
	AXX	A15: ANSI150# Flange; A30: ANSI 300# Flange...
	JXX	J10: JIS 10K Flange; J20: JIS 20K Flange...
	XXX	On request
Body Material	CS	Carbon Steel
	S4	Stainless Steel 304
	S6	Stainless Steel 316

### 3.2 Sanitary Type H- Series



#### Length

DN10-DN25: L= 200mm  
DN32-DN100: L= 300mm

### Model Selection

Model	Suffix Code	Description
LDGS-		Sanitary Electromagnetic Flowmeter
Diameter	XXXX	Stand for diameter 0010: DN10 0100: DN100
Structure	S	Compact Type with local display
	L	Remote Type;10 meters cable default
Electrode Material	M	SS316L
	T	Titanium
	D	Tantalum
	H	Hastelloy Alloy C
	P	Platinum-Iridium
Signal Output	0	No Output
	1	4-20mA / Pulse
Liner Material	F	PTFE
	A	PFA
Power Supply	-0	110-240V AC
	-1	24V DC (20-36V DC)
	-2	Battery Power Supply
Communication	0	No Communication
	1	Modbus RS485
	2	HART
	3	GPRS
	4	Profibus DP
Sensor Grounding	0	No Grounding
	1	Grounding Ring
	2	Grounding Electrode
Connection	TRC	Tri-clamp for sanitary connection
Body Material	S4	Stainless steel 304

### 3.3 Insertion Type(LDGC)

Simple Type series



Ball Valve Type series



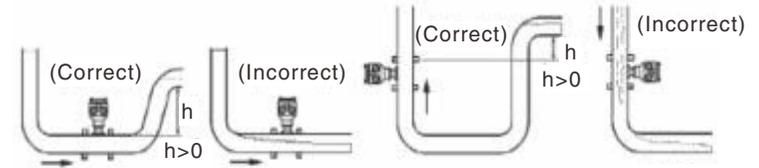
### Model Selection

Model	Suffix Code	Description
LDGC-		Insertion Magnetic Flowmeter
Diameter	XXXX	Stand for diameter 0200: DN200 3000: DN3000
Structure	S	Compact type with local display
	L	Remote type 10 meters cable default
Electrode Material	M	SS316L
	T	Titanium
	D	Tantalum
	H	Hastelloy Alloy C
	P	Platinum-Iridium
Signal output	0	NO Output
	1	4-20mA / Pulse
Power Supply	-0	110-240V AC
	-1	24V DC (20-36V DC)
	-2	Battery Power Supply
Communication	0	No Communication
	1	Modbus RS485
	2	Hart
	3	GPRS
	4	Profibus DP
Connection	S	Simple Type
	B	Ball Valve Type

## 4. CAUTIONS FOR INSTALLATION

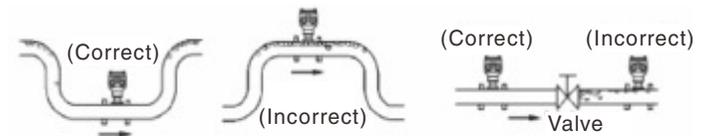
### 4.1 Mounting Positions

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



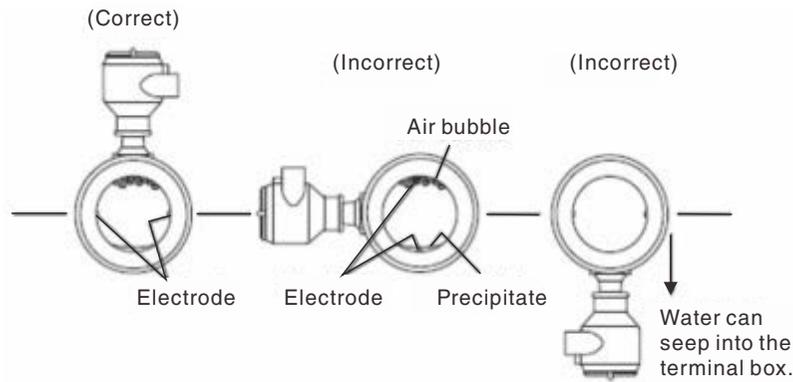
Mounting Positions

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



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.



Mounting Orientation

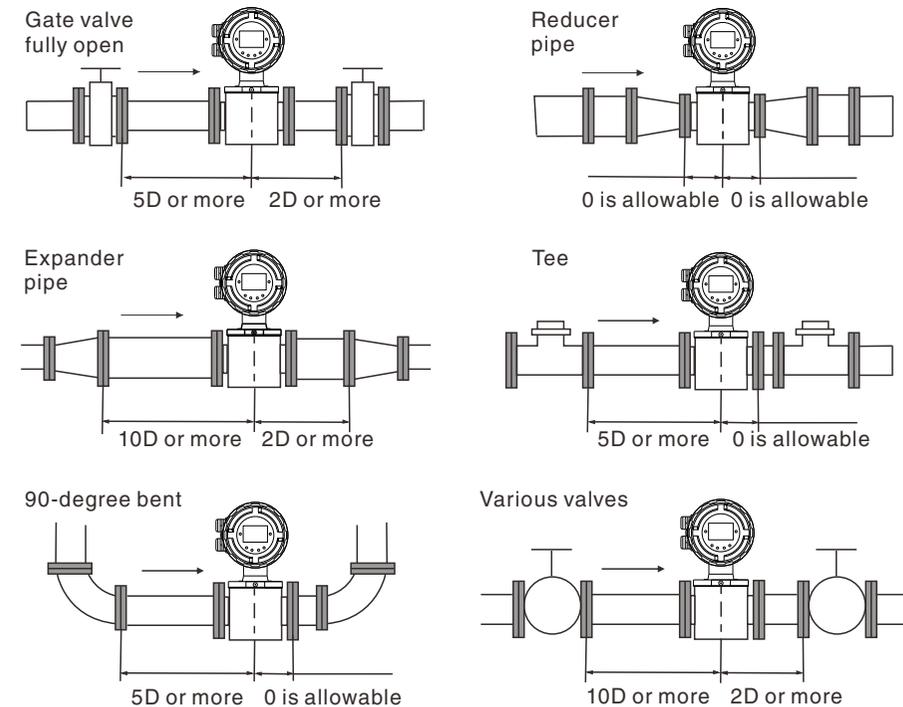
- ★ Avoid all pipe locations where the flow is pulsating, such as in the outlet side of piston or diaphragm pumps.
- ★ Avoid locations near equipment producing electrical interference such as electric motors, transformers, variable frequency, etc.
- ★ Install the meter with enough room for future access for maintenance purposes.
- ★ The magnetic meter isolating liner, whether if 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. This could affect the reading accuracy of the measuring signal.



**Warning: Precaution for direct sunshine and rain when the meter is installed outside.**

## 4.2 Required Lengths Of Straight Runs

For optimum accuracy performance, it is required to provide sufficient inlet and outlet straight pipe runs. 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 diagram 1 for required straight runs when there is altering device.



Note: D: Flowtube Size

Diagram 1. Required straight runs



**Special Notice**

*When the meter contains removable coverplates, leave the coverplate installed unless accessory modules specify removal. Don't remove the coverplates when the meter is powered, or electrical shock and explosion hazard can be caused.*

### 4.3 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 flowmeter. As such, it applies to the instrumentation aspect of grounding, rather than to “safety grounding”:

Proper installation and grounding of magnetic flowmeter is important for accurate, 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 magmeter.

Manufacturers provide a variety of elements (ground straps, ground electrodes, ground rings) and directions for the standard grounding of the magmeter.

Applications exist in which the user can not or should not make use of the traditional grounding connection to adjacent piping or to earth ground. These flow measurement applications are frequently encountered in electrolytic processes. In this case, the fluid passing through the magmeter flow tube may be at a potential 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 magmeter. 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.

### 4.4 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

See Figure 1, Figure 2 and Table 2 for detailed dimensions.

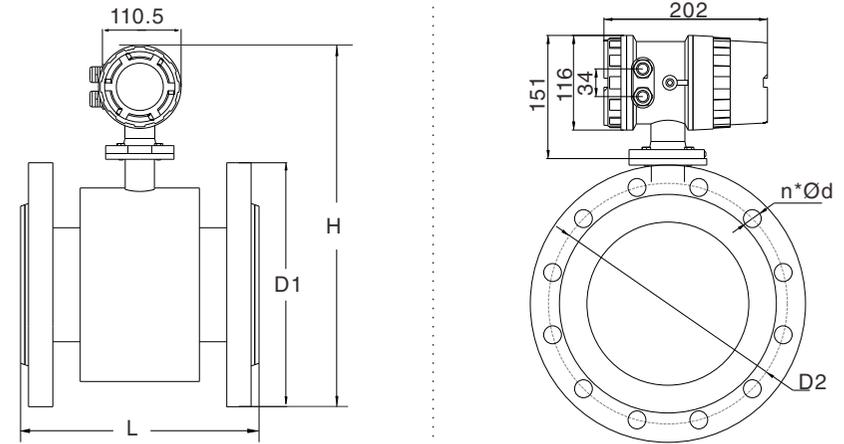


Figure 1 Drawings of Compact Electromagnetic Flow Meter

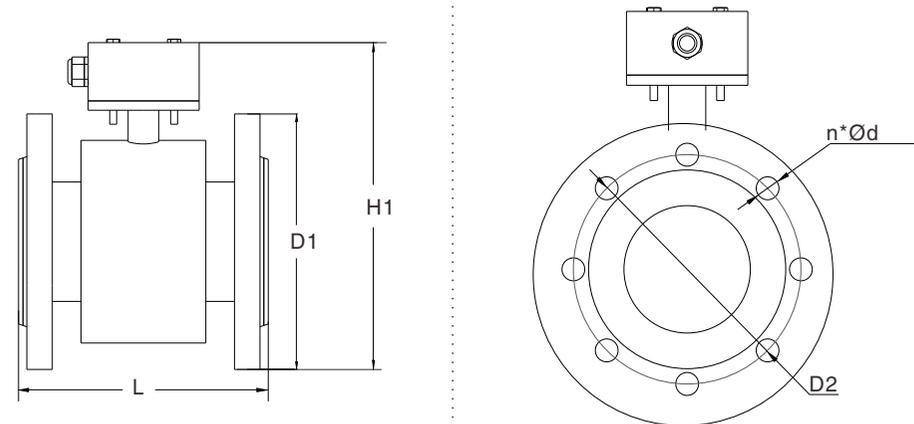


Figure 2 Drawings of Remote Electromagnetic Flow Meter

Table 1. Dimensions (DIN PN16, JIS 10K, ANSI 150#; Unit: mm)

2.1 Flange: DIN PN16								
Diameter DN	B Type L(mm)	T Type L(mm)	H (mm)	H1 (mm)	D (mm)	D1 (mm)	D2 (mm)	n × Φ d (mm)
10	160/120	120	360	220	90	60	41	4×14
15	160/120	200	360	220	95	65	45	4×14
20	160/120	200	360	220	105	75	58	4×14
25	200	200	360	220	115	85	68	4×14
32	200	200	370	235	140	100	78	4×18
40	200	200	370	235	150	110	88	4×18
50	200	200	385	242	165	125	102	4×18
65	250	200	400	256	185	145	122	4×18
80	250/200	200	415	275	200	160	138	8×18
100	250/200	250	435	295	220	180	158	8×18
125	250	NA	465	325	250	210	188	8×18
150	300	NA	497	355	285	240	212	8×22
200	350	NA	550	410	340	295	268	12×22
250	450	NA	610	488	405	355	320	12×22
300	500	NA	660	520	460	410	375	12×22

2.2 Flange: JIS 10K								
Diameter DN	B Type L(mm)	T Type L(mm)	H (mm)	H1 (mm)	D (mm)	D1 (mm)	D2 (mm)	n × Φ d (mm)
10	160/120	120	360	220	90	64	46	4×15
15	160/120	200	360	220	95	70	52	4×15
20	160/120	200	360	220	100	75	58	4×15
25	200	200	360	220	125	90	70	4×19
32	200	200	370	235	135	100	76	4×19
40	200	200	370	235	140	105	85	4×19
50	200	200	385	242	155	120	100	4×19
65	250	200	400	256	175	140	120	4×19
80	250/200	200	415	275	185	150	130	8×19
100	250/200	250	435	295	210	175	155	8×19
125	250	NA	465	325	250	210	185	8×23
150	300	NA	497	355	280	240	215	8×23
200	350	NA	550	410	330	290	265	12×23
250	450	NA	610	488	400	355	325	12×25
300	500	NA	660	520	415	400	370	16×25

2.3 Flange: ANSI 150#

Diameter DN	B Type L(mm)	T Type L(mm)	H (mm)	H1 (mm)	D (mm)	D1 (mm)	D2 (mm)	n x Φ d (mm)
15	160/120	200	360	220	90	60	40	4x15
20	160/120	200	360	220	98	70	43	4x15
25	200	200	360	220	108	79.5	51	4x15
40	200	200	370	235	127	98.5	73	4x15
50	200	200	385	242	152	120.5	92	4x19
65	250	200	400	256	178	139.5	105	4x19
80	250/200	200	415	275	190	152.5	127	4x19
100	250/200	250	435	295	229	190.5	157	8x19
125	250	NA	465	325	254	216	186	8x23
150	300	NA	497	355	279	241.5	216	8x23
200	350	NA	550	410	343	298.5	270	8x23
250	450	NA	610	488	406	362	324	12x25
300	500	NA	660	520	483	432	381	12x25

## 5. ELECTRICAL WIRING

 **Warning: Electrical Hazard**  
*Disconnect power before beginning electrical wiring.*

### 5.1 Terminal Configuration Diagram

#### 5.1.1 Compact Converter (BMF: 110-240V AC; BMF: 18-24V DC)



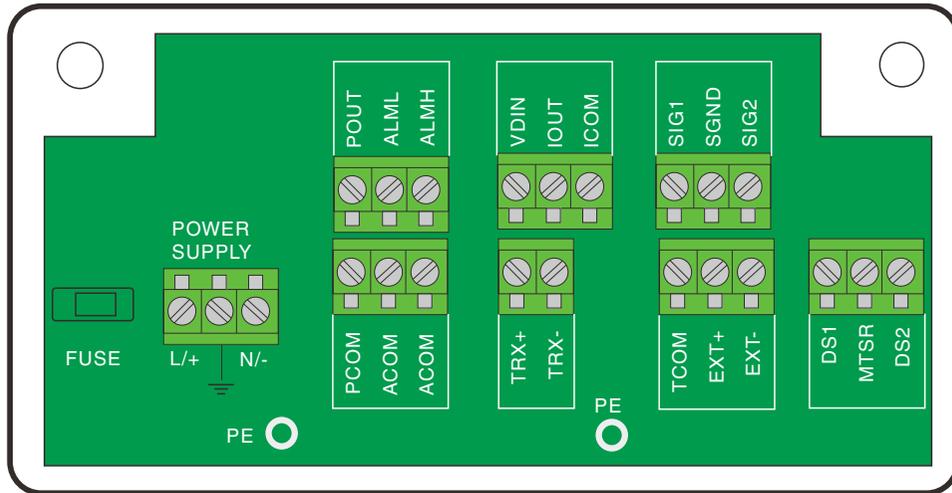
Terminal Configuration

#### Terminal Wiring For Compact Converter

<b>I+</b>	Output Current for Flow Measurement
<b>COM</b>	Output Current (Ground) for Flow Measurement
<b>P+</b>	Frequency(Pulse) Output for Bi-directional Flow
<b>COM</b>	Frequency (Pulse) Output (Ground)
<b>AL</b>	Alarm Output for Low Limit
<b>AH</b>	Alarm Output for Upper Limit
<b>COM</b>	Alarm Output (Ground)
<b>FUSE</b>	Fuse for Power Supply
<b>T+</b>	+Communication Input Signal(RS485-A)
<b>T-</b>	-Communication Input Signal(RS485-B)
<b>G</b>	Rs232 Communication Ground
<b>L1</b>	220V (24V) Power Supply
<b>L2</b>	220V (24V) Power Supply

### 5.1.2 Remote Converter (211B: 110-240V AC; 221B: 18-24V DC)

#### Terminal Configuration



#### Terminal Wiring for Remote Converter

<b>Pulse Output</b>	POUT	Frequency(Pulse) Output for Bi-directional Flow
	PCOM	Pulse Output Ground
<b>Alarm Output</b>	ALMH	Alarm Output for Upper Limit
	ACOM	Alarm Output Ground
<b>Alarm Output</b>	ALML	Alarm Output for Low Limit
	ACOM	Alarm Output Ground
<b>RS485(Function Optional)</b>	TRX+	Communication RS485+
	TRX-	Communication RS485-
<b>Analog Current Output</b>	VDIN	24VDC Power Supply for 2-wire 4-20mA Output
	IOUT	Analog Current Output
	ICOM	Analog Current Output Ground
<b>Power Supply</b>	L / +	L: Live Wire of 110-240Vac; +: 24V DC +
	N / -	N: Naught Wire of 110-240VAC; -: 24V DC -
<b>Signal from Sensor</b>	SIG1	Signal 1
	SGND	Signal Ground
	SIG2	Signal 2
	TCOM	Reserved
	EXT+	Exciting Current+
	EXT-	Exciting Current-
	DS1	Shielded Exciting1
	DS2	Shielded Exciting2

*Note: Don't connect 110-240V AC Power on 221B converter which is DC Power Supply Type.*

## 6. PROGRAMMING AND SETUP

This Flowmeter uses L-mag series converter, please refer to the software manual stated below on the operation.

### Owner's manual – SOFTWARE

## 7. TROUBLESHOOTING

Symptom	Probable Cause	Solution
Measurement is not accurate	1. Parameter wrong	Check the parameters (Transmitter, K-factor and size)
Flow rate indication is unstable	2. Pipe is not fully filled	Check if meter is fully filled
	1. Grounding issue	(1) Make sure meter is properly grounded to a good earth ground (2) Please use ground ring when the pipe is not conductive, such as PVC or other plastic pipe
	2. Air	Make sure fluid does not contain air bubbles
	3. Converter location outside electrical interference	Make sure converter is not too close to sources of electrical interference
No Display	1. No power	Apply correct power
	2. Incorrect power	Check power supply
	3. Wiring connections	Check power input/output connections
	4. Fuse blown	Replace fuse

## Limited Warranty Policy

We hereby provides a limited warranty against defects in materials and workmanship. This product includes a 1-year warranty. The warranty period shall begin on the date of the original new equipment purchase. Warrantor's obligation hereunder shall be limited to repairing defective workmanship or replacing or repairing any defective parts.

In the event purchaser believes the product is defective, the product must be returned to us, transportation prepaid by Purchaser, within the appropriate warranty period relative to the product. If our's inspection determines the workmanship or materials are defective and the required maintenance has been performed and, has been properly installed and operated, the product will be either repaired or replaced, at our's sole determination, free of additional charge, and the goods will be returned, transportation paid by us, using a transportation method selected by us.

Prior to returning the product to us, Purchaser must obtain a Returned Material.

Authorization (RMA) Number from our' s Customer Service Department within 30 days after discovery a purported breach of warranty, but not later than the warranty period; otherwise, such claims shall be deemed waived.

If our' s inspection reveals the product to be free of defects in material and workmanship or such inspection reveals the goods were improperly used, improperly installed, and/or improperly selected for service intended, we will notify the purchaser in writing and will deliver the goods back to Purchaser upon receipt of Purchaser's written instructions and agreement to pay the cost of transportation. If Purchaser does not respond within thirty (30) days after notice from us, the goods will be disposed of in our's discretion.

We do not warrant the product to meet the requirements of any safety code or other jurisdiction, and Purchaser assumes all risk and liability whatsoever resulting from the use thereof, whether used singly or in combination with other machines or apparatus.

This warranty shall not apply to any our product or parts thereof, which have been repaired outside our's factory or altered in any way, or have been subject to misuse, negligence, or accident, or have not been operated in accordance with our's printed instructions or have been operated under conditions more severe than, or otherwise exceeding, those set in the specifications.

FOR NON-WARRANTY repairs or calibrations, consult us for current repair/ calibration charges. Have the following information available BEFORE contacting us:

1. P.O. number to cover the COST of the repair/calibration,
2. Model and serial number of the product.
3. Repair instructions and/or specific problems relative to the product.

## SOFTWARE

### 1. Device Description

Magnetic flowmeters are designed exclusively to measure the flow and conductivity of electrically conductive, liquid media.

Your measuring device is supplied ready for operation. The factory settings for the operating data have been made in accordance with your order specifications.

The following versions are available:

- ◆ Compact version (the signal converter is mounted directly on the measuring sensor)

Part Number	Power Supply
BMF	110-240 V AC
BMF	18-36V DC
W800L	Battery
W800W	Battery
W803C	Battery/24V DC

- ◆ Remote version (electrical connection to the measuring sensor via field current and signal cable)

Part Number	Power Supply
211B	110-240 V AC
221B	18-36V DC
W800F	Battery

## 2. ELECTRICAL CONNECTION

### 2.1 Safety Instruction



**DANGER!**  
*All work the electrical connections may only be carried out when the power is disconnected. Take note of the voltage data on the nameplate!*



**DANGER!**  
*Observe the national regulations for electrical installations!*



**WARNING!**  
*Observe without fail the local occupational health and safety regulations. Any work done on the electrical components of the measuring device may only be carried out by properly trained specialists.*



**INFORMATION!**  
*Look at the device nameplate to ensure that the device is delivered according to your order. Check for the correct supply voltage printed on the nameplate.*

### 2.2 Important notes on electrical connection



**CAUTION!**

- ◆ *Use suitable cable entries for the various electrical cables.*
- ◆ *The sensor and converter are configured together in the factory. For this reason, please connect the devices in pairs. Ensure that the sensor constant GK are identically set.*

## 2.3 Electrical Wiring

### 2.3.1 Electrical Wiring for Compact Housing Terminal Configuration



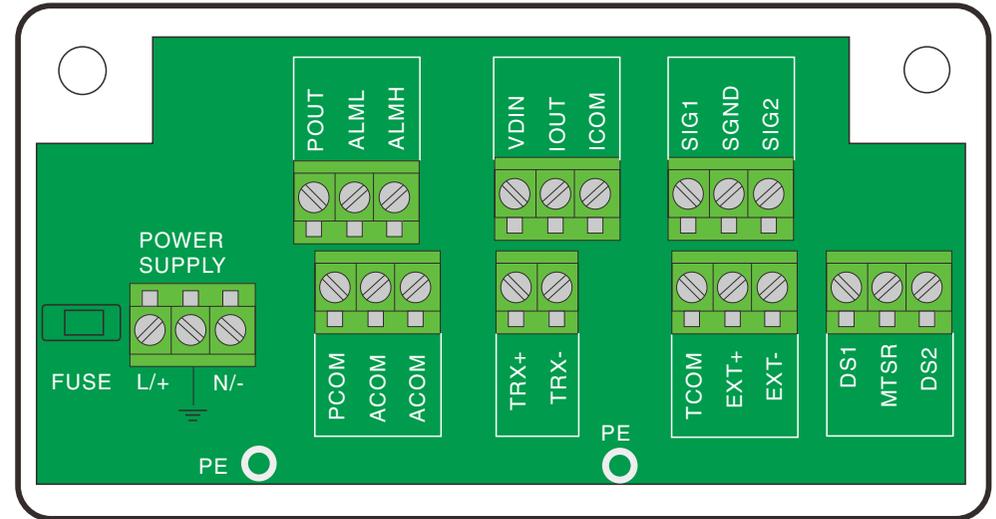
Terminal Configuration

#### Terminal Wiring For Compact Converter

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

### 2.3.2 Electrical Wiring for Remote Housing

#### Terminal Configuration



### Terminal Wiring for Remote Converter

<b>Pulse Output</b>	POUT	Frequency(Pulse) Output for Bi-directional Flow
	PCOM	Pulse Output Ground
<b>Alarm Output</b>	ALMH	Alarm Output for Upper Limit
	ACOM	Alarm Output Ground
<b>Alarm Output</b>	ALML	Alarm Output for Low Limit
	ACOM	Alarm Output Ground
<b>RS485(Function Optional)</b>	TRX+	Communication RS485+
	TRX-	Communication RS485-
<b>Analog Current Output</b>	VDIN	24VDC Power Supply for 2-wire 4-20mA Output
	IOUT	Analog Current Output
	ICOM	Analog Current Output Ground
<b>Power Supply</b>	L / +	L: Live Wire of 110-240V AC; +: 24V DC +
	N / -	N: Naught Wire of 110-240V AC; -: 24V DC -
<b>Signal from Sensor</b>	SIG1	Signal 1
	SGND	Signal Ground
	SIG2	Signal 2
	TCOM	Reserved
	EXT+	Exciting Current+
	EXT-	Exciting Current-
	DS1	Shielded Exciting1
	MTSR	Reserved
DS2	Shielded Exciting2	

*Note: Don't connect 110-240V AC Power on the converter which is DC Power Supply Type.*

## 2.4 Description of Outputs

### 2.4.1 Digital Frequency Output

<b>Frequency Output Range</b>	1 to 5000 Hz
<b>Output Electric isolate</b>	Photoelectric Isolate > 1000V
<b>Frequency Output Capacity</b>	Field-effect transistors Output Maximum Voltage: 36V DC Maximum Current: 250 mA

### 2.4.2 Digital Pulse Output

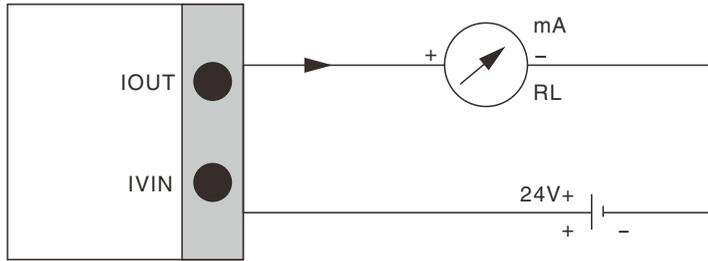
<b>Pulse Output Range</b>	1 to 100 Pulse/s
<b>Pulse Output Value</b>	0.001- 1.000m <sup>3</sup> /cp; 0.001-1.000 Liter/cp
<b>Pulse Output Capacity</b>	Field-effect transistors Output Maximum Voltage: 36V DC Maximum Current: 250mA

### 2.4.3 Alarm Output

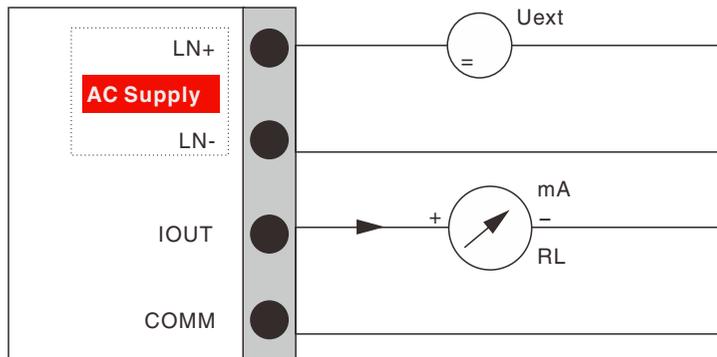
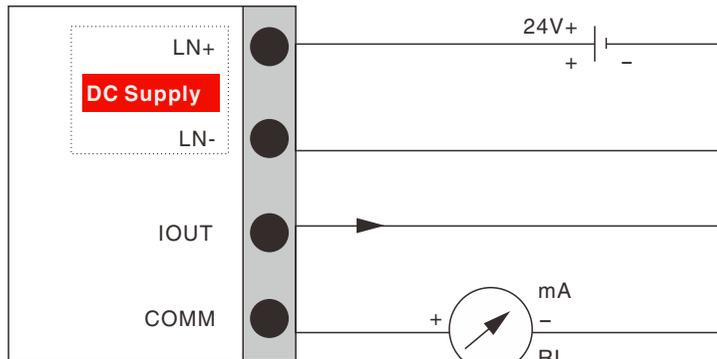
<b>Alarm Output Junction</b>	ALMH: Upper Limit; ALML: Lower Limit
<b>Alarm Output Capacity</b>	Field-effect transistors Output Maximum Voltage: 36V DC Maximum Current: 250 mA

## 2.5 Connection Diagrams Of Outputs

### 2.5.1 Current Output(On special request)

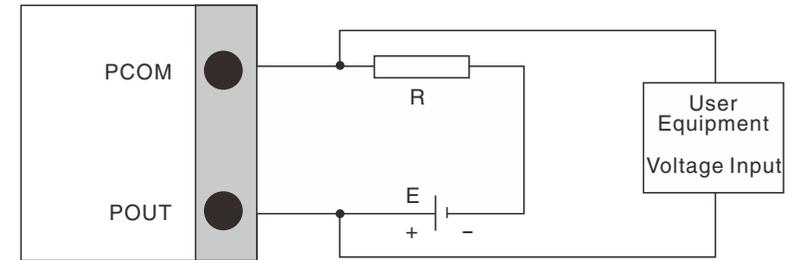


Current Output -Two Wire Connection

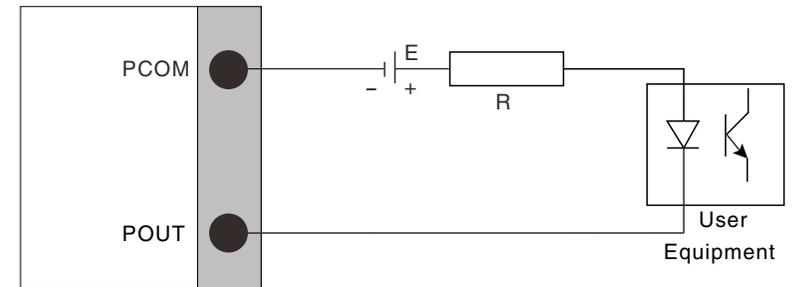


Current Output -Four Wire Connection(Isolated)

### 2.5.2 Digital Voltage Output

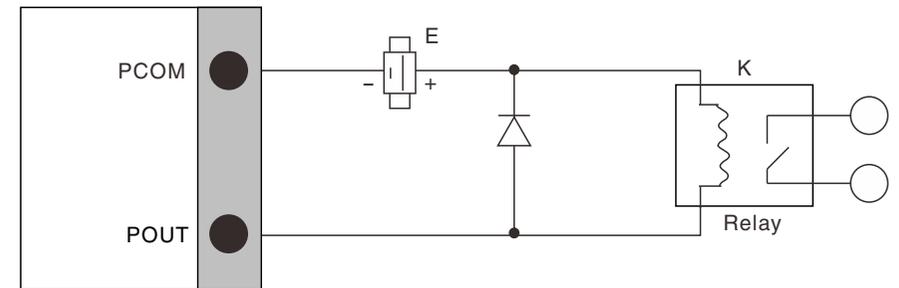


### 2.5.3 Digital Output To Photoelectricity Coupling



Generally, photoelectricity coupling current is about 10mA. When  $E/R=10\text{mA}$ ,  $E=5\sim 24\text{V}$ .

### 2.5.4 Digital Output To Relay



Digital Output To Relay

Generally, E (Voltage) of the relay is 12V or 24V; D is extended diode, most middle relays have this diode inside. If not, user should connect one outside.

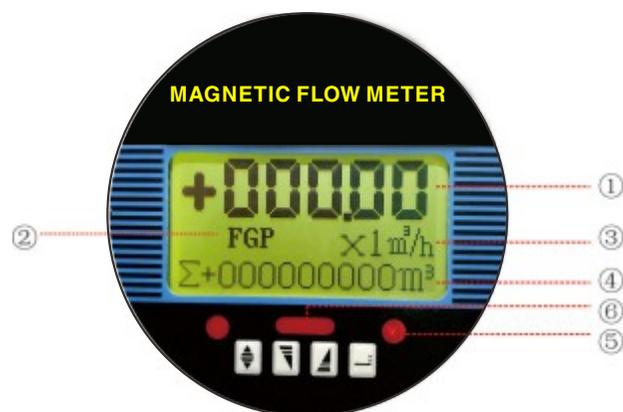
Table of digital output parameter: POUT

Parameter	Test Condition	Mini	Typical	Max	Unit
Voltage	IC=100 mA	3	24	36	V
Current	Vol=1.4V	0	300	350	mA
Frequency	IC=100 mA Vcc=24V	0	5000	7500	Hz
High Voltage	IC=100 mA	Vcc	Vcc	Vcc	V
Low Voltage	IC=100 mA	0.9	1.0	1.4	V

### 3. OPERATION AND SETUP

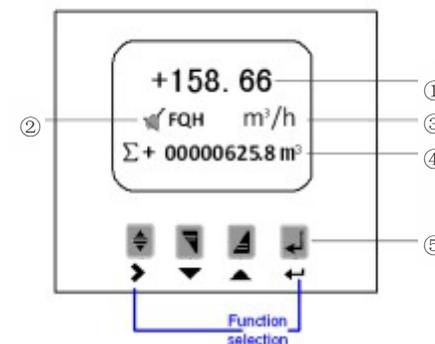
#### 3.1 Display and Keys

##### 3.1.1 Compact Type



①	Flow Rate
②	Alarm Symbol and Message: FQH; FQL; FGP; SYS
③	Flow Rate Unit
④	Flow Velocity; Percentage; Positive, Negative or Net Total (Switchable)
⑤	Keys (See table below for function and representation in text)
⑥	Infrared Sensor (not present in all signal converter versions)

##### 3.1.2 Remote Type



①	Flow Rate
②	Alarm Symbol and Message: FQH; FQL; FGP; SYS
③	Flow Rate Unit
④	Flow Velocity; Percentage; Positive, Negative or Net Total (Switchable)
⑤	Keys (See table below for function and representation in text)

Key	Measuring Mode	Menu Mode	Sub-menu or Function Mode	Parameter and Data Mode
➤ + ⬅	Function Selection (1)Parameters Set (2)Clr Total Rec: Reset Totaliser (3)Fact Modif Rec: check the modification record!			
⬅ (Enter Key)	Enter the function selection	Return to the measuring mode but prompt whether the data should be saved	Press 1 time, return to menu mode, data saved	Return to sub- menu or function, data saved
At any modes, Press and hold "Enter" for 3 seconds to return to measuring mode				
▼ or ▲	Switch between display pages: Flow velocity, Percentage, Positive Total, Negative Total, NetTotal	Select menu	Select sub- menu or function	Use cursor highlighted to change number, unit, setting and to move the decimal point
➤ + ▲ or ➤ + ▼	Adjust LCD Contrast			For numerical values, move cursor one position to the right or left
It returns to the measuring mode automatically after 3 minutes without any action under parameter setting mode.				

### 3.2 Function Selection Menu

At measuring mode, press + can lead to function selection menu including three sub-menu.

Key (Measuring mode)	Function Selection	Description
+	(1) Parameters Set	Choose this menu and one page with password protect can be displayed. Input the correct password and press  +  to enter the parameters set.
	(2) Clr Total Rec	Choose this menu and one page with password protect can be displayed. Input the correct password and press  +  to perform the total flow reset. <i>Note: factory default password is "10000"; change this password when get the flowmeter to avoid unintended reset on total flow.</i>
	(3) Fact Modif Rec	Track the modification record on factor

### 3.3 Parameters Set

Press + , it leads to function selection menu and the first menu is "Parameters Set", press to confirm the enter "Parameters Set". Input the pssword, and press + There are total 54 menus in "Parameters Set" and users can access and modify these menus depending on the input password grade. See table in next page for more information on password grade.

Table. Description of Password Grade

Password Grade	Password	Login Privileges	Menu Access
Grade 1	00521	Read Only	Menu 1 to 54
Grade2	03210	Read and Edit	Read: Menu 1 to 54 Edit: Menu 1 to 24
Grade3	06108	Read and Edit	Read: Menu 1 to 54 Edit: Menu 1 to 25
Grade4	07206	Read and Edit	Read: Menu 1 to 54 Edit: Menu 1 to 38
Grade5	Please consult your local representative	Read and Edit	Read: Menu 1 to 54 Edit: Menu 1 to 52

Specific Menu- Parameters Set

Menu	Parameter Name	Setting Method	Grades	Range
M1	Language	Select Parameter	2	English
M2	Comm Address	Input Value	2	0~99
M3	Baud Rate	Select Parameter	2	600~14400
M4	Snsr Size	Select Parameter	2	3~3000
M5	Flow Unit	Select Parameter	2	L/h, L/m, L/s, m³/h, m³/m, m³/s
M6	Flow Range	Input Value	2	0~99999
M7	Flow Rspns	Select Parameter	2	1~50
M8	Flow Direct	Select Parameter	2	Rlus/Reverse
M9	Flow Zero	Input Value	2	0~±9999
M10	Flow Cutoff	Input Value	2	0~599.99%
M11	Cutoff Ena	Select Parameter	2	Enable/Disable
M12	Total Unit	Select Parameter	2	0.001m³~1m³, 0.001L~1L
M13	SegmaN Ena	Select Parameter	2	Enable/Disable
M14	Analog Type	Select Parameter	2	0~10mA/4~20mA
M15	Pulse type	Select Parameter	2	Freque / Pulse
M16	Pulse Fact	Select Parameter	2	0.001m³~1m³, 0.001L~1L
M17	Freque Max	Select Parameter	2	1~5999HZ
M18	Mtsnsr Ena	Select Parameter	2	Enable/Disable
M19	Mtsnsr Trip	Input Value	2	59999%
M20	Alm Hi Ena	Slect Parameter	2	Enable/Disable
M21	Alm Hi Val	Input Value	2	000. 0~599. 99%
M22	Alm Lo Ena	Select Parameter	2	Enable/Disable
M23	Alm Lo Val	Input Value	2	000. 0-599. 99%
M24	Sys Alm Ena	Select Parameter	2	Enable/Disable
M25	Clr Sum Key	Input Value	3	0-99999
M26	Snsr Code 1	User set	4	Finished Y M
M27	Snsr Code 2	User set	4	Product Number

Menu	Parameter Name	Setting Method	Grades	Range
M28	Field Type	Select Parameter	4	Type1,2,3
M29	Sensor Fact	Input Value	4	0.0000-5.9999
M30	Line Crc Ena	Select Parameter	4	Enable/Disable
M31	Lineary CRC 1	User Set	4	Set Velocity
M32	Lineary Fact 1	User Set	4	0.0000-1.9999
M33	Lineary CRC 2	User Set	4	Set Velocity
M34	Lineary Fact 2	User Set	4	0.0000-1.9999
M35	Lineary CRC 3	User Set	4	Set Velocity
M36	Lineary Fact 3	User Set	4	0.0000-1.9999
M37	Lineary CRC 4	User Set	4	Set Velocity
M38	Lineary Fact 4	User Set	4	0.0000-1.9999
M39	FwdTotal Lo	Correctable	5	00000-99999
M40	FwdTotal Hi	Correctable	5	00000~9999
M41	RevTotal Lo	Correctable	5	00000~99999
M42	RevTotal Hi	Correctable	5	00000~9999
M43	PlsntLmtEna	Select Parameter	5	Enable/Disable
M44	PlsntLmtVal	Select Parameter	5	0.010-0.800m/s
M45	Plsnt Delay	Select Parameter	5	400-2500ms
M46	PassWord 1	User Correct	5	00000-99999
M47	PassWord 2	User Correct	5	00000-99999
M48	PassWord 3	User Correct	5	00000-99999
M49	PassWord 4	User Correct	5	00000-99999
M50	Analog Zero	Input Value	5	0.0000-1.9999
M51	Anlg Range	Input Value	5	0.0000-3.9999
M52	Meter Fact	Input Value	5	0.0000-5.9999
M53	MeterCode 1	Factory Set	6	Production Date:Y/M
M54	MeterCode 2	Factory Set	6	Product Serial No

### 3.4 Parameter Function Table

No.	Function	Settings/Descriptions
language		
M1	Language	English / Chinese Language selection depends on the device version.
RS485 Communication		
M2	Comm Addr	Value: Integer 01 to 99 Device Address for RS485 (Not Present in all converter)
M3	Baud Rate	Selectable: 600, 1200, 2400, 4800, 9600, 19200
Sensor Diameter		
M4	Sensor Size	Select the sensor size (See the nameplate)
Flow Parameter:Unit,Range,Response Time,Direction,Zero Calibration,Small Flow Cutoff		
M5	Flow Unit	Selectable: L/h(liter/hour), L/m(liter/minute), L/s(liter/second)m <sup>3</sup> /h (cubic meter/hour), m <sup>3</sup> /m(cubic meter/min), m <sup>3</sup> /s(cubic meter/second)
M6	Flow Range	Value: 0-99999 (This parameter represents the Max,Flow Rate of flowmeter) Change this value will affect other parameter (M10) and current output value.
M7	Flow Rspns	Damping time / Time constant, default value: 3 second Set large value can enhance the stability of flow display and output digital, which is suitable for accumulative total from pulse output; the small value means fast respond rate, which is suitable for production control.
M8	Flow Direct	Selectable:Plus/Reverse Define polarity of flow direction. Plus/Forwards(according to the arrow on the measuring sensor) or Reverse/Backwards(in the opposite direction to the arrow)
M9	Flow Zero	Zero Calibration First row - small words: FS-new zero calibration value Second row - large words: zero point correction value To ensure the flowmeter's accuracy, FS should be 0. Change the value at second row to make sure FS is 0. Note: ONLY perform "Flow Zero" when the pipe is full filled static fluid.
M10	Flow Cutoff	Sets output value of all outputs to "0": (Low flow cutoff) For example: Flow Cutoff value = 20% Then the Min. Flow rate = 20% of Max. Flow rate (the value in M6) Note: this function is ONLY effective if M11 (SegmaN Ena) is Enable.
M11	Cutoff Ena	Selectable: Enable / Disable The switch on M10(Flow Cutoff)
M12	Total Unit	Selectable: 0.001m <sup>3</sup> , 0.01m <sup>3</sup> , 0.1m <sup>3</sup> , 1m <sup>3</sup> , 0.001L, 0.01L, 0.1L, 1L 9Digital, this parameter can control the resolution for accumulative flow.

No.	Function	Settings/Descriptions
Outputs:		
M13	SegmaN Ena	The switch to control outputs of reverse Flow: current or pulse output.
		The output function is ONLY effective for reverse flow if M13 is Enabled. For example, M13 = "Disable", then there is still no output even though there is reverse flow rate in pipe. Note: this switch can't control output of Plus Flow Rate.
M14	Analog Type	Selectable: 4-20mA / 0-10mA
		Select the correct current output mode base on user's application.
M15	Pulse Type	Selectable: Freque (Frequency) / Pulse Freque: Frequency Output Pulse: Scaled Pulse Output
M16	Pulse Fact	Selectable: 0.001L, 0.01L, 0.1L, 1L; 0.001 m <sup>3</sup> , 0.01 m <sup>3</sup> , 0.1 m <sup>3</sup> , 1 m <sup>3</sup>
		The scaled pulse output value for each pulse, ONLY effective if M15 is selected as "Pulse". For example, M16="0.1L", it means each pulse is 0.1L Max. Pulse Output: 100 Pulses/Second.
M17	Freque Max	Value: 1-5000Hz Max. Frequency is corresponding to M6 (Flow range).
Alarms:		
M18	Mtsnsr Ena	Selectable: Enable / Disable Empty Pipe Detect is ONLY valid if M18 (Mtsnsr Ena) = Enable.
M19	Mtsnsr Trip	First row: measured conductivity value (V1) Second row: the value (V2) which can trigger the Empty Pipe Alarm. Generally, set V2 as three to five times of V1. Flow indication, pulse output and current output " = 0 " when pipe empty Note: perform this parameter set when the pipe is full filled with fluid.
M20	Alm Hi Ena	Selectable: Enable / Disable Upper Flow Limit Alarm is ONLY valid if M20 (Alm Hi ENa) = Enable
M21	Alm Hi Val	Value: 0% - 199.9% (The value to trigger the Upper Flow Limit Alarm)
		Upper Flow Limit Alarm is ONLY triggered when M20= Enable and Flow rate > M21*M6
M22	Alm Lo Ena	Selectable: Enable / Disable Low Flow Limit Alarm is ONLY valid if M22 (Alm Lo Ena) = Enable
M23	Alm Lo Val	Value: 0% - 199.9% (The value to trigger the Low Flow Limit Alarm)
		Low Flow Limit Alarm is ONLY triggered
M24	Sys Alm Ena	When M22= Enable and Flow rate < M10*M6
		Selectable: Enable / Disable System Exciting Alarm is ONLY valid if M24 = Enable

No.	Function	Settings/Descriptions
Reset Totaliser Password:		
M25	Clr Sum Key	The password is used to reset the totalizer. Note: please set M25 "Clr Sum Key" first, and use this password to perform reset according to Section 3.29 (Page 51)
Sensor:		
M26	Snsr Code1	User can set sensor production date in M26 to track whether the Sensor Factor is correct
M27	Snsr Code2	Sensor Serial Number
M28	Field Type	Selectable: 1/16; 1/20; 1/25
		Three types of Exciting frequency. Usually use 1/16 for small size sensor, and others two for large size sensor.
M29	Sensor Fact	Input Measuring Sensor Constant: GK User can get this factor from the calibration certificate.
Linearity Correction:		
M30	Line Crc Ena	Selectable: Enable / Disable
		This parameter is used to control the linearity correction function. Enable: use the linearity correction; Disable: linearity correction is not used even M31 to M38 are set.
M31	Lineary CRC 1	Correction Point 1: the velocity of point 1
M32	Lineary Fact 1	Linearity Fact 1: the correction factor for point 1
M33	Lineary CRC2	Correction Point 2: the velocity of point 2
M34	Lineary Fact 2	Linearity Fact 2: the correction factor for point 2
M35	Lineary CRC3	Correction Point 3: the velocity of point 3
M36	Lineary Fact 3	Linearity Fact 3: the correction factor for point 3
M37	Lineary CRC4	Correction Point 4: the velocity of point 4
M38	Lineary Fact4	Linearity Fact 4: the correction factor for point 4
Set Value for Total Flow: For flowmeter maintenance or replacement, maybe the previous total flow should be set. And change M39 to M42 can accomplish this function.		
M39	FwdTotal Lo	Set Value: 00000 - 99999
		Low Bbyte of Positive Total Flow

No.	Function	Settings/Descriptions
M40	FwdTotal Hi	Set Value: 0000 - 9999
		High Byte of Positive Total Flow
M41	RevTotal Lo	Set Value: 00000 - 99999
		Low Byte of Negative Total Flow
M42	RevTotal Hi	Set Value: 0000 - 9999
		High Byte of Negative Total Flow
Peak Suppression Function:		
M43	PlsntLmtEna	The switch for Peak Suppression Enable: Peak Suppression ON; Disable: Peak Suppression OFF. For paper pulp, slurry and other serosity, "Peak Interference" can occur when the solid grain scrubs or strikes the electrodes. Peak suppression arithmetic can restrain this interference via the setting of M43, M44 and M45.
M44	PlsntLmtVal	This parameter determines the change rate of Peak Interference, based on the percent of flow velocity; ten grades: 0.010m/s (Grade 1), 0.020m/s, 0.030m/s, 0.050m/s, 0.080m/s, 0.100m/s, 0.200m/s, 0.300m/s, 0.500m/s, 0.800m/s (Grade 10) The sensitivity of Peak Suppression is highest for Grade 1.
M45	Plsnt Delay	This parameter can determine the width of time to restrain Peak Interference and the unit is ms.
		If the duration of one signal is less than the value in M45, this signal can be determined as Peak Interference and will be suppressed; otherwise it will be determined as normal signal.
Password Management:		
M46	PassWord 1	M46 to M49 can be changed using Grade 5 Password to enter parameter setting.
M47	PassWord 2	
M48	PassWord 3	
M49	PassWord 4	
Factory Use ONLY: Zero point calibration or Full scale calibration		
M50	Analog Zero	Zero Point Calibration for current output to make sure the Zero point is 0 mA/ 4 mA.
M51	Anlg Range	Full scale calibration for current output to make sure the Full Scale is 10mA or 20mA.
M52	Meter Fact	Factory Use ONLY.
M53	MeterCode 1	Converter Production Date
M54	MeterCode 2	Converter Serial Number

## 4. INFRARED INTERFACE

*Note: the infrared interface is optional with extra charge. Infrared interface can read and write writing all parameters with IR interface (option) without opening the front cover.*

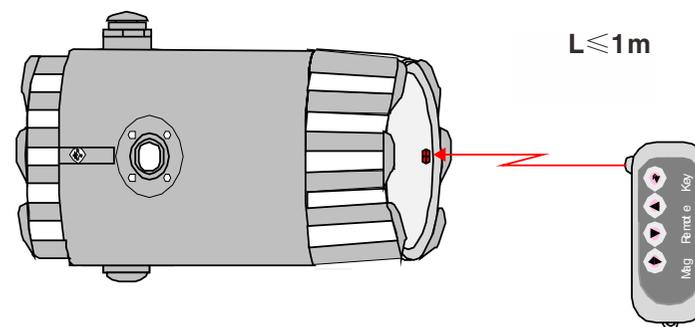


Fig 4.1 Infrared Interface for operating converter without opening the front cover

## 5. ALARM INFORMATION

Converters have self-diagnose function. This information  displays at the left of LCD. The explanations of Alarm are as below:

FQH: Upper Flow Limit Alarm

FQL: Low Flow Limit Alarm

FGP: Empty Pipe Alarm

SYS: System Excitation Alarm

## 6. TROUBLESHOOTING

Symptom	Probable Cause	Solution
No Display	1. No power	Apply correct power
	2. Fuse blown	Replace a fuse with same parameter
	3. Contrast of LCD is too low	Increase the contrast
Empty Pipe Alarm	1. Fluid is not full filled the pipe	Increase the flow rate
	2. Electrode was polluted	Clean the electrode if voltage of DS1 and DS2>1V
	3. Fluid's conductivity is too small	If connect three terminals SIG 1, SIG 2, SGND and the alarm disappears, which means the fluid's conductivity is small. Replace other kind of flowmeter
Flow rate indication is unstable	1. Grounding issue	Make sure meter is properly grounded to a good earth ground
	2. Air	Make sure fluid does not contain air bubbles
	3. Converter location-outside electrical interference	Make sure Converter is not too close to sources of electrical interference