



PRODUCT MANUAL

FloCat MFE Electromagnetic Flow Meter





## *Flocat Electromagnetic Flowmeter*

# Operation Manual

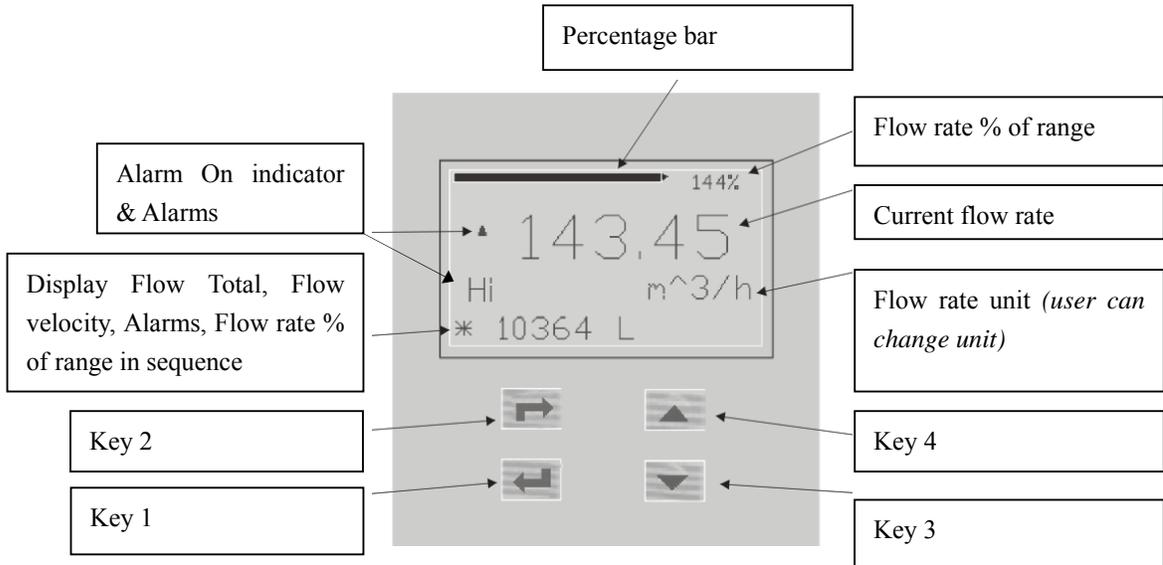
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# Part 1. 3-line Display on Transmitter

The standard transmitter has a three-line LCD display for viewing flow data and a four-button keypad for programming the meter. (Explosion proof transmitters have the same three-line LCD display but use four magnetic operating keys).

## Main Interface



### (1) Alarm Indicator and Alarms

If Alarm is turned on, a bell icon is displayed on the screen, indicating that the alarm feature is enabled.

The following types of alarms are available and can be displayed on the line below the Alarm indicator. (Note that only Emp-Pipe and Coil alarms are turned on by default)

Alarm identification displayed	Explanation
"Fwd"	Forward flow alarm
"Rev"	Reverse flow alarm
"Cut"	Alarm when flow velocity in mm/s below which all outputs are set to zero
"High"	Alarm when flow excess high limit.
"Low"	Alarm when flow excess low limit.
"Anlg"	Alarm when current output exceeds limit
"Pulse"	Alarm when pulse output exceeds limit
"EROM"(eeprom error)	Alarm when the initial default parameter is lost
"Copy"	Copy initial default parameter
"Emp-Pipe"	Alarm when pipe is empty
"Coil"	Alarm when excitation coil occurs

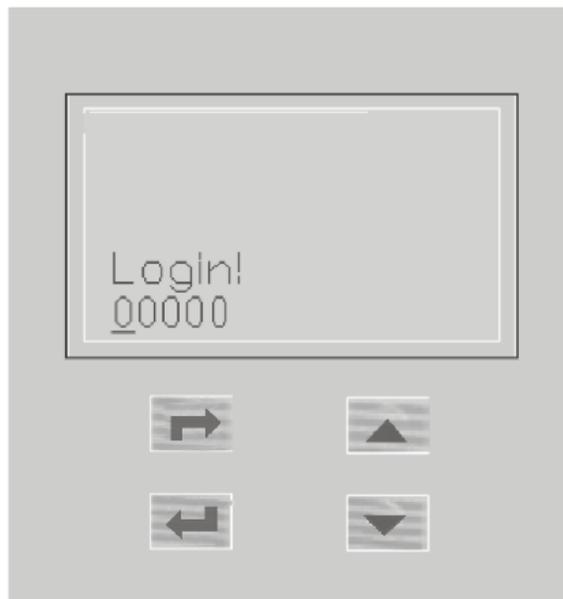
(2) Press Key 1  to view the following items on the 3<sup>rd</sup> line in sequence:

- > Forward flow total value
- < Reverse flow total value
- \* Net flow total value (e.g. \* 10364 L)
- V Current flow velocity
- Q current flow rate
- % Flow rate percent of range

(3) Press Key 3  to reset Flow total value.

This task can only be done when the parameter of "Reset Total" is set to "Yes" through the parameter configuration menu (see Part 2 for how). If "Reset Total" is not changed into "Yes", pressing  on the main interface will result in display of "CtrEn=0", which means reset is not successful.

(4) Press Key 2  to enter login screen as shown below:



Enter the password as provided. The correct password will bring you into the programming interface. See Part 2 for the parameter settings.

## Part 2. Programming Guide

This section describes how to navigate the menu and configure the parameters according to user's application.

Note: *Only user with authorization can perform the following tasks.*

Security setting:

Note: the password of level 1 and level 2 is all a 5-digit security code. Correct password brings you to the parameter setting menu.

The first level of password is '02041', permitting user to set the parameters; the second level of password is '04121', permitting technician to set the parameters.

To enter password: After getting into the login screen, press  key to the digit you want to enter, and then press either  or  key to reach the desired digit. Continue until all digits have been set, and press  switch. If a correct password is entered, the parameter setting menu will be displayed and you will be able to navigate the menu on the next page and perform programming tasks. Otherwise you will be brought back to the main interface.

### Configuration Menu Overview

Press  Moves 

Return to 'Flow Span'  

Page one    Page two.....

Press  Moves 

Flow Span	Current High	Pulse Scale	Total Unit (Remark 2)	Alarm1 Status	Alarm2 Status	High Alarm	Span Input	Empty pipe Set	Sensor Id	Test Mode	Hardware Fact1	Flow Decimal	Reset!	Debug reset
Flow Unit (Remark 1)	Current Low	Pulse Span	Reset Total	Alarm1 Enable	Alarm2 Enable	Low Alarm	TotalClear Input	Empty pipe Value	Sensor Tag	Test Out	Hardware Fact2	Write protect		Debug Fwd/Tot
Flow Damping	Flow Direct	Pulse Value	Total password	Alarm1 Coil	Alarm2 Coil	H/L ALM HYS	FlowHold Input	Idle Time	Nominal Size	Test Flow		Header Length		Debug Rev/Tot
Dead Time	Flow Span2	Pulse Idle Stat		Alarm1 Forward	Alarm2 Forward	Alarm Enable	FlowCut Input	Velocity High	Sensor Fact1	Test Percent		Net address		Debug Setcon
Dead Time Switch	Current Value			Alarm1 Reverce	Alarm2 Reverce		Input IdleState		Sensor Fact2	Test Frequency				
Flow Percent	Current Direct1			Alarm1 LowCut	Alarm2 LowCut				Auto Zero	Test Current				
Velocity Cutoff	4-20mA Full1			Alarm1 Empty	Alarm2 Empty				Fact Copy	Test Velocity				
	4-20mA Zero1			Alarm1 High	Alarm2 High					Test Alarm				
	Current Direct2			Alarm1 Low	Alarm2 Low									
	4-20mA Full2			Alarm1 PulseHigh	Alarm2 PulseHigh									
	4-20mA Zero2													

- **How to Navigate Menu and Set Parameters:**

Press  and  keypads (M or E key for explosion-proof transmitter) to cycle through the units till the desired one is found, then press  or  keypad (+ or - key for explosion-proof transmitter) to change the value. Once the desired value is set, press  (E for explosion-proof transmitter) to confirm.

**(1) Setting Flow**

Item	R/W	Data Range	Unit	Default	Explanation
Flow Span	W		Flow Unit	100	Flow range (Corresponding to max value of 4-20mA output)
Flow Unit	W	(see <b>Remark 1</b> )		m <sup>3</sup> /h	
Flow Damping	W	0~7	s	3.2	Nominal time constant
Dead Time	W	0~7	s	0.8	The amount of time the meter will ignore abnormal flow readings and hold the last valid reading
Dead Time Switch	W	0~100(%)		30	If the flow fluctuates more than a set percentage of the flow range, the flow meter will ignore the fluctuation for the duration of the Dead Time
Flow Percent	R				Flowrate percentage
Velocity Cutoff	W	0~255	ft/s	0.1	Velocity Cutoff. Flow velocity in ft/s below which all outputs are set to zero

**Remark 1:** The available Flow Unit options include Ltr/S, Ltr/M, Ltr/H, MLtr/D, M<sup>3</sup>/S, M<sup>3</sup>/M, M<sup>3</sup>/H, M<sup>3</sup>/D, Ft<sup>3</sup>/S, Ft<sup>3</sup>/M, Ft<sup>3</sup>/H, Ft<sup>3</sup>/D, Gal/S, Gal/M, Gal/H, MGal/D, In<sup>3</sup>/S, In<sup>3</sup>/M, In<sup>3</sup>/H, In<sup>3</sup>/D, aFt/H, aFt/D, aIn/H, aIn/D, Bbl/M, Bbl/H, and Bbl/D.

Display of Flow Unit: (Ltr = Liter; M<sup>3</sup> = Meter<sup>3</sup>; Ft = foot ; Gal = gallon; In = inch; aFt = acre-foot; aIn = acre-inch; Bbl = Barrel. S = second; M = Minute; H = Hour; D = Day)

Flow Unit Ltr/S	Flow Unit Ltr/M	Flow Unit Ltr/H	Flow Unit MLtr/D
Flow Unit M <sup>3</sup> /S	Flow Unit M <sup>3</sup> /M	Flow Unit M <sup>3</sup> /H	Flow Unit M <sup>3</sup> /D
Flow Unit Ft <sup>3</sup> /S	Flow Unit Ft <sup>3</sup> /M	Flow Unit Ft <sup>3</sup> /H	Flow Unit Ft <sup>3</sup> /D
Flow Unit Gal/S	Flow Unit Gal/M	Flow Unit Gal/H	Flow Unit MGal/D
Flow Unit In <sup>3</sup> /S	Flow Unit In <sup>3</sup> /M	Flow Unit In <sup>3</sup> /H	Flow Unit In <sup>3</sup> /D
Flow Unit aFt/H	Flow Unit aFt/D		
Flow Unit aIn/H	Flow Unit aIn/D		
Flow Unit Bbl/M	Flow Unit Bbl/H	Flow Unit Bbl/D	

## (2) Setting 4~20mA

Item	R/W	Data Range	Unit	Default	Explanation
Current High	W	0~20	mA	20	Output current in mA for 100% flow range
Current Low	W	0~4	mA	4	Output current in mA for 0% flow range
Flow Direct	W	[-]/[+]		+	+ is forward direction; - is reverse
Flow Span2	W	(%)		100(%)	Full scale flow range for second analogue range as percentage of main flow range <b>**SPECIAL ORDER**</b>
Current Value	R		mA		Present electric current output
Current Direct1	W	[-]/[+]		+	Direction of channel1 current output
4-20mA Full1	W			0	Calibration function. Revised value of channel1 electric current output at full scale
4-20mA Zero1	W			0	Calibration function. Revised value of channel1 electric current output at zero
Current Direct2	W	[-]/[+]		+	Direction of channel2 electric current output <b>**SPECIAL ORDER**</b>
4-20mA Full2	W			0	Calibration function. Revised value of channel2 electric current output at full scale <b>**SPECIAL ORDER**</b>
4-20mA Zero2	W			0	Calibration function. Revised value of channel2 electric current output at zero <b>**SPECIAL ORDER**</b>

**Note:** IC1+ is standard for electromagnetic flowmeter. IC2+ is optional item and should be specially indicated at the time of ordering. The value [+] of Current Direct means forward direction of flow and [-] means reverse direction of flow. Flow direction could be changed by changing the value of Flow Direct.

## (3) Setting Pulse Output

Item	R/W	Data Range	Unit	Default	Explain
Pulse Scale	W			1	Number of pulses per Total Unit
Pulse Span	W	0~2000	Hz	800	Max output frequency in Hz. The recommended span is 800 ~ 1000 Hz. Higher values may affect performance of the flowmeter. Over 3000Hz will cause a system reset
Pulse Value	R		Hz		Present output frequency in Hz
Pulse Idle Stat	W	High/Low		Low	State when there is no pulse output
Pulse Mode	W	High/Low			Indicates if above or below 4 Hz

**Note:** The unit of pulse output is the same as Total Unit. 1 Pulse means 1 Total Unit by default. For example, if Total Unit is m<sup>3</sup>, 1 Pulse means 1 m<sup>3</sup>.

Please refer to Appendix 1 for the pulse settings for the different sizes of flowmeter. For example, for DN25, the max flow (i.e. Flow Span) is 6 m<sup>3</sup>/h, Total Unit is ml, then the max pulse (i.e. Pulse Span) = Flow Span x Flow Scale = 6m<sup>3</sup>/h x 0.1 = 6000000ml/3600s x 0.1 = 166.6666667 ml/s = 166.6666667 Hz.

Forward Total Flow is output through FOUTA, and reverse Total Flow is output through FOUTB.

#### (4) Setting Flow Total

Item	R/W	Data Range	Unit	Default	Explanation
Total Unit	W	(see <b>Remark 2</b> )		m <sup>3</sup>	
Reset Total	W	Yes/No		No	Selecting Yes enables totalizer reset by pressing the  key
Total Password	W			12345	Modify Total values in the following options: (1)Total Integer[+]: the integer portion of forward Total. (2)Total Decimal[+]: the decimal portion of forward Total. (3)Total Integer[-]: the integer portion of reverse Total. (4)Total Decimal[-]: the decimal portion of reverse Total.

**Note:** After setting the Reset Total to “Yes”, the next step is to exit the programming menu, go back to the main interface and press the  key to reset the total. The Alarm code “ClrEn=0” will be displayed if the above steps aren’t completed.

**Remark 2:** The available Total Unit options include Ltr, hLtr, M<sup>3</sup>, In<sup>3</sup>, Ft<sup>3</sup>, Yd<sup>3</sup>, Gal, Kgal, Bbl, aFt, and aIn.

Display of Total Unit: (hLtr = 100xLitre; Kgal = 1000xGallon; Yd<sup>3</sup> = Yard<sup>3</sup>)

Flow Unit Ltr/S	Flow Unit Ltr/M	Flow Unit Ltr/H	Flow Unit MLtr/D
Flow Unit M <sup>3</sup> /S	Flow Unit M <sup>3</sup> /M	Flow Unit M <sup>3</sup> /H	Flow Unit M <sup>3</sup> /D
Flow Unit Ft <sup>3</sup> /S	Flow Unit Ft <sup>3</sup> /M	Flow Unit Ft <sup>3</sup> /H	Flow Unit Ft <sup>3</sup> /D
Flow Unit Gal/S	Flow Unit Gal/M	Flow Unit Gal/H	Flow Unit MGal/D
Flow Unit In <sup>3</sup> /S	Flow Unit In <sup>3</sup> /M	Flow Unit In <sup>3</sup> /H	Flow Unit In <sup>3</sup> /D
Flow Unit aFt/H	Flow Unit aFt/D		
Flow Unit aIn/H	Flow Unit aIn/D		
Flow Unit Bbl/M	Flow Unit Bbl/H	Flow Unit Bbl/D	

### (5) Setting Alarm Output of Channel 1

Item	R/W	Data Range	Unit	Default	Explanation
Alarm1 Status	W	High/Low		High	Idle state for alarm output
Alarm1 Enable	W	Yes/No		Yes	No=Alarm output disabled; Yes=Alarm output enabled
Alarm1 Coil	W	Yes/No		Yes	Alarm occurs for excitation coil
Alarm1 Forward	W	Yes/No		No	Alarm occurs for forward flow
Alarm1 Reverse	W	Yes/No		No	Alarm occurs for reverse flow
Alarm1 LowCut	W	Yes/No		No	Alarm occurs for Cutoff
Alarm1 Empty	W	Yes/No		Yes	Alarm occurs for empty pipe
Alarm1 High	W	Yes/No		No	Alarm occurs for Flow High
Alarm1 Low	W	Yes/No		No	Alarm occurs for Flow Low
Alarm1 PulseHigh	W	Yes/No		No	Alarm occurs for exceeding Pulse range

**Note:** Terminal ALARM 1 outputs a constant voltage to show the current alarm status of the flowmeter. The initial status could be set through Alarm 1 Status.

### (6) Setting Alarm output of Channel 2. (SPECIAL ORDER)

Item	R/W	Data Range	Unit	Default	Explanation
Alarm2 Status	W	High/Low		High	Idle state for alarm output
Alarm2 Enable	W	Yes/No		Yes	No=Alarm output disabled; Yes=Alarm output enabled
Alarm2 Coil	W	Yes/No		Yes	Alarm occurs for excitation coil
Alarm2 Forward	W	Yes/No		No	Alarm occurs for forward flow
Alarm2 Reverse	W	Yes/No		No	Alarm occurs for reverse flow
Alarm2 LowCut	W	Yes/No		No	Alarm occurs for Cutoff
Alarm2 Empty	W	Yes/No		Yes	Alarm occurs for empty pipe
Alarm2 High	W	Yes/No		No	Alarm occurs for Flow High
Alarm2 Low	W	Yes/No		No	Alarm occurs for Flow Low
Alarm2 PulseHigh	W	Yes/No		No	Alarm occurs for exceeding Pulse range

**Note:** Terminal ALARM 2 outputs a constant voltage to show the current alarm status of the flowmeter. The initial status could be set through Alarm 2 Status.

Alarm 2 is not available on explosion-proof transmitters. For regular transmitters, Alarm 2 is disabled by default, unless user specifies it in the order.

## (7) Setting Alarm

The settings are used for both Alarm 1 and Alarm 2 (if enabled).

Item	R/W	Data Range	Unit	Default	Explanation
High Alarm	W	0~200(%)		110	High flow alarm trip point as % of the range
Low Alarm	W	0~200(%)		0	Low flow alarm trip point as % of the range
H/L ALM HYS	W	0~200(%)		10	Setting hysteresis/sluggish length/width of automatic range transformation.
Alarm Enable	W	Yes/No		Yes	Turn on/off alarm. "Yes" means to make alarm indicator available.

Alarm identification	Explanation
"Fwd"	Forward flow alarm
"Rev"	Reverse flow alarm
"Cut"	Alarm when flow velocity is lower than velocity cutoff setting
"High"	Alarm when flow exceeds high limit
"Low"	Alarm when flow exceeds low limit
"Anlg"	Alarm when current output exceeds limit
"Pulse"	Alarm when pulse output exceeds limit
"EROM"(eeprom error)	Alarm when the initial default parameter is lost
"Copy"	Copy initial default parameter
"Emp-Pipe"	Alarm when pipe is empty
"Coil"	Alarm when excitation coil error occurs

## (8) Setting Output of External Control

Item	R/W	Data Range	Unit	Default	Explanation
Span Input	W	Yes/No		Yes	Switch to the second flow range <b>**SPECIAL ORDER**</b>
TotalClear Input	W	Yes/No		No	Reset totalizer
FlowHold Input	W	Yes/No		No	Hold flowmeter output value
FlowCut Input	W	Yes/No		No	Set flow rate output to zero
Input IdleState	W	High/Low		Low (EXTI/P+ act on short circuit), High (EXTI/P- act on open circuit)	Configure external control status

**Note:** EXTI/P+ and EXTI/P- works as an external output channel and connects with control system. When Input IdleState is "Low", EXTI/P+ and EXTI/P- supply low potential. When Input IdleState is "High", EXTI/P+ and EXTI/P- supply high potential. The flowmeter has four kinds

of options for control as shown in the above list.

If ONE of “Span Input”, “TotalClear Input”, “FlowHold Input”, or “FlowCut Input” is Yes, the other three will be automatically set to No.

### (9) Setting Empty Alarm

Item	R/W	Data Range	Unit	Default	Explanation
Empty Pipe Set	W	0~20000	K Ω	1000	Set resistance limit of Empty sensor
Empty Pipe Value	R		K Ω		Display Empty Pipe sensor real time resistance value
Idle Time	W	0~255	Min	5	Idle time in minutes. Idle Time is the sampling time period for empty pipe detection.
Velocity High	W	0~20.000	m/s	6	The max flow rate measured by flowmeter

**Notes:**

- (i) Empty Pipe Value is the resistance between two electrodes in sensor. When resistance exceeds the value of Empty Pipe Set, the value of flow rate will be displayed as “0”, and flowmeter will return to the status of empty pipe.
- (ii) When flow rate exceeds the value of Velocity High, the displayed flow rate will be “0”.

### (10) Setting Sensor

Item	R/W	Data range	Unit	Default	Explanation
Sensor Id	W	0~99999999		11111111	Serial No
Sensor Tag	W	0~255		1	Tag No (legacy setting, not on all units)
Nominal Size	W	0~3000(>0)	mm	100	Nominal Diameter in mm
Sensor Fact1	W	(>0)		1	Slope
Sensor Fact2	W			0	Offset in mm/s at zero
Auto Zero	W	0~2		0	Velocity zero set
Fact Copy	W	0~19		0	Creates back-up copy of sensor parameters

**Notes:**

- (i) Each flowmeter has its own Sensor Id (Identity) which is also used as address of HART communication.
- (ii) When setting the value of Fact Copy to be “19”, all the parameters may get multiple backup, which may take a few seconds. During this period, please don’t cut off the power supply. Pressing the keypads of transmitter does not have effect. When the keypads become responsive, it means the backup is completed.
- (iii) Auto Zero:  
After installing the flowmeter on a pipeline, please make Auto Zero Adjustment before using it to measure flow, by following the steps below:

Step 1: Let the liquid fill full of the pipeline, and the flow velocity be zero.

Step 2: switch the menu of “Sensor Id” to “Auto Zero”;

Step 3: change the value of “Auto Zero” from “0” to “1”, and then wait for 1 minute without any operations on transmitter and pipeline.

The value will come back to “0” after one minute to indicate that the Auto Zero Adjustment is completed.

### (11) Setting Test Mode

Item	R/W	Data range	Unit	Default	Explanation
Test Mode	W	Yes/No		No	If Yes, the transmitter is in Test Mode
Test Out	W	No		No	Data output (MUST NOT BE SWITCHED FROM NO)
Test Flow	W		Flow Unit	100	Simulate input flow
Test Percent	R			0	Show Flowrate as a percentage
Test Frequency	R		mA	0	Show Pulse Output frequency
Test Current	R			0	Show Output frequency
Test Velocity	R			0	Show flow velocity in sensor
Test Alarm	R			0	Show currently active alarms

**Note:** When Test Mode is set to be “Yes”, the flowmeter enter simulation status of measurement.

If there isn't any action on the keypads of transmitter for more than 15 minutes when the interface is in status of test mode, the transmitter will quit and return to the main menu of the interface.

### (12) Setting Circuit Board

Item	R/W	Data range	Unit	Default	Explanation
Hardware Fact1	W			1	Correction coefficient 1 of circuit board
Hardware Fact2	W			0	Correction coefficient 2 of circuit board

**Note:** This menu is for the factory only. It's forbidden for customers to change these parameters by themselves.

### (13) Setting Display

Item	R/W	Data range	Unit	Default	Explanation
Flow Decimal	W	0~7		3	Decimal digits

#### (14) Others

Item	R/W	Data range	Unit	Default	Explanation
Reset!	W	Yes/No		No	If the value is changed to “Yes”, the transmitter will be rebooted without changes to parameters.

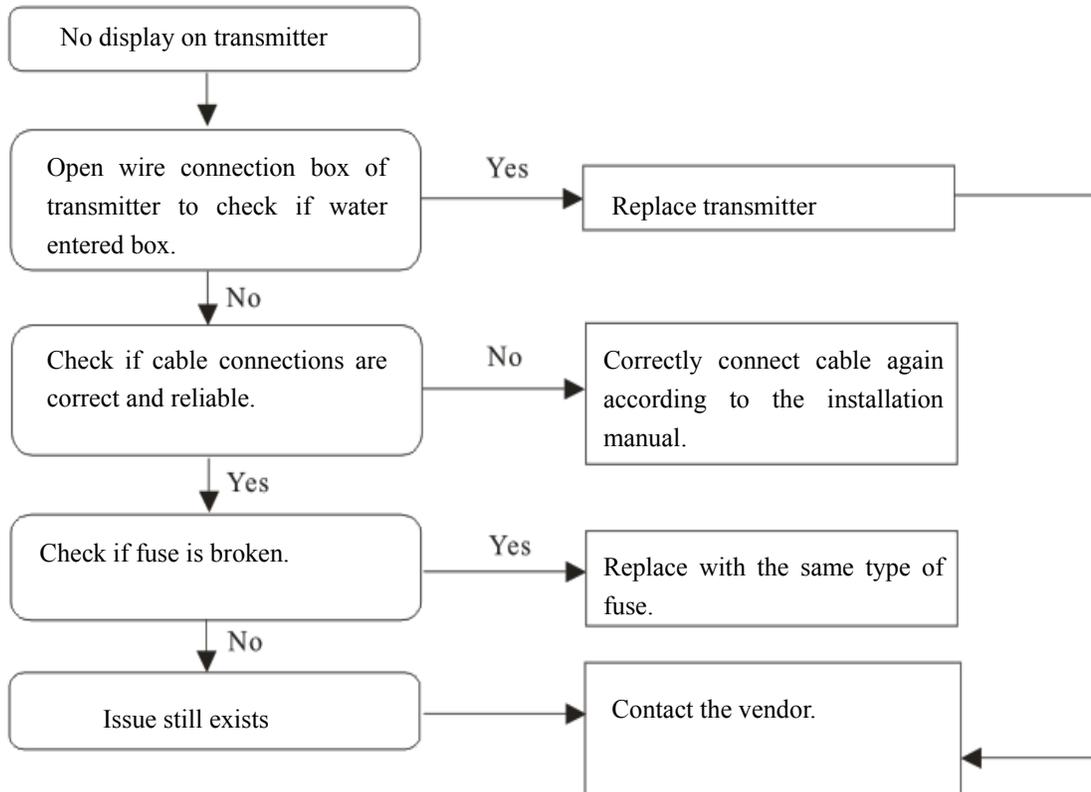
**Notes:**

1. R means that the field is read only; W means that the field is writable/editable
2. The value 'Yes' means that the option is selected; 'No' means that the option is not selected.
3. Use the keypads on transmitter to cycle through the menu and set the parameters accordingly.
4. If there isn't any action on the keypads of transmitter for more than 30 minutes when the flowmeter is in the parameter setting mode, the transmitter will quit and return to the main menu.

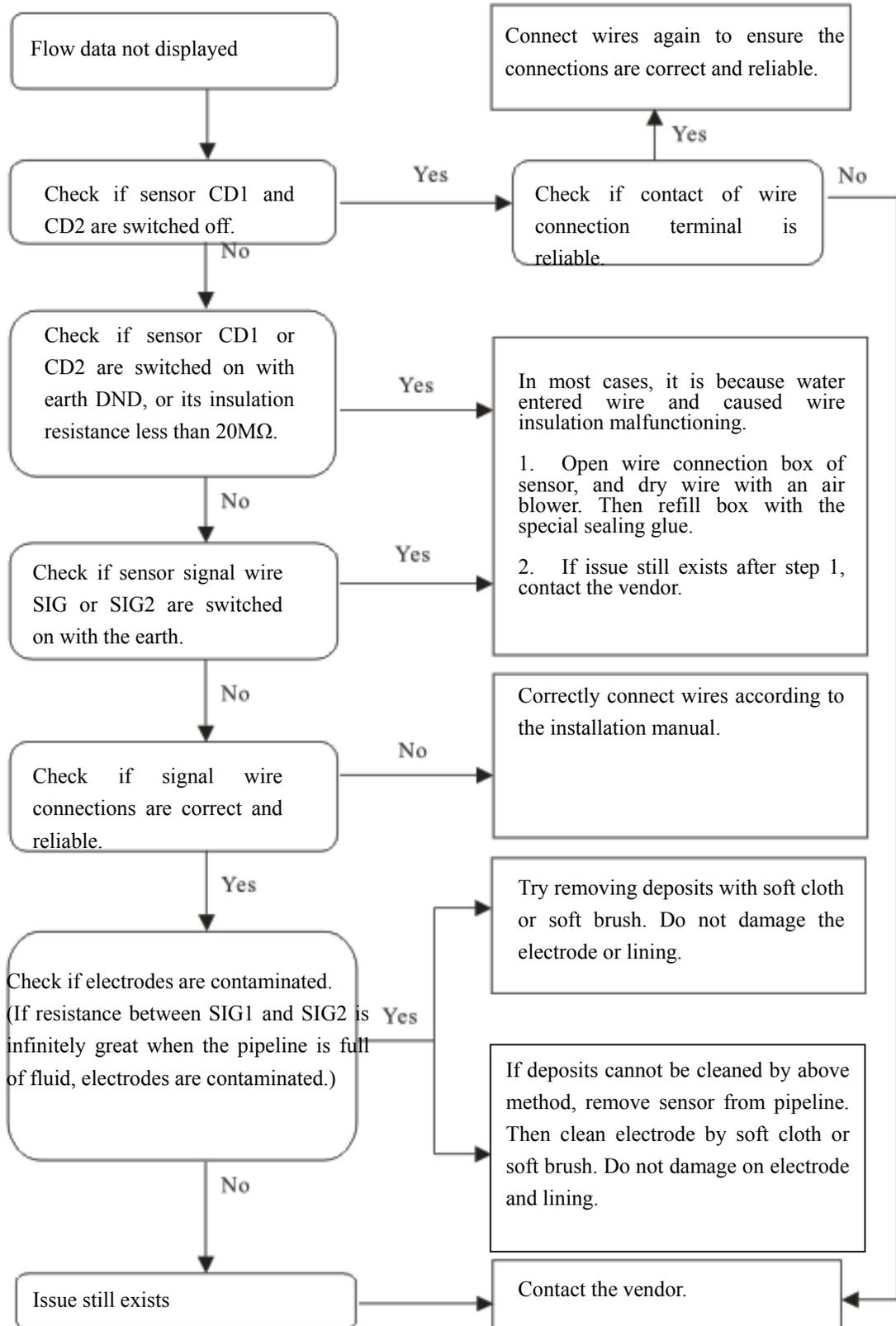
# Part 3. Troubleshooting Guide

The FloCat MFE Electromagnetic Flowmeter is designed for many years of optimal performance and requires little maintenance. However, if a malfunction occurs, we recommend you try resolving the issue by referring to the following guide. If you need further assistance, please contact your vendor.

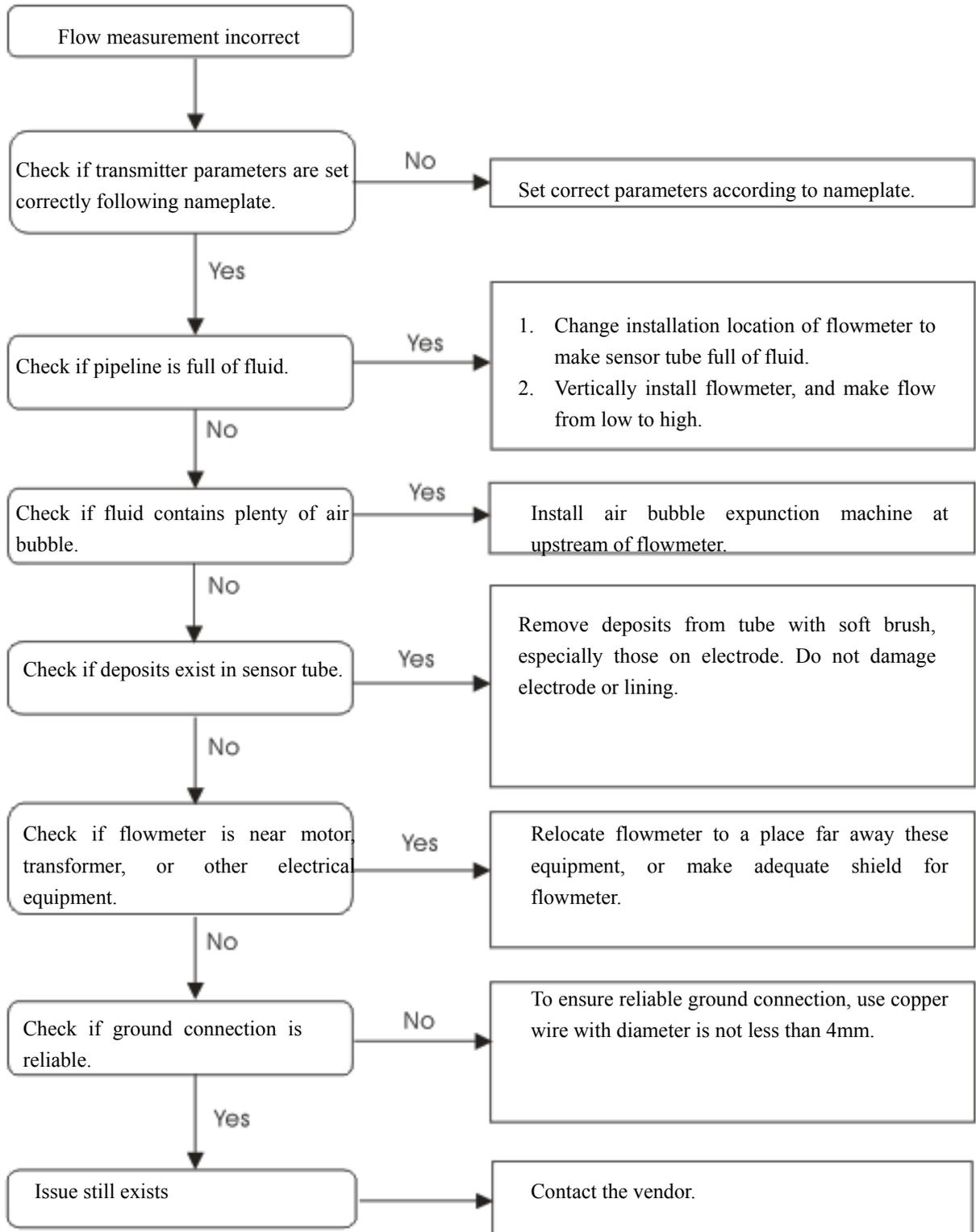
## (1) No Display on Transmitter



**(2) Flow Data not Displayed on Transmitter**



### (3) Flow Measurement Incorrect



#### (4) Other Errors

Errors	Recommended Actions
<p>Empty pipe error</p> <p>Note: Only “Emp-pipe” and “Coil” alarm are enabled by default. To see other alarm information, user must turn on them according to their needs. Please refer to the <i>Programming Guide – Setting Alarm output of Channel 1 (or 2)</i> for how-to.</p>	<ol style="list-style-type: none"> <li>1. Check if pipeline is full of fluid.</li> <li>2. Connect SIG1 and SIG2 to SIG GND to see if errors can be excluded.</li> <li>3. Check if signal wires are correctly connected.</li> <li>4. Check if electrodes contaminated.</li> <li>5. If flow exists, check if resistance between SIG1 and earth, or between SIG2 and earth is less than 50k<math>\Omega</math>.</li> </ol>
<p>Analog output error</p>	<ol style="list-style-type: none"> <li>1. If analog output is out of range, refer to the <i>Programming Guide</i> to set the value of the <i>Current range</i>.</li> <li>2. Switch off current output cable, check the Current Value in the setting and the current value between output terminals IC+ and IC- to see if they are equal.</li> <li>3. If flow is full of the range and current output is up to full scale, check if current output circuit resistance is less than 750<math>\Omega</math>.</li> </ol>
<p>PLS frequency error</p>	<ol style="list-style-type: none"> <li>1. If frequency output is out of range, refer to the <i>Programming Guide</i> to set the value of the <i>Pulse Span</i>.</li> <li>2. If PLS frequency output is incorrect, use the test function to test output frequency to exclude output connection errors.</li> </ol>
<p>Other error</p>	<p>Reset the parameters and see if error disappears.</p>

**Appendix 1:**

Size	Flow Span (m3/h)	Pulse Scale	Unit	Volume/unit	Total Unit	Pulse Span (Hz)
DN2.5	0.055	1	1	ml/1	ml	15.27777778
DN4	0.15	1	1	ml/1	ml	41.66666667
DN5	0.24	1	1	ml/1	ml	66.66666667
DN6	0.35	1	1	ml/1	ml	97.22222222
DN8	0.6	1	1	ml/1	ml	166.6666667
DN10	1	1	1	ml/1	ml	277.7777778
DN12	1.4	1	1	ml/1	ml	388.8888889
DN15	2	1	1	ml/1	ml	555.5555556
DN20	4	1	1	ml/1	ml	1111.111111
DN25	6	0.1	10	ml/1	ml	166.6666667
DN32	10	0.1	10	ml/1	ml	277.7777778
DN40	15	0.1	10	ml/1	ml	416.6666667
DN50	25	0.1	10	ml/1	ml	694.4444444
DN65	40	0.1	10	ml/1	ml	1111.111111
DN80	60	0.01	100	ml/1	ml	166.6666667
DN100	100	0.01	100	ml/1	ml	277.7777778
DN125	150	0.01	100	ml/1	ml	416.6666667
DN150	200	0.01	100	ml/1	ml	555.5555556
DN200	300	0.01	100	ml/1	ml	833.3333333
DN250	600	1	1	l/1	l	166.6666667
DN300	900	1	1	l/1	l	250
DN350	1200	1	1	l/1	l	333.3333333
DN400	1600	1	1	l/1	l	444.4444444
DN450	2000	1	1	l/1	l	555.5555556

DN500	3000	1	1	1/1	1	833.3333333
DN600	4000	1	1	1/1	1	1111.111111
DN700	5000	0.1	10	1/1	1	138.8888889
DN750	6000	0.1	10	1/1	1	166.6666667
DN800	7000	0.1	10	1/1	1	194.4444444
DN900	9000	0.1	10	1/1	1	250
DN1000	10000	0.1	10	1/1	1	277.7777778
DN1100	12000	0.1	10	1/1	1	333.3333333
DN1200	12000	0.1	10	1/1	1	333.3333333
DN1400	12000	0.1	10	1/1	1	333.3333333
DN1600	12000	0.1	10	1/1	1	333.3333333
DN1800	12000	0.1	10	1/1	1	333.3333333
DN2000	12000	0.1	10	1/1	1	333.3333333