



Mass Flow Meter

Operation Manual Standard: GB/T 31130-2014





Attention

Please read this manual carefully before installation and operation. It is a detailed introduction of configuration, design, specifications, installation, etc. of Sealand mass flow meter.

The meter is produced according to *National Regulation of Coriolis Mass Flow Meter GB/T 31130-2014*, approved & certified. Each sensor has its own paired transmitter. Please do not change any component in case of failure.

Please cut off the power before installation. Keep junction box intact and wiring correct; make sure no gasket, o-ring or holding screw missing, and electricity ex-proof device in good condition during the installation.



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1.1 Introduction

The meter is designed and produced according to world's latest Coriolis technology, with better appearance, stability and accuracy to measure mass flow rate of a fluid traveling through a tube, widely applied to alternative energy, oil & gas, chemical, food & beverage, industrial energy, marine, metals and mining, power, pulp & paper, water & wastewater industries, etc.

1.2 Operating principle

Mass flow meter measures the mass based on Coriolis effort. The operating principle involves inducing a vibration of the tube through which the fluid passes. The vibration, though not completely circular, provides the rotating reference frame that gives rise to the Coriolis effect. While specific methods vary according to the design of the flow meter, sensors monitor and analyze changes in frequency, phase shift, and amplitude of the vibrating flow tubes. The changes observed represent the mass flow rate and density of the fluid.

1.3 Features

- Measurement is not influenced by flow density, viscosity, temperature & pressure;
- Low requirement of straight pipe, because nothing inside holds back the flow;
- Internal nominal diameter varies from DN06 to DN100;
- Low power dissipation; stable zero point; better accuracy;
- Meter is ARM system, with 3 calculators to count density, temperature & mass flow rate;
- Transmitter is assembled by surface mounting technology, with self-inspection function;
- Ex-mark is Ex ib II B/II CT1~T6 Gb.

1.4 Operating conditions

Sensor	-50°C~+200°C		
Transmitter	-20°C~+50°C		
5%~95%, non co	ondensed		
Liquid/Gas/Slurry			
-200°C~+200°C			
4MPa(general model)			
25MPa(high pres	sure model)		
AC/85~265V; D0	C/20V~26V		
	Sensor Transmitter 5%~95%, non co Liquid/Gas/Slurr -200°C~+200°C 4MPa(general m 25MPa(high pres AC/85~265V; DO		

Chapter 2 Composition

The meter is composed of mass flow sensor and transmitter, with executive standard GB/T 31130-2014.

2.1 Mass flow sensor

Mass flow sensor is a phase-sensitive resonant sensor based on Coriolis effect, composed of vibration tube, signal detector, concussion driver, structural support, shell, etc.



2.1.1 Main parameters

Item	Parameters
Accuracy grade	0.2, 0.3, 0.5
Wetted tubes	Stainless steel 316L
Pressure loss	≤0.2MPa
Housing protection	IP65
Ex-mark	Ex ibIIB/IIC T1~T6 Gb

Table 2-1 Main parameter of sensor

2.1.2 Dimension

There are 3 different configurations, CNG-15, Triangle and U type.



Pic. 2-1 Configurations of sensor

Turne	Nomo		Max.flow	Di	imensi	on	F	lange (Standard DI	N2635)
туре	name		rate(kg/h)	A	в	с	d	d ₀	n-d₁	Bolt
CNG-15	CNG-15	15	3600	136	326	210	M32×1.5 nut			
	CG-06	6	1080	160	255	243	95	65	4- <i>Φ</i> 14	M12×60
Triangle	CG-15	15	3000	191	361	318	95	65	4- <i>Φ</i> 14	M12×60
	CG-25	25	12000	211	503	480	115	85	4- <i>ф</i> 14	M12×60
	CG-50	50	60000	556	708	501	165	125	4- <i>Ф</i> 18	M16×60
	CG-80	80	180000	830	970	501	200	160	8- <i>Ф</i> 18	M16×60



2.2 Mass flow transmitter

Mass flow transmitter is a micro-programming-centered electronic system, which supplies thrust to sensor, transforms sensor signal into mass flow signal and others, and improves accuracy in accordance with temperature parameter.



It is composed of switching power supplier, guard grating, core processor board, display module, etc, installed in a ex-proof junction box. Switching power supply offers power for the transmitter; safe grating isolates flow sensor and transmitter intrinsically; core processor detects & processes sensor phase signal, sends mass flow signal and process communication.

2.2.1 Main features

- Power≤15W;
- 3 calculators, to count flow rate, density & temperature respectively;
- 2 ways for parameter setting, infrared sensor buttons and software on computer connected through RS232;
- RS485 port, Modbus protocol(please contact our sales team for detail protocol);
- Pulse signal output is OC door output, which can be connected with electronic totalizer;
- Factory set: 1 pulse signal equals 0.1g, customizable before production.

2.2.2 Dimension

There are 2 different configurations, F210 & F23X.



Pic 2-2 Dimension of transmitter/mm

Chapter 3 Installation

Please read this manual carefully before installation. Take measure to avoid electric shock, and connect sensor with pipes correctly, without any leakage. Fluid pressure should be no more than the value marked on nameplate. It is highly recommended to hire professional technicians for installation and maintenance.

3.1 Installation steps

- a) Make sure flange, housing & wire plug undamaged, wiring & wiring board tight and undamaged, and the model number on nameplate is same as ordered;
- b) Choose correct installation site;
- c) Install the meter according to direction mark on sensor;
- d) Connect transmitter & sensor with 12-pin cable;
- e) Start.



3.2 Announcements

3.2.1 Site selection

- a) Sensor stays away from mechanical vibration source, for example, pump. Use flexible pipe to connect meter with pipeline if inevitable. The housing must be standalone, out of touch with any other device. There must be 3 times the size of sensor between 2 sensors if there are many flow meters on the same pipeline, to avoid resonance.
- b) Sensor stays away from industrial electromagnetic field, such as large generator and transformer, better 5m at least. Such device influences the performance of drive coil and pickoffs. Make sure magnetic field intensity less than 400A/m.
- c) Do not install sensor on pipeline that easily expands with hot and contracts with cold, especially near expansion joint, which leads to a worse stability.
- d) Sensor should be installed on lower pipeline, to be easily full of fluid.
- e) Make sure Ex-mark meet application requirements if in hazardous area.
- f) Build a sunshade if the meter is under direct solar radiation.
- g) Keep the meter from corrosive liquid.

3.2.2 Installation methods

The sensor can not be a support point of the whole pipeline; the pipeline should support itself. Meanwhile, sensor should not be under overlarge tension stress during the connection, since pipeline expansion will make this stress heavier.

There are 3 installation methods for different fluid, as follows.



Pic. 3-1 Installation methods

- a) For liquid, install the sensor downwards, to avoid air gathering in tubes.
- b) For gas, install the sensor upwards, to avoid condensate gathering in tubes.
- c) For slurry, install the sensor on vertical pipe, to avoid particle gathering in tubes.

3.2.3 Ground

Current signal from sensor is extremely weak, only several millivolt even when full range; thus, sensor should be well grounded to filter other signals. There are 2 requirements as follows.

a) The electric potential of ground terminal of sensor and transmitter should be the same as that of fluid.



b) Make the ground as zero potential to reduce interference. It's easy to meet this requirement, because generally the pipeline is metal and grounded itself already. However, the meter should be grounded itself if there is strong interference. Meter ground cable should be copper material, with section over 4mm^2 , and not connected with common ground cable of motor, etc.; ground resistance should be less than 10Ω .

3.2.4 Start

Please check following items before operation, and operate according to relevant rules.

- a) If the meter is damaged during shipment and installation;
- b) If the voltage is same as marked on nameplate;
- c) If the fuse is correct;
- d) If the meter is grounded properly.

If everything is fine, please conduct zero calibration after first start, at least twice, and should do this all over again if the meter is moved to another site.

Preparation for zero calibration:

- a) The transmitter should be powered on for at least 20min;
- b) Run the meter for few minutes to wash away residual impurity inside pipelines;
- c) Run the meter until the temperature of sensor becomes common operating temperature;

d) Shut off the outlet valve, to make the sensor full of fluid and the fluid stop flowing.

Please refer to Chapter 7.5 for detail operation of zero calibration.

3.2.5 Others

- a) Make sure the meter coaxial with pipeline, and axis deviation no more than 1.5mm if the meter diameter is 50mm or less.
- b) Make sure the gasket of high corrosion resistance, and not touch tube interior.
- c) Make sure fasteners in good condition, and well lubricated.
- d) Protect the meter from heat during cutting and welding of nearby pipes.

Attention





Chapter 4 Wiring

Please cut off the power before wiring, use circular section cable so that wiring plug can seal better, and make sure supply voltage same as marked on nameplate.

4.1 General wiring

There are 2 optional voltages for transmitter, AC220V/DC24V. Power cable section should be more than 0.8mm², and length less than 300m.



Pic. 4-1 General wiring diagram of transmitter F23X



Pic. 4-2 General wiring diagram of transmitter F210 (same wiring color as F23X)



Wiring requirements

- a) Cut off power before wiring;
- b) Use correct wire;
- c) Correct steps to thread wire: Loosen locknut; remove block board; thread wire through locknut, rubber ring and wire plug all at once; do the wiring; settle wires; tighten locknut.
- d) Do not damage insulating layer when pare wire. For sensor signal input wire, do not pare shielding layer if wirable.

4.2 Wiring between sensor & transmitter

Sensor and transmitter are connected through a 12-pin cable, provided by manufacturer. The definition is as follows.

S/N	1	2	3	4	5	6	7	8	9	10	11	12
Code	R+	R-	PE	L+	L-	TPE	S ₂	S ₁	C1	DPE	D-	D+
Color	white	yellow	black (shield)	gray	purple	black (shield)	black	green	orange	black (shield)	red	blue
Function		Right, le	ft coil dete	ection		Tem	peratur	e detec	tion	Co	oil drive	r



Chapter 5 Operation interface

5.1 Operation panel



Pic. 5-1 Transmitter schematic

There are 2 infrared sensors, SET and SELECT, between which there is a indicator light, which blinks green once per second during operation, and blinks red when infrared sensor detects operation.



5.2 Operation interface



Pic. 5-2 Interface frame diagram

Not all interfaces are introduced here. Please refer to Appendix 2 *Abbreviation Explanation Table* for more information, if you do not know the meaning of abbreviation.

5.2.1 Main interface 1

On main interface 1, sweep over SET to switch from mass total to mass flow rate alternately; SELECT from volume total to volume flow rate alternately.



Pic.5-3 Main interface 1



Content	Unit	Section	Display accuracy	
		m > 99999.999	Scientific notation %+10.3e	
Mass total	т	m < 99999.999	Show in full screen, keep as many decimals as possible	
		m > 99999.999	Scientific notation %+10.3e	
		100< m <999999.999	%+10.3f 10-digit, 3-decimal	
	KG or LB	10< m <100	%+10.3f 10-digit, 3-decimal	
		1< m <10	%+10.4f 10-digit, 4-decimal	
		m <1	%+10.5f 10-digit, 5-decimal	
Maga flow rate	A II	m > 9999.9999	Scientific notation %+10.3e	
Mass now rate	All	m < 9999.9999	%+10.3f 10-digit, 3-decimal	
Volumo flow rato	All	V > 9999.9999	Scientific notation %+10.3e	
volume now rate	All	V < 9999.9999	%+10.3f 10-digit, 3-decimal	
		100< V <99999.999	%+10.3f 10-digit, 3-decimal	
		10< V <100	%+10.3f 10-digit, 3-decimal	
Volume total	All	1< V <10	%+10.3f 10-digit, 3-decimal	
		V <1	%+10.4f 10-digit, 4-decimal	
		V > 99999.999	%+10.5f 10-digit, 5-decimal	

Table 5-1 Display accuracy of main interface 1

Mark:

|N|: absolute value of N

%+10.3e: calculated by scientific notation with 10-digit & sign, retaining 3-decimal.

%+10.nf: output floating-point data, with 10-digit & sign, retaining n-digit.

All: all units, outputs parameters according to display accuracy, regardless of parameter unit.

5.2.2 Main interface 2

On main interface 2, sweep over SET to switch from mass data to volume data alternately.



Dic	5_1	Main	interface	2
PIC.	5-4	main	Internace	2

Content	Unit	Section	Display accuracy	
Mass flow rate	All	(+∞, -∞)	%+12.3f 12-digit, 3-decimal	
		m < 1	%+12.5f 12-digit, 5-decimal	
	All	1< m <10	%+12.4f 12-digit, 4-decimal	
Mass total		10< m <100	%+12.3f 12-digit, 3-decimal	
		m >=100	%+12.3f 12-digit, 3-decimal	
Volume flow rate	All	(+∞, -∞)	%+12.3f 12-digit, 3-decimal	
	All	V < 1	%+12.5f 12-digit, 5-decimal	
		1< V <10	%+12.4f 12-digit, 4-decimal	
volume total		10< V <100	%+12.3f 12-digit, 3-decimal	
		V >=100	%+12.3f 12-digit, 3-decimal	
	g/cm ³	(+∞, -∞)	%8.4f 8-digit, 4-decimal	
Density	kg/m ³		%8.3e scientific notation, 3-digit	
	kg/cm ³	$(+\infty, -\infty)$		
Temperature	All	$(+\infty, -\infty)$	%8.2f 8-digit, 2-decimal	

Table 5-2 Display accuracy of main interface 2

5.2.3 Developer interface



Pic.5-5 Developer interface

Password hint: Hexadecimal code, randomly generated by system

Password: Denary code, calculated manual. The calculation method is reserved by developer, because improper operation in this interface will leads to invocatable damage.







Main interface 1 will show mass/volume data if Mass/Volume is clicked; vice versa. Password has to be input if ClearT is clicked; vice vaersa. The screen will rotate 180° if you set θ 180°.

Chapter 6 Configuration software

6.1 Brief introduction

The whole interface is as follows, with tool bar on the top, current comm. port on left bottom, and connection status between meter & computer on right bottom.



6.2 Connection between meter & computer

Connect the meter and computer with a USB-to-RS485 converter; turn to device manager of this computer to check COM port connected with meter.

Start the software, comes the following interface automatically.

Address: 1	Baudrate: 19200	•	Parity:	None	•
Ser.Port: COM1	• Datebits:8	•	Stopbits:	2	•
	C.	nnec	t Ca	ncel	٦

Select the right COM port and click Connect; do not change any other parameter. You can click Connection on tool bar to disconnect or connect again.



6.3 Process variable monitoring

This interface comes automatically after the meter and computer are connected. You can also click Functions -->Process variables on tool bar to callout this interface. It shows real-time Flow rate, Total, Density & Temperature as follow.

Mass			
1	Flow:	0	Kg/min
ľ	Total:	0	Kg
Volume			
1	Flow:	0	L/min
	Total:	0	L
Other			
	Density:	0	Kg/m³
I	Temp. :	0	°C

6.4 Communication test

This interface is for communication test between software and meter. You can click Functions --> Communication test to callout. Polling period is the communication testing interval between meter and software. Software will visit meter database as you set, and shows times of dispatch and error. It is recommended to set it no less than 50ms to guarantee communication stability and operation fluency.

🖳 Status					
	Scan	Rate:	50	ms	
	Send	Number:	0		
	Err	Number:	0		
		🗖 Enable	Polling		
					Close

6.5 Mainboard information

This interface is to read mainboard number and mainboard real-time operating temperature. You can click Functions --> Mainboardmessage to callout.

MainBoardMessage	
Mainboard Version:	
MainBroadTemp.: 0 °C	
Close	



6.6 Density calibration

Do not change any parameter in this interface, but only when the transmitter is replaced. You can click Functions --> Demarcate --> Densitycalibration1 on tool bar to callout, and input parameters marked on the nameplate of new transmitter.

Density:	0	Kg/m ³
en.Fre.:	0	Hz
Air Density:	0	Modified
Water Density:	0	Modified
AirDen. Con.:	0	Modified
WaterDen.Con. :	0	Modified
ſemp. Co.:	0	Modified
r Den.State:	• w	ater Den.State: 😑

Chapter 7 Operation



Pic. 7-1 Sweep over screen Pic. 7-2 Sweep over SET/SELECT Pic. 7-3

Please sweep over 5~30mm away from screen to ensure movement recognition, and do no other movement. For example, do not sweep over SELECT when you just need to sweep over SET. Sweep once, recognize once. Please refer to Appendix 1 Function/operation table, if you need more information.

7.1 Calibration coefficient setting

- By transmitter
- 1.On main interface, sweep over screen as Pic. 7-1 until comes interface 3 a 2 0 ...;
- 2.Sweep over SET/SELECT as Pic. 7-2 until cursor points to \$\$;
- 3. Press SET until indicator light turns red & blinks, comes password input interface;
- 4.Input password:
 - a.Sweep over SET/SELECT to set the value, SET=Decrease, SELECT=Increase.
 - b.Sweep over screen to move to nearby digit, from SET to SELECT=Move right, SELECT to SET=Move left.
 - c.Press SET until indicator light turns red & blinks, to confirm password(or press SELECT until indicator light turns red & blinks, to cancel operation).

5.Comes interface Configuration ; the cursor points to FCF(Calibration Coefficient)



directly(if not, please sweep over SET/SELECT until it points to FCF); press SET until indicator light turns red & blinks; input new FCF(refer to Step 4); done;

6. Press SELECT until comes pop-up menu, asking whether to return to main interface; sweep over SET for yes, SELECT for no, and sweep over SET/SELECT again to confirm.

Every meter has its own calibration coefficient marked on standardization certificate and nameplate of sensor. Each sensor has its own paired transmitter. Customer can use the meter directly without setting new FCF, but in the following 2 cases: 1. Transmitter is replaced; 2. Measuring result has a big difference from real value. Formula:

Original FCF New FCF = 1 + (Measuring result - Real value Real value)

By software

Start the software; check tool bar on the top; click Functions --> Configuration; comes setting interface; click Modified on the right of FlowCalFactor; input new FCF; click OK to confirm; click Application; done.



7.2 Min. flow cut-off setting

• By transmitter

1.On main interface, sweep over screen as Pic. 7-1 until comes interface 3 a 2 0 ...;

2.Sweep over SET/SELECT as Pic. 7-2 until cursor points to 🌣;

3.Press SET until indicator light turns red & blinks, comes the password input interface;

- 4.Input password:
 - a. Sweep over SET/SELECT to set the value, SET=Decrease, SELECT=Increase.
 - b. Sweep over screen as to move to nearby digit, from SET to SELECT=Move right, SELECT to SET=Move left.

PE

c. Press SET until indicator light turns red & blinks, to confirm password(or press SELECT until indicator light turns red & blinks, to cancel operation).

- 5.Comes interface MFC(Min. flow cut-off); press SET until indicator light turns red & blinks; input new MFC(refer to Step 4); done;
- 6.Press SELECT until comes pop-up menu, asking whether to return to main interface; sweep over SET for yes, SELECT for no, and sweep over SET/SELECT again to confirm.



By software

Start the software; check tool bar on the top; click Functions --> Configuration; comes setting interface; click Modified on the right of MassFlowCutoff; input new MFC; click OK to confirm; click Application; done.

Connection	Functions Language About				
	Configuration				
	Process Variables	Configuration			
	Totalizer Control				
	Demarcate +				
	Status	FlowCalFactor:	0		Modified
	Communication Test				
	Fix Freq Out Test	MassFlowCutoff:	0	Kg/min	Modified
	MainBoardMessage	MarFropulso	0	Цa	Modified
	Volume Measurement Config	maxi repuise.	U	112	
		PulseEquivalent:	0	Kg/pulse	Modified
		r arbobqar (arono)	°	no, paroo	
			Appli	ication Cancel	Close

7.3 Pulse output frequency setting

- By transmitter
- 1. On main interface, sweep over screen as Pic. 7-1 until comes interface 4 a 2 0 x;
- 2. Sweep over SET/SELECT as Pic. 7-2 until cursor points to \$;
- 3. Press SET until indicator light turns red & blinks, comes the password input interface;
- 4. Input password:
 - a. Sweep over SET/SELECT to set the value, SET=Decrease, SELECT=Increase.
 - b. Sweep over screen as to move to nearby digit, from SET to SELECT=Move right, SELECT to SET=Move left.
 - c. Press SET until indicator light turns red & blinks, to confirm password(or press SELECT until indicator light turns red & blinks, to cancel operation).

FCF MFC MF PE

- 5.Comes interface (Interface (Interface); sweep over SET/SELECT until cursor points to MF(Pulse output frequency); press SET until indicator light turns red & blinks; input new MF(refer to Step 4); done;
- 6.Press SELECT until comes pop-up menu, asking whether to return to main interface; sweep over SET for yes, SELECT for no, and sweep over SET/SELECT again to confirm.
- By software

Start the software; check tool bar on the top; click Functions --> Configuration; comes setting interface; click Modified on the right of MaxFrePulse; input new MF; click OK to confirm; click Application; done.

Configuration Process Variables Totalizer Control	Configuration			
Demarcate Status Communication Test Fix Freq Out Test MainBoardMessage Volume Measurement Config	FlowCalFactor: MassFlowCutoff: MaxFrepulse: PulseEquivalent:	0 0 0 0	Kg/min Hz Kg/pulse	Modified Modified Modified Modified
		Appl	ication Cancel	Close



7.4 Pulse equivalent setting

- By transmitter
- 1. On main interface, sweep over screen as Pic. 7-1 until comes interface 4 a 4 ;;
- 2. Sweep over SET/SELECT as Pic. 7-2 until cursor points to 🌣;
- 3. Press SET until indicator light turns red & blinks, comes the password input interface;
- 4. Input password:
 - a. Sweep over SET/SELECT to set the value, SET=Decrease, SELECT=Increase.
 - b. Sweep over screen to move to nearby digit, from SET to SELECT=Move right, SELECT to SET=Move left.
 - c. Press SET until indicator light turns red & blinks, to confirm password(or press SELECT until indicator light turns red & blinks, to cancel operation).

FCF MFC MF PE

- Press SELECT until comes pop-up menu, asking whether to return to main interface; sweep over SET for yes, SELECT for no, and sweep over SET/SELECT again to confirm.
- By software

Start the software; check tool bar on the top; click Functions --> Configuration; comes setting interface; click Modified on the right of PulseEquivalent; input new PE; click OK to confirm; click Application; done.

e Connection	Functions Language About				
Connection	Configuration Process Variables Totalizer Control Demarcate Status Communication Test Fix Freq Out Test MainBoardMessage Volume Measurement Config	Configuration FlowCalFactor: MassFlowCutoff: MaxFrepulse: PulseEquivalent:	0 0 0 0	Kg/min Hz Kg/pulse	Modified Nodified Nodified Nodified
			Appl	ication Cancel	Close

7.5 Zero calibration setting

Please refer to Chapter 3.2.4 before zero calibration.

- By transmitter
- 1. On main interface, sweep over screen as Pic. 7-1 until comes interface 4 a 2 0 x;
- 2. Sweep over SET/SELECT as Pic. 7-2 until cursor points to \$;
- 3. Press SET until indicator light turns red & blinks, comes the password input interface;
- 4. Input password:
 - a. Sweep over SET/SELECT to set the value, SET=Decrease, SELECT=Increase.
 - b. Sweep over screen to move to nearby digit, from SET to SELECT=Move right, SELECT to SET=Move left.
 - c. Press SET until indicator light turns red & blinks, to confirm password(or press SELECT until indicator light turns red & blinks, to cancel operation).



5. Comes interface LZ: 0.0000 kg/sin [PAZ: 0]

PE

MF ∩

Peroform Auto Zero O Confie AutoZero FR0at D; sweep SELECT until cursor points to Peroform Auto Zero; press SET

until indicator light turns red & blinks; zero calibration begins; it takes about 2 min, and shows Peroform Auto Zero again when over; done;

- 6. Press SELECT until comes pop-up menu, asking whether to return to main interface; sweep over SET for yes, SELECT for no, and sweep over SET/SELECT again to confirm.
- By software

Start the software; check tool bar on the top; click Functions --> Demarcate --> Zero Calibration; comes setting interface; click Per. Aoto Zero; done.

e Connection	Functions Language About Configuration Process Variables			
r	Totalizer Control	TI	and Zero Calibration	
	Status Communication Test Fix Freq Out Test MainBoardMessage Volume Measurement Config	The temperature calibration slope Densitycalibration1 Densitycalibration2 Zero Calibration	Cali.In Progress: Cali.Failure: Live Zero: 0 ZeroCount: 0 Per.Auto Ze	Kg/min ro Close

7.6 Fix frequency output setting

This function is to simulate a fix frequency output, to help test counting accuracy and max. frequency input of the pulse receiver(generally, it is an electronic controller). This output will disappear in about 1 min automatically.

- By transmitter
- 1. On main interface, sweep over screen as Pic. 7-1 until comes interface _______;
- 2. Sweep over SET/SELECT as Pic. 7-2 until cursor points to \$;
- 3. Press SET until indicator light turns red & blinks, comes the password input interface;
- 4. Input password:
 - a. Sweep over SET/SELECT to set the value, SET=Decrease, SELECT=Increase.
 - b. Sweep over screen to move to nearby digit, from SET to SELECT=Move right, SELECT to SET=Move left.
 - c. Press SET until indicator light turns red & blinks, to confirm password(or press SELECT until indicator light turns red & blinks, to cancel operation).

FCF MFC MF PE

5. Comes interface (Unit Configuration Auto); sweep over screen until comes interface

 SOT
 FFS

 00000
 №
 O OFF

 w0
 Fix_f_0wt
 C+T

 Fix_f_0wt
 C+T
 C+T

indicator light turns red & blinks; the screen shows ON instead of OFF; sweep over SELECT until cursor points to SOT; press SET until indicator lights turns red & blinks; input new frequency output(refer to Step 4); done;

6.Press SELECT until comes pop-up menu, asking whether to return to main interface; sweep over SET for yes, SELECT for no, and sweep over SET/SELECT again to confirm.



By software

Start the software; check tool bar on the top; click Functions --> Fix Freq Out Test; comes setting interface; click Fix Freq Output, the screen shows red spot (click UnFix Freq to cancel this function, the screen shows green spot); click Modified to input fix frequency output.

Hass flowmeter co	onfiguration control		
File Connection	Functions Language About		
	Configuration		
	Process Variables	Fix Freq Out Test	
	Totalizer Control		
	Demarcate +	7	
	Status		
	Communication Test	Set Output To: 0 Hz	Modified
	Fix Freq Out Test		
	MainBoardMessage		
	Volume Measurement Config	Freq Fixed:	
			(1)
		Fix Freq Output UnFix Freq	Close

7.7 Total clearance

There will be no record of current Total once cleared; thus, please keep a record manually if necessary.

By transmitter

There are 2 methods to clear Total.

Method 1

+0.0001.Sweep over screen as Pic. 7-1 until comes interface $\frac{VoluTi}{0.0000} \frac{VoluTi}{r}$ 0.00 °C Or

press SELECT until comes pop-up menu, asking whether to clear; sweep over SET for yes, SELECT for no, as Pic. 7-2; sweep over SET/SELECT again to confirm; comes password input interface;

us_gal/mir

- 2. Input password:
 - a. Sweep over SET/SELECT to set the value, SET=Decrease, SELECT=Increase.
 - b. Sweep over screen to move to nearby digit, from SET to SELECT=Move right, SELECT to SET=Move left.
 - c. Press SET until indicator light turns red & blinks, to confirm password(or press SELECT until indicator light turns red & blinks, to cancel operation); done.

Method 2

- 🛠 🖻 🙅 🛈 🔅 1. On main interface, sweep over screen as Pic. 7-1 until comes interface
- 2. Sweep over SET/SELECT as Pic. 7-2 until cursor points to \$\$;
- 3. Press SET until indicator light turns red & blinks, comes the password input interface;
- 4. Input password:
 - a. Sweep over SET/SELECT to set the value, SET=Decrease, SELECT=Increase.
 - b. Sweep over screen to move to nearby digit, from SET to SELECT=Move right, SELECT to SET=Move left.
 - c. Press SET until indicator light turns red & blinks, to confirm password(or press SELECT until indicator light turns red & blinks, to cancel operation).



5. Comes interface (Unit Configuration Auto); sweep over screen until comes interface

PF

Û

MT: 0.000 kg VT: 0.000 L ▼rout ClearTotal V_Cal ▶; press SELECT until III turns up; press SET until indicator light turns

red & blinks; comes pop-up menu, asking whether to clear; sweep over SET for yes, SELECT for no; sweep SET/SELECT to confirm; done;

- 6. Press SELECT until comes pop-up menu, asking whether to return to main interface;
- sweep over SET for yes, SELECT for no, and sweep over SET/SELECT again to confirm. ● By software

Start the software; check tool bar on the top; click Functions --> Totalizer Control; comes setting interface; click Reset Mass Total; done.

File Connection	Functions Language About		
	Process Variables		
	Totalizer Control	"T Totalizer Control	
	Demarcate Status Communication Test Fix Freq Out Test MainBoardMessage Volume Measurement Config	Flow: 0 Mass Total: 0	Kg/min Kg
		Reset Mass Total	Close

7.8 Volume calculation setting

O FixedDensity

Mass flow meter measures mass directly; however, some customer wants to show in volume unit, such as L, gallon. In this way, transmitter has to process mass into volume. This function is meaningless if you apply mass directly.

- By transmitter
- 1. On main interface, sweep over screen as Pic. 7-1 until comes interface _______;
- 2. Sweep over SET/SELECT as Pic. 7-2 until cursor points to \$;
- 3. Press SET until indicator light turns red & blinks, comes the password input interface;
- 4. Input password:
 - a. Sweep over SET/SELECT to set the value, SET=Decrease, SELECT=Increase.
 - b. Sweep over screen to move to nearby digit, from SET to SELECT=Move right, SELECT to SET=Move left.
 - c. Press SET until indicator light turns red & blinks, to confirm password(or press SELECT until indicator light turns red & blinks, to cancel operation).

FCF MFC MF F

0.0000

5. Comes interface (Configuration Auto); sweep over screen until comes

interface (@ RealyTimeDensity g/cm^{*}); sweep over SET/SELECT until cursor points to FixedDensity or RealTimeDensity; press SET until indicator light turns red & blinks; done. Fixed density has to be inputted if select FixedDensity(refer to Step 4).

- 5.Press SELECT until comes pop-up menu, asking whether to return to main interface; sweep over SET for yes, SELECT for no, and sweep over SET/SELECT again to confirm.
- By software

Start the software; check tool bar on the top; click Functions --> Volume Measurement Config; comes setting interface; click Standard Density or Real Density; click Apply; done.



Standard density has to be input if select Standard Density. Status below will show the current volume calculation method you select.

Configuration Configuration Process Variables Totalizer Control Demarcate	Volume Measurement	
Status Communication Test Fix Freq Out Test MainBoardMessage Volume Measurement Config	 Standard Density RealDensity 	
	Status:	Apply Return

7.9 Measurement unit setting

- 1. On main interface, sweep over screen as Pic. 7-1 until comes interface 4 a 2 0 x;
- 2. Sweep over SET/SELECT as Pic. 7-2 until cursor points to 🌣;
- 3. Press SET until indicator light turns red & blinks, comes the password input interface;
- 4. Input password:
 - a. Sweep over SET/SELECT to set the value, SET=Decrease, SELECT=Increase.
 - b. Sweep over screen to move to nearby digit, from SET to SELECT=Move right, SELECT to SET=Move left.
 - c. Press SET until indicator light turns red & blinks, to confirm password(or press SELECT until indicator light turns red & blinks, to cancel operation).

FCF MFC MF PE

5. Comes interface (Vait Configuration Autor); sweep over screen until comes interface

→ Mass :kg Density: g/cm³↔

→Volume: L Temp : C →; sweep over SET/SELECT until cursor points to the unit you need to change; press SET until indicator lights turn red & blinks, the unit will change at the same time, operate again until it changes to the unit you need; done.

6.Press SELECT until comes pop-up menu, asking whether to return to main interface; sweep over SET for yes, SELECT for no, and sweep over SET/SELECT again to confirm.

ltem	Unit available			
Mass	KG(kilogram) LB(pound) T(ton)			
Volume	L(liter) us_gal(US gallons) uk_gal(Imperial gallons)			
Density	g/cm ³ kg/m ³ kg/cm ³			
Temperature	°C(Celsius) °F(Fahrenheit) K(Kelvin)			

Table 7-1 Unit table

7.10 Password setting

- 1. On main interface, sweep over screen as Pic. 7-1 until comes interface 4 a 2 0 *;
- 2. Sweep over SET/SELECT as Pic. 7-2 until cursor points to **û**;
- 3. Press SET until indicator light turns red & blinks, comes the password setting interface;
- 4. Input old password
 - a. Sweep over SET/SELECT to set the value, SET=Decrease, SELECT=Increase.
 - b. Sweep over screen to move to nearby digit, from SET to SELECT=Move right,



SELECT to SET=Move left.

- c. Press SET until indicator light turns red & blinks, to confirm password(or press SELECT until indicator light turns red & blinks, to cancel operation).
- 5. Input new password; input new password again; done. It show Change the Password Succeed on screen, and comes back to main interface automatically.

7.11 Screen power-off setting

- 1. On main interface, sweep over screen as Pic. 7-1 until comes interface _______;
- 2. Sweep over SET/SELECT as Pic. 7-2 until cursor points to Φ;
- 3. Press SET until indicator light turns red & blinks; the screen dims. Sweep over SET/SELECT if you need to turn on the screen again.

7.12 Screen auto-off setting

- 1. On main interface, sweep over screen as Pic. 7-1 until comes interface _______;
- 2. Sweep over SET/SELECT as Pic. 7-2 until cursor points to 🔅;
- 3. Press SET until indicator light turns red & blinks; comes interface

4. Sweep over SET/SELECT until cursor points to [™]; press SET until indicator light turns red & blinks;

- 5. Input auto-off time
 - a. Sweep over SET/SELECT to set the value, SET=Decrease, SELECT=Increase.
 - b. Sweep over screen to move to nearby digit, from SET to SELECT=Move right, SELECT to SET=Move left.
 - c. Press SET until indicator light turns red & blinks, to confirm auto-off time(or press SELECT until indicator light turns red & blinks, to cancel operation); done.

Mark: Setting range is from 0~9999; it will be on all the time if set 0.

7.13 Screen brightness setting

- 1. On main interface, sweep over screen as Pic. 7-1 until comes interface <u>* • • ;</u>;
- 2. Sweep over SET/SELECT as Pic. 7-2 until cursor points to -Q-;
- 3. Press SET until indicator light turns red & blinks; comes interface
- Sweep over SET/SELECT until cursor points to [▲];
- 5. There are 5 levels; press SET until indicator light turns red & blinks, it will come to next level circularly.

Chapter 8 Explosion-proof

This meter is processed according to Ex-proof standard GB3836.1-2010 and GB3836.4-2010;

It consists of intrinsically safe sensor, transmitter and connection cable. Sensor meets Ex-mark Ex ib IIBT1~T6 Gb/Ex ib II CT1~6 Gb requirements, and transmitter Ex d[ib] II BT4Gb requirements;

The meter can be installed in explosive gas environment IIB, and temperature T3 intrinsically safe equipment, with ex-proof system as follows.





Pic. 8-1 Ex-proof system

The biggest capacitance from sensor to transmitter allowed is 0.11μ F, the biggest inductance 0.2mH;

Nama	Max. output voltage	Max. output current	Max. Output
Name	V	mA	capacitance/µF
Dirve coil	11.8	100	9.9
Temperature sensor	6.2	43	790
Pickoff	7.8	54	130

Table 8-1

- Ambient temperature: -20~+50°C;
- The meter should be well grounded during operation;
- Do not replace any component or part inside transmitter without manufacturer's guide;
- Inner diameter of wiring cable should be φ8.5 or φ12, external diameter between φ8 & φ8.5 or φ8.5 & φ12. Please replace wiring cable if wornout;
- Keep corrosive gas from junction box;
- Do not install or dismount under inflammable gas environment.

Chapter 9 Troubleshooting

9.1 Self-diagnosis

The software has self-diagnosis function. Please click Functions --> Status on tool bar to callout the following interface. It shows 6 kinds of error, storage error, sensor error, temperature sensor error, zero calibration failure, meter initialization, and others. The light is green under smooth operation, and turns red when not.





9.2 Troubleshooting Possible cause Error Maybe the screen is under auto-off status. No display Check if the voltage between terminal L/+ & N/- is 220V/24V. Check if the wiring between display terminal and mainboard is loosen or wrong. Transmitter operation failure Check if the wiring between display terminal and mainboard is loosen or wrong. Check if the communication wiring is loosen or wrong. No Modbus communication Check communication port setting. Check if the pipe is full of gas/liquid. Check if there is any bubble inside. Check if the meter is properly grounded. Unstable zero point Check if motor, transformer or other electrical equipment is near. Check if the detector is under mechanical pressure. Check if the junction box is kept away from dust and water. Check if zero point setting is correct. Check if flow unit and min. cutoff value is set properly. Flow rate accuracy failure Check if the meter is properly grounded. Check if there is any bubble inside. Check if the reference value is correct. Check if the density unit is set properly. Check if it is fixed density. Check if the pipe is full of fluid, without any other impurity. Density accuracy failure Check if the temperature measurement is correct. Check if the meter is rusted or corrupted. Check if there is any impurity piled inside. Check the wiring of transmitter. Check if platinum resistor PT100 is correct. Temperature accuracy failure Check if the unit is the same. Check if the suspicious output signal setting is correct. Signal output failure Check if the output is normal. Please contact the manufacturer if problem can not be solved.

Chapter 10 Completeness

The meter consists of sensor, transmitter and the cable to connect them. Please mark in PO if companion flange is needed. Besides, there will be one operation manual, certificate of approval in the package.



Chapter 11 Transport and storage

Please keep the meter in good condition during transport, better packed in the original package from the manufacturer.

Please make sure the site meets following requirements, if keep the meter in storage.

- a) Waterproof and moistureproof;
- b) With few mechanical vibration and crush;
- c) Temperature from -20°C to +60°C;
- d) Humidity less than 80%, better about 50%;
- e) Please clear up the sensor if storage used one;
- f) Performance will be influenced if storage in the open.



Appendix 1 Function/operation table

Function	Operation	Time
Item shift in same interface	Sweep over SET/SELECT as Pic. 7-2 until	< 1 50
Value setting (SET=Decrease;	indicator light turns red & blinks.	< 1.55
SELECT=Increase)		
Confirm	Press SET until indicator light turns red &	
Brightness adjustment	blinks.	1.05 < 321 < 45
Short cut to enter SETTINGS	Press SET until indicator light turns red,	
when on main interface 1	blinks and finally turns off.	45 < 521
Cancel	Press SELECT until indicator light turns red	
	& blinks.	1.05 < SELECT < 45
Poturn to main interface	Long-press SELECT until comes pop-up	
	menu, sweep over SET twice as Pic. 7-2	45 \ SELECT
	Sweep over screen as Pic. 7-1	
Interface shift, Value shift	SET→SELECT=Move right	0.1s <time<0.5s< td=""></time<0.5s<>
	SELECT→SET=Move left	



Appendix 2 Abbreviation explanation table

Interface	Abbreviation	Definition
Main interface	VolumeFlowRate	Volume flow rate
	VolumeTotal	Volume total
	MassTotal	Mass total
	MassFlowRate	Mass flow rate
	FlowR	Mass flow rate
	MassT	Mass total
	VoluR	Volume flow rate
	VoluT	Volume total
Configuration	FCF	Calibration coefficient
	MFC	Min. flow cutoff value
	MF	Pulse output frequency
	PE	Pulse equivalent
Auto zero	PeroformAutoZeo	Zero calibration
	PAZ	Zero point offset
	LZ	Zero point flow value
Fix_f_out	SOT	Fixed frequency output
	FFS	Fixed frequency output status
Clear Total	МТ	Mass total
	VT	Volume total



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