Turbine Flow Meter Model:GTF

Liquid Turbine Flow Meter

Operation Manual

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1. GENERAL INFORMATION

This manual will assist you in installing, using and maintaining Liquid Turbine Flowmeter. 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 Liquid turbine 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 Liquid Turbine Flowmeter removal, liquid may spill. Follow the manufacturer's safety precautions for clean up of minor spills

Product Description

Operating Principle

Liquid flows through the turbine housing causing an internal rotor to spin. As the rotor spins, an electrical signal is generated in the pickup coil. This signal is converted into engineering units (liters, cubic meters, gallons etc.) on the local display where is applicable. Optional accessory modules can be used to export the signal to other equipment.

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

Make sure the turbine flow 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 turbine. Refer to the nameplate for your customized product's specification.

2. TECHNICAL DATA

Measuring System

Application Range	Liquid: water; diesel; gasoline
	(1) Without impurity
	(2) Low viscosity
Measured Value	
Primary Measured Value	Flow rate
Secondary Measured Value	Volume flow

Design

Features	
Modular Construction	The measurement system consists of a flow sensor and a signal converter. It is available as compact and as separate version.
Compact Version Converter	GTF- N1: no display; pulse output
	GTF- N2: no display; explosion-proof pulse output
	GTF- A: no display; 2 wire 4-20mA output
	GTF- E: local display; 4~20mA/ pulse output
Connection	Thread: DN4-DN50
	Flange: DN15-DN200 (DIN, ANSI, JIS)
	Wafer: DN15-DN100
Measurement Ratio	Standard - 10:1; Optional - 20:1

Process Connections

Flange	
EN 1092-1	DN15…200 in PN 6…40
ASME	1/2 " …8 " in 150 lb RF
JIS	1/2 " …8 " in 10…20K
Design of Gasket Surface	RF
Other Sizes or Pressure Ratings on Request	
Thread	DN4…DN50 in PN63

Measurable Flow Range

Diameter	Standard Flow Range	Extended Flow Range
(mm)	(m^3/h)	(m^3/h)
4	0.04 to 0.25	0.04 to 0.4
6	0.1 to 0.6	0.06 to 0.6
10	0.2 to 1.2	0.15 to 1.5
15	0.6 to 6	0.4 to 8
20	0.8 to 8	0.45 to 9
25	1 to 10	0.5 to 10
32	1.5 to 15	0.8 to 15
40	2 to 20	1 to 20
50	4 to 40	2 to 40
65	7 to 70	4 to 70
80	10 to 100	5 to 100
100	20 to 200	10 to 200
125	25 to 250	13 to 250
150	30 to 300	15 to 300

Note:The flow range above is for reference only. Consult the factory if you have special requirement. Refer to the nameplate or certificate for actual flow range.

Measuring Accuracy

Reference Conditions	Flow conditions similar to EN 29104
	Medium: water
	Electrical conductivity: ≥ 300 μS/cm
	Temperature: +10…+30°C / +50…+86°F
	Inlet section: ≥ 10 DN
	Operating pressure: 1 bar / 14.5 psig
Flow Meter Accuracy	Standard: 1.0% of rate
	Optional: 0.5% of rate

Installation Conditions

Installation	Take care that flow sensor is always fully filled
	For detailed information see chapter "Cautions for Installation"
Flow Direction	Forward
	Arrow on flow sensor indicates flow direction.
Inlet Run	≥ 10 DN
Outlet Run	≥ 5 DN

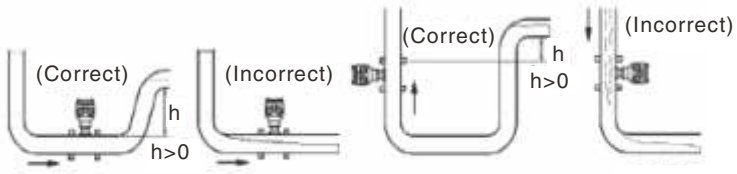
Materials

Sensor Housing	SS304		
	Other materials on request		
Flanges	SS304		
	Other materials on request		
Rotor			
Standard: 2Cr13	EN10088-3	1.4021	X20Cr13
	ANSI	420	
	BS	420S37	
	JIS	SUS410J1	
Optional: CD4MCU	DN15…DN80		
Bearing and Shaft	Tungsten Carbide		
Converter Housing	Standard: polyurethane coated die-cast aluminum		

3. CAUTIONS FOR INSTALLATION

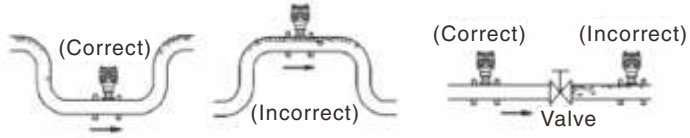
3.1 Mounting Positions

★ 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

★ 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

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

3.2 Required Lengths of Straight Runs

Flow altering device such as elbows, valves and reducers can affect accuracy. See diagram below for typical flow meter system installation.

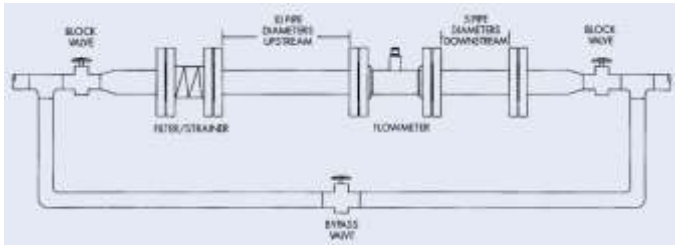
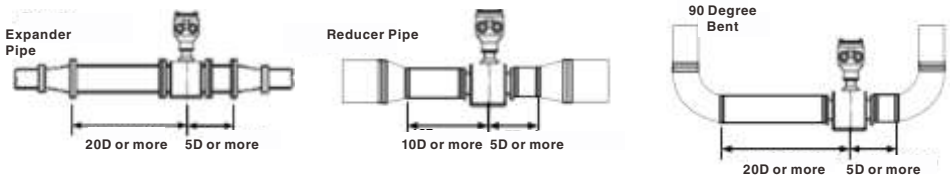


Diagram 1. Typical Flow Meter System Installation



The recommended guidelines are given to enhance accuracy and maximize performance. Distance given here are minimum requirements; double them for desired straight pipe lengths.

★ Upstream: allow a minimum straight pipe length at least 10 times the internal diameter of the pipe. For example, with the 50mm pipe, there should be 500mm of straight pipe immediately upstream. Desired downstream straight pipe length is 1000mm.

★ Downstream: allow a minimum straight pipe length at least 5 times the internal diameter of the pipe. For example, with the 50mm pipe, there should be 250mm of straight pipe immediately upstream. Desired downstream straight pipe length is 500mm.

3.3 Anti-Cavitation

Cavitation can be caused by entrained air. An amount higher than about 100 mg/l of entrained air or gas can produce error. In addition, cavitation can be caused by too little backpressure on the flow meter. For our turbine flow meters, you should provide a backpressure (downstream pressure) of at least 1.25 times the vapor pressure, plus 2 times the pressure drop through the flow meter. See formula 1.

Formula 1: $Pb \geqslant 1.25 \times Pv + 2 \times (Pin - Pout)$

In formula 1: (Pb: Back pressure; Pv: Vapor Pressure; Pin: Inlet Pressure; Pout: Outlet Pressure) Create backpressure by installing a control valve on the downstream side of the meter at the proper distance detailed above.

Special Notice

- ★ ***Foreign material in the liquid being measured can clog the meter's rotor and adversely affect accuracy. If this problem is anticipated or experienced, install screens to filter impurities from incoming liquids.***
- ★ ***To ensure accurate measurement, drain all air from the system before use.***
- ★ ***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.***

3.4 Connections

3.4.1 Thread Connection

Note: Default Thread is Male G Thread, other thread are available on request. For example: Female NPT Thread, Male NPT Thread; Consult us for more information

DN4…DN10: Straight runs and filter are included in the length for DN4 to DN10

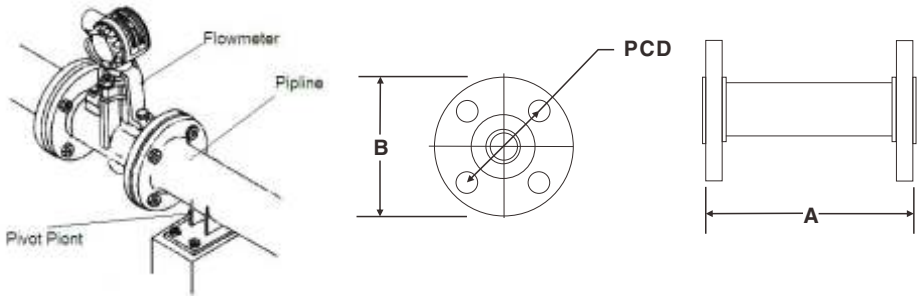
DN15…DN50: Straight runs are optional on request.

Diameter(mm)	L(mm)	Thread Criteria
4	270	G½″
6	270	G½″
10	390	G½″
15	75	G1″
20	80	G1″
25	100	G1-¼″
32	140	G2″
40	140	G2″
50	150	G2-½″

Filter and Straight Pipe

3.4.2 Flange Connection

Flange	
EN 1092 - 1	DN15...200 in PN 6...40
ASME	1/2″...8″ in 150 lb RF
JIS	1/2″...8″ in 10 ...20k
Design of Gasket Surface	RF
	Other sizes or pressure ratings on request

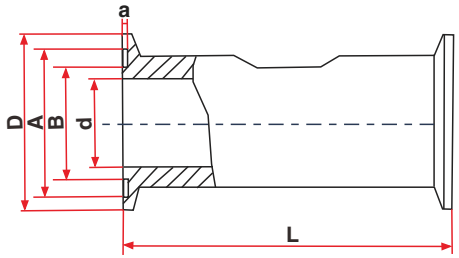


ANSI 150# Flange Meter Dimensions							
Size Code		A	ANSI Flange Rating Class	Flange Diameter (B)	Bolt Hole Diameter	Bolt Circle Diameter (PCD)	Bolt Hole Quantity
(Inch)	(mm)	(mm)		(mm)	(mm)	(mm)	
1/2"	15	75	150	89	16	60	4
3/4"	20	80	150	99	16	70	4
1"	25	100	150	108	16	79	4
1-1/4"	32	140	150	115	16	89	4
1-1/2"	40	140	150	127	16	99	4
2"	50	150	150	152	19	121	4
2-1/2"	65	170	150	180	19	140	4
3"	80	200	150	191	19	152	4
4"	100	220	150	229	19	191	8
5"	125	250	150	255	22	216	8
6"	150	300	150	279	22	241	8
8"	200	360	150	343	22	298	8

DIN PN16 Flange Meter Dimensions							
Size Code		A	DIN Flange Pressure Rating	Flange Diameter (B)	Bolt Hole Diameter	Bolt Circle Diameter (PCD)	Bolt Hole Quantity
(Inch)	(mm)	(mm)	MPa	(mm)	(mm)	(mm)	
1/2"	15	75	2.5	95	14	65	4
3/4"	20	80	2.5	105	14	75	4
1"	25	100	2.5	115	14	85	4
1-1/4"	32	140	2.5	140	14	100	4
1-1/2"	40	140	2.5	150	18	110	4
2"	50	150	2.5	165	18	125	4
2-1/2"	65	170	1.6	185	18	145	4
3"	80	200	1.6	200	18	160	8
4"	100	220	1.6	220	18	180	8
5"	125	250	1.6	250	18	210	8
6"	150	300	1.6	285	22	240	8
8"	200	360	1.6	340	22	295	12

3.4.3 Sanitary Connection (Max. Pressure: 10bar)

a	DN4-DN40	1mm
	DN50-DN80	1.5mm
	DN100	2mm



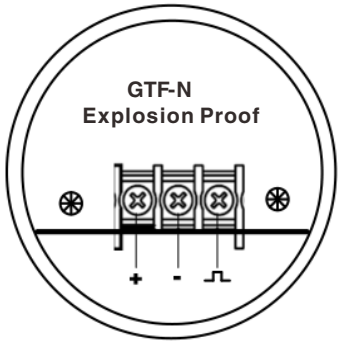
Diameter (mm)	D (mm)	A (mm)	B (mm)	d (mm)	L (mm)
DN 4	50.5	46	40.5	4	100
DN 6				6	
DN10				10	
DN15				15	
DN20				20	
DN25				25	
DN32				32	120
DN40	64	59	54	40	140
DN50	77	73.5	68.5	50	150
DN65	91	86	80.5	65	170
DN80	106	94	94	80	200
DN100	119	106	106	100	220

4. ELECTRICAL WIRING

4.1 GTF-N1: Pulse Output, Basic Model

Cable Color	Terminal Symbols	Description
Red Wire	Power (+)	Power Supply: “24V+”
White Wire	Common	GND
Yellow Wire	Pulse(+)	Pulse Output

4.2 GTF-N2: Pulse Output, Explosion Proof Model.

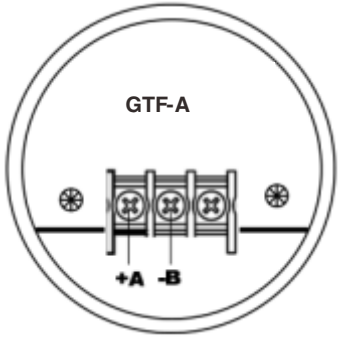


Terminal Configuration

Terminal Symbols	Description
+	Power Supply: “24V+”
-	GND
⎍	Pulse Output

Terminal Wiring

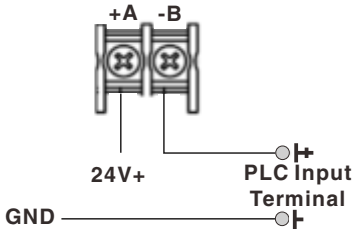
4.3 GTF-A: Two-wire 4-20mA Output, No Local Display



Terminal Configuration

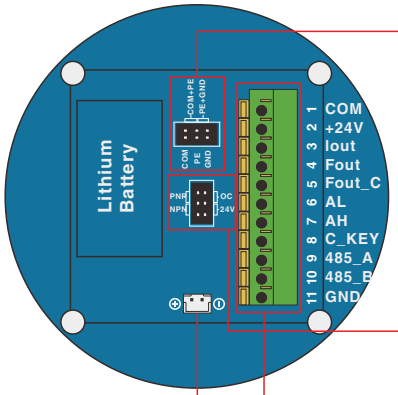
Terminal Symbols	Description
+A	Power Supply: “24V+”
-B	Current Output

Terminal Wiring



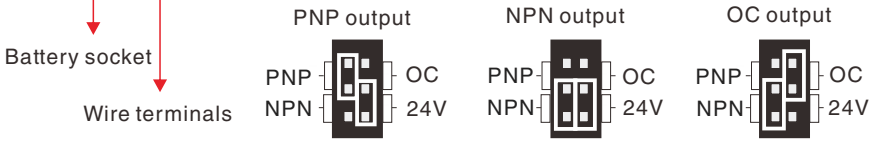
4.4 GTF-E

Terminal Board of E type



If the signal is interfered at working site, please try to short the terminals as following drawing(a). After "a" step, if the situation is not improved, please short the terminals as drawing(b)

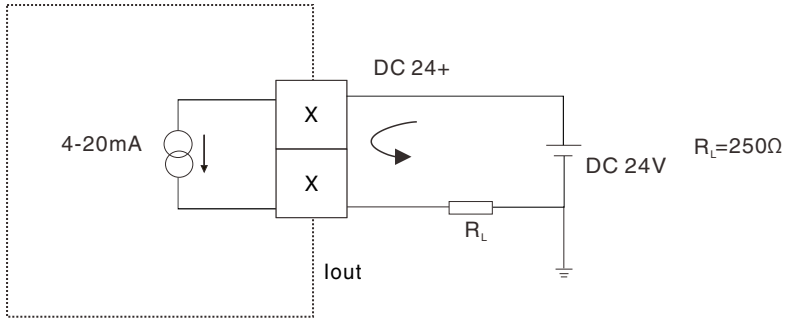
The PNP, NPN and OC output could be chosen by shorten the followingterminals.



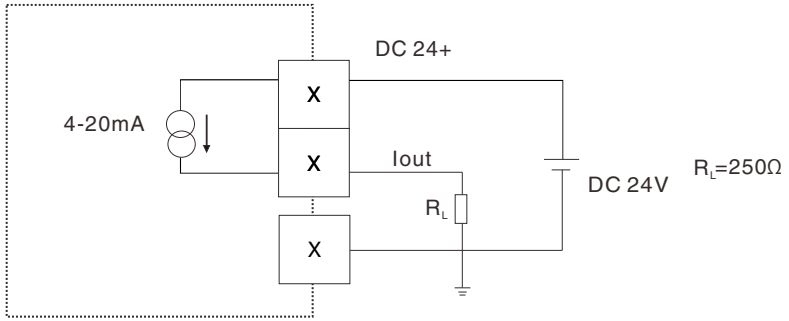
Wire Terminals

Type	Terminals	Description
E2: 2-wire 4~20mA output	2	24V DC+
	3	(Iout) Current Output
E3: Frequency & Pulse output	1	(COM) 24V DC-
	2	24V DC+
	5	Frequency/ Pulse output
E4: 3 wire 0-20mA output **E5**: 3 wire 4-20mA output	1	(COM) 24V DC-
	2	24V DC+
	3	Current Output
RS485 Optional for E2,E3,E4,E5	9	(Optional) RS485+
	10	(Optional) RS485-

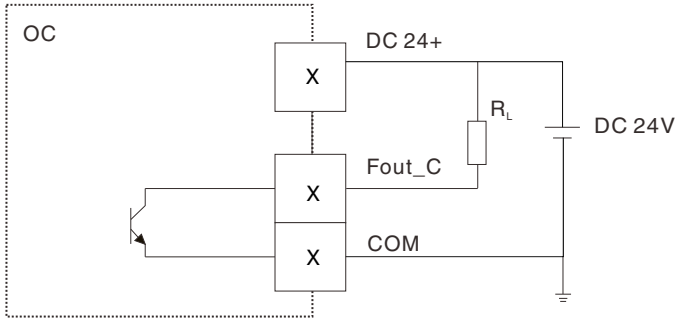
(1) 2 wire 4-20mA output

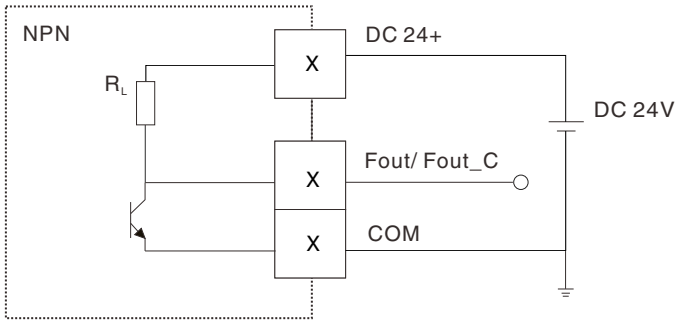


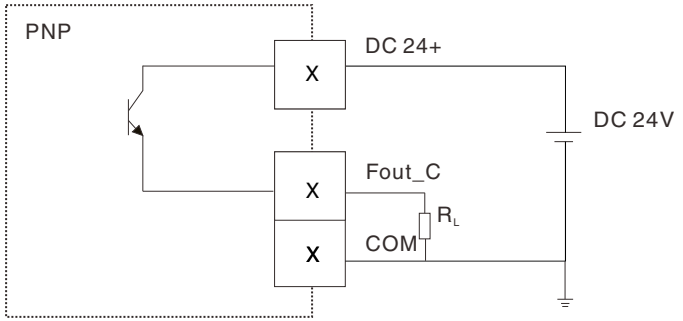
(2) 3 wire 4-20mA output



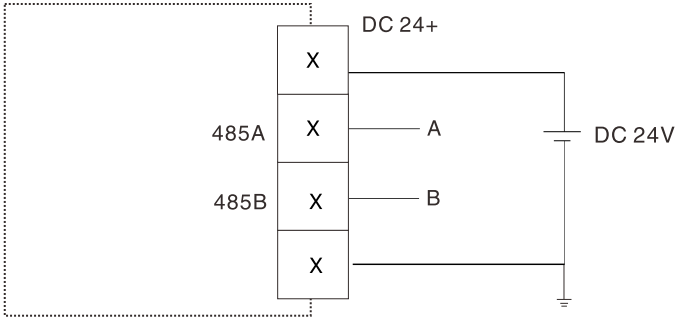
(3) Frequency output







(4) RS485 Communication



Modbus - RTU Protocol RS485

Function Code	Explanation
03(HEX)	Read single or multi register

Data Format

There are two types of data in this protocol: float and integer.

The read-write property of date in register: R-Read only; W-Write; R/W- Read & Write

1. Single Float (Format: IEEE754, data from high digit to low)

   There are 32 bits (4 bytes) for single float data,

   The bits are laid out from high to low: 31, 30, and 29…0 digit

31	30-23	22-0
S(1: negative, 0: positive)	Exponent(8 bits)	Fraction (23bits)

2. Double-precision Float (Format: IEEE754, data from high digit to low)

   There are 64 bits (8 bytes) for double-precision float data.

   The bits are laid out from high to low: 63, 62, 61…0 digit

63	62-52	51-0
S(1: Negative, 0: Positive)	Exponent(11 bits)	Fraction (52bits)

3. Unsigned int: 0-65535

Register Table

Privilege	Name	Register Address(Hex)	Register quantity	Register Length	Data Type	Description
R	Total Flow	0	4	8	Double	
R	Total Flow	4	2	4	Float	
R	Flow Rate	6	2	4	Float	
R/W	Unit	8	1	2	Unsigned Int	0: m^3/h
						1: L/h
						2: L/m
						3: US Gal/min
						4: UK Gal/min
						5: US Gal/h
						6: UK Gal/h
						7: kg/h
						8: t/h
						9: ft^3/h
R	Voltage	9	2	4	Float	Unit: V

Error Response Code

01: Address error
02: Length error
03: CRC validation error
04: Code error

5. PROGRAMMING AND SETUP

All flowmeters are tested and calibrated prior to leaving the factory, and the unique K-factor is provided on the calibration certificate. Keep the calibration certificate well to avoid the loss of K-factor.

5.1 GTF-N1: No display; pulse output

Customer should set the correct K-factor into PLC or Flow totalizer in order to get the correct flow rate.

5.2 GTF-N2: No display; explosion-proof pulse output

It owns explosion-proof function .

5.3 GTF-A: No Display; 2 wire 4-20mA Output

Only perform the Zero Point Calibration where it's necessary.

5.3.1 Zero Point Calibration

(1) Shut off the value where the flowmeter is installed, ensure there is no flow rate in pipe.

(2) Put high accuracy amperometer into the circuit loop as series connection.

(3) Adjust the potentiometer W502 to make sure the display on amperometer is 4mA.

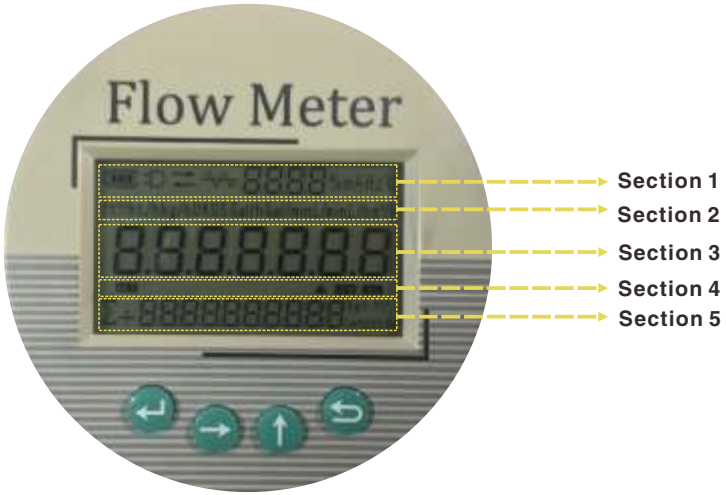
5.3.2 Full Scale Calibration: It's ONLY available for factory; Return the flowmeter to factory for full scale calibration where is applicable.

5.4 GTF-E: Local display; 4~20mA/ pulse output

Note: all menus are present in all signal converter versions, but some parameter settings are ONLY valid for specified models.

5.4.1 Display and Key

Five Sections on Display Screen



Section 1: Functional region which consists of battery situation, communication, current, frequency, flow percentage (Temperature could be available on request)

Section 2: Units section which consists of 10 units: m^3/h, L/h, L/min, US Gal/min, UK Gal/min, US Gal/h, UK Gal/h, kg/h, t/h, ft^3/h

Section 3: Flow rate (7 digital figure upper line)

Section 4: Alarm sign which consists of SET prompt and alarm prompt

Section 5: Total flow (11 digital figure lower line) with two decimal places

Buttons

Interface buttons (four keys)

Buttons		
Interface Buttons		Turn page/Confirm
		Move Cursor
		Increase number/ Turn page
		Exit

Operation

Menu				
Main menu	Go to sub-menu	×	×	×
Sub-menu	Go to password menu	×	×	Back to main menu
Password Menu	a. False or No password will go to the next menu b. Correct password: The parameter is settable.	Move cursor	Set parameter	Back to main menu
Settable Menu	Set/Save	Move cursor	a. Settable status: increase number or choose number; b. Un-settable status:Turn to previous menu.	Cancel the setting and back to main menu
Un-settable menu	Turn to next menu	×	Turn to previous menu	Back to main menu

5.4.2 Parameters Set

Passwords

Type	Passwords	Note
User password	1234	It will display "1234"
Engineer password	1010	It will display "1010"
Total flow reset	5555	It will display "5555"
Storage factory defaulted	5678	It will display "5678"
Reload factory defaults	1111	It will display "1111"
Total flow set	9999	It will display "9999"
Fixed current output	0101	It will display "0101"

Note: It will display "0000" before input password. If the password is incorrect, it will go to P1 menu automatically under un-settable status.

Passwords	Code	Functions	Parameters	Note
0000	Main menu	Normal display	Display working condition, flow rate, total flow	
	Sub-menu	Frequency display	The second line is original frequency	
			The third line is corrected frequency/signal intensity	Up key can be used to switch
	Password	Password input	4 digital figure	

Passwords	Code	Functions	Parameters		Note
1234	P1	Unit	0- m^3/h	5- US Gal/h	Other parameters setting, the variables associated with units will be related automatically, according to the units of P1 to calculate, such as total flow, flow rate, scaled pulse and so on.
			1- L/h	6- UK Gal/h	
			2- L/min	7- kg/h	
			3- US Gal/min	8- t/h	
			4- UK Gal/min	9- ft^3/h	
	P2	Damping Time	01-99s		To slow flow changes and prevent jump
	P3	Maximum Flow Rate	Maximum Flow settings, the unit corresponds to the flow.		Exceed the maximum flow, showing the imum flow.
	P4	Minimum Flow Rate	Minimum flow settings, the unit corresponds to the flow.		When the flow rate is lower than minimum flow rate, the flow rate will show "0" .
	P5	Max frequency Output	The upper limit setting of measuring frequency		When it exceeds the upper limit, it will display max value.
	P6	Relative Density	Absolute density of medium, Unit: kg/m3		Use quality units It will be used in the calculation
	P7	Frequency Output Mode	0- Shut down and keep low level		This parameter just aims at Fout_c port operation, Fout is not restricted by this menu.
			1- Negative pulse correction frequency		
			2- Positive pulse correction frequency		
			3- Negative scaled pulse		
			4- Positive scaled pulse		
	P8	Scaled-pulse Output	0.001, 0.01, 0.1, 1, 10, 100, 1000		Unit is in accord with P1 menu.
	P9	Pulse Width	1 ~ 2000 ms		The width setting of scaled pulse
	P10	Communication	0: RS485	1: Hart	1: It' s available to current output with HART version.

Passwords	Code	Functions	Parameters			Note
1234	P11	Communication Parameter	RS485	Address	0-255	
				Baud Rate	1200, 2400, 4800, 9600, 19200	
				Verification	N, O, E	No verify、Odd fy、Even verify
				Data Length	7, 8	
				Stop Bits Length	1, 2	
			HART	Address	0-255	
	P12	High Limit Alarm	Switch Settings		Yes	On
					no	Close
			Alarm Level		HIGH	High Level
					LOW	Low Level
			Alarm Value		0-100%	Alarm Value
	P13	Low Limit Alarm	Switch Settings		Yes	On
					no	Close
			Alarm Level		HIGH	High Level
					LOW	Low Level
			Alarm Value		0-100%	Alarm Value setting, corresponding to flow rate
	P14	Backlight	Working Mode		0- Off mode	2：2-wire power supply shuts down; 3-wire power supply normally opens; battery powered button turns off the delay. Long press Esc key to switch 0 mode and 1 mode, searching network.
					1- Automatic mode	
					2- On mode	
			Brightness Setting		0-30%	
					1-70%	
					2-100%	

Passwords	Code	Functions	Parameters	Note
9999	P15	Total Flow	Modifying total flow value	
1010	P16 ~ P23	Linearization of the flowcurve	The first line is corrected frequency，the second line is coefficient error P16-P23 F1~F8：eight coefficient modification Wn=Kn / KP（n：1~8）3	F1 must be started，and F2-F8 are started in proper order. If the factor is 0, this point and following corrected points should be stopped.
	P24	Correct Coefficient	The first line shows the corrected frequency;the second line shows the meter coefficient, and the unit of coefficient is pulse/m³	It could be any of the coefficient (Kn) from F1~F8 or Max one or Average.
	P25	Diameter	Selecting the diameter of body and sensor	Unit：mm
	P26	Medium	0- Gas 1- Liquid	the type selection of measured fluid
	P27	Min vibration strength	The collection value in second line in the process of learning can be manually changed.	P27-P30 Self learning antivibration：Continue to press the up button 5 seconds,and the countdown is completed in 60 seconds. Notice: this operation is prohibited when there is flow rate.
	P28	Max vibration strength	The third line shows the strength of the current signal.	
	P29	Min vibration frequency	The collection value in second line in the process of learning can be manually changed.	
	P30	Max vibration frequency	The third line shows the frequency of the current signal.	
	P31	Min working frequency	Lowest acceptable signal frequency The third line shows the current signal frequency.	Meter working area setting Instruction: in the pipeline of having slight vibration, it can significantly enhance the capacity of resisting disturbance through the three screen parameter settings and strict limit of effective range.
	P32	Max working frequency	Highest acceptable signal frequency The third line shows the current signal frequency.	
	P33	Min signal intensity	Lowest acceptable signal frequency The third line shows the current signal intensity.	
0101	P34	Fixed current output	Input Range：0-99 Effective Value：4-20 Unit：mA	The utility model is suitable for the current loop test, the system adjustment and the instrument calibration.

Menu	Parameter Name	Setting Method	Grade	Range
P--14	Backlight	Select Parameter	User	0: Off Backlight
				1: Automatic mode
				2: ON mode
P--15	Total Rate	Input Value	User	It could be modified with right code
P--16 F--1	Linearization of the Flowcurve: point 1	Input value	Factory ONLY	First Row: Frequency (P1)
				Second Row: K-Factor (P1)
P--17 F--2	Linearization of the Flowcurve: point 2	Input value	Factory ONLY	First Row: Frequency (P2)
				Second Row: K-Factor (P2)
P--18 F--3	Linearization of the Flowcurve: point 3	Input value	Factory ONLY	First Row: Frequency (P3)
				Second Row: K-Factor (P3)
P--19 F--4	Linearization of the Flowcurve: point 4	Input value	Factory ONLY	First Row: Frequency (P4)
				Second Row: K-Factor (P4)
P--20 F--5	Linearization of the Flowcurve: point 5	Input value	Factory ONLY	First Row: Frequency (P5)
				Second Row: K-Factor (P5)
P--21 F--6	Linearization of the Flowcurve: point 6	Input value	Factory ONLY	First Row: Frequency (P6)
				Second Row: K-Factor (P6)
P--22 F--7	Linearization of the Flowcurve: point 7	Input value	Factory ONLY	First Row: Frequency (P7)
				Second Row: K-Factor (P7)
P--23 F--8	Linearization of the Flowcurve: point 8	Input value	Factory ONLY	First Row: Frequency (P8)
				Second Row: K-Factor (P8)
P--24 F--9	Average K-Factor	Input value	Factory ONLY	First Row: Frequency (P)
				Second Row: K-Factor (P)

Passwords	Code	Functions	Parameters	Note
5555		Total flow reset		
5678		Storage factory defaulted	Save factory defaults	Backup current settings
1111		Reload factory defaults	Reload factory defaults	Restore factory parameters from backup area

6. PRESSURE DROP

DN	Standard Range	Extend Range	Start Flow	Max Pressure Drop
(mm)	(m^3/h)	(m^3/h)	(m^3/h)	*1(kPa)
4	0.04～0.25	0.04～0.4	0.02	120
6	0.1～0.6	0.06～0.6	0.05	80
10	0.2～1.2	0.15～1.5	0.07	50
15	0.6～3.6	0.5~5	0.35	35
20	0.8～8	0.45～9	0.3	35
25	1～10	0.5～10	0.4	35
32	1.5～15	0.8～15	0.6	35
40	2～20	1～20	0.6	35
50	4～40	2～40	1	35
65	7～70	5～70	4	25
80	10～100	7～100	5	25
100	20～200	10～200	8	25
125	25～250	13～250	10	25
150	30～300	15～300	12	25
200	80～800	40～800	20	25

7. TROUBLESHOTING

Symptom	Probable Cause	Solution
More Volume/ Output than displayed or registered	1. Rotor may drag due to foreign matter obstruction.	Check for debris inside the meter. Clean and reassemble.
	2. Magnetic pickup not screwed down all the way into the turbine flowmeter body. This causes it not to detect all the rotor blades as they pass	Screw the magnetic pickup all the way down into the turbine flow-meter body. Hand-tighten only.
	3. Turbine flowmeter rotor installed backward	Install the flowmeter in accordance with the process flow direction
	4. Turbine flowmeter rotor installed backwards	Install the flowmeter rotor in accordance with the process flow direction
	5. K-factor is too high in electronic/readout device	Verify K-factor used. K-factor should be decreased.
Less volume/ Output than displyed or registered	1. Caused by trapped air in the process line	Install an air eliminator upstream of turbine flowmeter
	2. K-factor is too low in electronic/readout device	Verify K-factor used. K-factor should be increased.
Flow rate indication is unstable	1. Battery Power Type: Bad contact on the connector between battery and PCB	Open back cover and repower the flow meter
	2. DC Power Type: supply voltage is abnormal	Check and ensure power supply is 24V DC