

Gas Turbine Flow Meter Owner's Manual



1.0 SPECIFICATIONS

Performance

Repeatability: $\pm 0.2\%$

Accuracy: Standard: $\pm 1.5\%$ ($Q_{\min} \sim 0.2 * Q_{\max}$: $\pm 3.0\%$; $0.2 * Q_{\max} \sim Q_{\max}$: $\pm 1.5\%$)
Optional: $\pm 1.0\%$ ($Q_{\min} \sim 0.2 * Q_{\max}$: $\pm 2.0\%$; $0.2 * Q_{\max} \sim Q_{\max}$: $\pm 1.0\%$)
(Comply to criteria: ISO 9951)

Wetted Components

Housing: Standard-Tungsten Carbide;
Optional-304, 316 Stainless Steel
Bearings and Shaft: ABS (Corrosion Resist) or Aluminum-Alloy
Rotor: ABS (Corrosion Resist) or Aluminum-Alloy
Retaining Rings: 304 Stainless Steel

Output Signal: (Where applicable)

Sensor: Pulse signal (Low Level: $\leq 0.8V$; High Level: $\geq 8V$)
Transmitter: 4 to 20 mA DC current signal

Signal Transmission Distance: $\leq 1,000m$

Electrical Connections:

Basic Type: Hausman Connector or three-core cable
Explosion Proof Type: ISOM 20 $\times$ 1.5 Female

Explosion Proof Level: Standard:

None
Optional: Exd IIB T6

Protection Level: IP65

2.0 OPERATION CONDITIONS

Ambient:

Temperature: -10°C to +55°C
 Pressure: 86 to 106 KPa
 Relative Humidity: 5% to 90%

Power Supply:

Sensor: +12VDC (Optional: +24VDC)
 Transmitter: +24VDC
 Field Display Type B: Integral 3.2V Lithium Battery
 Field Display Type C: +24VDC

Fluid Temperature and Pressure:

Temperature: -20°C to +80°C
 Pressure: Fluid pressure should be limited according to flange rating.

Measurable Flow Rate Range and Pressure Level: (See table 1)

Table 1. Measurable Flow Rate Range and Pressure Rating

Nominal Diameter		Standard Flow Range (SFR)		Extended Flow Range (EFR)		Standard Pressure Rating
(mm)	(in.)	Mark	(m ³ /h)	Mark	(m ³ /h)	(MPa)
25	1	S1	3 to 30	W1	1.5 to 30	2.5
		S2	4 to 40	W2	2 to 40	2.5
				W3	0.5 to 4	2.5
				W4	0.7 to 7	2.5
				W5	1.5 to 30	2.5
40	1.5	S1	5 to 50	W1	2.5 to 50	2.5
		S2	8 to 80	W2	4 to 80	2.5
50	2	S1	10 to 100	W1	5 to 100	2.5
		S2	15 to 150	W2	8 to 150	2.5
65	2.5	S	15 to 200	W	10 to 200	1.6
80	3	S1	15 to 300	W1	10 to 300	1.6
		S2		W2	15 to 350	1.6
100	4	S	20 to 400	W1	15 to 400	1.6
				W2	20 to 500	1.6
125	5	S	20 to 800	W1	18 to 800	1.6
				W2	20 to 900	1.6
150	6	S	50 to 1000	W1	25 to 1000	1.6
				W2	50 to 1200	1.6
200	8	S	150 to 2000	W	80 to 2500	1.6
250	10	S	200 to 3000	W	150 to 3500	1.6
300	12	S	250 to 4000	W	200 to 4000	1.6
400	16	S	400 to 8000	W	260 to 8000	1.6

3.0 CAUTIONS FOR INSTALLATION

Mounting Positions

Turbine flowmeters should be installed at the place in compliance with the requirements below:

- ◆ Easy maintenance
- ◆ No vibration
- ◆ No electromagnetic interface
- ◆ Away from heat source

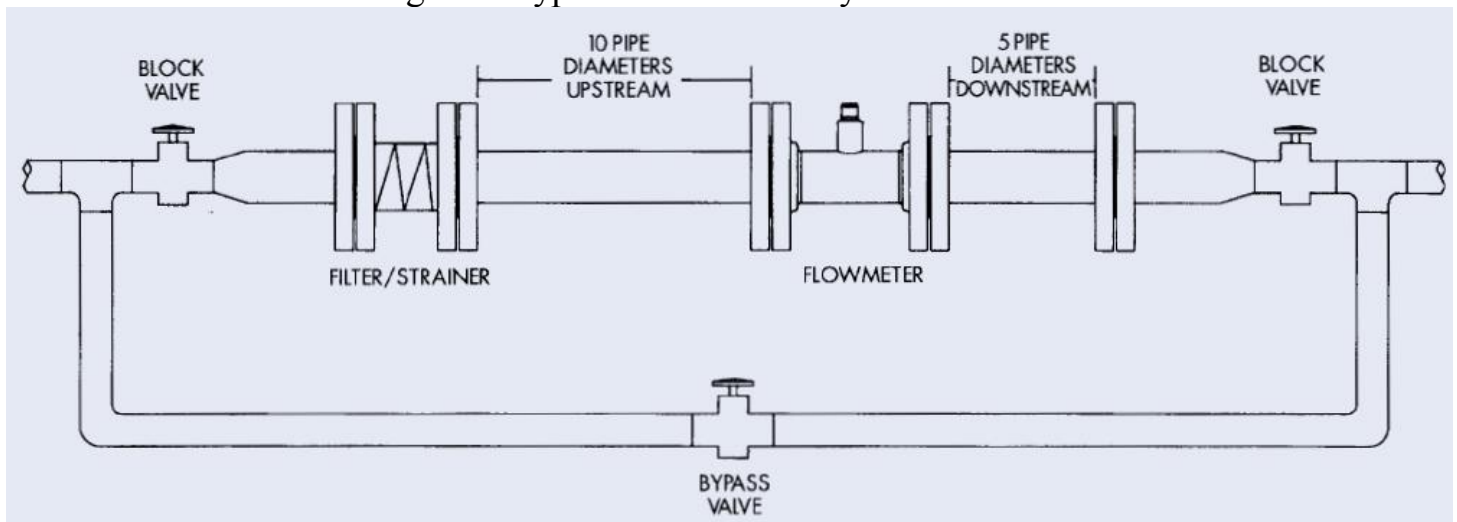
Mounting Orientation

All turbine flowmeters are designed to measure flow in only one direction. The direction is indicated by the arrow on the body.

Required Lengths of Straight Runs

Flow altering device such as elbows, valves and reducers can affect accuracy. See diagram 1 for typical flow meters stem installation.

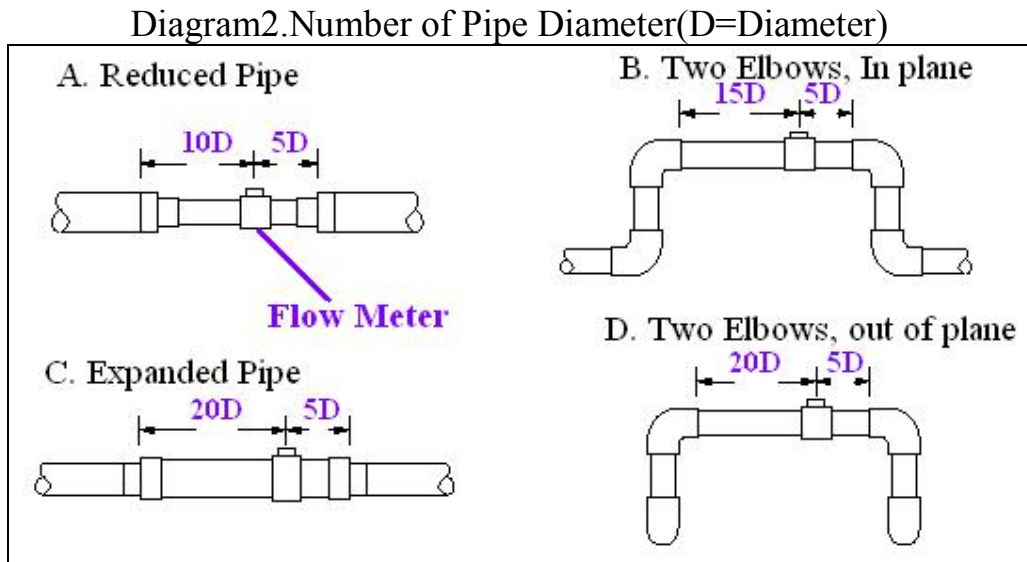
Diagram 1. Typical Flow Meter System Installation



There commended guide lines 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 10times the internal diameter of the pipe. For example, with the 50mm pipe, there should be 500mm of straight pipe immediately upstream. Desired upstream straight pipe length is 1000mm.
- Downstream: allow a minimum straight pipe length at least 5times the internal diameter of the pipe. For example, with the 50mm pipe, there should be 250mm of straight pipe immediately upstream. Desired upstream straight pipe length is 500 mm.

See diagram2 for straight pipe length requirement when there is altering device.



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



Special Notice

- ◆ Foreign material in the gas 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 gas.
- ◆ When the meter contains removable cover plates, leave the cover plate installed unless the accessory module specifies removal. Don't remove the cover plates when the meter is powered, or electrical shock and explosion hazard can be caused.
- ◆ Avoid opening the valve from shut to full open, as the sudden flow can cause permanent damage to the turbine's rotor.

Flange Connections

The flange follows ISO7005-1; BS4504RF (Raised Face).

Note: flange can be customized following other criteria.

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 overtighten the flange bolts. This may cause the gasket to become pressed into the flow stream and may decrease the accuracy of the meter.

4.0 Installation Dimensions

Thread or flange connection is used according to different flow models. See Figure 1 and Table 3 for detailed dimensions.

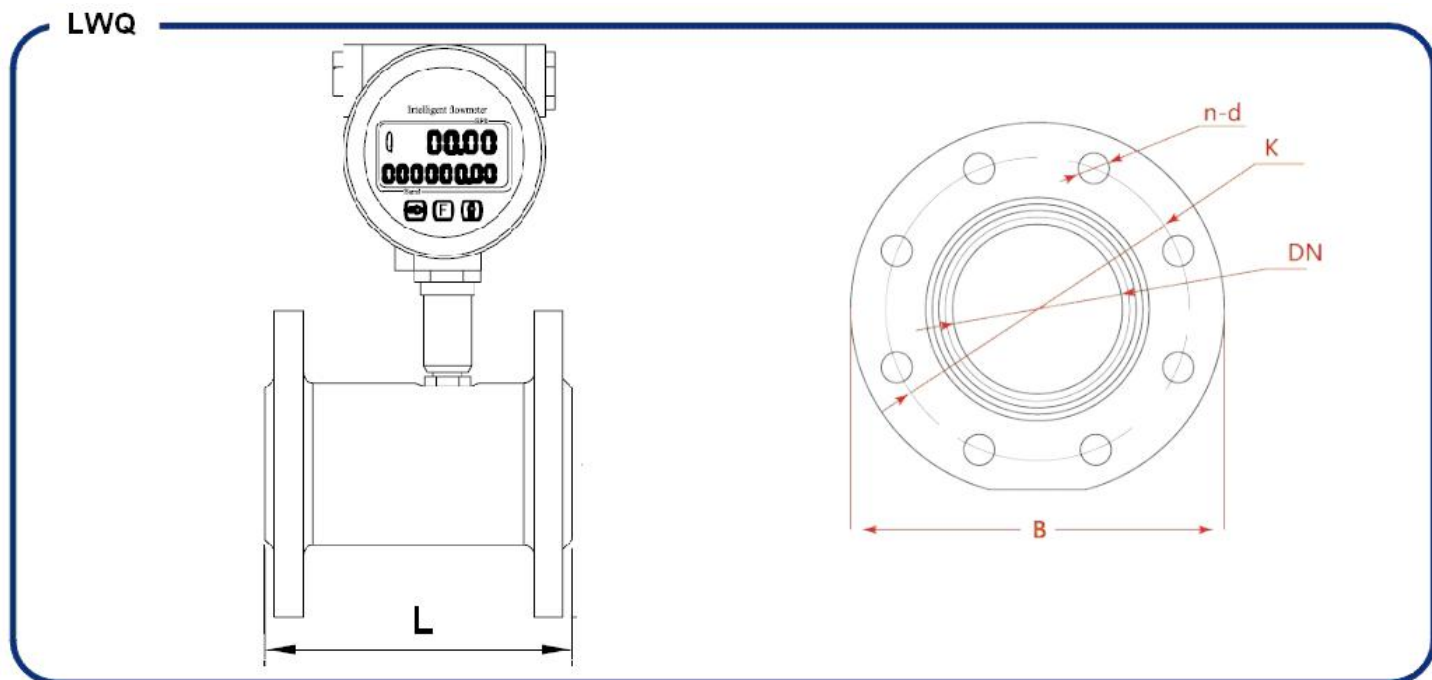


Figure 1: Installation Dimension

Table 3. Dimensions (mm)

3.1 Flange: BS4504 PN16 (DIN PN16)

Diameter DN	L	B	K	n×Φd
25	170	115	85	4×14
40	200	150	110	4×18
50	220	165	125	4×18
65	220	185	145	4×18
80	240	200	160	8×18
100	300	220	180	8×18
125	340	250	210	8×28
150	450	285	240	8×22
200	500	340	295	8×22
250	500	400	355	12×26
300	500	460	410	16×26
400	1200	580	525	16×30

5.0 Electrical Wiring

Sheet 5-1 Configuration of Temperature & Pressure Compensation

Power Supply	Display	Output Type							
		Pulse	Scaled Pulse	4-20mA		IC card	RS485	Alarm	
				Two wire 4-20mA	Three wire 4-20mA			AH	AL
Battery+DC24V	●	●	●	●	●	●	●	●	●

Note:

1. Pulse refers to the pulse signal which is proportional against rotor rotational speed;
2. Scaled pulse refers to the pulse signal (same with IC card signal) when reach the cumulative amount of units (such as 0.1m³, 1m³ or 10m³, etc.);
3. Battery model is ER34615, lifetime can be ensured at least 2 years;
4. ● means standard configuration; ○ means optional configuration;

5.1 Terminal Configuration Diagram

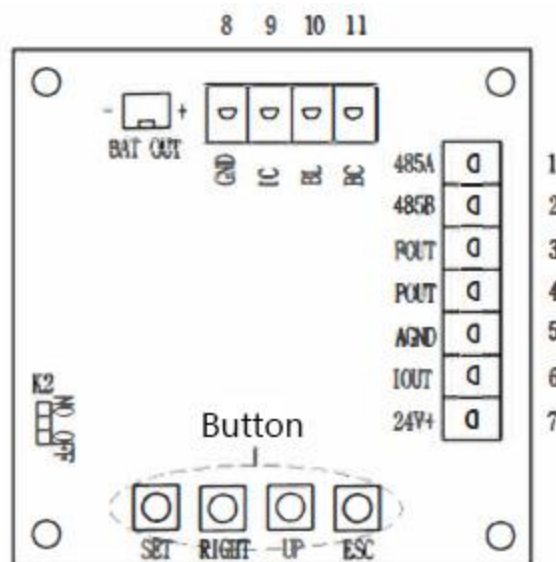


Diagram 5-1 Terminal board of D2S Converter

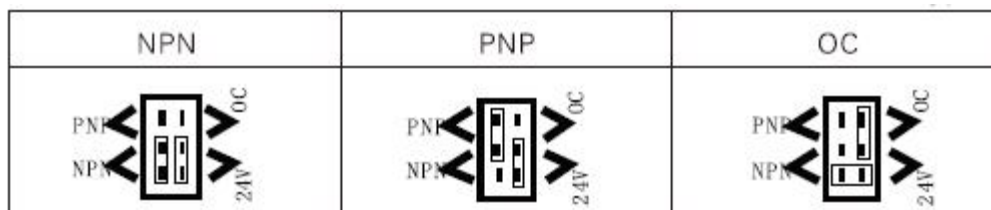
Sheet 5-2 Terminal Wiring

No.	Terminal Symbols	Description	Remark
1	485A	Communication RS485A	
2	485B	Communication RS485B	
3	FOUT	Pulse Output	Corresponding Menu V_03
4	POUT	Frequency Output	Calibration dedicated
5	AGND	24V DC-	
6	IOUT	Current Output	
7	24V+	24V DC+	
8	GND	IC+	
9	IC	IC-	
10	BL	Battery power under voltage alarm output	
11	BC	Error alarm output	

Pulse output wire jumper description

- A. Switch of Pulse output type selection is located on the back of the mainboard of D2S converter, corresponding FOUT. Output type can be selected NPN, PNP or OC by dial switch, details operation have been shown as Sheet 5-3; pulse output type is corresponding with parameters of V-03 menu;

Sheet5-3



B. POUT is frequency output for calibration, output correction frequency fixed.

5.2 Electrical Wiring

1. 2 wire 4-20mA Output

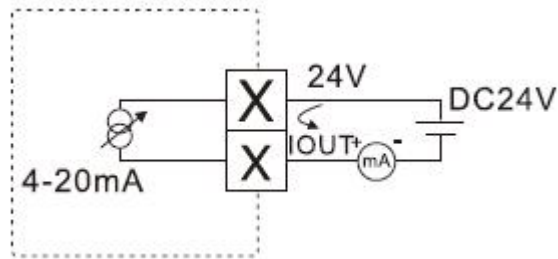


Diagram 5-2 2 wire 4-20mA Output Wiring Diagram

2. 3 wire 4-20mA Output, Pulse Output and RS485 communication

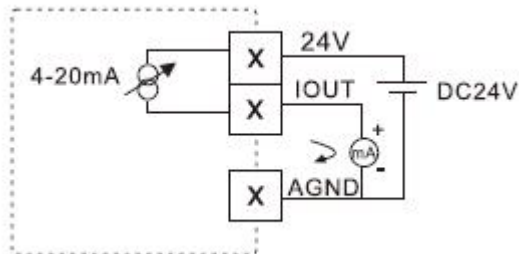


Diagram 5-3 3 wire 4-20mA Output Wiring Diagram

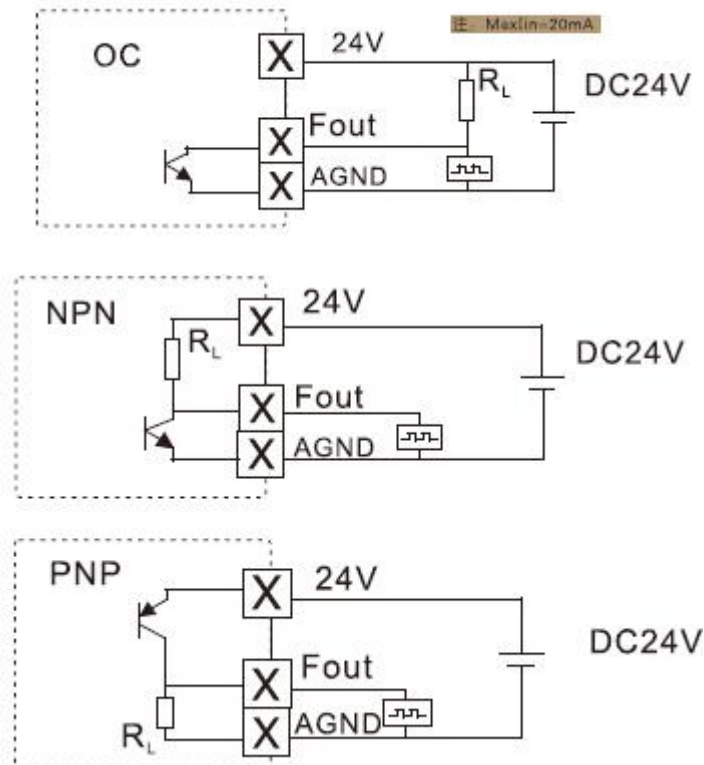


Diagram 5-4 Pulse Output Wiring Diagram

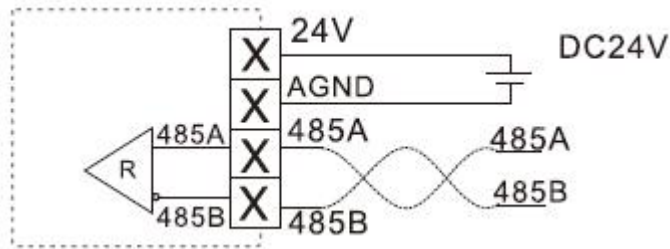


Diagram 5-5 RS485 Wiring Diagram

3. IC card signal Output

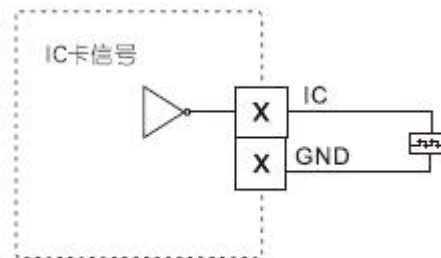


Diagram 5-6 IC Card Signal Wiring Diagram

Note:

1. Low electrical level as default, high electrical level is also workable; high electrical level $> 2.8V$, low electrical level $< 0.2V$. Pulse width can be set. The electrical wiring of BC and BL are same with IC card signal; more details, please check menu description.
2. IC card signal output are workable under any kinds of power supply.

4. Alarm output

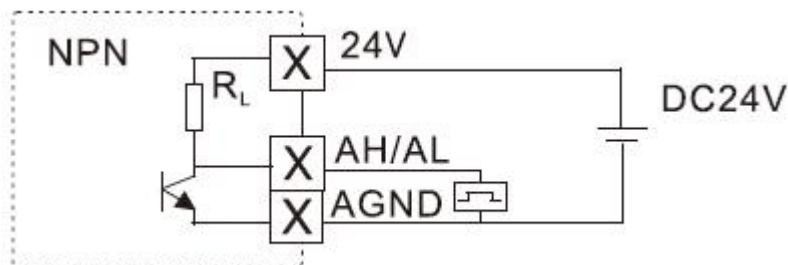


Diagram 5-7 Alarm Output Wiring Diagram

6.0 Operating Instructions

6.1 Basic Structure of Converter.

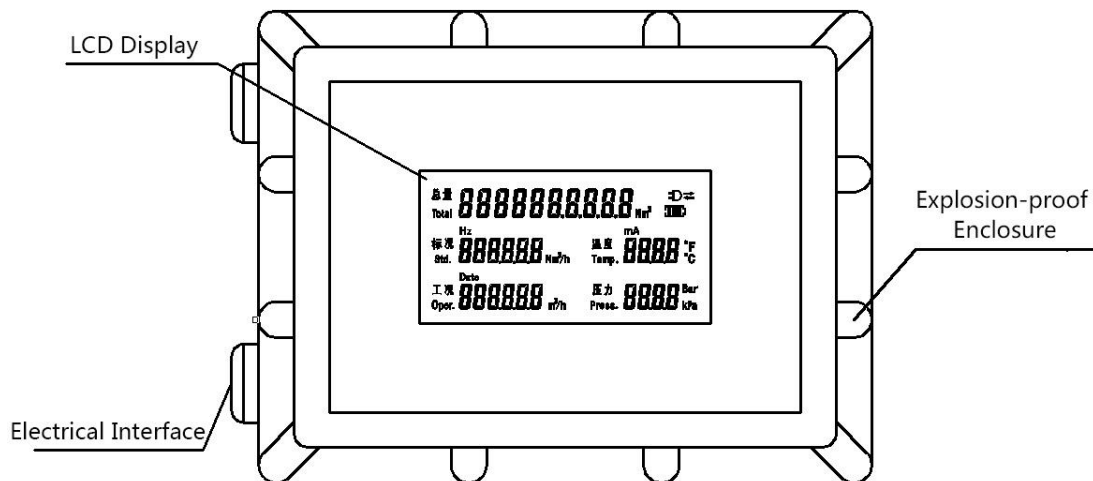


Figure 6-1 Basic Structure of the Converter.

6.2 Key Manual

D2S has four keys: "SET" "RIGHT" "UP".

Table 6-1 Key Function Description.

Key	Symbol Description
SET	Page down/Modified data saved.
RIGHT	Shift Key.
UP	Increase value under parameter setting mode;page upunder unmodified state.
ESC	) Esc key(Exit modify under parameter setting mode;back to main screen under unmodified state.

6.3 Working Screen Instruction

6.3.1 Main Screen Instruction

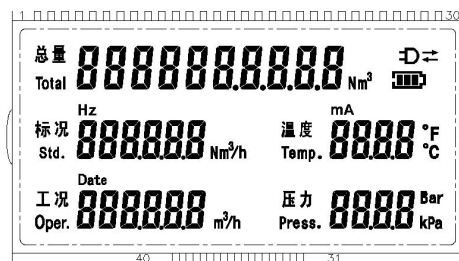


figure6-2 working screen diagram.

It can display power supply status or

output mode, The following table shows the meaning of symbol.

Table 6-2 comparison table of symbol description.

Symbol	Description
	Battery power display.
	Display when access to 24V external power supply or loop power supply.
	1、1.RS485 communication sombol, ← is sending, --- is receiving. 2、 ←Passport is correct when setting parameters.

- ◆ Total: Three decimal places could be kept at most, and the figure automatic carry and digit forward.
- ◆ counter.
- ◆ a) m³ : Operation condition total flow;
- ◆ b) Nm³ : Standard condition total flow.
- ◆ Unit kg/h, reserved.
- ◆ Standard condition flow rate: Three decimal places could be kept at most, and the figure automatic.
- ◆ carry and digit forward counter. The max-value is 999999Nm³/h.
- ◆ Operation condition flow rate: Two decimal places could be kept at most, and the figure automatic.

- ◆ carry and digit forward counter. The max-value is 999999m³ / h.
- ◆ Temperature: Two decimal places could be kept at most, and the unit is °C.
- ◆ Pressure: Two decimal places could be kept at most, and unit is kPa.
- ◆ External Power symbol: It will be light up when external power is provided.
- ◆ Communication symbol: It will be light up when it communicates with RS485.
- ◆ Enter
- ◆ the menu, and enter the right passport , light is on, then the parameters can be modified, or the passport is wrong, only can read the parameters.

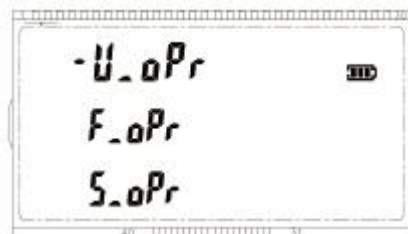
6.3.2 Secondary Screen Instruction

Press the "RIGHT" key on the main screen to enter the Secondary Screen, then Press the "RIGHT" key to select pages, achieve a quick view of the following parameters

Secondary Screen	
Operation	Parameters
On main screen, Press the "RIGHT" key one time	First line: Total flow rate of working condition, unit m ³ . Second line: Original frequency, unit Hz. Third line: Frequency of amendment (unit Hz), compaction factor.
Press the "RIGHT" key two times	First line: Instrument coefficient, unit P/m ³ . Second line: Baud rate Third line: UART parameters, battery voltage (unit V)
Press the "RIGHT" key three times	First line: Upper limit of the flow rate, unit Nm ³ /h. Second line: Software version Third line: Current value, unit mA.

Press the "RIGHT" key four times	First line: Hour:Minute:Second Second line: Year Third line: Month/date
Press the "RIGHT" key five times	Back to main screen

6.3.3 Menu



Menu level	Password explain
U _ oPr	User menu
F _ oPr	Engineer menu
S _ oPr	Special function menu

Press “right ” or “up” to enter menu, then press “set’ to enter password.

6.4 Menu explanation

Press U_oP, then press “SET ” , you will get the following user menu interface

U _ oPr user menu		
Code	Parameter	Explanation
U_01	Damping time	01-99s , the bigger value means the slower flow change
	Upper flow limit	20mA and 1000Hz frequency output will match this value. When the flow is 1.5 times of upper flow limit, then it will display as 1.5 times value.
	Working flow cutoff	Below this flow, it will display 0

U_02	Address	001 -255 decimal When set to 0, the default country 1; when over 255, the default is 255.
	Baud rate	0:1200; 1:2400; 2 :4800; 3 :9600 ; 4:19200
	Uart setup	n: no parity; O: odd parity; E even parity. 7 : 7 data bits; 8 : 8data bits 1 : 1 stop bits ; 2 : 2 stop bits
U_03	Scaled pulse	0.001-9999.999 Nm3, settable
	Pulse width	Left on second line: unit : ms, range; 1-9999ms
	Output mode	Right on second line 0: Scaled pulse output 1: 0-1000 working flow rate 2 : verification frequency output
	Output electrical level	0: NPN corresponds to low level, PNP corresponds to high level, oc corresponds to normally closed 1 : NPN corresponds to a high level, PNP corresponds to a low level, and oc corresponds to a normally open corresponding terminal FOUT and a pulse output jumper.
U_04	Alarm limit value 1	Unit is same with main menu unit
	signal source	Left on the second line: 0: standard flow rate 1: working flow rate
	Alarm mode 1	Right on the second line : 0: below set value 1: beyond set value
	Alarm electrical level 1	0: Default low level, output high level when alarming. 1: Default high level, output low level when alarming. Corresponding terminal AH
U_05	Alarm limit value 2	Same as above , terminal : AL
	signal source 2	
	Alarm mode 2	
	Alarm electrical level 2	
U_06	Language	0: Chinese 1: English
	Black light	0: no black light
		1: The battery is automatically on for 20 seconds, the two wire is not light, the three wire is always bright
		2 : Batter power and 3 wire always bright, 2 wire is dark
U_07	Time setting	Year,month, date, hour ,minutes

U_08	Password change	4 digit passwords can be set manually, the second line is encryption prompt,, when user forget password, please contact manufacture
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F_oPr. Engineer menu		
Code	Parameter	Explanation
F_01	Meter type	0: turbine meter 1: gas roots meter
	Output signal	0: porcelain resistance sensor 1: coil sensor
F_02-9	correction factor	First line: correction factor second line: frequency
F_10	K- factor	Unit : P/m3
F_11	Temperature compensation	0 : no compensation 1: set
	Set temp	Set value range : -40-150℃
	Temperature shift	Only for automatic mode
F_12	Pressure compensation	0: no compensation 1: set 2 : automatic
	Set pressure	Unit : kpa
	Pressure shift	Only for automatic mode
F_13	Pressure upper limit	Unit : kPa
	sensor mode	0: absolute pressure sensor 1: gauge pressure sensor
	Local air presure	Not work for ansolute pressure sensor,unit:KPa
F_14	Pressure correction	0: no correction 1: correction
	5 points correction	First line is standard pressure Value, second line is correction value
F_15	Standard temp	Unit :℃。
	Standard pressure	Unit : kPao

F_16	Compression factor setup	setup the compensation value of the compression factor
	Compression factor compensation method	0: No 1: Setup 2. Mole component, using format NX-9 calculation 3. Physical property value, using SGERG-88 calculation
	Relativity Density	
F_17	CO2 mole fraction	Mole component algorithm, using NX-19 calculate, range as below:
	H2 mole fraction(second line in left)	Relativity Density=0.55-0.75 CO2 mole content<0.15
	Upper limit heating value(second line in right)	N2 mole content<0.15 Physical property value, using SGERG-88 calculation, range as below:
	N2 mole fraction	Relativity Density=0.55-0.75 CO2 mole content<0.15 N2 mole content<0.1 Upper limit heating value=27.95-41.93
F_18	Working condition relative humidity	Gas humidity compensation
	Standard condition relative humidity	
F_19	GPRS Communication interval	Interval by day
	By day	
	Hours	Second line in left for interval hours
	Minute	Second line in right for interval minute
F_20	Second	Interval by second
	Password modify	The four-digital password is arbitrarily modified, and the second line is a password encryption prompt. When the user forgets the password, they can contact the manufacturer for decryption
S_0Pr Special function menu setup		
Code	Parameter	Description

S_01	Total flow clear	S_02 & S_03 will be clear all after input confirmation clear password
S_02	Total flow under working condition setup	Input total flow password and setup, save it
S_03	Total flow under standard condition setup	Input total flow password and setup, save it
S_04	Restore factory/storage factory selection	0: F-r confirmation to restore factory setup, input password and save it; 1: F-s confirmation to save factory original data, input password and save it
S_05	Special function setup	Single digit: to read D4 protocol while setup value as “1”; ten’s: to support 2 wires GPRS open while set value as “1”
S_06	Password modify	The four-digital password is arbitrarily modified, and the second line is a password encryption prompt. When the user forgets the password, they can contact the manufacturer for decryption

Reminder:

Press and hold the ESC key for 5 seconds to switch the auto and off status of the backlight setting.

7.0 TROUBLESHOOTING

Symptom	Probable Cause	Solution
Measurement is not accurate	1. Turbine operated below minimum rate. 2. Installed too close to fittings.	Increase flowrate. Refer to Section 3.0 Operation Conditions Install correctly. Refer to Section 5.0 Cautions for Installation
LCD Display Abnormity	1. Battery Power Type: Bad contact on the connector between battery and PCB 2. DC Power Type: supply voltage is abnormal	Open back cover and repower the flow meter Check and ensure power supply is 24V DC