--- user's manual ---

TURBINE FLOW METER

Content

I Generality

Turbine Flow Meter (Abbr. TUF) is a main type of Impeller Flowmeter also including the Anemoscope and Water meter. TUF is made up of Sensor and Conversion-Show. The Sensor reacts to the average velocity of fluid with multi-blades rotor so as to speculating the flow value and the accumulative flow value. The velocity (or circles) of rotor can be picked up by the way of mechanism, electromagnetic induction, photo electricity, before displaying and transmitting the records by reading device.

It is said that America announced the first TUF patent early in 1886. The patent in 1914 recorded that the TUF flow value is relevant to frequency. The first developed TUF in 1938 is applied to measuring the fuel flow in the aircraft. It is eventually achieved to use in the industry until the end of the world war two, since it is urgent for the jet engine and liquid jet fuel to demand high accuracy, quick responses flow measurement instrument. Nowadays, it can be extensively used in the fields of oil, chemical, defence, science, measuring, etc..

SRS-LWGY series Turbine Flowmeter draw the leading technology integrating with advanced design to produce the new generation of turbine flowmeter with the features of simple structure, light weight, high accuracy, good repeatability, flexible reaction, convenient installation/maintenance/application etc.. It is widely applied to measuring the liquid of which kinematic viscosity is under $5*10^{-6}$ ㎡/s and have no impurity of fiber, grain etc., and no corrosive interaction with the stainless steel 1Cr18Ni9Ti,2Cr13,and A12O3, and hard alloy in seal pipes. The liquid of kinematic above $5*10^{-6}$ ㎡/s can be measured after real liquid calibration of flowmeter. It can be used in value control, siren when excess, if co-ordination with special display instrument. So it is the ideal instrument of measuring flow value and saving energy.

Ⅱ Principle of Operation

As the measured liquid flows through the sensor, the vane begins to turn, which velocity is in direct proportion to average flow one in the pipe. The turn of vane periodically changes the magnetic resistance value. Magnetic flux in the magnetic test coil happens to change cyclically with it to produce periodic induced voltage, it is the pulse signal, that will be sent to the display to show after amplified by magnifier.

Flow rate equation of Turbine Flowmeter includes both practical and theoretical one:

(1) Practical equation:

$Q_{v=}f / k$

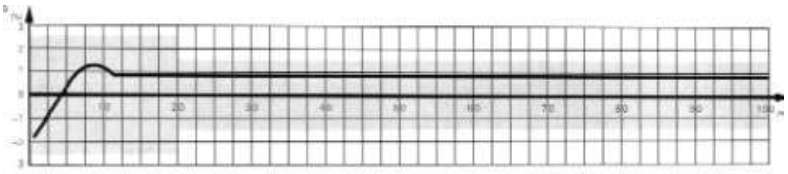
$Q_m= Q_v \nu\rho$

Q_v refers to volume flow rate, (unit： m^3/s)

Q_m refers to mass flow rate, (unit ㎏/s)

f : refer to output signal frequency (unit Hz)
k : refer to the Flowmeter factor, (unit P/m^3).

The related curve of flowmeter factor and flow rate is in the graph (Diagram: Turbine flowmeter characteristic curve). As your seeing, the factor curve can be divided into two parts of linearity and non-linearity. The linear part accounts for two-thirds of the entire curve which feature is related to the structure, size of sensors, and fluid viscosity. The feature in non-linearity part is influenced by friction force from bearing, the viscosity resistance of liquid. When flow rate is below the lower limit of sensor, the instrument factor are quickly increasing with it. The value of pressure loss and the flow rate are similar to be square relations. If flow rate surpassed the upper limit, pay attention to preventing from cavitation. When the turbine flowmeter has similar structure, their curves have similar feature but have different system errors.



(Diagram: Turbine flowmeter characteristic curve)

The sensor factor can be worked out by calibration instrument, which may have no consideration of the sensor's inside fluid mechanism, and can be confirmed by inputting flow rate and outputting pulse signals of frequency. So we can see the sensor as a black box , that is convenient for application. But please note that the conversion factor (or instrument factor) should comply with some conditions which calibration condition is the reference condition. If it deviate from this condition, the factor will happen to change. The changes would be determined in terms of the sensors type, the pipe installation condition, and fluid physical parameters.

(2) Theoretical flow rate equation:

According moment of momentum theorem can list the equation of motion impeller.

$$J\,\mathbf{dw\ dt} = M_1 - M_2 - M_3 - M_4$$

In the formula,

J: impeller inertia moment;
dw dt: rotational acceleration;
M_1 : Liquid-driven torque
M_2 : Viscous resistance moment
M_3 : Bearing friction moment
M_4 : Magnetic moment.

When impeller is rotating according to constant velocity, J **dw dt** =0, and $M_1=M_2+M_3+M_4$. Through the analysis in theory and verification in experiment, the formula can be deduced that is:

$$n=Aq_v+B-\mathbf{C}\,q_v$$

In the formula,
n: refers to impeller rotational speed;
q_v: refers to volume flow rate;
A: the factors related to fluid physical properties (include density, viscosity etc.), impeller structure parameters (blade angle, impeller diameter, flow channel cross-sectional area etc.);
B: the factors related to top vane gap, and fluid flow velocity distribution;
C: the factor related to friction moment.

The scholars domestic and abroad have put forward to many flow equations in theory, applied to various sensors structures and fluid working conditions. Until now, the hydrodynamic characteristic of turbine instrument ones is still unclear, for it has complicated relationship with fluid physical property, and flow characteristics. For instance, when there appears to swirling and unsymmetry velocity distribution in flow field, the hydrodynamic characteristics are very complicated.

So instrument factors cannot be deduced by theoretical formula, can be confirmed by real flow calibration. But theoretical formula has been significant in practice. It can be used in instruction in the design of sensor structure parameter and the forecast, and assessment of instrument factor changing rule.

Ⅲ Product Feature:

(1) High accuracy (regular accuracy±1%R, ±0.5%R, highest accuracy±0.2% R);
(2) Good repeatability (short-term one reaches 0.05%--0.2%), priority to be used in trade settlement for its extremely high accuracy in the regular calibration or on-line calibration.
(3) Pulse frequency signal output is applicable to totality calculation and computer connection with no zero drift and strong anti-interference capacity.
(4) High frequency (3-4kHz) can be achieved, and has high resolution.
(5) Wide range ratio: medium or large diameter may reach 1:20,and small diameters are 1:10.
(6) Compact and light weight structure, convenient installation and maintenance, extensive application ability.
(7) Application to high pressure measurement with its unnecessary opening hole to be made into high pressure instruments.
(8) Complete tailored version sensors can be designed to different kinds of types according to users special needs. For instance, low temperature type, high pressure type, sanitary type, etc.
(9) Insertion type can be made, that is applicable to large normal diameters

measurement for its little pressure loss, low price, unnecessary stopping flow to take out it, and convenient installation and maintenance.

Ⅳ Basic Parameters / Technical Specification

1. Technical Specification:

Nominal Diameter(mm) and Connection method	4, 6, 10, 15, 20, 25, 32, 40 (thread connection) 15, 20, 25, 32, 40 (thread and flange connection) 50, 65, 80, 100, 125, 150, 200 (flange connection)
Accuracy Class	Regular accuracy ±1%R, ±0.5%R, Highest accuracy ±0.2% R
Measurement Range Rate	1:10, 1:15, 1:20
Instrument material	304 stainless steel; 316L stainless steel; etc.
Medium Temperature(Deg C)	－20 ~＋120
Ambient Conditions	Temperature: －10～＋55 Deg C, Relative Humidity: 5％～90％ Atmosphere Pressure:86～106Kpa
Signal Output	Sensor: pulse frequency signal, low level≤0.8V high level≥8V. Transmitter: current signal 4～20mA DC two wires
Supply Power	Sensor: +12V DC, +24V DC (option) Transducer: +24V DC Scene display type meter: 3.2V Lithium cell
Signal Transmission Line	STVPV 3×0.3 (three wires), 2×0.3(two wires)
Transmission Distance	≤1000m
Signal Line Interface	Internal thread M20×1.5
Explode-proof Class	ExdIIBT6, CLASS 1, DIV.1 GR.D
Protection Class	IP65 / NEMA

2. Measurement range and Working pressure for liquid

Nominal Diameter (mm)	Regular Flow rate (m^3/h)	Expanding flow rate (m^3/h)	Regular tolerance pressure(MPa)	Special tolerance pressure(MPa) (flange connection)
DN4	0.04—0.25	0.04—0.4	6.3	12, 16, 25
DN6	0.1—0.6	0.06—0.6	6.3	12, 16, 25
DN10	0.2—1.2	0.15—1.5	6.3	12, 16, 25
DN15	0.6—6	0.4—8	6.3, 2.5(flange)	4.0, 6.3, 12, 16, 25
DN20	0.8—8	0.45—9	6.3, 2.5(flange)	4.0, 6.3, 12, 16, 25
DN25	1—10	0.5—10	6.3, 2.5(flange)	4.0, 6.3, 12, 16, 25
DN32	1.5—15	0.8—15	6.3, 2.5(flange)	4.0, 6.3, 12, 16, 25
DN40	2—20	1—20	6.3, 2.5(flange)	4.0, 6.3, 12, 16, 25
DN50	4—40	2—40	2.5	4.0, 6.3, 12, 16, 25
DN65	7—70	4—70	2.5	4.0, 6.3, 12, 16, 25
DN80	10—100	5—100	2.5	4.0, 6.3, 12, 16, 25
DN100	20—200	10—200	2.5	4.0, 6.3, 12, 16, 25
DN125	25—250	13—250	1.6	2.5, 4.0, 6.3, 12, 16
DN150	30—300	15—300	1.6	2.5, 4.0, 6.3, 12, 16
DN200	80--800	40—800	1.6	2.5, 4.0, 6.3, 12, 16

3. Measurement range and Working pressure for gas

Model	Diameter (mm)	Flow Rate (m^3/h)	Initial Flow Rate (m^3/h)	Tolerance pressure(Mpa) (flange connection)
LWQ-25A	25 (1”)	0.7—7	0.6	4.0 Flange or Thread
LWQ-25B		1.5—15	1.0	4.0 Flange or Thread
LWQ-25C		3—30	2.0	4.0 Flange or Thread
LWQ-40A	40 (1.5”)	4—40	2.5	4.0 Flange or Thread
LWQ-40B		8—80	3	4.0 Flange or Thread
LWQ-50A	50 (2”)	10—100	3.5	4.0 Flange
LWQ-50B		15—150	4	4.0 Flange
LWQ-80	80 (3”)	15—300	4	1.6 Flange
LWQ-100	100 (4”)	20—400	5	1.6 Flange
LWQ-150	150 (6”)	50—1000	8	1.6 Flange
LWQ-200	200 (8”)	100—2000	20	1.6 Flange
LWQ-250	250 (10”)	150—3000	30	1.6 Flange
LWQ-300	300 (12”)	200—4000	40	1.6 Flange

Ⅴ Product Category

1. LWGY series can be divided into two categories by function:
   - Turbine flow sensor / transmitter
   - Intelligent integration Turbine Flowmeter
2. Function illustration:
   - Turbine flow sensor/ transmitter

   This kind of products have no scene display function, only produce signals to transmit output to far distance. The flow signals can be divided into pulse or current (4-20ma) signal. This instrument has low price, high assemble, small size, so can be applicable to match second displayer, PLC, DCS so on computer control system to use.

   According to different signal outputs, it can be divided into LWGY-N and LWGY-A types.

   - LWGY—N sensor

12--24V DC power supply, three wires pulse outputs,
high level≥8V, low level≤0.8V, signal transmission distance≤1000M.

✧ LWGY—A transmitter

24V DC power supply, two wires current (4—20mA) signal output, signal transmission distance≤1000M.

➢ Intelligent integration turbine flowmeter

It adopts an advanced super-low power consumption single-chip microprocessor technology to make up of new intelligent flowmeter with turbine flow sensor and accumulative calculation displayer integration. It has many obvious advantages which are double-row LCD display at the scene, compact structure, direct and clear reading, high reliability, anti-interference from outside power, anti-thunder attack, and low cost ,etc.

It has the instrument factors' three points rectified, non-linear intelligently compensated, and revision at the scene.

High clear LCD display simultaneously shows both instant flow rate (four valid figures) and accumulative flow rate (eight valid figures, and accumulative flow rate (eight valid figures with reset). All valid data can be kept for ten years. This kind of turbine flowmeter all are explosion-proof products, and the explosion-proof class is ExdIIB6.

This type of turbine flowmeter can be divided into type LWGY—B and LWGY—C in terms of supply power and the remote signal transmitting methods.

LWGY—B type: supply power 3.2V10AH(Lithium battery) can continuously run more than four years, but no signal output.

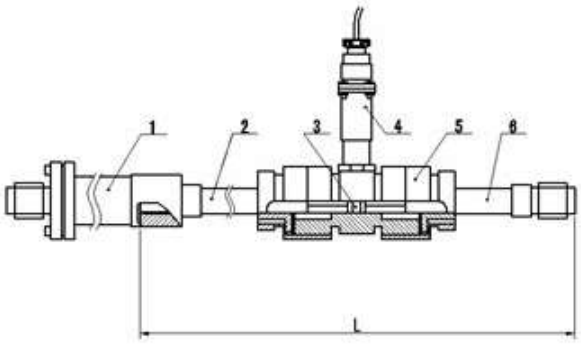
LWGY—C type: supply power 24V DC outside, output normal two wires current signal (4-20 m A) , and can add RS485 or HART communication according to different scene demand.

Ⅵ Type Choice

Model								Explanation
LWGY- □/	□/	□/	□/	□/	□/	□		
DN (mm)	4							4mm, normal flow range0.04-0.25m^3/h, wide flow range0.04-0.4m^3/h
	6							6mm, normal flow range0.1-0.6m^3/h, wide flow range0.06-0.6m^3/h
	10							10mm, normal flow range0.2-1.2m^3/h, wide flow range0.15-1.5m^3/h
	15							15mm normal flow range0.6-6m^3/h, wide flow range0.4-8m^3/h
	20							20mm normal flow range0.8-8m^3/h, wide flow range0.4-8m^3/h
	25							25mm normal flow range1-10m^3/h, wide flow range0.5-10m^3/h
	32							32mm normal flow range1.5-15m^3/h, wide flow range0.8-15m^3/h
	40							40mm normal flow range2-20m^3/h, wide flow range1-20m^3/h
	50							50mm normal flow range4-40m^3/h, wide flow range2-40m^3/h
	65							65mm normal flow range7-70m^3/h, wide flow range4-70m^3/h
	80							80mm normal flow range10-100m^3/h, wide flow range5-100m^3/h
	100							100mm normal flow range20-200m^3/h, wide flow range10-200m^3/h
	125							125mm normal flow range25-250m^3/h, wide flow range13-250m^3/h
	150							150mm normal flow range30-300m^3/h, wide flow range15-300m^3/h
	200							200mm normal flow range80-800m^3/h, wide flow range40-800m^3/h
Type		N						Basic type, +12Vsupply power, pulse output, high level≥I8V, low level≤0.8V
		A						4—20mA two wires current output, remote transmitting type.
		B						Battery supply power, scene display type.
		C						scene display/4—20m A two wires current output
		C1						Scene display/ RS485 communication protocol
		C2						Scene display /HART communication protocol
Accuracy class			05					Accuracy class 0.5
			10					Accuracy class 1.0
Measurement range mark				W				**Wide flow range turbine**
				S				**Standard measurement range turbine**
Materials					S			**304 Stainless steel**
					L			**316(L) Stainless steel**
Explosion-proof						N		**No mark, non-explosion-proof**
						E		**Explosion-proof(ExdIIBT6)**
Pressure class							N	**Normal (reference to picture before)**
							H(x)	**High pressure (reference to picture before)**

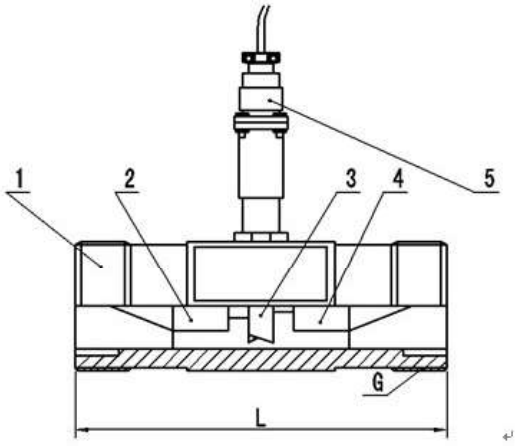
Note: DN15—DN40 need thread connection regularly, but can be made into flange connection through adding the “FL” to the nominal diameter at its end.

Ⅶ Installation Size



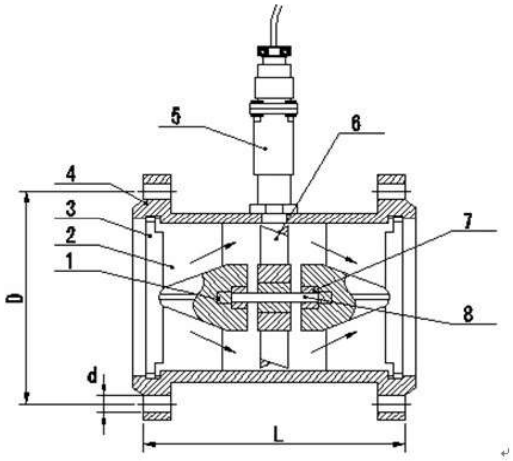
LWGY 4~10 Sensor Structure & Installation Diagram

1.Strainer 2.Before Straight Pipe 3.Impeller 4. Preamplifier 5.Body 6. Back Straight Pipe



LWGY 15~40 Sensor Structure & Installation Diagram

1. Body 2. Former Guide Part 3. Impeller 4. Back Guide Part 5. Preamplifier



LWGY 50~200 Sensor Structure & Installation Diagram

1.Ball Bearing 2. Former Guide Part 3. O ring 4. Body 5. Preamplifier 6. Impeller 7. Bearing 8. Shaft

Nominal diameter(mm)	L(mm)	G	D(mm)	d (mm)	hole number
4	295	G1/2			
6	330	G1/2			
10	450	G1/2			
15	75	G1	ϕ65	ϕ14	4
20	80	G1	ϕ75	ϕ14	4
25	100	G5/4	ϕ85	ϕ14	4
32	140	G2	ϕ100	ϕ14	4
40	140	G2	ϕ110	ϕ18	4
50	150		ϕ125	ϕ18	4
65	170		ϕ145	ϕ18	4
80	200		ϕ160	ϕ18	8
100	220		ϕ180	ϕ18	8
125	250		ϕ210	ϕ25	8
150	300		ϕ250	ϕ25	8
200	360		ϕ295	ϕ25	12

Ⅷ Cautions in Installation

(1) The installation site:

Sensor should be installed in the sites where is convenient to maintain, have no vibration of pipe, no strong electromagnetic interference, and hot radiation influence. The typical pipe installation system of turbine flowmeter is following as the picture. The each part of configuration can be chosen in view of the objects measured, which needn't all. It is sensitive for turbine flowmeter to velocity aberrance and rotating flow, so entering sensor should be the pipe flow developed enough and match the necessary straight pipe or rectifier. If upstream side components of flow resistance are variables, the pipeline length upstream generally is not less than 20D and the pipeline length downstream is not less than 5D. If the installation space does not satisfy these demands, the flow rectifier may be installed between the component of flow resistance and sensor. The sensor should be installed outside where avoids the direct sunshine and rain.

(picture)

Upstream component types	Single 90°angle bend	Double 90°angle bends at the same level	Double 90°angle bends at the different level	Concentric reducing pipe	Open whole valve	Open half valve	Downstream side length
L/DN	20	25	40	15	20	50	5

(2) The installation demands on connection with pipes:

The horizontally installed sensor demands the pipeline inclination shouldn't be visible (generally within 5°), and the vertically installed one should be same as it. The site needed to run continuously should install the by-pass pipe and reliable cut-off valve. It must be assured that the by-pass pipe has no leakage when measuring.

Location of sensor in a new pipeline is replaced into a short pipe first. After the pipeline inside has been cleared , the short pipe can be changed back into sensor formally. For this step always has been reflected, the sensor may often be damaged during clearing pipeline.

If the measured fluid includes impurity , the filter should be installed before sensor of upstream side. To continuous flow liquid should install two sets of filters which clear impurity in turn, or choose auto clearing type filer. If the air mixes in the liquid, the eliminator should be installed in the upstream side. The mouth of filter or eliminator must be led to safe site.

If the location of sensor is at the lower point of the pipeline, the drain valve should be fixed after the sensor to discharge the impurity regularly in order to prevent from dwelling deposit. If the measured liquid is easy to be aerified , the exit pressure of sensor should be more than Pmin in order to prevent from air pockets that may damage the accuracy and live time.

$$P_{min}=2\triangle P+1.25P_v \quad Pa$$

$P_{min:}$ The lowest pressure, Pa;

$\triangle P$: the pressure loss while the sensor flow rate is the biggest Pa;

P_v : the saturation vapour pressure when the use temperature arrives at the highest point Pa.

Flow control valve should be fixed in the sensor's downstream ,and the cut-off valve at the upstream side all should be opened, whose valves may not produce vibration and leakage toward outside. To the flow range that might make the reversed flow should prevent the fluid's reversed flow with fixing the check valve. Both sensor and pipeline

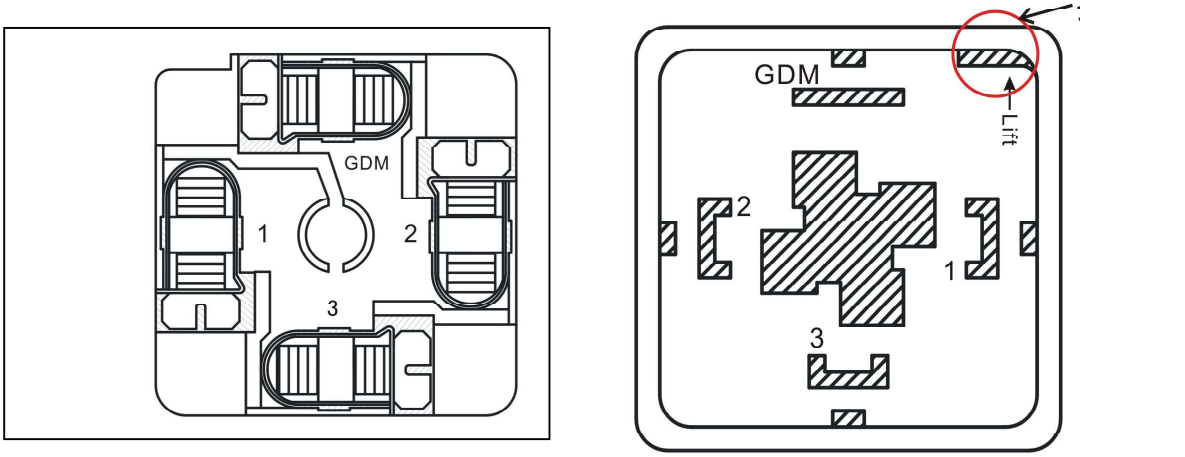
should be concentric. The sealed washer is not allowed to have it protruded into the pipeline. The liquid sensor should not be fixed at the top of the horizontal pipeline lest the air converging into the pipe stops in the sensor not to be expelled so as to effect the measurement.

The sensor's front and back pipe sections should be supported firmly so as not to produce vibration. If the fluid is easy to condense, the measurement of keeping temperature should be taken in the sensor and its front and back sections of pipeline.

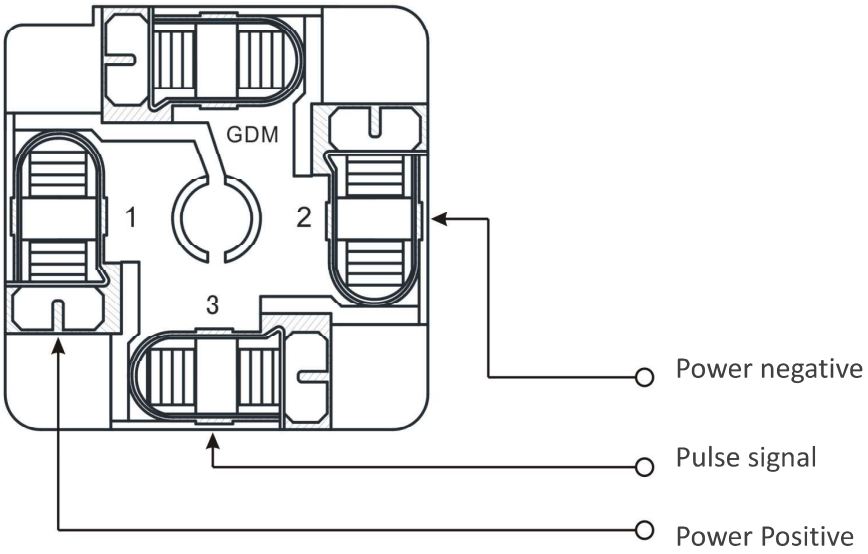
Ⅸ Connection Way

◆ Turbine flow sensor/transmitter:(model LWGY-N, model LWGY-A)

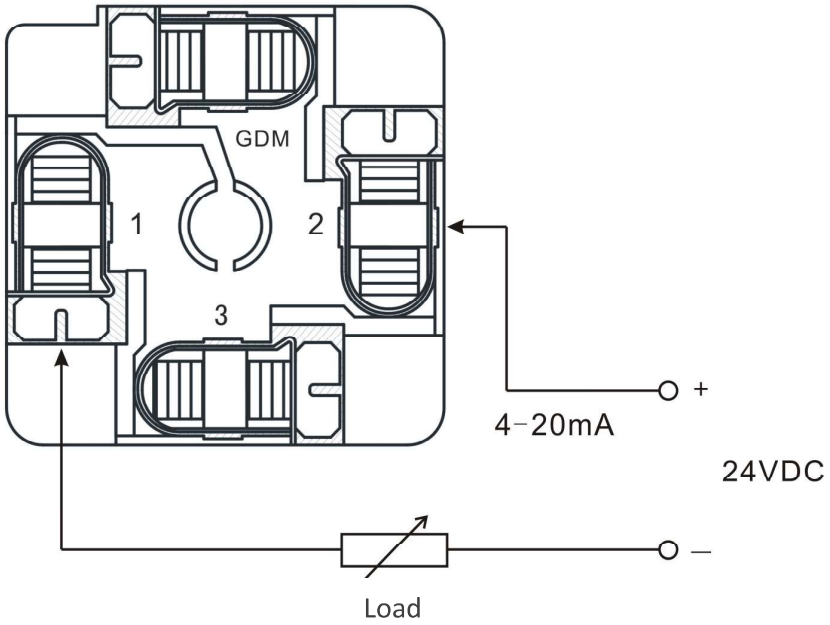
1. Basic type:



LWGY-□N type Turbine flow meter connection way

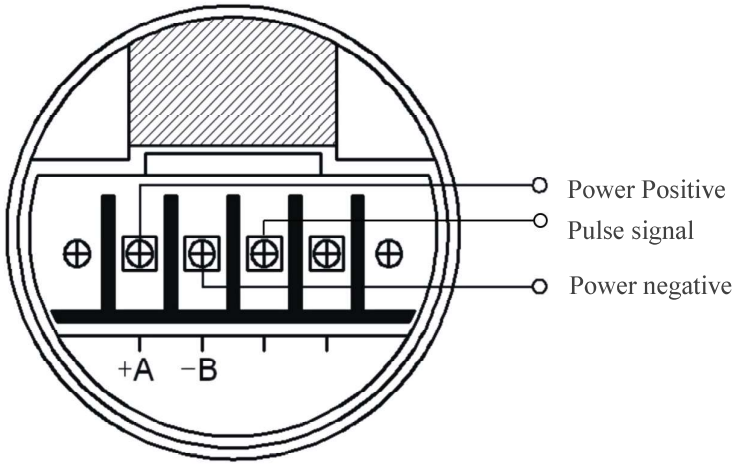


LWGY-□A type turbine transmitter connection way

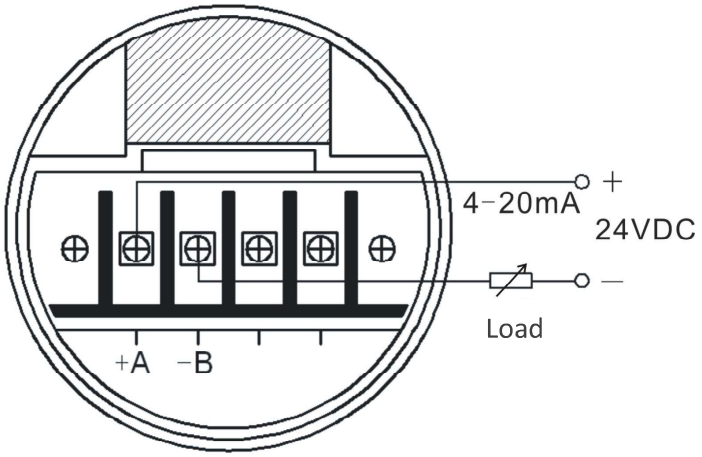


2. Anti-explosion type:

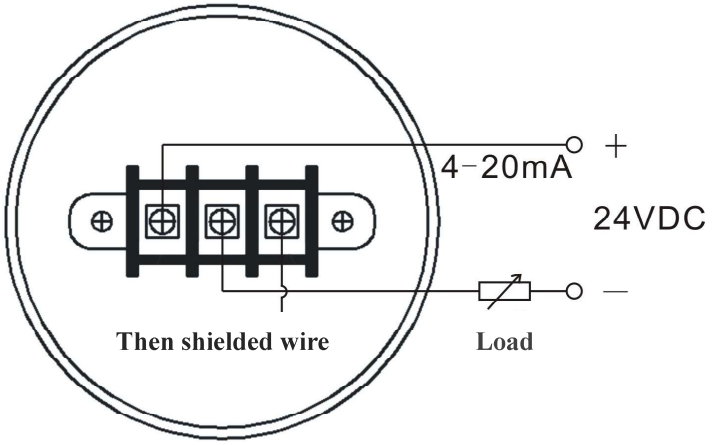
LWGY-□N type turbine flow meter sensor connection way:



LWGY-□A type turbine flow transmitter connection way:



◆ Intelligent integration turbine flowmeter (model LWGY-C)



Ⅹ Adjustment and Application

LWGY-N basic type turbine flow meter:

This sensor has been calibrated and adjusted before sales, so needn't examination.

The sensor combines with displayer: in the first place, checking the output feature(the pulse frequent range, level, wide etc.) which should match the entry feature of displayer. The displayer parameters must set in terms of sensor factors. The sensor power , wire, and resistance must match each other as well.. In addition, the sensor's prepositional amplifier must be considered to prevent from electromagnetic interference, for instance, to take action of rain proof.

LWGY-A turbine flow transmitter:

This transmitter should be set the flow rate output zero point and the full range value well according to the customer demand when purchasing.

When the flowmeter works on and the flow rate output zero point should be adjust on site, the operation method is doing as the follows:

Close the valves of flowmeter pipe, confirm there is not flow rate in pipe; put on the power, the series-connected current meter can monitor the flowmeter output current; slightly adjust the W502 potentiometer on the circuit board to come the output current back to 4mA.

Note: the flowmeter full range value couldn't be adjusted on site after it works; If need, please return it to factory to complete that in the standard installation according to your need.

LWGY-B intelligent turbine flowmeter display on site

- The internal parameter set: (only engineer operation)

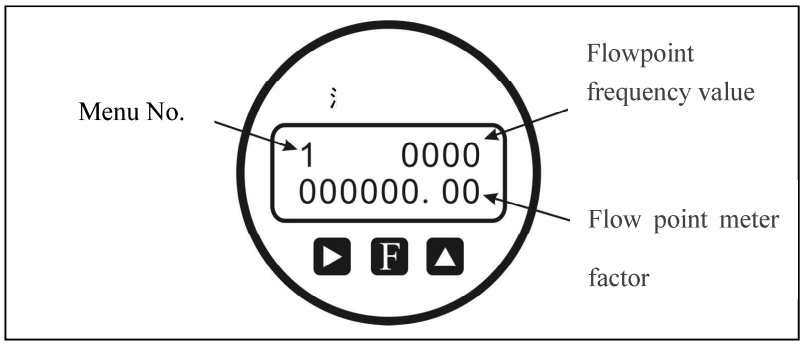
  01. the panel keys illustration

  - entry (exit) parameter set menu: in the working state simultaneously press the key  and key **F**;
  - cursor moves towards right：in the parameter set state press the key 
  - cursor adds one figure：in the parameter set state press the key 
  - parameter menu switch：in the parameter set state press key F；

- cumulative flow value to clear: in the working state simultaneously press the key F and key ▲ .

02. internal parameter illustration:

The flow meter program includes three menus, which shows with three screens that is the three points modification: the top one is the value of frequency, the three menus can circularly be switched with the key **F**



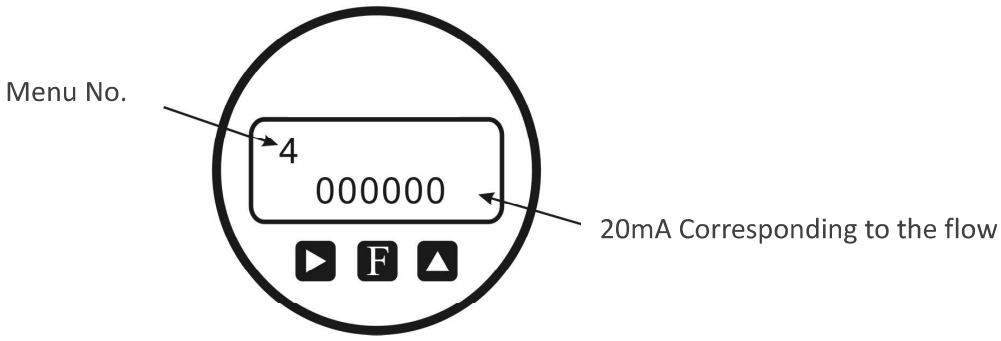
LWGY-C intelligent turbine flow meter with 4-20mA current output

01. The panel key illustration:

The turbine flow meter with battery and supply power on site display.

02. Internal parameter illustration:

The meter has four menu programs which displays in four screens: the first three menus are three points parameters modification the same as the type o f battery supply on site display turbine flow meter; the fourth one is the full range value of current 4-20m A (the 20m A point flow value). These menus can be circularly switched with the key **F .**



Ⅺ Cautions in Using

（1） The switch order putting into running

※The sensor that have not the branch pipe should slightly open up the half upstream valve, then the downstream valve. When running for a while through a small rate(about ten minutes), open the whole upstream valve and the downstream valve to the normal flowrate.

※The sensor with branch should first open the branch pipe valve, the half upstream valve, the downstream valve, close the branch valve to small flowrate, and running for a while. Then open the whole upstream valve, close the whole branch valve(be assure of no leak) , finally adjust the downstream valve to the needed flowrate.

（2） The low and high temperature fluid starts up

When low temperature fluid flows through the pipe, first the water should be expelled, then running for fifteen minutes with a minimum flow, and gradually rise to the normal flow. When stop flowing , also should gradually reduce to approaching pipe temperature and ambient temperature.

The high temperature fluid’s running is similar to this low one.

（3） Other notes:

1) Opening and closing the valve should be slow. If adopted the auto control switch, it is best to use “two open, two close” way to prevent the fluid against vane wheel to damage it.

2) Check the sensor’s downstream pressure to adopt measures to prevent cavitation.

3) For the sensor factors could appear to change should regularly calibrate away from pipe line. If the flow is not within the allowed range , sensor should be change .

4) Cleaning the pipe needs confirm to the standards of used flow direction, value, pressure,and temperature etc., otherwise can make the accuracy fall, even damage.

5) Strengthen the check for sensor in order to assurance of long time normal working. As finding the unnormal, the measure should be taken. For instance, hearing the unnormal voice as monitoring the vane wheel rotation

Ⅻ Problem and Solution

problem	Possible reason	solution
No showing or no total adding when liquid normally flows.	Check: 1)open circuit、 loose contact (wire power wire\fuse\coil\PCB） 2)the vane wheel has no rotation	1)find the problem point with electrical meter or replace this circuit board with spare one. 2)clean or replace vane wheel ,and assure no rubbing with its neighboring parts.
The flow showing is gradually falling.	1) filter blocks up 2) valve in pipe is loose to the core 3) vane wheel has impurity	1) clean up the filter 2) repair or replace the valve 3) clean the sensor, then need to calibrate again
Its screen has still flow showing when liquid has no flow	1) the cable has no good ground wire with the outer interference; 2) the pipe with vibration to produce error signal 3) the cutoff valve has leakage with leaking flow 4) internal circuit or component of displayer is damaged to produce interference	1) repair or replace to have a good ground wire; 2) strengthen the pipe line, or install blacket to prevent from vibration; 3) maintain or replace valve 4) gradually check and clear up the interference source.
The displaying value has obvious difference with experience estimation one	1) The sensor’s internal tunnel wrong; 2) Sensor’s interior appears cavitation; 3) The flow inside pipe causes problems 4) The displayer interior wrong 5) The effect of permanent magnet material is weaker and weaker 6) The real flow is not within its normal range	1)-4) need first find cause so that use the correct methods; 5)replace the magnet material 6)choose the proper sensor

ⅩⅢ Transportation and Storage

The sensor should be put in the solid wooden box(small diameters can be put in carton) and cannot be free to wobble in the box. When carrying, it must be care to put down ,and refuse to load or unload crustily.

The location of reservation should be confirmed to the conditions as the following:

1. avoid rain and humidity;
2. avoid mechanical vibration and strike;
3. temperature range:-20℃--+55℃;
4. relative humidity: not more than 80%;
5. ambient environment does not include corrosive gas.

ⅩⅣ Cautions in unpacking

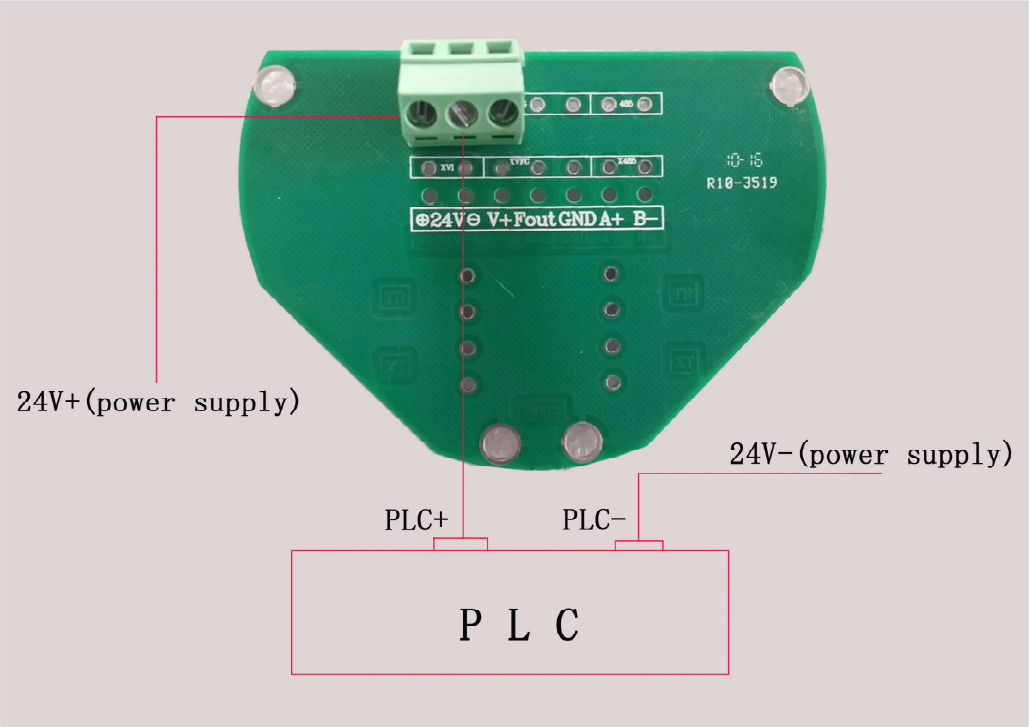
When opening box, files and accessory should be complete. The files in the box include a user manual, a piece of test certificate, and a piece of packing list. The sensor should be observed whether it happens damage during transportation so that dealing with it well. Users must protect the certificate from loss otherwise the instrument factors cannot be set.

ⅩⅤ Necessary knowledge on order

User should notice that when ordering turbine flowmeter, the proper model specification should be chosen according to fluid's nominal diameter, operating pressure, operating temperature, flow range, the fluid category and the surrounding condition. The anti-explosion type sensor should be chosen when having explosion-proof demand and noticing strictly the explosion-proof classes.

When the display instrument is matched by our company, please refer to the related instruction to choose your proper model or use our design of technological engineer for your choosing in terms of your information offering. The cable using in sending signal you want should provide the length and specification.

Intelligent integration of turbine flowmeter (LWGY-B/C LWGYS-B/C)



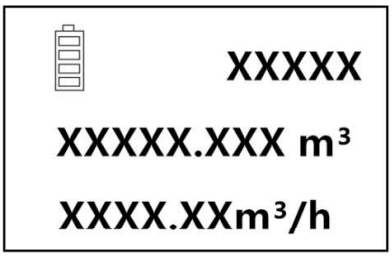
LWGY-B/C Digital turbine internal parameter settings

1. Instrument panel Operating Instructions （Figure 1）
   (1) First line： The cumulative amount of high temperature ， Fixed 5 integer display ， No 5-digit display “0”
   (2) second line：The cumulative amount of the low，After five integer three decimal places，Some units are not time consistent with the instantaneous flow units
   (3) The third line：Instantaneous flow，Two or a press 5 or 6 decimal integer and automatically reserved，Flow unit is set by the menu

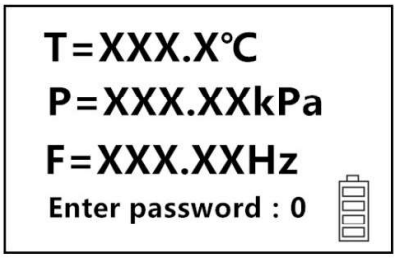
   Upper left corner of the display the battery charge， Battery-powered instruments，Display battery level。

   Working condition Press “＞”， Entering the password input interface, Press“＜”bond， Approximately 1.2 seconds Start typing the password。
   Set a password for 2010（Engineer Operation）Figure 2
   Key Description：
   Press“＜”Button （ Press“＜”Button Approximately 1.2seconds Represents confirmation）
   Press“+” Button（Press“＜”Button Approximately 1.2seconds It means exit）

Press“+” Button In the input state Cycle to change the value at the cursor
Press“＜” Button Move the current cursor position input
Press the input state“＜”， Passcodes The right to enter the menu, The Wrong Return to the initial state input.



（Figure 1）



（Figure 2）

Instrument panel Operating Instructions:

Submenu number	Menu Display	Meaning	Select the item or Value range
1	Flow unit selection	Flow unit selection（Default 0）	0：m³/h 1：m³/h 2：L/h 3:L/m 4:+/h 5:+/h 6:kg/h 7:kg/m
2	Algorithm Selection	Algorithm Selection（Default 0）	00：Conventional volume flow，01：Conventional mass flow，02：Conventional gas volume flow，03：Conventional gas mass flow
3	Flow Coefficient	Flow Coefficient（Default 3600）	Set the meter factor，UnitsP/m³
4	Full Scale Output flow	Full Scale Output flow（Default 1000）	When the instrument output4-20MA Analog signals The value must be set，Not to 0 Units and consistent flow units
5	Density setting	Density setting（Default 1.0）	When the algorithm to select the mass flow（01、03），This must be set，Units: KG/m³
6	Temperature settings	Temperature settings（Default 0.0）	Set the temperature value，Choose 02、03 Algorithm，This must be set ，Units：℃
7	Absolute pressure settings	Setting gas absolute pressure	---
8	The lower cut traffic	Set pulse input percentage removal	When the% value of full-scale removal of traffic 0-100 ，Use this Current Mode and Pulse type Range should be set correctly
9	485 Address	Set RS485 serial communication	Scope：0-255
10	Damping time	Setting the display output damping time（Default 4S）	Set current output and display damping time，To avoid the output current with the flow fluctuations and display the range: 2-32
11	Clear the total flow	Clear the total flow	Clear the total flow Choose“YES”，Press “E”