1. General:

LWGY turbine flowmeter consists of turbine flow sensor and display instrument and it is made by us using foreign state-of-the-art technologies, which is an ideal gauge for measuring of liquid flow. The flowmeter is characterized by simple structure, high precision and easy installation and repair. The product may be used in a wide range of industries, including oil industry, chemical industry, metallurgy, water supply, paper-making, environment protection and food industry. It is applicable for use in closed pipes to measure flow of liquid which will not erode stainless steel (1Cr18Ni9Ti), 2Cr13, Al_2O_3 and hard alloy and is free of impurities such as fiber and granules. If this product is used in association with display instruments with special functions, it can be used for purpose of automatic definite quantity control and alarming in case of excessive amount.

2. Product Features:

1． The sensor is of hard alloy bearing thrust type, which may guarantee the precision and improve the wear resistance performance as well.

2．Simple and firm structure, easy for installation and dismantling.

3．Wide range of measuring with very low lower flow velocity limit.。

4．Small loss of pressure, fine repeatability and high precision.

5．High resistance to electromagnetic interference and vibration.

3. Working Principle:

When liquid flows through the casing of sensor, the impulse of fluid will provide the blade with a rotation moment as there is an angle between the blade of impeller and the flow direction. The blade will rotate as the friction moment and the fluid resistance are overcome and it will reach a stable speed when the moments are at balance. Under certain conditions, the rotation speed of blade will be in direct proportion to the flow velocity. Due to the magnetic conductivity of blade, when located in the magnetic field generated by signal detector (made of permanent magnet steel and coils), the rotating blade will cut the magnetic lines and periodically change the flux through the coil, thereby inducing electrical impulse signals at both ends of the coil. The induced signals, after amplified and rectified by amplifier, will form a continuous rectangular impulse wave with certain amplitude which may be remotely transmitted to display instrument indicating the instant flow and the cumulative flow of fluid. Within a certain range of flow, the impulse frequency f is in direct proportion to the instant flow of fluid flowing through the sensor, which is shown in the equation below:

$$Q = 3600 \times \frac{f}{k}$$

Wherein:

f- Impulse frequency [Hz];

k- Instrument factor of sensor [1/m^3], which is given by checklist. If [1/L] is used as the unit, the equation will be: $Q = 3.6 \times \frac{f}{k}$

Q- Instant flow of liquid (in operation) [m3/h];

3600- Conversion factor.

Instrument factor of each sensor will be filled out in verification certificate by the manufacturer. The instant flow and cumulative flow will be displayed when the value of k is loaded into associated display instrument.

4. Major Technical Performance:

1. Nominal drift diameter: （4～200） mm, refer to Table 1 for the basic parameters;

2. Medium temperature:（-20～80）°C; Split type (－20～120) °C;

3. Ambient temperature:（-20～55）°C;

4. Precision: ±0.5%, ±1%;

5. Detector signal transmission wiring system: three-wire voltage impulse (three-core shield wire);

6. Power supply: voltage 12V±0.144V, current: ≤10mA;

7. Output voltage amplitude: high level≥8V, low level≤0.8V;

8. Transmission distance: the distance between the sensor and the display instrument may be as far as 1000m;

9. Local display power supply: 3.6V (Lithium battery, may be used continuously for more than 3 years);

10. Display mode: local LCD displays instant flow and cumulative flow;

11. Power supply for local display with signal output: 24V; 4～20mA double wire current output;

Table 1

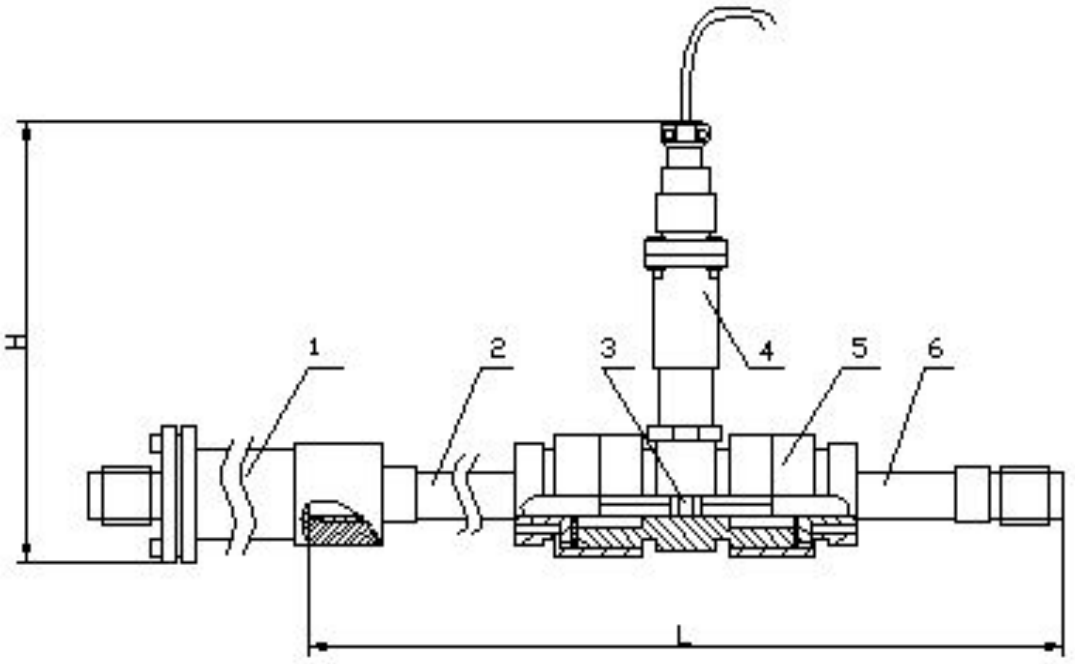
<table>
<tr><td></td><td>LWGY□</td><td>□□□</td><td>□</td><td>□</td><td>□</td><td colspan="4">Description</td></tr>
<tr><td rowspan="3">Type</td><td>LWGYA</td><td></td><td></td><td></td><td></td><td colspan="4">Flow sensor pulse output three-wire system, +12V power supply;</td></tr>
<tr><td>LWGYB</td><td></td><td></td><td></td><td></td><td colspan="4">Local display, powered by 3.6V battery;</td></tr>
<tr><td>LWGYC</td><td></td><td></td><td></td><td></td><td colspan="4">Local display with 4～20mA or pulse output, powered by 24V;</td></tr>
<tr><td>LWGYD</td><td></td><td></td><td></td><td></td><td colspan="4">Flow transmitter 4～20mA output, powered by ， 24V;</td></tr>
<tr><td colspan="2" rowspan="15">Nominal drift diameter</td><td>4</td><td></td><td></td><td></td><td rowspan="15">Normal flow range m^3/h</td><td>0.04～0.25</td><td rowspan="15">Extended flow range m^3/h</td><td>0.04～0.4</td></tr>
<tr><td>6</td><td></td><td></td><td></td><td>0.1～0.6</td><td>0.06～0.6</td></tr>
<tr><td>10</td><td></td><td></td><td></td><td>0.2～1.2</td><td>0.15～1.5</td></tr>
<tr><td>15</td><td></td><td></td><td></td><td>0.6～6</td><td>0.4～8</td></tr>
<tr><td>20</td><td></td><td></td><td></td><td>0.8～8</td><td>0.45～9</td></tr>
<tr><td>25</td><td></td><td></td><td></td><td>1～10</td><td>0.5～10</td></tr>
<tr><td>32</td><td></td><td></td><td></td><td>1.5～15</td><td>0.75～15</td></tr>
<tr><td>40</td><td></td><td></td><td></td><td>2～20</td><td>1～20</td></tr>
<tr><td>50</td><td></td><td></td><td></td><td>4～40</td><td>2～40</td></tr>
<tr><td>65</td><td></td><td></td><td></td><td>7～70</td><td>3.5～70</td></tr>
<tr><td>80</td><td></td><td></td><td></td><td>10～100</td><td>5～100</td></tr>
<tr><td>100</td><td></td><td></td><td></td><td>20～200</td><td>10～200</td></tr>
<tr><td>125</td><td></td><td></td><td></td><td>25～250</td><td>12.5～250</td></tr>
<tr><td>150</td><td></td><td></td><td></td><td>30～300</td><td>15～300</td></tr>
<tr><td>200</td><td></td><td></td><td></td><td>80～800</td><td>40～800</td></tr>
<tr><td colspan="2" rowspan="2">Explosion protection</td><td colspan="2" rowspan="2"></td><td></td><td colspan="4">Not marked, without explosion protection</td></tr>
<tr><td></td><td colspan="4">Explosion protection type</td></tr>
<tr><td colspan="3" rowspan="2">Precision class</td><td>A</td><td></td><td colspan="4">Precision: Class 0.5</td></tr>
<tr><td>B</td><td></td><td colspan="4">Precision: Class 1.0</td></tr>
<tr><td colspan="4">Turbine type</td><td>A</td><td colspan="4">Normal flow range</td></tr>
</table>

	B	Extended flow range
Note: Sensors with pipe diameter of DN4～DN40 are of thread connections with maximum operating pressure of 6.3Mpa. Sensors with pipe diameter of DN50～DN200 are of flange connections with maximum operating pressure of 2.5Mpa. Sensors with pipe diameter of DN4～DN10 are provided with front and rear straight pipe sections and filters. Please specify when placing an order if flange connections are required for pipe diameter of DN15～DN40. Please specify when placing an order for high pressure type and special requirements.		

5. Overall Dimension:

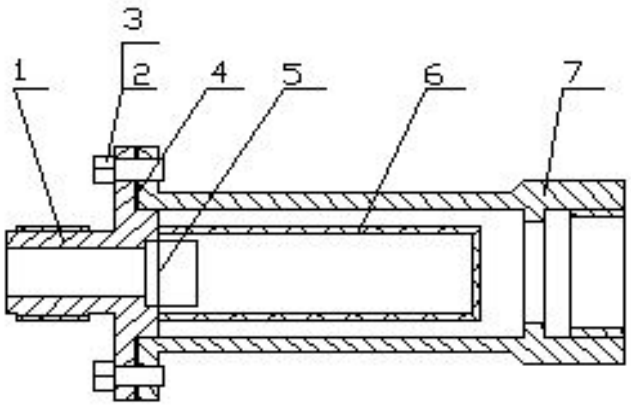
The installation types of sensors vary according to specifications, which may be connected either by thread or flange. The installation types are shown in Fig. 1, Fig. 2, Fig.3, Fig. 4 and Fig. 5. The installation dimensions are shown in Table 2.

Fig. 1 Structure of DN4～DN10 sensor and installation dimension diagram



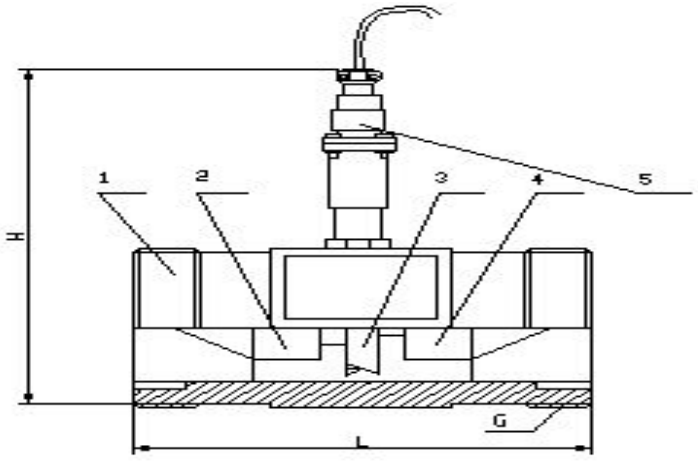
1. Filter 2. Front straight pipe section 3. Impeller 4. Preamplifier 5. Casing 6. Rear straight pipe section

Fig. 2 Filter structure diagram



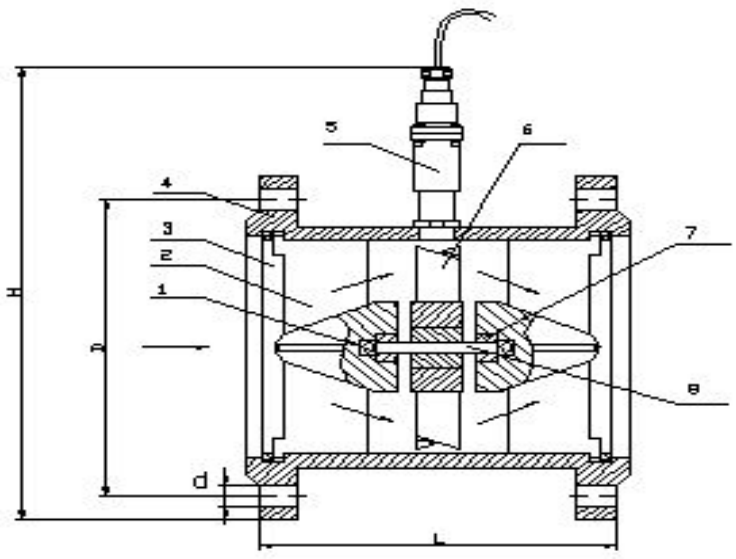
1. Clamp ring 2. Bolts 4×14 3. Washer 4. Sealing washer 5. Steel wire 1Cr18Ni9Ti-0.8×2.5 6. Filter screen 7. Base

Fig. 3 Structure of DN15～DN40 sensor and installation dimension diagram



1. Casing 2. Front guide part 3. Impeller 4. Rear guide part 5. Preamplifier

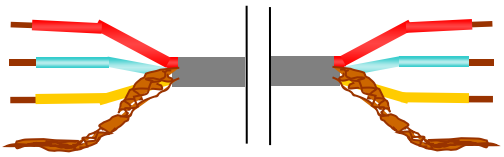
Fig. 4　Structure of LWGY—50～200 sensor and installation dimension diagram



1．Ball bearing　2．Front guide part　3．Expansion ring　4．Casing　5．Preamplifier　6．Impeller　7．Bearing　8．Shaft

Fig. 5 Wiring diagram for connection between sensor and display instrument

Connected to display instrument＋12V output	Red
Connected to display instrument ground wire	Blue
Connected to display instrument signal output	Yellow
Connected to display instrument ground wire	Shield wire



Red	Pin 1 welded
Blue	Pin 2 welded
Yellow	Pin 3 welded
Shield wire	Pin 4 welded

Table 2 Unit: (mm)

Type	Nominal drift diameter	L	H	G	L´	D	d	Number of holes
LWGY-4	4	295	145	G1/2	195			
LWGY-6	6	330	145	G1/2	230			
LWGY-10	10	450	165	G1/2	350			
LWGY-15	15	75	173	G1				
LWGY-25	25	100	180	G5/4				
LWGY-40	40	140	178	G2				
LWGY-50	50	150	252			ø125	ø18	4

LWGY-80	80	200	287			ø160	ø18	8
LWGY-100	100	220	322			ø180	ø18	8
LWGY-150	150	300	367			ø250	ø25	8
LWGY-200	200	360	415			ø295	ø23	12

6. Installation Requirements:

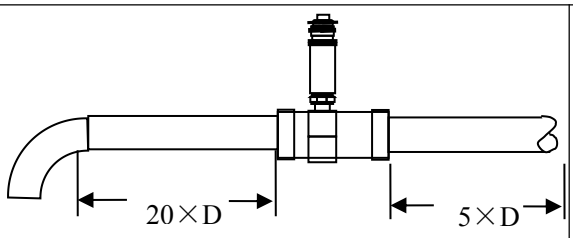
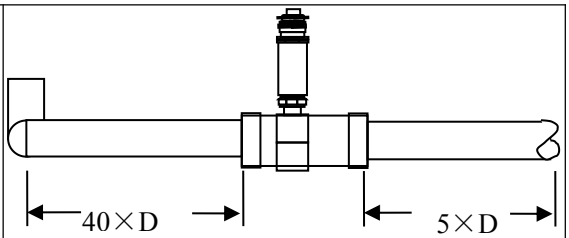
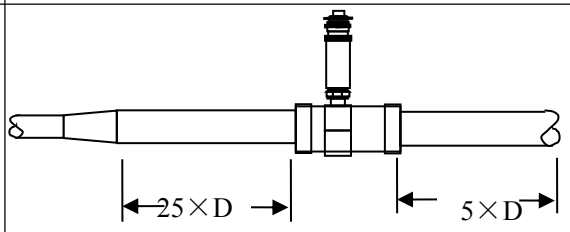
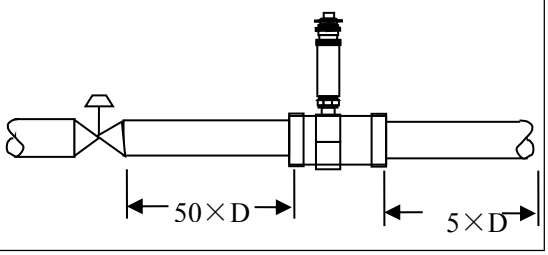
Flowmeter may be installed horizontally or vertically. In the latter case the fluid shall be flowing from downward and fulfill the pipe to avoid bubbles; the flowing direction of liquid shall be consistent with the direction indicated by the arrow on casing of the sensor; as far as front and rear straight pipe sections are concerned (see Fig. 6), at upstream there shall be front straight pipe section at least 10 times of nominal drift diameter in length and at downstream no less than 5 times of nominal drift diameter in length. The internal wall of pipe sections shall be smooth and clean, free of defects such as indent, fouling and peeling. The pipe axis of the sensor shall be aligned with that of the neighboring pipe and the washers used for connection and sealing may not be embedded into depth of the pipe cavity; the sensors shall be kept away from foreign electric field and magnetic field, effective shielding measures shall be taken in case of necessity to avoid external interference.

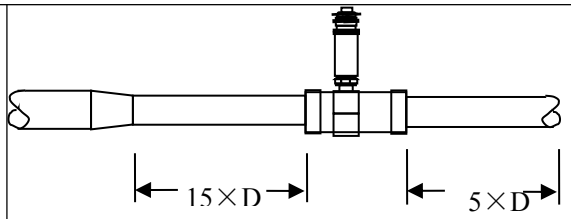
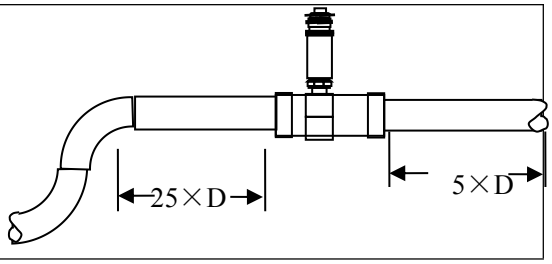
In order that the normal transfer of liquid will not be affected by maintenance, it is recommended that bypass pipes be installed at position of sensor.

In case of open air installation, water proof measures shall be taken for purpose of amplifier and plug of the sensor. The wiring between sensor and display instrument is shown in Fig. 5.

When fluid contains impurities, filter shall be additionally installed. The number of filter screen meshes is determined in accordance with the flow and impurity, normally 20 to 60 meshes. When fluid is mixed with free gases, gas eliminator shall be additionally installed. The complete pipe system shall be well sealed. The user shall fully understand the erosion nature of the measured medium to protect the sensor from being eroded.

Fig. 6 Requirements on straight pipe section for installation of flowmeter:

One 90° elbow		Two 90° elbows for two planes	
Concentric expander		Control valve half-open	

Concentric shrinkage wide open valve		Two 90° elbows for one plane	

7. Operation

◆ When sensor is used, the liquid to be measured shall be clean and free of impurities such as fiber and granules.

◆ When sensor is used, it shall be at first slowly filled with liquid, then open the outlet valve (which should be installed behind the flowmeter). It is prohibited to render the sensor under impact of high-velocity fluid when it is not filled with liquid.

◆ The maintenance interval for sensor is in general half a year. In case of maintenance and cleaning, attention shall be paid not to damage the parts in the measuring cavity, particularly the impeller. During assembly, watch carefully the positional relation between guide part and impeller.

◆ When the sensor will be out of service for a long time, the internal liquid shall be cleaned. After dried, the sensor shall be provided with protection sleeves at both ends to protect against dust and it shall be placed in dry conditions for storage.

◆ The associated filter shall be cleaned on regular basis and the internal liquid shall be cleaned when it is out of service for a long time. Similar to sensor, the filter shall also be provided with dust protection and stored in dry conditions.

◆ The transmission wire of sensor may be overhead or buried (iron bushing shall be provided in the latter case).

◆ Prior to installation of sensor, the connection thereof with display instrument or oscilloscope shall be finished. Then switch on the power, blow the impeller with mouth or move the impeller with hand to make it rotate quickly, see if there is any reading. Install the sensor if there is reading. In case of no reading, the related sections shall be inspected to eliminate any fault.

8. Introduction of LWGYB Turbine Flowmeter:

LWGYB local display turbine flowmeter is developed on basis of LWGY basic turbine flow sensor, which is powered by battery and provided additional function of local LCD display. The flowmeter is an integrated flow measuring meter which is developed using leading technology of extraordinarily low power consumption single chip and combines display and computation. Compared with conventional measuring system consisting of turbine flow sensor which is provided with secondary instrument, this product is characterized by small volume, light weight, clearly visualized reading, high reliability, immunity to foreign power supply and resistance to lightening. It can be used in a wide range of industries, including oil industry, chemical industry, light industry and food industry for purpose of measuring liquid. The product is superior in performance and ranked among top level in peer products.

1. Display mode: 7 digits LCD display in one line, instant flow and cumulative flow may be displayed automatically and alternatively at set interval.

2. System operation at low power consumption: one lithium battery is sufficient for continuous operation of more than 3 years.

3. Cumulative flow: the display precision will be expanded automatically and the cumulative flow value may be cleared.

4. Instrument factor: it can be loaded on site.

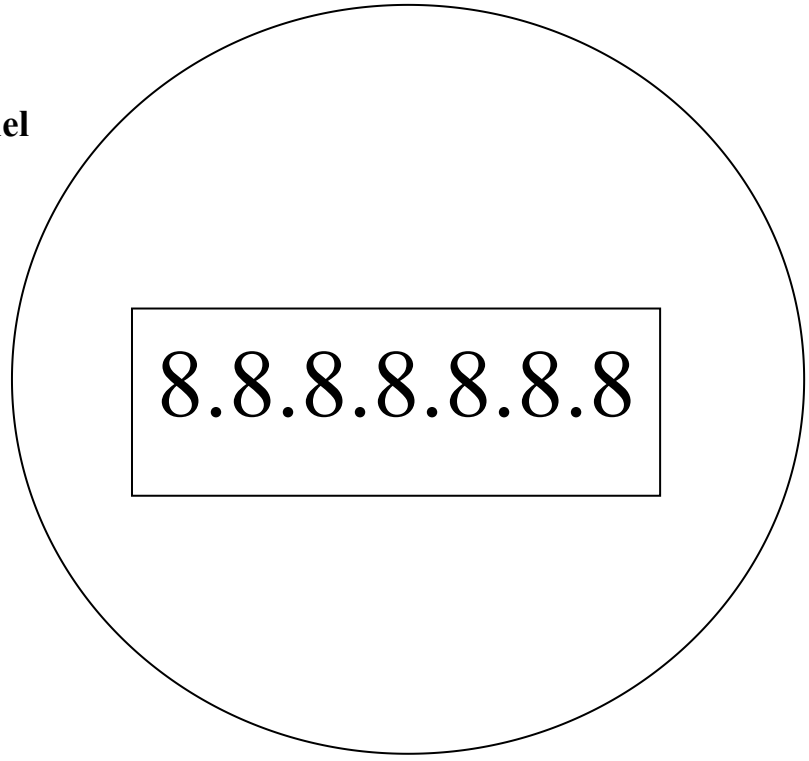
5.Power failure protection: the instrument factor and cumulative flow value can be maintained for 10 years.

9. Introduction of LWGYC Turbine Flowmeter:

	LWGYC turbine flowmeter is developed on basis of LWGYB turbine flow sensor with additional 24VDC power supply and 4-20mA double wire current transmitting function, which is particularly suitable for coordination with computer control system such as display panel, industrial control computer and DCS.

Operating Instructions

1. Panel



2. Display

Instant flow and cumulative flow are displayed on the panel with unit symbols and prompt, the flow displaying decimal is floating. Alternative or constant display is optional.

3. Parameter Inquiry and Setting

3．1 Parameter Description

1． Instrument factor, unit: 1 / L

2． Maximum flow (flow at full range), unit: m^3/h

3． Minimum flow, unit: m^3/h

4． Instant flow unit: 0- m^3/h 1-L/min 2-L/s

5． Cumulative flow unit: 0- m^3 1-L

6． Damping coefficient: 0 ～ 9

7． Display setting, 0 ： 1 5 seconds alternative display, 1 : instant flow, 2 : cumulative flow

8． Cumulative flow back to zero is set as “5”

9． 4 ～ 2 0 mA commissioning

10． Parameter setting password, four arbitrary digits of numbers

3．2 Parameter Inquiry

Press "▶" key, " E — x x " and this parameter will be displayed alternatively; press "▲" key to display item by item; press "←" key to quit. In this condition, the collection and accumulation of flow will be in normal operation and if no press operation is done in 20 seconds, it will exit to flow display status.。

3．3 Parameter Setting

In the status of "**Parameter Inquiry**", press "▶" key to display " 0 0 0 0 " parameter setting password and press "▶" key and "▲" key for adjustment, then press "←" for confirmation. The factory password is " 0 0 0 0 " (In-factory password: 8597)

As the password is correctly set, press "▲" key to the desired parameter and press "▶" to enter; press "▶" key and "▲" for adjustment. When the decimal point blinks, press "▶" to move it rightward in cycles. After setting of all the parameters is completed, press "←" to quit.

Note: Parameter setting must be quitted in manual way with the exception of "Parameter Setting Password", in which case the automatic quitting set parameters are not functional.

4~20mA description:

1． Switch on the sensor, LL-02.02 will be displayed on the panel, which means 4~20mA output is provided

2． Full range flow is corresponding to 20mA

3． Lower limit flow means small flow elimination

4． Damping coefficient is sampled on basis of display value plus one second

5． Current commissioning items

00：4mA

01：8mA

02：12mA

03：16mA

04：20mA

Preliminary test:

1． Adjust the voltage to 3.6V.

2． Connect left side of the battery port with positive pole and connect the right side with negative pole via resistor.

3． Energize to measure the voltage at ends of resistor, which shall be lower than 2 mv.

4． The contact signal port (external) shall have flow display

5． **All the items must be set before leaving factory, in particular the cumulative flow must be cleared.**

10. Repair and Common Faults:

Common faults of sensor and their elimination methods are shown in Table 3. The maintenance cycle shall be no more than half year.

Table 3

No.	Fault Phenomenon	Cause	Elimination Method
1	Neither flow signal nor inspection signal is displayed on the panel	1. Power not switched on, incorrect voltage. 2. Panel is faulty.	1. Switch on power and provide voltage as required. 2. Repair the display panel.
2	Inspection signal is displayed but flow signal is not displayed	1. Wiring between sensor and panel is wrong or has faults such as open circuit, short circuit or poor contact 2. Amplifier is faulty or damaged 3. Converter (coil) is in open circuit or short circuit 4. Impeller is locked. No fluid is flowing in the pipe or it is clogged.	1. Refer to Fig. 4, check whether the wiring is correct and the wiring quality. 2. Repair or replace the amplifier. 3. Repair or replace the coil. 4. Clean the sensor and pipe. Open valve or start pump to clean the pipes.
3	Operation of display instrument is instable; measuring is incorrect.	1. The actual flow is in excess of the measuring range or instable. 2. Instrument factor K is not set correctly. 3. Impurities such as fiber are attached in the sensor. 4. There are bubbles in the liquid. 5. There is strong electromagnetic interference beside the sensor.	1. Align the measured flow to the measuring range of the sensor and stabilize the flow. 2. Set the factor K correctly. 3. Clean the sensor. 4. Take measures to eliminate the bubbles. 5. Try to keep away from the interference or take shielding

		6. Sensor bearing and shaft are badly worn. 7. Wire shield coatings of the sensor or other grounded wires are disconnected from the grounding wire or in poor contact. 8. The display panel is faulty.	measures. 6. Replace the guide part or the impeller shaft. 7. Refer the Fig. 4, make a good wiring. 8. Repair the display panel.

On condition that the user abides by the regulations of user manual in terms of storage and use, the manufacturer may repair the sensors which are incapable of operating due to poor fabrication free of charge within one year staring from the date of delivery.

11. Transportation and Storage

The sensor shall be packed in rigid wooden case (instruments with small specifications may be packed in cartons), which shall be fixed and handled with care.

The place of storage shall be consistent with following conditions:

a. Rain and damp proof.

b. Invulnerable to mechanical shock or impact.

c. With temperature range of -20℃～+55℃.

d. The relative humidity shall be no more than 80%.

e. The ambient shall be free of erosive gases.

12. Cautions for Unpacking

1． After unpacking, check if documents and accessories are complete with reference to packing list.

The packing documents include: one copy of operating instruction.

One product conformity certificate.

One verification certificate.

2． Observe if the sensor is damaged due to transportation so as to handle properly.

3． It is expected that the user preserve the verification certificate properly, otherwise the instrument factor can not be set.

13. Ordering Instructions

When ordering turbine flowmeter sensor, the users should select proper specifications according to the nominal drift diameter, operating pressure, operating temperature, flow range, fluid type and ambient conditions. In case that explosion protection is required, sensors of explosion protection type must be selected with explosion protection grade duly considered.