

**User Manual**

# Turbine Flowmeter

U-PUS-YGWL-EN9.1

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## Preface

- Thank you for purchasing our product.
- This manual is about the various functions of the product, wiring methods, setting methods, operating methods, troubleshooting methods, etc.
- Please read this manual carefully before operation, use this product correctly to avoid unnecessary losses due to incorrect operation.
- After you finish reading, please keep it in a place where it can be easily accessed at any time for reference during operation.

## Note

- The contents of this manual are subject to change without notice due to real-time factors such as function upgrades.
- We strive to ensure the accuracy of the manual. Nevertheless, if you identify any errors or inaccuracies, please contact us.
- Unauthorized reprinting or copying of this manual is strictly prohibited.

## Version

U-PUS-YGWL-EN9.1

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## Confirm the contents of the package

Please confirm the product and accessories after unpacking. Once the product is wrong, the quantity is wrong or there is a problem in appearance, please contact our company.

### Product List

| No. | Item              | Quantity |
|-----|-------------------|----------|
| 1   | Turbine Flowmeter | 1        |
| 2   | Manual            | 1        |
| 3   | Certificate       | 1        |

### Precautions

Users are expected to keep the “Product Qualification Certificate” in a safe place and ensure it is not misplaced.

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## Chapter 1 Overview

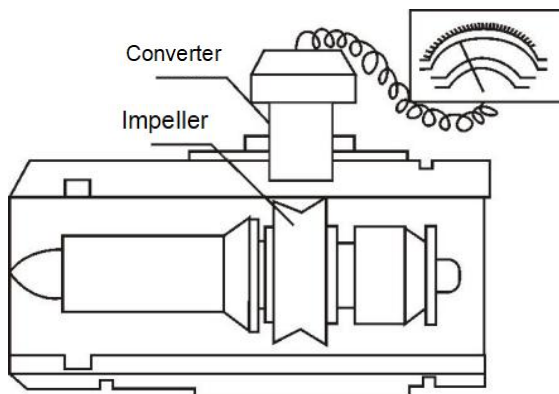
The LWGY turbine flowmeter is connected to the converter through the flow sensor, which can realize multiple functions such as pulse output, current output, and local display. The flowmeter has the characteristics of high accuracy, wide measuring range, long life, simple operation and maintenance, etc. It can be widely used in food, medicine, petrochemical, metallurgy, paper making and other industries. It is an ideal instrument for flow measurement.

The flowmeter is suitable for liquids that do not corrode stainless steel 304, 430F, corundum ( $\text{Al}_2\text{O}_3$ ), cemented carbide, etc., and are free of impurities such as fibers and particles.

If the user needs a special type of flowmeter, it can be supplied by agreement.

## Chapter 2 Working Principle

When the measured liquid flows through the flowmeter sensor, its internal impeller rotates with the help of liquid kinetic energy. At this time, the impeller blade causes the magnetic resistance in the detection device to change periodically. Therefore, an electric pulse signal proportional to the flow rate is induced at both ends of the detection coil, and is amplified by the preamplifier then sent to the display unit. The single chip microcomputer system in the display unit calculates according to the number of pulses measured and the meter coefficient  $K$  of the flowmeter, and displays the instantaneous flow rate and the accumulated total amount.



The relationship between the meter coefficient and instantaneous flow, frequency, pulse number, and cumulative total is:

$$K=f/Q \text{ and } K=N/V$$

In the formula:

$f$ —flow signal frequency (Hz)

$Q$ —instantaneous flow rate ( $\text{m}^3/\text{s}$ , or  $\text{L}/\text{s}$ )

$N$ —pulse number

$V$ —Total volume ( $\text{m}^3$ )

$K$ —Meter coefficient( $1/\text{m}^3$  or  $1/\text{L}$ )

## Chapter 3 Main Technical Parameters

Table 1

| Input                |                                                                                                                                                       |                   |
|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|
| Measured variables   | flow                                                                                                                                                  |                   |
| Nominal diameter     | DN4 ~ DN200                                                                                                                                           |                   |
| Flow range           | See Table 2                                                                                                                                           |                   |
| Range ratio          | DN4~DN10                                                                                                                                              | 1:6               |
|                      | DN15~DN200                                                                                                                                            | 1:10              |
| Output               |                                                                                                                                                       |                   |
| Transmitter output   | Output type                                                                                                                                           | (4~20)mA          |
|                      | Output accuracy                                                                                                                                       | 0.02%             |
|                      | Output load                                                                                                                                           | (0~750) $\Omega$  |
| Pulse output         | Pulse width                                                                                                                                           | Automatic or 10ms |
|                      | Pulse frequency                                                                                                                                       | (1~2000) Hz       |
|                      | Pulse coefficient                                                                                                                                     | 1~20000 1/L       |
| Communication output | RS485                                                                                                                                                 | Modbus protocol   |
| Power supply         |                                                                                                                                                       |                   |
| Power supply         | DC: 12V, 24V<br>Battery power supply: 3.6V lithium battery                                                                                            |                   |
| Power consumption    | 12VDC power supply: maximum power consumption 0.15W<br>24VDC power supply: maximum power consumption 0.5 W<br>Battery powered: Maximum current 0.8 mA |                   |



|                          |                                                                                                                                                                                                             |
|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Electrical interface     | M20*1.5 cable gland                                                                                                                                                                                         |
| Performance parameters   |                                                                                                                                                                                                             |
| Accuracy                 | Level 0.5/1.0                                                                                                                                                                                               |
| Repeatability            | 1/3 of the accuracy grade                                                                                                                                                                                   |
| Response time            | 20ms (5s meter head without display)                                                                                                                                                                        |
| Protection level         | IP65 (IP67, IP68 available upon negotiation, pulse head is IP00)                                                                                                                                            |
| Process conditions       |                                                                                                                                                                                                             |
| Medium viscosity         | Less than $5 \times 10^{-6} \text{ m}^2/\text{s}$ ( For liquids with a flow rate greater than $5 \times 10^{-6} \text{ m}^2/\text{s}$ , the flowmeter must be calibrated with standard solution before use) |
| Medium temperature       | Regular model: $(-20 \sim 80)^\circ\text{C}$<br>High temperature: $(-20 \sim 120)^\circ\text{C}$                                                                                                            |
| Process pressure         | See Table 2                                                                                                                                                                                                 |
| Environmental conditions |                                                                                                                                                                                                             |
| Operation                | Temperature: $(-20 \sim 60)^\circ\text{C}$<br>RH: 5% to 90%                                                                                                                                                 |
| Storage                  | Temperature: $(5-40)^\circ\text{C}$                                                                                                                                                                         |

Table 2 Flow range

| Diameter<br>(mm) | Flow range<br>( $\text{m}^3/\text{h}$ ) | Extended<br>flow range<br>( $\text{m}^3/\text{h}$ ) | Threaded<br>connection<br>pressure<br>(MPa) | Flange<br>connection<br>pressure<br>(MPa) | Clamp<br>connection<br>pressure<br>(MPa) |
|------------------|-----------------------------------------|-----------------------------------------------------|---------------------------------------------|-------------------------------------------|------------------------------------------|
| 4                | 0.04~0.24                               | —                                                   | 6.3, 25, 32                                 | —                                         |                                          |
| 6                | 0.1~0.6                                 | —                                                   |                                             |                                           |                                          |
| 10               | 0.2~1.2                                 | —                                                   |                                             |                                           |                                          |
| 15               | 0.6~6                                   | 0.3~6                                               | 6.3, 32                                     | —                                         | 1.6                                      |
| 20               | 0.8~8                                   | 0.4~8                                               | 6.3                                         | —                                         | —                                        |
| 25               | 1~10                                    | 0.5~10                                              | 6.3, 32                                     | 1.6, 2.5, 4.0                             | 1.6                                      |
| 32               | 1.5~15                                  | 1~15                                                | 6.3                                         | 1.6, 2.5, 4.0                             | —                                        |
| 40               | 2~20                                    | 1~20                                                | 6.3                                         | 1.6, 2.5, 4.0                             | 1.6                                      |
| 50               | 4~40                                    | 2~40                                                | —                                           | 1.6, 2.5, 4.0                             | 1.6                                      |
| 65               | 8~80                                    | —                                                   |                                             | 1.6, 2.5, 4.0                             | 1.6                                      |
| 80               | 10~100                                  | 5~100                                               |                                             | 1.6, 2.5, 4.0                             | 1.6                                      |
| 100              | 20~200                                  | 10~200                                              |                                             | 1.6, 2.5                                  | 1.6                                      |
| 150              | 30~300                                  | 15~300                                              |                                             | 1.6, 2.5                                  | —                                        |
| 200              | 80~800                                  | 40~800                                              |                                             | 1.6                                       | —                                        |

**Chapter 4 Structure and Installation**

**4.1. Pulse type structure and size**

The flowmeter structure is divided into thread, flange and clamp connection according to the different connection modes of the sensor part. The specific structure is shown in Figure 1 to Figure 5.

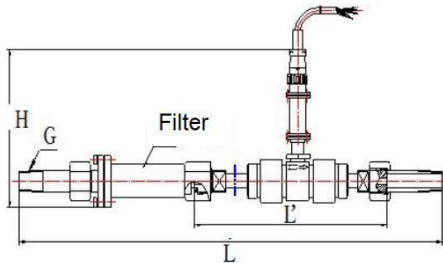


Fig.1 DN4~DN10 threaded connection flowmeter structure and installation dimensions

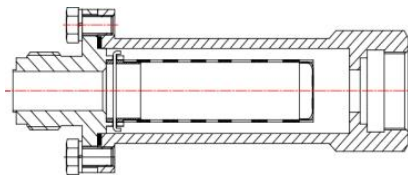


Fig.2 DN4~10 threaded connection turbine flowmeter filter

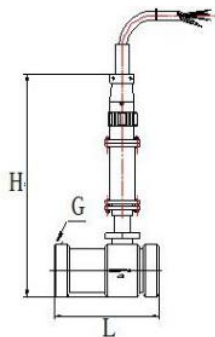


Fig.3 Threaded-connected flowmeter diagram

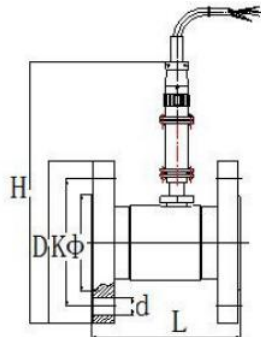


Fig.4 Flange-connected flowmeter diagram

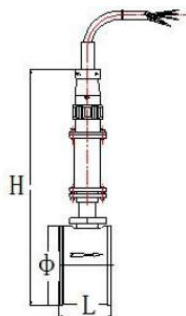


Fig.5 Clamp-connected flowmeter  
diagram

Table 3 Dimensions of pulse turbine flowmeter

| Diameter<br>(mm) | Connect<br>Type | L<br>(mm) | H<br>( mm ) | G         | L'<br>(mm) | D<br>(mm) | K<br>(mm) | n -d<br>(mm) | Weight<br>(kg) |
|------------------|-----------------|-----------|-------------|-----------|------------|-----------|-----------|--------------|----------------|
| 4                | thread          | 4 25      | 140         | R3/8      | 225        |           |           |              | 1.02           |
|                  | flange          | 225       | 168         |           |            | Φ90       | Φ60       | 4- Φ14       | 1.51           |
|                  | clamp           | 225       | 149         |           |            | Φ50.5     |           |              | 1.72           |
| 6                | thread          | 4 25      | 141         | R3/8      | 225        |           |           |              | 1.03           |
|                  | flange          | 225       | 169         |           |            | Φ90       | Φ60       | 4- Φ14       | 1.52           |
|                  | clamp           | 225       | 150         |           |            | Φ50.5     |           |              | 1.72           |
| 10               | thread          | 5 45      | 142         | R3/8      | 345        |           |           |              | 1.09           |
|                  | flange          | 345       | 17 3        |           |            | Φ90       | Φ60       | 4- Φ14       | 1.57           |
|                  | clamp           | 345       | 151         |           |            | Φ50.5     |           |              | 1.72           |
| 15               | thread          | 75        | 14 5        | G1        |            |           |           |              | 0.7            |
|                  | flange          | 75        | 175         |           |            | Φ95       | Φ65       | 4- Φ14       | 1.82           |
|                  | clamp           | 75        | 153         |           |            | Φ50.5     |           |              | 2.27           |
| 20               | thread          | 85        | 149         | G1        |            |           |           |              | 0.7            |
|                  | flange          | 85        | 183         |           |            | Φ105      | Φ75       | 4- Φ14       | 2.4            |
|                  | clamp           | 85        | 155         |           |            | Φ50.5     |           |              | 2.36           |
| 25               | thread          | 100       | 15 5        | G1<br>1/4 |            |           |           |              | 1.02           |
|                  | flange          | 100       | 190         |           |            | Φ115      | Φ85       | 4- Φ14       | 3.22           |

| Diameter<br>(mm) | Connect<br>Type | L<br>(mm) | H<br>( mm ) | G         | L'<br>(mm) | D<br>(mm) | K<br>(mm) | n -d<br>(mm) | Weight<br>(kg) |
|------------------|-----------------|-----------|-------------|-----------|------------|-----------|-----------|--------------|----------------|
|                  | clamp           | 100       | 159         |           |            | Φ50.5     |           |              | 2.46           |
| 32               | thread          | 120       | 162         | G1<br>1/2 |            |           |           |              | 1.34           |
|                  | flange          | 120       | 206         |           |            | Φ140      | Φ100      | 4- Φ18       | 4.77           |
|                  | clamp           | 120       | 163         |           |            | Φ50.5     |           |              | 3.32           |
| 40               | thread          | 140       | 170         | G2        |            |           |           |              | 2.18           |
|                  | flange          | 140       | 215         |           |            | Φ150      | Φ110      | 4- Φ18       | 5.97           |
|                  | clamp           | 140       | 173         |           |            | Φ64       |           |              | 4.12           |
| 50               | thread          | 150       | 184         | G2<br>1/2 |            |           |           |              | 3.18           |
|                  | flange          | 150       | 227         |           |            | Φ 165     | Φ125      | 4- Φ18       | 7.7            |
|                  | clamp           | 150       | 184         |           |            | Φ78       |           |              | 5.32           |
| 65               | thread          | 175       | 201         | G3        |            |           |           |              | 4.51           |
|                  | flange          | 175       | 245         |           |            | Φ185      | Φ145      | 8- Φ18       | 10.17          |
|                  | clamp           | 175       | 198         |           |            | Φ91       |           |              | 6.72           |
| 80               | thread          | 200       | 211         | G3<br>1/2 |            |           |           |              | 6.2            |
|                  | flange          | 200       | 261         |           |            | Φ200      | Φ160      | 8- Φ18       | 11.62          |
|                  | clamp           | 200       | 215         |           |            | Φ106      |           |              | 8.27           |
| 100              | flange          | 220       | 280         |           |            | Φ220      | Φ180      | 8- Φ18       | 14.72          |
|                  | clamp           | 220       | 230         |           |            | Φ 119     |           |              | 9.87           |
| 150              | flange          | 300       | 337         |           |            | Φ285      | Φ240      | 8- Φ22       | 27.22          |
| 200              | flange          | 360       | 391         |           |            | Φ340      | Φ295      | 12-Φ22       | 42.82          |

#### 4.2. The dimension and structure of the Flowmeter with local display

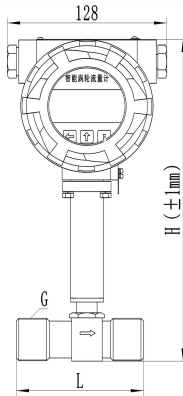


Fig.6 Threaded-connected flowmeter diagram

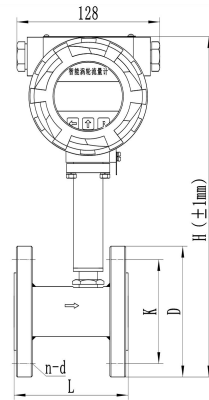


Fig.7 Flange-connected flowmeter diagram

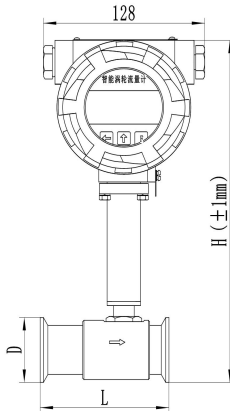


Fig.8 Clamp-connected flowmeter

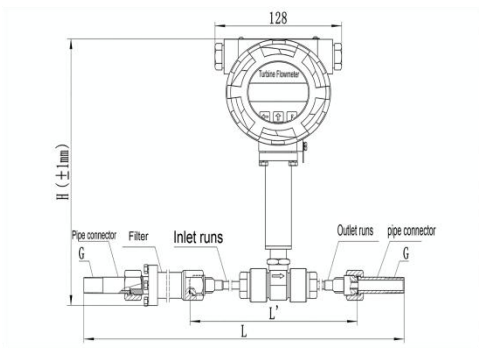


Fig.10 Diagram of DN4~DN10 threaded connection turbine flowmeter

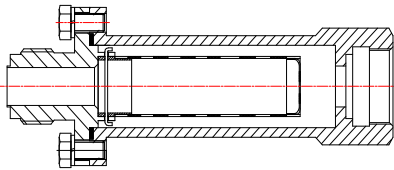


Fig.9 Diagram of DN4~ DN10 threaded connection flowmeter filter

Table 4 Dimensions of turbine flowmeter with display

| Diameter<br>(mm) | Connect<br>Type | L<br>(mm) | H<br>( mm ) | G    | L'<br>(mm) | D<br>(mm) | K<br>(mm) | n -d<br>(mm) | Weight<br>(kg) |
|------------------|-----------------|-----------|-------------|------|------------|-----------|-----------|--------------|----------------|
| 4                | thread          | 4 25      | 208         | R3/8 | 225        |           |           |              | 2.34           |
|                  | flange          | 225       | 236         |      |            | Φ90       | Φ60       | 4- Φ14       | 2.83           |
|                  | clamp           | 225       | 217         |      |            | Φ50.5     |           |              | 3.04           |
| 6                | thread          | 4 25      | 209         | R3/8 | 225        |           |           |              | 2.35           |
|                  | flange          | 225       | 237         |      |            | Φ90       | Φ60       | 4- Φ14       | 2.84           |
|                  | clamp           | 225       | 218         |      |            | Φ50.5     |           |              | 3.04           |
| 10               | thread          | 5 45      | 210         | R3/8 | 345        |           |           |              | 2.41           |
|                  | flange          | 345       | 238         |      |            | Φ90       | Φ60       | 4- Φ14       | 2.89           |
|                  | clamp           | 345       | 219         |      |            | Φ50.5     |           |              | 3.04           |
| 15               | thread          | 75        | 214         | G1   |            |           |           |              | 2.02           |
|                  | flange          | 75        | 243         |      |            | Φ95       | Φ65       | 4- Φ14       | 3.14           |
|                  | clamp           | 75        | 221         |      |            | Φ50.5     |           |              | 3.59           |
| 20               | thread          | 85        | 217         | G1   |            |           |           |              | 2.02           |
|                  | flange          | 85        | 251         |      |            | Φ105      | Φ75       | 4- Φ14       | 3.72           |

| Diameter<br>(mm) | Connect<br>Type | L<br>(mm) | H<br>( mm ) | G      | L'<br>(mm) | D<br>(mm) | K<br>(mm) | n -d<br>(mm) | Weight<br>(kg) |
|------------------|-----------------|-----------|-------------|--------|------------|-----------|-----------|--------------|----------------|
|                  | clamp           | 85        | 223         |        |            | Φ50.5     |           |              | 3.68           |
| 25               | thread          | 100       | 222         | G1 1/4 |            |           |           |              | 2.34           |
|                  | flange          | 100       | 258         |        |            | Φ115      | Φ85       | 4- Φ14       | 4.54           |
|                  | clamp           | 100       | 22 6        |        |            | Φ50.5     |           |              | 3.78           |
|                  |                 |           |             |        |            |           |           |              |                |
| 32               | thread          | 120       | 230         | G1 1/2 |            |           |           |              | 2.66           |
|                  | flange          | 120       | 274         |        |            | Φ140      | Φ100      | 4- Φ18       | 6.09           |
|                  | clamp           | 120       | 2 3 1       |        |            | Φ50.5     |           |              | 4.64           |
|                  |                 |           |             |        |            |           |           |              |                |
| 40               | thread          | 140       | 238         | G2     |            |           |           |              | 3.5            |
|                  | flange          | 140       | 283         |        |            | Φ150      | Φ110      | 4- Φ18       | 7.29           |
|                  | clamp           | 140       | 241         |        |            | Φ64       |           |              | 5.44           |
|                  |                 |           |             |        |            |           |           |              |                |
| 50               | thread          | 150       | 252         | G2 1/2 |            |           |           |              | 4.5            |
|                  | flange          | 150       | 295         |        |            | Φ 165     | Φ125      | 4- Φ18       | 9.02           |
|                  | clamp           | 150       | 251         |        |            | Φ78       |           |              | 6.64           |
|                  |                 |           |             |        |            |           |           |              |                |
| 65               | thread          | 175       | 269         | G3     |            |           |           |              | 5.83           |
|                  | flange          | 175       | 31 2        |        |            | Φ185      | Φ145      | 8- Φ18       | 11.49          |
|                  | clamp           | 175       | 26 6        |        |            | Φ91       |           |              | 8.04           |
|                  |                 |           |             |        |            |           |           |              |                |
| 80               | thread          | 200       | 279         | G3 1/2 |            |           |           |              | 7.52           |
|                  | flange          | 200       | 329         |        |            | Φ200      | Φ160      | 8- Φ18       | 12.94          |
|                  | clamp           | 200       | 282         |        |            | Φ106      |           |              | 9.59           |
|                  |                 |           |             |        |            |           |           |              |                |
| 100              | flange          | 220       | 350         |        |            | Φ220      | Φ180      | 8- Φ18       | 16.04          |
|                  | clamp           | 220       | 298         |        |            | Φ 119     |           |              | 11.19          |
| 150              | flange          | 300       | 405         |        |            | Φ285      | Φ240      | 8- Φ22       | 28.54          |
| 200              | flange          | 360       | 458         |        |            | Φ340      | Φ295      | 12-<br>Φ22   | 44.14          |



4.3. Structure and size of the flowmeter without display

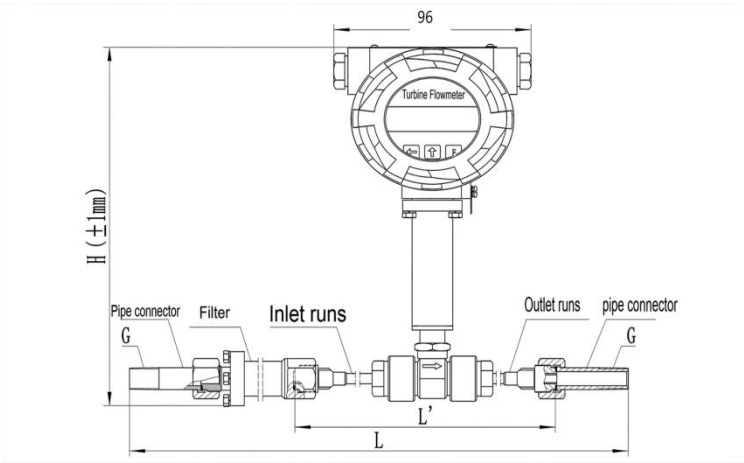


Fig. 11 Diagram of DN4~DN10 threaded connection turbine flowmeter

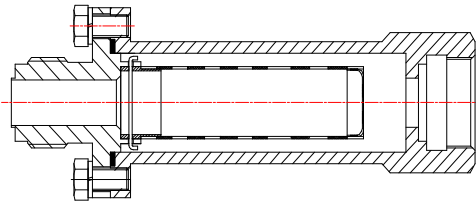


Fig. 12 Diagram of DN4~10 threaded connection turbine flowmeter filter

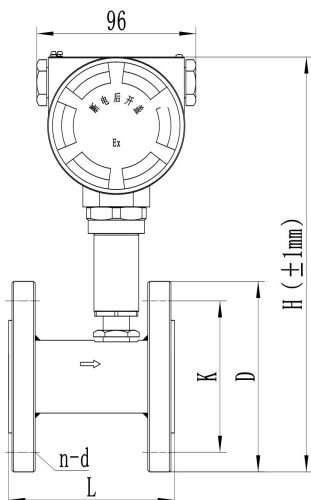


Fig. 13 Flange-connected flowmeter diagram

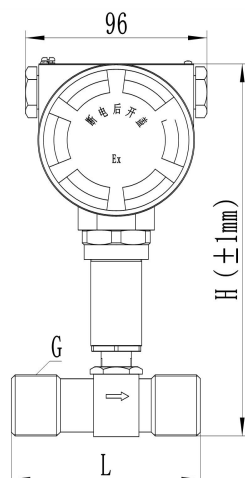


Fig. 14 Threaded-connected flowmeter diagram

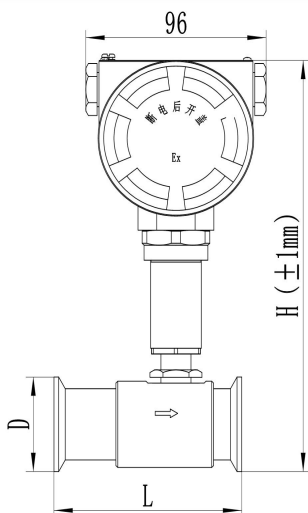


Figure 14 Diagram of clamp-connected turbine flowmeter

Table 5 Dimensions of turbine flowmeter without display

| Diameter<br>(mm) | Connect<br>Type | L<br>(mm) | H<br>( mm ) | G      | L'<br>(mm) | D<br>(mm) | K<br>(mm) | n -d<br>(mm) | Weight<br>(kg) |
|------------------|-----------------|-----------|-------------|--------|------------|-----------|-----------|--------------|----------------|
| 4                | thread          | 425       | 203         | R3/8   | 225        |           |           |              | 1.67           |
|                  | flange          | 225       | 231         |        |            | Φ90       | Φ60       | 4- Φ14       | 2.16           |
|                  | clamp           | 225       | 212         |        |            | Φ50.5     |           |              | 2.37           |
| 6                | thread          | 4 25      | 204         | R3/8   | 225        |           |           |              | 1.68           |
|                  | flange          | 225       | 232         |        |            | Φ90       | Φ60       | 4- Φ14       | 2.17           |
|                  | clamp           | 225       | 213         |        |            | Φ50.5     |           |              | 2.37           |
| 10               | thread          | 5 45      | 205         | R3/8   | 345        |           |           |              | 1.74           |
|                  | flange          | 345       | 233         |        |            | Φ90       | Φ60       | 4- Φ14       | 2.22           |
|                  | clamp           | 345       | 21 2        |        |            | Φ50.5     |           |              | 2.37           |
| 15               | thread          | 75        | 20 6        | G1     |            |           |           |              | 1.35           |
|                  | flange          | 75        | 238         |        |            | Φ95       | Φ65       | 4- Φ14       | 2.47           |
|                  | clamp           | 75        | 216         |        |            | Φ50.5     |           |              | 2.92           |
| 20               | thread          | 85        | 21 0        | G1     |            |           |           |              | 1.35           |
|                  | flange          | 85        | 24 4        |        |            | Φ105      | Φ75       | 4- Φ14       | 3.05           |
|                  | clamp           | 85        | 218         |        |            | Φ50.5     |           |              | 3.01           |
| 25               | thread          | 100       | 217         | G1 1/4 |            |           |           |              | 1.67           |
|                  | flange          | 100       | 253         |        |            | Φ115      | Φ85       | 4- Φ14       | 3.87           |
|                  | clamp           | 100       | 222         |        |            | Φ50.5     |           |              | 3.11           |
| 32               | thread          | 120       | 225         | G1 1/2 |            |           |           |              | 1.99           |
|                  | flange          | 120       | 269         |        |            | Φ140      | Φ100      | 4- Φ18       | 5.42           |
|                  | clamp           | 120       | 2 25        |        |            | Φ50.5     |           |              | 3.97           |
| 40               | thread          | 140       | 23 1        | G2     |            |           |           |              | 2.83           |
|                  | flange          | 140       | 275         |        |            | Φ150      | Φ110      | 4- Φ18       | 6.62           |
|                  | clamp           | 140       | 23 4        |        |            | Φ64       |           |              | 4.77           |
| 50               | thread          | 150       | 244         | G2 1/2 |            |           |           |              | 3.83           |
|                  | flange          | 150       | 290         |        |            | Φ 165     | Φ125      | 4- Φ18       | 8.35           |
|                  | clamp           | 150       | 246         |        |            | Φ78       |           |              | 5.97           |
| 65               | thread          | 175       | 264         | G3     |            |           |           |              | 5.16           |

| Diameter<br>(mm) | Connect<br>Type | L<br>(mm) | H<br>( mm ) | G         | L'<br>(mm) | D<br>(mm) | K<br>(mm) | n -d<br>(mm) | Weight<br>(kg) |
|------------------|-----------------|-----------|-------------|-----------|------------|-----------|-----------|--------------|----------------|
|                  | flange          | 175       | 3 07        |           |            | Φ185      | Φ145      | 8- Φ18       | 10.82          |
|                  | clamp           | 175       | 2 60        |           |            | Φ91       |           |              | 7.37           |
| 80               | thread          | 200       | 274         | G3<br>1/2 |            |           |           |              | 6.85           |
|                  | flange          | 200       | 324         |           |            | Φ200      | Φ160      | 8- Φ18       | 12.27          |
|                  | clamp           | 200       | 275         |           |            | Φ106      |           |              | 8.92           |
| 100              | flange          | 220       | 340         |           |            | Φ220      | Φ180      | 8- Φ18       | 15.37          |
|                  | clamp           | 220       | 293         |           |            | Φ 119     |           |              | 10.52          |
| 150              | flange          | 300       | 398         |           |            | Φ285      | Φ240      | 8- Φ22       | 27.87          |
| 200              | flange          | 360       | 450         |           |            | Φ340      | Φ295      | 12-Φ22       | 43.47          |

#### 4.4. Process connection

Flange connection: GB/T9124.1-2019

Threaded connection: British G thread

Clamp connection: ISO 2852-1993

#### 4.5. Material

Sensor and process connection: 304SS / 316LSS

Impeller: 430F stainless steel / Duplex steel 2205

## Chapter 5 Installation

### 5.1. Installation Tips



**Note!**

Please inspect the packaging box for any damage or signs of rough handling. If there is any damage, report it to the delivery personnel, the manufacturer, or the instrument supplier.



**Note!**

Please check the packing list to make sure the items you received are complete.



**Note!**

Please inspect the nameplate on the instrument to confirm that the supplied items match your order. Verify that the power supply information on the nameplate is correct. If it is incorrect, contact the manufacturer or the instrument supplier.



**Note!**

The installation diagram is for reference only; Please refer to the actual product.

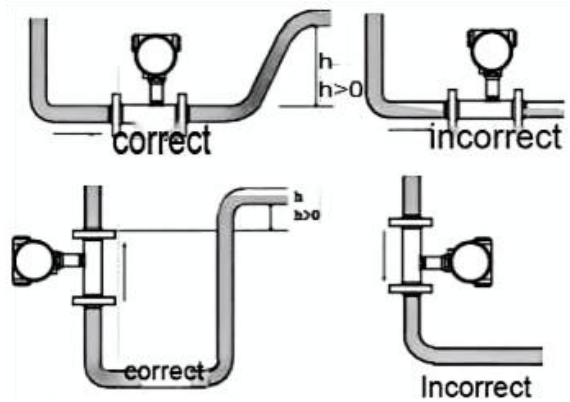
### 5.2. Storage

- (1) The instrument shall be stored in a dry and clean place.
- (2) Avoid exposure in direct sunlight for long.
- (3) Instrument shall be stored in the original package.

### 5.3. Installation Sites

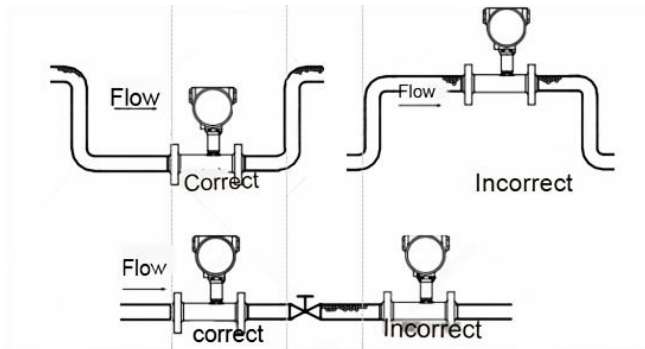
**(1) Liquids shall always be filled with pipes.**

Pipes shall be arranged to ensure that the electromagnetic flowmeter measuring tube is always filled with liquids.



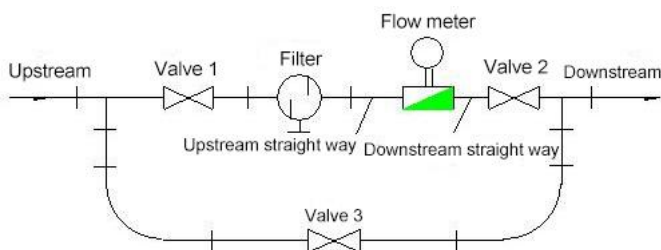
**(2) No bubbles shall be observed in the pipes.**

Pipes shall be designed to prevent the air bubbles in the fluids from accumulating the measurement pipe of a sensor. If a valve exists near the flowmeter, try to mount the flowmeter on the valve's upstream side for preventing a decrease of pressure inside the pipe possibly, consequently avoiding the possibility of air bubbles.



## 5.4. Installation Requirements

Typical installation of the turbine flowmeter.



### Piping Installation Precautions

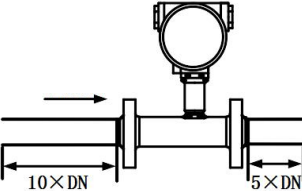
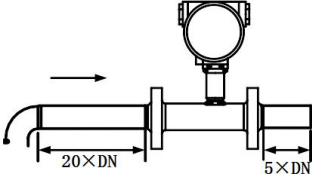
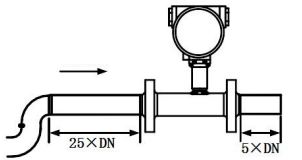
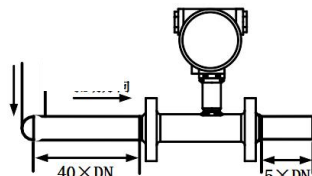
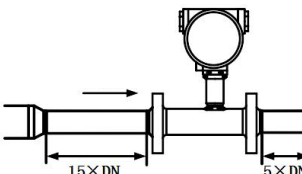
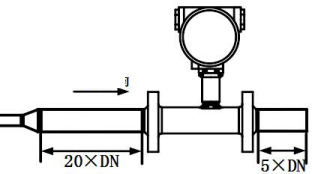
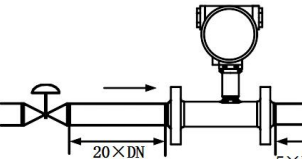
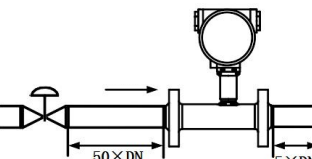
- (1) Install the sensor in a location that is easy to access for maintenance, away from pipeline vibration, strong electromagnetic interference, and heat radiation.
- (2) For horizontal installation, the pipeline should be level, with no visible tilt (generally within  $5^\circ$ ). For vertical installation, the deviation from vertical should also be less than  $5^\circ$ . In systems where flow cannot be stopped, a bypass line with reliable shut-off valves should be installed (see diagram above). Ensure that the bypass is completely sealed during measurement.
- (3) When installing on newly laid pipelines, fit a short section of pipe in place of the sensor until pipeline flushing is completed and the interior is confirmed clean. Only then should the sensor be installed.
- (4) If the process fluid contains solids, install a strainer upstream of the sensor, and periodically remove accumulated sediment from the pipeline. If the liquid contains gas, fit an air eliminator upstream. Discharge outlets from the strainer and air eliminator should vent to a safe location.
- (5) When the sensor is installed outdoors, protect it from direct sunlight and rain exposure.
- (6) For explosion-proof flowmeters, never open the front or rear covers while powered in hazardous locations. After any cover is opened, ensure it is fully tightened during reassembly. Disassembly or reassembly of the instrument housing must only be carried out in a safe area.

## 5.5. The Length of Straight Runs

The turbine flowmeter is sensitive to distorted velocity profiles and swirl in the

pipeline. The flow entering the sensor should be fully developed turbulent flow. Therefore, depending on the type of upstream flow obstruction, an appropriate straight pipe section or flow straightener should be installed. The required straight pipe lengths for the inlet and outlet sections are shown in the table below.

Table 6 Common pipeline installation conditions

| Inlet baffle type                | Installation conditions                                                             |                | Inlet baffle type                  | Installation conditions                                                             |                |
|----------------------------------|-------------------------------------------------------------------------------------|----------------|------------------------------------|-------------------------------------------------------------------------------------|----------------|
|                                  | Inlet section                                                                       | Outlet section |                                    | Inlet section                                                                       | Outlet section |
| Standard                         |    |                | 90 ° bend                          |    |                |
| Two 90 ° bends on the same plane |    |                | Two 90 ° bends on different planes |    |                |
| Pipe reducer                     |   |                | Pipe expander                      |   |                |
| Fully open valve                 |  |                | Half-open valve                    |  |                |



## 5.6. Post-installation inspection

Table 7 Post-installation check

| Inspection items                                                                                                                                                          | result                   |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|
| Is the instrument intact (visual inspection)?                                                                                                                             | <input type="checkbox"/> |
| Does the flow meter comply with the technical specifications of the measuring point, such as medium temperature, process pressure, ambient temperature, nominal diameter? | <input type="checkbox"/> |
| Have adequate protective measures been taken to protect the instrument from sun and rain?                                                                                 | <input type="checkbox"/> |
| Are the set screws securely tightened using a suitable wrench?                                                                                                            | <input type="checkbox"/> |

After installation, the instrument should not be left unused for long periods. If the instrument will not be used for an extended period, the following measures must be taken:

1. Check the sealing of the end cap and wiring ports to ensure that moisture and water do not penetrate the instrument.
2. Perform regular inspections. Check the conditions of the measures mentioned above at least once a year. If there is a possibility of water ingress (e.g., after heavy rainfall), the meter should be checked immediately.

## Chapter 6 Flowmeter operation method

### 6.1. Turbine flow sensor

#### 6.1.1. Main technical parameters

Power supply: +12V DC, +24V DC (maximum voltage +26VDC)

Output signal: pulse signal

#### 6.1.2. Field connection method

The connection between the flowmeter and the display instrument can be selected according to the power supply of the instrument(Figure 14).

Warning: When wiring the instrument, it must be operated after power off.

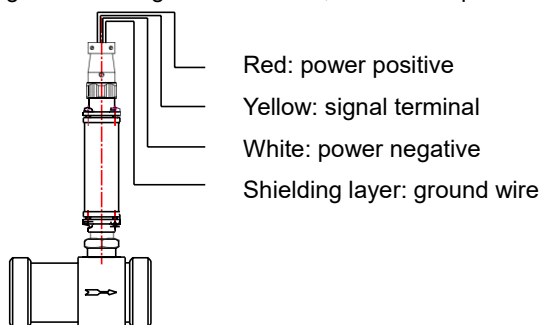


Figure 11 Wiring diagram of sensor and display instrument

#### 6.1.3. Sensor supporting display instrument

Intelligent display instrument: It can display the cumulative quantity and instantaneous quantity, the display error is better than 0.2% FS, 8-segment broken line non-linear correction function, the alarm output can be set as the instantaneous upper and lower limit alarm or cumulative quantity preset output. Power failure record function can record the total power failure time. Number of power outages and power-on time. Output current: 4~20mA, 0~10mA; external power supply: 24V DC, 12V DC, optional RS485 communication interface. Dimensions: 160×80×125 or 80×160×125.

Display instrument: used for liquid quantitative filling or batching control, basic error 0.2%, 8-digit total and 6-digit batch display.

## **6.2. Turbine flowmeter with local display**

### **6.2.1. Main technical parameters**

Power supply: LWGY-1—3.6V lithium battery (19Ah built-in)

LWGY-2/3/4—+24V DC power supply

display content: instantaneous flow 6 digits, cumulative total 8 digits

Output mode: LWGY-1—pulse output (optional, need external power supply)

LWGY-2/3/4—4~20mA current output, pulse output (optional) ModBus

communication (optional), the output function cannot be used at the same time.

### **6.2.2. Display operation method**

#### **(1) Button function**

①In the automatic measurement state, the Button function:

F key: enter the parameter setting state;

Up key: Cyclic display of turbine frequency, density, meter coefficient, unit code, instantaneous flow and Totalizer.

Left button: No function temporarily

#### **②Key function in parameter setting state**

Press the left button to display the menu items in a forward cycle;

Press the middle button to display the menu items in reverse cycle;

Press the right button to confirm and enter the parameter setting interface of the corresponding menu item, you can modify the parameters;

in the parameter setting interface:

Press the left button to shift or scroll;

press the middle button to scroll ;

Press the right button to confirm and save the corresponding parameters and exit the parameter setting interface.

## (2) LCD screen

Double row segment LCD, no decimal point at the end of the upper and lower rows, use "\_" instead of the decimal point.

Upper row: Q xxxxxx, 6-digit instantaneous flow, the unit is shown in Table 2;

Bottom row: xxxxxxxx, 8-digit cumulative total, the unit corresponds to the instantaneous flow.

## (3) Parameter setting

Press the F key to enter the password input interface:

Enter the level 1 user password "00001111", and then press the F key to enter the user setting menu state, and the user can view and modify items 1-9.

Enter the level 2 administrator password "0000XXXX" (manufacturers used for debugging, not provided to customers), and then press the F key to enter the administrator setting menu status, and the user can view and modify items 1 to 27.

PS: The password error system returns to the running state;

In the setting state, first press the left button, and then press the middle button at the same time to return to the running state

Restore factory settings: Press the right button, enter the factory reset password "0000XXXX" (manufacturers used for debugging, not provided to customers), and then press the right button to confirm, you can restore the parameters to the factory data.

The Totalizer is cleared:

① Press the F key, enter the cumulative reset password "00005170"

(manufacturers used for debugging, not provided to customers), and then press the F key to confirm, the cumulative total can be cleared.

② Clear the reed pipe. (Optional for this function) The unit of accumulated pulse equivalent is L/P.

The bar code on the right side of the LCD simulates the instantaneous flow rate, and each bar represents 10% of the instantaneous flow rate.

Table 3 User setting menu

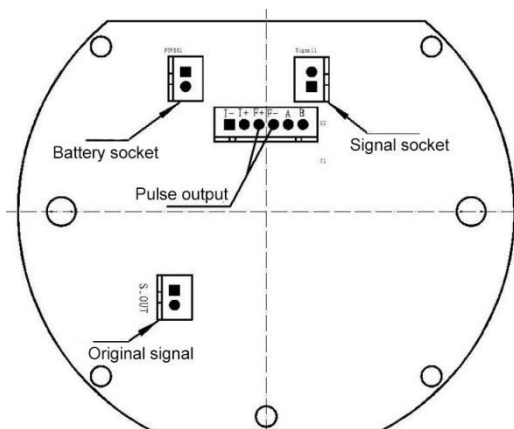
| NO. | Setting parameters          | Parameter symbol | Default | Description                                                                                                                                                                    | Level |
|-----|-----------------------------|------------------|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| 1   | range                       | FH               | 100.000 | Upper limit of flow                                                                                                                                                            | 1     |
| 2   | Small signal removal        | FL               | 0.001   | Lower limit of flow                                                                                                                                                            | 1     |
| 3   | Correction factor           | Fn               | 1.000   | Set to 1 when no correction is needed                                                                                                                                          | 1     |
| 4   | unit                        | E                | 1       | The units represented by 0-9 are:<br>m3/s、<br>m3/h、 L/s、 L/h、 Kg/s、 Kg/h、 g/s、<br>g/h、 t/s、 t/h                                                                                | 1     |
| 5   | density                     | dEn              | 1000.00 | Density unit: Kg/m3                                                                                                                                                            | 1     |
| 6   | Slave address               | Adr              | 01      | 00-99 (No 485 communication when battery powered)                                                                                                                              | 1     |
| 7   | Communication rate          | bPs              | 1200    | 1200、2400、4800、9600 (No 485 communication when battery powered)                                                                                                                | 1     |
| 8   | Output options              | FO               | 0       | 0: No pulse output;<br>1: Cumulative pulse output (from artery width)<br>2: Accumulated pulse output (10ms pulse width)<br>3: Current output (invalid when powered by battery) | 1     |
| 9   | Cumulative pulse equivalent | Fdd              | 0.01    | 0.0001、0.001、0.01、0.1、1、2、5、10、100、1000、10000、100000 (unit: L/P)                                                                                                               | 1     |
| 10  | Damping coefficient         | dt               | 0.0000  | The larger the value, the greater the damping, 0~60                                                                                                                            | 1     |
| 11  | Meter factor                | U                | 100.000 | Average calibration factor                                                                                                                                                     | 2     |
| 12  | Segment compensation enable | CP               | 0       | 0: No compensation 1: Compensation                                                                                                                                             | 2     |
| 13  | Calibration frequency 1     | Fr1              | 250.000 | First frequency                                                                                                                                                                | 2     |
| 14  | Calibration frequency 1     | U1               | 100.000 | The coefficient corresponding to frequency Fr1                                                                                                                                 | 2     |
| 15  | Calibration frequency 2     | Fr2              | 500.000 | Second frequency                                                                                                                                                               | 2     |
| NO. | Setting parameters          | Parameter symbol | default | description                                                                                                                                                                    | level |
| 16  | Calibration factor 2        | U2               | 100.000 | The coefficient corresponding to frequency Fr2                                                                                                                                 | 2     |
| 17  | Calibration frequency 3     | Fr3              | 750.000 | Third frequency                                                                                                                                                                | 2     |
| 18  | Calibration factor 3        | U3               | 100.000 | The coefficient corresponding to frequency Fr3                                                                                                                                 | 2     |
| 19  | Calibration factor 4        | Fr4              | 1000.00 | Fourth frequency                                                                                                                                                               | 2     |
| 20  | Calibration factor 4        | U4               | 100.000 | The coefficient corresponding to frequency Fr4                                                                                                                                 | 2     |

|    |                    |   |     |         |                                                |   |
|----|--------------------|---|-----|---------|------------------------------------------------|---|
| 21 | Calibration factor | 5 | Fr5 | 1250.00 | Fifth frequency                                | 2 |
| 22 | Calibration factor | 5 | U5  | 100.000 | The coefficient corresponding to frequency F5  | 2 |
| 23 | Calibration factor | 6 | Fr6 | 1500.00 | Sixth frequency                                | 2 |
| 24 | Calibration factor | 6 | U6  | 100.000 | The coefficient corresponding to frequency F6  | 2 |
| 25 | Calibration factor | 7 | Fr7 | 1750.00 | Seventh frequency                              | 2 |
| 26 | Calibration factor | 7 | U7  | 100.000 | The coefficient corresponding to frequency Fr7 | 2 |
| 27 | Calibration factor | 8 | Fr8 | 2000.00 | Eighth frequency                               | 2 |
| 28 | Calibration factor | 8 | U8  | 100.000 | The coefficient corresponding to frequency Fr8 | 2 |

Note: Frequency points 1~8 are arranged in order from small to large. When the CP value is "0", items 13~28 are not displayed,

#### (4) Wiring instructions

LWGY-□□□□1 battery-powered turbine flowmeter



LWGY-□□□□2/3/4 Turbine flowmeter

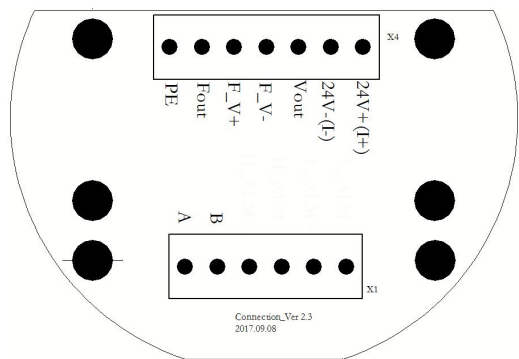
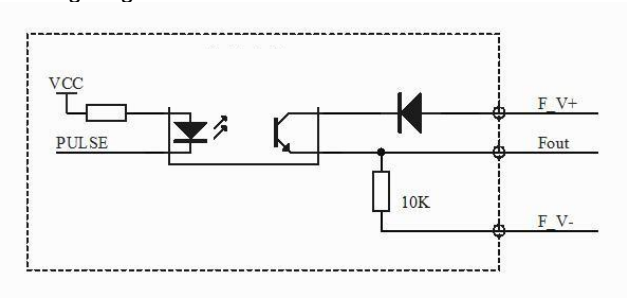


Figure 12.Schematic diagram of internal wiring

Table 4

|           |                             |
|-----------|-----------------------------|
| 24V+ (I+) | 24V Power + (current +)     |
| 24V- (I-) | 24V Power-(current -)       |
| Vout      | Voltage output+             |
| F_V-      | Pulse output power supply-  |
| F_V+      | Pulse output power supply+  |
| Fout      | Pulse output                |
| FE        | Ground                      |
| B         | Modbus communication line B |
| A         | Modbus communication line A |

Pulse output wiring diagram:



When there is no sampling resistance inside the system, F\_V+ is connected to the positive pole of the power supply, F\_V- is connected to the negative pole of the power supply, and Fout is connected to the pulse signal;

When there is a sampling resistor inside the system, F\_V+ is connected to the

positive pole of the power supply, Fout is connected to the pulse signal, and F\_V- does not need to be connected.

note! The pulse signal power supply voltage range is DC5V~24V.

#### (5) Battery replacement

Accumulatively powered on for two years, unconditionally replace the battery. If the meter does not display or displays abnormally within the battery lifespan, and the measured battery voltage is lower than 2.8V, you should immediately cut off the power supply and replace the battery, otherwise the circuit unit in the meter will be damaged.

When replacing the battery, pay attention to the polarity of the battery to be consistent with the battery box label, and not reverse it. Each time the cover is opened and then assembled, the front and back covers of the instrument should be tightened.

### **6.3. Turbine flowmeter without display**

#### **6.3.1. Main technical parameters**

Power supply: +24V DC

Output signal: 4~20mA current output

#### **6.3.2. Usage**

(1) The complete connection method of the flowmeter (see Figure 14).

(2) Schematic diagram of internal wiring (see Figure 15)

(3) Schematic diagram of fine adjustment of full-scale flow (see Figure 17)

Full scale fine-tuning button: press K1 and K2 at the same time, LED2 lights up to enter the adjustment mode and release the button, press K1 to increase the current, and press K2 to decrease the current. It will automatically exit the adjustment mode if there is no operation for 1 minute.

\*Note: The current has been adjusted before the product is sold, please do not adjust it at will;



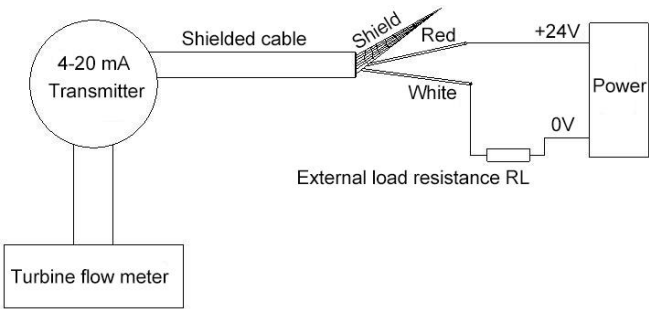
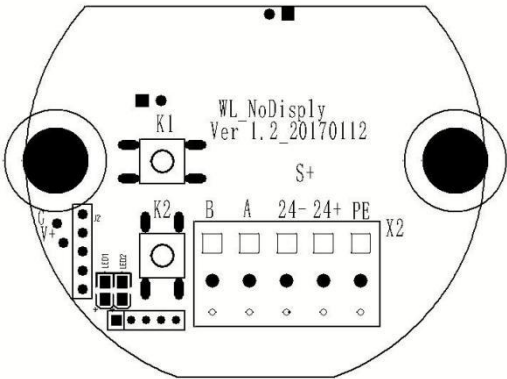


Figure 16 Schematic diagram of external wiring



|     |                     |
|-----|---------------------|
| PE  | Ground              |
| 24+ | 24V power supply+   |
| 24- | 24V power supply    |
| A   | 485 Communication A |
| B   | 485 communication B |

Figure 17 Schematic diagram of internal wiring diagram

## **Chapter 7 Maintenance and troubleshooting**

### **7.1. Precautions when using**

- (1) When using, keep the tested liquid clean and free of impurities such as fibers and particles.
- (2) Each time the flowmeter is used, valve 1 should be slowly opened (see Figure 11), and the pipe should be filled with liquid slowly, and then downstream valve 2 should be slowly opened. The impact of the fluid. Otherwise the sensor may be damaged!
- (3) It is recommended that the flowmeter maintenance cycle should not exceed half a year. Clean the impeller and the cavity parts of the sensor during maintenance and be careful not to damage it. Pay attention to the correct position of each part when assembling.
- (4) When the flowmeter is not in use, the liquid inside the sensor should be cleaned, and protective sleeves should be added to both ends of the sensor to prevent dust from entering, and stored in a dry place.
- (5) The configured filter should be cleaned and replaced regularly, and the internal liquid should be cleaned when not in use, with a dust cover, and stored in a dry place.
- (6) The transmission cable of the flowmeter can be laid overhead or buried (the iron pipe should be covered when buried). The cable length is 10m when the product leaves the factory.

## 7.2. Troubleshooting

Table 5 Common faults and solutions of flowmeters

| Troubles                                                                                                                            | Possible causes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Solutions                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| No display on display instrument<br>(Or no current signal)                                                                          | <ol style="list-style-type: none"> <li>1. The power is not connected or the fuse is blown</li> <li>2. The display instrument is faulty</li> <li>3. Battery failure</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                            | <ol style="list-style-type: none"> <li>1. Turn on the power or replace the fuse</li> <li>2. Overhaul the display instrument</li> <li>3. Replace the battery</li> </ol>                                                                                                                                                                                                                                                                                                           |
| The display instrument has display on the calibration signal but no display on the flow signal (or the output current is incorrect) | <ol style="list-style-type: none"> <li>1. The sensor and display instrument wiring is wrong</li> <li>2. Amplifier failure</li> <li>3. The converter (coil) is open or shorted</li> <li>4. The impeller is stuck</li> <li>5. No fluid flow or blockage in the pipeline</li> </ol>                                                                                                                                                                                                                                                                                                         | <ol style="list-style-type: none"> <li>1. Check the correctness and quality of the wiring</li> <li>2. Repair or replace the amplifier</li> <li>3. Repair or replace the coil</li> <li>4. Clean sensor and pipeline...</li> <li>5. Open the valve or pump and clean the pipeline</li> </ol>                                                                                                                                                                                       |
| Incorrect measurement or unstable display (or incorrect output current)                                                             | <ol style="list-style-type: none"> <li>1. The actual flow exceeds the measuring range of the sensor</li> <li>2. The meter coefficient K is set incorrectly</li> <li>3. The sensor is entangled by fiber impurities</li> <li>4. There are bubbles in the liquid</li> <li>5. There is a strong electromagnetic field near the sensor</li> <li>6. The sensor bearing and shaft are severely worn</li> <li>7. The sensor cable shielding layer or other grounding wires are disconnected from the line grounding wire or have poor contact</li> <li>8. Display instrument failure</li> </ol> | <ol style="list-style-type: none"> <li>1. Adjust the measured flow rate to match the measuring range of the sensor</li> <li>2. Make the meter coefficient K set correctly</li> <li>3. Clean the sensor parts</li> <li>4. Take degassing measures to eliminate bubbles</li> <li>5. Stay away from interference sources or take shielding measures</li> <li>6. Replace the guide or impeller shaft</li> <li>7. Check the wiring</li> <li>8. Overhaul display instrument</li> </ol> |

## **Chapter 8 Warranty & After-sales Service**

We promise to the customer that the hardware accessories provided during the supply of the instrument have no defects in material and manufacturing process. From the date of the purchase, if the user's notice of such defects is received during the warranty period, the company will unconditionally maintain or replace the defective products without charge, and all non customized products are guaranteed to be returned and replaced within 7 days.

Disclaimers:

- During the warranty period, product faults caused by the following reasons are not in the scope of Three Guarantees service
- Product faults caused by improper use by customers.
- Product faults caused by disassembling, repairing and refitting the product.

After-sales service commitment:

- We promise to deal with the customer's technical questions within 2 hours.
- For the instruments returned to the factory for maintenance, we promise to issue the test results within 3 working days and the maintenance results within 7 working days after receiving them.

## Chapter 9 Communication

The communication protocol is designed for the industrial application of bus turbine flowmeter, which is version 1.0, which is mainly used for real-time data acquisition, flow measurement and flow accumulation control, and currently only supports register readout function.

### 9.1. Standard basis

GB/T 19582-2008 The standard is based on the industrial automation network specification targeted by the Modbus protocol.

### 9.2. Communication mode

The Modbus serial link is built in 485mi A, and the hardware interface adopts 485communication mode. At present, the interface supports up to 32 extension networks.

The communication mode is RTU mode, the baud rate range 1200、2400、4800、9600bps。

### 9.3. RTU transmission mode

- The message contains two 4-bit hexadecimal characters in each 8-bit byte, and the message needs to be transmitted in a continuous character stream.
- Format of each byte (10 bits).
  - (1) 1 start bit.
  - (2) 8 data bits, first send the least significant bits.
  - (3) 1 stop bit.
- Message frame description.

Address(1) + Function code(1)+ Data (0-252)+ CRC check(1).

- Time sequence

The idle interval of at least 3.5character time distinguishes the message frame, which is tentatively set as a fixed time 100ms to determine the beginning of the data frame.

#### 9.4. Function code definition

- Read register

Read the contents of the register in the instrument, including a variety of information parameters, high in the low address and low in the high address.

Big end mode:

Table 6

| Name                           | Register address | Data type | Number of bytes |
|--------------------------------|------------------|-----------|-----------------|
| Instantaneous flow             | 0                | float     | 4               |
| Cumulative flow                | 4                | float     | 4               |
| Turbine frequency              | 8                | float     | 4               |
| Upper limit of flow<br>(range) | 12               | float     | 4               |
| Lower limit of flow            | 16               | float     | 4               |
| Unit                           | 20               | Char      | 1               |

Unit comparison table :

Table 7

| Unit code | Unit              | Unit code | Unit |
|-----------|-------------------|-----------|------|
| 0         | m <sup>3</sup> /s | 5         | kg/h |
| 1         | m <sup>3</sup> /h | 6         | g/s  |
| 2         | l/s               | 7         | g/h  |
| 3         | l/h               | 8         | t/s  |
| 4         | kg/s              | 9         | t/h  |

9.5. Example

Table 8

|                |                |
|----------------|----------------|
| 40001: <0000H> | 40011: <0000H> |
| 40002: <0000H> | 40012: <0000H> |
| 40003: <4007H> | 40013: <0000H> |
| 40004: <EAD2H> | 40014: <0000H> |
| 40005: <0000H> | 40015: <0000H> |
| 40006: <0000H> |                |
| 40007: <42C8H> |                |
| 40008: <0000H> |                |
| 40009: <3A83H> |                |
| 40010: <126FH> |                |

- (1) 40001-40002 : 00 00 00 000.000 Instantaneous flow.
- (2) 40003-40004 : 40 07 EA D2 2.12371 Cumulative flow.
- (3) 40005-40006 : 00 00 00 000.000 Turbine frequency.
- (4) 40007-40008 : 42 C8 00 00 100 m3/s Upper limit of flow.
- (5) 40009-40010 : 3A 83 12 6F 0.001 m3/s Lower limit of flow.
- (6) 40011: 00m3/s unit.