



2014F013-34



# **Metal Scraper Flowmeter**

## **Instruction Manual**



**HEFEI JINGDA INSTRUMENT CO.,LTD**

The enterprise has passed ISO9001 quality management system certification

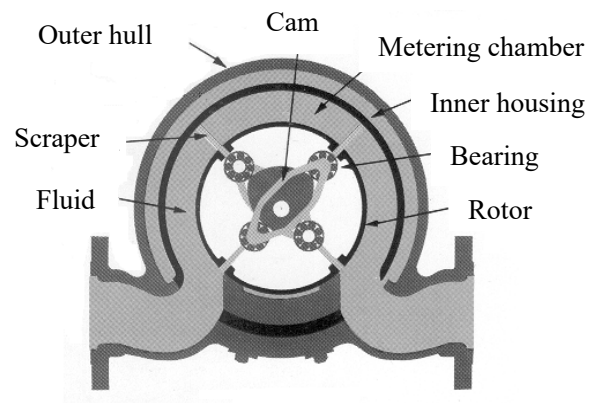


## General Description

LBJ Metal Scraper Flowmeter is a positive displacement flowmeter. Used for continuous or intermittent precision measurement of liquid flow through pipelines. It adopts double shell structure, the rotor rotates at the same speed, with smooth operation, no pulsation, low noise, large flow, sand control, high measurement accuracy, long service life and viscosity change adaptability, widely used in petroleum, chemical, light industry, transportation, commercial and other departments, especially suitable for measuring crude oil, residual oil, refined oil, light hydrocarbons and other media transfer and trade settlement measurement. Flowmeter can be indicated on the spot and can be remote signal output.

## Working Principle

When the measured liquid enters the flow time, the liquid impacts the scraper, pushes the scraper and the rotor to rotate clockwise along the cam, and the scraper expands and expands along a certain track with the cam, and forms an accurate measuring chamber with the rotor, the inner shell, the cover plate, etc., with the continuous rotation of the rotor and the scraper, the purpose of measuring the measured medium is achieved.



## Main technical parameters

Nominal diameter (mm) : 25, 40, 50, 80, 100, 150, 200, 250, 300

Nominal Pressure (MPa) : 1.6, 2.5, 4.0, 6.3

Working Temperature (°C) : -20~60,

Environmental temperature (°C) : -41~60 (Cast iron material: -15~60)

Accuracy grade : 0.5, 0.2

Sender type: Type BGF pulse volume transmitter、BMF analog signal transmitter.

Output : BGF-I pulse amplitude 0.5~9V; BGF-II pulse amplitude 1~20V; BMF analog signal (4~20mA) .

Supply Voltage: BGF-I DC12V、BGF-II DC24; BMF DC24V.

Flange standard: GB/T9112-2010, or according to user requirements.

Explosion-proof sign: ExdIICT6,ExiaIICT6

Flow range: Accuracy 0.5



DN	Flow range (m <sup>3</sup> /h)			Pulse equivalent (L/P)
	0.8~2(mPa.s)	2~100(mPa.s)	100~200(mPa.s)	
25	1.5~6	0.6~6	0.5~5	0.01
40	3.6~18	1.8~18	1.08~10.8	0.1
50	5~25	2.5~25	1.8~18	
80	16~80	8~80	6~60	0.25
100	28~140	14~140	10~100	
150	50~250	25~250	18~180	
200	80~400	40~400	30~300	0.5
250	120~600	60~600	45~450	
300	200~900	100~1000	75~750	

Accuracy 0.2

DN	Flow range (m <sup>3</sup> /h)			Pulse equivalent (L/P)
	0.8~2(mPa.s)	2~100mPa.s)	100~200(mPa.s)	
25	2~6	1.5~6	1~5	0.01
40	4.5~18	3.6~18	2.7~13.5	0.1
50	6~25	5~25	3.6~18	
80	20~80	16~80	12~60	0.25
100	45~140	28~140	20~100	
150	60~250	50~250	36~180	
200	130~400	80~400	60~300	0.5
250	200~600	120~600	90~450	
300	300~1000	200~1000	150~750	

Note: 1.Flowmeter pressure loss≤0.08MPa;

2.When the working temperature is 60~120°C, the heat sink must be added;

3.When the viscosity of the medium is higher than 100mpa.s, its maximum flow rate is multiplied by the following coefficients:

Medium viscosity	100~200mpa.s	200~400mpa.s	>400mpa.s
Coefficient	0.9	0.8	0.7

### Flowmeter appearance and connection dimensions

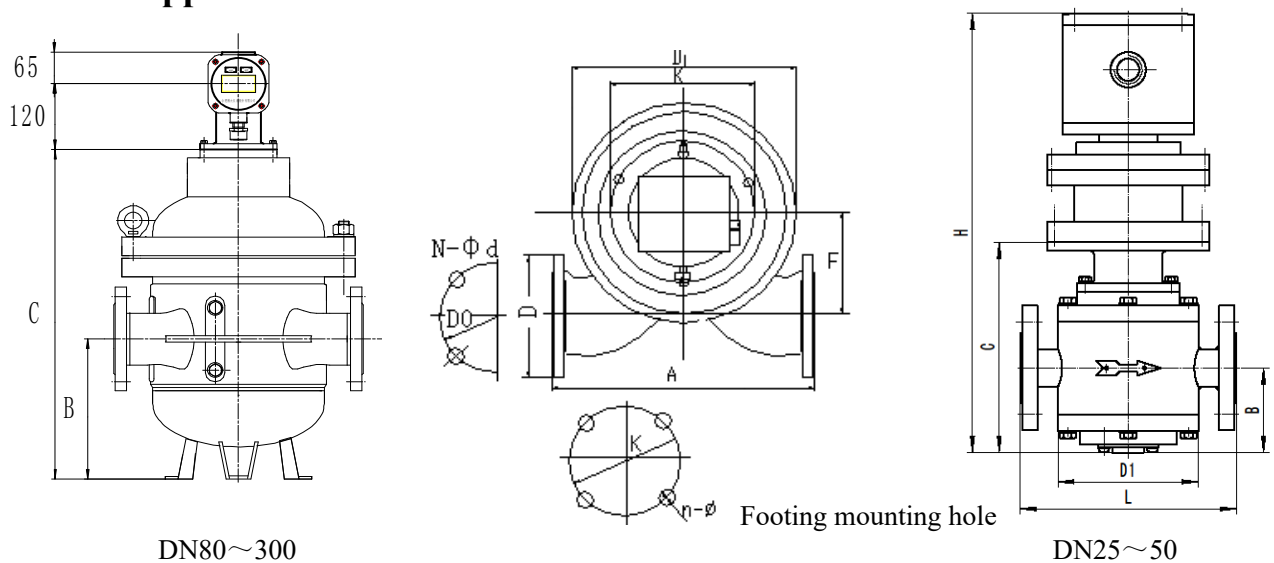


FIG. 1



DN	Pressure (Mpa)	A	B	C	D1	F	K	n	Φ
25	1.6~6.3	200	78	195	122				
50(40)	1.6~6.3	260	96	240	175		150		
80	1.6~6.3	460	270	650	450	118	240	3	15
100	1.6~6.3	500	286	677	472	160	343	3	15
150	1.6~6.3	650	310	757	540	165	392	3	20
200	1.6~6.3	700	420	921	650	229	436	4	24
250	1.6~6.3	1000	610	1168	760	280	540	4/6	26
300	1.6~6.3	1000	660	1379	900	381	700	6	34

The connection flange of the flowmeter according to GB/T9112-2010, when the user uses the field is not the above standard, it can be manufactured according to the user's proposed flange standard.

DN	Pressure 1.6Mpa			Pressure 6.3Mpa				
	D	D <sub>0</sub>	d	N	D	D <sub>0</sub>	d	N
25	115	85	4	14				
40	150	110	18	4				
50	165	125	18	4				
80	200	160	18	8	215	170	22	6
100	220	180	18	8	250	200	26	8
150	285	240	18	8	345	280	33	8
200	340	295	22	12	415	345	36	12
250	405	355	26	12	470	400	36	12
300	460	410	26	12	530	460	36	16

## Matching transmitter

### 1. BGF series transmitter

#### ■ BGF series transmitter overview

BGF series transmitter is a rotary axis angular displacement sensor, which is used with our positive displacement flowmeter, which can convert the flow rate of the measured medium into an electrical pulse signal for remote transmission use, and can also be used to send a signal of internal safety.

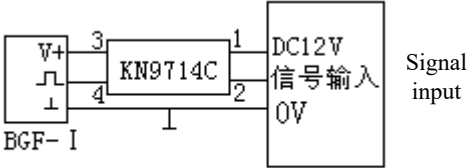

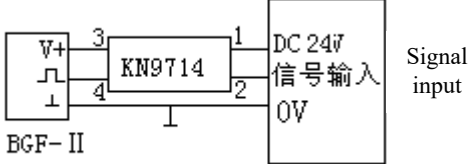

#### ■ BGF series transmitter key generic technologies

- 1、No contact, square wave output, reliable sending
- 2、The frequency of transmission is proportional to the size of the flow
- 3、Working environment temperature:  $-40\sim 65^{\circ}\text{C}$
- 4、Explosion-proof sign: ExiaIICT5、ExdIICT6
- 5、Signal output nozzle size: G1 / 2"
- 6、Dimensions of the hole in the cable:  $\Phi 11$
- 7、High precision, anti-vibration, especially suitable for quantitative filling.



FIG. 2



<p>■BGF-Itransmitter technical feature</p> <ol style="list-style-type: none"> <li>1、 Supply Voltage: DC12V±10%</li> <li>2、 Signal output: Voltage pulse high level greater than 9V Voltage pulse low level less than 0.5V</li> <li>3、 Auxiliary safety grid: KN9714C</li> <li>4、 Three-wire system ( 12V 、 signal、 0V )</li> <li>5、 Intrinsically safe explosion-proof connection diagram</li> </ol>  <p style="text-align: center;">Secondary meter</p> <p>6、 General and flameproof interface circuit diagram</p>  <p style="text-align: center;">Secondary meter</p>	<p>■BGF-IItransmitter technical feature</p> <ol style="list-style-type: none"> <li>1、 Supply Voltage: DC24V±10%</li> <li>2、 Signal output Voltage pulse high level greater than 20V Voltage pulse low level less than 1 V</li> <li>3、 Auxiliary safety grid: KN9714</li> <li>4、 Three-wire system ( 24V 、 signal、 0V )</li> <li>5、 Intrinsically safe explosion-proof connection diagram</li> </ol>  <p style="text-align: center;">Secondary meter</p> <p>6、 General and flameproof interface circuit diagram</p>  <p style="text-align: center;">Secondary meter</p>
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**2. BMF series 4 ~ 20mA analog output transmitter**

■ Summarize

MF series transmitter can be matched with our positive displacement flowmeter to convert instantaneous flow into 4-20mA analog output on site, and far to the control room for instantaneous flow display, regulation and control, not for cumulative flow. The four-wire system can also output pulses.

■ Feature

1、 Four-Wire system

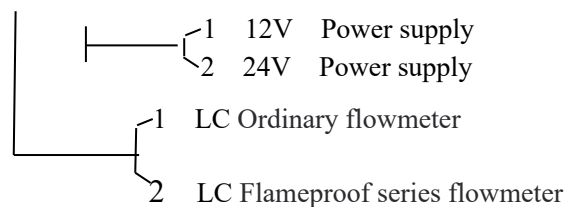
(Positive power cord、 4~20mA electric streamline、 Pulse line、 Power ground) , The user does not use pulse output.

Two-wire system (24V DC power supply, 4 to 20mA output)

2、 Flowmeter direct output 4~20mA, long transmission distance, safe and reliable.

3、 Naming Methods

BMF—X X /2 two-wire system; 4 four-wire system





### ■ Technical Specification

#### 1、 Output signal :

a、 Analog quantity 4~20mA

b、 Voltage pulse:  $V_L < 0.5V$

$V_H > 9V$  12V;

(Four-wire system)  $V_L < 1V$

$V_H > 20V$  24V;

#### 2、 Allowable error

Analog quantity:  $\pm 0.5\%FS$

Pulsed quantity:  $\pm 1$  pulse

3、 Environmental temperature:  $-25^{\circ}C \sim +50^{\circ}C$

4、 Analog load resistance (user side)

$< 400\Omega$  (12V Power supply)

$< 800\Omega$  (24V Power supply)

5、 Power supply (four-wire system)

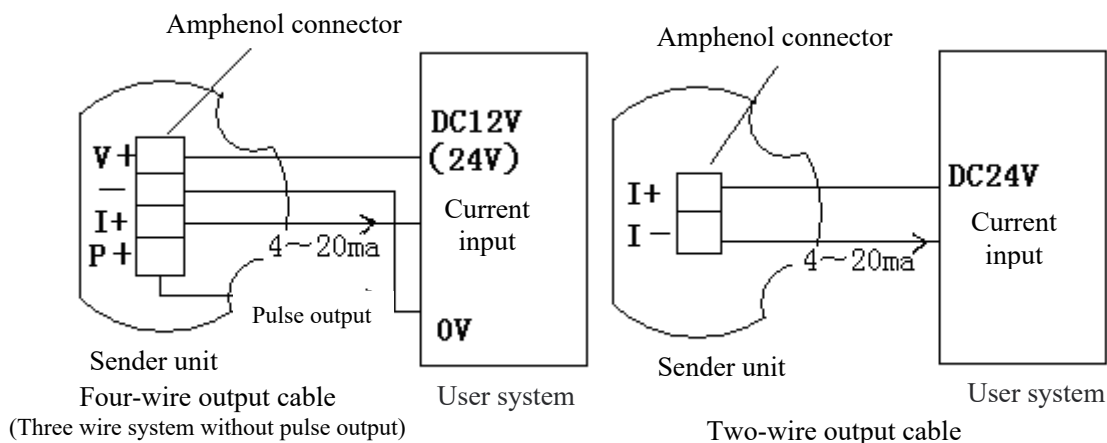
DC12V $\pm 10\%$  60mA

DC24V $\pm 10\%$  60mA

6、 Explosion-proof sign: ExiaIICT6、

ExdIICT6

### ■ See the following figure for connection:



## Installation

### 1、 Machinery installation

(1) The installation position of the flowmeter should try to avoid the environment with large mechanical vibration, high temperature and strong magnetic field interference. And choose the location for easy maintenance installation.

(2) Install the flowmeter on the new pipeline, in order to avoid impurities in the pipeline into the flowmeter, you can first replace the flowmeter with a section of pipe, clean the pipe, and then replace the flowmeter.

(3) The flowmeter should be installed on the main channel of the horizontal pipeline, and the bypass pipeline should be set up according to the figure below for easy cleaning and maintenance.

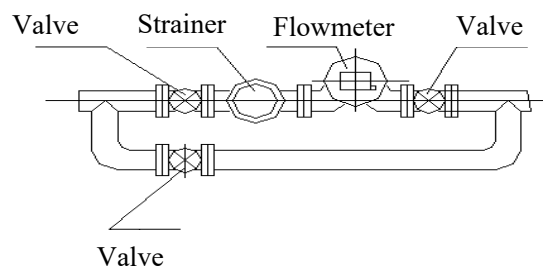


FIG. 3

(4) The arrow direction on the installation flowmeter body should be consistent with the direction of liquid flow. Counter oriented can be adjusted according to user needs.

(5) The strainer is installed before the flowmeter is imported. In order to make the measurement accurate, the gas in the pipeline should be excluded, and the gas eliminator should be installed.



(6) Flowmeter regulating flow valve should be installed on the downstream side of the flowmeter.

(7) Both ends (flanges) of the flowmeter should be concentric with the pipe, and when connected with the flowmeter, the sealing gasket can not burst into the liquid.

## 2、Line connection

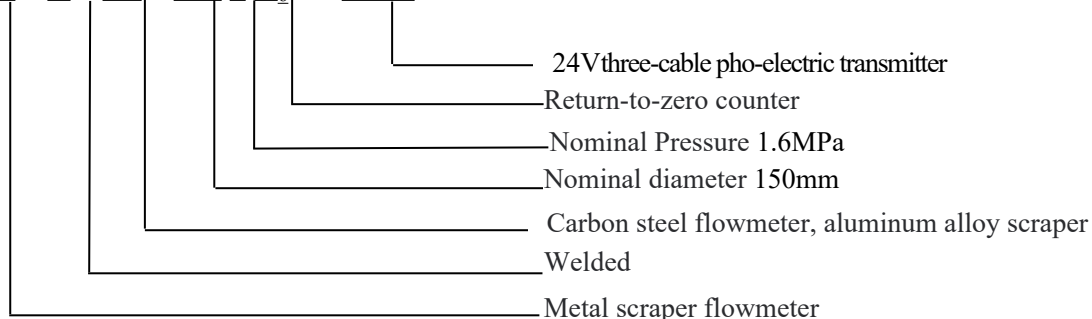
LBJ Metal Scraper Flowmeter with transmitter, its line connection according to the fifth article of this manual wiring, installation can not damage the explosion-proof surface.

### LBJ Metal Scraper product marking

Type code	Special symbol	Material		DN	Nominal pressure	Counter	Transmitter	Accuracy	Description
		shell	scraper						
LBJ-	H								Metal scraper flowmeter
									Welded steel flowmeter
		E							Cast steel material
		A							Cast iron material
		M							Graphite
		A							Cast iron
		L							Aluminium alloy
					25				Nominal diameter 25mm
					...			...	
					300				Nominal diameter 300mm
						.2/			1.6MPa
						.3/			2.5MPa
						.4/			4.0MPa
						.6/			6.3MPa
						A <sub>5</sub> 、J <sub>1</sub>			Pointer counter
						A <sub>6</sub>			Return-to-zero counter
						BELZ			Electronic digital display counter
					BXZ			Small digital counter	
					BGF-I			12V three-cable photo-electric transmitter	
					BGF-II			24V three-cable photo-electric transmitter	
					BMF			Analog transmitter	
							J	High precision flowmeter	

Example :

LBJ—H EL 150.2/A<sub>6</sub> BGF-II



### Product implementation standards and production licenses

1.JB/T9242-1999 《 General technical conditions for positive displacement flowmeter 》 ;  
Q/JD2.004-2010 《Liquid positive displacement flowmeter》

2.Measuring instrument production license: Anhui System No. 01000018.

3.Remote display site explosion-proof class ExiaIICT6, EXdiICT6.



## Error calculation and adjustment

1. The basic error of the scraper flowmeter is calculated by the measured values of each verified flow point according to the following formula:(volumetric method)

$$E=(V_m-V)/V \times 100\%$$

E—Flowmeter error (generally referred to as cumulative error) takes two significant digits.

$V_m$ —Flowmeter value(shown value)

V—After correction, the flow standard device measured Value (actual value)

Calculated by the basic error formula, when

$V_m > V$ , the basic error of the flowmeter is a "+" value, indicating that the flowmeter goes faster.

$V_m < V$ , the basic error of the flow meter is the value of "-", indicating that the flow meter is slow.

In order to keep the flowmeter error within the basic error limit,error adjustment is often required. That is, the mechanical transmission speed ratio is changed by replacing a pair of adjusting gears (adjusting teeth) installed in the counter, so that the indicator value of the flowmeter is adjusted.

Error adjustment does not change the flow characteristics of the flowmeter, but only makes its characteristic curve artificially in a new coordinate system.

In general, within the specified (or actual use) flow range, the basic error range of the maximum and minimum flow detection point is not greater than the basic error limit of the specified accuracy, and the basic error of the flowmeter can be qualified by error adjustment.

The used flowmeter generally uses the original adjusting gear for error verification first, and then carries out error adjustment according to the specific error situation.

### 2. Error adjustment method of metal scraper flowmeter

2.1 The standard double gear at the time of design is 38/36. If the flowmeter is found to go faster during inspection, there will be (+) error, such as +1.02 ~ +0.3, the double gear 38/36 should be replaced by 43/41, then the error curve origin will be the zero position corresponding to the 38/36 gear. Move up to the position of +0.64 for the 43/41 gear pair (see table), so that the error curve is in the new coordinate system, and the error of the flowmeter is

Error adjustment %	Adjusting gear group		
	Z Up	Z Down	
When the indicator value is less than the actual value, Z up and Z down can be selected from the bottom up → ← When the indicator value is greater than the actual value, Z up and Z down can be selected from the top down	4.21	33	30
	3.90	34	31
	3.62	35	32
	3.35	36	33
	3.10	37	34
	2.86	38	35
	2.63	39	36
	2.42	40	37
	2.22	41	38
	2.02	42	39
	1.84	43	40
	1.75	29	27
	1.67	44	41
	1.50	30	28
	1.35	46	43
	1.27	31	29
	1.05	32	30
	0.85	33	31
	0.66	34	32
	0.48	35	33
	0.31	36	34
	0.15	37	35
	0.00	38	36
	0.14	39	37
	0.28	40	38
	0.40	41	39
	0.53	42	40
	0.64	43	41
	0.75	44	42
	0.86	45	43
0.96	46	44	
1.14	24	23	
1.32	25	24	
1.47	26	25	
1.62	27	26	
1.75	28	27	
1.88	29	28	
2.00	30	29	
2.11	31	30	
2.21	32	31	
2.30	33	32	
2.39	34	33	
2.48	35	34	
2.63	37	38	
2.77	39	38	
2.89	41	40	
3.01	43	42	
3.16	46	45	

adjusted in the range of +0.38 to -0.34 to meet the conformity requirements (see Figure 4).

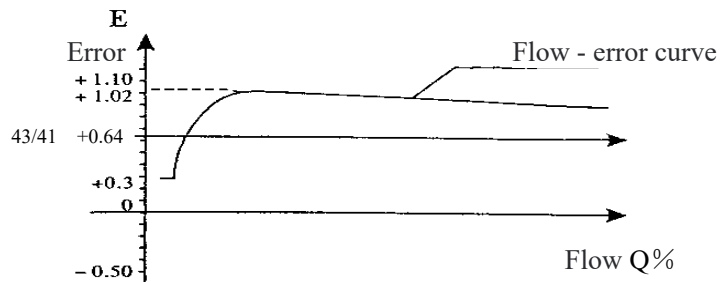


FIG. 4

2.2 Flowmeter in use, due to different working conditions and changes, the error often changes, may be out of tolerance, as long as the error range does not exceed 1%, generally can be adjusted to qualified, such as the instrument error drops to +0.2 ~ -0.69, and need to replace the double-layer gear, first should see how many teeth of the double-layer gear, if 38/35 is adjusted according to (1) method, If it is 43/41 gear, the corresponding error +0.64 of the gear should be taken as zero (that is, the coordinate origin), then the 43/41 gear should be changed into 41/39 double gear, then the error curve origin will be moved down from the zero position corresponding to 43/41 to the +0.40 position of 41/39 gear. In this way, the error can be adjusted to the range of +0.44 to -0.45 to ensure conformity (see Figure 5).

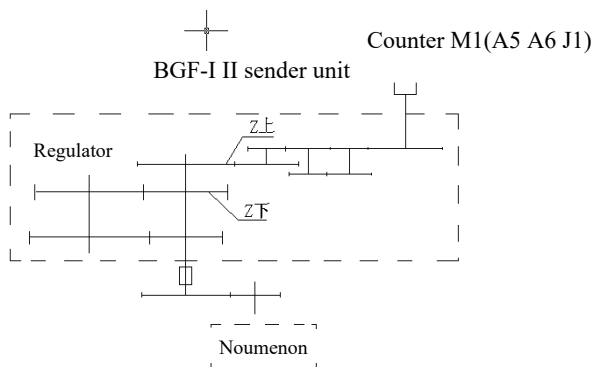


FIG. 5

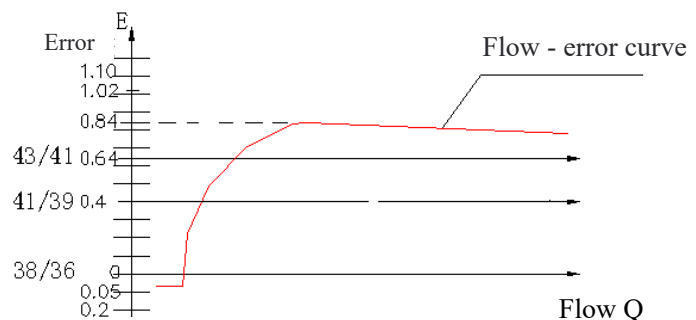


FIG. 6

## Use, maintenance and repair

### 1. Flow meter operation before starting

After the flow meter and pulse transmitter are installed, let the fluid slowly pass through the bypass of the horizontal line to clean the impurities in the line. And note that the temperature, pressure and flow of the fluid can not exceed the limited range. When the operating temperature is higher than 65 °C, the operation specified in Article 3 shall be strictly installed.

### 2. Start-up process for room temperature use

After pipe cleaning, start as follows:

- a. Connect the DC power supply to the pulse transmitter
- b. Open bypass valve 3, see Figure 2



- c. Slowly open the upstream valve of the flowmeter 1
- d. Slowly open the downstream valve of the flowmeter 2
- e. Close the bypass valve 3
- f. Check whether the temperature, pressure, flow rate, etc. comply with the specified range

When it is necessary to use a large word counter to reset zero, the grip wheel on the right side of the counter should be pressed in, so that the word wheel rotates clockwise until all the word wheels are reset to zero. Pay special attention to when the flow meter is running, it is strictly prohibited to zero the large word counter, otherwise the counter will be damaged.

### 3. High temperature used in the start-up process

When the use temperature is higher than 65 ° C, in order to avoid permanent damage to the flow meter, it is necessary to preheat the flow meter for 10-15 minutes before high temperature use, and the starting procedure is as follows:

- a. Valves 1 and 2 are closed, as shown in Figure 2.
- b. Gradually open the bypass valve 3 until the temperature of the pipeline reaches the working temperature and is stable, then the valve 3 can be fully opened.
- c. When bypass valve 3 and valve 1 are fully open, open valve 2 by about 5% so that the fluid can pass through the flow meter. At this time, if the flow meter rotor is stuck or makes noise, do not change the opening position of valve 2. The opening of valve 2 should not be further opened until the internal temperature of the flowmeter is completely stable and the rotor is in normal operation.
- d. After the rotor is running normally, gradually open the opening of valve 2.
- e. When valve 1 and valve 2 are fully open, gradually close valve 3 and adjust the opening of valve 2 so that the flow of fluid is stable within the controlled flow range.

Note: The above procedure must be followed each time the flowmeter is raised from normal temperature to operating temperature above 65 ° C.

### 4. Flowmeter maintenance

- ★When the flow meter is used, it is necessary to regularly check whether the temperature, pressure and flow rate are limited within the specified range;
- ★When the flow meter is running, pay attention to whether the flow meter has noise, whether the word wheel counter is normal, and whether the pressure loss is stable;
- ★Clean the filter regularly;
- ★Check and inspect the flowmeter regularly;
- ★When it is necessary to close the flow timing, first fully open the valve 3, then slowly close the valve 2, and then close the valve 1, to prevent the sudden closure of the flow meter inlet and outlet valve, to avoid a sudden rise in pipeline pressure, damage the flow meter and other equipment;



### 5. Flowmeter troubleshooting method

Fault symptom	Possible causes of the fault	Remove method
Fluid cannot be increased by flowmeter or differential pressure	Rotor (scraper) or measuring chamber side wall damage	Repair the bruise
The indicated traffic value is lower than the actual value	Bypass valve leakage The traffic is below the lower limit	Repair or replace bypass valves Increased flow value
The indicated traffic value is higher than the actual value	There is air in a pipe or liquid	Remove air from pipes or liquids
There is fluid passing through the flowmeter, but the direct reading counter word wheel does not turn	The transmission component is loose or damaged Counter transmission is damaged	Repair or replace transmission parts Replace the counter drive
With fluid passing through the flowmeter, the direct reading counter word wheel rotates normally, but there is no input signal from the display meter or computer	Pulse transmission line damaged Pulse transmitter damaged	Check transmission line Replacement pulse generator

### Ordering instructions

- 1、 Name, model, specification, material.
- 2、 Medium temperature, working pressure, flow range.
- 3、 Medium viscosity value or medium name.
- 4、 There are no special requirements (e.g. explosion-proof, etc.).
- 5、 Pipe flange standard requirements, installation method.
- 6、 Name of ordering and receiving unit.
- 7、 Mailing address, telephone number, postal code.
- 8、 Settlement unit, bank, account number.
- 9、 Transportation mode, arrival station name, contact person.
- 10、 For more information about our products, please write to us for information.
- 11、 The company's products implement three guarantees. Track maintenance during service life.

## JINGDA service concept

- Ensure that customers rest assured to choose fine large products.
- The convenience of customers is the trust of enterprises.
- Every day a company loses a customer is another day it loses a market.
- Service first find their own problems, giving priority to the interests of customers.
- Customers will not use JINGDA products, it is not the customer's fault, but our service work is not done.

## JINGDA service principle

- Process first, analyze later.
- Act first, talk later.
- Get it right the first time.



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