

The selection is detailed on page 11

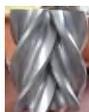


FG80-D Spiral Rotameter

Working principle

The spiral rotameter consists of a flow transmitter and a counter. The main part of the transmitter is composed of a measuring chamber equipped with a pair of special toothed spiral rotors and a sealing coupling. The counting mechanism includes a decelerating mechanism, a precision adjusting mechanism, a word wheel accumulator and an electric pulse transmitter.

The measuring room is mainly equipped with a sealed cavity composed of a special rotor and a cover plate as a measurement unit of flow. The rotor is rotated by the pressure difference at the inlet and outlet of the flow meter, so that the liquid at the inlet is constantly measured by the sealed cavity and sent to the outlet. The amount of liquid flowing through each revolution is eight times that of the sealing chamber in the figure. The total number of rotations of the rotor and the speed of rotation are transmitted to the counting mechanism by the sealing coupling, and the pointer is displayed and the word wheel is accumulated, so that the total amount of liquid in the pipeline can be known. In the counting mechanism can also be installed pulse transmitter, that is, a flow meter with a signal, with the company's electric display instrument, can achieve remote transmission (quantitative, cumulative, instantaneous and other functions) automatic measurement and control. See also the instructions for display meter classification.



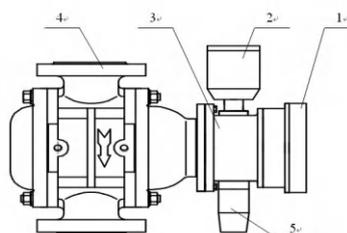
Product description

Spiral rotameter is a high precision measuring instrument for continuous measurement of liquid flow in pipeline. The flowmeter is the latest generation of positive displacement flowmeter manufactured by the introduction of technology, with no pulsation, very low noise, high precision, high reliability, large range, small pressure loss, strong viscosity adaptability, can measure high temperature, high viscosity liquid, easy calibration, easy installation and many other advantages.

The flowmeter is equipped with field pointer display and word wheel accumulation counting device, which can directly display the accumulated flow of liquid flowing through the pipeline, and can also be connected with electronic instruments or computers through the transmitter for remote display.

Product application

Commercial trade measurement and project management control in petrochemical, chemical, chemical fiber, transportation, commerce, food, medicine and health industries.



1. counter
2. sender
3. Precision regulator
4. Flow transmitter
5. External finisher



Technical parameter

1, Accuracy level: 0.5, 0.2

2, The measured liquid temperature °C : (ambient temperature can be -41°C ~ +60°C) 0.5 (-20°C ~ +80°C); Grade 0.2 (-20°C ~ +60°C);

Under the high temperature adjustment, the high temperature radiator can reach 250°C

3, Repeatability error: the repeatability error of the flowmeter does not exceed 1/3 of the absolute value of the basic error limit of the flowmeter

4, Flange standard: GB/T9113.1-2000

5, Flow range m³/h (accuracy 0.5)

Model number	caliber	viscosity mPa.s						
		0.3~0.8	0.8~2	2~15	15~400	400~1000	1000~2000	2000~3500
		Gasoline	kerosene	Diesel, engine oil	Heavy oil	High viscosity liquid		
FG80-D	25	3~9	1.5~10	1~10	1~10	1~8	1~8	1~6
	40	3~9	1.5~10	1~10	1~10	1~8	1~8	1~6
		7~20	3~22	2.5~25	2.5~25	2~18	2~18	3~12
	50	7~20	3~22	2.5~25	2.5~25	2~18	2~18	3~12
		9~36	4.5~36	3.6~36	3.6~36	2.8~25	2.8~25	4.5~18
	80	9~36	4.5~36	3.6~36	3.6~36	2.8~25	2.8~25	4.5~18
		20~80	10~80	10~100	10~100	6.5~56	6.5~56	5~40
	100	20~80	10~80	10~100	10~100	6.5~56	6.5~56	5~40
		25~100	20~100	15~150	15~150	8.5~80	8.5~80	6.5~55
	150	25~100	20~100	15~150	15~150	8.5~80	8.5~80	6.5~55
		55~225	30~250	25~250	25~250	18~150	18~150	10~100
	200	55~225	30~250	25~250	25~250	18~150	18~150	10~100
		90~360	50~400	40~400	40~400	28~240	28~240	20~160
	250	90~360	50~400	40~400	40~400	28~240	28~240	20~160
		130~540	65~540	60~600	60~600	42~360	42~360	30~240
	300	130~540	65~540	60~600	60~600	42~360	42~360	30~240
220~800		110~900	95~950	95~950	70~600	70~600	54~450	
350	220~800	110~900	95~950	95~950	70~600	70~600	54~450	

Flow range m³/h (accuracy 0.2, 0.3)

Model number	caliber	viscosity mPa.s						
		0.3~0.8	0.8~2	2~15	15~400	400~1000	1000~2000	2000~3500
		gasoline	kerosene	Diesel, engine oil	Heavy oil	High viscosity liquid		
FG80-D	25	3.5~8	3~10	2~10	2~10	2~8	2~8	2~6
	40	3.5~8	3~10	2~10	2~10	2~8	2~8	2~6
		8~20	5.5~22	4.5~22	4.5~22	4~18	4~18	3~12
	50	8~20	5.5~22	4.5~22	4.5~22	4~18	4~18	3~12
		15~36	9~36	7~36	7~36	6~25	6~25	4.5~18
	80	15~36	9~36	7~36	7~36	6~25	6~25	4.5~18
		30~80	20~80	15~80	15~80	14~56	14~56	10~40

Technical parameter

FG80-D	100	30~80	20~80	15~80	15~80	14~56	14~56	10~40
		40~100	25~100	20~120	20~120	18~72	18~72	14~55
	150	40~100	25~100	20~120	20~120	18~72	18~72	14~55
		88~220	57~225	44~220	44~220	38~150	38~150	25~100
	200	88~220	57~225	44~220	44~220	38~150	38~150	25~100
		150~360	90~360	72~360	72~360	50~210	50~210	40~160
	250	150~360	90~360	72~360	72~360	50~210	50~210	40~160
		180~540	135~540	100~540	100~540	90~360	90~360	60~240
	300	180~540	135~540	100~540	100~540	90~360	90~360	60~240
		250~800	220~900	180~900	180~900	150~600	150~600	110~450
	350	250~800	220~900	180~900	180~900	150~600	150~600	110~450

Note: Accuracy can be improved upon special requirements.

6, the main component materials and nominal pressure

Model number	Shell, front cover, back cover	Cover plate	Helical rotor	Shaft	Shaft sleeve	Nominal pressure (MPa)
FG80-D	Cast steel	Cast steel	Cast iron, aluminum alloy, Gold, stainless steel	Stainless steel	graphite	DN100 below 4.0; DN150 and above 2.5
FG80-DA/B	Stainless steel	Stainless steel		Stainless steel	Graphite/ball weighing shaft	1.6, 2.0, 2.5
FG80-D	Double body flow meter, specifications for DN80, DN100, DN150 nominal pressure 6.3MPa; The nominal pressure of DN200 is 4.0MPa					
Note	FG80-DA material is 0Cr18Ni12Mo2Ti; The FG80-DB material is 0Cr18Ni9Ti					

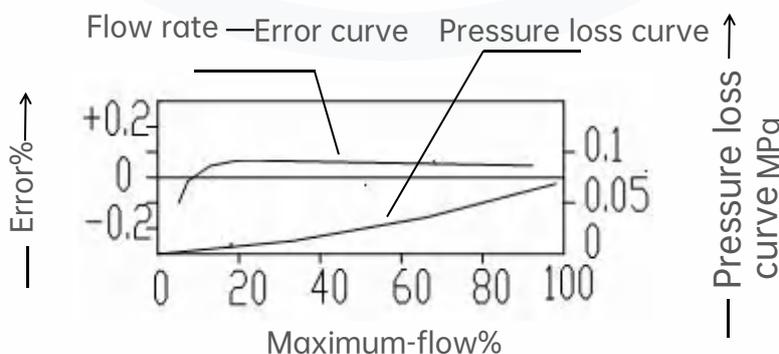
Note: Special requirements can be specially designed

7, measurement features

- The spiral rotor rotates at the same speed in the metering chamber, with equal flow and speed;
- Smooth operation, very low noise;
- Large flow, small pressure loss;
- The constant velocity rotating fluid pulsation of spiral rotor is small, and the sending pulse is stable and accurate;
- Can be configured with a variety of counters, governors and external fine adjusters;
- Can be installed vertically (please specify when ordering vertical installation, and generally DN200 caliber below).

8, performance (error and pressure loss curve)

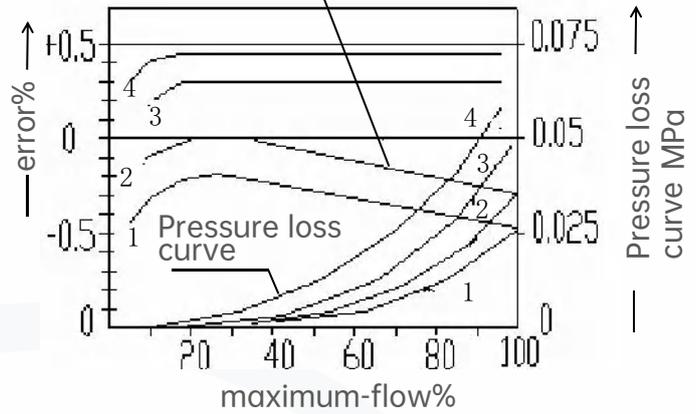
Error and pressure loss curve of 0.2 flowmeter



Curve of error and pressure loss of 0.5 flowmeter

- 1、 Aviation gasoline 0.7mPa.s
- 2、 water 1mPa.s
- 3、 Light diesel oil 5mPa.s
- 4、 Transformer oil 20mPa.s

Flow rate—Error curve



Matching transmitter and accessories

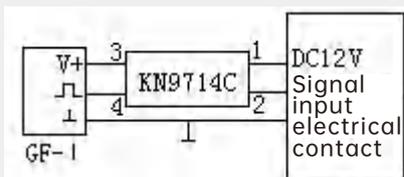
The transmitter is installed on the spiral rotameter (or transmitter) produced by the company, and the signal can be transmitted far, which converts the flow rate of the measured medium into a pulse signal, so as to achieve automatic system control.

GF transmitter

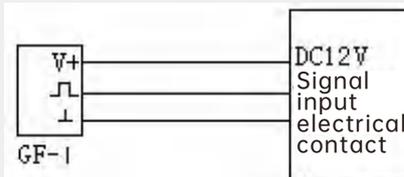
GF transmitter is a pulse transmitter device which is used in ExiallCT6 and dlICT6 with spiral rotameter. The explosion-proof forms are intrinsically safe and flameproof respectively. There are obvious explosion-proof marks on the shell and nameplate. GF transmitter is connected with the safety grid and used with the display instrument.

GF-I Technical characteristics of transmitter

- 1. Working voltage DC12V±10%
- 2, output signal: voltage pulse high level is greater than 9V voltage pulse low level is less than 0.5V
- 3, supporting safety grid: KN9714C
- 4, three-wire system (positive power supply, signal, power supply)
- 5. Intrinsic safety explosion-proof connection diagram
- 6, general and flameproof interface circuit diagram



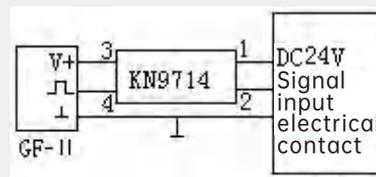
Secondary instrument



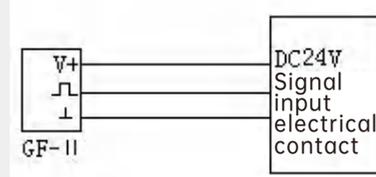
Secondary instrument

GF-II Technical characteristics of transmitter

- 1. Working voltage: DC24V±10%
- 2, output signal: voltage pulse high level is greater than 20V voltage pulse low level is less than 1V
- 3, supporting safety fence: KN9714
- 4, three-wire system (positive power supply, signal, power supply)
- 5. Intrinsic safety explosion-proof connection diagram
- 6, general and flameproof interface circuit diagram



Secondary instrument



Secondary instrument

MF series 4 ~ 20mA analog output transmitter

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. At the same time, the output flow pulse signal is used to integrate the flow value.

1. Four-wire system (positive power cord, 4~20mA current line, pulse signal line, power ground wire)
 Note: Only 4~20mA output is three-wire system, the pulse signal line is not imported at the time of supply
- 2, flowmeter direct output 4~20mA, long transmission distance, safe and reliable.
3. Naming method

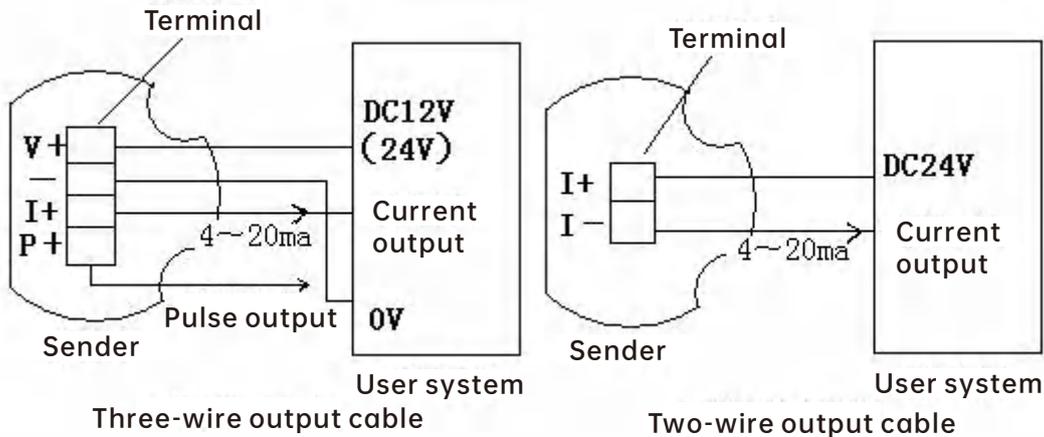


Technical parameter

1. Output signal:
 - a, analog volume 4~20mA
 - b, Voltage pulse: VL<0.5V VH>9V 12V;
2. Allowable error:
 - VL<1V VH>20V 24V;
- Analog: ±0.5%FS
- Pulse quantity: ±1 pulse
3. Ambient temperature
 - 41 ~ +60°C (with explosion-proof requirements -10°C ~ +60°C)
- 4, analog load resistance (client)
 - <400Ω 12V power supply
 - <800Ω 24V power supply
5. Power Supply
 - DC12V±10% 60mA
 - DC24V±10% 60mA
- 6, explosion-proof mark: ExialICT6, ExdIICT6

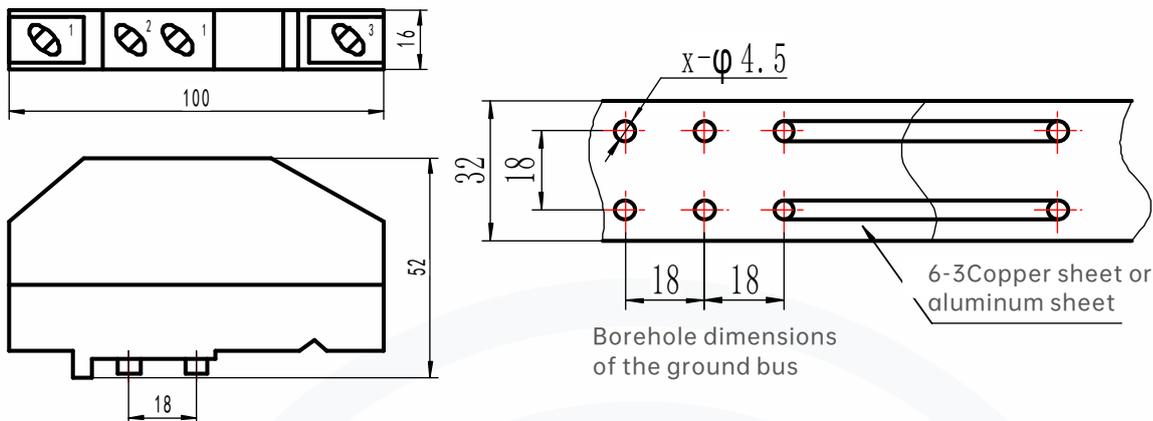
User notice

When ordering, the user should indicate whether it is 24V DC power supply or 12V power supply. And connect according to the picture below.



Safety grid profile and mounting size (FG80-U)

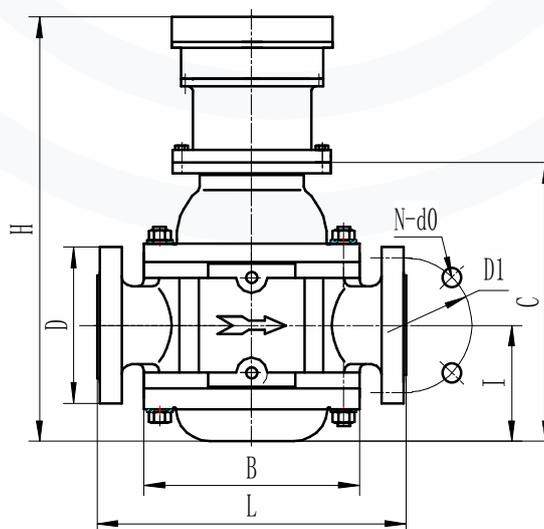
Note: The company can support the FG80-U safety grid, the user must specify when ordering



Parameter table of pulse transmitter and spiral rotameter

DN	L/P	P/S	DN	L/P	P/S
Model number			Model number		
0252	0.01	277	1501	0.1/1	417/41.7
0401	0.01	277	1502	1	69.4
Caliber			2001	1	69.4
0402	0.1	69.4	2002	1	111.1
0501	0.1	69.4	2501	1	111.1
0502	0.1	100	2502	1	166.7
0801	0.1	100	3001	1	166.7
0802	0.1	227.8	3002	1	263.9
1001	0.1	227.8	3501	1	263.9
1002	0.1/1	417/41.7			

Outline and mounting dimensions



Spiral rotameter dimensions

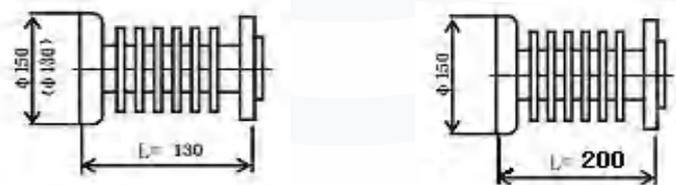
Stainless steel oval gear flowmeter dimensions

Model number	Connection path	L		H	B	C	I	D	D1	N	d ₀	Stress APa	Reference weight
		Standard	Disome										
FG80-D	25	300		420	175	228	90	115	85	4	14	The flange in this table uses 4.0MPa as an example	29
	40	300		420	175	228	90	150	110	4	18		33
		300		450	200	258	112	150	110	4	18		40
	50	300		450	200	258	112	165	125	4	18		42
		340		525	240	333	150	165	125	4	18		62
	80	340		525	240	333	150	200	160	8	18		64
		380	400	580	285	388	175	200	160	8	18		94
	100	380	400	580	285	388	175	235	190	8	22		98
		440	450	660	339	468	250	235	190	8	22		146
	150	440	450	660	339	468	250	300	250	8	26		152
		500	560	740	410	548	270	300	250	8	26	238	
	200	500	560	740	410	548	270	360	310	12	26	245	
		550	700	820	455	628	285	360	310	12	26	The flange is 2.5MPa	337
	250	550	700	820	455	628	285	425	370	12	30		350
		700		910	550	718	350	425	370	12	30		570
	300	700		910	550	718	350	485	430	16	30		600
		800		1010	645	818	415	485	430	16	30		855
	350	800		1010	645	818	415	555	490	16	30		890

Note:

- (1) The size of "H" is the size of the G-type governor and A5/A6;
- (2) Flowmeter with thermal insulation jacket, heat source inlet and outlet for DN15 flange connection method;
- (3) If the high temperature radiator is configured, please add the radiator size to the table H size, that is, the total height of the high temperature flowmeter;
- (4) Ring M12 below 100 caliber; 150 caliber above the ring M16;
- (5) The nominal pressure of the two-body flowmeter can reach 6.3MPa; DN200 nominal pressure up to 4.0MPa. Specially designed up to 10MPa

Radiator



Note: T appears in the model for high temperature flowmeter, used for 60 ~ 120°C, no radiator can be configured without a transmitter;

T1in the model is a high temperature flowmeter, used for 120 ~ 250°C, equipped with a long radiator;

T2in the model is a high temperature flowmeter, used for 60 ~ 120°C with a transmitter, equipped with a short radiator.

FG80-D spiral rotameter with insulated jacket

In order to facilitate the normal transportation and flow detection of the medium that is easy to solidify at normal temperature, or easy to condense and crystallize at a certain temperature in the pipeline, it is often necessary to heat the medium in the system pipeline so that the medium melts and keeps heat. However, since the installation of the spiral rotameter is not allowed to directly through the steam (the purpose is to prevent damage to the flowmeter), for this reason, our company designed a series of flowmeter products with thermal jacket, that is, to increase the thermal jacket outside the flowmeter shell, hot water, hot oil or steam below 200°C can be used to pass into the thermal jacket, so that the flow meter (or through the filter) in the solidified medium melt. And maintain a certain temperature, so as to ensure the normal operation of the flowmeter.

The filter installed before the spiral rotameter can also be in the form of a thermal jacket structure.

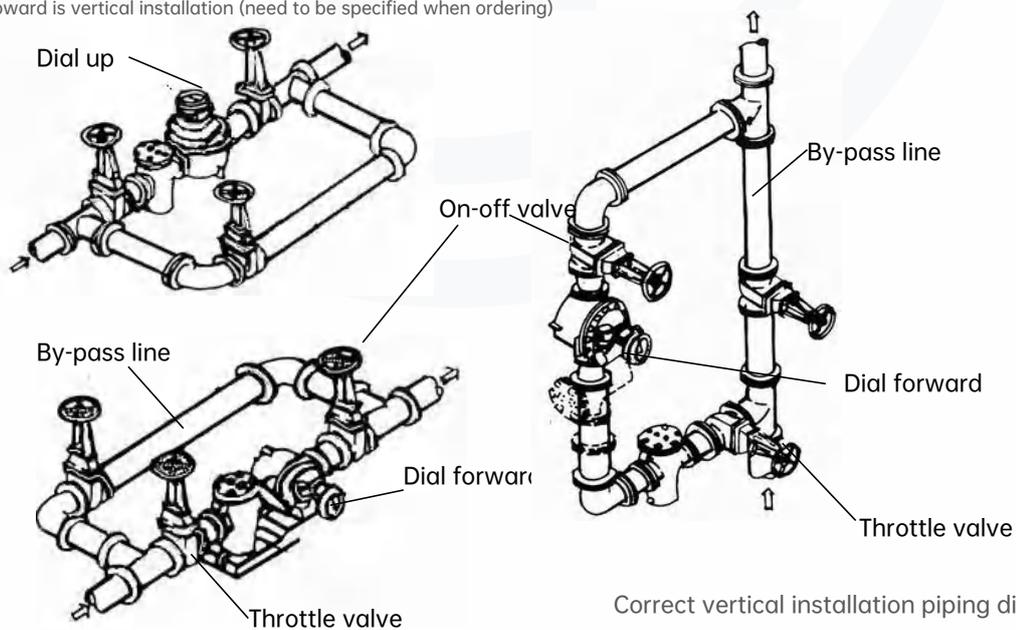
The inlet and outlet interface of the thermal insulation jacket is generally designed in accordance with DN15 caliber flange, and the interface of the user's special requirements can also be designed.

The nominal pressure of the insulation jacket is 0.5MPa, and it can also be designed according to the nominal pressure of the special requirements of the user.

Installation and use of spiral rotameter

- 1, the filter should be installed before the flow meter, and the arrow on the shell of the two is pointing in the same direction as the flow.
- 2, when the measured liquid contains gas, the flow meter should be installed before the gas separator.
- 3, flowmeter in the correct installation of the case, if it is not easy to see the reading, you can turn the counter to 180° or 90°, can be.
- 4, the new flow meter in the installation of the first bamboo stick from the exit to push the gear several times, if found not moving, you can use gasoline immersion (to avoid the factory verification after the memory sediment).
- 5, the throttle valve should be installed at the entrance of the flow meter, the opening and closing valve is installed at the exit, the use of the opening and closing valve to start slowly, do not suddenly open the valve.
6. It is strictly prohibited to use sweeping steam through the flowmeter.
- 7, in the continuous use of the department, the flow meter must be added bypass pipeline.
- 8, before the installation of the flow meter, the pipe must be washed, and the straight pipe section (instead of the flow meter position) is used to prevent welding slag, debris, etc., from entering the flow meter.
- 9, it is strictly prohibited to check the flow meter composed of cast iron and cast steel with water.
- 10, flowmeter in the use of flow size shall not exceed the technical requirements. The flowmeter works at a maximum flow rate of 40-80%.

Dial upward is vertical installation (need to be specified when ordering)



Correct horizontal installation piping diagram

Correct vertical installation piping diagram

Error calculation and adjustment

The basic error of the flowmeter is calculated from 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 -- the value measured by the flowmeter (i.e. the value shown)

V -- After correction, the flow standard device measured value (i.e. the actual value)

Calculated by the basic error formula, when

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

When $V_m < V$, 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.

Spiral rotameter error adjustment method (error adjustment table instructions)

Common error adjustment method

1. The standard double gear at the time of design is 38/35. If the flow meter is found to go faster during inspection, there will be (+) error, such as +1.02 ~ +0.3, the double gear 38/35 should be replaced by 41/38, then the error curve origin will be the zero position corresponding to the 38/35 gear. Move up to the position of the 41/38 gear pair at +0.6338/35 (see table), so that the error curve is in the new coordinate system, and the error of the flowmeter is adjusted in the range of +0.39 to -0.33 to meet the conformity requirements (see Figure 1).

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 -0.7 ~ +0.2, 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 41/38 gear, the corresponding error +0.63 of the gear should be taken as zero (that is, the coordinate origin), then the 41/38 gear should be replaced with 40/37 double-layer gear, and the error can be adjusted to the range of -0.5 ~ +0.4 to ensure conformity (see Figure 2).

3. The specific method of calibration and adjustment of 0.2 spiral rotameter is according to the national metrological verification regulations JJG667-1997 "Liquid Positive Displacement flowmeter verification Regulations".

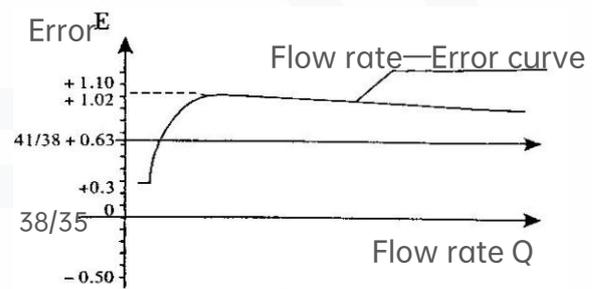


Figure 1

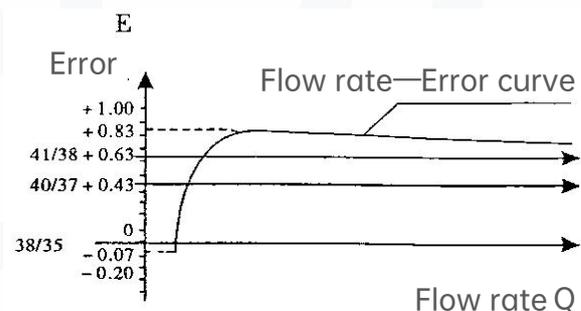


Figure 2

External finisher error adjustment method

GF3 is an external precision regulator, in the error adjustment of the flow meter, do not need to remove the governor can be directly adjusted in the external, easy to operate, simple and accurate.

Examples of adjustment methods:

When the calibration flowmeter appears an error of +0.63 ~ 0.67%, after unscrewing the cover of the external regulator, you can see the left and right two knobs, and adjust according to the surface scale of the external fine regulator. Coarse adjustment of 0.45% specifications per grid, adjust the coarse adjustment gear in the negative direction by one grid, that is, -0.45%, which can make the original error +0.63 ~ +0.67% theoretically adjusted to +0.18 ~ +0.22%, then adjust the fine-tuning gear in the negative direction by 2 grid, the adjustment amount is $0.05 \times 2 = 0.10\%$. Then +0.18 ~ +0.22% is adjusted to +0.08 ~ +0.12, achieving the best error value.

It is recommended that the high precision (0.2 class) flowmeter be configured with GF3.

Error adjustment table

Instructions	Error adjustment%	Adjusting gear group		Error adjustment %	Adjusting gear group	
		ZUp	Z down		ZUp	Z down
Z Up、 Z down → ← Instrument indication value	4.21	33	30	0.28	40	38
	3.90	34	31	0.40	41	39
	3.62	35	32	0.53	42	40
	3.35	36	33	0.64	43	41
	3.10	37	34	0.75	44	42
	2.86	38	35	0.86	45	43
	2.63	39	36	0.96	46	44
	2.42	40	37	1.14	24	23
	2.22	41	38	1.32	25	24
	2.02	42	39	1.47	26	25
	1.84	43	40	1.62	27	26
	1.75	29	27	1.75	28	27
	1.67	44	41	1.88	29	28
	1.50	30	28	2.00	30	29
	1.35	46	43	2.11	31	30
	1.27	31	29	2.21	32	31
	1.05	32	30	2.30	33	32
	0.85	33	31	2.39	34	33
	0.66	34	32	2.48	35	34
	0.48	35	33	2.63	37	38
	0.31	36	34	2.77	39	38
	0.15	37	35	2.89	41	40
	0.00	38	36	3.01	43	42
	0.14	39	37	3.16	46	45

FG80-D-Selection composition

Selection example **FG80-D** **A** **H** **S** **1-10** **N** **A** **G** **N** **V**

1 2 3 4 5 6 7 8 9

1.Instrument type	A	integrated
	B	Other mounting forms
2.Working power supply	G	Ac 220V
	H	Dc 24VDC
	I	Battery power 3.6V
3.Output signal	S	4-20mA
	O	4-20mA+HART
	P	Pulse
	Q	RS485
	N	4-20mA+ switching output
4.Range range	R()	Range (Note range range)
5.Explosion-proof requirement	X	Intrinsically safe explosion protection
	Y	Flameproof
	N	Non-explosion proof
6.Medium temperature	A	< 65°C
	B	< 120°C
	C	-196°C-200°C
7.Material	G	304 stainless steel
	H	316 stainless steel
	I	Aluminium alloy
	J	PP
	T()	Other materials
8.Sealing material	N	FKM
	O	PP
	T()	Other materials



FG80-D-Selection composition

Selection example **FG80-D** **A** **H** **S** **1-10** **N** **A** **G** **N** **V**

1 2 3 4 5 6 7 8 9

9.Flange connection	P	DN25
	U	DN40
	V	DN50
	W	DN80
	Q	DN100
	X	DN150
	Y	DN200
	Z	DN250
	A	DN300
	B	DN350
	T ()	Other flange connection
10.Special requirements	Y	hyperthermia
	Z	High tension

Instructions:

It indicates that the FG80-D spiral rotammeter is integrated, the power supply is 24VDC, the output signal is 4-20mA, the measuring range is 1-10t/h, no explosion proof, the medium temperature is < 65°C, the material is 304 stainless steel, the sealing material is FKM, and the flange connection is DN50, the 10th part in the above table is not required.

Product certification

Compliance and approval; Ludwig flow meters meet key standards and certifications for process measurement technology; Thus guaranteeing the highest reliability in such Settings;

