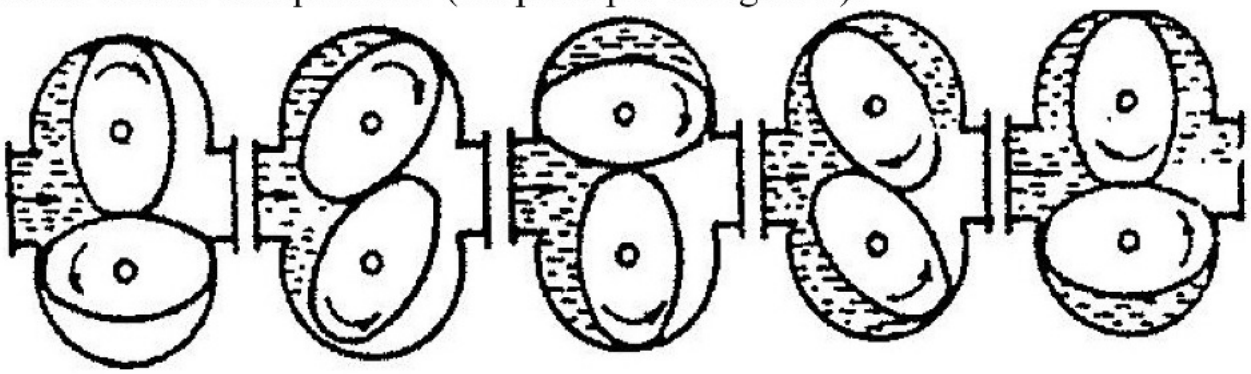
Oval Gear Flow Meter

1、Using

Oval gear flow meter is a pointer display .It is a kind of light volume flow meter of which the print wheel has cumulative count and zero. This flow meter is widely used in various industrial areas to control the liquid flow. It is applicable to all types of liquid measuring, such as crude oil, diesel, gasoline and so on, with great range and high precision, convenient use and maintenance. Different materials selected can meet the petroleum, chemical, pharmaceutical, food, metallurgy, electricity, transportation and other fields of liquid flow measurement.

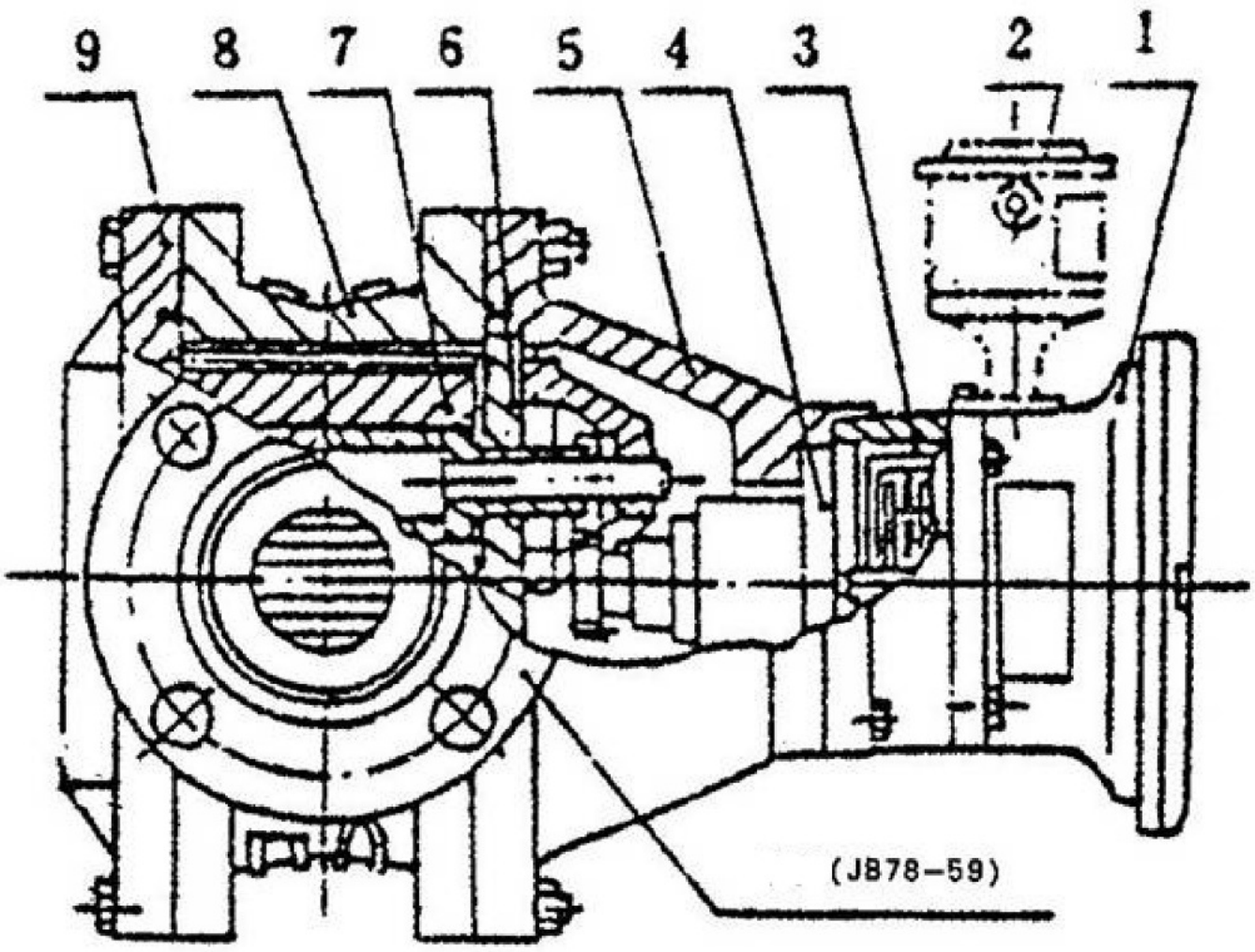
2、The working principle and structure

Flow meter is installed in the metering tank and the measurement of a pair of oval box gear, with the upper and lower cover an early Lunar sealed cavity (due to rotation of the gear, so sealing is not an absolute) as a unit of emissions. When measured by the pipe into the liquid flow meter, due to pressure generated by the Import and Export Department to promote a pair of differential gears for rotation, the constant measurement by cavity after the beginning of the Lunar liquid delivery to the exit, elliptical gear with each revolution time displacement is the product of four times the measured volume of liquid flow (the principle of Figure 1).



Picture 1　Oval gear operation Schematic

The flow meter is composed by the shell, counter, oval gear and coupling (magnetic coupling and sub-axial coupling). (Reference to picture 2).



(Picture 2) Oval gear flow meter structure

1、 Counter 2、 Output signal device 3、 Precision regulator (DN50 and above only)

4、 Sealing coupling 5、Front cover 6、Cover

7、 Oval gear 8、 Shell 9、Rear cover

3、 Technical Data

（1）Ordinary cast iron type（A）， Steel type（E），Stainless steel type （B）

Model / Item	LC-A cast iron		LC-E steel		LC-B stainless steel	
Pressure(Mpa)	1.0 1.6		2.5 4.0 6.4		1.0 1.6	
Measured liquid viscosity	2~200 mpa.s					
Measured liquid temperature	-20℃~+100℃					
Flow range m^3/h						
Model / Size	LC-A cast iron		LC-E steel		LC-B stainless steel	
	Accuracy 0.5	Accuracy 0.2	Accuracy 0.5	Accuracy 0.2	Accuracy 0.5	Accuracy 0.2
10	0.08~0.4	0.1~0.4	0.08~0.4	0.1~0.4	0.1~0.5	0.1~0.5
15	0.25~1.5	0.3~1.5	0.25~1.5	0.3~1.5	0.3~1.5	0.3~1.5
20	0.5~3	0.6~3	0.5~3	0.6~3	0.6~3	0.6~3
25	1~6	1.2~6	1~6	1.2~6	1.2~6	1.2~6
40	2.5~15	3~15	2.5~15	3~15	3~15	3~15
50	4~24	4.8~24	4~24	4.8~24	4.8~24	4.8~24
65	2~40	2.8~40	2~40	2.8~40	2~40	2.8~40
80	10~60	12~60	10~60	12~60	12~60	12~60
100	16~100	20~100	16~100	20~100	20~100	20~100
150	32~190	38~190	32~190	38~190	38~190	38~190

200	34~340	68~340	34~340	68~340	68~340	68~340

（2）High temperature cast iron type（TA）， Steel type（TE），Stainless steel type （TB）

Model / Item	LC-TA cast iron		LC-TE steel		LC-TB stainless steel	
Pressure(Mpa)	1.0 1.6		2.5 4.0 6.4		1.0 1.6	
Measured liquid viscosity	2~200 mpa.s					
Measured liquid temperature	+100℃~+280℃					
Flow range m^3/h						
Model / Size	LC-TA cast iron		LC-TE steel		LC-TB stainless steel	
	Accuracy 0.5	Accuracy 0.2	Accuracy 0.5	Accuracy 0.2	Accuracy 0.5	Accuracy 0.2
10	0.04~0.4	0.1~0.4	0.08~0.4	0.1~0.4	0.1~0.5	0.1~0.5
15	0.24~1.35	0.35~1.35	0.24~1.35	0.35~1.35	0.36~1.35	0.36~1.35
20	0.54~2.7	0.72~2.7	0.54~2.7	0.72~2.7	0.72~2.7	0.72~2.7
25	1.2~5.4	1.4~5.4	1.2~5.4	1.4~5.4	1.4~5.4	1.4~5.4
40	2.7~13.5	3.6~13.5	2.7~13.5	3.6~13.5	3.6~13.5	3.6~13.5
50	4.4~21.6	5.75~21.6	4.4~21.6	5.75~21.6	5.75~21.6	5.75~21.6
80	10.8~54	14.4~54	10.8~54	14.4~54	14.4~54	14.4~54
100	18~90	24~90	18~90	24~90	24~90	24~90
150	38~170	45.6~170	38~170	45.6~170	45.6~170	45.6~170
200	34~340	68~340	34~340	68~340	68~340	68~340

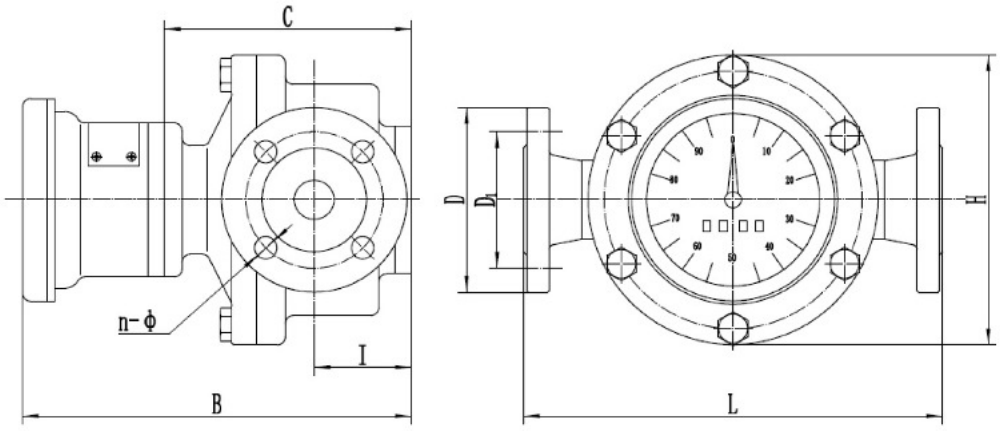
(3)High viscosity cast (NA), steel (NE),

Model / Item	LC-NA cast iron	LC-NE steel	LC-NB stainless steel
Pressure(Mpa)	1.6		2.5 4.0
Measured liquid viscosity	200~3000 mpa.s		
Measured liquid temperature	-10℃~+100℃		
Accuracy	0.5		

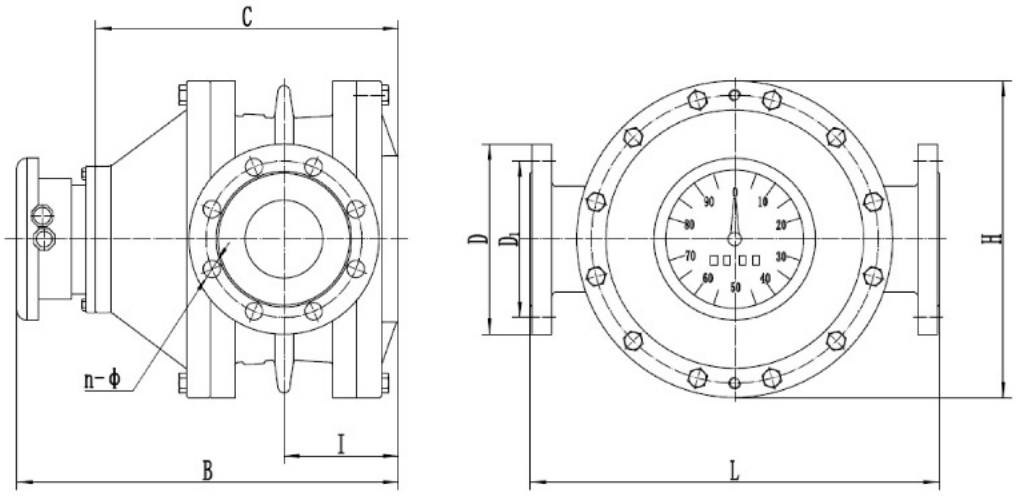
Flow range m^3/h

Diameter DN mm	10	15	20	25	40	50	80	100	150	200
Flow range	0.04~0.2	0.15~0.75	0.3~1.5	0.6~3	1.5~7.5	2.4~12	6~30	10~50	38~100	34~300

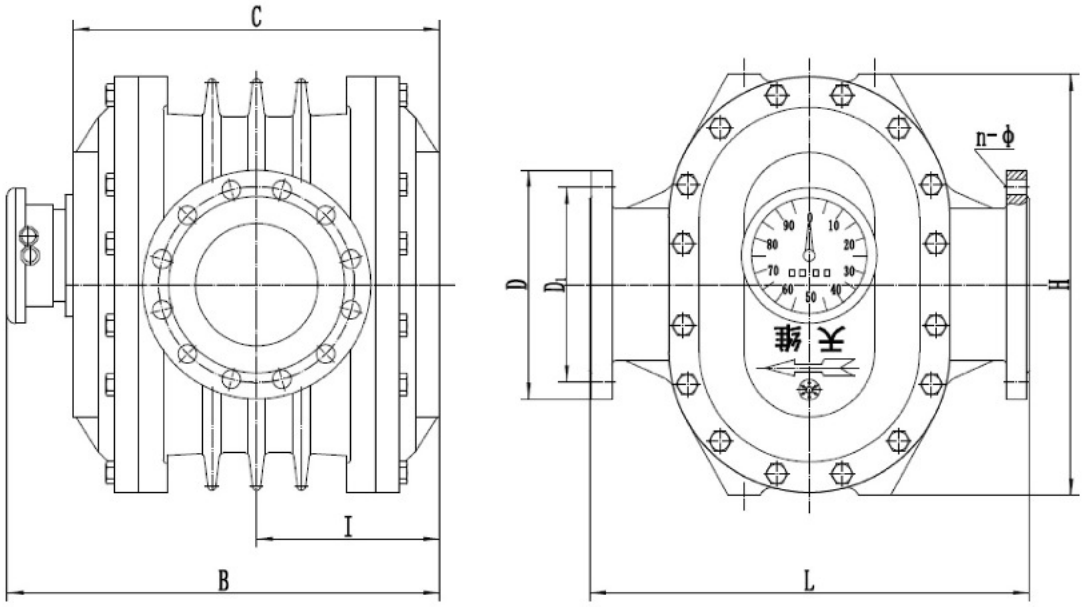
4、Dimensions



DN10-40



DN50-100



DN150、200

(A) The dimensions of the cast iron type, high viscosity cast iron type(size B includes the height of mechanical counter)

DN(Size)	L	H	I	B	C	D	D1	N（个）	Φ	Weight KG
10	150	100	455	213	135	90	60	4	14	6
15	170	118	48	226	147	95	65	4	14	8
20	200	150	53	238	155	105	75	4	14	11
25	260	180	60	246	164	115	85	4	14	18
40	245	180	77	271	199	145	110	4	18	20
50	340	250	88	379	249	160	125	4	18	46
50II	287	201	118	370	287	165	125	4	18	28

65II	265	235	118	410	265	185	142	4	18	40
80	420	325	118	443	311	195	160	8	18	87
80II	265	237	136	450	265	200	160	8	18	67
100	515	418	131	467	337	220	180	8	18	160
150	540	515	210	565	435	280	240	8	23	245
200	650	650	247	624	494	335	295	12	23	400

Unit：mm

B) The dimensions of steel type, high viscosity steel type(size B includes the height of mechanical counter)

Units：mm

DN(Size)	L	H	I	B	C	D	D1	N（个）	Φ	Weight KG
15	200	138	53	220	145	105	75	4	14	12
20	250	164	65	245	165	125	90	4	18	18
25	300	202	68	255	175	135	100	4	18	22
40	300	202	83	285	205	165	125	4	23	27
50	384	262	88	400	270	175	135	4	23	66
80	450	337	118	460	330	210	170	8	23	118
100	555	442	131	485	355	250	200	8	25	210
150	540	510	210	565	435	300	250	8	26	260
200	650	650	247	625	495	300	310	12	26	430

(C) Size of stainless steel type

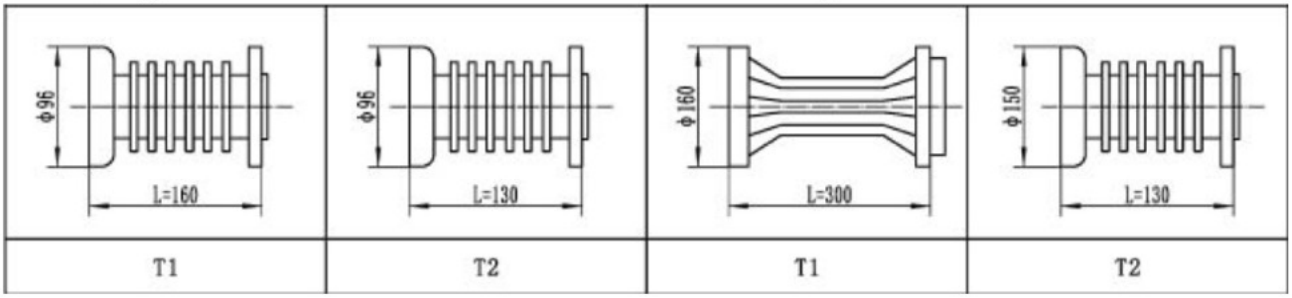
Units：mm

DN(Size)	L	H	I	B	C	D	D1	N（个）	Φ	Weight KG
15	200	120	45	226	226	95	65	4	14	11
20	230	150	48	238	238	105	75	4	14	17
25	280	195	58	246	249	115	85	4	14	21
40	265	178	64	370	370	150	110	4	18	24
50	265	178	92	370	370	165	125	4	18	24
65	365	265	125	460	460	165	145	4	18	56

80	420	305	133	459	459	200	160	8	18	82
100	515	400	181	554	554	220	180	8	18	127
150	540	515	210	607	607	280	240	8	23	280
200	650	650	247	646	646	340	295	12	23	435

The height of high-temperature type is: size B should plus length of colling tube .
Dimension of cooling tube :

Cooling tube for DN 10mm-40mm **Cooling tube for DN50mm-200mm**



5、Other LC series special oval gear flow meter

(I) LC-13 type oval gear flow sensor

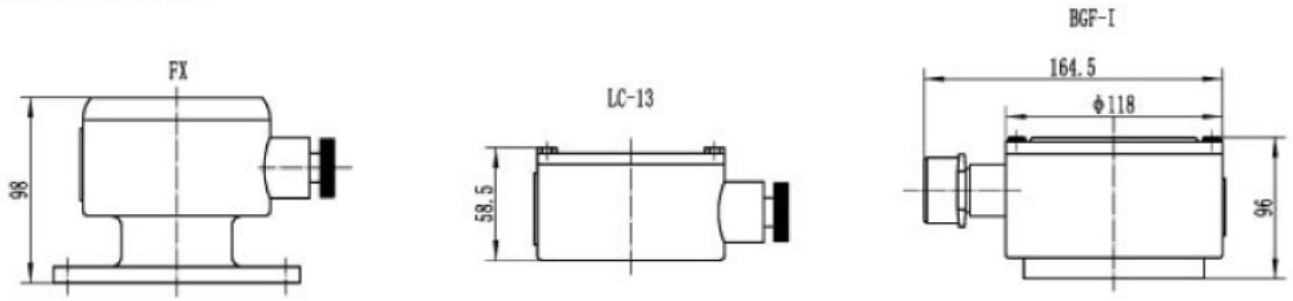
Introduction

LC-13 type oval gear flow sensor consists of body and sender unit,which can transfer the flow of fluid in pipe to pulse signal or analog signal output. It can complete remote reading and automatically control and memorize when the flow pulse signal or analog signal is matched with DH series monitor or other monitors and systems .

Technical parameter

Accuracy:0.5% , 0.2%
Medium temperature:generally at -10~60 deg c
Sender unit : GF,QF,MF,AG19
Sender unit structure: type BGFI , type FX ,type LC13
Anti-explosion : Exia II CT5－FX ， LC13 , d IIBT4－BGFI

Structure Dimension



(II) LC-U type warm keeper flow meter

LC-U type flow meter is designed for fluid needed to measure which is easy to turn to solid or to condense or crystallize in pipeline . This sorts of medium in pipeline should be heated to be melted and keep warm so that the flow of fluid can be measured by flow meter . However , it is not allowed to put into steam where flow meter is installed. In this case , the special designed LC-U flow meter which is added to warm keeper outside of flow meter body is useful. Supplying hot water, hot oil or steam below 200 deg c through warm keeper to melt the solid fluid and keep warm to ensure the flow meter operating smoothly.

Filter installed before flow meter can be also designed to warm keeper type .

The flange diameter of warm keeper is generally 15mm,designed as requirements available .

The nominal pressure of warm keeper is 0.5Mpa ,designed as requirements available .

6、 Flow meter installation

1、Pipes should be thoroughly cleaned before installing, and strainer is before of the flow meter to prevent debris entering the flow meter. The air separator should be installed if the measured liquid containing gas.

2、Attention the gear axis of the flow meter installed must be horizontal position, that is, the counter vertical dial. Regulation valve 、starting valve and closing valve should installed on the meter side of the Import and Export.

3、The direction of arrows on the shell should be installed with the liquid pipe flow direction.

4、 Continuous flow of the pipeline which is horizontal can installed a bypass in order to clean and maintenance. If the flow meter is installed on the vertical pipe, we can install it in the bypass pipe to prevent debris from falling into the instrument.

5、Under the right conditions, according to the needs of the custom, the counter of flow meter can rotating 180° or 90°。

7、Cautions:

1. Do not check flow meter with water when cast iron or steel body material.

2. Starting or stopping, the gate valve should be slow to prevent a sudden shock, and should prevent backflow.

3. When the flow meter repairing, there shall be no demolition of the rear cover so as to avoid re-generated when the impact of changes to the precision accuracy.

4. Calculation and adjustment of the deviation

The deviation of flow meter, flow test points measured every time were determined using the following equation: (volume method)

$$E=Vm-V/V\times100\%$$

E——meter deviation (generally refers to the cumulative deviation) get two Significant figures。

Vm——meter measured number (that is, display number)

V——as amended, the flow meter measured the value of the standard device (that is, the actual number) from the basic formula for calculating the error. When Vm> V, the basic error of flow meter is "+"value, means pointer is go faster.

Vm <V, the basic error of flow meter is "-" value that take the slow flow meter.

In order to make the basic error in the limit of flow meter error, we often need to adjust the error. That is we can replace adjustment gears (adjusted teeth)which are installed in the counter to change the mechanical transmission ratio, so that the flow meter to adjust the show deserves.

Error adjustment can not change the flow meter characteristics, but it curves in artificially in the new coordinate system.

In general, the provisions of (or actual use) the flow range of the maximum and minimum flow test point margin of error of not more than the basic provisions of the basic error of precision limit can be adjusted through the error so that the basic error of flow meter qualified .

Flow meter has been used, the general regulation of first gear with the original error test group, and then the error in accordance with the specific error to adjust the situation further.

8、 other

1, Stainless steel flow meter is for 98% sulfuric acid, 60% nitric acid, 50% liquid caustic soda and other chemical measurement.

2, The instrument before delivery is test with light diesel oil, do not use water, the specific testing in accordance with the national metrological verification <<JJG235-90 oval gear flow meter standards>>.

9、Ordering Information

1、 Name, model, Specifications, materials.

2、 Medium temperature, working pressure, flow range.

3、 Medium or medium viscosity .

4、 Any special requirements (such as explosion-proof, etc.).

5、 The name of order and delivery name.
6、 Detailed mailing address, telephone, telegraph, postal code,
7、 Clearing units, the depositary bank, the account number.
8、 Reaching station, contact.
9、 If you need to learn more about the product, please call for information.
10、Warranty services of factory products, follow-up maintenance in the period.

10、Positive displacement flow meter counter reading methods

Counter	Description	
A、A5	Needle indicator , six digits totalizer flow, liter(L) unit	Needle indicator: 1 L/circle for DN10,10 L/circle for smaller than DN25,100 L/circle for DN40
A1	Same as above ,and available to equipped with transmitter to output signal	
J1	Same as counter A1	100 L/circle for smaller than DN80,1000 L/circle for larger DN100
Z、A6	Two lines digits,six digits as totalized flow,four digits as single flow, zero resettable	Needle indicator:1 L/circle for DN10 , 10 L/circle for smaller than DN25 , 100 L/circle for smaller than DN80, 1000 L/circle for larger than DN100
M11	Two lines digits,seven digits as totalized flow,five digits as single flow ,zero resettable,direction of rotating bearing should be same as of counter screen	Generally equiped with larger than DN80 Flowmeter, totalized flow multiply by 10 L, multiply by 100 L for larger than DN150 flowmeter
M12	Same as above,except that the direction of rotating bearing is vertical to counter screen's direction	
S1	Mechanical instantaneous flow indicator	Instantaneous flow indicator
ELZ	Electronic display,totalized/single/instantaneous and zero clearing	Applied in various flow meter
BELZ	Ex-proof electronic display,totalized/instantaneous flow, analog output	Applied in positive displacement flow meter

11、 Common reasons for failure and solution

Fault phenomenon	Reasons	Measures	Remarks
Oval gear does not turn	1. Debris in pipeline. 2. Measured liquid contains debris which damages the filter and gear get stuck .	Clean up meter and pipeline, repairing filter.	

Axial seal leakage coupling	Seal packing seal wear or lacking of oil	Pressed screw cap or replacement fill, seal oil loading	
Pointer rotation instability, or when the stop-and-go	Indicators, such as pad volumes or loose pieces of rotating non-rotating flexible	Re-fastening, eliminate the phenomenon of non-flexible	
Negative bias in small-flow error is too large	Oval gear encounter with the metering box walls, the reasons for bearing wear, or deformation measurement box	Replacement of bearings, repair of varying tooth Department and gear metering box wall, so that rotational flexibility to ensure that the necessary clearance.	
Error variation is too large	Contains a large pulse of fluid or gas.	Pulse or retrofitted to reduce gas separator	
Error is too large, but the biggest error between them does not exceed ± 1%	More than the use of, or maintenance, such as changes in space	Re-adjustment	
Output device is no signal	1、The device installed in the wrong place	Re-adjust the position	
	2, then the anti-polarity	Into the re - ： 1.“＋” Then the red line 2.“—” Then the black line 。	