

Oval Gear flowmeter

Type LC - Electronic Operation Manual



1. GENERAL INFORMATION

This manual will assist you in installing, using and maintaining Electromagnetic Flow meter. It is your responsibility to make sure that all operators have access to adequate instructions about safe operating and maintenance procedure.



Warning

For your safety, review the major warnings and cautions below before operating your equipment.

1. Use only fluids that are compatible with the housing material and wetted components of your Electromagnetic Flow Meter.
2. When handling hazardous liquids, always exercise appropriate safety precautions.
3. When measuring flammable liquids, observe precautions against fire or explosion.
4. When working in hazardous environments, always exercise appropriate safety precautions.
5. Handle the sensor carefully. Even small scratches or nicks can affect accuracy.
6. For best results, calibrate the meter at least 1 time per year.
7. Do not purge the flow meter with compressed air.
8. During Electromagnetic Flow Meter removal, liquid may spill. Follow the manufacturer's safety precautions for clean up of minor spills

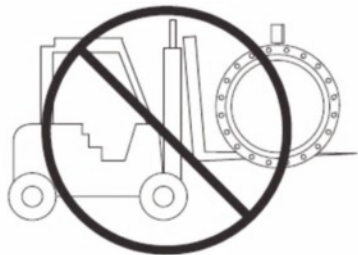
1.2 Unpacking and inspection

Upon receipt, examine your meter for visible damage. The meter is a precision measuring instrument and handled carefully. Remove the protective plugs and caps for a thorough inspection. If any items are damaged or missing, contact us.

Make sure the flow meter model meets your specific needs. For your future reference, it might be useful to record this information on nameplate in the manual in case it becomes unreadable on the meter.

Transportation and Handling

Do not lift the detector from the Converter housing, the junction box or the connecting cable. Use lifting lugs for larger sizes is recommended. Very large meter sizes are packed and crated with the meter laying on its side for shipping safety and stability reasons. In order to lift the meter in vertical position, it's recommended to use a sling rigged method as shown below.



Warning: NEVER introduce the forklift, chains, wire slings or any other sharp object inside the flow tube for lifting or handling purpose. This could permanently damage the isolating liner and could render the meter inoperable.

If using a forklift, do not lift the detector from its body between the flanges. The housing could be accidentally dented and permanent damage could be caused to the internal coil assemblies.



2. USING

Oval gear flow meter is a pointer count accumulated round devices and light devices to zero volume flow meter is widely used in various industrial areas of the liquid flow control, applicable to all types of liquid measurements, such as crude oil, diesel , petrol and so on, with great range and high precision, convenient use and maintenance of the characteristics of different materials selected to meet the petroleum, chemical, pharmaceutical, food, metallurgy, electricity, transportation and other fields of liquid flow measurement.

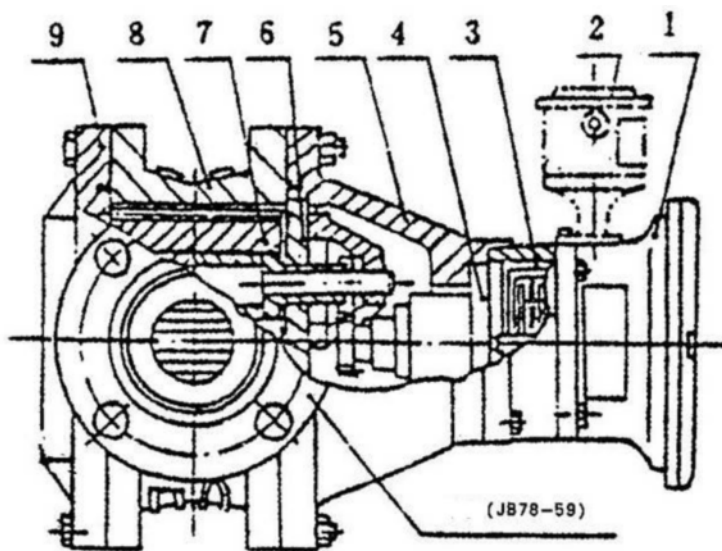
3. THE WORKING PRINCIPLE AND STRUCTURE

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).



Figure 1 Schematic oval gear operation

Mainly by the shell flow meter, counter, oval gear and coupling (magnetic coupling and sub-axial coupling), such as composition (structure see Figure 2).



(Figure 2) oval gear flowmeter structure

1. counter
2. letter device
3. precision regulator (DN50 and above only)
4. sealing the coupling
5. the front cover
6. Flat
7. oval gear
8. the shell 9, the rear cover

4. TECHNICAL DATA

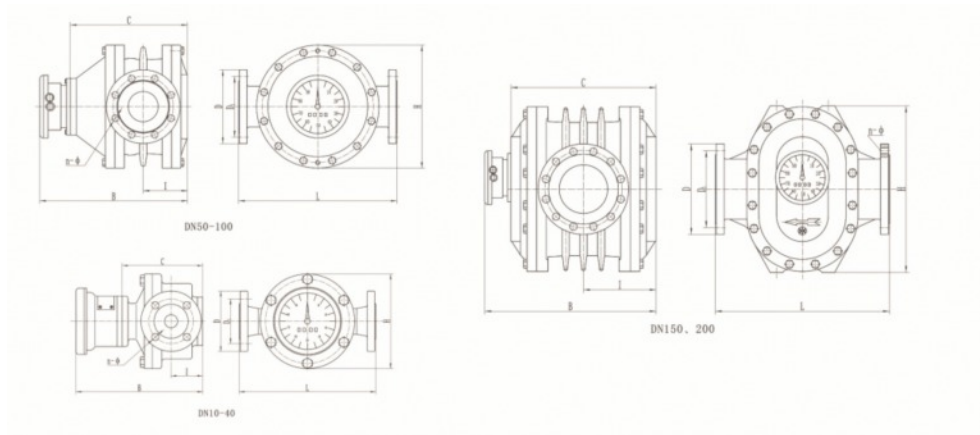
1. Ordinary cast iron type (A); Steel type (E); Stainless steel type (B); Oval gear flow meter

Model Item	LC-A cast iron	LC-E cast	LC-B stainless
Pnmpa	1.0 1.6	2.5 4.0 6.4	1.0 1.6
Tested liquid viscosity	2-8 mpa.s		
Measured temperature of the liquid	-20°C-100°C		
Input	pulse voltage		
Sensor	a. Wiegand sensor(high frequency)		
	b. A.H.Hall sensor(low frequency).		
Display	use the Segment LCD.		
Output	pulse voltage; 4~20mA		
Communication interface	a. RS232		
	b. RS485		
Communication protocol	Modbus		
Power supply	Battery supply; DC3.6V, the battery lasts for 2 years, the battery icon will flash in low battery to prompt user to replace the battery.		
	DC 24V-DC 12V; Pulse output, 4- 20mA output, communication and automatic heating require external power supply.		

Flow range m ³ /h						
Model Nominal size	LC-A cast iron		LC-E cast		LC-B stainless	
	0.50%	0.20%	0.50%	0.20%	0.50%	0.20%
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	0.5-1.5	0.25-1.5	0.5-1.5	0.5-1.5	0.5-1.5
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
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

5. THE OVAL GEAR FLOW METER SIZE

(A) type of cast iron, cast iron blood type, high temperature cast iron, cast iron oval gear flow meter type deformation dimension



Units: mm

DN	L	H	A	B	D	D1	N	Φ
10	150	100	165	210	90	60	4	14
15	170	118	172	226	95	65	4	14
20	200	150	225	238	105	75	4	14
25	260	180	232	246	115	85	4	14
40	245	180	249	271	145	110	4	18
50	340	250	230	372	160	125	4	18
65	420	325	270	386	180	145	4	18
80	420	325	315	433	195	160	8	18
100	515	418	370	458	215	180	8	18
150	540	515	347	557	280	240	8	23
200	650	650	476	720	335	295	12	23

(B) of steel type, steel blood type, high temperature steel oval gear flow meter size

DN	L	H	B	A	D	D1	N	Φ
15	200	138	232	180	105	75	4	14
20	250	164	220	160	125	90	4	18
25	300	202	252	185	135	100	4	18
40	300	202	293	208	165	125	4	23
50	384	262	394	312	175	135	4	23
80	450	337	452	332	210	170	8	23
100	555	442	478	310	250	200	8	25
150	540	510	557	347	300	250	8	26
200	650	650	720	476	36	310	12	26

Cast iron, cast steel oval gear flow meters type high-temperature size: DN15 ~ DN25, A, B according to the table, data size plus 160mm extension tube heat: DN40 ~ DN80, A, B-size table size increases by thermal extension of 300mm pipe, rest size of the corresponding size table

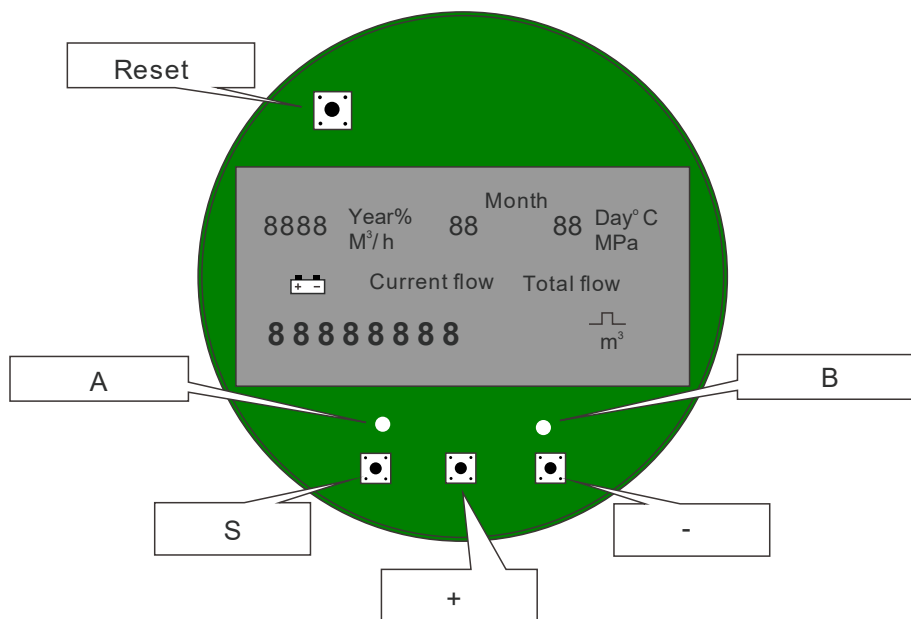
(C) type of stainless steel oval gear flow meter size

DN	L	H	B	A	D	D1	N	Φ
15	208	120	228	172	95	65	4	14
20	236	150	238	225	105	75	4	14
25	287	195	246	232	115	85	4	14
40	265	178	349	265	145	110	4	18
50	265	178	349	265	160	125	4	18
65	365	260	436	319	180	145	4	18
80	420	305	459	324	200	160	8	18
100	515	400	554	373	220	180	8	18
150	540	515	607	397	280	240	8	23

6. FLOW METER INSTALLATION

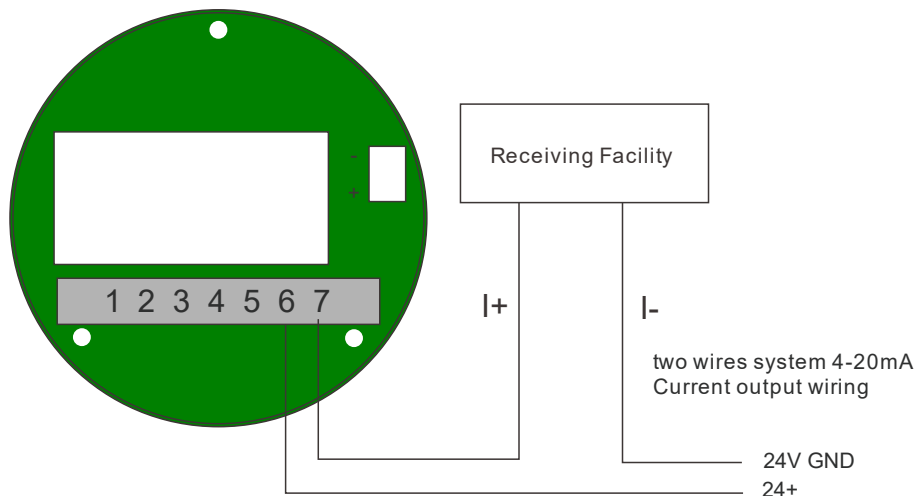
1. should be thoroughly cleaned before installing pipes, and pre-installed in the flow meter filter to prevent debris entering the flow meter. Measured liquid containing gas is air separator should be installed.
2. attention the gear axis of the flow meter installed must be horizontal position. That is, the horizon should vertically dial. Regulation of traffic and start to close the valve should be installed on the meter side of the Import and Export.
3. the arrows point to the shell flow meter should be installed with the liquid pipe flow direction.
4. continuous flow of the pipeline, the level of the installation of flow meter bypass valve should be fitted with pipes, so regular cleaning and maintenance. Vertical pipe flow meter should be installed in the bypass pipe to prevent debris from falling into the instrument within.
5. flow meter installed in the right conditions, for ease of reading, according to the needs of the counter rotating 180o or 90o installation requirements

7. INSTRUMENT DIAGRAM



A and B are the point of magnetic induction. When you switch display content (such as time), please use magnetic steel to across the above of A or B.

8. WIRING



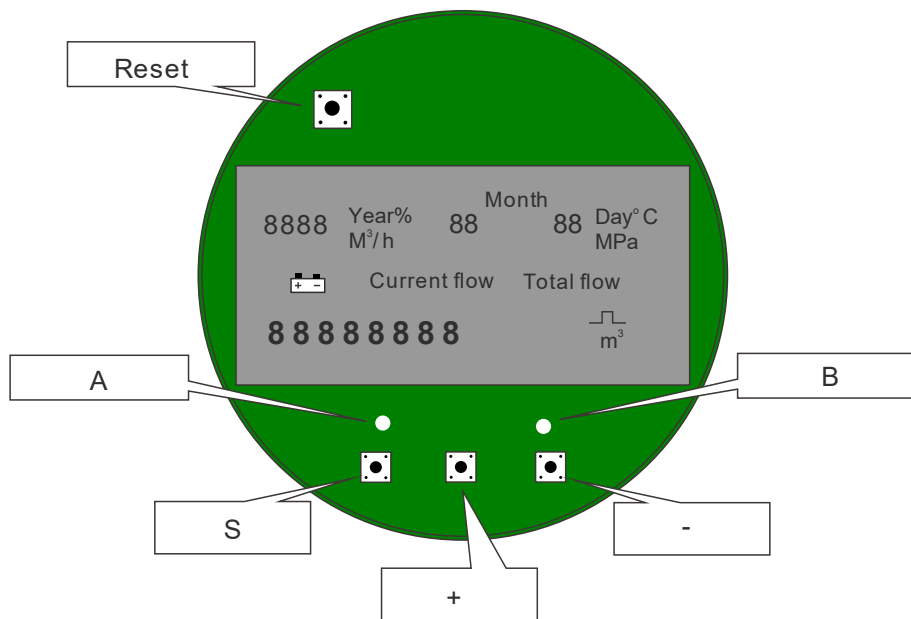
Terminal1	Connect to DC24V or DC12V power+
Terminal2	Connect to DC24V or DC12V power- (when two-wire system 4- 20mA, 1,2 are not connected)
Terminal3	Pulse voltage signal output
Terminal4	Communication RS485A+
Terminal5	Communication RS 485B-
Terminal6	Two-wire system 4~20mA +
Terminal7	Two-wire system4~20mA -






9. OPERATION

9.1 Parameter code instruction

P00-P04	Flowmeter's pulse equivalent (unit: L). When P22 is set to 0, there is only P00 that's validity.
P05	Maximum flow (for 4-20mA, unit: m ³ /h).
P06	Instantaneous flow has back to zero time, if it's more than this time, there's no signal and the time back to zero (unit: second).
P07	4-20mA zero re-set (generally for 23, adjustable).
P08	to adjust full current (generally adjustable when 3950)
P09	to adjust the unit of instantaneous flow (m ³ /h when setting as number 0, L/min. When setting as number 1)
P10	calculate circle of instantaneous flow (Unit: second)
P11-P14	Segmented value of flow meter, unit: m ³ /h (use the unit when P09=0)
P15-P18	Segmented value of flow meter, unit : L/min. (use the unit when P09=1)
P19	Output pulse width. (Output high electrical level width, unit: ms)
P20	Pulse output model. (number 1 is timely pulse output, number 0 is modulated pulse output)
P21	pulse equivalent when adjusting pulse output. (valid when parameter P20 is 0)
P22	on-off of segmented value. (unsegmented when number 0 and coefficient is P00, segmented coefficient is P00-P04 when number 1)
P23	Correspondence Address. (0~16)
P24	Communication baud rate. (2400 when setting 0, 4800 when 1 ,9600 when 2)
P25	Indicating parameter. Indicating current flow and time when press button S and setting number 0 at the same time. Indicating total flow and time when button S and setting number 1. Indicating current flow, total flow and time when press button S and setting number 2.
P26	Return to original setting (Saving after setting 123 and exist)

9.2 Button instruction



1. There are four buttons in total inside of flow meter . Upper one is button resetting, those which are below of it are respectively , ,  from left to right and two touch sensitive button A and B.
2. Outside of it is a sensor button .
3. When installing the flow meter and inserting the display board , press the reset button and then the screen starts to work.
4. When at working situation ,press  and touch sensitive button  , the function is same.
5. When at working situation , using magnetic steel to scratch outside of A and B, the screen will shift to display daily flow, total flow and time.

9.3 Time setting

1. Press **[S]** and **[+]** at the same time and then unstuck them , the screen will enter into time setting state and flickering the year.
2. Press **[+]** or **[-]** and then adjust the year needed to set .
3. Press **[S]** , flickering the month . Then adjust it.
4. Adjust the date ,time as above rules .
5. After adjusting the time , do as 7.4.4 instruction to save and exit setting program.

9.4 Coefficient setting

7.4.1 When at working or holding state , press **[S]** and **[+]** at the same time for twice, P00 flickering. The meter clock enters state of coefficient setting. When state of time setting, press **[S]** and **[+]** at the same time for one time, the meter clock enters coefficient setting.

7.4.2 When parameter code PXX flickering, press **[+]** or **[-]** to find the corresponding code, the below line will indicate the parameter which the code stands for.

7.4.3 If revising parameter, press **s** to move to the location needed to be revised, press **[+]** or **[-]** to plus or minus the value of parameter.

7.4.4 Save and then exit, press **[+]** and **[-]** at the same time, and then loosen the buttons at the same time, instrument showing ----- . Press **[+]** and **[-]** at the same time again for 3 seconds. If instrument shows End, parameters saving succeed, and setting end; if instruments shows Err, parameters saving fail, and need to reset.

e.g.Adjust P00=000.12345, as the following steps:

- Press **[S]** and **[+]** twice, entering to system setting.
- Press **[S]** , the first digit flashing, and then press **[+]** and **[-]** , adjusting to 0.
- Press **s** again, adjusting the second digit to 0.
- Infer from this, adjusting the value of P00 to 000.12345, as the step 4.4.4, saving and exiting setting.

9.4.5 4-20mA Zero set and full set

Wiring according to wiring diagram, connect with ampere meter, and get through external switching power supply.(12V or 24V)

- (1) Zero setting: Entering to page P07 from parameters setting, press **[S]**, moving to parameters value, and then press **[+]** or **[-]**. When parameter's value changes, ampere meter's changes accordingly. The smaller the P07 value is, the smaller the current is. When ampere meter value is 4mA, press **[S]**, move to P07, flashing, and then press **[+]**, showing P08 parameters, zero setting end, and enter to full setting.
- (2) Full setting: parameters adjust to P08, steps as zero setting. By adjusting parameters, make ampere meter value to 20mA. When setting end, save as step 7.4.4 and then exit.

9.4.6 The method of flow segmented

Flow ratio defers from different flow meters. Especially when min flow rate gap is big, the measuring range will be influenced. But digital counter could overcome it by flow segmentation comparison. Instruction is as follows:

- (1) When instantaneous flow adopt the unit of m^3/h (P09=0), and actual instantaneous flow $\leq P11$, use P00 for pulse equivalent.
When $P11 < \text{actual instantaneous flow} \leq P12$, use P01 for pulse equivalent.
When $P12 < \text{actual instantaneous flow} \leq P13$, use P02 for pulse equivalent.
When $P13 < \text{actual instantaneous flow} \leq P14$, use P03 for pulse equivalent.
When actual instantaneous flow $> P14$, use P04 for pulse equivalent.
- (2) When instantaneous flow adopt the unit of L/M (P09=1), and actual instantaneous flow $\leq P15$, use P00 for pulse equivalent; when actual flow $\geq P18$, use P04 for pulse equivalent.
- (3) If without adopting flow segmentation, using one pulse equivalent, then just need to set P22 to. In this situation, P00 is pulse equivalent for any flow rate.

7.4.7 Instrument adjusting method

- (1) When adjusting instrument, set P22 to 0 firstly (no flow segmentation)
- (2) Flow meter works at the middle flow, adjusting P00 pulse equivalent, making flow meter showing data equal to filling data.
- (3) Choosing instantaneous flow unit, namely P09 is 1 or 0.
- (4) Set P10 to be 1.
- (5) Set P06 to be about 1/3 of the min flow. When instantaneous flow $< P06$, instantaneous flow shows 0.
- (6) If without flow segmentation compensation, instrument adjusting ends; if with flow segmentation compensation, then follow step (7).
- (7) According to the instantaneous flow of instrument, adjusting flow rate to min flow, calculate the equivalent by measuring tank and write it down. Adjust the flow to different flow ranges, and respectively calculate the corresponding equivalent.

- (8) Take as much as a few flow points throughout the flow range, and analyze the equivalent value in different flow points. To set the P11-P14 or P15-P18 according to the value of P09----0 or 1, then combine the different equivalent in P00-P04.
- (9) Last, switch back and forth to different flow points to see whether the accuracy of the flow meter can meet the requirement.

9.5 Clear the daily flow and total flow

9.5.1 Clear the daily flow

Keep pressing the s key for 5 seconds till the daily flow on the screen displays 0, then loose the key to complete the procedure.

9.5.2 Clear the total flow

Keep pressing the - key for 10 seconds till the total flow on the screen displays 0, then loose the key to complete the procedure.

Remark:

- a. the measuring unit of daily flow is Liter, and the total flow is Cubic Meter.
- b. the screen will display 4 decimal places after the clearance of daily flow and total flow.
- c. when the numeric value on the screen is expired, the decimal point will automatically move back.
- d. when no decimals is expired (that is 9,999,999), it will automatically do the Clearance.

10. CAUTION

1. No water flow meter test.
2. To start or stop when the gate valve should be slow to prevent a sudden shock, and should prevent back flow.
3. Flow meter repair, there shall be no demolition of the rear cover so as to avoid re-generated when the impact of changes to the precision accuracy.

10.1 Calculation and adjustment of deviation

(A) the basic error of flow meter, flow test points by the time measured were determined using the following equation: (volume method)

$$E = \frac{V_m - V}{V} \times 100\%$$

E-meter error (generally refers to the cumulative error) the two digits.

V_m - meter measured value (that is, that value) V -, as amended, the flow meter measured the value of the standard device (that is, the actual value) from the basic formula for calculating the error, when $V_m > V$, the basic error of flow meter "+" value, said flow meter go faster.

$V_m < V$, the basic error of flow meter "-" values that take the slow flow meter.

In order to make the basic error in the flow meter error limit is often the need for error. That is installed in the counter through the replacement of a pair of adjustment gears (adjusted teeth) to change the mechanical transmission ratio, so that the flow meter to adjust the show deserves. Error can not change the flow meter to adjust the flow characteristics, so that it curves in artificially in the new coordinate system.

In general, the provisions of (or actual use of) 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.

11. OTHER

1. Stainless steel flow meter for 98% sulfuric acid, 60% nitric acid, 50% liquid caustic soda and other chemical measurement.
2. The instrument with light diesel oil factory test, do not use the school, the specific order in accordance with the national metrological verification JJG235-90 oval gear flow meter standards.
3. Ordering Information
 - Name, model. Specifications, materials,
 - Medium temperature, pressure, flow range.
 - Medium or medium viscosity name.
 - Any special requirements (such as explosion-proof, etc.).
 - The name of order and delivery unit.
 - Detailed mailing address, telephone, telegraph, postal code,
 - Clearing units, the depositary bank, the account number.
 - Reached the station, contact.
 - You need to learn more about the product, please call for information.
 - Three bags of factory products, the use of follow-up maintenance period.



12. COMMON REASONS FOR FAILURE AND TROUBLESHOOTING

Fault phenomenon	Reasons	Measures	Remarks
Oval gear does not turn	1. Pipeline in debris. 2. Measured liquid containing more than debris, damaged filter. Debris to enter the table, the gear stuck.	instrumentation and piping, repairing filter.	
Axial seal leakage coupling	Seal packing seal wear and tear or lack 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, the elimination of 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.	School is scheduled to be repaired
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 difference between the minimum error does not exceed $\pm 1\%$	More than the use of, or maintenance, such as changes in space	Re-adjustment of the school seizure	
Sent a letter of no signal	Improperly located 1 block letters	Re-adjust the position around before and after the mobile	
	2, then the anti-polarity	Into the re - : 1.“+” Then the red line 2.“-” Then the black line .	

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