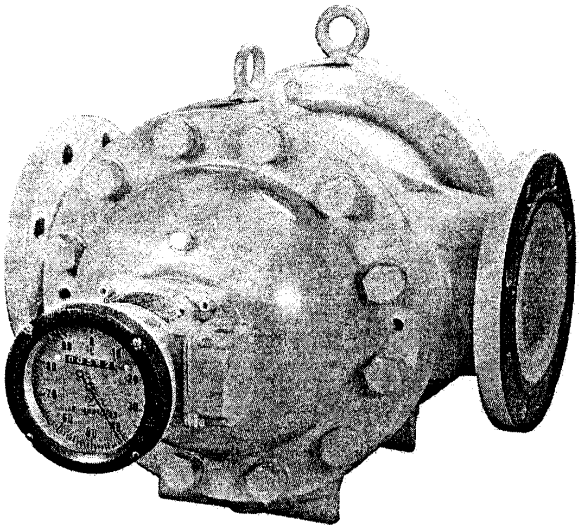
LSZ Series Double Rotator Flowmeter
User Manual



Please read through this manual before use.

LSZ Double-Rotator Flowmeter

Summary

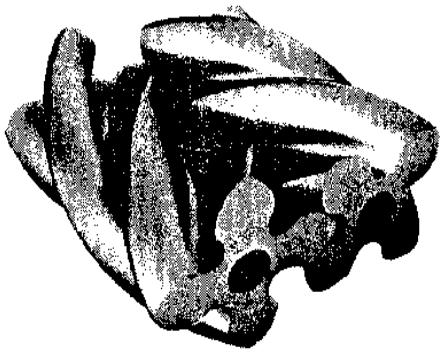


Fig. 1

LSZ Double-Rotator Flowmeter is the latest & international super-class volumetric-type flowmeter researched and developed by our company. It is a type of precise instrument measuring and controlling liquid flow in the pipeline, featuring high measurement precision, smooth running, free of pulsation, low noise, long service life and excellent adaptability to viscosity etc.. Therefore, the product has been widely used in various fields such as petroleum, chemical, metallurgy, electric power, shipping, traffic, dock, mine, thermal power, and foodstuff industries etc.. It is especially suitable for commercial trade measurement for crude oil, high condensation oil, crude oil with high water content, petroleum products, foodstuff and chemical solutions as well as measuring management and control of engineering automation.

The codes and characters displayed on the flowmeter can be directly read locally. The photo-electric pulse converter equipped can output electric pulse(current) signals to the displaying instrument and computer for handling. Thus, the flow in the pipeline can be remotely controlled.

Patent No.: ZL 00216334.9

ZL 99250679.4

Principle

The measuring chamber of the double-rotator flowmeter consists of interior casing, a pair of helix rotators and top & bottom cover plates. These formed a cavity with known volume which can be used as the measuring unit for the flowmeter. The rotator of the flowmeter rotates under the tiny pressure difference between the inlet and outlet and continually sends the liquid at inlet to the outlet after cavity measurement(See Fig.2). The rotator transmits the rotating numbers to the counter by means of sealed coupling and driving system so that the total volume of the liquid passing the flowmeter can be directly displayed

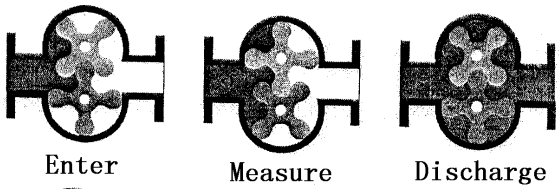


Fig. 2

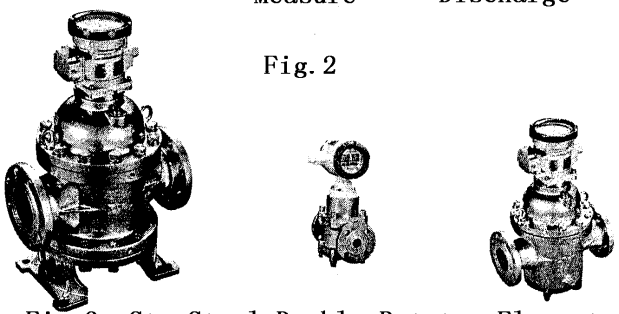


Fig. 3. St. Steel Double-Rotator Flowmeter

Main Technical Parameters

Table 1.

Nominal Dia. (mm)	8~400
Accuracy	±0.1%, ±0.2% and ±0.5%
Pressure loss	0~1000mPa.s<80Kpa 1000~20000mPa.2<150KPa
Nominal pressure	1.6, 2.5, 4.0, 6.4 MPa
Temperature range	-20°C ~ +80°C +80°C ~ +150°C +150°C ~ +250°C
Media viscosity	0~20000mPa.s
Ambient temperature	-30°C ~ +70°C
Connected flange	GB9115.0719-2000 JB/T82-94 *Can be customer made other standard flange.
Photoelectric pulse(current)converter	Anti-explosion: Exd II BT4 Anti-explosion certificate No.: 2012047 Exd II CT4(No acetylene) Anti-blast certificate No: GYB03478
Electronic meterhead	Anti-explosion : Exd II CT4 Anti-blast certificate No:GYB03479

Range of Flow

Double-Rotator Flowmeter For Accuracy: 0.5% and 0.2%

Table.2

Nominal Dia. (mm)	Range of flow m3/h												Pulse equivalent liter/pulse
	0.32-0.8mPa.s		0.8-2mPa.s		2-5mPa.s		5-400mPa.s		400-2000mPa.s		2000-20000mPa.s		
	Gasoline/ liquefied gas		Kerosene		Light diesel		Crude oil, heavy oil		Hi-viscosity Liquid		Liquid with high water content & super-high viscosity liquid		
	0.5%	0.2%	0.5%	0.2%	0.5%	0.2%	0.5%	0.2%	0.5%	0.2%	0.5%	0.2%	
15	0.6-3		0.4-4		0.4-4		0.4-4		0.3-2.4		0.3-2.4		0.001
25	3-8		1.5-10		1-10		1-10		1-8		1-6		
40	8-20	8-20	2.7-22	5.5-22	2.5-25	4.4-22	2.5-25	4.4-22	2.1-18	4.2-18	1.5-12	3-12	0.01
50	9-36	15-36	4.5-36	9-36	4-40	7.2-36	4-40	7.2-36	2.8-24	6-24	2.2-18	4.5-18	
80	20-80	32-80	10-80	20-80	9-90	16-80	9-90	16-80	6.5-56	14-56	5-40	10-40	
100	25-100	40-100	13-100	25-100	12-120	20-100	12-120	20-100	8.5-72	18-72	6.5-54	14-54	
150	55-225	88-220	31-250	57-225	25-250	44-220	25-250	44-220	18-150	38-150	12-100	25-100	
200	90-360	150-360	50-400	90-360	40-400	72-360	40-400	72-360	28-240	53-210	20-160	40-160	0.1
250	135-540	180-540	68-540	135-540	60-600	108-540	60-600	108-540	42-360	90-360	30-240	60-240	
300	220-900	300-900	112-900	225-900	100-1000	180-900	100-1000	180-900	70-600	150-600	54-450	113-450	
400	400-1600	550-1600	200-1600	400-1600	180-1800	320-1600	180-800	320-1600	130-1100	275-1100	90-750	180-750	

Double-Rotator Flowmeter Accuracy: 0.1% Table.3

Nominal Dia. (mm)	Range of flow m3/h							Pulse equivalent liter/pulse
	0.32-2 mPa.s		2-5 mPa.s	5-50mPa.s	500-400 mPa.s	400-2000 mPa.s	2000-20000 mPa.s	
	Gasoline/ liquefied gas	Kerosene	Light diesel	Crude oil,	heavy oil	Hi-viscosity Liquid	Liquid with high water content & super-high viscosity liquid	
40	11-22	9-22	7.5-22	7.5-22	7.5-22	4-12	3.3-10	0.001
50	18-36	14.4-36	12-36	12-36	12-36	7.5-22	6-28	0.01
80	40-80	32-80	26.7-80	26.7-80	26.7-100	16-48	15-45	
100	50-100	40-100	34-100	34-100	34-100	24-72	20-60	
150	115-220	90-220	73-220	73-220	73-220	40-120	30-90	0.1
200	180-360	144-360	120-360	120-360	120-360	60-180	50-150	
250	270-540	216-540	180-540	180-540	180-540	100-300	60-180	
300	450-900	360-900	300-900	300-900	300-900	200-600	150-450	
400	800-1600	640-1600	530-1600	530-1600	530-1600	400-1200	300-900	

Double-Rotator Flowmeter-(Electron Meterhead) Accuracy: 0.5%, 0.2% Table 4

Nominal Dia. (mm)	Range of flow m3/h												Pulse equivalent liter/pulse
	0.32-0.8mPa.s		0.8-2mPa.s		2-5mPa.s		5-4mPa.s		400-2000mPa.s		2000-20000mPa.s		
	Gasoline/ liquefied gas		Kerosene		Light diesel		Crude oil, heavy oil		Hi-viscosity Liquid		Liquid with high water content & super-high viscosity liquid		
	0.5	0.2	0.5	0.2	0.5	0.2	0.5	0.2	0.5	0.2	0.5	0.2	0.01
8	0.06-0.3	0.10-0.3	0.05-0.3	0.07-0.3	0.03-0.3	0.06-0.3	0.03-0.3	0.06-0.3	0.03-0.27	0.06-0.27	0.03-0.24	0.06-0.24	
15A	0.2-0.8	0.27-0.8	0.1-0.8	0.2-0.8	0.08-0.8	0.16-0.8	0.08-.8	0.16-0.8	0.08-0.7	0.16-0.7	0.08-0.6	0.15-0.6	
15B	0.25-1	0.33-1	0.2-1	0.25-1	0.1-1	0.2-1	0.1-1	0.2-1	0.1-0.9	0.2-0.9	0.1-0.8	0.2-0.8	
25	1.5-6	1.2-6	1.2-6	1.5-6	0.6-6	1.2-6	0.6-6	1.2-6	0.5-5.4	1.2-5.4	0.6-5	1.2-5	0.1

Double-Rotator Flowmeter-St. steel (-20°C ~ +80°C) Accuracy: 0.5% and 0.2% Table 5

Nominal Dia. (mm)	Range of flow m3/h												Pulse equivalent liter/pulse
	0.32-0.8 mPa.s		0.8-2 mPa.s		2-5 mPa.s		5-400 mPa.s		400-2000 mPa.s		2000-20000 mPa.s		
	Gasoline/ liquefied gas		Kerosene		Light diesel, diesel		Crude oil, heavy oil		Hi-viscosity Liquid		Liquid with high water content & super-high viscosity liquid		
	0.5	0.2	0.5	0.2	0.5	0.2	0.5	0.2	0.5	0.2	0.5	0.2	
15	0.75-3		0.75-3		0.6-3		0.6-3		0.6-3		0.5-2.5		0.001
25	2-8		2-8		1.6-8		1.6-8		1.2-6		1-5		
40	6-24	8-24	6-24	8-24	4.8-24	6-24	4.8-24	6-24	3.6-18	4-16	2.4-12	2.5-10	0.01
50	9-36	12-36	9-36	12-36	7.2-36	9-36	7.2-36	9-36	4.8-24	5.5-22	3.6-18	4-16	
80	20-80	27-80	20-80	27-80	16-80	20-80	16-80	20-80	12-56	12-48	8-40	9-36	0.1
100	25-100	34-100	25-100	34-100	20-100	25-100	20-100	25-100	15-75	15-60	11-54	11-45	
150	55-220	75-220	55-220	75-220	45-220	55-220	45-220	55-220	30-150	35-135	20-100	23-90	
200	90-360	120-360	90-360	120-360	72-360	90-360	72-360	90-360	43-210	50-200	32-160	38-150	
250	135-540	180-540	135-540	180-540	108-540	135-540	108-540	135-540	72-360	90-360	48-240	60-240	
300	225-900	300-900	225-900	300-900	180-900	225-900	180-900	220-900	120-600	150-600	90-450	113-450	

Double-Rotator Flowmeter-St. steel high temp. type (+80°C ~ +150°C) Accuracy: 0.5%, 0.2% Table 6

Nominal Dia. (mm)	Range of flow m3/h										Pulse equivalent liter/pulse
	2-5 mPa.s		5-50 mPa.s		50-400 mPa.s		400-2000 mPa.s		2000-20000 mPa.s		
	Light diesel		Crude oil, heavy oil		Crude oil, heavy oil		Hi-viscosity Liquid		Liquid with high water content& super-high viscosity liquid		
	0.5	0.2	0.5	0.2	0.5	0.2	0.5	0.2	0.5	0.2	
40	5.6-22.5	7-20	5.6-22.5	7-20	5.6-22.5	7-20	4-15	4-12	3-12	3.5-10	0.01
50	9-36	10-32	9-36	10-32	9-36	10-32	4.5-22	7-20	4.5-18	6-18	
80	20-80	25-75	20-80	25-75	20-80	25-75	12-48	13-40	9-36	10-30	0.1
100	25-100	30-90	25-100	30-90	25-100	30-90	15-60	17-50	11-45	14-40	
150	45-220	75-220	45-220	75-220	45-220	75-220	35-135	34-100	23-90	27-80	
200	90-360	120-360	90-360	120-360	90-360	120-360	50-200	54-160	38-150	43-130	
250	135-540	180-540	135-540	180-540	135-540	180-540	90-360	120-360	60-240	80-240	
300	225-900	300-900	225-900	300-900	225-900	300-900	150-600	200-600	113-450	150-450	

Double-Rotator Flowmeter-St. steel high temp. type (+150°C ~ +250°C) Accuracy: 0.5% and 0.2% Table 7

Nominal Dia. (mm)	Range of flow m3/h										Pulse equivalent liter/pulse
	2-5 mPa.s		5-50 mPa.s		50-400 mPa.s		400-2000 mPa.s		2000-20000 mPa.s		
	Light diesel		Crude oil, heavy oil		Crude oil, heavy oil		Hi-viscosity Liquid		Liquid with high water content& super-high viscosity liquid		
	0.5	0.2	0.5	0.2	0.5	0.2	0.5	0.2	0.5	0.2	
40	7.5-22.5	10-20	7.5-22.5	10-20	7.5-22.5	10-20	5-15	6-12	4-12	5-10	0.01
50	12-36	16-32	12-36	16-32	12-36	16-32	7.5-22.5	10-20	6-18	9-18	
80	26.7-80	35-75	26.7-80	35-75	26.7-80	35-75	16-48	20-40	12-36	15-30	
100	34-100	45-90	34-100	45-90	34-100	45-90	20-60	25-50	15-45	20-40	0.1
150	75-220	110-220	75-220	110-220	75-220	110-220	45-135	50-100	30-90	40-80	
200	120-360	180-360	120-360	180-360	120-360	180-360	65-200	80-160	50-150	65-130	

Double-Rotator Flowmeter-Carbon steel high temp. type (+150°C ~ +250°C) Accuracy: 0.5, 0.2 Table 8

Nominal Dia. (mm)	Range of flow m3/h										Pulse equivalent liter/pulse
	2-5 mPa.s		5-50 mPa.s		50-400 mPa.s		400-2000 mPa.s		2000-20000 mPa.s		
	Light diesel		Crude oil, heavy oil		Crude oil, heavy oil		Hi-viscosity Liquid		Liquid with high water content& super-high viscosity liquid		
	0.5	0.2	0.5	0.2	0.5	0.2	0.5	0.2	0.5	0.2	
40	4.5-22.5	5.6-22.5	4.5-22.5	5.6-22.5	4.5-22.5	5.6-22.5	4.2-18	5-15	3-12	4-12	0.01
50	7.2-36	9-36	7.2-36	9-36	7.2-36	9-36	6-24	7.5-22.5	4.5-18	5.5-17.5	
80	16-80	20-80	16-80	20-80	16-80	20-80	14-56	16-48	10-40	12-36	
100	20-100	25-100	20-100	25-100	20-100	25-100	18-72	20-60	14-54	16-48	
150	45-220	55-220	45-220	55-220	45-220	55-220	38-150	45-135	25-100	30-90	0.1
200	72-360	90-360	72-360	90-360	72-360	90-360	53-210	65-200	40-160	50-150	
250	108-540	135-540	108-540	135-540	108-540	135-540	72-360	90-360	60-240	80-240	
300	180-900	225-900	180-900	225-900	180-900	225-900	120-600	150-600	113-450	150-450	

Note: The flowmeter is also suitable for interim measurement during installing/uninstalling and ship installing.

Installation Sketch See Fig. 5

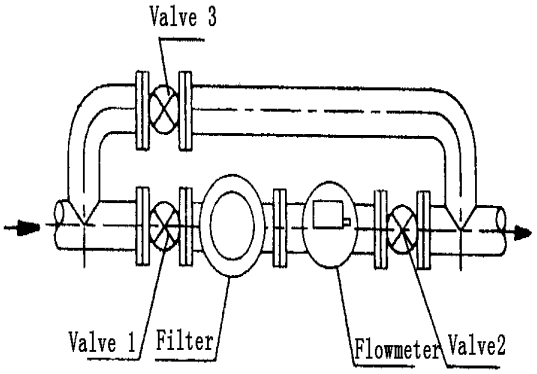


Fig.4 Mechanical Installation

1. Mechanical Installation See Fig.4

a.The position of the flowmeter shall avoid vibration, high temperature and strong magnetic disturbance and shall be easy for maintenance.

b. When the flowmeter is installed on the new pipeline, a section of pipe can be installed instead of the flowmeter for pipe cleaning in order to prevent the impurity from entering the flowmeter.

c. The flowmeter shall be installed vertically on the horizontal main pipeline. The bypass pipeline shall refer to Fig.4. The horizontal piping shall leave space for maintenance.

d. While the flowmeter is installed, the arrow on the flowmeter shall be identical with the liquid flowing direction.

e. Filter shall be installed at the front of flowmeter inlet. In order to make the measurement precise, the air in the pipeline shall be exhausted. Hence, exhauster shall be installed.

f. The valve regulating flow shall be installed at the downstream side of the flowmeter.

g. If it is not convenient to read the flowmeter locally, the fixing screw of the gauge outfit shall be removed. Then, turn the outfit to the convenient side and tighten the screw again.

h. The front & rear valve of the flowmeter shall be closed before the water pressure test is done for the new pipeline to prevent water from entering the flowmeter. If the water enters the flowmeter, the remained water and air after water discharging may corrode the internal parts of the flowmeter, rust the rotation parts, affect the precision and shorten the service life.

2. Wiring

The wiring for LSZ double-rotator flowmeter with anti-blasting transmitter shall be done as per the user's manual of the anti-blasting transmitter. The anti-blasting transmitter shall not be damaged during installation.

3. Avoid using crude oil to test the flowmeter. If crude oil must be used for test, it shall be exhausted when hot after test from the oil outlet of the flowmeter.

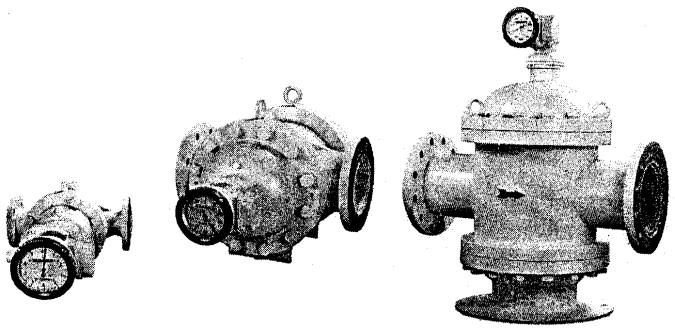


Fig. 5 Installation Sketch

Flowmeter outline drawing and dimension

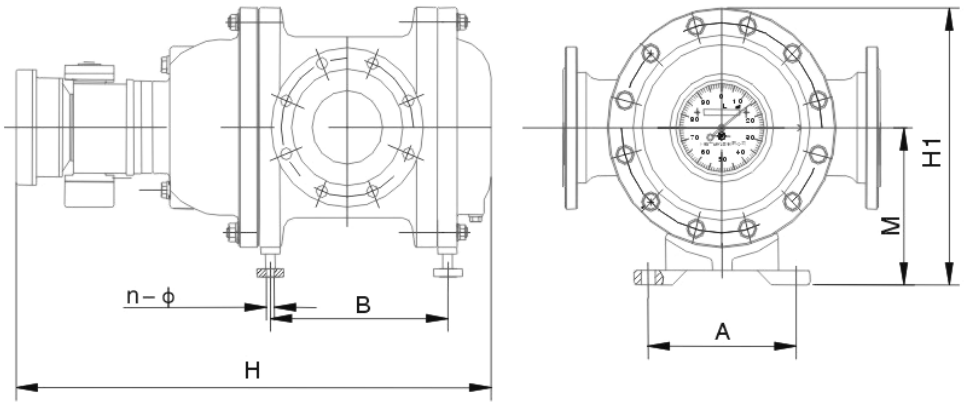


Fig.6 Drawing of Horizontal installation

Horizontal installation dimension Table 9

Nominal Dia. mm	Flange space L		Total height H	Center height M	Install hole space A × B	Bolt hole size n-Φ	Mass Kg
	STD	Special					
8	82*	180/150	260	35			5
15	180	200	300	55			10
25	200	250	350	80			15
40	250	300	500	130			40
50	360	378	580	140			70
80	400	380	700	230			140
100	450	500**	700	260	250×220	4-Φ20	180
150	560	650**	800	290	250×270	4-Φ20	320

* Connection to be conical tube thread 1/8” ** Nominal pressure is 6.4MPa.

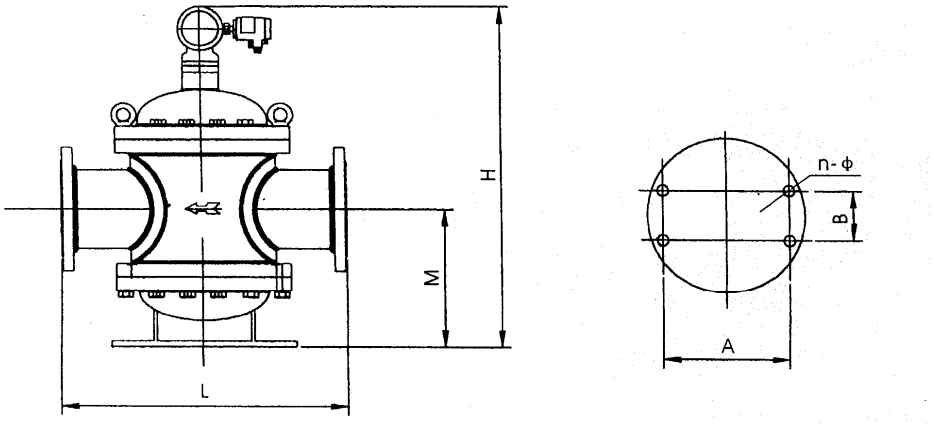


Fig.7 Drawing of Vertical installation

Vertical installation dimension Table 10

Nominal Dia. mm	Flange space L		Total height H	Center height M	Install hole space Footing A × B	Bolt hole size n-Φ	Mass Kg
	STD	Special					
100	450	500	700	260(280)	340×215	4-Φ23	180
150	560	650	800	290(310)	450×240	4-Φ23	320
200	700		1180	450	445×200	4-Φ23	560
250	1000		1210	500	524×250	4-Φ25	1000
300	1000		1460	640	645×300	4-Φ25	1460
400	1200		1700	700	700×300	8-Φ25	2000

Setting for Electronic Counter

Pulse output

The flow integrating instrument can display 4 digit of instant flow, with 1 digit accuracy after decimal(0-999.9m3/h) or 2 digits(0-99.99m3/h)after decimal. The accumulative flow function can display accumulated flow, with 4 digit accuracy after decimal(0-9999.9999m3/h) or 5 digit (0-999.99999m3/h) after decimal.

The flow integrating instrument adopts instant flow and accumulated flow switching display methods and provides three-wire system pulse remote transmission output, see Fig.4. All key operation must be done while the instrument is running(With flow input). Or the instrument will be in low-power dissipation sleeping status.

SET is setting key(Only it is pressed first, other keys can be effective); Press this key to set or modify flow factor.

INC means to add one number; Press this key to add one number for current factor (0-9). If press FA/SL key and INC key at the same time, the factors can be increased rapidly.

DEC means to reduce one number; Press this key to reduce one number for the factor. If press FA/SL key and DEC key at the same time, the factors can be reduced rapidly.

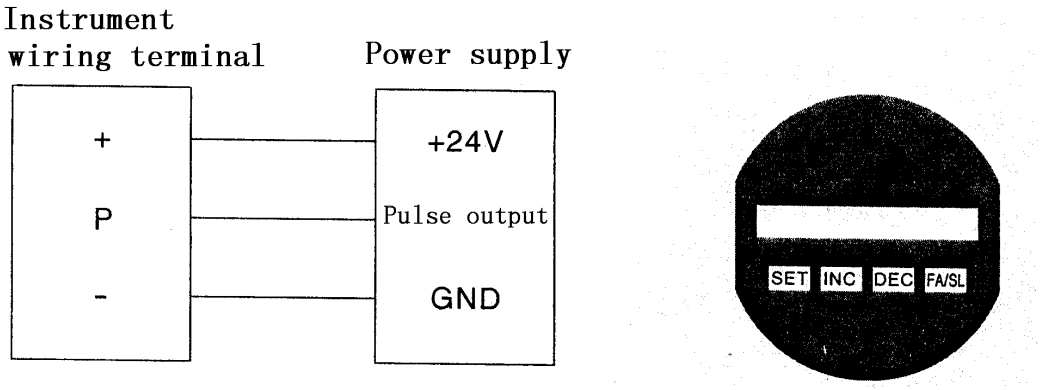


Fig. 7

Current Output

The flow integrating instrument can display 4 digit of instant flow, with 1 digit accuracy after decimal(0-999.9m3/h) or 2 digits(0-99.99m3/h)after decimal. The accumulative flow function can display 8 digit of accumulated flow, with 4 digit accuracy after decimal(0-9999.9999m3/h) or 5 digit (0-999.99999m3/h) after decimal.

The flow integrating instrument adopts instant flow and accumulated flow switching display methods and provides 4-20mA current remote transmission output (two-wire system), see Fig.5. All keys must be set while the instrument is running(With flow input). Or the instrument will be in low-power dissipation sleeping status.

SET is setting key(Only it is pressed, other keys can be effective); Press this key to set or modify flow factor.

INC means to add one number; Press this key to add one number for current factor (0-9). If press FA/SL key and INC key at the same time, the factors can be increased rapidly.

DEC means to reduce one number; Press this key to reduce one number for the factor. If press FA/SL key and DEC key at the same time, the factors can be reduced rapidly.

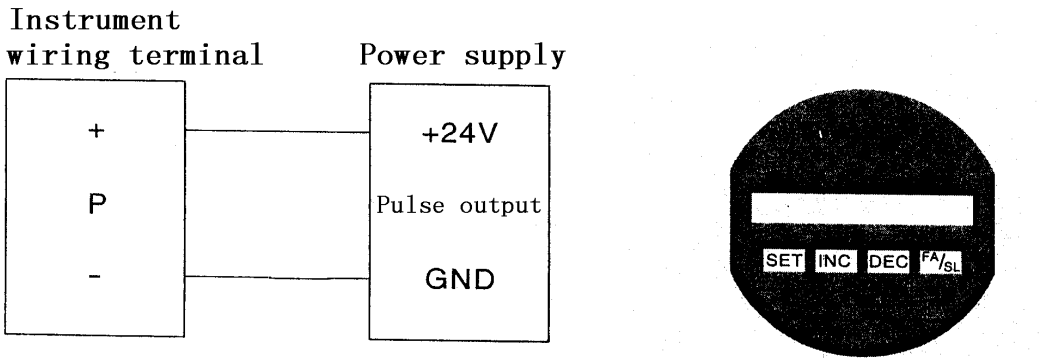


Fig. 8

Model Selection

Table 11

Basic type	-	1	2	3	4	5	6	7	8	Description
LSZ	-	Nominal Dia.	Counter	Nominal pressure	Feature	Material Quality	Work Temp.	Transmitter	Accuracy	
		8								Double-rotator flowmeter
		15A								Nominal Dia: 8mm
		15B								Nominal Dia: 15mm Type A
		25								Nominal Dia: 15mm Type B
		40								Nominal Dia: 25mm
		50								Nominal Dia: 40mm
		80								Nominal Dia: 50mm
		100								Nominal Dia: 80mm
		150								Nominal Dia: 100mm
		200								Nominal Dia: 150mm
		250								Nominal Dia: 200mm
		300								Nominal Dia: 300mm
		400								Nominal Dia: 400mm
			T							Pulse transmitter without local display
			J							Mechanical counter
			D							Electronic counter
			M							Zero-reset mech. counter
			M_1							Large code counter
				1.6						Nominal pressure: 1.6MPa
				2.5						Nominal pressure: 2.5MPa
				4.0						Nominal pressure: 4.0MPa
				6.4						Nominal pressure: 6.4MPa
					P					Basic specification
					Q					Special for gasoline & liquefied gas
						G				Common type
						S304				Rotator is 304 st. steel
						S316				Rotator is 316 st. steel
						SS304				Casing &rotator: 304 st. steel
						SS316				Casing &rotator: 316 st. steel
							A			Work temp. -20°C ~ +80°C
							B			Work temp+80°C ~ +150°C
							C			Work temp+150°C ~ +250°C
								F		Photoelectric converter: pulse output
								I		Photoelectric converter: current output
								F_1		Electronic counter: pulse output
								I_1		Electronic counter: current output
									0.5	Accuracy:±0.5%
									0.2	Accuracy: ±0.2%
									0.1	Accuracy: ±0.1%

Example: LSZ-100J2.5ZS304AI0.2
Specifications:
LSZ Double-rotator flowmeter: Nominal dia. 100mm; Mechanical display;
nominal pressure: 2.5Mpa, with driving device; Rotator is 304 st. steel; Working temperature: -20°C ~ +80°C; Photoelectric pulse converter: 4-20mA output(anti-explosion class: ExdIIBT4); Accuracy class: 0.2.

Notes:
1. LSZ-8mm have to be made with flange size of 15mm, but can not be used for average working temperature higher than 80°C!
2. Except LSZ-8mm and LSZ-15mm, all other size LSZ can be made with Warm Jacket for high viscosity liquid!

Please pay attention to following contents while ordering:

The flowmeter Model：_____

1. Nominal diameter: DN_____mm.
2. Working temperature:_____℃.
3. Transmitter:_____;
5. Name of fluid:_____ ;
6. Density of fluid:_____g/cm3;
7. Viscosity of fluid:
8. Range of flow:____ Max; ____Normal , ____Min.m3/h;
9. Counter: ☐ Pulse transmitter without gauge outfit ☐ Mechanical counter ☐ Electronic counter
   ☐ Zero-reset mechanical counter ☐ Large code counter ☐ imported large code counter;
10. Pressure of fluid: Max. Normal Lowest MPa;
11. Feature: ☐ Basic specification ☐ Gasoline and liquefied gas ☐ Driving device ☐ Mechanical sealing
12. Material quality: ☐ Rotator 304 ☐ Rotator 316 ☐ Rotator and casing 304 ☐ Rotator and casing 316;
13. Flange standard: ☐ Flush welding ☐ concave ☐ convexity
14. Way of Installation: ☐ Horizontal ☐ Vertical
15. Companion filter type:_____.

Appendix: User Manual of Electronic Counter

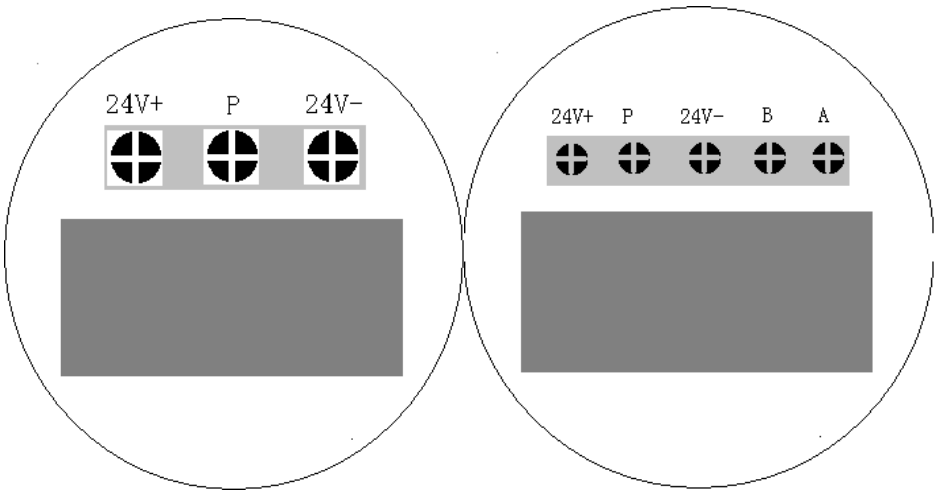
I. Brief Introduction

This manual is applied for updated electronic counter of LSZ Series Double Rotator flowmeter, which has the following features:

1. It can display only the instantaneous flow and total flow but also the batch total flow. Among them, batch total flow can be reset to zero.
2. High precise correction curve has been embedded into the electronic counter to ensure the accuracy of measurement of the flowmeter.
3. Pulse output (powered by DC24V ± 5％, $V_H \geqslant 20V$, VL<1V and output load ＜200Ω), 4-20mA output (two wire system and resolution is 1/65536) and RS485 communication with Modbus/RTU (powered by DC24V ± 5％ and <60mA) are optional for various choice.

II. Connection:

There are four wiring types totally according to the various functions of electronic counter as follows:



Type-1 **Type-2**

Type 1: Function with pulse (shown in drawing of Type-1)

24V+: DC24V+;

P: Pulse;

24V-:DC24V-.

Type 2: Function with both pulse and RS485 together (shown in drawing of Type-2)

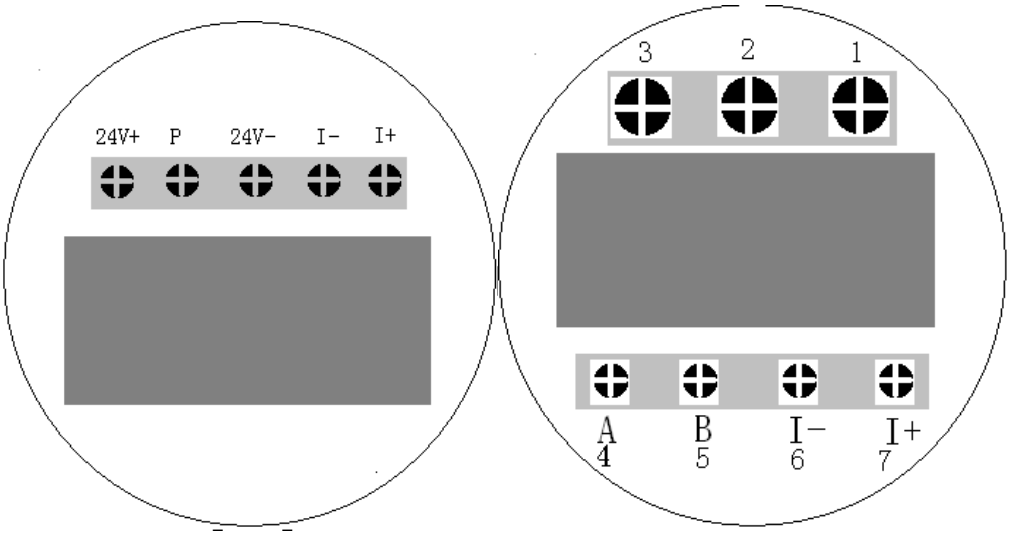
24V+: DC24V+;

P: Pulse output;

24V-: DC24V-;

B: RS485 communication output B;

A: RS485 communication output A.



Type-3 **Type-4**

Type 3: Function with both pulse and 4-20mA together (shown in drawing of Type-3) but it is necessary to require two separate DC24V for connection of pulse and 4-20mA.

24V+： DC24V+；

P： Pulse；

24V-： DC24V-；

I-： two wire system 4～20mA output ”－”；

I+： two wire system 4～20mA output ”＋”.

Type 4: Function with pulse, 4-20mA and RS485 together (shown in drawing of Type-4) but it is necessary to require two separate DC24V for connection of pulse and 4-20mA.

1 (+)： DC24V+；

2 (P)： Pulse output；

3 (-)： DC24V-；

4 (A)： RS485 communication output A；

5 (B)： RS485 communication output B；

6 (I-)： two wire system 4～20mA output ”－”；

7 (I+)： two wire system 4～20mA output ”＋”.

Note: If there are lines in electronic counter, please refer to the meanings as follows:

Pulse output lines: 24V+(Red), 24V－(Blue), Pulse signal line(Yellow).

4-20mA output lines: 24V+(Red)；Current signal line(Blue)

Ⅲ. Parameters and Operation

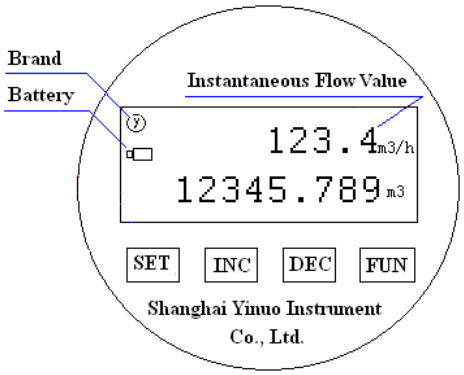
1. Keyboard and Display

A. Keyboard:

There are totally four buttons on the panel of LCD: “SET”, “INC”, “DEC” and “FUN” (as shown in the picture 1)

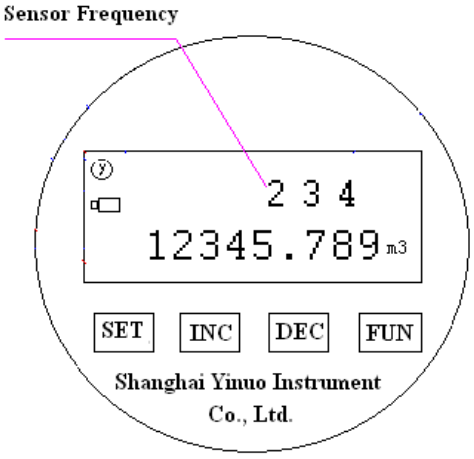
B. Display

LCD display is shown as Picture 1.

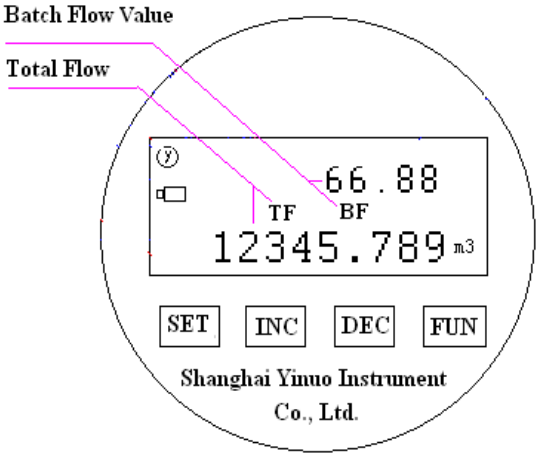


Picture 1

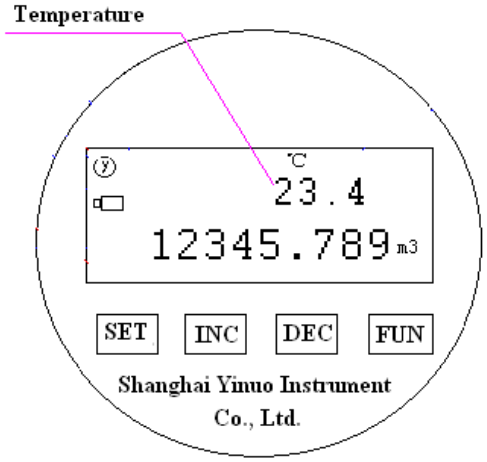
Press the button of INC to inter-change the displays among Picture 1, Picture 2, Picture 3, Picture 4 and Picture 5.



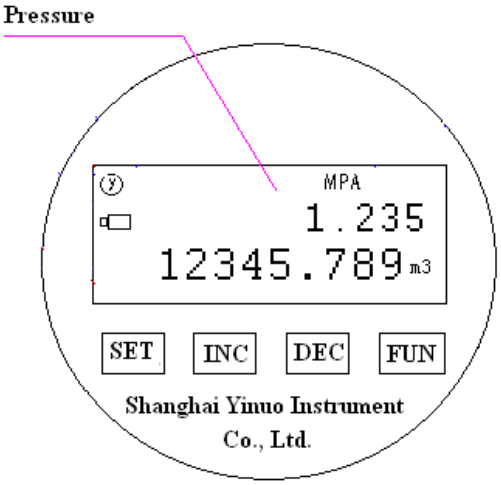
Picture 2



Picture 3

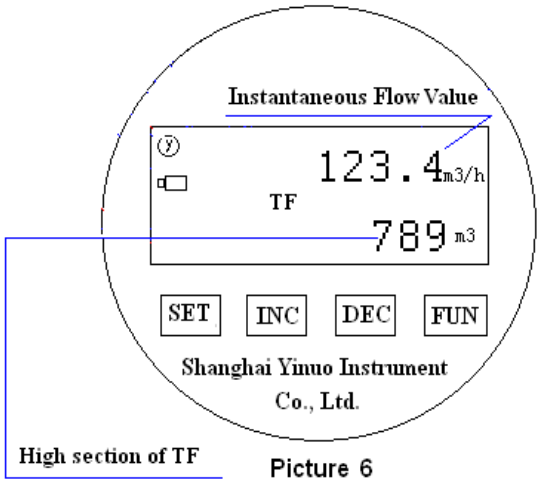


Picture 4

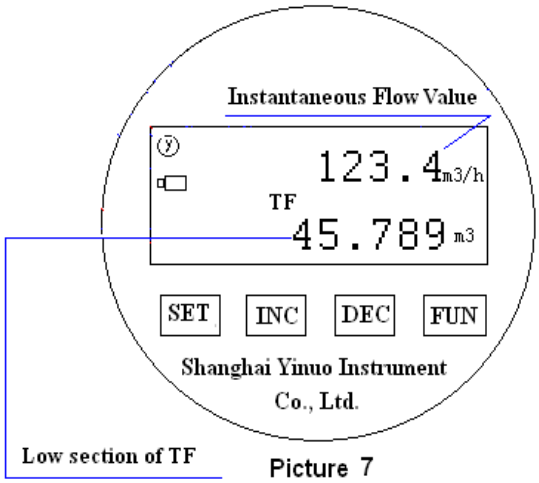


Picture 5

Press the button of DEC to inter-change the displays among Picture 1, Picture 6 and Picture 7.



Picture 6



Picture 7

Note: "TF or Total Flow" in above pictures do not means the totalizer (Total Flow Value)!!!

The total flow value (totalizer) of liquid flowmeters should be calculated by combining high section with low section because it can not be read directly. Supposed TOTALIZER is total flow value, Total_H means High section of TOTAL while Total_L means Low section of TOTAL, and there are three situations as follows (shown in Pictures 6 and 7):

1). If there are three digits decimal of High section,

TOTALIZER＝TOTAL_L＋TOTAL_H×100000;

2). If there are four digits decimal of High section,

TOTALIZER＝TOTAL_L＋TOTAL_H×10000;

3). If there are five digits decimal of High section,

TOTALIZER＝TOTAL_L＋TOTAL_H×1000.

2. Operation of the keyboard

First, press the buttons of FUN and SET together at the some time and Picture 8 will be shown (PRT means Parameters). Second, input the password of "5136" and press the button of SET to enter into the menu of parameter setting, now press the SET to select the parameter which should be modified. After modification, press FUN and SET together at the some time again to exit the display of parameter setting;

Picture 8

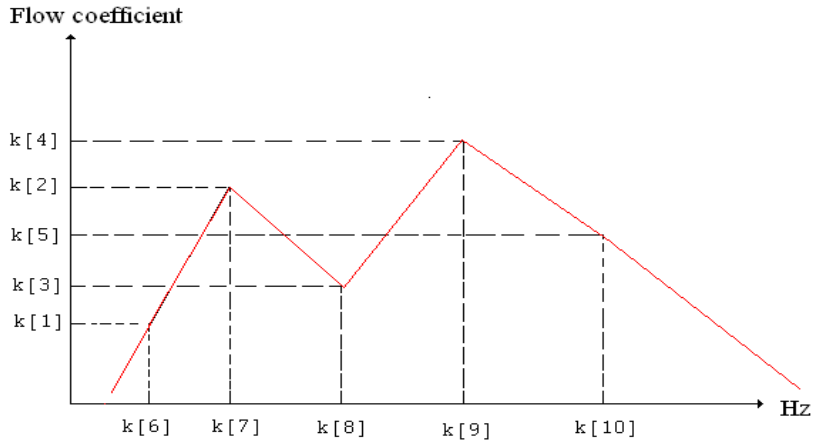
Among them, press the button of INC, the value marked by the cursor will increase one while press the button of DEC, the value marked by the cursor will decrease one. Press the buttons of FUN and INC together at the some time, the cursor will move one digit toward left side while press the buttons of FUN and DEC together at the some time, the cursor will move one digit toward right side;

Note: When picture 8 is showing, inputting “8057” and pressing the button of SET will restore factory default setting.

IV. Functional parameter.

K[1] ~K[5]: flow coefficient and K[6] ~K[10]: flow signal section points.

The correction curve is as bellow:



Picture 9

Calculation of flowrate section points coefficients, i.e.: Kx（x=[6~10]）:

$K[x-5]_{new}=K[X-5]_{old}\times$（standard flow/ displayed flow）

For example: Suppose K[6]=100 relevant coefficient K[1]=1223

Displayed flow value of the Tested Meter is 1500L while actual flow value of Master Meter is 1523L, then the new coefficient:

$K[1]_{new}=K[1]_{old}\times 1523L/1500L=1242$

K[11]：linear correction coefficient

Move the whole curve integrally and parallelly.

Calculation: $K[11]_{new}=K[11]_{old}\times$（standard flow/ displayed flow）

For Example: $K[11]_{old}=1100$, the displayed flow value in the course of the calibration is 1300L while the actual flow value is 1345L, then $K[11]_{new}=1100\times1345/1300=1138$.

K[12]option of the instantaneous flowrate decimal:

K[12]＝0 instantaneous flowrate without decimal；

K[12]＝1 instantaneous flowrate with one decimal；

K[12]＝2 instantaneous flowrate with two decimal；

K[12]≥3 instantaneous flowrate with one decimal.

K[13] option of temperature and pressure compensation：

K[13]＝0 no pressure and temperature compensation；

K[13]＝1 pressure and temperature compensation；

K[13]>1 no pressure and temperature compensation.

K[14] upper limitation of the pressure：

Upper limitation of the pressure sensor's range

K[15] pressure zero-amendment：

Zero point amendment value of the pressure sensor

K[16] maximum flowrate：

The relevant instantaneous flowrate of 20mA under 4~20mA output

K[17] upper limitation of the temperature：

Upper limitation of the temperature sensor's range, which has been set before delivery

K[18] temperature zero-reset：

Zero point amendment value of the temperature sensor, which has been set before delivery

K[19]communication address：

RS232/R485 communication address range 0~255

K[20]communication baud rate：

K[20]＝0　frequency＝1200；

K[20]＝1　frequency＝2400；

K[20]＝2　frequency＝4800；

K[20]＝3　frequency＝9600；

K[20]>3　frequency＝9600

K[21] type of the flowmeter

K[21]＝0　for liquid；

K[21]＝1　for gas；

K[21]≥2　for liquid

K[22] diameter of the flowmeter：

Input the flowmeter's nominal diameter directly with unit of mm

K[23] flowmeter's unit：

K[23]＝0　Cubic meter(m3);

K[23]＝1　Liter(L)；

K[23]＝2　Ton(T)；

K[23]＝3　Kilogram(Kg)；

K[23]＝4　US. Gallon(G)；

K[23]≥4　Cubic meter(m3)

K[24] frequency distribution coefficient：

Reserved by factory

K[25] option of pulse equivalent（L/P）：

K[25]＝0　pulse equivalent＝10；

K[25]＝1　pulse equivalent＝1；

K[25]＝2　pulse equivalent＝0.1；

K[25]＝3　pulse equivalent＝0.01；

K[25]＝4　pulse equivalent＝0.001

Appendix 2 : User Manual of Mechanical Counter

Adjustment Method for Mechanical Flowmeter Error Curve

---- Mechanical small gauge outfit gear adjustment

Normally, the manufacturer of volumetric flowmeter(Hereinafter called: flowmeter) uses fluid like: diesel, machine oil or water to verify the flowmeter. However, the liquids actually used by users vary greatly. The actual fluid viscosity often has big difference with the one when it is verified. This caused the deviation for error curve of the flowmeter. Therefore, it is necessary to correct the error curve of the flowmeter.

1. LSZ-40~300 error adjustment method

✯ Gear adjusting mechanism see Fig. 9, in which:
No.1 is adjusting plate fixing screw
No.2 is adjusting gear1(Z: 44/42)
No.3 is output gear(Z: 25)

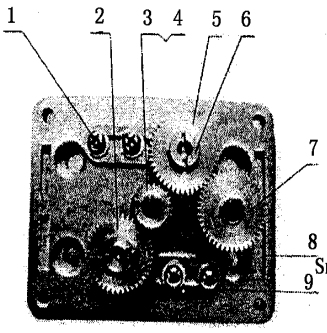
No.4 is carrier gear(Z: 27)
The big gear(Z:48) of adjusting gear 2(No.5) is installed

towards the interior.
No.5 is adjusting gear 2(Z: 48/46)
No.6 is adjusting gear lock screw

No.7 is input gear(Z: 44)
No.8 is gear installation bottom plate
No.9 is adjusting plate.
Look up table 12: Adjusting gear is at +0.54 position.

The direction of big & small gear must be correct while installation.

✯ Adjusting gear installation see Fig.10.
Loosen 4 fixing screws(No.1); move adjusting gear 1/2.
Loosen lock screw(No.6) to remove adjusting screw 1/2.
Note: The small gear(Z:42) of adjusting gear 1(No.2) is installed towards the interior.



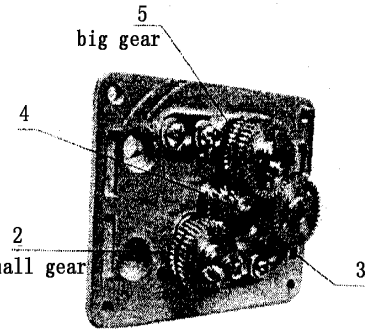


Fig. 9 Fig.10

✯Error curve adjustment method:

Example 1: The accuracy of LSZ-80 double-rotator flowmeter is class 0.2 when ex-factory. When the verification is done at site, the change (or other cause) of the fluid which verifies the flowmeter caused the deviation of flowmeter error curve. The verification result at site showed that the error of the flowmeter is –0.4 ~ –0.7%, which exceeded the range of class 0.2.

Look up table at site. The gear combination for adjusting gear 1 is 44/42 and the gear combination for adjusting gear 2 is 48/46(Note: The gear number of two groups of adjusting gears as well as the position of error adjustment table are printed on the certificate of the flowmeter.). Look up table 12. The position of two groups of adjusting gears is at +0.54%.

The error of the flowmeter is –0.4 ~ –0.7%. Its max. linearity is 0.3%. Adjust the linearity based on the half of the 0.3% linearity and adjust the flowmeter to the position of +0.15 ~ –0.15%.

The adjusting method is:

The linear error adjusting amount: +0.15%~(–0.4%) = +0.55% or
-0.15%~(–0.7%) = +0.55% or

i.e: The amount to be adjusted for the flowmeter shall be +0.55%. The original position of the two groups of adjusting gears +0.54% plus +0.55% which need to be adjusted. The new position of the two groups of adjusting gears shall be at +1.09%. Look up table 1: The adjusting gear at +1.09% position is 51/49 and 47/45.

When the two groups of adjusting gears 51/49 and 47/45 are installed, the gaps between the gears shall not be too large and the gears shall not be too tight. The joggles between the gears shall have a certain space. Thus, the error of the flowmeter has been adjusted.

Example 2: The accuracy of LSZ-100 Double-Rotator Flowmeter is class 0.2 when ex-factory. When the verification is done at site, the change (or other cause)of the fluid which verifies the flowmeter caused the deviation of flowmeter error curve. The verification result at site showed that the error of the flowmeter is +0.35 ~ +0.7%, which exceeded the range of class 0.2.

Look up table at site. The gear combination for adjusting gear 1 is 44/42 and the gear combination for adjusting gear 2 is 48/46.

The error of the flowmeter is +0.35 ~ +0.7%. Its max. linearity is 0.35%. Adjust the linearity based on the half of the 0.35% linearity and adjust the flowmeter to the position of +0.175 ~ –0.175%.

The adjusting method is:

The linear error adjusting amount: +0.175%-(+0.7%) = +0.525%
-0.175%-(+0.35%) = +0.525%

i.e: The amount to be adjusted for the flowmeter shall be +0.525%. The original position of the two groups of adjusting gears +0.54% plus +0.525% which need to be adjusted, the new position of the two groups of adjusting gears shall be at +0.015%. Look up table 12: There is no +0.015% adjusting gear. So, select the gear position +0.02% which is the nearest position for +0.015%. The adjusting gear shall be 49/47 and 39/37.

Example 3: The accuracy of LSZ-100 Double-Rotator Flowmeter is class 0.2 when ex-factory. When the verification is done at site, the great change of the fluid (such as gasoline or other cause) which verifies the flowmeter caused the great deviation of flowmeter error curve. The verification result at site showed that the error of the flowmeter is +0.85% ~ +2.25%, which exceeded the range of class 0.2.

Look up table at site. The gear combination for adjusting gear 1 is 44/42 and the gear combination for adjusting gear 2 is 48/46. Look up table 12. The position of two group of adjusting gears is at +0.54%. The error of the flowmeter is –1.85 ~ -2.25%. Its max. linearity is 0.40%. Adjust the linearity based on the half of the 0.40% linearity and adjust the flowmeter to the position of +0.2 ~ –0.2%. The adjusting method is:

The linear error adjusting amount: +0.20%-(-1.85%) = +2.05% or

-0.20%-(-2.25%) = +2.05%

i.e: The amount to be adjusted for the flowmeter shall be +2.05%. The original position of the two groups of adjusting gears +0.54% plus +2.05% which need to be adjusted. The new position of the two groups of adjusting gears shall be at +2.59%. Look up table 12: There is no +2.59% adjusting gear and it has exceeded the range in Table 1.

Here, the only way is to change the input gear (No.7Z=44) to (Z=43). If the tooth number of the input gear is changed from 44 to 43, the adjusting amount is +2.27‰, which exceeded the adjusting amount of +2.05%. Every 1 tooth number reduced for input gear, the adjusting amount will increase 2.27%. The adjusting method is:

a. First, change 44 teeth to 43 teeth;
b. +2.27% - (+2.05%) = + 0.22% (+ 0.22% more adjusted)
c. +0.54% - (+0.22%) = + 0.32% (the new position of two groups of gears)
d. Look up table 1: the adjusting gear at + 0.32% position is 51/49 and 40/38.
e. Example 3 shall change output gear 44 teeth to 43 teeth, and adjusting gear (49/46, 44/42) to (51/49, 40/38).

Example 4: The accuracy of LSZ-100 Double-Rotator Flowmeter is class 0.2 when ex-factory. When the verification is done at site, the great change of the fluid (such as gasoline or other cause) which verifies the flowmeter caused the great deviation of flowmeter error curve. The verification result at site showed that the error of the flowmeter is +0.85% ~ +2.25%, which exceeded the range of class 0.2. After looking up the table at site, the gear combination for adjusting gear 1 is 44/42 and the gear combination for adjusting gear 2 is 48/46. Look up table 12: The position for two groups of adjusting gears is at +0.54%. The error of the flowmeter is –1.85 ~ -2.25%. Its max. linearity is 0.40%. Adjust the linearity based on the half of the 0.40% linearity and adjust the flowmeter to the position of +0.2 ~ –0.2%.

The adjusting method is:

The linear error adjusting amount: +0.20%-(-1.85%) = +2.05% or

-0.20%-(-2.25%) = +2.05%

i.e: The amount to be adjusted for the flowmeter shall be +2.05%. The original position for the two groups of adjusting gears +0.54% plus +2.05% which need to be adjusted. The new position for the two groups of adjusting gears shall be at +2.59%. Look up table 12: There is no +2.59% adjusting gear and it has exceeded the range in Table 1.

Here, the only way is to change the input gear (very few Z=45) into (Z=44). If the tooth number of the input gear is changed from 45 to 44, the adjusting amount is +2.22%, which exceeded the adjusting amount of +2.05%. Every 1 tooth number reduced for output/input gear, the adjusting amount will increase 2.22%. The adjusting method is:

a. First, change 45 teeth to 44 teeth;
b. +2.22% - (+2.05%) = + 0.17% (+ 0.17% more adjusted)
c. +0.54% - (+0.22%) = + 0.37% (the new position of two groups of gears)
d. Look up table 1: the adjusting gear at + 0.32% (+0.36%) position is 50/48 and 41/39.
e. Example 4 shall change output gear 45 teeth to 44 teeth, and adjusting gear (48/46, 44/42) to (50/48, 41/39).

✯If the flowmeter is found running too fast through site verification, the input gear can be changed from (Z=43) to (Z=44). Thus, every 1 tooth increases, the adjusting amount will reduce 2.33%. The error calculation and adjustment methods are the same as Example 2.

✯When calculating the adjusting amount for adjusting gear, the adjusting direction shall be noticed. If the flowmeter runs faster(i.e: positive error), adjust towards negative("minus" adjusting amount at original position); If the flowmeter runs slower(i.e: negative error), adjust towards positive ("Plus" adjusting amount at original position)

✯If any problems are met during flowmeter error curve adjustment (As per the methods in this manual)at site, please contact our company right away.

Notes for Ordering:

Flowmeter error adjustment table

1. LSZ-15, 25 error adjusting gear table

39/41 +1.60 25/27 +4.21 43/44 –1.10

……

39/41	+1.60	25/27	+4.21	43/44	-1.10
40/42	+1.47	26/28	+3.94	42/43	-1.04
41/43	+1.36	27/29	+3.70	41/42	-0.98
42/44	+1.25	28/30	+3.50	40/41	-0.93
43/45	+1.15	29/31	+3.20	39/40	-0.86
44/46	+1.05	30/32	+3.00	38/39	-0.80
45/47	+0.96	21/33	+2.82	37/38	-0.73
46/48	+0.86	32/34	+2.64	36/37	-0.65
47/49	+0.77	33/35	+2.52	35/36	-0.57
24/25	+0.69	34/36	+2.35	34/35	-0.49
25/26	+0.53	35/37	+2.19	33/34	-0.41
26/27	+0.38	36/38	+2.04	32/33	-0.32
27/28	+0.25	37/39	+1.89	31/32	-0.22
28/29	+0.13	38/40	+1.89	30/31	-0.11
29/30	0			29/30	

2. LSZ-40-300 Error Adiusting Gear Table

Adjust Gear	Error	Adjust Gear	Error	Adjust Gear	Error		Adjust Gear	Error	Adjust Gear	Error	Adjust Gear	Error	Adjust Gear	Error	Adjust Gear	Error
46/44 41/39	0%						46/44 41/39	0%								
49/47 39/37	+0.02	51/49 42/40	+0.57	51/49 47/45	+1.09		47/45 40/38	-0.03	40/38 41/39	-0.69	48/46 32/30	-1.27	44/42 46/43	-1.79	42/40 43/40	-2.70
51/49 38/36	+0.01	50/48 43/41	+0.60	49/47 49/47	+1.11		50/48 38/36	-0.04	46/44 36/34	-0.71	41/39 36/34	-1.28	41/45 44/41	-1.98	38/45 46/43	-2.74
48/46 40/38	+0.06	49/47 44/42	+0.62	53/51 46/44	+1.15		49/46 39/37	-0.07	52/50 33/31	-0.73	50/48 31/29	-1.31	40/38 49/46	-2.02	36/34 48/45	-2.76
47/45 41/39	+0.10	48/46 45/43	+0.64	52/50 46/45	+1.15		45/43 41/39	-0.10	44/42 37/35	-0.77	47/45 32/30	-1.36	42/40 47/44	-2.05	35/33 49/46	-2.79
46/44 42/40	+0.12	46/44 47/45	+0.65	51/49 47/46	+1.17		46/44 40/38	-0.13	47/45 35/33	-0.79	49/47 31/29	-1.40	43/41 46/43	-2.08	41/39 43/40	-2.83
49/47 40/38	+0.15	51/49 43/41	+0.68	50/48 48/47	+1.18		47/46 39/37	-0.17	39/37 41/39	-0.82	40/38 36/34	-1.41	44/42 45/42	-2.13	34/32 50/47	-2.84
51/49 39/37	+0.18	50/48 44/42	+0.71	53/51 49/45	+1.19		52/50 36/34	-0.19	42/40 28/26	-0.84	46/44 32/30	-1.46	39/37 49/46	-2.16	42/40 42/39	-2.88
48/46 41/39	+0.19	49/47 45/43	+0.73	52/50 47/46	+1.24		44/42 41/39	-0.21	48/46 34/32	-0.88	48/46 31/29	-1.49	42/40 46/43	-2.20	37/35 46/43	-2.90
41/45 42/40	+0.22	52/50 43/41	+0.76	51/49 48/47	+1.26		45/43 40/38	-0.23	46/44 35/33	-0.89	38/36 37/35	-1.53	43/41 45/42	-2.24	35/33 48/45	-2.93
46/44 43/41	+0.24	51/49 44/42	+0.79	53/51 49/46	+1.27		46/44 39/37	-0.26	44/42 36/34	-0.93	39/37 36/34	-1.55	46/44 43/40	-2.26	40/38 43/40	-2.96
49/47 41/39	+0.20	50/48 45/43	+0.81	52/50 48/47	+1.35		49/47 37/35	-0.28	52/50 32/30	-0.93	43/41 33/31	-1.58	44/42 44/41	-2.29	34/43 49/46	-2.98
48/46 42/40	+0.31	48/47 46/44	+0.83	51/49 50/48	+1.35		47/45 38/36	-0.31	40/38 39/37	-0.95			39/37 48/45	-2.30	41/39 42/39	-3.01
51/49 40/38	+0.32	52/50 44/42	+0.87	53/51 49/47	+1.42		50/48 36/34	-0.35	38/36 41/39	-0.97	46/44 47/44	1.61-	41/39 46/43	-2.33	33/31 50/47	-3.04
46/44 44/42	+0.35	51/49 45/43	+0.89	51/49 51/49	+1.44		48/46 37/35	-0.37	42/40 37/35	-1.00	43/41 19/46	-1.65	42/40 45/42	-2.36	36/34 46/43	-3.06
50/48 41/39	+0.36	50/48 46/44	+0.92	52/50 51/ 49	+1.51		46/44 38/36	-0.41	51/49 32/30	-1.01	44/42 48/45	-1.67	43/41 44/41	-2.41	38/36 44/41	-3.07
49/47 42/40	+0.40	48/46 48/46	+0.93	852/50 52/50	+1.59		43/41 40/38	-0.45	43/41 36/34	-1.04	45/43 47/44	-1.71	38/36 48/45	-2.44	39/37 43/40	-2.10
48/46 43/41	+0.42	53/51 44/42	+0.94	52/50 53/51	+1.66		42/40 39/37	-0.47	46/44 34/32	-1.07	48/46 45/42	-1.72	37/35 49/46	-2.46	34/32 48/45	-3.12
51/49 41/39	+0.44	52/50 45/43	+1.00	53/51 53/51	+1.74		45/43 38/36	-0.51	44/42 35/33	-1.10	46/44 46/43	-1.76	41/39 45/45	-2.48	40/38 42/39	-3.14
46/44 45/43	+0.45	51/49 46/44	+1.02				48/46 36/34	-0.53	37/35 41/35	-1.12	43/41 48/45	-1.79	42/40 44/42	-2.53	33/31 49/46	-3.17
50/48 42/40	+0.48	49/47 48/46	+1.05				46/44 37/35	-0.56	52/50 31/29	-1.15	44/42 47/44	-1.82	45/43 42/49	-2.54	37/35 44/41	-3.22
49/47 43/41	+0.52	43/51 45/43	+1.07				43/41 39/37	-0.58	47/45 33/31	-1.16	45/44 46/43	-1.86	38/36 47/44	-2.59	32/30 50/47	-3.25
48/46 44/42	+0.54	52/50 46/44					47/45 36/34	-0.62	49/47 32/30	-1.18	41/39 49/46	-1.89	37/35 48/45	-2.60	34/32 47/44	-3.26
							45/43 37/35	-0.66	51/49 31/29	-1.23	43/41 47/44	-1.93	41/39 44/41	-2.65	33/31 48/45	-3.31

V. Trouble shooting

No.	Description	Method
01	No display	1. Renew the battery and check if the voltage <3V. If so replace it 2. check the circuit if it's short-circuited
02	There is flow in the pipe but the display value is unchanged.	1. To check if the flowmeter is blocked. If so, take it down to clean. If no block, check the settings of the parameters according to the user manual. 2. If the parameters are correct, disassemble the counter, connect the signal input part of counter with another signal source ($V_{H-H} \leqslant 5V$) to check if the counter can work. If yes, there is something wrong with the sensor, otherwise, contact factory for repair. Note: pay attention to the connection of signal line's cathode and anode.
03	No pulse output or inaccurate signal output.	1. Check the wiring according to the illustration in II. 2. Check the compatibility of pulse equivalent between the flowmeter and secondary instrument. 3. Check the pulse frequencies and amplitudes between flowmeter and secondary instrument/system using oscillograph to confirm they are suited.
04	No 4-20mA output or no precise 4-20mA output	1. Check the wiring according to the illustration in II. If the connection is incorrect, please contact the factory. 2. If there is current output, please check if the set max. flowrate in secondary instrument or system is same with that of the flowmeter.
05	RS485 communication can no be connected.	1. Check the wiring according to the illustration in II. 2. Check if it's powered with 24V battery and if the wiring is correct. If so, please contact the factory.