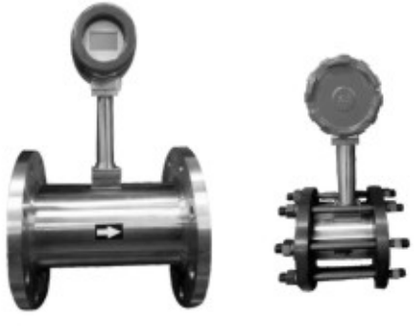
LEKTON

LUDC Series

Vortex Shedding Flowmeter

Installation and operating Instruction



Contents

LUDC Series
Vortex Shedding Flowmeter

Summary

LUDC Series Vortex Shedding Flow meter is used in the flow measurement of the fluid in the industrial pipe line, such as gas, liquid, steam, etc..Its characteristics are less pressure loss, no movable mechanism in the meter. This flow meter adopts piezoelectric sensor, has high reliability, works with in -20℃~+250℃. There are standard analogue signal (4-20mA) or pulse signal outputs, it is easy to be used together with digital systems, such as computer, etc.

Measure Principle

If insert a bluff body vertically into the flowing fluid,vortexes will be generated altematively at its sides.These vortexes follow together with the fluid to the down streaam,and form series vortexes (Karman vortex street,see figure1).The bluff body which the generates vortex is called as vortex shedder.Experiment prover that frequency of vortex is in directly proportional to flow velocity it can be shown as following formula:

$$f = Sr \frac{V}{(1 - \frac{4d}{\pi D})d}$$

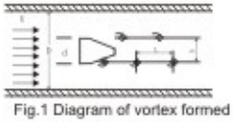


Fig.1 Diagram of vortex formed

f-Vortex frequency
d-Width of buff body which face against the flow
Sr-Strouhol number
V-Average flow velocity in the pipe
D-Inside diameter of pipe

The experiment proves that if the distance between two vortex steries.hand The distance between two adjacent vortexes in same series L are satiated with The formula L/h=0.218,then the non-symmetric vortex series can be kept in steady status.Ifthe renolds number Re of flow varies within 5000 to 150000,Sr will basically be kept unchanged.Sowhen Sr and dare constant,fwillbe directly proportional to the average flow velocity of the fluid,i,e,f is directly proportonal to the volumetric flowrate Q of the fluid,but has no relation to the parameters as pressure,temperature,density,etc..

When vortexes are generated at both sides of the bluff body,the bluff body is subjected by the a action direction,signal is inducer.The alternationg freguency of the ascending force is same as the frequency of the vortex.
After the sens or transmitted the signal to the conveter,the signal is amplified and shaped,the impulse signal which is linearly proportional to the velocity is got.This signal is output directly or converted into a 4-20mA standard output.The reation ship between the volumetric flowrate Q andfrequency fis:

$$Q = \frac{f}{k}$$

Q:The volumetric flowrate of the fluid in liter/sec.,
f:Frequency in number of pluse/sec.,
k:The meter coefficient in number of pulse/liter

Function block as follow figure:

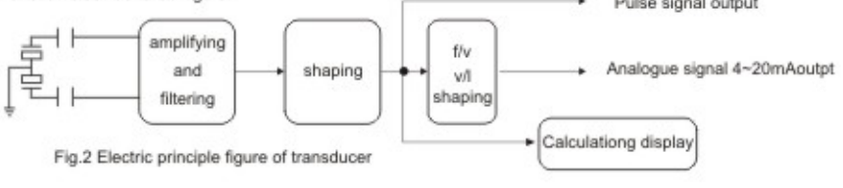


Fig.2 Electric principle figure of transducer

LUDC Series
Vortex Shedding Flowmeter

Technical Parameter

❶ Main Technical Parameter

Table 1.

Standard adopted		JB/T6807-93
Measuring media		Gas, liquid. steam
Diameter	Wafer Type	15,20,25, 32, 40, 50, 65,80, 100,125,150
	Flange connection type	125,150,200,250,300
Measuring range	Normal flow velocity	Gas 5-50m/s Liquid 0.5 - 7m/s
	Normal flow range	Liquid, gas, steam type flow range refer to table 2,3 as follows
Accuracy		Liquid ±1%，gas and steam: ±1.5%
Medium temperature		Routine temperature -25℃ - +100℃ high temperature -25℃ - +150℃ or -25℃ - +250℃
Working pressure		1.6Mpa; 2.5Mpa, 4.0Mpa(Supply as order's requirement)
Output signal (signal cable connection is M20x1.5)	Pulse voltage	High level 8-10V,Low level 0.7-1.3V
		Duty ratio of pulse is about 50%, transmission distance 100 meters.
	Standard Current	4-20mA Allowable external load resistance less than 600Ω(24VDC) Transmission distance is 3000 meters
Working environmental condition		Temperature: -25℃-+55℃ humidity:5-90% RH50℃
Material		Meter body:1Cr18Ni9Ti, Converter housing: AL-allog
Power supply		24V DC ± 10%; Or dual lithium battery 3.6 V 7.5 Ah
Protection grade		Ip65
Requirement of straight connecting pipe on both sides of the meter		Upstream≥15-35 DN ; Downstream≥10 DN

❷ Liquid.Gas (at working condition) Flow Range

Table 2.

DN (mm)	15	(20)	25	(32)	40	50	(65)	80	100	(125)	150	200	250	300
Liquid (m^3/h)	0.3-3	0.5-5	2.2-22	1.5-15	2.2-22	4-40	6-60	9-90	14-140	22-220	35-350	65-650	120-1200	180-1800
Gas (m^3/h)	5-30	5.5-56	10-90	15-150	22-220	35-350	60-600	90-900	140-1400	220-2200	300-3000	550-5500	1100-11000	1500-15000

LUDC Series
Vortex Shedding Flowmeter

❸ Flow Range of Saturated Steam

Table 3.

Caliber / Pressure	25mm		32mm		40mm		50mm		65mm		80mm		100mm		125mm		150mm		200mm		Temp	Density
	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	℃	kg/m³
0.1	20	101	22.5	150	36	229	59	358	93	600	129	917	220	1.43	348	2.25	479	3.22	840	5.73	120.1	1.126
0.2	21	136	29.5	210	47	333	77	520	124	880	168	1.33	288	2.08	463	3.30	628	4.68	1.10	8.34	133.3	1.638
0.3	24	151	36	280	56	436	92	680	152	1.15	201	1.74	345	2.78	567	4.30	750	6.13	1.32	11.0	143.2	2.140
0.4	27	186	42	340	65	536	105	836	171	1.40	231	2.14	396	3.39	640	5.24	862	7.54	1.51	13.6	151.4	2.635
0.5	30	248	46	410	72	636	118	994	188	1.69	259	2.55	444	3.98	691	6.23	966	8.95	1.70	15.9	158.3	3.127
0.6	34	256	50	470	80	733	130	1.15	206	1.95	285	2.94	489	4.66	766	7.20	1.07	10.3	1.87	18.6	164.4	3.615
0.7	37	325	54	530	87	833	142	1.30	225	2.20	310	3.34	531	5.22	832	8.15	1.16	11.7	2.03	20.9	169.8	4.099
0.8	39	325	58	600	93	931	152	1.45	243	2.47	334	3.73	572	5.91	888	9.10	1.25	13.1	2.19	23.6	174.7	4.581
0.9	42	394	62	650	100	1.03	163	1.61	253	2.73	357	4.12	612	6.44	936	10.0	1.34	14.5	2.34	25.8	179.2	5.064
1.0	45	441	66	720	106	1.13	173	1.76	272	3.00	379	4.51	650	7.16	1.00	11.0	1.42	15.8	2.49	28.6	183.3	5.553
1.1	47	479	70	780	112	1.23	183	1.92	289	3.26	401	4.91	687	7.67	1.07	12.0	1.50	17.3	2.63	30.7	187.2	6.033
1.2	50	463	73	850	118	1.32	193	2.05	306	3.50	422	5.29	723	8.4	1.12	13.0	1.58	18.5	2.76	33.6	190.8	6.509
1.3	52	555	77	910	123	1.42	202	2.22	314	3.77	422	5.68	757	8.88	1.17	13.9	1.65	20.0	2.89	35.5	194.2	6.980
1.4	54	593	79	970	129	1.51	211	2.37	328	4.00	461	6.07	792	9.49	1.22	14.8	1.73	21.3	3.02	37.6	197.5	7.456
1.5	57	630	82	1.00	135	1.60	219	2.52	341	4.30	481	6.47	825	10.3	1.26	15.8	1.80	22.6	3.15	41.4	200.5	7.934
1.6	59	669	86	1.1	140	1.71	229	2.68	353	4.55	501	6.86	858	10.7	1.31	16.8	1.87	24.1	3.28	42.9	203.5	8.419
1.7	61	707	89	1.15	146	1.81	237	2.83	365	4.80	519	7.24	890	11.3	1.36	17.7	1.94	25.9	3.40	45.3	206.2	8.897
1.8	63	746	93	1.22	151	1.91	246	2.98	385	5.07	538	7.64	922	11.9	1.41	18.7	2.01	26.9	3.53	47.8	208.9	9.388
1.9	66	784	96	1.28	155	2.01	254	3.14	395	5.33	556	8.03	954	12.6	1.46	19.6	2.08	28.3	3.65	50.0	211.5	9.868
2.0	68	822	98	1.35	161	2.10	262	3.27	404	5.60	574	8.43	985	13.2	1.50	20.6	2.15	29.6	3.76	53.5	213.9	10.35
3.0	87	1.21	128	1.98	207	3.10	338	4.84	532	8.21	743	12.4	1.27	19.3	1.95	30.3	2.78	43.5	4.86	77.4	234.6	15.21
4.0	106	1.61	158	2.60	251	4.11	409	6.43	647	11.0	898	16.5	1.53	25.7	2.40	40.2	2.35	57.8	5.87	102.8	250.7	20.21
4.3	111	1.73	161	2.80	264	4.43	429	6.91	666	11.6	942	17.7	1.61	27.7	2.47	43.0	3.52	62.2	6.17	110.6	254.9	21.74

Note: Unit in red frame data is t/h Rest is kg/h. Unit of pressure: MPa

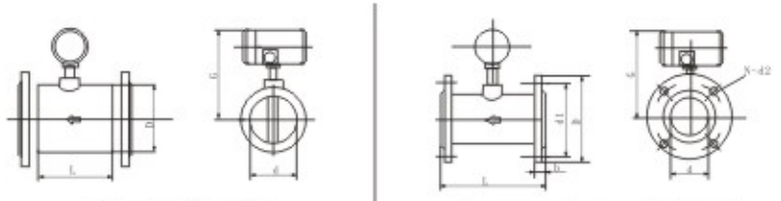
LEKTON
Vortex Shedding Flowmeter
LUDC Series
Vortex Shedding Flowmeter

Construction and Size

❶ This series has two kinds of connection froms and external dimensions

► Wafer type
Used for Vortex Shedding Flowmeter of fully filled type in DN15 – 150 ranges. See Fig 3 and Table4.

► Flange connecting type
Used for Vortex Shedding flow–meter of fully filled type in DN125 – 300. See Fig 3 and Table4.



Wafer type (DN15-150)

Flange connecting type(DN125-300)

Fig.3 Wafer and Flange connecting type

❷ Dimensions

Table 4.

Form	Nominal Caliber	Pressure Grade	L	G		D	d1	N-d2	d	b	Weight
			mm	Normal temperature	High Temperature	mm	mm		mm	mm	Kg
Wafer Type	15(20)	4.0	66	280	500	65	—	—	15(20)	15	7.5
	25	4.0	66	280	500	65	—	—	25	25	7
	32	4.0	66	285	505	72	—	—	32	32	10
	40	4.0	70	290	510	80	—	—	40	40	11
	50	4.0	85	295	515	90	—	—	50	50	12.5
	65	2.5	98	310	530	105	—	—	65	65	17
	80	2.5	110	320	540	120	—	—	80	80	20
	100	2.5	110	330	550	150	—	—	100	100	27
	125	1.6	115	340	560	164	—	—	125	125	30
	150	1.6	130	350	570	188	—	—	150	150	35
Flange Connection type	125	1.6	250	323	545	245	210	8–Φ18	125	26	22
	150	1.6	300	335	555	280	240	8–Φ23	150	28	24
	200	1.6	320	370	590	335	295	12–Φ23	200	30	31
	250	1.6	320	400	620	405	355	12–Φ25	250	32	40
	300	1.6	320	420	640	460	410	12–Φ25	300	32	48

LUDC Series
Vortex Shedding Flowmeter

Model and Basic Code

Model	Basic code														Explain
LUDC															Basic model of stress vortex transmitters
Connection type	-1														Flange connection type(DN125~300)
	-2														Wafer type(DN15~150)
Medium		2													Liquid
		3													Gas
		4 or 4G													Saturated steam (4G at overheating steam)
		5													Hot water
Code of diameter			-XXX												See bottom table
Outpur signal				-0											No signal output
				-3											There wire system (pulse output)
				-4											Two wire system (4~20mA output)
Indicator or instrument					N										No indicator
					B										Dual row LCD,(instantaneous and tolaieing flowrates)
Power supply						X									12V DC (Only used in three wire system pulsed output)
						Y									24V DC
						Z									Power supplied by battery Only used inB indicator
Material of instrument							-C								OCr18Ni12Mo2Ti (316)
							-D								1Cr18Ni9Ti (304)
Prussure								1							1.6MPa (DN125~300)
								2							2.5MPa (DN65~100)
								3							4.0MPa (DN15~50)
Performance of explosion-pro tec tion									-N						No
									-B						Intrinsically safe class

Example:

LUDC —[2] [2]—[0 5 0]—[4] [B] [Y]— [D] [3]— [N]

- [2] Connection type: Water type
- [2] Medium: Liquid
- [0 5 0] Code of Diameter: DN 50mm
- [4] Output signal: 4~20mA
- [B] Indicator: LCD Intelligent meter
- [Y] Power supply: 24VDC
- [D] Material: Stainless steel 304
- [3] Pressure: PN4.0
- [N] Explosion proof: No

④ Code of diameter

table 5.

DN (mm)	15	20	25	32	40	50	65	80	100	125	150	200	250	300
Code	001	0012	002	003	004	005	006	008	010	012	015	020	025	030

LEKTON
Vortex Shedding Flowmeter

LUDC Series
Vortex Shedding Flowmeter

Installation

① Straight pipe at upstream and downstream

Its structure likes following Fig.4,in normal condition

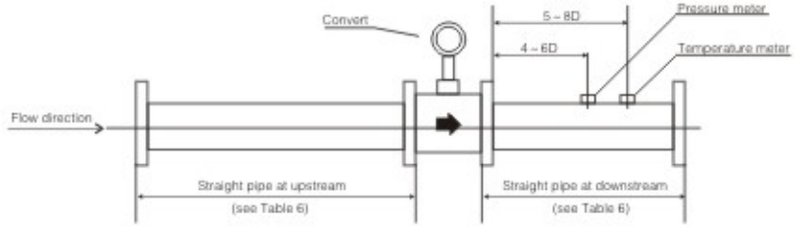


Fig.4 Position diagram of instrument installation

The straight pipe at upstream and downstream should satisfy Table 6

Table 6

Condition of upstream pipe	Length requirement of straight pipe	
	Upstream	downstream
Shrinking pipe	15D	5D
Amplifying pipe	35D	5D
One elbow pipe(90°)	20D	5D
Two elbow pipe(90°)at same plane	25D	5D
Two elbow pipe(90°)at different plane	40D	5D
Whole-open valve	15D	5D
Half-open valve	40D	5D

LUDC Series
Vortex Shedding Flowmeter

2 Pressure meter point and temperature meter point see Fig.5

3 It should be installed immediately when the instrument has arrived.It should beconsidered adequately to the requirement of straight part of pipe and the convenience of maintenance when the transducer is being installed.And it is forbidden to install at following place.

a.High pyretic gas inthe environment

b.Severe tmperature varation of the envirnment and high heat radiation.

c.Severe vibration of pipe and have no damping device.

d.The transducer can be installed in horizontal,vertical or inclining pipe,and the measuring must flow with full-pipe.When it is being installed,the straight part of pipe at upstream and downstream must satisfy the requirement of Table 6.

e.Valve and vortex meter are both installed in a pipe,you must install the vortex meter on the upstream.

Installation of wafer type and flange type during installation,the notation of flow direction on the instrument must in accord with the flow direction of medium.(It must be assured that the flow direction of medium is fron up todown when the meter is installed vertically).First,weiding mortice groove mortice groove flange on the straight part of pipe at upstream and downstream vertically,and fixing transducer and straight patr of pipe at upstream and downstream, the flange must be centred and bitted strictly.Then connecting transducr and straight part of Pipe at upstream and downstream on the pipe together.The sequence of disassemble is just contrary.Itmust be placed horizontally of installed upard when amplifier is being tested on high tempreture pipe,so it can reduce the influence to amplifier form high temperature.It must be installed respectively according to Fig.5,when the point for measuring pressure and temperature is installed nearby transducer.The shell of amplifier must ground connection well.The resister of grounding must litter than 10Ω.

Installation see Fig.5
It must be stratified with following requirement

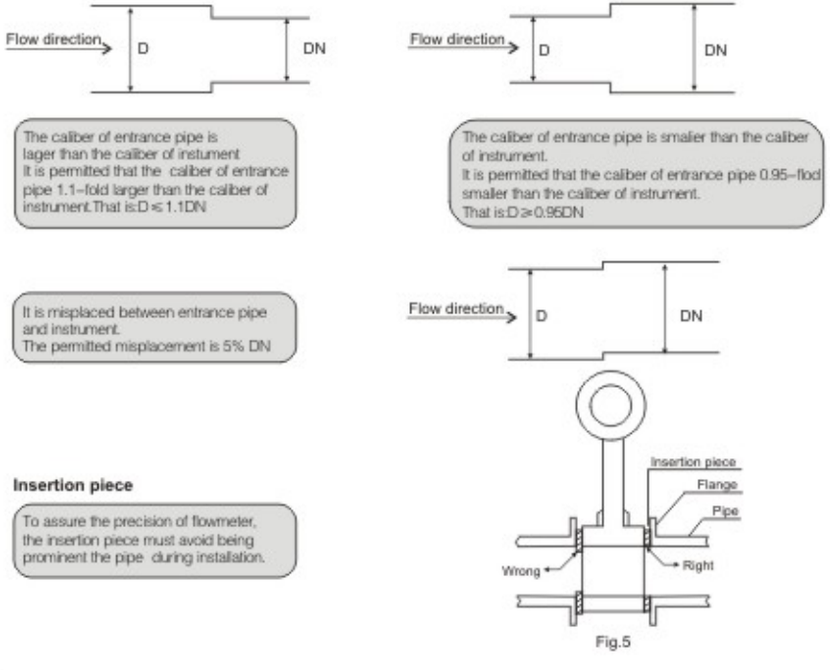


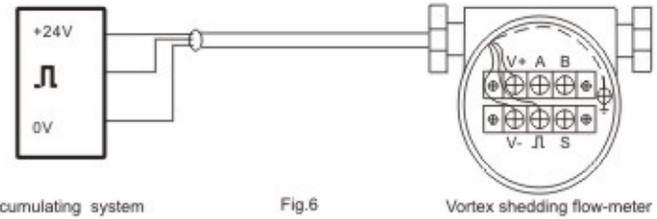
Fig.5

LUDC Series
Vortex Shedding Flowmeter

Meter wiring

1 Three-wire System (Pulse Output)

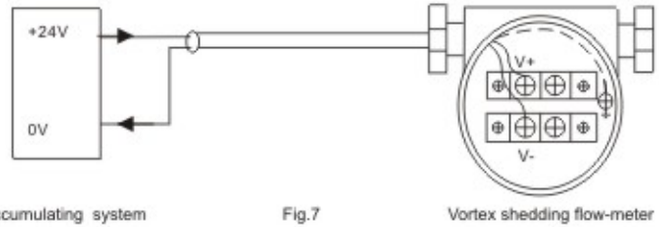
Three-wire system flow sensor with frequency signal as its output form uses DC 24V or DC12Vpower supply , connects Display Meter or computer by three-core shielded cabling. A layer of shielding can connect ground through the ground screw of amplifier's Enclosure. Shielded cable should meet the requirement of the site environment. Shielded cable should separate from other high power electrical line, parallel line is not allowed. Sensor terminal connection chart is shown as follows:



Accumulating system Fig.6 Vortex shedding flow-meter

2 Two-wire System (4-20mA Current Output)

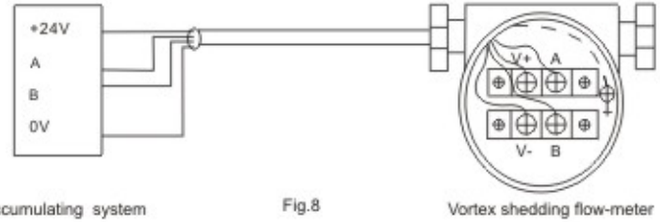
Two-wire system transmitter with output criteria 4-20 mA Current Signal uses DC 24V power supply, connects Display Meter or computer by two-core shielded cabling. A layer of shielding can connect ground through the ground screw of amplifier's Enclosure. Shielded cable should meet the requirement of the site environment. Shielded cable should separate from other high power electrical line, parallel line is not allowed. Transmitter terminal connection chart is shown as follows:



Accumulating system Fig.7 Vortex shedding flow-meter

3 RS-485 Communication Interface

Wiring Design of Vortex shedding Flow-meter With RS-485 communication interface uses DC24V power supply, connects other instruments with four-wire transmission mode. Meter terminal connection chart is shown as follows:



Accumulating system Fig.8 Vortex shedding flow-meter

Operation Menu for Vortex-Shedding Flow-meter with Display Model

1 Working Screen

Flow meter does self-check once switching on the power, after that, it enters into main work interface (Fig 9 or Fig 10)

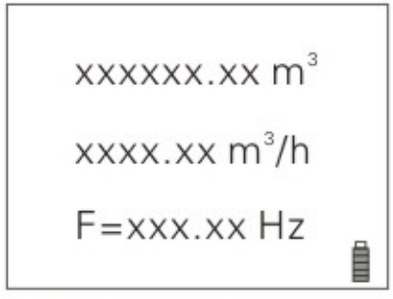


Fig.9

Pulse Output Type（-3BY）and Battery Powered Type (-0BZ) work interface

Or

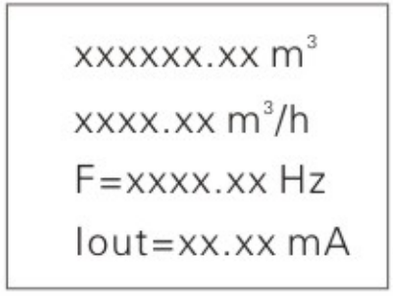


Fig.10

Current Output Type (-4BY) work interface

First Line:

Cumulative Flow, show two decimals, the decimal point automatically carries.Units same with instantaneous flow.

Second Line:

Instantaneous Flow, accurate to the second decimal place, flow unit see setting menu, also can be edited.

Third Line:

Flow Signal frequency value: show F=xxxx.xx Hz, accurate to the second decimal place.

Forth Line:

Output current value: show I =xx.xx mA accurate to the second decimal place （ONLY 4BY has this function), if choosing battery power meter, Battery level shown at the lower right corner.

LEKTON
Vortex Shedding Flowmeter
LUDC Series
Vortex Shedding Flowmeter

2 Press"<"button or"+"button to enter"initial interface of parameter setting"

Fig.11 initial interface of parameter setting

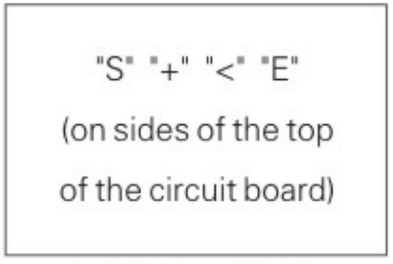


Fig.12 key–press position plan

- Press"E" button to enter into intial state of"Enter Password", enter passord: 0000
- Press"+"button to change the number(0.....9)where Currsor blinks circularly
- Press"〈" button to move the cursor's position circularly
- ntial passord of the meter is "2010"

At the intial state of " enter passord: 0000" , enter the correct passord" 2010" by pressing "+" button to increase the number and " 〈" button to move the cursor's position, press" E" button to verify, and then submenu" parameter setting" is shown. Details are shown in the following chart.
If the password is wrong, then go back to the state" enter passord: 0000" .

Notes: At the moment, press "s" button will go back to initial interface of parameter setting:" enter password:xxxx" , if continuing press "+" button or "〈" button, it will go back to main work interface.

3 Operation Menu: when Viewing the Menu

Press "+" button to page down; press "〈" button to page up; press " E" button to enter submenu "Option or value" ; press "s" button to back to initial interface of parameter setting(Pic17).

Press "E" button to enter modification section, then press "+" button to choose downward, press "〈" button to choose upward, press "E" button to verify. If it is input modification, then operate according to input operation("+" is to increase number, "〈" is to move the cursor's position).

Notes: when set the parameter, the display content can only be saved after pressing "E" button.

LUDC Series
Vortex Shedding Flowmeter

4 Parameter Setting Submenu(User Password: 2010)

Submenu No.	Menu Display	Meaning	Options or number range
1	Flow Unit Choose	Flow Unit Choose (Default 0)	0 : m^3/h 1 : m^3/m 2 : l/h 3 : l/m 4 : t/h 5 : t/m 6 : kg/h 7 : kg/m (notes: /m is per minute)
2	Algorithm Choose	Algorithm Choose (Default 00)	00 : General Volume Flow 01 : General Mass Flow 02 : General Gas Volume Flow 03 : General Gas Mass Flow 04 : Saturated Steam Temperature Compensation 05 : Saturated Steam Pressure Compensation 06 : Superheated Steam Temperature and Pressure Compensation
3	Flow Coefficient	Flow Coefficient (Default 3600)	Set Instrument coefficient, unit is P/ m^3
4	Full Scale Output Flow	Full Scale Output Flow (Default 1000)	When the meter outputs 4–20mA analog signal , this value should be set(Cannot be Zero), unit should be same with flow unit.
5	Density Setting	Density Setting (Default 1.0)	When algorithm choose is set mass flow (01,03), this item must be set, unit is kg/ m^3
6	Temperature Setting	Temperature Setting (Default 0.0)	When set temperature simulation values and choose 02,03,04,06 algorithms, this item should be set, unit is℃
7	Absolute Pressure Setting	Set Gas Absolute Pressure (Default 101.325)	When set gas absolute pressure simulation values and choose 02, 03, 05, 06 algorithms, this item should be set, unit is kPa (Vacuum is 0.0 and it will lead to flow zero)
8	Lower Level Excision Flow	Set Excising pulse input percent (Default 1%)	Value is between 0–100
9	Damping Time	Set output current damping time (Default4s)	Only VT2WE Type set output current damping time, to avoid output current fluctuating too much along with flow, range is from 2 to 32.
10	Reset Cumulant	Reset Cumulant	Choose YES and press "E" to reset Cumulant