



Typical application: conductive liquid with strong corrosion and impurities, such as acid, alkali and sea water.

## LDG Integrated (Split) Electromagnetic Flow Meter

### One. Overview

LDG (Sure 103) intelligent electromagnetic flow meter is composed of sensor and converter. It works basing on Faraday's law of electromagnetic induction and it is used to measure the volume flow of the conductive liquid whose conductivity is bigger than  $5\mu\text{S}/\text{cm}$ . It is one kind of flow meter to measure volume flow of conductive medium. Besides volume flow of normal conductive liquid, it can also measure the volume flow of corrosive liquid with strong acid or strong alkali and uniform liquid-solid two-phase suspension liquid, such as mud, mine mud and pulp. It has been widely applied to do flow measurement in petroleum, chemistry, metallurgy, textile, paper, environmental protection, food industry and municipal administration, water conservancy, river dredging.

### Two. Working principle

According to Faraday's law of electromagnetic induction, install a pair of detecting electrodes on the pipe wall which is vertical with axis of measuring pipe and magnetic force line. When conductive liquid pass along with axis of the measuring pipe, conductive liquid cuts the magnetic force line and produces induced electromotive force. The induced electromotive force is detected by the two electrodes and its value is proportional to flow. The value is  $E=KBVD$

In the equation:

E- induced electromotive force.

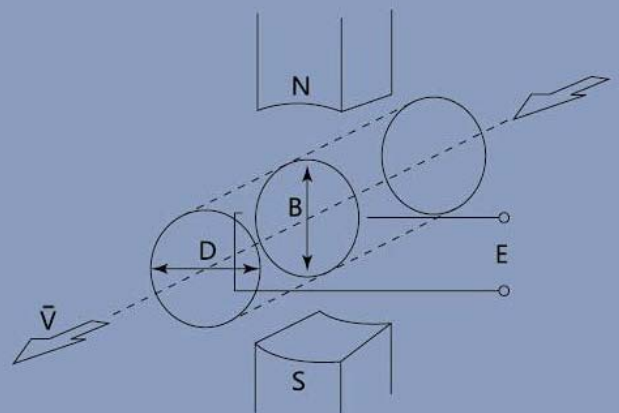
K-coefficient related to magnetic field distribution and axial length.

B-magnetic induction.

V-average velocity of the conductive liquid.

D-interval distance of the two electrodes (inner diameter of measuring pipe).

Sensor uses induced electromotive force E as flow signal and sends it to converter. After flow signal is amplified, transform filtered and digitalized, instantaneous flow and cumulative flow are displayed by backlight dot-matrix LCD. Converter has 4\_20mA output, alarm output and frequency output. It also has communication interface such as RS-485 which supports HART and MODBUS protocol.



### Three. Product features

- All digitalized data process, strong ability in anti-noise, reliable measurement, high accuracy, flow measuring range can be 150:1.
- Ultra-low switch power supply, applied to big variance in power voltage, excellent ability in anti-EMI.
- Use 16-bit embedded micro processor, high computing speed, high accuracy, low programmable frequency, improve the flow measuring stability, low power consuming.
- Use SMD device and Surface Mount Technology (SMT) technology, reliability of the circuit is high.
- No movable device in the pipe, no spoiler device, almost no additional pressure loss in measuring.
- Customer can adjust the measuring range according to their needs.
- Measuring result is related to the physical parameters such as fluid velocity distribution, pressure of fluid, temperature, density, viscosity.
- Backlight LCD with high definition, all Chinese menu operation, convenient, simple and easy to learn.
- Digital communication protocol such as RS485, RS232, HART, MODBUS. (optional)
- Have function of self-detection and self-diagnosis.
- Cumulative flow recorded in hour, use hour as recording unit, suitable to meter recording with different time. (optional)
- Three calculators built in the flow meter which can separately display positive cumulative flow, negative cumulative flow and difference computation. Non-power down built-in clock can record power down time for 16 times. (optional)
- Infrared hand held operator, communication rate 115KHZ, operate all the function of converter remotely and non-contact.

### Four. Technical parameters

Chart 1

Nominal Diameter (special model can be ordered)	Pipe style PTFE pad: DN10~DN600
	Pipe style rubber pad: DN40~DN2200
Fluid direction	Forward, reverse, net flow
Ratio of the range	150:1
Error of repeatability	±0.1% of the measured value
Accuracy level	Pipe style: 0.5 level, 1.0 level
Temperature of measured medium	Ordinary rubber pad: -20~+60°C
	High temperature rubber pad: -20~+90°C
	PTFE pad: -30~+100°C
	High temperature PTFE pad: -20~+180°C
Rated working pressure (High pressure can be ordered)	DN10-DN150: ≤1.6MPa
	DN200-DN350: ≤1.0MPa
	DN400-DN1000: ≤0.6MPa
	DN450-DN2200: ≤0.25MPa
Liquid velocity range	0.1-15m/s
Range of conductivity	Conductivity of measured medium ≥5μs/cm
Signal output	4~20mA, (load resistor 0~750Ω)pulse/frequency, control voltage level
Communication output	RS485, MODBUS HART protocol
Power supply	AC220V or DC24V
Required length of Straight pipe section	Upstream ≥5DN, downstream ≤2DN
Connection type	Flange connection between flow meter and matched pipes, national standard of flange:GB/T9115.1-2000
Explosion proof level	ExdeiaII BT4-T6
Protective level	IP65, special order can reach to IP68
Ambient temperature	-25~+60°C
Relative humidity	5%~95%
Consumption of total power	Less than 20 W

## Five. Instrumentation selection

### 1. Selection code

Chart 2

Model										Notes	
LDG-	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Diameter											10-2200mm
Assemble	S										Integrated type
	L										Split type
Electrode material	M										Stainless steel
	T										Ti
	D										Ta
	H										Hastelloy alloy
	P										Pt
	N										Ni
Output style	0										No output
	1										4-20mA/1-5KHz
	2										4-20mA
Pad material	X										Rubber
	F										PTFE
	P										Polyethylene
	J										Polyurethane Rubber
Live show in site	0										No live show in site
	1										Live show in site
Communication protocol type	0										No communication
	1										RS485
	2										RS232
	3										MODBUS
	4										HART
Grounding ring	0										No grounding ring
	1										Grounding ring
	2										Grounding electrode
Upper flow threshold									(n)		Upper flow threshold(measuring range) m <sup>3</sup> /h

Example: select an electromagnetic flow meter with live show to measure sewage. Diameter of the customer pipe is DN50 with rubber lining, stainless electrode, 4~20mA output, no communication and upper flow threshold is 30 m<sup>3</sup>/h. The model is: LDG-50S-M1X100-30.

2. Model selection instructions

Diameter of the instruction: refer to Chart 3.

Chart 3

Inner diameter	10	15	20	25	32	40	50	65
Qmin(m <sup>3</sup> /h)	0.05	0.1	0.3	0.4	0.8	1.2	2	3
Qmax(m <sup>3</sup> /h)	3.5	8	15	22	35	55	95	150
Inner diameter	80	100	125	150	200	250	300	350
Qmin(m <sup>3</sup> /h)	5	8	12	18	25	35	50	60
Qmax(m <sup>3</sup> /h)	220	350	550	800	1400	2200	3200	4500
Inner diameter	400	450	500	550	600	700	800	900
Qmin(m <sup>3</sup> /h)	80	120	180	230	300	400	500	600
Qmax(m <sup>3</sup> /h)	5500	7500	9000	11000	13000	16600	21700	27468
Inner diameter	1000	1100	1200	1400	1600	1800	2000	2200
Qmin(m <sup>3</sup> /h)	800	1000	1200	1600	2100	2700	3300	4000
Qmax(m <sup>3</sup> /h)	33900	41000	48800	66400	86800	109000	135000	164000

Materials of lining: refer to Chart 4

Chart 4

Material of inner lining	Name	symbol	function	Highest working temperature	Applied liquid
rubber	Neoprene	CR	Middle friction resistance, low resistance to concentrated acid and alkali corrosion	< 60°C	Running water, industry water, sea water
	Polyurethane	PU	Extremely excellent friction resistance, low resistance to acid and alkali corrosion	< 60°C	Pulp, mine mud
Fluoroplastics	PTFE	F4 or PTFE	Stable chemical function, resistance to boiled Hydrochloride, Sulfate, Aqua regia and Strong alkali	< 160°C	Acid, alkali and salty water with high corrosion
	FEP	F46 or FEP	Chemical stability is equal to F4, resistance to pressure and tensile strength is better than 4	< 120°C	Acid, alkali and salty water with corrosion
	Copolymer of Tetrafluoroethylene and Ethylene	F40 or ETFE	Chemical stability is equal to F4, resistance to pressure and tensile strength is better than 4	< 120°C	Acid, alkali and salty water with corrosion
plastic	Polyethylene	PO	Resistance to diluted acid, alkali and salty water	< 60°C	Resistance to sewage of acid, alkali and salty water
	Polyphenylene Sulfide	PPS	Resistance to diluted acid, alkali and salty water	< 100°C	Resistance to sewage of acid, alkali and salty water

Materials of electrode or grounding electrode: refer to Chart 5

Chart 5

Material	Resistance to corrosion
316L	Application: 1.running water, industry water, well water, sewage water in the city 2. acid, alkali and salty water with weak corrosion
Hastelloy B	Application: 1.Non-oxidizing acid (density is below 10%), such as Hydrochloride. 2. Sodium hydroxide (density is below 50%), Alkali solution of sodium hydroxide in any density. 3. Phosphate, organic acids. Not suitable application: Nitrate
Hastelloy C	Application: 1. Mixed acid, such as acid mixed with chromic and sulfate acid. 2. Oxidizing salts, such as Fe+++ , Cu++ , sea water. 3. Phosphate, organic acids, Not suitable application: Nitrate
Titanium (Ti)	Application: 1.Salt (1) Chloride, (Magnesium chloride/ Aluminum chloride/ Calcium chloride/ Ammonium chloride/ Ferric chloride) 2. Sodium hydroxide whose density is below 50% such as Ammonium hydroxide, Barium hydroxide, etc. Not suitable application: Reducing acid such as Hydrochloride, sulfate, Phosphate, Hydrofluoric acid.
Tantalum (Ta)	Application: 1.Hydrochloride (density is below 40%), concentrated and dilute sulfuric acid not including oleum. 2. Chlorine Dioxide, Ferric chloride, Hypochlorite, Sodium cyanide, Acetic acid. 3. Oxidizing acid such as Nitrate (including Fuming nitric acid), Aqua regia whose temperature is below 80°C. Not suitable application: alkali, Hydrofluoric acid.
Platinum (Pt)	Application: almost all the acid, alkali, salty dilute (including oleum and Fuming nitric acid ). Not suitable application: Aqua regia and ammonium salt.
WC	Application: pulp, sewage, resistance to inference from solid particles. Not suitable application: inorganic acid, organic acid, Chloride.

If customer can not make sure which material for lining and electrode will be used, please refer the seventh part: " overall chart for materials of electrodes and lining with resistance to corrosion " .

### Six. Installation size.

1. Outer size of flow meter.

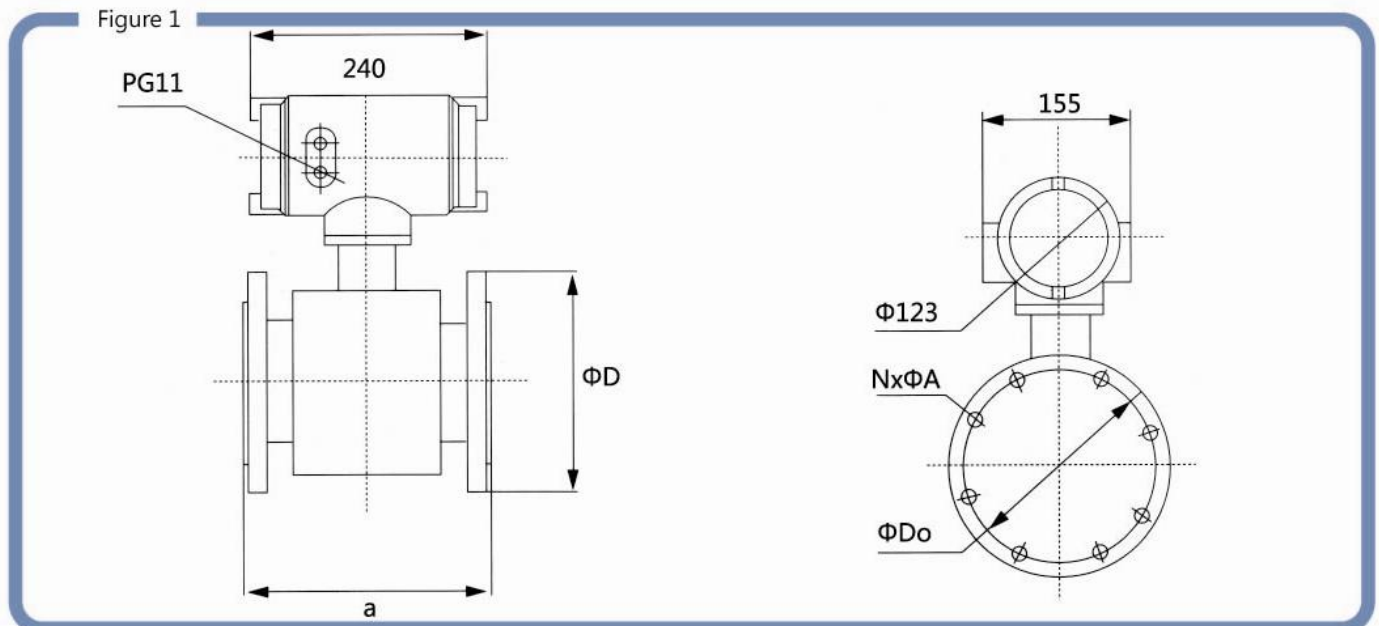
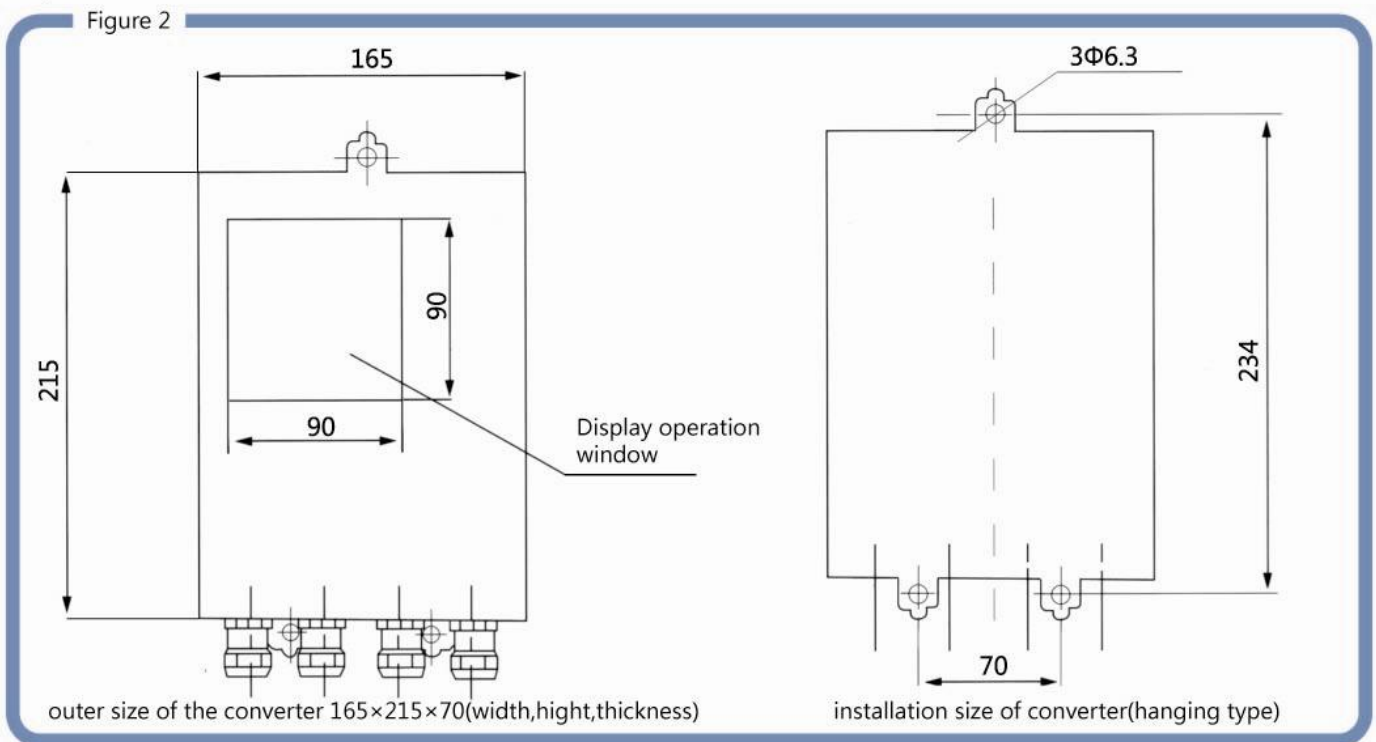


Chart 6

DN	a	D	Do	N×A
10	230	90	60	4×14
15	230	95	65	4×14
20	230	105	75	4×14
25	230	115	85	4×14
32	230	140	100	4×18
40	230	150	110	4×18
50	230	165	125	4×18
65	230	185	145	4×18
80	230	200	160	8×18
100	230	220	180	8×18
125	280	250	210	8×18
150	280	285	240	8×22
200	310	340	295	8×22
250	360	395	350	12×22
300	460	445	400	12×22
350	460	505	460	16×22
400	460	565	515	16×26
450	460	615	565	20×26
500	460	670	620	20×26
600	600	780	725	20×30
700	700	895	840	24×33
800	800	1015	950	24×33
900	900	1115	1050	28×33
1000	1000	1230	1160	28×36
1200	1200	1405	1340	32×33
1400	1400	1630	1560	36×36
1600	1600	1830	1760	40×36
1800	1800	2045	1970	44×39
2000	2000	2265	2180	48×42
2200	2200	2405	2315	52×45

2. split convert installation size



## Seven. overall chart for materials of electrodes and lining with resistance to corrosion

Chart 7-A

Name	Density/%	Temperature/°C	Stainless steel	Hastelloy C	Ti	Da	Pt	PTFE	PFA	Polyurethane Rubber	Chloroprene rubber
Acetic acid	5~10	R~S	A	A	A	A	A	A	A	N	A
	Over 50	R~S	N	A	A	A	A	A	A	N	N
	S	R~S	N	A	A	X	A	A	A		N
Aluminum chloride	10	Below 100	N	N	A	B	A	A			A(M)
	25~100	Below 100	N	N	N	B	A	A			A(M)
Ammonia	10	R	A	A	A	X	A	A			
	10~100	Below S	B	A	A	N	A	A	A		A(M)
Bauxite slurry			A	A		A	A	A			
Beer			A	A		A	A	A			
Black liquor			B			A	A	A		N	N
Brine		R~S	B	A	A	X	A	A		N	A(M)
Citric acid	5~25	R~S	A	A	A	X	A	A			A(M)
	50	R	A	A	A	X	A	A			A
	50	S	A	A	B	X	A	A			A(M)
Slurry			N	B		A	A	A		B	A
Coal+water slurry			A	A		A	A	B		N	N
Copper sulfate	5~50	R~S	B	B	B	A	A	A		A(M)	A(M)
	50~Sat	R~S	B	B	B	X	A	A		A(M)	A(M)
Dairy products			A	A		A	A	B		N	N
Dye			A	A		A	A	A		N	N
Fatty acid	100	R	A	A	A	X	A	A			B
	100	S	B	A	A	X	A	A			N
	100	135	A	A	A	X	A	A			B(M)
	100	315	A	B	A	X	A	A			
Hydrochloric acid Hastelloy B included	05~5	R	N	X	A	A	A	A	A		B
	10~20	R	N	B	A	A	X	A	A		B
	37	R	B	N	N	A	X	A	A		B
	10	50	N	B	N	A	A	A	A		B
	5	60	N	N	A	A	A	A	A		B
	0.5'5	S	N	N	A	X	A	A	A		N
	10~37	S	N	N	N	X	X	A	A		N
Glucose syrup			A	A		A	A	A	A	A	A
Green liquid			A	A		A	A	A	A		N
Lime slurry			N	B		A	A	A		A	A
Lime stone slurry			N	B		A	A	A		A	A
Magnesium hydroxide	100		N	N		N	A	A	A		
molasses			A	A		A	A		A	N	N

Symbol instruction: A-applicable; B-can be used, short life; N-can not be used; X-resistance to corrosion but not recommended; Blank-no data;R-room temperature; S-boiling point; Sat- Saturation; (M)-depending on the highest temperature that lining can bear.

To be continued in next page >>

Chart 7-B

Name	Density/%	Temperature/°C	Stainless steel	Hastelloy C	Ti	Da	Pt	PTFE	PFA	Polyurethane Rubber	Chloroprene rubber
Drilling mud			A	A		A	A		N	A	N
Nickel sulfate		80	N	N	X	A	A	A		A(M)	A(M)
Nitric stock	7~65	R	X	X	X	A	A	A	A		B
	7~65	S	X	N	X	A	A	A	A		N
	100	R	N		X	A	A	A	A		N
	100	R~S			A	A	A	A	A		N
Paper stock		R	B	A	X	A	A	A			N
Phosphoric acid	1~30	R	X	X	B	A	A	A	A		A
	45~Sat	140~150	B	X	N	A	A	A	A		A
	80~Sat	R	N	N		A	A	A	A		A(M)
Potassium hydroxide	10~20	R	A	X	N	N	A	A	A		A
	20~50	S	B	X		N	A	A	A		A
	10~50		B	X	A	N	A	A	A		A
Sewage		R		A	A	A	A	A		A	A
Sea water			B	A	A	A	A	A			N
Sludge		R~S	A	A	A	A	A	A		N	B
Sodium bicarbonate	10~20	R~S	A	A	B	A	A	A			A(M)
	To 100	R	N	N	A	A	A	A	A		A(M)
Sodium hydroxide	10~20	R	A	N	A	N	A	A	A		A
	34~50	~150	B	N	A	N	A	A	A		A
	10~20	70~150	N	N	B	N	A	A	A		A(M)
	30~50	180	N	N	B	N	A	A	A		A(M)
	50	~150	N	N	B	N	A	A	A		A(M)
	60~100	R	N	N	X	N	A	A	A		A(M)
Sulfuric acid	2~5	R	N	X	X	A	A	A	A		A
	10	R	N	X	B	A	A	A	A		N
	25~60	R	N	X	N	A	A	A	A		N
	70~85	R	N	X	N	A	A	A	AA		N
	90~96	150	X	X	X	A	A	A	A		N
	2~5	180	N	N	N	N	A	A	A		A(M)
	5~60	150	N	N	N	N	A	A	A		N
	77~96		N	N		N	A	A	A		N
Urea	50	R	A	A			A	A		N	N
Uric acid			A	A		X	A	A			A
White liquid			N	N		A	A	A			B

Symbol instruction: A-applicable; B-can be used, short life; N-can not be used; X-resistance to corrosion but not recommended; Blank-no data;R-room temperature; S-boiling point; Sat- Saturation; (M)-depending on the highest temperature that lining can bear.