

## Instructions

# Intelligent electromagnetic flowmeter



## Summary

The LDG intelligent electromagnetic flowmeter is suitable for measuring the volume of conductive liquids and slurries in closed pipelines, such as clean water, sewage, various acid, alkali and salt solutions, slurries, mineral slurries, pulp, and food related liquids.

## Measuring principle

The measurement principle of LDG intelligent electromagnetic flowmeter is based on Faraday's law of electromagnetic induction: when the conductive liquid moves through the cutting anchor force line in the anchor field, the induction potential is generated in the conductor, and the induction potential  $E$  is:

$$E=KB\bar{V}D$$

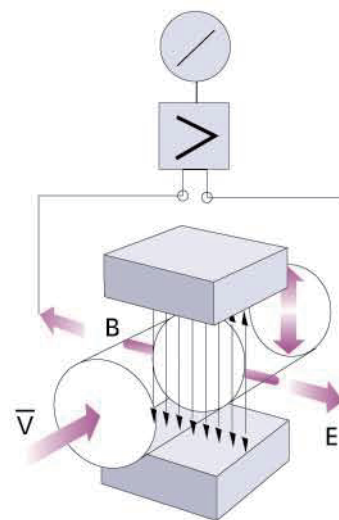
In the equation:

$K$  -- instrument constant

$B$  -- intensity of magnetization

$\bar{V}$  -- Measure the average flow rate within the pipe section

$D$  -- Measure the inner diameter of the pipe section



When measuring the flow rate, the conductive liquid flows through a magnetic field perpendicular to the direction of flow at velocity  $V$ . The flow of the conductive liquid induces a voltage proportional to the average flow rate. The induced voltage signal is detected through two or more electrodes in direct contact with the liquid, and sent to the converter through cable for intelligent processing. The LCD was then displayed or converted into standard signals 4 – 20 mA and 0 – 1 kHz output.

## How to choose correctly

The selection of instrument is a very important work in the application of instrument. According to the relevant data, 2 / 3 of the faults in the actual application of instrument are caused by the wrong selection and installation of the instrument, please pay special attention.

1. Collect data.

- ① Name of the fluid being tested.
- ② Maximum flow, minimum flow.
- ③ maximum working pressure.
- ④ Maximum temperature and minimum temperature.

2. The measured fluid must have a certain conductivity, conductivity of  $5 \mu S / cm$ .

3. The maximum and minimum flow rate must meet the values in the table below.

Bore size (mm)	10	15	20	25	32	40	50	65
Minimum (m <sup>3</sup> /h)	0.0283	0.0636	0.12	0.176	0.29	0.452	0.7	1.19
Maximum (m <sup>3</sup> /h)	4.24	9.54	16.96	26.5	43.42	67.85	106.0	179.0
Bore size (mm)	80	100	125	150	200	250	300	350
Minimum (m <sup>3</sup> /h)	1.8	2.82	4.41	6.36	11.3	17.6	25.4	34.6
Maximum (m <sup>3</sup> /h)	271.0	424.0	662.0	954.0	1690	2650	3810	5190
Bore size (mm)	400	450	500	550	600	700	800	900
Minimum (m <sup>3</sup> /h)	45.2	57.2	77.6	85.5	101.0	138.0	180.0	229.0
Maximum (m <sup>3</sup> /h)	6780	8570	10600	12800	15200	20700	27100	34300
Bore size (mm)	1000	1100	1200	1400	1600	1800	2000	2200
Minimum (m <sup>3</sup> /h)	282.0	342.0	407.0	554.1	732.7	916.0	1131.0	1368.3
Maximum (m <sup>3</sup> /h)	42400	51300	61000	83121	108566	137404	169635	205258

4. The actual maximum working pressure must be less than the rated working pressure of the flowmeter.

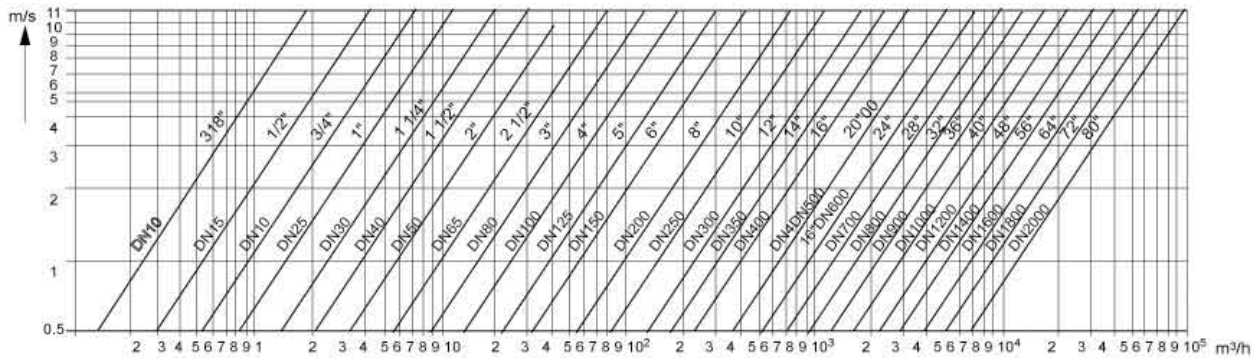
5. The highest working temperature and the minimum working temperature must meet the temperature requirements specified by the flowmeter.

6. Determine whether there is a negative pressure situation.

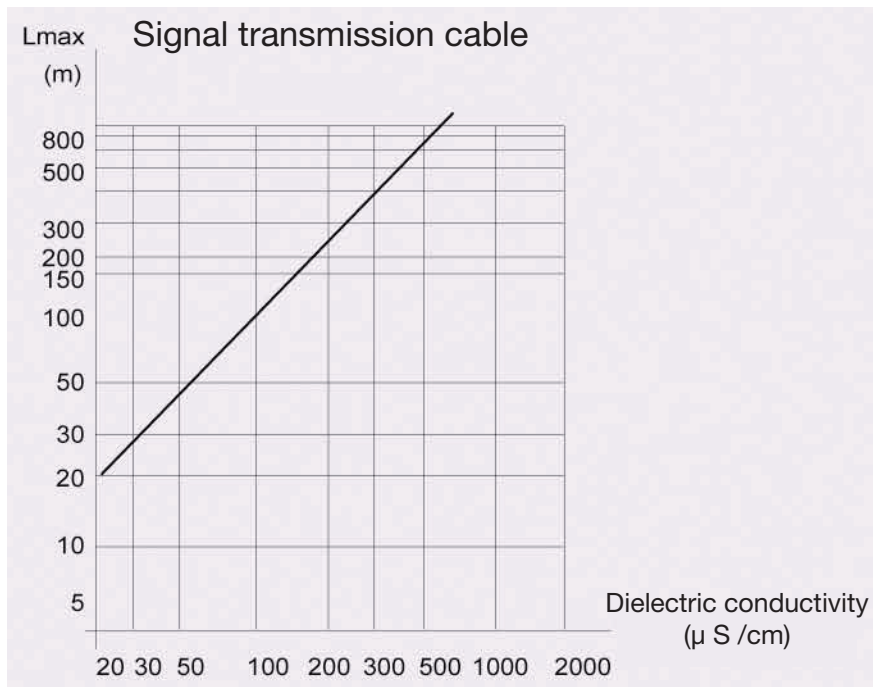
You can choose the corresponding electromagnetic flowmeter according to the flow rate in the above table. If the inner diameter of the selected electromagnetic flowmeter is not consistent with the inner diameter of the current process pipeline, shrinkage or expansion should be conducted.

- 1. If the pipe is shrunk, consider whether the pressure loss caused by the shrinkage will affect the process.
- 2. Considering the product price, you can choose a smaller caliber electromagnetic flow meter to reduce the investment relatively.
- 3. When measuring clean water, the economic flow rate is  $2 \sim 3 m/s$ . When measuring the solution easy to crystallization, the flow rate should be appropriately increased to prevent the electrode of the electromagnetic flowmeter from being covered.

- The graph of flow rate and flow rate



- Graph of the maximum split distance, cable copper core section and dielectric conductivity



In practical application, the shorter the split distance is, the better, the cable is too long, affected by its distribution capacitance, it is easy to cause signal interference. For example, the conductivity of general tap water is about 100  $\mu S/cm$ , and the maximum distance of the split is about 100cm.

## How to select the electrode material

The material of the electrode should be selected according to the corrosion of the tested fluid. Please check the corrosion prevention manual and test the special fluid.

Material	Corrosion resistance properties
Molybdenum stainless steel (0Cr18Ni12Mo2Ti)	Nitric acid, <5°C sulfuric acid at room temperature, boiling phosphoric acid, formic acid, alkali solution, sulfuric acid, seawater, acetic acid under certain pressure
Hastelloy C Hastelloy B (HC、HB)	Oxidant acid resistance, oxidizing salt resistance, seawater resistance, non-oxidizing acid resistance, non-oxidizing salt resistance, alkali, normal temperature sulfuric acid
Titanium (HC)	Seawater, various chlorides and hypochlorohydrochloric acid, chlorinated acid (including smoke nitric acid), organic acids, alkali
Ta (Ta)	The rest of the chemical media except hydrofluoric acid, smoke sulfuric acid, alkali, including boiling point hydrochloric acid, nitric acid and <175°C sulfuric acid
Platinum (Pt)	All kinds of acid, alkali and salt, excluding wangshui

## How to select the lining material

The lining material shall be selected according to the corrosion, wear and temperature of the tested medium.

The lining material	Name	Symbol	Function	Maximum operating temperature	Applicable liquid
Rubber	Neoprene rubber		Moderate wear resistance, generally low concentration of acid and alkali salt corrosion resistance	<80°C	Tap water Industrial water Sea water
	Polyamide rubber		Excellent wear resistance performance, acid and alkali resistance performance is poor	<60°C	Pulp, pulp and other slurry
Fluoroplastic	Politef	The F4 or the PTFE	Chemical performance is very stable, boiling resistance to hydrochloric acid, sulfuric acid, royal water, concentrated alkali corrosion	<180°C	A highly corrosive acid and alkali salt liquid
	Tetrafluoroethylene and hexafluoropropylene (Teflon FEP)	The F46 or the FEP	Chemical properties are slightly inferior to the F4		Corrosive acid and alkali salt liquids
	Tetrafluoroethylene and ethylene	The F4 or the ETFE	Chemical properties are slightly inferior to the F4		Corrosive acid and alkali salt liquids
Plastics	Polytene	PO	Stable chemical properties	<60°C	Sewage
	Poly	PPS		<150°C	Hot-water

## | How to select the protection level

According to national standard GB420B-84 and International Electrotechnical Commission standard IEC529-76 for shell protection grade:

- IP65: water spray type, allowing the faucet to spray water on the sensor from any direction, the water spray pressure is 30 kPa, the water output is 12.5L/s, and the distance is 3m.
- IP68: diving type, long-term work in the water.

The protection level should be selected according to the actual situation, the sensor is installed below the ground, often flooded, IP68 should be selected, the sensor is installed above the ground, IP65 should be selected.

## | How to select the additional features

The basic type of LDG intelligent electromagnetic flowmeter has been displayed, with the output of 4-20 mA and 0-1 KHz, alarm and other functions. Other additional functions can be selected according to the actual situation:

1. Split installation: the sensor should be installed below the ground or for other reasons, the split installation method should be selected.
2. RS-485 communication: For communication between sensors and other equipment, the RS-485 communication function should be selected.
3. Need other functions, please call for customized.

## | How to change the direction of the converter box

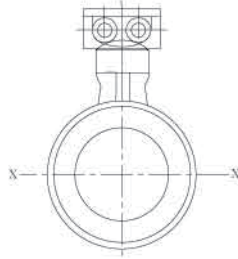
The converter box can be transformed in four different directions as needed.

1. Change of the converter box direction of the combined flowmeter
  - ① Remove the 4 hexagonal screws fixing the converter box.
  - ② Turn the converter box to the ideal direction and watch the internal cable when rotating.
  - ③ Fix the converter box again.

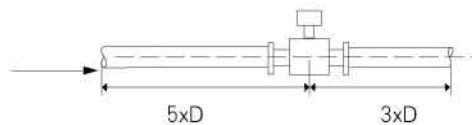
## | How to properly select the installation point

Correct selection of the installation point and correctly installing the flowmeter are very important links. If the error is made in the installation process, the light one will affect the measurement accuracy, the heavy one will affect the service life of the flowmeter, and even damage the installation position of the flowmeter, special attention should be paid to:

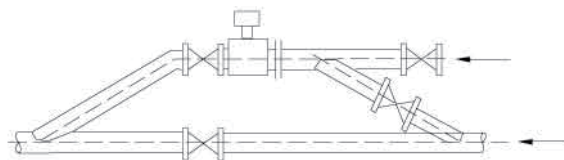
1. The axis of the measuring electrode must be similar to the horizontal direction



2. The measuring pipe must be fully filled with liquid
3. The front of the flowmeter should have at least 5 D (D is the inner diameter of the flowmeter), and the rear 3 D (D is the inner diameter of the flowmeter) in the rear

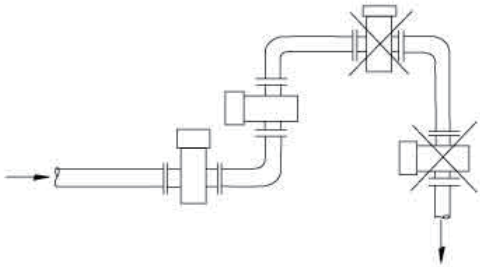


4. The flow direction of the fluid is consistent with the arrow direction of the flowmeter
5. there should be a vacuum in the pipeline will damage the lining of the flowmeter, special attention should be paid
6. There should be no strong electromagnetic field near the flowmeter
7. There should be ample space near the flowmeter for installation and maintenance
8. If the measuring pipe has vibration, there should be fixed supports on both sides of the flowmeter
9. When measuring the mixing liquid of different media, the distance between the mixing point and the flowmeter should be at least 30 D (D is the inner diameter of the flowmeter) in length
10. To facilitate the future cleaning and maintenance of the flow meter, bypass pipes shall be installed

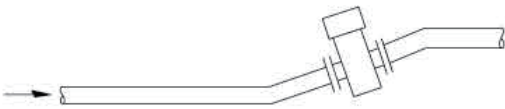


11. When installing the flow meter of PVC lining, the bolts connecting the two flanges should be tightened evenly, otherwise it is easy to crush the PVC lining, and it is best to use the torque wrench

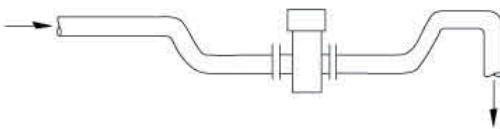
## How to select the installation method correctly



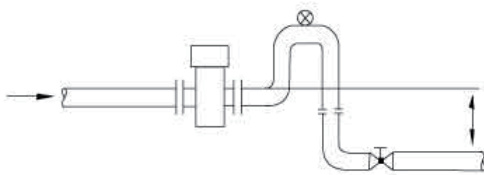
It should be installed at the lower part of the horizontal pipeline and vertically upwards, avoiding installation at the highest point and vertically downwards of the pipeline



It should be installed at the rising point of the pipeline



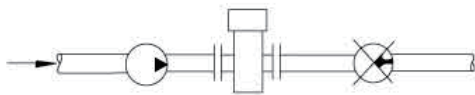
The installation of pipelines with open discharge should be installed at the lower part of the pipeline



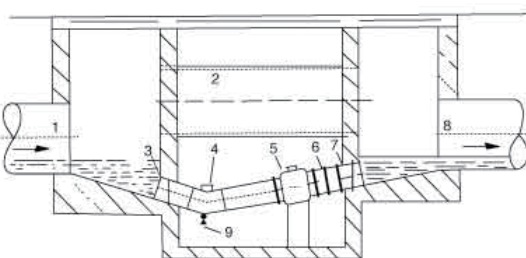
If the pipeline drop exceeds 5m, install an exhaust valve downstream of the sensor



Control valves and shut-off valves should be installed downstream of the sensor, at the outlet of the pump



Sensors should never be installed at the inlet of the pump, but at the outlet of the pump

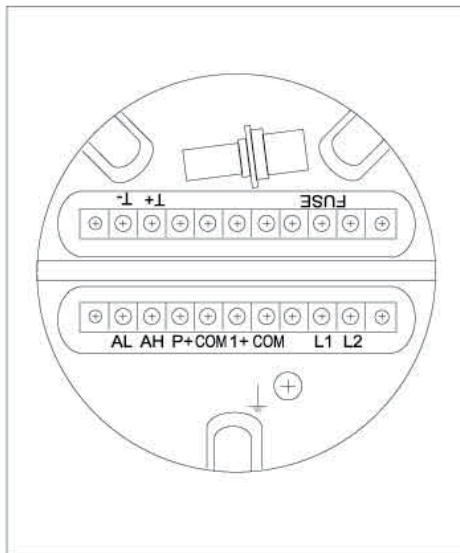


How to install a flow meter in a measuring well

- |                       |                    |
|-----------------------|--------------------|
| 1. Entrance           | 2. Overflow pipe   |
| 3. Population barrier | 4. Cleaning holes  |
| 5. Flowmeter          | 6. Short pipe      |
| 7. Export             | 8. Discharge valve |

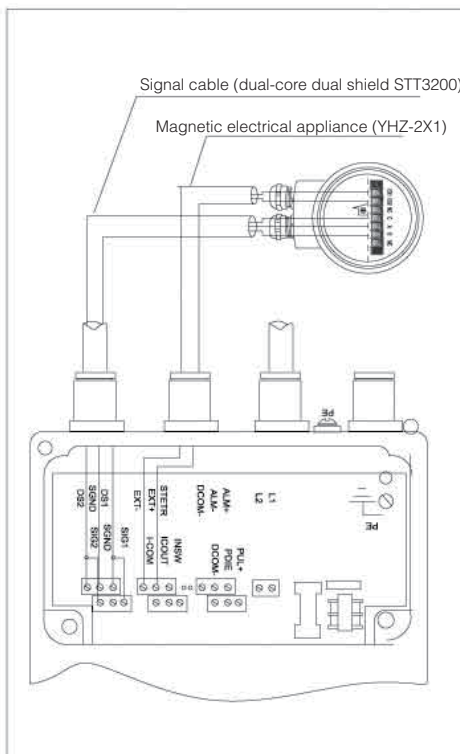
## Instrument wiring and installation requirements

- If the split installation is used, the connected signal cable adopts customized special cable, the shorter the cable, the better
- YZ medium rubber sleeve cable, its length is the same as signal cable
- Signal cable and excitation cable must be strictly separated, can not be laid in the same pipe, can not be laid in parallel, can not be twisted together, should be respectively separately worn in the steel pipe
- The Signal cables and excitation cables should be as short as possible. The excess cables cannot be rolled together. The excess cables should be cut off and the joints should be rewelded together



Each each terminals of the integrated converter

I+ :	Flow current output
COM :	Current output
P+ :	Bidirectional flow frequency (pulse) output
COM :	Frequency (pulse) output ground
AL :	Lower limit alarm output
AH :	Upper limit alarm output
COM :	Alarm output
FUSE :	Input the power supply fuse
T1+ :	RS485 communication output
T2- :	RS485 communication output
L1 :	A 220V (24V) power supply input
L2 :	The 220V (24V) power input converter terminals are marked



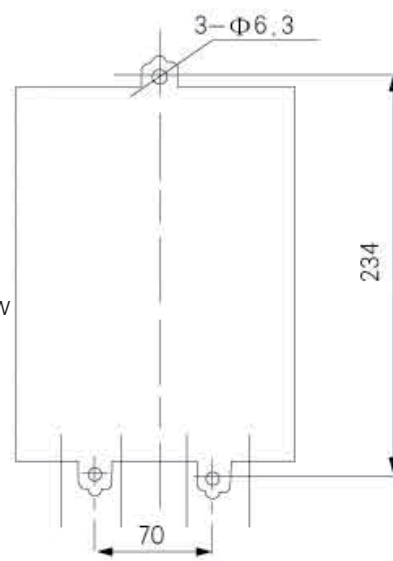
Terminal marks of the split converter

SIG1 :	Signal 1	Contact size sensor
SGND :	Signal ground	
SIG2 :	Signal 2	
DS1 :	Motivation shielding 1	
DS2 :	Motivation shielding 2	
EXT+ :	exciting current +	
EXT- :	exciting current-	
INSW :		
ICOUT :	Positive and negative flow current output	
ICCOM :	Current output	
ALM2 :	Air traffic control, excitation line break state alarm output	
PUL+ :	Positive and reverse flow frequency " Pulse) output	
PDIR :		
D- :	Frequency (pulse) output ground	Two-way alarm output
COM :	Lower limit alarm output	
ALM1 :	Upper limit alarm output	
STETR :	Alarm output	

# Appearance of the split-type electromagnetic flowmeter and the installation size of the converter



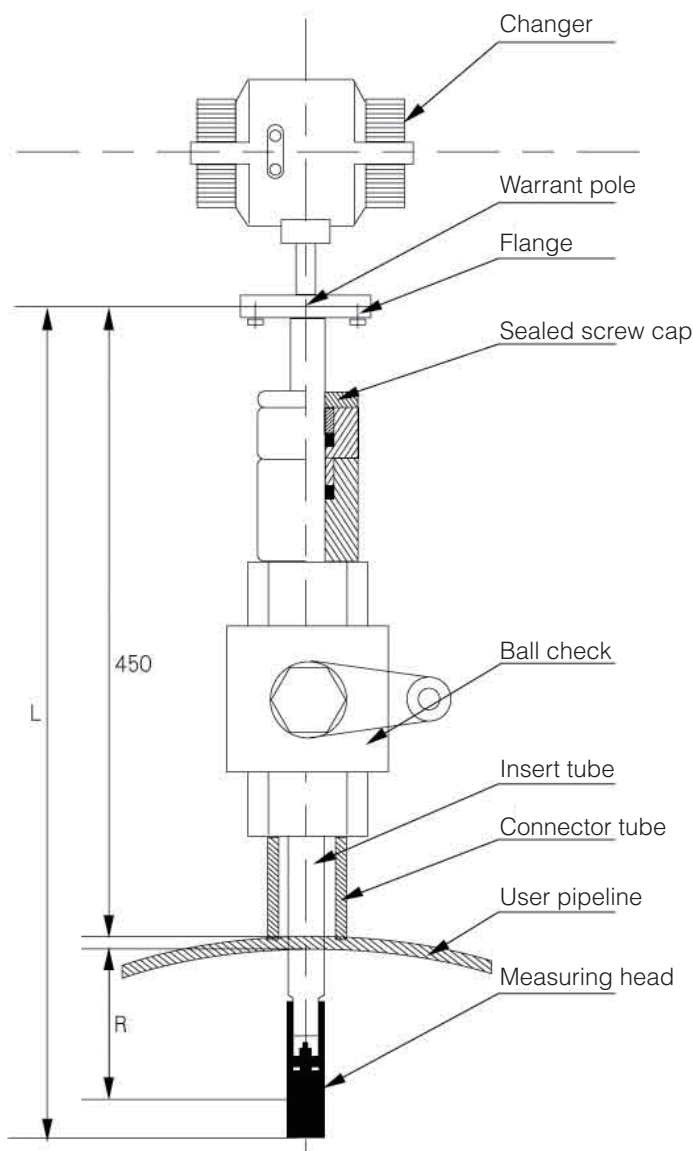
Converter installation size  
165x215x70 (width and thickness)



Converter installation size  
(wall mounted)

## Structure and external dimension of the plug-in electromagnetic flowmeter

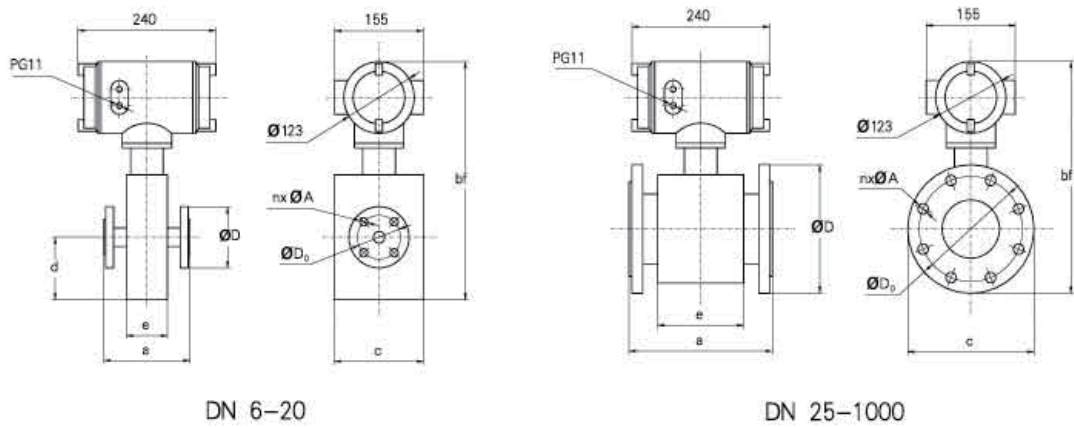
Structural composition: the plug-in electromagnetic flowmeter consists of measuring head (electrode assembly), insertion rod, insertion mechanism (ball valve, connecting short pipe, flange, etc.) and converter (integrated or split type).



DN	Standard tube wall thickness	R	L
250	273x11.5	125	600
300	325x12.5	150	625
350	377x3.5	175	650
400	426x3	200	675
450	480x15	90	565
500	530x15	100	575
600	630x9	120	595
700	720x10	140	615
800	820x10	160	635
900	920x10	180	655
1000	1020x10	200	675
1200	1220x10	240	715
1400	1420x10	280	755
1600	1620x10	320	795
1800	1820x10	360	835
2000	2020x10	400	975

Note: The relationship between the standard pipe outer diameter and the wall thickness is provided above is for reference only. R is the depth of insertion

## Overall dimensions of the body-type flow meter



DN	Rated pressure (MPa)	Instrument dimensions (mm)					Flanged connection size (mm)		
		a	bf	c	d	e	D	D <sub>0</sub>	nxA
10	4.0	150	408	156	107	72	90	60	4x14
15		150	408	156	107	72	95	65	4x14
20		150	408	156	107	72	105	75	4x14
25		150	303	115		78	115	85	4x14
32		150	319	140		78	140	100	4x18
40		150	332	150		93	150	110	4x18
50		200	346	165		109	165	125	4x18
65		200	367	185		105	185	145	8x18
80		200	382	200		101	200	160	8x18
100	1.6	250	397	220		150	220	180	8x18
125		250	429	250		150	250	210	8x18
150		300	459	285		180	285	240	8x22
200	1.0	350	517	340		222	340	295	8x22
250		400	570	395		254	395	350	12x22
300		500	617	445		316	445	400	12x22
350		500	668	505		305	505	460	16x22
400		600	723	565		380	565	515	16x26
450		600	773	615		380	615	565	20x26
500		600	825	670		400	670	620	20x26
600		600	930	780		456	780	725	20x30
700		700	1038	895		545	895	840	24x30
800		800	1148	1015		580	1015	950	24x33
900		900	1248	1115		690	1115	1050	28x33
1000		1000	1355	1230		750	1230	1160	28x36
1200	0.6	1200	1674	1405		1206	1405	1340	32x33
1400		1400	1874	1630		1406	1630	1560	36x36
1600		1600	2084	1830		1606	1830	1760	40x36
1800		1800	2304	2045		1806	2045	1970	44x39
2000		2000	2504	2265		2006	2265	2180	48x42
2200	0.25	2200	2704	2405		2206	2405	2315	52x45

## Model description of the flowmeter

Specification code		Explain
Instrument type	LDG	Intelligent electromagnetic flowmeter
The path code	XXX	Example: 100 means DN100, if the path after I indicates the insert, A means the adjustable input
The electrode form	1	Standard fixed type
	2	Scrapper type
	3	Removing replacement type
Electrode material	0	Stainless steel
	1	Platinum Pt
	2	Harter B (HB)
	3	Ta Ta
	4	Titanium Ti
The lining material	5	Harbin C (HC)
	3	Chloroprene rubber
	4	Polylimb ester rubber
	5	F4 (PTEE) PTFE
	6	F46 (FEP) polyfluorinated ethypropylene
	7	F40 (ETFE) tetrafluoroethylene-one-ethylene
	8	PO (PE) polyethylene
Rated pressure (MPa)	9	PPS poly
	4.0	DN10_80
	1.6	DN100-150
	1.0	DN200-1000
	0.6	DN1100-2000
Working temperature	0.25	DN2200
	E	<80°C
Ground ring	H	<180°C
	0	No grounding ring
Levels of protection	1	There is a grounding ring
	0	IP65
Converter type	1	IP68
	0	Integrated
Communication	1	Split type
	0	Not have
	1	RS-485
	2	Hart
	3	PA highway
Sheathing material	4	FF highway
	-0	Carbon copper
Table body flange	1	Stainless steel
	0	Carbon copper
Install the timing flange	1	Stainless steel
	0	Not take
Power Supply Voltage	1	Belt
	0	220VAC
Instrument range	1	24VDC
	( XXX )	Example: (2000) indicates that the maximum flow rate corresponding to 20 mA is 2000m <sup>3</sup> / h

Example 1: LDG-100 223 1, 6E-00000-0010

Description 1: LDG intelligent electromagnetic flowmeter, DN100, scraper type Hastelloy B electrode, chloroprene rubber lining, rated pressure of 1,6Mpa, temperature  $\leq 80\text{ }^{\circ}\text{C}$ , without grounding ring, IP65, integrated, without communication, shell material and meter flange made of carbon steel, with mounting companion flange (including bolt nut), 220V AC power supply.

Example 2: LDG-5001-105-1, 6E-0000-1001 (2000)

Explanation 2: LDG type plug-in intelligent electromagnetic flowmeter, DN500, standard fixed stainless steel electrode, plastic lining. Rated pressure 1.6Mpa, temperature  $\leq 80\text{ }^{\circ}\text{C}$ , without grounding ring, IP65. Integrated, no communication, shell material made of stainless steel, body flange made of carbon steel, no mounting companion flange, 24 volt DC power supply. The maximum flow rate corresponding to 20mA is  $2000\text{m}^3/\text{h}$ .

## Technical parameter

The performance value of the product does not exceed the given error. The error-free values given are the mean performance values obtained from a range of instruments of the same model.

Measuring fluids	Conductive liquids, slurries
Measuring range	$\geq 5\ \mu\text{ S/cm}$
Flow rate range	0.5~10m/s
Expansion range	0.1~15m/s
Flow direction	Forward, reverse, and flow rate
Accuracy level	$\pm 0.2\% \pm 0.3\% \pm 0.5\%$
Repeatability	$\pm 0.1\% \pm 0.15\% \pm 0.25\%$
Working pressure	$\leq 4.0\text{MPa}$ (DN10 ~ 80) $\leq 1.6\text{mpa}$ (DN100 ~ 150) $\leq 1.0\text{mp}$ (DN200 ~ 1000) $\leq 0.6\text{mpa}$ (DN1100 ~ 2200) Special withstand voltage customization
Fluid temperature	Grade E is $< 80^{\circ}\text{C}$ Grade H is $< 180^{\circ}\text{C}$
Levels of protection	IP65 IP68
Electrode material	Stainless steel 316L Platinum iridium B.C Tantalum Titanium

Electrode form	Standard, scraper, detachable
Number of electrodes	2-6
Inner lining material	Chloroprene rubber Polyvinyl chloride rubber F4 (PTFE) Polytetrafluoroethylene F46 (FEP) Polyfluoroethylene propylene F40 (ETFE) Tetrafluoroethylene Ethylene Photopolymerization P0 (E) Polyethylene PPS Phenyl sulfide
Flange materials	Carbon steel, stainless steel
Output signal	Standard current 4-20mA Frequency 0-1kHz
Output function	Forward and reverse, net flow signal
Communication	RS-485 Har PA Total FF bus
Alarm (normally open)	Air traffic control, excitation, flow upper and lower limits
Working power supply	DC24V10VA AC220V10VA
Working environment	Temperature: -25°C-60°C Humidity: 5%~90%