



TRODEKS

# TRODEKS

Datasheet

electromagnetic flow meter

TEMDE

### Electromagnetic flow meter for flow measurement TEMDE-DNXX flow meter

trodeks's electromagnetic flow meter does not contain any moving parts, rotating gears or turbines, or bearings. Instead, it relies on two electrodes to measure the density of the induced magnetic field that results from an electrically conductive fluid, such as water, flowing through a pipe. So there is no susceptibility to bearing wear or other mechanical wear-and-tear issues.

As for the electrodes and the liner used in electromagnetic flow meter, these components can be fabricated from a variety of materials to make the mag meter compatible with virtually various electrically conductive fluid, including aggressive acids.

The only limitation of the electromagnetic flow meter is that the measured fluid media must be electrically conductive ( $> 5\mu\text{S/cm}$ ). Non-conductive fluids, such as oil and other petroleum-based fluids, cannot be measured with mag meter technology.

#### Application

- Sewage treatment
- printing and dyeing
- Chemical industry
- Environmental protection
- metallurgy
- medicine
- papermaking
- Tap water supply

#### Features

##### PROS

- 0.5%F.S measuring accuracy
- RS485 mod-bus communication 4-20mA output
- It can measure the flow of fluid in the forward and reverse directions.
- Unaffected by the temperature, pressure, density of the liquid.
- There is no pressure loss.
- Readings that are unaffected by changes in density or viscosity.

##### CONS

- Cannot detect gases and liquids without electrical conductivity.



Electromagnetic flow meter

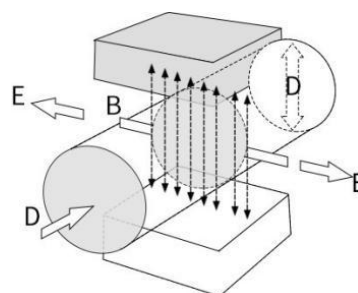
## Principle

The measurement principle of magnetic flowmeters can be described as follows: when the liquid goes through the pipe at the flow rate of  $v$  with a diameter  $D$ , within which a magnetic flux density of  $B$  is created by an exciting coil, the following electromotive  $E$  is generated in proportion to flow speed  $v$ :

$$E = K \times B \times V \times D$$

Where:

- $E$ —Induced electromotive force
- $K$ —Meter constant
- $B$ —Magnetic induction density
- $V$ —Average flow speed in cross-section of measuring tube
- $D$ —Inner diameter of measuring tube

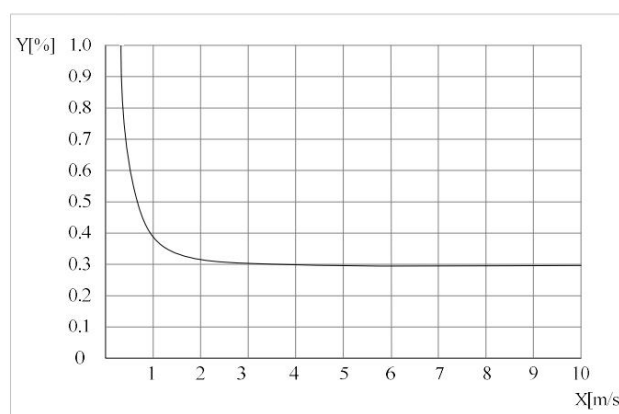


The induced voltage signal is detected by two electrodes and transmitted to the converter via a cable. After a series of analog and digital signal processing, the accumulated flow and real-time flow are displayed on the display of the converter.

## Accuracy

### Reference condition

- (1) Medium: water
- (2) Temperature: 20°C
- (3) Pressure: 0.1MPa
- (4) Front straight conduit:  $\geq 5DN$ , Rear straight conduit:  $\geq 2DN$



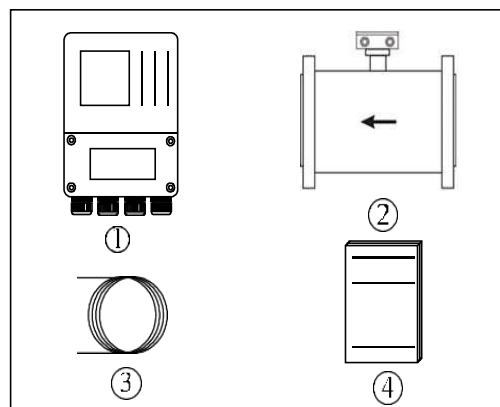
- ① X[m/s]: Flow rate
- ② Y[%]: Actual measured value deviation (mV)

## Parament

### Type

#### Remote type

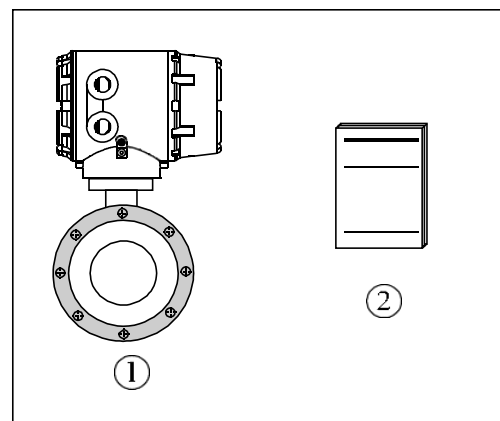
- ① Remote type flowmeter signal converter
- ② Remote type electromagnetic flowmeter sensor
- ③ Signal cable
- ④ User manual



### Compact type

#### Compact type

- ① Compact type electromagnetic flowmeter
- ② User manual



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## Parameter

### Power supply

Power supply	100-240VAC, 50/60Hz, 22VDC—26VDC
Power consumption	Max 15VA
Signal cable	Apply only to remote type
Shielded cable	Signal section, wire: 0.5mm <sup>2</sup> Cu /AWG20

### Output

Current output		
function	Measurement of volume and quality (in the case of constant density)	
Setting	scope	4-20mA
	Max	20mA
	Min	4mA
Internal voltage	24VDC	
loading	≤750Ω	
Pulse and frequency output		
function	Set up Pulse and frequency output	
Pulse output	basis	Output pulse width: 0.25ms ~100ms
		Duty cycle: 50% (Pulse frequency ≥5Hz) Fmax ≤ 5000 cp/s
frequency	setting	0.001L – 1m3
	Max	Fmax ≤ 5000Hz
	setting	0-5000Hz
passive	UOuter ≤ 36VDC	
Status output		
function	Output as alarm	
passive	UOuter≤ 36VDC	

### Communications

Serial communications	RS-485
Output	Current (4-20 mA) , pulse , frequency , state switch
Function	ATC recognition, electrode contamination

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Measurement Accuracy	
Max measuring error	Measurement value $\pm 0.5\%$ (Flow speed > 1m/s) ; Measurement value $\pm 0.5\% \pm 2\text{mm/s}$ (Flow speed < 1m/s)
Repetitiveness	0.15%
Temperature sensor measuring range	-20°C~120°C
Maximum measurement error	$\pm 0.1^\circ\text{C}$ (Within the measuring range of temperature sensor)

Operating Environment	
Temperature	
Environment	-10°C - 55°C for Compact-Type Flowmeter -10°C - 60°C for Converter of Remote-Type Flowmeter -10°C - 55°C for Converter of Remote-Type Flowmeter
Storage	-40°C - 65°C

Electric Conductivity	
Water	Min. 20 $\mu\text{S/cm}$ (Actual electric conductivity should be greater than 50 $\mu\text{S/cm}$ )
Other	Min. 5 $\mu\text{S/cm}$ (Actual electric conductivity should be greater than 50 $\mu\text{S/cm}$ )

Material	
Sensor housing	Carbon steel
Converter	Standard die cast aluminum

Display User Interface	
Graphic display	Monochrome LCD, white backlight; Size: 128*64 pixels
Display function	2 measurement value pictures (measurements, condition, etc
Language	Chinese/ English
Unit	You can configure the menu to select the unit Refer to "6.5 Configuration details" --- "flow units 1-1"
Operating unit	4 Mechanical keys (Compact Type) or 4 touch key (Remote Type)

Measuring System	
Measuring principle	Faraday's law of electromagnetic induction
Function	Real-time flow rate, flow velocity, mass flow (when the density is constant), real-time measurement and flow accumulation
Module configuration	Measurement system is made up of signal converter and measurement sensor

Converter	
Compact Type	IP65
Remote Type	IP65(IP68 optional)

Measurement sensor		
Nominal Diameter	DN15-DN1000	
Flange	In line with GB/T9119-2000 standard carbon steel (Optional stainless steel flanges), other standard flange can be customized	
Pressure rating (High pressure can be customized)	DN6 - DN80, PN<4.0MPa DN100 - DN150, PN<1.6MPa DN200 – DN1000, PN<1.0MPa DN1200 – DN2000, PN<0.6MPa	
Lining Material	Chloroprene rubber (CR), Polytetrafluoroethylene (PTFE/F4), Fluorinated ethylene propylene (FEP/F46), Teflon(PFA)	
Electrode Material	316L Stainless Steel, Hastelloy C, Hastelloy B, Ti, Ta, Pt	
	IP68	IP65
Medium temperature	-25 – 180℃	-10 – 80℃
Buried depth	Less than 5 meters (only IP68 protection of remote type sensor)	
Immersion depth	Less than 3 meters (only IP68 protection of remote type sensor)	
Sensor cable	Only for remote type, the standard 10m cable; other cables suggest custom no longer than	

## Parameter

### Electrode selection

Material	Corrosion Resistance
Molybdenum-containing stainless steel (0Cr18N12Mo2Ti)	Applicable: Domestic/industrial water, sewage, weak acid and alkali saline as well as concentrated nitric acid at room temperature. Not Applicable : Hydrofluoric acid, hydrochloric acid, chlorine, bromine, iodine and other media.
Hastelloy B	Applicable: Non-oxidizing acid, such as hydrochloric acid and hydrofluoric acid of certain concentration and other alkali liquor with a concentration of no less than 70% sodium hydroxide Not Applicable: Nitric acid and other oxidizing acids
Hastelloy C	Applicable: corrosion by oxidizing acids such as Nitric acid, acid mixtures and sulfuric acid and environmental corrosion by oxidation resistant salt or that contains other oxidants. For example, Hypochlorite solution higher than room temperature is strongly corrosion resistant to sea water. Not Applicable: Reducing acid and chloride such as hydrochloric acid
Ti	Applicable: chloride, hypochlorite, sea water, oxidizing acid. Not applicable: reducing acid such as hydrochloric acid, sulphuric acid
Ta	Applicable: most acids like concentrated hydrochloric acid, nitric acid and sulfuric acid including hydrochloric acid and nitric acid at the boiling point as well as sulfuric acid under 175 °C. Not applicable: alkali, hydrofluoric acid and smoke sulfuric acid.
Pt	Various acids, bases and salts, excluding aqua regia.

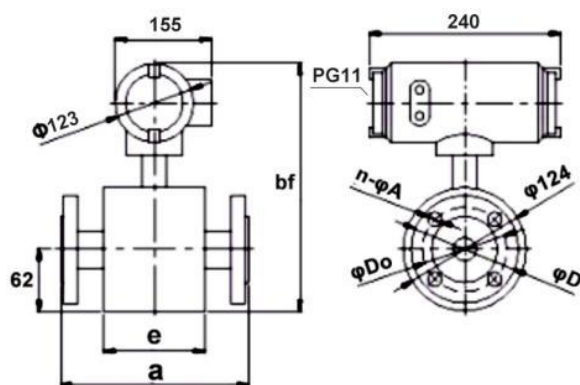
### Lining Selection

Lining material	Symbol	Properties	Max .operating temperature	Applicable medium	Nominal diameter
Neoprene	CR	Average abrasiveness, good for acidic, alkali, and salts solutions.	<60℃	Water, sea water, industrial water	≥DN50
Polyurethane	PUR	With very good antiabrasiveness; No good for acid, alkali solutions	<60℃	Slurry like mine slurry, paper slurry	DN25- DN500
Teflon	F4/ PTFE	Stable chemical property, proof against the corrosion of boiling hydrochloric acid, sulphuric acid, nitric acid and aqua regia, concentrated alkali	<160℃	Strong corrosive acid, alkali solution	≥DN10
FEP(F46)	FEP (F46)	Same chemical properties as F4, but with better tensile strength and pressure resistance.	<120℃	Corrosive acidic, alkali, and salts solutions	DN10~200
PFA	PFA	Same chemical properties as F46, but with better tensile strength and pressure	<180℃	Corrosive acidic, alkali, and salts solutions	DN10~300

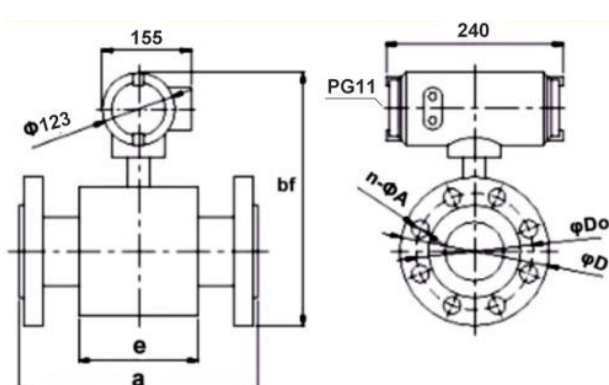


resistance.

## Dimensions and Pressure



**DN6-25**



**DN32-2200**

DN	flowmeter(mm)			Flange (mm)		n*A	Pressure (Mpa)
	a	bf	e	D	Do		
6	102	252	62	76	58	4-φ7	4
10	150	322	82	90	60	4-φ14	
15	150	322	82	95	65	4-φ14	
20	150	322	78	105	75	4-φ14	
25	150	312	78	115	85	4-φ14	
32	150	327	74	135	100	4-φ18	
40	150	335	74	145	110	4-φ18	
50	200	354	86	160	125	4-φ18	
65	200	366	92	180	145	8-φ18	
80	200	385	92	195	160	8-φ18	
100	250	406	114	215	180	8-φ18	1.6
125	250	436	114	245	210	8-φ18	
150	300	465	136	280	240	8-φ23	
200	350	518	156	335	295	8-φ23	1
250	400	570	202	390	350	12-φ23	
300	500	620	230	440	400	12-φ23	
350	500	675	278	500	460	16-φ23	
400	600	733	320	565	515	16-φ25	
450	600	782	374	615	565	20-φ25	
500	600	835	388	670	620	20-φ25	
600	600	940	408	780	725	20-φ30	
700	700	1048	520	895	840	24-φ30	
800	800	1160	580	1010	950	24-φ34	
900	900	1260	660	1110	1050	28-φ34	0.6
1000	1000	1370	720	1220	1160	28-φ34	
1200	1200	1585	1130	1405	1340	32-φ34	
1400	1400	1810	1260	1630	1560	36-φ36	
1600	1600	2040	1450	1830	1760	40-φ36	
1800	1800	2250	1640	2045	1970	44-φ39	
2000	2000	2460	1820	2265	2180	48-φ42	

## Flow Range

Nominal Diameter (mm)	Flow range (m³/h)		
10	0.02827-0.25	0.3-1.6	2.0-3.3924
15	0.0636-0.6	0.8-3.0	4.0-7.632
20	0.131-1.0	1.2-5.0	6.0-13.6
25	0.176-1.6	2.0-8.0	10-21
32	0.2895-2.5	3.0-12	16-35
40	0.4524-4.0	5.0-20	25-45
50	0.707-6.0	8.0-40	50-85
65	1.195-10	12-60	80-143
80	1.81-16	20-120	160-217
100	2.83-25	30-160	200-339
125	4.42-40	50-250	300-530
150	6.36-60	80-400	500-763
200	11.3-100	120-600	800-1357
250	17.7-160	200-800	1000-2120
300	25.45-250	300-1200	1600-3054
350	34.6-300	400-1600	2000-4157
400	45.2-400	500-2000	2500-5429
450	57.3-500	600-2500	3000-6871
500	70.7-600	800-3000	4000-8482
600	102-800	1000-4000	5000-12216
700	139-1200	1600-5000	6000-16620
800	181-1600	2000-6000	8000-21720
900	229-1600	2000-8000	10000-27480
1000	283-2000	2500-10000	12000-33924
1200	407-2500	3000-12000	16000-48833
1400	554-3000	4000-16000	20000-66468
1600	723-4000	5000-20000	27000-86815

Reduction formula: (Flow )Q = (flow velocity) V ×  $\pi \times (DN/2)^2$ , Unit: m/s and m³/h

## Flow and Velocity

<div> <div>Flow (m/s)</div> <div>DN (mm)</div> <div>Flow (m<sup>3</sup>/h)</div> </div>	0.1	0.2	0.4	0.5	1	10	12	15
DN10	0.02827	0.0565	0.1131	0.1414	0.2827	2.827	3.39	4.24
DN15	0.0636	0.127	0.25	0.318	0.636	6.362	7.632	9.54
DN20	0.131	0.226	0.45	0.566	1.131	11.31	13.572	16.965
DN25	0.176	0.35	0.71	0.8835	1.767	17.67	21.204	26.505
DN32	0.2895	0.58	1.16	1.448	2.895	28.95	34.74	43.425
DN40	0.4525	0.90	1.81	2.62	4.524	45.24	54.208	67.86
DN50	0.707	1.414	2.83	3.535	7.069	70.69	84.83	106
DN65	1.195	2.39	4.78	5.973	11.946	119.5	143.35	179.2
DN80	1.81	3.62	7.24	9.048	18.1	181	217.2	271.5
DN100	2.83	5.65	11.31	14.14	28.27	282.7	339.24	424.05
DN125	4.42	8.84	17.67	22.09	44.18	441.8	530.16	662.7
DN150	6.36	12.7	25.5	31.81	63.62	636.2	763.44	954.3
DN200	11.3	22.6	45.2	45.55	113.1	1131	1357.2	1696.5
DN250	17.7	35.4	70.7	88.36	176.7	1767	2110.4	2650.5
DN300	25.45	51	102	127.24	254.5	2545	3054	3878.5
DN350	34.64	69	139	173.2	356.4	3464	4156.8	5196
DN400	45.24	90	181	226.2	452.4	4524	5428.8	6786
DN450	57.3	114	229	286.3	572.6	5726	6871.2	8589
DN500	70.7	141	283	353.4	706.9	7069	8484.8	10603.5
DN600	102	203	407	508.9	1018	10179	12216	15270
DN700	139	277	554	692.7	1385	13854	16620	20775
DN800	181.0	362	723	905	1810	18096	21720	27150
DN900	229.0	458	916	1145	2290	22902	27480	34350
DN1000	283	565	1131	1414	2827	28274	33924	42405
DN1200	407	814	1628	2034.7	4069.4	40694	48832.8	61041
DN1400	554	1108	2216	2769.5	5539.4	55390	66468	83085
DN1600	723	1447	2894	3617.3	7234.6	72346	86815.2	108519

## Parameter

**Note : Flange can be customized, and the pressure need to be considerate**

DN6 - DN80, PN<4.0MPa

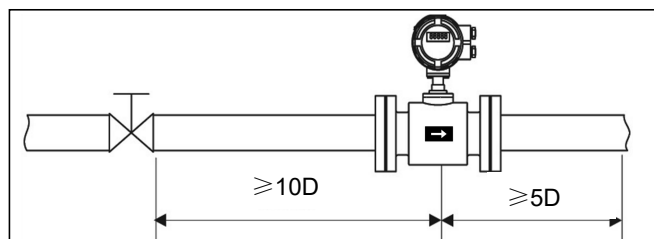
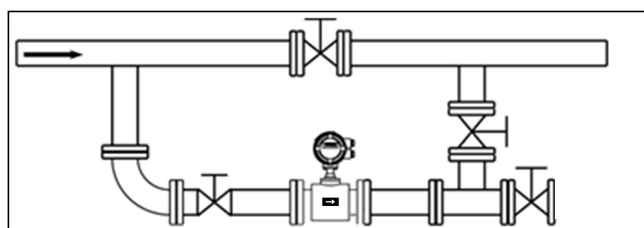
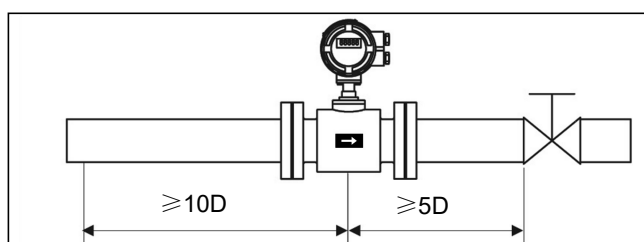
DN100 - DN150, PN<1.6MPa

DN200 – DN1000, PN<1.0MPa

DN1200 – DN2000, PN<0.6MPa

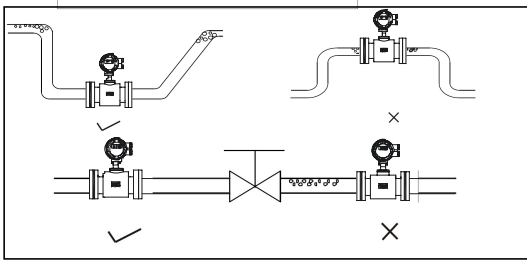
### ★ Location

Do not install the electromagnetic flowmeter on a free-vibrating pipe without any support. Instead, a mounting base shall be used to secure the measuring tube. When the electromagnetic flowmeter is required to be installed underground, the pipes at both inlet and outlet ends shall be provided with support items, and a metal protection plate shall be installed above the flowmeter.



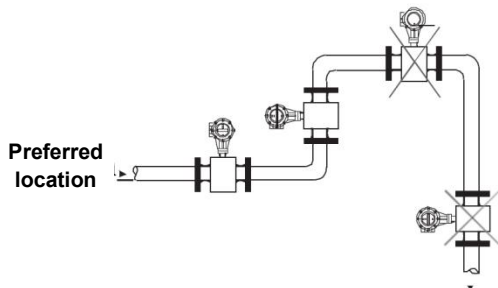
**(1) No bubbles shall be observed in the pipes.**

Pipes shall be designed to prevent the air bubbles in the fluids from accumulating the measurement pipe of a sensor. If a valve exists near the flowmeter, try to mount the flowmeter on the valve's upstream side for preventing a decrease of pressure inside the pipe possibly, consequently avoiding the possibility of air bubbles. ensure that no gas can be separated from the liquid.



**(2) Flow direction**

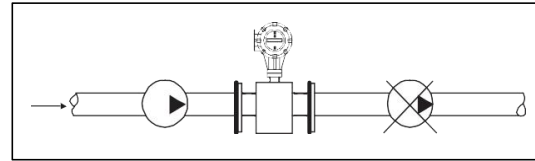
The flowmeter can be set to automatically detect the positive and negative flow direction. The flow direction arrow on the sensor casing indicates the positive flow direction specified by the manufacturer. Generally, when installing the meter, the user shall make the flow arrow consistent with the on-site process flow.



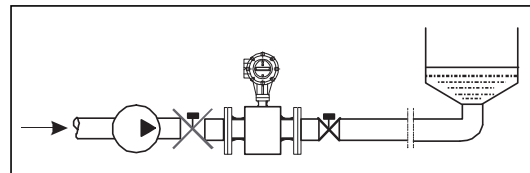
The pipe is routed to the highest point  
(Bubble accumulation in the measuring  
tube is likely to cause produce measurement  
errors!)

It is easy to cause a non-full tube

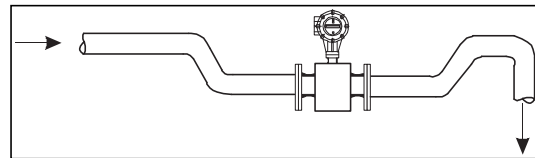
**(3) The electromagnetic flowmeter cannot be installed on the suction side of the pump**



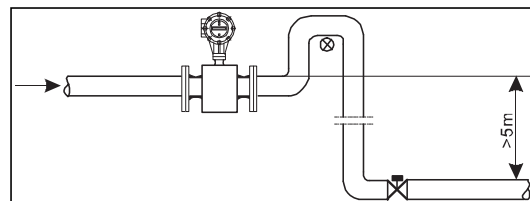
**(4) For long pipelines, control valves are generally installed on the downstream of the electromagnetic flowmeter.**



**(5) For pipes with open discharges, the electromagnetic flowmeter shall be installed at the bottom section (lower part of the pipe).**



**(6) For places where fall head of pipes is over 5 m, the air valve shall be installed on the downstream of the electromagnetic flowmeter**



(7) Measurement error caused by incidental gas and damage of lining caused by vacuum shall be avoided

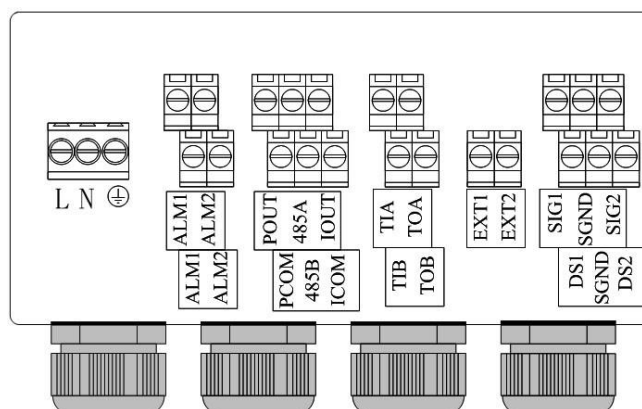
## (8) Grounding

As the voltage of induced signal of electromagnetic flowmeter is small, it's more prone to be affected by noises or other electromagnetic signals. This is why the electromagnetic flowmeter needs to be grounded in many occasions. This functions to form an internal space for shielding external interference through the grounding of flowmeter casing, thereby improving measurement accuracy.

# Wiring

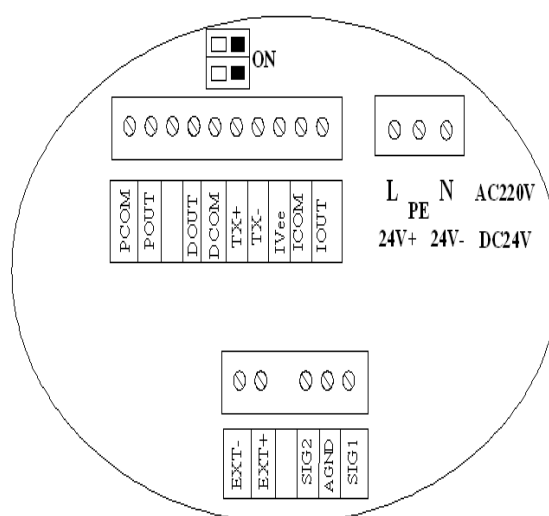
## Remote

L, N:	100-240VAC power supply 24V power supply
ALM1, ALM2	Relay out
POUT, PCOM	Pulse/Frequency output
485A, 485B:	RS485 communication
IOUT, ICOM:	4-20mA output
EXT1, EXT2	Excitation signal
SIG1, SIG2, SGND	Electrode signal
DS1, DS2	Electrode shield



## Compact type

L, N:	100-240VAC power supply 24V power supply
485A, 485B:	RS485 communication
IOUT, ICOM:	4-20mA output connection
POUT, PCOM:	Pulse/Frequency/Relay out
CCOM:	RS485 communication ground
	Converter instrument grounding protection



## Ordering code

TEMDE -M1-DN50-J1-D2-I2-V1-P3-T1-E1-L2-G2-B1-IP1														Description
TEMDE	-	-	-	-	-	-	-	-	-	-	-	-	-	
Type	M1													Compact type
	M2													Remote type
Pipe size	DNXX													DN10 - DN2000
Accuracy			J1											1.00%
			J2											0.50%
Output				O0										No output
				O1										Pulse output
				O2										4-20mA output
Communication				D0										No
				D1										RS232
				D2										RS485
				D3										-----
Installation					I1									Thread installation
					I2									Flange installation
					I3									Clamp mounting
					I4									Clamp installation
Power supply					V1									220VAC
					V2									24VDC
					V3									Battery powered
Pressure rating						P1								0.6MPa
						P2								1.0MPa
						P3								1.6MPa
						P4								2.5MPa
						P5								4.0MPa
						PZ								Others
Temperature rating							T1							≤60℃(CR/PU)
							T2							≤120℃(F4/F46)
							T3							≤150℃ (PFA)
Electrode material							E1							316L stainless steel
							E2							Titanium
							E3							Tantalum
							E4							Hastelloy B
							E5							Hastelloy C
							E6							Platinum
							E7							Tungsten carbide
Lining material								L1						Neoprene (CR)
								L2						Polyurethane (PU)

	L3		F4/PTFE
	L4		Teflon (F46/FEP)
	L5		Tetrafluoroethylene (PFA)
Grounding	G0		No grounding
	G1		Grounding ring
	G2		Grounding electrode
	G3		Grounding screw
Body material		B1	Carbon steel
		B2	304 stainless steel
		B3	316 stainless steel
Ingress protection		IP1	IP65
		IP2	IP67
		IP3	IP68

