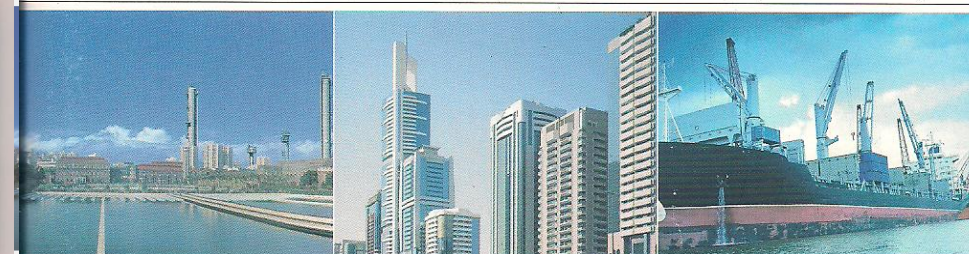




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选型手册



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**龙口中隆计控设备有限公司**



电磁流量计  
Electromagnetic Flowmeter

我公司是集产品研发、生产、销售为一体的现代化高新技术企业，主要产品电磁、涡街流量计年产量均过几千台，在全国流量仪表行业享有较高的知名度。

强大的研发团队是本公司前进的动力，研发人员均拥有10年以上自动化仪表设计研发经验，生产技术人员具备多年生产制造流量仪表的丰富经验，使产品质量得到可靠保证。

产品广泛应用于化工、环保、给排水、造纸、食品、纺织、冶金等行业。

我们以执着的精神追求优良品质，为您提供精确的计量。

- >>> 希望有机会与您合作
- >>> 欢迎您来我公司实地考察
- >>> 质量与价格都具有很大的竞争力

My company is a collection of development, production, sales for the integration of modern high-tech enterprise, main product electromagnetic vortex flowmeter, annual output reached thousands of Taiwan, in the flow meter industry enjoys high reputation.

Professional and powerful R&D team is the driving force for the progress of the company. Our R&D personnel acquires over 10 years' experience in the design and development of automation instrumentation and production technicians have rich experience in the production and manufacturing of flow instrument, which jointly ensures reliable product quality.

Our products are widely used in chemical, environmental, water supply and drainage, papermaking, food, textile and metallurgical industry.

We are in pursuit of high quality with persistent spirit to provide you with accurate measurement.

- >>> Looking forward to cooperating with you
- >>> Welcome to make a on-site survey in our company
- >>> Both our quality and price have great competitiveness

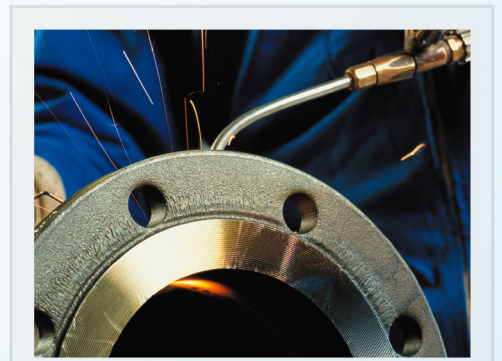


电磁流量计  
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电磁流量计在流量仪表领域中多年经验的结晶，其设计与质量控制体系保证了产品的高精度和高可靠性，具有快速响应和消除输出噪声功能，而且可采用衬里，从而使得该电磁流量计的应用更加广泛。

The electromagnetic flowmeter, as the product of long-term experience in the field of flow instrument, has the functions of rapid response and output noise elimination. Its design and quality control system have guaranteed the high accuracy and reliability of the product, and the application of lining makes the electromagnetic flowmeter applied more widely.

## 特点:

- 提高了流量测量的稳定性
- 快速响应和高稳定性，甚至对于高浓度浆液和低电导率流体也如此
- 高可靠性电极结构
- 可采用衬里和内置接地电极
- 口径从10mm到3200mm
- 交、直流电源均可使用
- 多功能智能转换器
- 断电时，EEPROM可保护设定参数和累积值
- 高清晰度LCD背光显示

## Features:

- The stability of flux measurement has been improved.
- Rapid response and high stability, even for highly concentrated serous fluid and fluid with low conductivity.
- Electrode structure with high reliability.
- Lining and built-in grounding electrode are both applicable.
- Diameter from 10mm to 3200mm.
- Both AC and DC power supplies are available.
- Multi-functional Intelligent Converter.
- When in power failure, EEPROM may protect the set parameters and accumulated values.
- High-definition LCD Backlight Display.



## 技术指标

### 电磁流量转换器部件技术指标

输入信号：来自检测器的与流量成正比的信号

输出信号：4~20mA DC  
(负载电阻0~750)

通过参数设定选择脉冲/报警输出

脉冲输出/报警输出：(额定值：30VDC, 200mA)

通信信号 (选择功能)

电脑通信信号 (叠加在4~20mA DC信号上)

负载电阻：205~600 (包括电缆电阻)

负载电容：最大0.22μF

负载电感：最大3.3mH

电缆线间距：≥15cm (以避免平行布线)

接收仪表的输入阻抗：≥10k (在2.4kHz时)

最大电缆长度：2km (使用“CEV”电缆时)

### 量程范围设定功能：

通过设定体积单位，流量值和流量计口径来设定体积流量

体积单位：m<sup>3</sup>

速度单位：m/s

流量计口径：mm

瞬时流量显示功能：显示流量单位显示，也显示量程百分比

累积流量显示功能：可以显示正，反向累积值和总累积值

脉冲输出功能：通过设定一个脉冲系数就可以输出代表任何  
流量单位所表示的脉冲量

脉冲宽度：占空比50%或固定脉冲宽度供用户选择

输出速率：10-400 (脉冲数/秒) (只有在选择脉冲输出  
方式时使用)

失电数据保护：由EEPROM贮存数据，无需备用电池

正、反流量测量功能：在正、反流向测量模式中，可以测量  
反向流量

上限报警：流量大于上限设定值

下限报警：流量小于下限设定值

阻尼功能：可设定范围从0.2秒~100秒 (63%响应时间)

## Technical Index

### Technical Index of Electromagnetic Flow Converter Components.

Input Signal: Signal emitted from the detector and is directly proportional to the flux.

Output Signal: 4~20mA DC  
(Load Resistance 0~750)

Choose the pulse/warning output by parameter setup.

Pulse Output/Warning Output: (Rated Value: 30VDC, 200mA)

Communication Signal (Function Selection)

Signal of Computer Communication (Superposed to Signal of 4~20mA DC).

Load Resistance: 205~600 (Including cable resistance)

Load Capacitance: Maximum 0.22μF

Load Inductance: Maximum 3.3mH

Space between Cables: ≥15cm (so as to avoid parallel wiring)

Input Impedance of Receiving Instrument: ≥10k (When 2.4kHz)

Maximum Length of Cable: 2km (When "CEV" cable is used)

Setup of Measurement Range:

The volumetric flux is set by the setup of volume unit, flow value and diameter of flowmeter.

Volume Unit: m<sup>3</sup>

Velocity Unit: m/s

Diameter of Flowmeter: mm

Display of Transient Flow: The flow unit and the range percentage are displayed.

Display of Integrated Flux: The forward and reverse integrated flux and total integrated flux are displayed.

Pulse Output: The pulse quantity expressed in any flux unit may be output by the setup of an impulse ratio.

Width of Pulse: Duty ratio of 50% or fixed pulse width is available for users to choose.

Output Speed: 10-400 (PPS) (Only applicable when the form of pulse output is selected).

Black-out Data Protection: Data will be stored by EEPROM without backup battery.

Forward and Reverse Flux Measurement: In the model of forward and reverse flow direction, the reverse flux may be measured.

Upper Limit Warning: The flux is larger than the upper limit of setting value.

Lower Limit Warning: The flux is smaller than the lower limit of setting value.

Function of Damping: The scope may be set from 0.2 second to 100 seconds (63% response time)

## 正常工作条件：

环境温度：-20~60℃

电源电压的额定值：  
220V AC型：100V~240VAC  
DC型：24V DC

## Normal Working Conditions:

Ambient Temperature: -20~60℃

Rated Voltage of Power Supply:  
220V AC: 100V~240VAC  
DC: 24 VDC

## 安装和结构

### 安装：

分离型：转换器，50mm管道或平面安装

组合型：与传感器装成一体

导线接口：ISO M 20×1.5内螺纹

接线端子：M3螺钉

壳体材料：铝合金

### 结构：

一般型：防护等级IP65

防水型：(IP68)

## Installation and Structure

### Installation:

Separate Model: Converter, 50mm pipe or plane installation

Combined Model: Combined with Sensor

Wire Connector: ISO M 20 × 1.5 Female Thread

Wiring Terminal: M3 Screw

Material of Shell: Aluminium Alloy

### Structure:

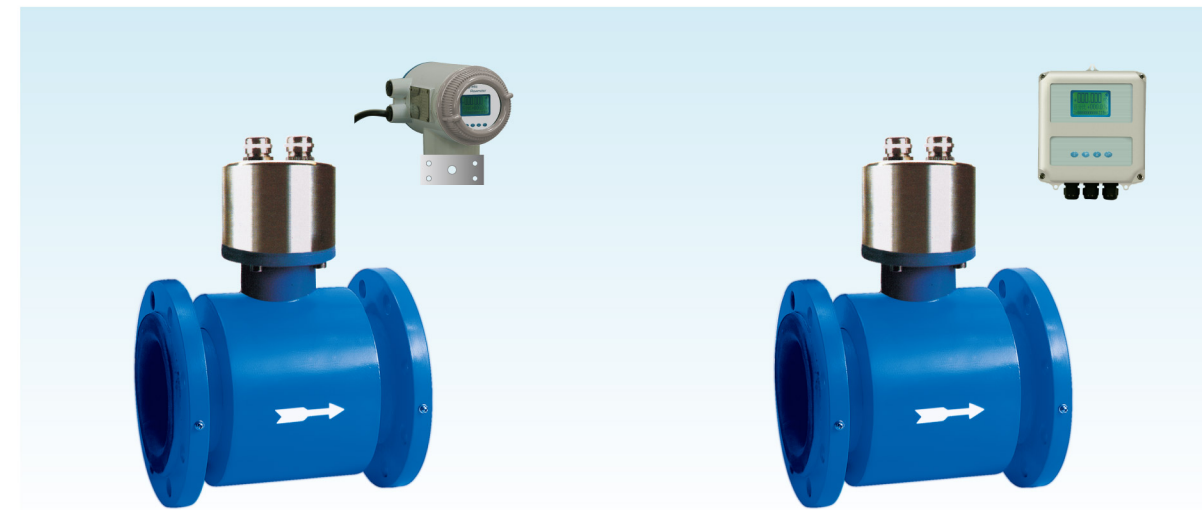
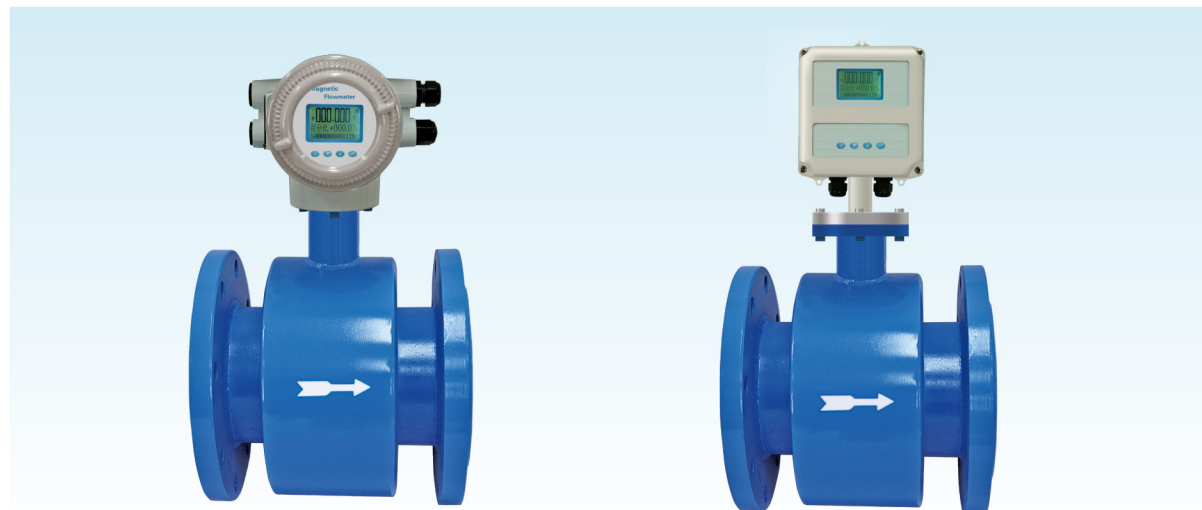
General Model: Degree of Protection IP65

Waterproof Model: (IP68)



## 电磁流量计 Electromagnetic Flowmeter

## 电磁流量计 Electromagnetic Flowmeter



口径	10-3200	Aperture	10-3200
励磁方式	双向恒流方波励磁	Excitation System	Bidirectional Constant Flow Squarewave Excitation
安装形式	一体型	Installation Form	Integral
衬里	氯丁橡胶, PTFE	Lining	Chloroprene Rubber, PTFE
电极材料	316L, HC, HB, 钛, 钽, 铂铱	Material of Electrode	316L, HC, HB, Titanium, Tantalum, Platiniridium
接地	内置接地电极	Grounding	Built-in Grounding Electrode
介质	导电性液体	Medium	Conductive Liquid
精度等级	0.2, 0.5, 1.0	Grade of Accuracy	0.2, 0.5, 1.0
介质电导率	>5 $\mu$ S/cm	Conductibility of Medium	>5 $\mu$ S/cm
流速	$\leq$ 15m/s	Flow Velocity	$\leq$ 15m/s
管道连接法兰	GB9119-2000或GB9115-2000	Flange of Pipe Connection	GB9119-2000 or GB9115-2000
管道连接	法兰连接	Pipe Connection	Flange Connection
介质温度	氯丁橡胶: -10 $^{\circ}$ C~+60 $^{\circ}$ C; PTFE: -10 $^{\circ}$ C~+120 $^{\circ}$ C	Temperature of Medium	Chloroprene Rubber: -10 $^{\circ}$ C~+60 $^{\circ}$ C; PTFE: -10 $^{\circ}$ C~+120 $^{\circ}$ C
额定压力	4MPa, 1.6MPa, 1.0MPa	Rated Voltage	4MPa, 1.6MPa, 1.0MPa
防护类别	IP65, IP68	Category of Shielding	IP65, IP68
输出信号	4~20mA电流, 脉冲, 上下限报警	Output Signal	4~20mA Current, Pulse, Warning beyond upper and lower limits
电缆接口	G1/2内螺纹	Cable Interface	G1/2 Female Thread
通讯	RS485通讯协议	Communication	RS485 Protocol
显示器显示	瞬时流量, 百分比, 流速, 正反向累积流量和总累积量	Display of Monitor	Transient Flow, Percentage, Flow Velocity, Forward and Reverse Integrated Flux and Total Integrated Flux
电源	220V AC, 24V DC	Power Supply	220V AC, 24V DC
使用类型	一般型, 防水型	Type of Application	General Type, Waterproof Type
*高压	定做	* High Voltage	Custom-made

口径	10-3200	Aperture	10-3200
励磁方式	双向恒流方波励磁	Excitation System	Bidirectional Constant Flow Squarewave Excitation
安装形式	分体型	Installation Form	Split
衬里	氯丁橡胶, PTFE	Lining	Chloroprene Rubber, PTFE
电极材料	SUS316L, HC, HB, 钛, 钽, 铂铱	Material of Electrode	316L, HC, HB, Titanium, Tantalum, Platiniridium
接地	内置接地电极	Grounding	Built-in Grounding Electrode
介质	导电性液体	Medium	Conductive Liquid
精度等级	0.2, 0.5, 1.0	Grade of Accuracy	0.2, 0.5, 1.0
介质电导率	>5 $\mu$ S/cm	Conductibility of Medium	>5 $\mu$ S/cm
流速	$\leq$ 15m/s	Flow Velocity	$\leq$ 15m/s
管道连接法兰	GB9119-2000或GB9115-2000	Flange of Pipe Connection	GB9119-2000 or GB9115-2000
管道连接	法兰连接	Pipe Connection	Flange Connection
介质温度	氯丁橡胶: -10 $^{\circ}$ C~+60 $^{\circ}$ C; PTFE: -10 $^{\circ}$ C~+120 $^{\circ}$ C	Temperature of Medium	Chloroprene Rubber: -10 $^{\circ}$ C~+60 $^{\circ}$ C; PTFE: -10 $^{\circ}$ C~+120 $^{\circ}$ C
额定压力	4MPa, 1.6MPa, 1.0MPa	Rated Voltage	4MPa, 1.6MPa, 1.0MPa
防护类别	IP65, IP68	Category of Shielding	IP65, IP68
输出信号	4~20mA电流, 脉冲, 上下限报警	Output Signal	4~20mA Current, Pulse, Warning beyond upper and lower limits
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通讯	RS485通讯协议	Communication	RS485 Protocol
显示器显示	瞬时流量, 百分比, 流速, 正反向累积流量和总累积量	Display of Monitor	Transient Flow, Percentage, Flow Velocity, Forward and Reverse Integrated Flux and Total Integrated Flux
电源	220V AC, 24V DC	Power Supply	220V AC, 24V DC
使用类型	一般型, 防水型	Type of Application	General Type, Waterproof Type
*高压	定做	* High Voltage	Custom-made



## 如何正确选型

流量计的选型是仪表应用中非常重要的工作，据有关资料表明，仪表在实际应用中有2/3的故障是仪表的错误选型和错误的安装而造成的，请特别注意。

### 1、收集数据

- ① 被测流体名称；
- ② 最大流量、最小流量；
- ③ 最高工作压力；
- ④ 最高温度、最低温度。

2、被测流体必须具备一定的导电性，导电率 $\geq 5\mu\text{S}/\text{cm}$ 。

3、最大流量和最小流量必须符合下页中的数值。

4、实际最高工作压力必须小于流量计的额定工作压力。

5、最高工作温度和最低工作温度必须符合流量计规定的温度要求。

6、确定是否有负压情况存在。

您可以根据上表中的流量选择相应的电磁流量计，若所选择的电磁流量计的内径与现在工艺管道的内径不符，应进行缩管或扩管。

1、若管道进行缩管，应考虑由于缩管引起的压力损失是否会影响工艺流程。

2、从产品价格上考虑，可以选择较小口径的电磁流量计，相对减少投资。

3、测洁净水时，经济流速是2~3m/s，测易结晶的溶液时，应适当地提高流速，以防止电磁流量计的电极被覆盖。

## How to Choose A Right Model

The Flowmeter model selection is very important in the application of instrument. The related information shows that in the practical application of instrument, 2/3 troubles are caused by incorrect selection of model and incorrect installation of instrument to which the special attention shall be paid.

### 1. Data Collection

- ① Name of measured liquid;
- ② Maximum flux and minimum flux;
- ③ Maximum working pressure; and
- ④ Maximum and minimum temperatures.

2. The measured liquid shall have a certain conductivity, with conductivity $\geq 5\mu\text{S}/\text{cm}$ .

3. The maximum flux and the minimum flux shall meet the values specified in the following page.

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

5. The maximum and minimum working temperatures shall meet the temperature requirement stipulated for flowmeter.

6. Whether negative pressure exists or not shall be confirmed.

You may choose a corresponding electromagnetic flowmeter according to the fluxes in the above table, and if the inside diameter of the selected electromagnetic flowmeter is different from that of the tube under existing process, the tube reduction or expansion shall be considered.

1. In case of tube reduction, whether the pressure loss caused by tube reduction will affect the process flow or not shall be considered.

2. If the price of product is considered, the electromagnetic flowmeter with smaller diameter may be selected to reduce investment relatively.

3. When the uncontaminated water is measured, the economic velocity is 2~3m/s, and when the solution which is easy to crystalize is measured, the velocity shall be increased appropriately so as to prevent the electrode of eletromagnetic flowmeter from being covered.

## 可测流量范围 Range of Measurable Flux

国际单位 (口径: mm, 流量:  $\text{m}^3/\text{h}$ )  
International Unit (Caliber: mm, Flux:  $\text{m}^3/\text{h}$ )

口径 Caliber (mm)	0—最小流量 Range of Minimum 量程 Flux (0.1m/s)	0—最大流量 Range of Maximum 量程 Flux (10m/s)
10	0.0283	2.8274
15	0.0636	6.3615
20	0.1131	11.3094
25	0.1767	17.6709
32	0.2895	28.9521
40	0.4524	45.2376
50	0.7068	70.6838
65	1.1946	119.4555
80	1.8095	180.9504
100	2.8274	282.7350
125	4.4177	441.7734
150	6.3615	636.1538
200	11.3094	1130.9400
250	17.6709	1767.0938
300	25.4462	2544.6150
350	34.6350	3463.5038
400	45.2376	4523.7600
500	70.6838	7068.3750
600	101.7846	10178.4600
700	138.5402	13854.0150
800	180.9504	18095.0400
900	229.0154	22901.5350
1000	282.7350	28273.5000

口径 Caliber (mm)	0—最小流量 Range of Minimum 量程 Flux (0.3m/s)	0—最大流量 Range of Maximum 量程 Flux (10m/s)
1100	1026.3281	34210.9350
1200	1221.4152	40713.8400
1400	1662.4818	55416.0600
1500	1908.4613	63615.3750
1600	2171.4048	72380.1600
1800	2748.1842	91606.1400
2000	3392.8200	113094.0000
2200	4105.3122	136843.7400
2400	4885.6608	162855.3600
2600	5733.8658	191128.8600



电极材料性能（仅供参考） Properties of electrode material (for reference only)

电极材料 Electrode material	测量材料性能（仅供参考） Properties of measured material (for reference only)	耐腐蚀性能 Corrosion resistance
不锈钢SUS 316L Stainless steelSUS 316L	生活及工业用水和污水 Domestic and industrial water and sewage	不能用于无机酸、有机酸、氯化物 Not for use in inorganic acid, organic acid, chloride
哈氏合金C Hastelloy alloy C	海水、硫酸钠 Seawater, sodium sulfate	不适用于氯化物、硫酸、适用于摩擦性流体 Not suitable for chloride, sulfuric acid, suitable for frictional fluid
钽 Tantalum	盐酸、王水 Hydrochloric acid, aqua regia	几乎适用于所有的化学物质，但对氢氟酸、发烟硝酸尚有些问题 Almost suitable for all chemicals, but there are also some problems for hydrofluoric acid and fuming nitric acid
钛 Titanium	乙酸、氯化钠 Acetic acid, sodium chloride	适用于氯化钠、硫化物、碱液、但不能用于盐酸、硫酸和硝酸 Suitable for sodium chloride, sulfide, alkali liquor, but not suitable for hydrochloric acid, sulfuric acid and nitric acid
铂-铱合金 Platinum-iridium alloy	氢氧化钠、浓硫酸 Sodium hydroxide, concentrated sulfuric acid	几乎适用于所有化学物质，但不适用于王水和铵盐 Almost suitable for all chemicals, but not suitable for aqua regia and ammonium salt
哈氏合金C Hastelloy alloy C	纸浆 Paper pulp	能抗固体颗粒干扰，不能用于无机酸、有机酸、氯化物 Solid particles anti-interference, not for use in inorganic acid, organic acid, chloride

接地环材料的选择 Selection of grounding ring material

接地环材料可以与电极材料相同，一般可选与管道材料耐腐蚀性相同的材料。

Grounding ring material can be the same as the electrode material; generally material with the same corrosion resistance as the pipeline material is selectable.

衬里材料的选择 Selection of lining material

衬里材料应根据被测液体种类和工作温度来选择。PFA是一种氟化塑料，具有良好的耐强酸、强碱的腐蚀性，同时具有良好的耐高温性，高温下不变形，不降低绝缘阻抗。99.9%高纯度氧化铝用于制作陶瓷衬里，它使得仪表能够高精度测量流量，因为与传统的高分子材料相比，陶瓷不会产生高温、高压变形，并且具有良好的耐磨性。

Lining material should be selected according to the type and working temperature of measured fluid. PFA is a fluorinated plastic, has good corrosion resistance to strong acid, strong alkali, at the same time has good high temperature resistance, does not deform at high temperature. Insulation resistance is not reduced. 99.9% high purity alumina is used for making ceramic lining so that the instrument can measure the flow with high precision. In comparison with traditional high polymer material, ceramics cannot create high temperature, high pressure deformation, and have good wear resistance.

电磁流量计衬里主要性能和适用范围（仅供参考）

衬里材料	主要性能	衬里适用范围	可测介质举例	注意事项
(特氟隆)	PTFE	1.化学稳定性优良，但氟元素和熔融状态的金属钠对其制品有一定腐蚀性。 2.能耐盐酸、硫酸、和王水，并且有机溶剂对它几乎不起作用。 3.耐磨性和粘接性能差。 4.电绝缘性能优异，但耐电晕性较差。	1.流量计长期使用温度-10~+120℃。 2.能用于测量大多数强酸、强碱、强氧化剂等强腐蚀性介质；但不适用于KOH，硝酸、氢氟酸等。 3.卫生类介质。	1.盐酸、硫酸、王水。 2.其它多数强酸、强碱和氧化剂。 3.不适用于带固体颗粒的介质。
	FEP	1.其化学稳定性、电绝缘性、润滑性、不粘性和不燃性与PTFE (F4)相仿，但FEP材料强度、耐老化性、耐温性能和低温柔韧性优于PTFE。 2.与金属粘接性好，耐磨性好于PTFE。 3.具有较好的抗撕裂性能。	1.流量计长期使用温度-40~+80℃。 2.能用于测量大多数强酸、强碱、强氧化剂等强腐蚀性介质；但不适用于KOH，硝酸、氢氟酸等。 3.卫生类介质。	1.盐酸、硫酸、王水 2.其它多数强酸、强碱和氧化剂。 3.带少量细小颗粒的介质。
	PFA	1.其化学稳定性、电绝缘性、润滑性、不粘性和不燃性与FEP (F46)相仿，但PFA材料强度、耐老化性、耐温性能优于PTFE、FEP。 2.与金属粘接性好，耐磨性好于PTFE、FEP。 3.低烟、难燃、耐高温，高温机械强度比PTFE高2倍	1.流量计长期使用温度-40~+160℃。 2.能用于测量大多数强酸、强碱、强氧化剂等强腐蚀性介质；但不适用于KOH，硝酸、氢氟酸等。 3.卫生类介质。	1.盐酸、硫酸、王水 2.其它多数强酸、强碱和氧化剂。 3.带少量细小颗粒的介质。 4.啤酒、皂化液化气等。
聚氨酯橡胶	1.有极好的耐磨性能，良好的耐油性。 2.强度高、耐撕裂性好，但耐酸、耐碱性能较差。 3.耐热性不好，一般为60℃	1.一般长期使用温度-10~+60℃。 2.耐磨性好，适用于含固体颗粒的液体。 3.不能用于测量含有有机溶剂的水。	1.中性强磨损的矿浆、煤浆、泥浆。 2.生活用水、工业用水、污水、海水。	1.液体温度范围0~40℃。 2.一般不用于测量混有有机溶剂的介质。
氯丁橡胶	1.有良好的弹性和抗撕裂性，具有一定耐油性。 2.抗老化性较差，其脆性温度为-28℃。 3.耐磨性能不如聚氨酯橡胶。 4.耐一般性低浓度酸、碱、盐介质的腐蚀，不耐氧化性介质的腐蚀。	1.长期使用温度-10~+80℃。 2.由于其中含有防老剂D，略有污染性。 3.适用于一般低浓度酸、碱、盐介质及污水测量。	1.一般水、污水 2.泥浆、矿浆	1.不能用于测量食品。 2.不适用于测量强酸、强碱、强氧化性介质。
陶瓷	1.强度高、高温、高压下不变形。 2.独特的铂-氧化铝金属陶瓷电极。 3.具有较好的抗泥浆噪声能力，适用于渗透性流体。 4.良好的耐磨性，其耐磨性是聚氨酯的10倍。	1.适合于高温高压流体、粘性流体、腐蚀性流体。 2.渗透性流体，含固体颗粒的浆液。	1.含硬固体的浆液、腐蚀性流体、粘性流体、高温高压流体。 2.硫酸铬、25%的次氯酸钠、硝酸等。	1.不适用于氢氟酸、硝酸、王水、NaOH、70%浓度的硫酸。 2.不能用于硫酸铜、碳酸氢钠等部分盐类物质。



Main properties and application range of electromagnetic flowmeter lining (for reference only)

Lining material	Main Properties	Application Range of Lining	Examples of Measurable Media	Notes	
(Teflon)	PTFE	1. Chemical stability is good, but chlorine element and metal sodium in the melting state have a certain corrosion resistance to the product. 2. It is hydrochloric acid, sulfuric acid and aqua regia-resistant and organic solvent has no effect on it. 3. Bad wear resistance and adhesive properties, excellent electrical insulating property, but bad corona resistance.	1. Long term usage temperature of the flowmeter is -10~+120°C. 2. For use in measurement of most of strong corrosive media such as strong acid, alkali, oxidant, but not suitable for KOH, nitric acid, hydrofluoric acid, etc. 3. Health media.	1. Hydrochloric acid, sulfuric acid, aqua regia. 2. Other most strong acids, alkalis and oxidants.	1. Not suitable for KOH, nitric acid, hydrofluoric acid. 2. Generally not for use in measurement of electrolyte, e.g. NaCl solution from electrolytic tank. 3. Not suitable for media with solid particles.
	FEP	1. Its chemical stability, electrical insulation property, lubricating property, non-stick property and incombustibility are similar with PTFE (F4), but the strength, aging resistance, temperature resistance and low temperature flexibility of FEP material are superior to PTFE. 2. Adhesion with metal is good; wear resistance is better than PTFE. 3. High tearing resistance	1. Long term usage temperature of the flowmeter is -40~+80°C. 2. For use in measurement of most of strong corrosive media such as strong acid, alkali, oxidant, but not suitable for KOH, nitric acid, hydrofluoric acid, etc. 3. Health media.	1. Hydrochloric acid, sulfuric acid, aqua regia. 2. Other most strong acids, alkalis and oxidants. 3. Media with less fine particles.	1. Not suitable for KOH, nitric acid, hydrofluoric acid. 2. Generally not for use in measurement of electrolyte, e.g. NaCl solution from electrolytic tank.
	PFA	1. Its chemical stability, electrical insulation property, lubricating property, non-stick property and incombustibility are similar with FEP (F46), but the strength, aging resistance and temperature resistance of PFA material are superior to PTFE, FEP. 2. Adhesion with metal is good; wear resistance is better than PTFE, FEP. 3. Low smoke, fire resistance, high temperature resistance. High temperature mechanical strength is two times higher than PTFE.	1. Long term usage temperature of the flowmeter is -40~+160°C. 2. For use in measurement of most of strong corrosive media such as strong acid, alkali, oxidant, but not suitable for KOH, nitric acid, hydrofluoric acid, etc. 3. Health media.	1. Hydrochloric acid, sulfuric acid, aqua regia. 2. Other most strong acids, alkalis and oxidants. 3. Media with less fine particles. 4. Beer, saponified liquefied gas, etc.	1. Not suitable for KOH, nitric acid, hydrofluoric acid. 2. Generally not for use in measurement of slurry, coal pulp and core pulp.
Polyurethane Rubber	1. Excellent wear resistance, good oil resistance. 2. High strength, good tearing resistance, bad acid and alkali resistance. 3. Bad heat resistance, generally 60°C.	1. Long term usage temperature is generally -10~+60°C. 2. Good wear resistance, suitable for fluid containing solid particles. 3. Not for use in measurement of water containing organic solvent.	1. Neutral and strong wearing ore pulp, coal pulp and mud. 2. Domestic water, industrial water, sewage and sea water.	1. The temperature of fluid ranges between 0 and 40 °C. 2. Generally not for use in measurement of media of organic solvent.	
Chloroprene Rubber	1. Good elasticity and tearing resistance, oil resistance. 2. Bad aging resistance, its brittleness temperature is -28°C. 3. Wear resistance is inferior to polyurethane rubber. 4. Corrosion resistance to ordinary low concentration acid, alkali and salt media, non-corrosion resistance to oxidizing media	1. Long term usage temperature is -10~+80°C. 2. Slight pollution because anti-aging agent is contained therein. 3. Suitable for measurement of low concentration acid, alkali, salt media and sewage.	1. Normal water, sewage 2. Slurry, ore pulp	1. Not for use in measurement of food. 2. Not suitable for measurement of strong acid, alkali, oxidizing media.	
Ceramics	1. Non-deformation at high strength, high temperature and high pressure. 2. Unique platinum-alumina metal ceramic electrode. 3. Good anti-slurry and anti-noise ability, suitable for permeable fluid. 4. Good wear resistance, which is ten times the polyurethane.	1. Suitable for high-temperature high-pressure fluid, viscous fluid, corrosive fluid. 2. Permeable fluid, slurry containing solid particles.	1. Slurry containing hard solid, corrosive fluid, viscous fluid, high-temperature high-pressure fluid. 2. Chromium sulfate, 25% of sodium hypochlorite, nitric acid, etc.	1. Not suitable for hydrofluoric acid, nitric acid, aqua regia, NaOH, 70% concentration of sulfuric acid. 2. Not for use in partial salt substances such as copper sulfate, sodium bicarbonate.	

防护等级的选择 Selection of protection grade

按GB4208-84, 国际电工委员会IEC标准 (IEC529-76) 关于外壳防护等级为:

IP65为防喷水型, 即可允许水龙头从任何方向对仪表喷水, 喷水压力为30KPa (0.3bar)。出水量为12.5升/分, 喷水离仪表距离3米。

IP67为防浸水型, 即仪表可短时间全部浸入水中, 试验时最高点应在水下至少150cm, 持续时间至少为30分钟。IP68为潜水型, 应能长期在水中工作, 其浸入的最大深度由制造厂与用户协商。

防护等级选用原则应根据以上要求和仪表实际工作条件选定。若仪表在地面以下的, 经常受水淹的, 宜选IP68; 若仪表安装在地面上, 并且环境不潮湿, 则选用IP65。

Degrees of protection provided by enclosure are as follows according to GB4208-84, International Electrotechnical Commission (IEC) standards (IEC529-76):

IP65 is an anti-spray type, i.e. a water faucet is allowed to spray water to the instrument in any direction. The pressure of spray water is 30KPa (0.3bar). Water yield is 12.5 liters/minute. The distance between spray water and the instrument is 3m. IP67 is an anti-immersing type, i.e. the instrument can be totally immersed in the water in a short time. The highest point is 150cm below the water during test. The duration time is 30min. IP68 is a submerged type, which can work in the water for a long period. The maximum depth immersed is negotiated by manufacturers and users.

The selection principles of protection grade are determined by the abovementioned requirements and actual working conditions of the instrument. If the instrument is installed underground and often immersed under water, it's suggested to select IP68. If the instrument is installed above the ground and the environment is not wet, choose IP65.





流量计型号说明 Flowmeter model description

名称 Name	规格代码 Specification code	说明 Explanation
厂标	GR	
仪表种类 Instrument type	LDE	智能电磁流量计 Intelligent electromagnetic flowmeter
通径代码 Diameter code	xxx	例:100表示DN100 For example: 100 represents DN100
电极形式 Electrode form	-1	标准固定式 Standard stationary type
电极材料 Electrode material	0	不锈钢(316L) Stainless steel (316L)
	1	铂Pt Platinum Pt
	2	哈氏B(HB) Hastelloy B (HB)
	3	钽Ta Tantalum Ta
	4	钛Ti Titanium Ti
内衬材料 Lining material	5	哈氏C(HC) Hastelloy C (HC)
	3	氯丁橡胶 Chloroprene rubber
	4	聚氨酯橡胶 Polyurethane rubber
额定压力(MPa) Rated pressure	5	F4(PTEE)聚四氟乙烯 F4 (PTEE) polyfluortetraethylene
	6	F46(FEP)聚全氟代乙丙烯 F46 (FEP) polyperfluoroethylene-propylene
	-4.0	DN10-80
工作温度 Operating temperature	1.6	DN100-150
	1.0	DN200-1000
	0.6	DN1100-2000
	0.25	DN2200
接地 Grounding	E	<60℃
防护等级 Grade of protection	H	<120℃
转换器型式 Converter type	0	内置接地电极 Built-in grounding electrode
外壳材料 Case material	0	IP65
	1	IP68
表体法兰 Instrument flange	0	一体式 Integral type
	1	分体式 Split type
安装配时法兰 Installing timing flange	-0	碳钢 Carbon steel
	1	不锈钢 Stainless steel
供电电源 Power supply source	0	碳钢 Carbon steel
	1	不锈钢 Stainless steel
仪表量程 Instrument range	0	不带 Without
	1	带 With
仪表量程 Instrument range	0	220VAC
	1	24VDC
仪表量程 Instrument range	(xxx)	例: (200)表示20mA对应的最大 流量为200m <sup>3</sup> /h For example: (200) represents maximum flux corresponding to 20mA 流量为200m <sup>3</sup> /h

举例: GRLDE 100-103-1.6E00-0010

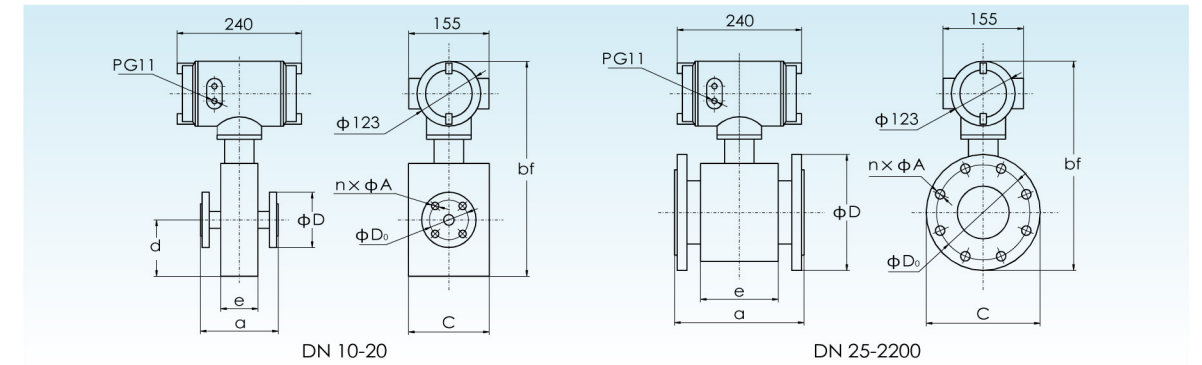
说明: 智能电磁流量计, DN100, 固定式不锈钢电极, 氯丁橡胶内衬, 额定压力1.6Mpa, 温度≤60℃, IP65, 一体式, 外壳材料和法兰为碳钢, 带安装配时法兰(包括螺栓螺母), 220伏交流供电。

For example: GRLDE 100-103-1.6E00-0010

Explanation: Intelligent electromagnetic flowmeter DN100 has a fixed stainless steel electrode and Chloroprene rubber lining with a rated pressure of 1.6 Mpa and a temperature less than or equal to 60 degrees centigrade, IP65, it is an integral type, case material and flange are carbon steel, with installed matched flange (including bolt and nut) and 220 V AC power supply is applicable.

一体式流量计外形尺寸

Outline dimension of integral flowmeter:



DN	额定压力 Rated pressure (MPa)	仪表外形尺寸(mm) Instrument outline dimension					法兰连接尺寸(mm) Flange connecting size			
		a	bf	c	d	e	D	D <sub>0</sub>	n × A	
10	4.0	150	408	156	107	72	90	60	4 × 14	
15		150	408	156	107	72	95	65	4 × 14	
20		150	408	156	107	72	105	75	4 × 14	
25		150	303	115		78	115	85	4 × 14	
32		150	319	140		78	140	100	4 × 18	
40		150	332	150		93	150	110	4 × 18	
50		200	346	165		109	165	125	4 × 18	
65		200	367	185		105	185	145	8 × 18	
80		200	382	200		101	200	160	8 × 18	
100		1.6	250	397	220		150	220	180	8 × 18
125	250		429	250		150	250	210	8 × 18	
150	300		459	285		180	285	240	8 × 22	
200	350		517	340		222	340	295	8 × 22	
250	400		570	395		254	395	350	12 × 22	
300	500		617	445		316	445	400	12 × 22	
350	500		668	505		305	505	460	16 × 22	
400	600		723	565		380	565	515	16 × 26	
450	600		773	615		380	615	565	20 × 26	
500	600		825	670		400	670	620	20 × 26	
600	1.0	600	930	780		456	780	725	20 × 30	
700		700	1038	895		545	895	840	24 × 30	
800		800	1148	1015		580	1015	950	24 × 33	
900		900	1248	1115		690	1115	1050	28 × 33	
1000		1000	1355	1230		750	1230	1160	28 × 36	
1200		0.6	1200	1674	1405		1206	1405	1340	32 × 33
1400			1400	1874	1630		1406	1630	1560	36 × 36
1600			1600	2084	1830		1606	1830	1760	40 × 36
1800			1800	2304	2045		1806	2045	1970	44 × 39
2000			2000	2504	2265		2006	2265	2180	48 × 42
2200	2200		2704	2405		2206	2405	2315	52 × 45	



## 电磁流量计的安装要求

Installation Instruction of electromagnetic flowmeter

电磁流量计的选型最好由熟悉现场工艺条件的技术人员进行按选型资料中可测流量范围表选择合适的口径材料选择最好由熟悉现场工艺条件的最终用户确定

The selection of the electromagnetic flowmeter is preferably performed by a technician who is familiar with on-site technological conditions, the technician shall select proper aperture material according to the measurable range table in the type selection material, and the selection is preferably confirmed by an end user who is familiar with the on-site technological conditions.

## 选择流量计类型 Selecting flowmeter type

### 一体型和分离型 Integral type and split type

一体型和分离型各有优点，选择的基本原则如下：分离型一般用于现场维护及调试时读数不方便或经常浸泡在水中和其它功能的场合。它也用于较恶劣的应用场合，如：高温流体、有振动源处及易爆环境中。大多数场合一体型和分离型都能满足使用要求。

Both integral type and split type have their own advantages, and basic principals for selection are as follows: the split type is usually used in situations inconvenient for one-site maintenance and numerical reading when debugging is difficult or the flowmeter is often immersed in water and with other functions. It is also used in poor application situations, such as high temperature fluid, a position with vibration source and explosive environment. In most cases, both the integral type and the split type can meet use requirements.

### 一般型和防爆型 General type and explosion-proof type

用户应根据流量计使用环境确定选择一般型还是防爆型。

Users shall confirm to select a general type or an explosion-proof type according to application environment of the flowmeter.

## 传感器的口径与连接的工艺管道口径

The diameter of the sensor and that of technological pipeline.

一般情况，考虑安装方便，不要选择异径管。但前提是流量计管内的使用流速应在0.3m/s~10m/s范围内。这种选择常适用于新设计的工程，在选择流速时既要考虑现在的工作情况，又要考虑将来设备满负荷运转时的情况。流量、流速与口径三者关系可查阅曲线图。但有时也选择传感器的口径与连接的工艺管道口径不相同。如：

- 1、管道内的流速偏低，工艺流量又能较稳定，为满足仪表对流量范围的要求，在流量计处局部提高流速，选择传感器口径小于工艺管道口径，在传感器前后加接异径管。
- 2、对于大口径电磁流量计，口径越大，价格越高，对管道内流速偏低，工艺参数稳定的情况，可选用口径较小的流量计，这不仅使流量计运行在较好的工作状态下，同时降低投资成本。

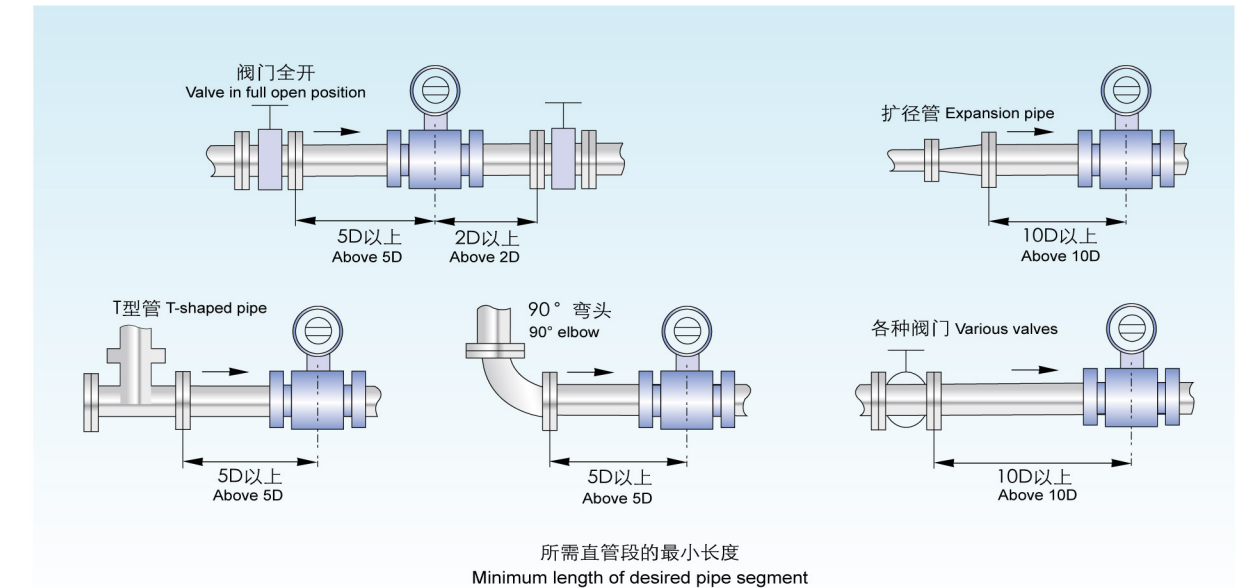
Generally, it's suggested not to select reducing pipe for the sake of convenient installation, provided that the use flow in the flowmeter pipe shall be within the range of 0.3m/s~10m/s. This kind of selection is usually applicable to a newly-designed project for which current work situation is not only considered when choosing a flow speed, but also a situation of running at full load of the device in the future shall also be considered. For the relationships among the flux, velocity and diameter, see curve graph. However, sometimes we also choose a sensor with a different diameter with the connected technological pipeline diameter, for example:

- 1、The flow speed in the pipeline is low and the process flow is stable, in order to meet the demand of instrument to flow range, to improve flow speed at local of the flowmeter, select a sensor with smaller diameter than the diameter of the technological pipeline, and additionally connect a reducing pipe at front and rear part of the sensor.
- 2、In terms of large diameter electromagnetic flowmeter, the diameter is larger, the price is higher, as for the situations with low flow speed in the pipeline and stable technological parameter, small diameter flowmeter may be chosen, this not only runs the flowmeter under good working state, but also reduces investment cost at the same time.

## 直管段长度 Length of straight pipe segment

为了保证电磁流量计高测量精度所需的上游管路条件。根据上述标准和管路条件测定数据，推荐如下图所示的管路条件。

Upstream pipeline condition desired in guaranteeing high measurement precision. To measure data according to above standard and pipeline condition, WE company recommends pipeline condition shown in following figure.



## 加装异径管应注意问题

Notes for additionally installing a reducing pipe

### 异径管锥角的选择 Selection of a reducing pipe cone angle

为了在安装异径管后不过多影射流场的分布，不影响电磁流量计的精度，可把异径管视为直管段的一部分。要求异径管的中心锥角 $\alpha$ 不大于 $15^\circ$ ，越小越好。

For not mapping distribution of flow field after installing the reducing pipe, and not influencing precision of the electromagnetic flowmeter, the reducing pipe can be regarded as one part of the straight pipe segment. The central cone angle  $\alpha$  of the reducing angle shall be no more than 15 degrees, and the smaller the better.

### 安装异径管会产生压力损失

总的压力损失由三部分组成：

$$\Delta P_1 = \rho/2\xi_1 V_1^2$$

$$\Delta P_3 = \rho/2\xi_3 V_2^2$$

$$\Delta P_2 = \rho/2\xi_2 V_2^2$$

总的压力损失为

$$\Delta P = 0.01 (\Delta P_1 + \Delta P_2 + \Delta P_3) \text{ (mbar)}$$

式中 $\rho$ 是介质密度，单位是 $\text{kg/m}^3$

$\xi_1 \xi_3$ 是分别为渐缩管的，渐扩管的与雷诺数有关的系数

$\xi_2 = 0.02$ 是传感器测量管的系数

$V_1 V_2$ 分别是工艺管道、传感器测量管中的流速，单位为 $\text{m/s}$

### Installing a reducing pipe will cause pressure loss

Total pressure loss composes pressure loss in the gradual contraction pipe by three parts:

$$\text{Pressure loss of a Gradual contraction pipe } \Delta P_1 = \rho/2\xi_1 V_1^2$$

$$\text{Pressure loss of a gradual enlargement pipe } \Delta P_3 = \rho/2\xi_3 V_2^2$$

$$\text{Pressure loss in the sensor measurement pipe } \Delta P_2 = \rho/2\xi_2 V_2^2$$

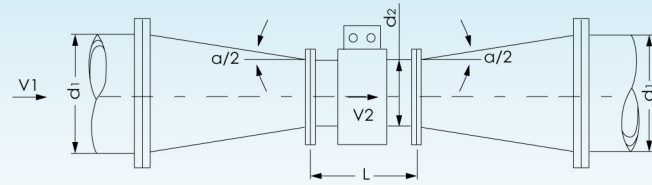
$$\text{The total pressure loss is: } \Delta P = 0.01 (\Delta P_1 + \Delta P_2 + \Delta P_3) \text{ (mbar)}$$

In the formula,  $\rho$  is a medium density, whose unit is  $\text{kg/m}^3$

$\xi_1 \xi_3$  are respectively coefficients related with the Reynolds number

$\xi_2 = 0.02$  it is a Coefficient of Transducer Measuring tube

$V_1 V_2$  are respectively flow speeds in the technological pipeline and sensor measurement pipe, whose unit is  $\text{m/s}$ .



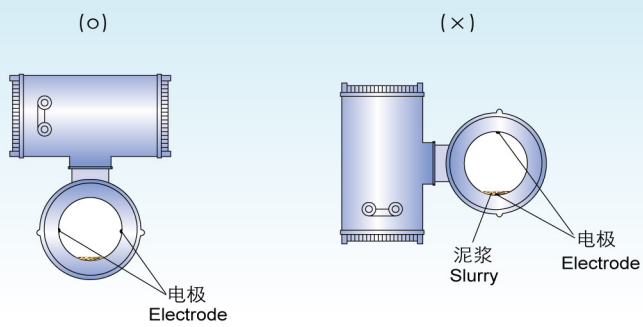
例如： $\alpha=8^\circ$ 时 $\zeta$ 的值 E.g. the value of  $\zeta$  when  $\alpha=8^\circ$

$d_1/d_2$	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0
$\zeta_1$	0.018	0.023	0.0255	0.028	0.03	0.0308	0.0315	0.0323	0.0332
$\zeta_3$	0.01	0.02	0.07	0.15	0.26	0.43	0.64	0.9	1.25

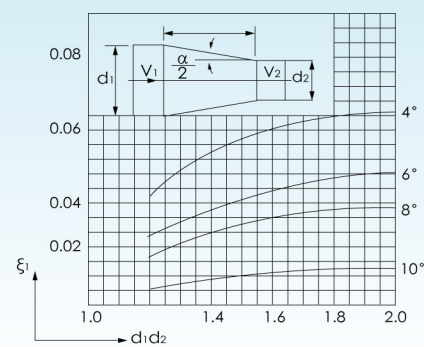
### 安装方向 Installation direction

在安装电磁流量计时，一般情况下，水平安装时电极的轴线应近似水平；如果电极的轴线与地面垂直的话，处于上面的电极附近容易集结气泡，阻挡液体与之接触而处于下面的电极容易被泥浆覆盖。应将转换器安装在管路的上面，防止水进入转换器。

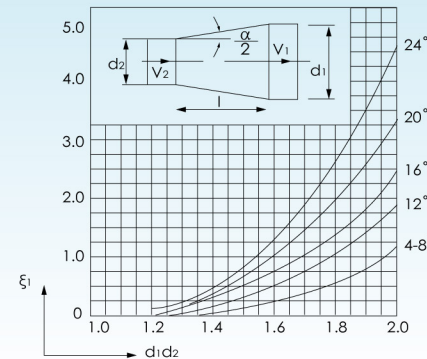
When installing an electromagnetic flowmeter, generally speaking, the axis line of the electrode shall be approximate level in horizontal installation; if the axis line of the electrode is perpendicular to the ground, bubbles will be easily collected near the electrode located on the upper side, the electrode located at lower side and stopping the liquid contacting with the same is covered by slurry. The converter shall be installed above the pipeline to prevent water from entering the converter.



### 渐缩管 Gradual contraction pipe



### 渐扩管 Gradual enlargement pipe



电磁流量计必须在满管条件下工作——不满管或空管的情况下，流量计都不能正常工作。  
Electromagnetic flowmeter must work in full pipe conditions; that is to say, the flowmeter cannot normally work in part-filled pipe or empty pipe conditions.

液体流动的正方向一般应与传感器上的箭头方向一致。流量计附近必须有足够的安装维修空间防止流量计受振动。在安装流量计时，流量计两边应有支撑管线的支座。防止由于管路振动、冲击及收缩而关系到应力。重污染液体，应考虑在旁路上安装流量计。

The positive direction in which fluid flows is generally in the same direction as the arrows in the sensor. There must be an enough installation and maintenance space close to the flowmeter to prevent the flowmeter from being vibrated. During installation of the flowmeter, supports for supporting pipelines should be provided on the two sides of the flowmeter. Stress is prevented from being affected because of pipeline vibration, impact and shrinkage. For heavy polluted fluid, a consideration that a flowmeter is installed on the pipeline should be given.

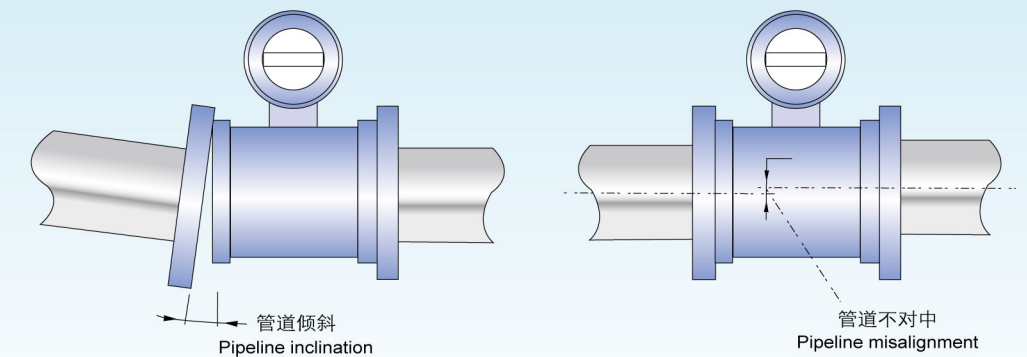
### 流量计配管 Flowmeter piping

管路的不对中或倾斜是管路法兰跳动和断裂的原因。

- (1) 在流量计安装时，应先校正管路的不对中或倾斜，以及两法兰之间的安装距离偏差。
- (2) 在安装的流量计管道路一般有异物（如焊渣和大屑）。在安装流量计之前应把这些杂物冲掉。

Misalignment or inclination of pipeline is a reason why the pipeline flange bounces and breaks.

- (1) During installation of flowmeter, misalignment or inclination of pipeline, and installation distance deviation between two flanges should be corrected first.
- (2) During installation of flowmeter, generally there are some foreign matters (e.g., welding slag and scraps) within pipeline road. Prior to installing the flowmeter, these impurities should be washed away.





### 液体电导率 Conductivity of fluids

不要把电磁流量计安装在液体电导率不均匀的地方。尤其在仪表上游有化学物质注入的情况下，极易导致电导率的不均匀性，从而对流量计测量产生严重干扰。在这种情况下，我们推荐在仪表下游注入化学物质。如果必须从仪表上游注入化学物质，则必须装上足够长的直管段，以保证液体充分混合均匀。

Electromagnetic flowmeter cannot be installed where the conductivity of fluids is very uneven. In particular when chemicals are injected from the upstream of the instrument, it is very easy to cause unevenness of conductivity, thereby seriously interfering the measurement of flowmeter. In this case, we recommend that chemicals should be injected from the downstream of the instrument. If chemicals must be injected from the upstream of the instrument, a straight pipe section which is long enough must be installed to ensure that fluids are mixed well.

### 液体密封剂 Liquid sealant

使用液体密封剂时应注意：

不要让它覆盖在电极和接地环表面，因为这样会影响对流量的测量。

The following points should be mentioned during using fluid sealant:

Don't let it cover the surfaces of electrode and grounding ring because this will influence the measurement of fluid flow.

### 采用节流阀和旁通阀 Adopting throttle valves and bypass valves

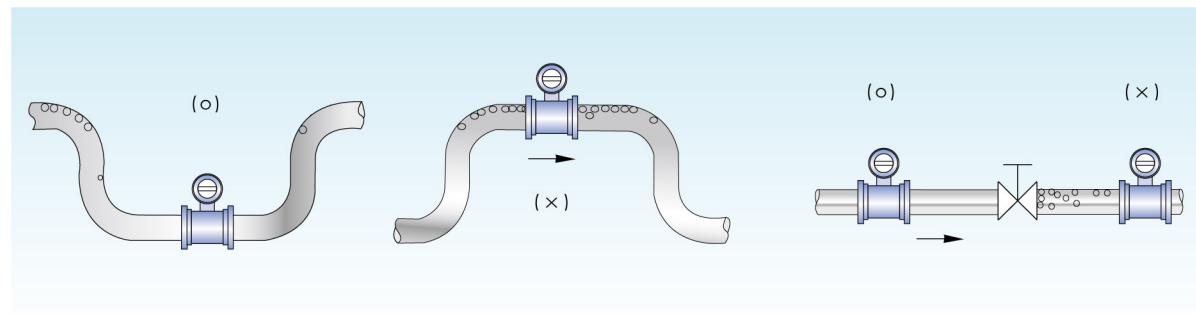
为了方便维修、调零，建议采用材料节流阀和旁通阀。

For convenient maintenance and zero setting, throttle valves and bypass valves are suggested to adopt.

#### 确保在流量计中无气泡 Ensuring no bubble in flowmeter

管路设计应确保液体中不会分离出气泡。一般流量计应安装在阀的上游。因为由于阀的作用使管道中的压力降低，从而产生气泡。

Pipeline design should ensure that no bubble can be separated from fluid. Generally, the flowmeter should be installed on the upstream of the valve, because the pressure in the pipeline is reduced under the action of the valve, thereby producing bubble.



### 电极材料的选择 Selection of electrode materials

电极材料的选择应根据被测介质的腐蚀性，由熟悉现场条件的用户负责选定。一般情况下，电极材料的而腐蚀性要比管道材料高一个等级。

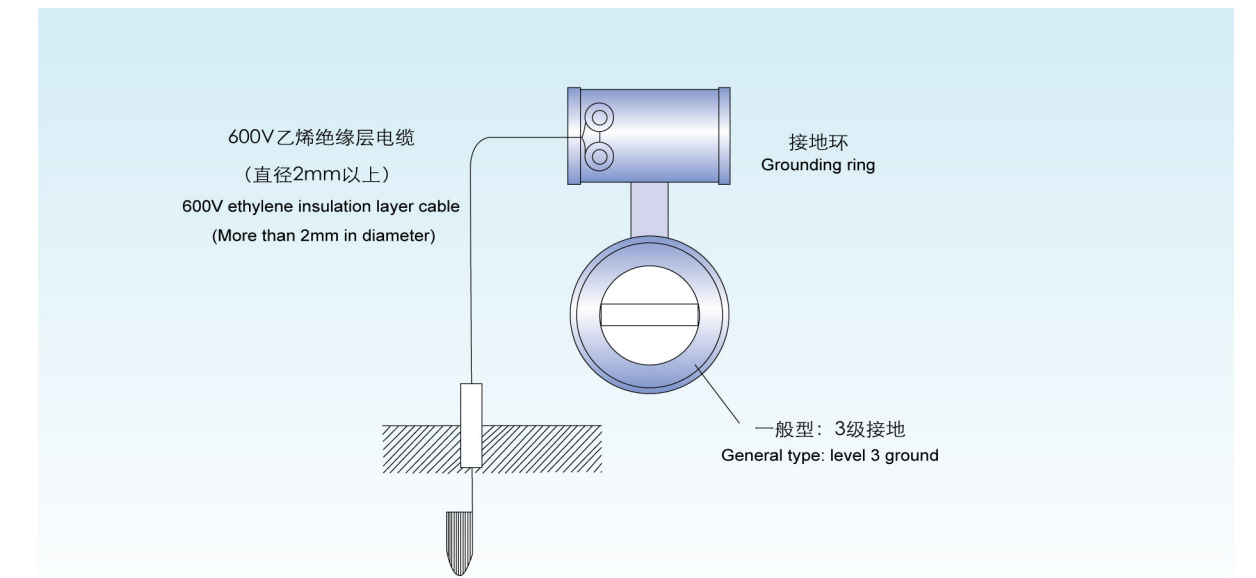
对一般介质，可查阅有关防腐手册，对混酸等成分复杂的介质，应做挂片试验。

Electrode materials should be selected according to corrosivity of measured medium, and selected by users familiar with site conditions. In general, the corrosion resistance of electrode material is higher than that of pipeline material by one grade. For ordinary media, please consult related anti-corrosion manuals. For media having complex components such as mixed acid, coupon tests should be done.

### 传感器接地 Sensor ground

由于电磁流量计的感应信号电压很小，容易受噪声的影响。其准电位必须与被测液体相同。因此，传感器的基准电位（端电位），转换器和放大器的基准电位都与被测液体相同，而液体电位又应与地电位相同电磁流量计配有接地环，其作用是通过与液体接触，建立液体接地，同时保护内衬。仪表接地如下图所示：

Because the voltage of sensing signals of the electromagnetic flowmeter is small, it is easily affected by the noise. The reference potential must be the same as the measured fluid. So the reference potential (terminal potential) of the sensor, the reference potentials of converter and amplifier are the same as the measured fluid. And the fluid potential should be the same as the ground potential. The electromagnetic flowmeter is equipped with a grounding ring, which plays a role in establishment of fluid ground by contacting the fluid, at the same time, protecting the lining. The instrument ground is as shown below:



### 噪声抑制 Noise suppression

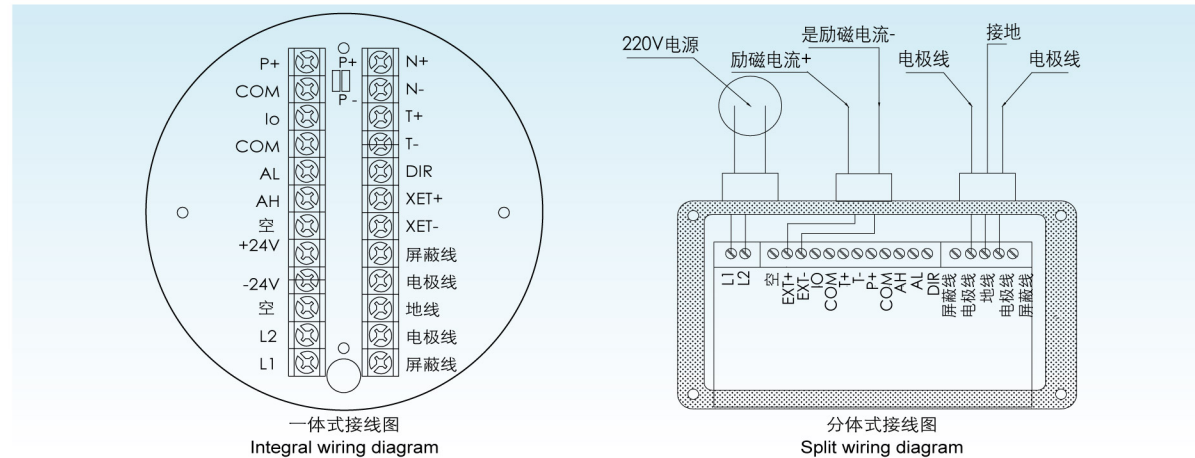
电磁流量计不要安装在那些容易引起感应干扰的电动机、变压器或其它电源附近。

The electromagnetic flowmeter cannot be installed near the motor, transformer or other power supplies easy to cause inductive interference.



为保护操作人员和维修人员不遭受电击以及防止外部噪声的影响。应将接地连接到 ⊕ 标志上 (≤100Ω)

To protect the operators and the maintenance personnel from electric shock and shield external noises, the earthing wire should be connected to the sign ⊕ (≤100Ω).



端子符号说明 Symbolic description of terminal

Terminal Symbol	Terminal Symbol	Function specification	Terminal Symbol	Function specification
1 P+	N+	双向流量脉冲输出/频率输出 Bi-directional flux pulse output/frequency output	N+	正反流量输出功能端口 Forward and reverse flow output functional port
2 COM	N-		N-	
3 IO	T+	4-20mA电流输出 4-20mA current output	T+	RS485通讯输出 RS485 Communication output
4 COM	T-		T-	
5 AL	DIR	流量下限报警输出 Alarm output for lower limit of flux	DIR	
6 AH	XET+	流量上限报警输出 Alarm output for upper limit of flux	XET+	励磁电流 Excitation current
7 空 Empty	XET-		XET-	
8 +24VDC	屏蔽线 Shielded wire	24V供电接入端 24V power supply access point	屏蔽线 Shielded wire	
9 -24VDC	电极线 Electrode wire		电极线 Electrode wire	
10 空 Empty	地线 Earthing wire		地线 Earthing wire	
11 L2	电极线 Electrode wire	220V供电接入端 220 power supply access point	电极线 Electrode wire	
12 L1	屏蔽线 Shielded wire		屏蔽线 Shielded wire	

中间短接件 Short circuit piece in between  
当短接件接在上方 (P+)时流量输出为正流量, 接下方 (P-)时输出为负流量  
The flow output will turn out to be positive when the short circuit piece is connected to (P+) above, while negative for (P-) below.

### 接线须知

接线时应注意以下几点:

- 为保证传感器接线盒内的绝缘性, 防止由于潮湿引起的绝缘性不好, 下雨天不要在室外连接电缆。
- 连接电源电缆和信号电缆两头要包有圆形的接线片。
- 建议使用导线管。导线管采用厚的且坚固的钢管道或柔性金属管道均可。
- 所有的电源电缆和非4芯24V DC的信号电缆必须套以钢的导线管。
- 当备有防水密封塞和接头、防水塞时, 应将防水密封塞拧紧, 以保证盒子内不渗水。

### Instructions to Wiring

The following suggestions should be followed in the wiring work:

- To protect the insulation within the terminal box of the sensor from being hit by humidity, it is suggested not to connect cables outdoor in rain.
- Circular lug plate should be wrapped around both ends of power cable and signal wire.
- Conduit tube is recommended. The tube can be thick and solid steel pipe or flexible metal pipe.
- All main cable and signal cables of non-four-core 24V DC must be sleeved in steel conduit tube.
- When there are sealing plugs, joint and waterproof plug, the sealing plug should be fastened to prevent the box from leaking.

### 附录1 常见液体电导率表

液体名称	浓度%	温度(°C)	电导率(S/cm)
硝酸银 Silver Nitrate(AgNO <sub>3</sub> )	5	18	2.56X10 <sup>-2</sup>
	60		21.01X10 <sup>-2</sup>
氯化钡 Barium Chloride(BaCl <sub>2</sub> )	5	18	3.89X10 <sup>-2</sup>
	24		15.34X10 <sup>-2</sup>
硝酸钡 Barium Nitrate [Ba(NO <sub>3</sub> ) <sub>2</sub> ]	42	25	2.09X10 <sup>-2</sup>
乙醇, 酒精 Ethyl Alchole (C <sub>2</sub> H <sub>5</sub> OH)	95	18	2.6X10 <sup>-7</sup>
	0.3		3.18X10 <sup>-4</sup>
醋酸 Acetic Acid(CH <sub>3</sub> CO <sub>2</sub> H)	20	18	16.05X10 <sup>-4</sup>
	70		2.35X10 <sup>-4</sup>
	99.7		4X10 <sup>-8</sup>
	100(纯)		1.2X10 <sup>-8</sup>
丙酸 Propionic Acid (C <sub>2</sub> H <sub>5</sub> CO <sub>2</sub> H)	1.00	18	4.79X10 <sup>-4</sup>
	20.02		10.42X10 <sup>-4</sup>
	69.99		8.5X10 <sup>-7</sup>
	100.00		7X10 <sup>-8</sup>
100(纯)	<10 <sup>-9</sup>		
丁酸 Butyric Acid (C <sub>3</sub> H <sub>7</sub> CO <sub>2</sub> H)	1.00	18	4.55X10 <sup>-4</sup>
	50.04		2.96X10 <sup>-4</sup>
	70.01		5.6X10 <sup>-7</sup>
100	6X10 <sup>-8</sup>		
草酸, 酢酸 Oxzlic Acid[(CO <sub>2</sub> H) <sub>2</sub> ]	3.5	18	5.08X10 <sup>-2</sup>
	5.0		6.43X10 <sup>-2</sup>
氯化钙 Cadmium Chloride(CdCL <sub>2</sub> )	25.0	18	17.81X10 <sup>-2</sup>
	35.0		13.66X10 <sup>-2</sup>
硝酸钙 Cadmium Nitrate[Cd(NO <sub>3</sub> ) <sub>2</sub> ]	6.25	18	4.91X10 <sup>-2</sup>
	25.0		10.48X10 <sup>-2</sup>
	50		4.69X10 <sup>-2</sup>
溴化镉 Cadmium Bromide(CdBr <sub>2</sub> )	0.0324	18	2.31X10 <sup>-4</sup>
	1		35.70X10 <sup>-4</sup>
	30		27.30X10 <sup>-3</sup>
	0.0503		4.95X10 <sup>-4</sup>
氯化镉 Cadmium Chloride(CdCl <sub>2</sub> )	1	18	55.10X10 <sup>-4</sup>
	20		29.90X10 <sup>-3</sup>
	50		13.70X10 <sup>-3</sup>
碘化镉 Cadmium Iodide(CdI <sub>2</sub> )	1	18	21.20X10 <sup>-4</sup>
	20		25.40X10 <sup>-3</sup>
	45		31.04X10 <sup>-3</sup>
硝酸镉 Cadmium Nitrate[Cd(NO <sub>3</sub> ) <sub>2</sub> ]	1	18	69.40X10 <sup>-4</sup>
	48		75.50X10 <sup>-3</sup>
硫酸镉 Cadmium Sulfate(CdSO <sub>4</sub> )	0.0289	18	2.47X10 <sup>-4</sup>
	0.495		23.93X10 <sup>-4</sup>
	5		14.60X10 <sup>-3</sup>
	36		42.10X10 <sup>-3</sup>
氯化铜 Copper Chloride(CuCl <sub>2</sub> )	1.35	15	18.70X10 <sup>-3</sup>
	35.2		69.90X10 <sup>-3</sup>
硝酸铜 Copper Nitrate[Cu(NO <sub>3</sub> ) <sub>2</sub> ]	5	18	36.50X10 <sup>-3</sup>
	15		85.80X10 <sup>-3</sup>
35	10.62X10 <sup>-2</sup>		
硫酸铜 Copper Sulfate(CuSO <sub>4</sub> )	2.5	18	10.90X10 <sup>-3</sup>
	17.5		45.80X10 <sup>-3</sup>
氢溴酸 Hydrobromic Acid(HBr)	5	15	19.08X10 <sup>-2</sup>
	15		49.40X10 <sup>-2</sup>
	100(纯)		8X10 <sup>-4</sup>



附录1 常见液体电导率续表

液体名称	浓度%	温度(°C)	电导率(S/cm)
甲酸, 蚁酸 Formic Acid(HCO <sub>2</sub> H)	4.94	18	55.00X10 <sup>-4</sup>
	39.955		98.40X10 <sup>-4</sup>
	100		2.80X10 <sup>-4</sup>
	100(纯)		5.6X10 <sup>-5</sup>
盐酸 Hydrochloride Acid(HCl)	5	15	39.48X10 <sup>-2</sup>
	40		51.52X10 <sup>-2</sup>
氢氟酸 Hydrofluoric Acid(HF)	0.004	18	2.50X10 <sup>-4</sup>
	0.121		21.00X10 <sup>-4</sup>
	4.80		59.30X10 <sup>-3</sup>
	29.8		34.11X10 <sup>-2</sup>
氢碘酸 Hydroiodic Acid(HI)	5	15	13.32X10 <sup>-2</sup>
硝酸 Nitric Acid (HNO <sub>3</sub> )	6.2	18	31.23X10 <sup>-2</sup>
	31.0		79.19X10 <sup>-2</sup>
	62.0		49.04X10 <sup>-2</sup>
磷酸 Phosphoric Acid (H <sub>3</sub> PO <sub>4</sub> )	10	15	56.60X10 <sup>-3</sup>
	70		14.73X10 <sup>-2</sup>
	87		70.90X10 <sup>-3</sup>
硫酸 Sulfuric Acid (H <sub>2</sub> SO <sub>4</sub> )	5	18	20.85X10 <sup>-2</sup>
	85		98.50X10 <sup>-3</sup>
	99.4		85.00X10 <sup>-4</sup>
二溴化汞 Mercuric Bromide(HgBr <sub>2</sub> )	0.223	18	16X10 <sup>-6</sup>
二氯化汞 Mercuric Chloride(HgCl <sub>2</sub> )	0.229	18	44X10 <sup>-6</sup>
溴化钾 Potassium Bromide(KBr)	5	15	4.65X10 <sup>-2</sup>
	36		35.07X10 <sup>-2</sup>
醋酸钾 Potassium Acetate(KCH <sub>3</sub> CO <sub>2</sub> )	4.67	15	34.70X10 <sup>-3</sup>
	65.33		47.90X10 <sup>-3</sup>
氰化钾 Potassium Cyanide(KCN)	3.25		52.70X10 <sup>-3</sup>
碳酸钾 Potassium Carbonate(K <sub>2</sub> CO <sub>3</sub> )	5	15	56.10X10 <sup>-3</sup>
	50		14.69X10 <sup>-2</sup>
草酸钾 Potassium Oxalate(K <sub>2</sub> C <sub>2</sub> O <sub>4</sub> )	5	18	48.80X10 <sup>-3</sup>
氯化钾 Potassium Chloride(KCl)	5	18	69.90X10 <sup>-3</sup>
	21		28.10X10 <sup>-2</sup>
氟化钾 Potassium Fluoride(KF)	5	18	65.20X10 <sup>-3</sup>
	40		25.22X10 <sup>-2</sup>
碘化钾 Potassium Iodide(KI)	5	18	33.80X10 <sup>-2</sup>
	55		42.26X10 <sup>-3</sup>
硝酸钾 Potassium Nitrate(KNO <sub>3</sub> )	5	18	45.40X10 <sup>-3</sup>
	22		16.25X10 <sup>-2</sup>
氢氧化钾 Potassium Hydroxide(KOH)	4.2	15	14.64X10 <sup>-2</sup>
	42		42.12X10 <sup>-2</sup>
硫化钾 Potassium Sulfide (K <sub>2</sub> S)	3.18	18	84.50X10 <sup>-3</sup>
	47.26		25.79X10 <sup>-2</sup>
硫酸钾 Potassium Sulfate (K <sub>2</sub> SO <sub>4</sub> )	5	18	45.80X10 <sup>-3</sup>
碳酸锂 Lithium Carbonate (Li <sub>2</sub> CO <sub>3</sub> )	0.20	18	34.30X10 <sup>-4</sup>
	0.63		68.50X10 <sup>-4</sup>
氯化锂 Lithium Chloride (LiCl)	2.5		41.00X10 <sup>-3</sup>
	40		84.80X10 <sup>-2</sup>
碘化锂 Lithium Iodide (LiI)	5	18	29.60X10 <sup>-3</sup>
	25		13.46X10 <sup>-2</sup>
氢氧化锂 Lithium Hydroxide (LiOH)	1.25		78.10X10 <sup>-3</sup>
	7.5		29.99X10 <sup>-2</sup>
硫酸锂 Lithium Sulfate (Li <sub>2</sub> SO <sub>4</sub> )	5		40.00X10 <sup>-3</sup>
	10		61.00X10 <sup>-3</sup>

附录1 常见液体电导率续表

一、水溶液电导率

液体名称	浓度%	温度(°C)	电导率(S/cm)
氯化镁 Magnesium Chloride(MgCl <sub>2</sub> )	5	18	68.30X10 <sup>-3</sup>
	30		10.61X10 <sup>-2</sup>
硝酸镁 Magnesium Nitrate [Mg(NO <sub>3</sub> ) <sub>2</sub> ]	5	18	43.80X10 <sup>-3</sup>
硫酸镁 Magnesium Sulfate (MgSO <sub>4</sub> )	5	15	36.30X10 <sup>-3</sup>
氯化锰 Manganese Chloride (MnCl <sub>2</sub> )	5	15	52.60X10 <sup>-3</sup>
	28		10.16X10 <sup>-2</sup>
醋酸钠 Sodium Acetate (NaCH <sub>3</sub> CO <sub>2</sub> )	5	18	29.50X10 <sup>-3</sup>
	32		56.90X10 <sup>-3</sup>
碳酸钠 Sodium Carbonate (Na <sub>2</sub> CO <sub>3</sub> )	5	18	45.10X10 <sup>-3</sup>
	15		83.60X10 <sup>-3</sup>
氯化钠 Sodium Chloride (NaCl)	5	18	67.20X10 <sup>-3</sup>
	10		12.11X10 <sup>-2</sup>
碘化钠 Sodium Iodide(NaI)	26	18	21.51X10 <sup>-2</sup>
	5		29.80X10 <sup>-3</sup>
	40		21.51X10 <sup>-2</sup>
硝酸钠 Sodium Nitrate (NaNO <sub>3</sub> )	5	18	43.60X10 <sup>-3</sup>
	30		16.06X10 <sup>-2</sup>
氢氧化钠 Sodium Hydroxide (NaOH)	2	18	46.50X10 <sup>-3</sup>
	20		32.84X10 <sup>-2</sup>
	50		82.00X10 <sup>-3</sup>
硅酸钠 Sodium Silicate (Na <sub>2</sub> O,nSiO <sub>2</sub> )	37	25	26X10 <sup>-3</sup>
	46		14X10 <sup>-3</sup>
硫化钠 Sodium Sulfide(Na <sub>2</sub> S)	2.02	18	61.20X10 <sup>-3</sup>
	18.15		21.84X10 <sup>-2</sup>
硫酸钠 Sodium Sulfate(Na <sub>2</sub> SO <sub>4</sub> )	5	18	40.90X10 <sup>-3</sup>
	15		88.60X10 <sup>-3</sup>
氨水 Ammonium (NH <sub>3</sub> )	0.10	15	2.51X10 <sup>-4</sup>
	8.03		10.38X10 <sup>-4</sup>
	30.5		1.93X10 <sup>-4</sup>
氯化铵 Ammonium Chloride(NH <sub>4</sub> Cl)	5	18	91.80X10 <sup>-3</sup>
	25		40.25X10 <sup>-2</sup>
碘化铵 Ammonium Iodide(NH <sub>4</sub> I)	10	18	77.20X10 <sup>-3</sup>
	50		42.00X10 <sup>-2</sup>
硝酸铵 Ammonium Nitrate(NH <sub>4</sub> NO <sub>3</sub> )	5	15	59.00X10 <sup>-3</sup>
	50		36.33X10 <sup>-2</sup>
硫酸铵 Ammonium Sulfate[(NH <sub>4</sub> ) <sub>2</sub> SO <sub>4</sub> ]	5	15	55.20X10 <sup>-3</sup>
	31		23.21X10 <sup>-2</sup>
硝酸铅 Lead Nitrate [Pb(NO <sub>3</sub> ) <sub>2</sub> ]	5	15	19.10X10 <sup>-3</sup>
	30		66.80X10 <sup>-3</sup>
氯化锶 Strontium Chloride (SrCl <sub>2</sub> )	5	18	48.30X10 <sup>-3</sup>
	22		15.83X10 <sup>-2</sup>
硝酸锶 Strontium Nitrate [Sr(NO <sub>3</sub> ) <sub>2</sub> ]	5	15	30.90X10 <sup>-3</sup>
	35		86.10X10 <sup>-3</sup>
氯化锌 Zinc Chloride (ZnCl <sub>2</sub> )	2.5	15	27.60X10 <sup>-3</sup>
	30		92.60X10 <sup>-3</sup>
	60		36.90X10 <sup>-3</sup>
硫酸锌 Zinc Sulfate (ZnSO <sub>4</sub> )	5	18	19.10X10 <sup>-3</sup>
	30		44.40X10 <sup>-3</sup>



附录1 常见液体电导率续表

二、其他杂项液体电导率

液体名称	温度(°C)	电导率(S/cm)
糖蜜	10	$3 \times 10^{-4}$
	50	$5 \times 10^{-3}$
糖液	25	$(1 \sim 3) \times 10^{-6}$
纯砂糖溶液	10	$3 \times 10^{-6}$
半砂糖溶液	30	$5.85 \times 10^{-4}$
杜松子酒会(90度)	25	$1 \times 10^{-5}$
伏特加酒会(100度)	25	$4 \times 10^{-6}$
巧克力利酒(Chociate Liqueur)	-	$< 10^{-13}$
豆油	25	$< 4 \times 10^{-8}$
	104	$< 10^{-13}$
花生酱(无糖)	30	$< 10^{-13}$
花生酱(加糖)	28	$1 \times 10^{-3}$
动物性脂肪	70	$< 10^{-13}$
石蜡烛 Paraffin Wax	66	$< 10^{-13}$
墨水	60	$2 \times 10^{-6}$
黑液	93	$5 \times 10^{-3}$
乳酸银31-56三醇	25	$0.77 \times 10^{-6}$
己酸二 Adipicacid	25	$0.7 \times 10^{-6}$
氧化铝 Aluminum Chloride	25	$25 \times 10^{-2}$
水合氧化铝溶液 Alumina Hydrate Solution	25	$35 \times 10^{-2}$
甲盐酸酯 Darbamate	25	$4 \times 10^{-4}$
亚神铜铵 Chemonite	25	$5 \times 10^{-3}$
氯化乙醚 Chlorinated Ether	25	$18 \times 10^{-6}$
异苯二酸聚酯树脂 Isophthalic Polyester Resin	25	$< 4 \times 10^{-8}$
异丙醇 Isoproponol	25	$1.8 \times 10^{-6}$
内酰胺 Lctam	25	$43 \times 10^{-6}$
橡胶浆 Laxtex	25	$5 \times 10^{-3}$
甲基异丁酮 Methl Isobufyl Kefone	25	$4 \times 10^{-6}$
丙二醇 Propylend Glycol	25	$4 \times 10^{-8}$
铝酸钠 Sodium Aluminafe	25	$70 \times 10^{-3}$
尿素(纯) Urea(Pure)	145	$5 \times 10^{-3}$
(66%)	25	$1 \times 10^{-4}$

附录2 有关国家常用不锈钢、耐热钢钢号对照表

对照表(供参考)

中国 GB1220 GB1221	国家标准 ISO683/13 ISO683/16	美国 AISI ASTMUNS	日本 JIS	前苏联 COCT5632	英国 BS970Part4 BS1449Part2	法国 NFA35-572 NFA35-576~582 NFA35-584	德国 DIN17440 DIN17224
0Cr18	1	410S S41000	SUS410	08×13		Z6C13	X7Cr13
0Cr13Al	2	405 S40500	SUS405		405S17	Z6CA13	X7Cra13
1Cr13	3	410	SUS410	12×13	410S21	Z12C13	X10Cr10
2Cr13	4	420 S42000	SUS420J <sub>1</sub>	20×13	420S37	Z20C13	X20Cr13
3Cr13	5		SUS420J <sub>2</sub>	30×13	420S45		
1Cr17	8	430 S43000	SUS430	12×17	430S15	Z8C17	XBCr17
1Cr17Ni2	9	431 S43100	SUS431	14×17H2	431S29	Z15CN16-02	X22CrNi17
00Cr19Ni11	10	304L S30403	SUS304L	03×18H11	304S12	Z2CN18.09	X2CrNi189
0Cr19Ni9	11	304	SUS304	08×18H10	304S15	Z6CN18.09	X5CrNi189
1Cr18Ni9	12	302 S30200	SUS302	12×18H9	302S25	Z10CN18.09	X12CrNi188
1Cr18Ni12	13	305	SUS305	12×18H12T	305S19	Z8CN18.12	X5CrNi911
0Cr18Ni11Ti (0Cr18Ni9Ti)	15	321 S32100	SUS321	08×18H10T	321S12 321S20	Z6CNT18.10	X10CrNiTi189
0Cr18Ni11Nb (1Cr18Ni11Nb)	16	347 S34700	SUS347	08×18H12T	347S17	Z6NNb18.10	X10CrNiNb189
00Cr17Ni14Mo2	19.19a	316L S31603	SUS316L	03×17H13M2	316S12	Z2CN17.12	X2CrNiMo1810
0Cr17Ni12Mo2	20.20a	316	SUS316	08×17H13M2T	316S16	Z6CN17.13	X5CrNiMo1810
00Cr19Ni13Mo3 (00Cr17Ni14Mo3)	24	317L S31703	SUS317L	03×16H15M3	317S12	Z2CND19.15	X2CrNiMo1816
0Cr19Ni13Mo3	25	317	SUS317	08×17H15M3	317S16		
1Cr18Ni9Ti				12×18H10T			XCrNiTi189
00Cr18Ni14Mo2Cu2			SUS316JIL				
00Cr30Mo2			SUS447J1				
2Cr23Ni13 (1Cr23Ni13)		309 S30900	SUH309	20×23H12	309S24	Z15CN24.13	
2Cr25Ni20 (1Cr25Ni20Si2)		310 S31000	SUH310	20×25H20C2	310S24	Z12CN25.20	CrNi2520
00Cr25Ni7Mo4N	S3270	SAF2507					



### 附录3 国内外法兰标准简介

#### 外形尺寸

管法兰是管道常用的连接件，因此，法兰与钢管的相互关系十分密切。不同系列的钢管外径要与其相适应的法兰相配。现将国外主要国家和国内有关的管法兰标准及适用的钢管外径列表1和表2

表1 国外主要国家和国际管法兰标准大致情况

	大致情况	
国际标准 ISO7005-1(1992)	系列1:PN10, 16, 20, 50, 110, 150, 260, 420 bar(ANS体系) 系列2:PN2.5, 6, 25, 40bar (DIN体系) DN10~4000mm	"英制管"
德国DIN (系列标准)	PN1, 2, 5, 6, 10, 16, 25, 40, 64, 100, 160, 250, 320, 400BAR,	"英制管"
美国 ANSI B 16.5 (1998)	PN Class 150, 300, 400, 600, 900, 1500, 2500 lb, 与SI制压力等级 对应关系如下: 150 lb-2.0MPa 600 lb-10.0MPa(ISO将其改为11.0MPa) 300 lb-5.0MPa 900 lb-15.0MPa 400 lb-6.8MPa 1500 lb-25.0MPa(ISO将其改为26.0MPa) DN15~600mm 2500 lb-42.0MPa	"英制管"
原苏联 FOCT (系列标准)	PN0.1, 0.25, 0.6, 1.0, 1.6, 2.5, 4.0, 6.4, 10.0, 16.0, 20.0MPa, DIN体系 (除20.0MPa外, 连接尺寸与德国法兰可以互换)	"英制管"
英国 BS4504	DIN体系 公称压力及连接尺寸与德国标准一致	"英制管"
英国 BS1560	ANSI体系 公称压力及连接尺寸与美国标准一致	"英制管"
法国 NF E29	DIN体系 公称压力及连接尺寸与德国标准一致	"英制管"
法国 NF M87	ANSI体系 公称压力及连接尺寸与美国标准一致	"英制管"
日本 JPI TS~15	ANSI体系 公称压力及连接尺寸与美国标准一致	"英制管"
日本 JIS B 2201-227	压力额定值: 2, 5, 10, 16, 20, 30, 40, 63kgf/cm (用2K, 5k, 10k=标记)DN10~1500mm	"英制管"

表2 国内有关管法兰标准大致情况

管法兰标准	大致情况	
HG 5003~5028-58 (化工部老标准)	PN1, 2, 5, 6, 10, 16, 25, 40, 64kgf/cm <sup>2</sup> 近似于DIN标准的原苏联50年代管法兰系列	"公制管"
JB 75~86-59 (机械部老标准)	PN1, 2, 5, 6, 10, 16, 25, 40, 64, 100, 160, 200kgf/cm <sup>2</sup> 近似于DIN标准的原苏联50年代管法兰系列	"公制管"
GB 9112~9131-88 (国家标准)	与ISO 7005-L相近似 PN0.25, 0.6, 1.0, 1.6, 2.5, 4.0MPa为DIN体系 PN2.0, 5.0, 10.0, 15.0, 25.0, MPa为DIN体系	"公制管"
HGJ 44~76-91(化工 部工程建设标准)	PN0.25, 0.6, 1.0, 1.6, 2.5, 4.0, 6.3, 10.0, 16.0MPa, DIN体系	"公制管"
SH 3406-92 (中国石化总公司标准)	PN1.0, 2.0, 5.0, 6.8, 10.0, 15.0, 25.0, 42.0, MPa, DIN体系	系列I:"英制管" 系列II:我国原冶金部生产的 相近于"英制管"的钢管系列
JB/T 74~90-94 (机械部标准)	第一系列:PN0.25, 0.6, 1.0, 1.6, 2.5, 4.0, 6.3, 10.0MPa 第二系列:PN0.25, 0.6, 1.0, 1.6, 2.5, 4.0, 6.3, 10.0 16.0, 20.0MPa(与原机标JB75~86-59)	"公制管"

### 附录5 电磁流量计产品制造标准、计量检定规程

GB/T 9119-2000  
GB/T 191-2000 GB 3836.1~3836.4-2000 JJG 198-1994  
GB/T 15464-1995  
JB/T 9329-1999  
JB/T 9248-1999  
EEC  
平面、突面板式平焊钢制管法兰  
包装储运图示标志  
爆炸性气体环境用电气设备  
速度式流量计检定规程  
仪器仪表包装通用技术条件  
仪器仪表运输、运输贮存基本环境条件及试验方法  
电磁流量计  
EMC directive 89/336