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Instrumentation

PI-5020 MAGMETER
Electromagnetic flowmeter

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Description

PI-5020 Magmeter is a flange type electromagnetic flowmeter ideal for conductive liquids. It comes in sizes from 10mm to 2000mm flow tubes. PI-5020 Magmeter is widely used for tap-water, waste water ,food & beverage, Pulp & Paper and many other applications. PI-5020 Magmeter is a stand alone magmeter that could also be used with various configurations, such integral or remote and AC or DC power requirement. HART, RS485 and profibus communications are available

Features

- Wide range of nominal diameter Size ½" to 80" with highest IP68 protection
- Flow Velocity range:0 m/s -15 m/s
- GPRS, CDMA and SRD radio communication
- Designed for clean water > 5 uS/cm
- IP68 enclosure that can be used for underground applications
- High accuracy of ±0.5% of reading
- Empty pipe, current excitation and battery capacity alarms
- NIST traceable calibration certificate
- Easy maintenance due to no moving parts
- Uninfluenced by temperature, pressure, viscosity, and density
- Self-detection, self-diagnostic functions, and safety alarms for upper and lower limit
- Features SMART excitation, which ensures zero-point stability, high reliability, and low power consumption
- Lining and electrode available in various materials which can measure nearly all conductive fluids
- Meters batching and blending totalization

Applications

- Waste water treatment Tapped water purification Sewerage
- Sea water desalination module Dyeing machines
- Solar energy and PCB wet processing Food manufacturing
- Pharmaceutical machines

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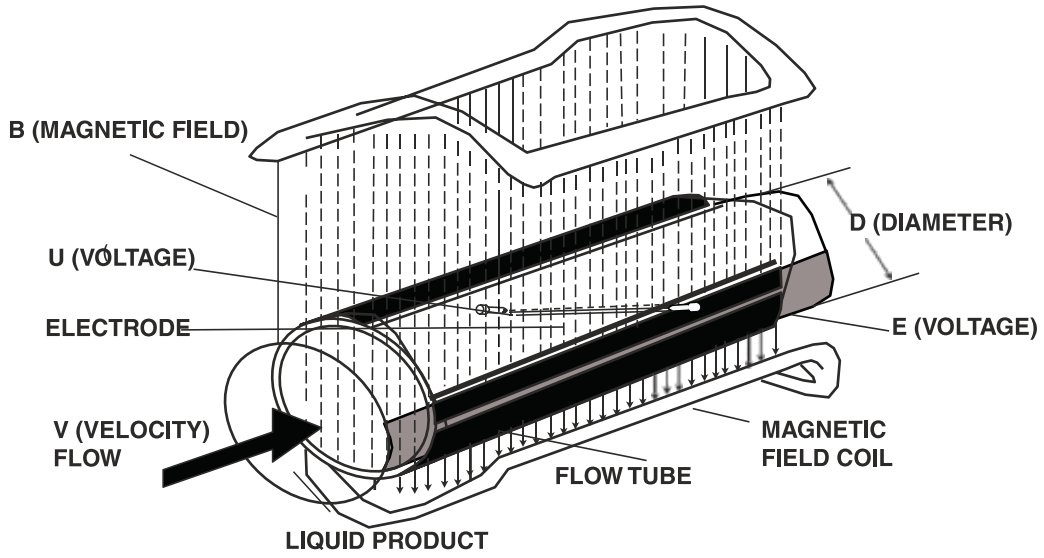
Principle

The working principle of the electromagnetic flowmeter is based on the Faraday law of electromagnetic induction.

When the conducting liquid flows in the orthogonal direction of the magnetic line direction, it will cut the magnetic lines and generate induced voltage, which shows linear relationship with the flowing speed. Thus, the fluidic volume flow can be calculated.

Peregrine Electromagnetic flow meter is mainly composed of the sensor and transmitter. The measuring tube of the sensor is equipped with the excitation coils upward and downward. The transmitter supplies the excitation current, which generates the magnetic field which goes through the measuring tube once it is powered on. A pair of induction electrodes installed on the inner side of the measuring tube comes in contact with the liquid to guide the induced voltage to the sensor.

Operation of an Electromagnetic Flowmeter



The induced voltage is calculated using the following equation:

$U = B \times d \times v$

Where,

U = Voltage Induced by the Conducting Fluid B = Magnetic Flux Density

d = Distance Between the Electrodes

v = Average Velocity of the Conductor (i.e. fluid flowing in the tube through the magnetic field)

Since the magnetic flux density and the distance between the electrodes remain constant, the induced voltage is directly proportional to the conductor velocity.

The value of the velocity is used to calculate the volumetric flow rate as follows:

$Q = A \times v$.

Where, Q = Flow Rate, A = Area and V = Average velocity

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Technical Specification

Display	LED 128*64 pixel backlit type	
Buttons	Four-button operation	
Communication Interface	RS-485 (Modbus) (Optional support for HART, PROFBUS)	
Accuracy	±0.5% of reading@1m/s (0.2% Optional)	
Medium temperature	Compact: 176 °F (80 °C)	
	Remote mount: 248 °F (120 °C) for PTFE: 176 °F (80 °C) for Rubber	
Ambient temperature	-40 °F to 158 °F (-40 °C to +70 °C) [1]	
Fluidic conductivity	> 5 uS/cm	
Measuring scope	0.1m/s ~ 10m/s	
Current output accuracy	0.1% of Pulse Output Accuracy Temperature coefficient (100ppm/BC)	
Current output mode	Proactive	
Output	4 ~ 20mA; pulse/ frequency	
Maximum load of current output	< 750Ω	
Protection rating	IP65 for transducer; IP67 for transmitter	IP68 (Transducer) IP65/ NEMA 4X (Transmitter) [2]
Enclosure material	Aluminum alloy	
Input power	AC 100~240V or DC 24V	
Power consumption	< 10W	
Wire inlet specification	M20 x 1.5*2 Female; 1/2" NPT	
Excitation mode	Pulse DC	
Vibration regulation	IEC 60068-2-3	
EMC regulation	IEC/EN 61326-1 Class A table2	

1 It can't display when LCM is lower than -20℃ (-68°F).
2 Continuous immersion in 6 meters of water for up to 48 hours.

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Main Electrode Material

Electrode Material	Anti-corrosive Property
Stainless steel (316L)	It is applied in water, sewage and organic and non-organic corrosive medium.
Hastelloy alloy	It is resistant to the corrosion of the medium mixture of oxidizing acid such as Nitric acid, mixed acid or Sulfuric acid. Moreover, it is resistant to the corrosion of the oxidizing salt such as Fe^{2+} 、 Cu^{2+} or other substances containing oxidants such as the salt solution of hypochlorous acid above the ambient temperature and sea water.
Titanium	It is resistant to the corrosion of sea water, various oxides, salt solution of hypochlorous acid, oxidating acid (including fuming Nitric acid) and organic acid and alkane. It is not resistant to the corrosion of pure reducing acid (such as Sulfuric acid and Hydrochloric acid). However, the anti-corrosion property will be greatly degraded if the acid contains some oxidants.
Tantalum	It has excellent corrosion resistance. Its characteristic is similar to glass. In addition to hydrofluoric acid , nitric acid , alkali, it could resist almost all chemical medium (including boiling hydrochloric acid, nitric acid and sulfuric acid below 175'C). It could not resist corrosion in alkali.

Lining material

Lining material	Main properties	Application scope
PTFE	▸ Stable chemical properties, resistant to various acid, alkane, and salt solutions and various organic solvents. It is not tolerant to the corrosion of CIF_3, high-temperature OF3 and high-speed liquid oxygen and ozone. ▸ The anti-abrasion property is average.	▸ -20°C ~ 120°C ▸ Strong corrosive medium such as concentrated acid and alkane.
NBR	▸ Excellent flexibility, highly tearing force capability, good wear resistance. ▸ It is resistant to low concentrations of acid, alkali, salt solution; It is not tolerant the corrosion of oxidizing mediums.	▸ < 80°C ▸ Neutral-strong wearing mineral pulp, coal slurry and mud slurry
Neoprene	▸ Neutral wearing capability ▸ It is resistant to low concentrations of acid, alkali, acid corrosion.	▸ < 80°C ▸ Water, Industrial water, Seawater

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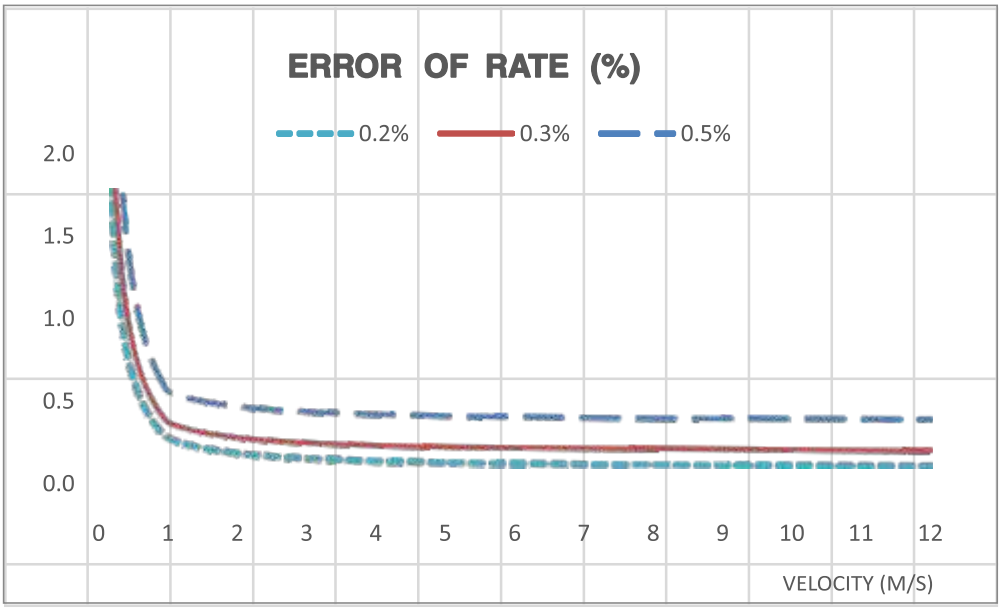
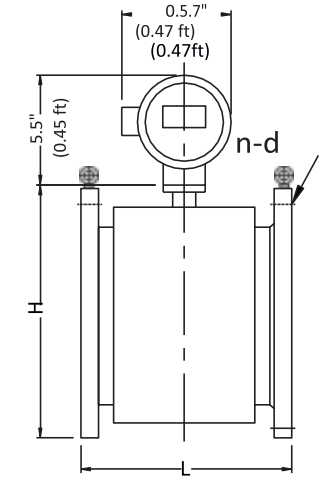
Flow Range and Nominal Diameter Selection

Inch (ft)	Velocity	
	0.98 ft/sec to 32.80 ft/sec	0.3 m/s to 10 m/s
	gal/min	m3/hr
½" (0.04)	0.8 to 28.2	0.19 to 6.4
1" (0.08)	2.4 to 77.9	0.53 to 17.7
2" (0.16)	9.4 to 312.6	2.13 to 71.0
3" (0.25)	23.9 to 796.9	5.43 to 181
4" (0.33)	37.4 to 1246	8.49 to 283
5" (0.41)	58.6 to 1946.1	13.3 to 442
6" (0.5)	84.1 to 2800.2	19.1 to 636
8" (0.66)	149.3 to 4975.2	33.9 to 1130
10" (0.83)	233.8 to 7793.1	53.1 to 1770
12" (1)	335.5 to 11183.3	76.2 to 2540
14" (1.16)	457.8 to 12684.9	104 to 3460
16" (1.33)	598.7 to 19901.5	136 to 4520
18" (1.5)	757.3 to 25184.4	172 to 5720
20" (1.66)	933.4 to 31128.3	212 to 7070
24" (2)	1347.3 to 44909.2	306 to 10200
28" (2.33)	1831.6 to 60979.7	416 to 13850

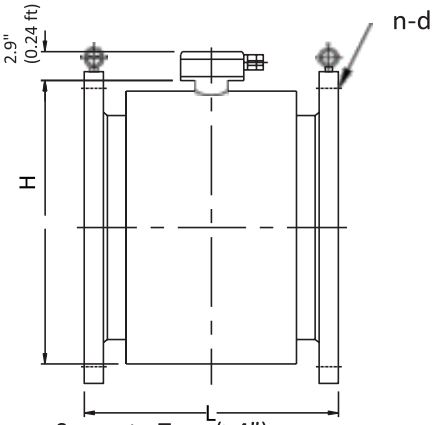
Accuracy class & tolerance



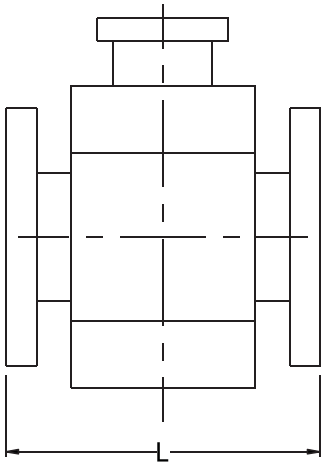
Dimensional Drawing



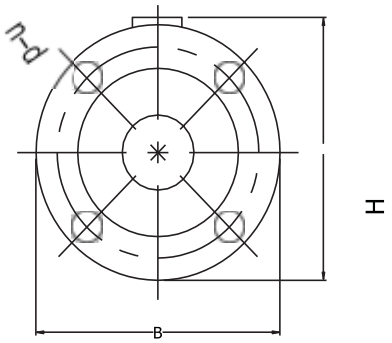
Integral Type (≥4")



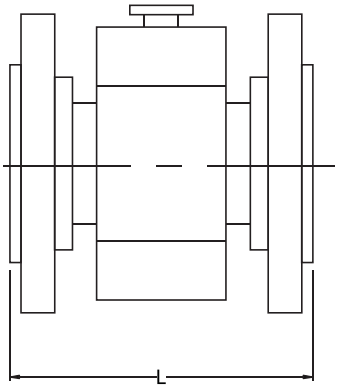
Separate Type (≥4")

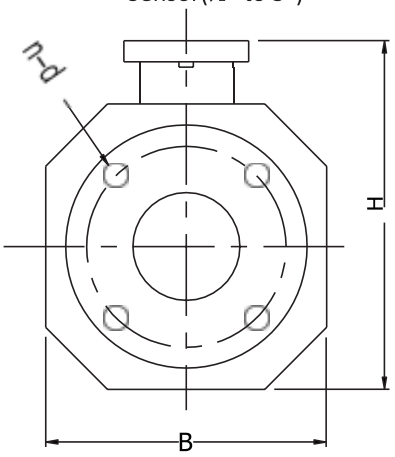


Sensor (½"to 3")



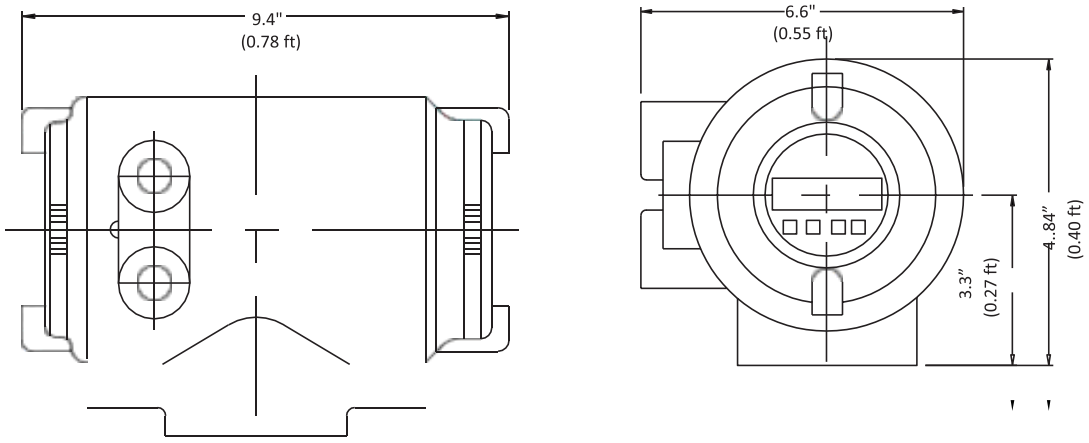
Sensor(½" to 3")





Outline Dimension of Medium and High Pressure Sensors

Compact Mount Transmitter



Size Inch (ft)	Sensor dimensions Inch (ft)			Flange Connection Dimension (ft)	Net Weight lb. (kg)
	L	B	H	n-d	
½" (0.04)	7.87" (0.65)	5.11" (0.42)	8.66" (0.72)	0.01-Φ0.04	17.63 (8)
1" (0.08)	7.87" (0.65)	5.59" (0.46)	9.05" (0.75)	0.01-Φ0.04	26.45 (12)
2" (0.16)	7.87" (0.65)	6.69" (0.55)	10.23" (0.85)	0.02-Φ0.05	39.68 (18)
3" (0.25)	7.87" (0.65)	7.87" (0.65)	11.22" (0.93)	0.02-Φ0.05	57.32 (26)
4" (0.33)	9.84" (0.82)	9.25" (0.77)	11.41" (0.95)	0.02-Φ0.07	66.13 (30)
5" (0.41)	9.84" (0.82)	10.62" (0.88)	12.79" (1.06)	0.02-Φ0.08	79.36 (36)
6" (0.5)	11.81" (0.98)	11.81" (0.98)	13.77" (1.14)	0.02-Φ0.08	92.59 (42)
8" (0.66)	13.77" (1.14)	13.38" (1.11)	15.15" (1.26)	0.03-Φ0.07	121.25 (55)
10" (0.83)	15.74" (1.31)	15.94" (1.32)	17.51" (1.45)	0.03-Φ0.08	154.32 (70)
12" (1)	19.68" (1.64)	18.11" (1.50)	20.27" (1.68)	0.03-Φ0.08	187.39 (85)
14” (1.16)	19.68" (1.64)	20.47(1.70)	22.44”(1.87)	0.03-Φ0.08	242.21(110)
16” (1.33)	23.62”(1.96)	22.83(1.90)	24.80”(2.07)	0.06-Φ0.09	286.60(130)
18" (1.5)	23.62" (1.96)	25.19" (2.09)	27.16" (2.26)	0.06-Φ0.09	330.69 (150)
20" (1.66)	23.62" (1.96)	28.14" (2.34)	29.92" (2.49)	0.06-Φ0.11	440.92 (200)
24" (2)	23.62" (1.96)	33.07" (2.75)	34.64" (2.88)	0.06-Φ0.13	573.20 (260)
28" (2.33)	27.55" (2.30)	35.23" (2.93)	38.18" (3.18)	0.07-Φ0.09	793.66 (360)

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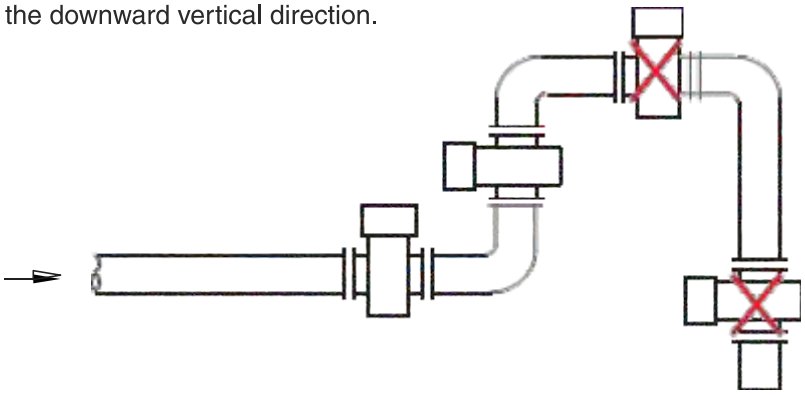
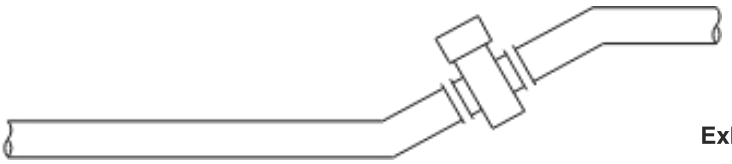
Installation

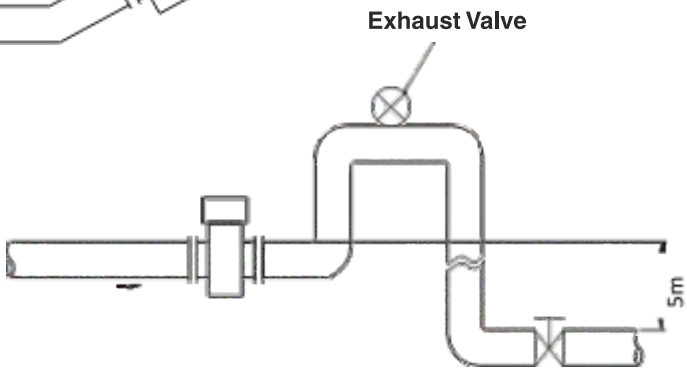
Install flowmeter at relative low of horizontal pipe or in upward vertical direction. Do not install the flow- meter at the highest point of the pipe and in the downward vertical direction.



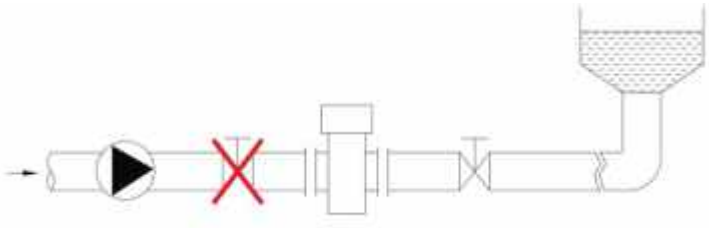
Install Flowmeter at the rising pipe



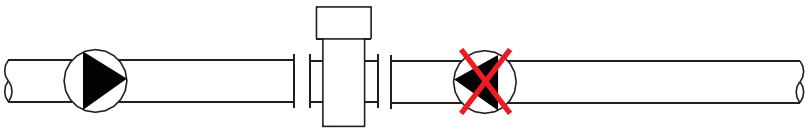
For installing at an open pipe, the flowmeter should be installed at a relative low point. If the fall in the pipe is more than 16.40 ft, the vent valve should be installed at down-stream of the sensor where it should have back pressure



The control valve and stop valve should be installed at the downstream of the sensor not on the upstream side



Sensor should be installed at the outlet of the pump not the inlet.



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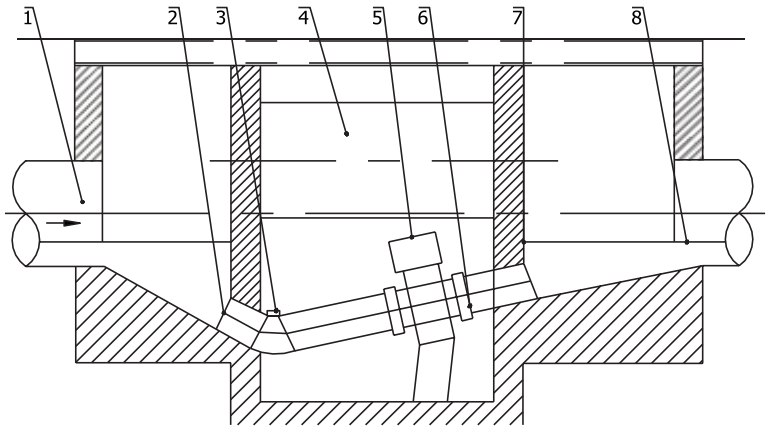
Flowmeter installation in a measuring well:

1. Inlet
2. Entrance Gate
3. Cleaning Hole
4. Overflow Pipe
5. Flowmeter
6. Nozzle Stub
7. Outlet
8. Drain Valve



MODEL SELECTION GUIDE

PI-5020 MAGMETER SERIES

PI-5020	Ordering Code	Description
3/8”	010	Line Size
1/2”	015	
1”	025	
1½"	040	
2”	050	
2½"	065	
3”	080	
4”	100	
6”	150	
8”	200	
10”	250	
12”	300	
14”	350	
16”	400	
18”	450	
20”	500	
22”	550	
24”	600	
28”	700	
30”	800	
Other	xx	

Stainless Steel 316L	0	Electrode
Hastelloy B	1	
Hastelloy C	2	
Titanium	3	
Tantalum	4	
Tungsten Carbide	5	
Platinum	6	

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Chloroprene	1	Liner Material
PTFE	2	
PFA	3	
Others	4	
DIN 1.0MPa	010	Flange connection
DIN 1.6MPa	016	
DIN 2.5MPa	025	
DIN 4.0 MPa	040	
DIN 6.3MPa	063	
ANSI 150# RF	150	
ANSI 300#RF	300	
JIS 10K	10K	
Special Connection	SPC	
Max Pressure 3625Psi (Dn10~80, 3/8”~3")	25	Nominal Pressure (MPa)/PSI
Max Pressure 2320Psi (Dn10~80, 3/8”~3")	16	
Max Pressure1450Psi (Dn10~200, 3/8”~4")	10	
Max Pressure 928Psi (Dn10~300, 3/8”~12")	6.4	
Max Pressure 580Psi (Dn10~300, 3/8”~12")	4.0	
Max Pressure 362Psi (Dn 10~600, 3/8”~24")	2.5	
Max Pressure 232Psi (Dn10~1000, 3/8”~40") 232Psi	1.6	
Max Pressure 145Psi (Dn10~1000, 3/8”~40") 232Psi	1.0	
80℃/176°F or less	L	Working Temperature
120℃/248°F or less, for remote structure only	H	
Not Needed	0	Grounding Rings
Needed	1	
IP65	0	Protection
IP68, for remote structure transducer only	1	
Compact version(Local display)	C	Transmitter
Remote version	R	
None	0	Communication
4 to 20mA/Pulse	1	
Hart, 4 to 20mA/Pulse	2	
RS485, 4 to 20mA/Pulse	3	
GPRS	4	
CDMA	5	
Carbon Steel	0	Housing Material
Stainless Steel 304 SS	1	
Carbon Steel	0	Flange Material
Stainless Steel 304 SS	1	
Needed	1	Companion Flange
Not Needed	0	
None	NX	Explosion proof
Explosion Proof	Ex	
24VDC	D	Power supply
100~240VAC	A	

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