ISEN-DR60/61

Capacitive level gauge

Capacitive smartlevel transmittersare a type of level transmitter that can be used for liquids, oils, and solid micro- particles. With no moving parts, reliability is greatly improved. They are minimally affected by water vapor, dust, or condensation, and feature long-term stability and reliability, high sensitivity, good linearity, and resistance to high temperatures and pressures.

Product Feature

- Simple structure, no moving or elastic parts (except for cable installation),high reliability, and low maintenance.
- Multiple signal output options.
- Suitable for liquid level measurement in high-temperature, high-pressure containers, and the measurement value is not affected by the shape and pressure of the container containing the liquid being measured.
- Particularly suitable for measuring strong corrosive liquids such as acids and alkalis.
- Complete overcurrent, overvoltage, and power polarity protection.
- With a variety of communication options.
- Can measure any conductive medium.

Working Principle

The sensor probe of a capacitive level gauge forms a capacitive sensor with the container of the measured medium, as shown in Figure 1. The inner electrode 1 and the metal container 3 form a coaxial capacitor CX, whose equivalent circuit principle is shown in Figure 2.

Cx=K1·H1+K2·H2 Cx=K1·H1+K2·(H- H=H1+H2

H1)=K2·H+(K1-K2)·H1….

Where: H1 is the liquid level height, H2 is the gas phase height; K1 and K2 are constants related to the container structure and the dielectric constants εliquid and εgas of
the medium; K1·H1 is the coaxial capacitance formed by the liquid portion;
K2·H2 is the coaxial capacitance formed by the gas portion;

As can be seen, the coaxial capacitance Cx formed between probe 1 and container 3 is linearly proportional to the liquid level H1 (since K1 > K2). By measuring changes
in the probe capacitance Cx, the height of the liquid level can be determined. In actual capacitive sensors, there is always a small amount of material buildup during
operation. The equivalent circuit of the sensor is shown in Figure 2. The capacitance Cg and resistance Rg caused by material buildup are superimposed on the sensor's
total output Zx, resulting in false liquid level readings. The liquid level meter signal processor employs radio frequency admittance technology to mitigate the impact of
material buildup on liquid level measurements, ensuring that measurement accuracy remains largely unaffected even under minor buildup conditions.

Working Principle (continued)

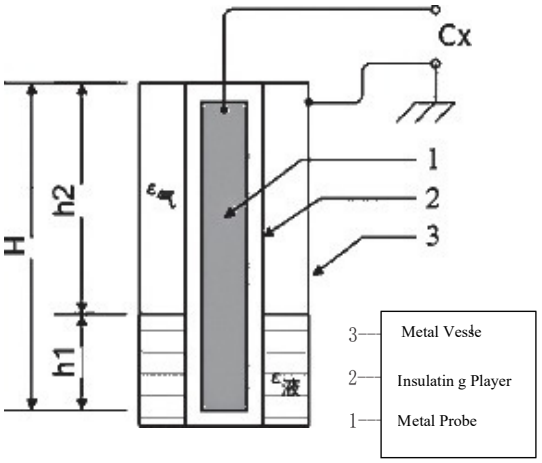
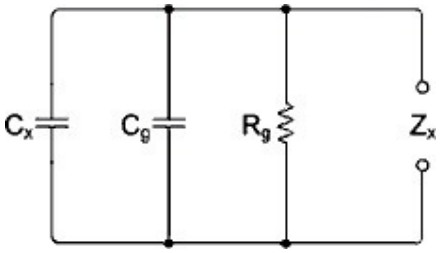


Figure 1: Measurement principle of capacitive sensors



Cx--- Probe capacitance Cg---Hanging material capacitance
Rg--- Hangingmaterial equivalentresistance
Zx--- Probe impedance

Figure 2 Equivalent circuit of capacitive sensor

Application Field

Capacitive level sensors are specifically applied in the following fields:
Industrial production: Used in liquid storage and processing equipment in industrial production, such as chemical plants, oil refineries, food processing plants, etc. They can be used to monitor and control the liquid level in containers such as storage tanks, reactors, and tanks, ensuring the stability and safety of the production process.
Water treatment: Used to monitor and control liquid levels in water tanks, reservoirs, and wells, helping to ensure the normal operation of water supply systems, monitor water level changes, and conduct water quality monitoring and environmental protection.
Petroleum and natural gas industry: Used for liquid level monitoring in oil tanks, storage tanks, and pipelines in the petroleum and natural gas industry. It can help monitor liquid level changes during the storage and transportation of petroleum products and natural gas.
Medical equipment: Capacitive level sensors are also applied in medical equipment, such as medical gas storage tanks and infusion devices, for monitoring and controlling liquid and gas levels.

Product Line

Product Line (Continued)

Technical Specification

1. ISEN-DR60 Compact Digital Capacitive Level Meter Parameters：

Measuring Range	1-1500mm
Accuracy	0.5%FS
Pressure Range	-0.1Mpa~30Mpa
Measurement Electrode Temperature Range	-50~150℃
Ambient Temperature	-40~80℃
Output Method	1*4-20mA +2*NPN/PNP
Process Interface	G1/2 external thread, G3/4 external thread, G1 external thread
	G3/4 external thread coaxial, G1 external thread coaxial), flange
Scale Length	500 mm, 1000 mm, 1500 mm (customizable length)
Wetted parts material	PTFE、Stainless Steel 316L
Housing material	Stainless Steel 304
Connection Type	M12*1 connector
Supply Voltage	18. 30VDC
Wiring protection	Reverse phase protection, overload protection, short circuit protection
Housing protection rating	IP67
Switch repeatability	±0.25%F.S(typ.)
Analog Accuracy	±0.5%F.S(typ.)
Temperature drift	±0.02%F.S(typ.)
Annual Drift	≤0.2%F.S/年
Current Consumption	≤35mA
Response Time	≤50mS
Vibration Resistance	10g/0~500Hz
Shock Resistance	50g/1ms

Technical Specification（Continued）

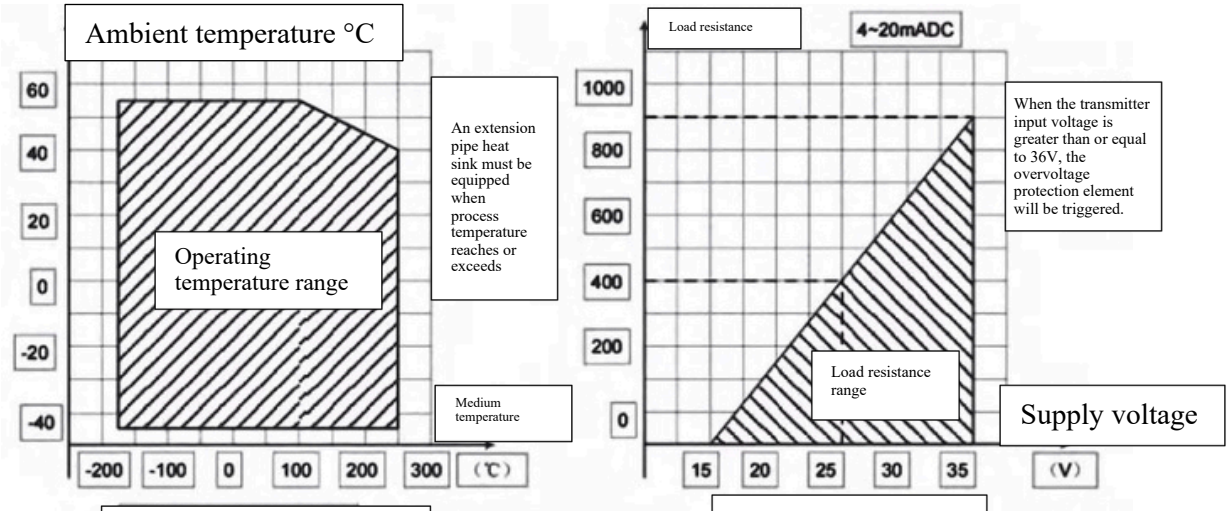
2. ISEN-DR60 Aviation Connector Capacitive Level Gauge Technology

Measuring Range	1-1500mm
Accuracy	0.5%FS
Pressure Range	-0.1Mpa~4Mpa
Measurement Electrode Temperature Range	-50~150℃
Ambient Temperature	-40~80°C
Output Method	1*4-20mA +RS485

3. ISEN-DR61 (2088 dial) capacitive level gauge technical parameters

Measuring Range	1 - 9999mm
Capacitance measurement range	0.1pF ~2800pF
Accuracy	0.2%FS
Pressure Range	-0.1Mpa ~ 30Mpa
Measurement Electrode Temperature Range	-50 ~400℃
Operating Temperature	-40 ~85℃
Storage temperature	-50 ~105℃
Output signal	4-20 mA, 485 communication, IOlinK, etc.

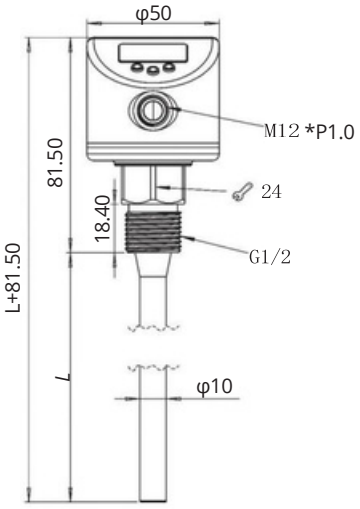
Operating temperature and load characteristics

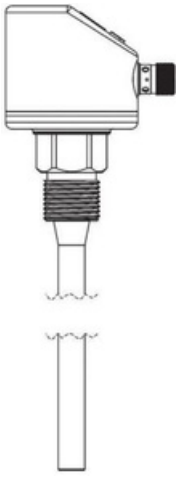


Operating Temperature Range of Level Gauges

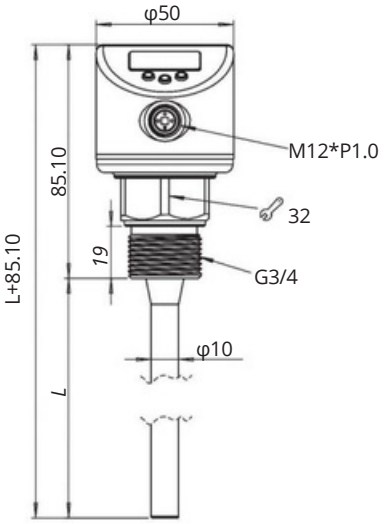
Level Gauge Load Characteristics

Typical Product Outside Dimensions (reference Continued)

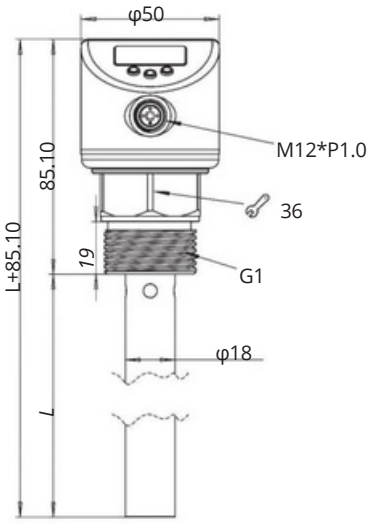




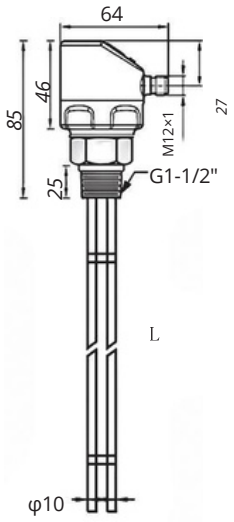
Compact digital display straight rod type (G1/2 thread)



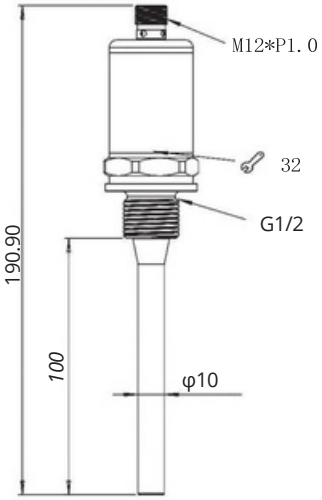
Compact digital straight rod type (G3/4 thread)



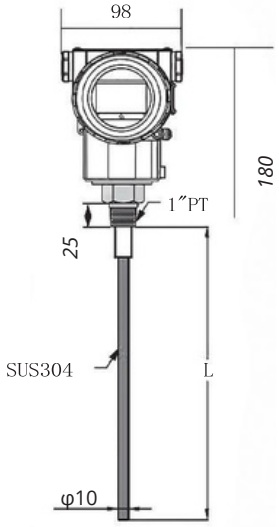
Compact Digital Coaxial



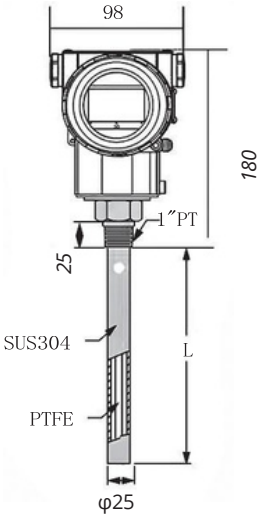
Compact Digital Dual Electrode



Air Plug Straight Type



Digital Straight Type

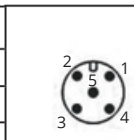


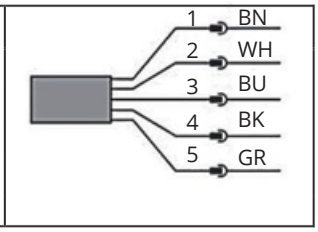
Standard Digital Coaxial

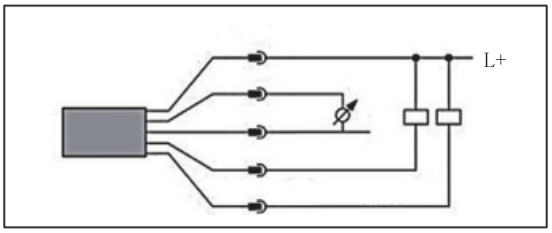
Electrical Wiring Diagram

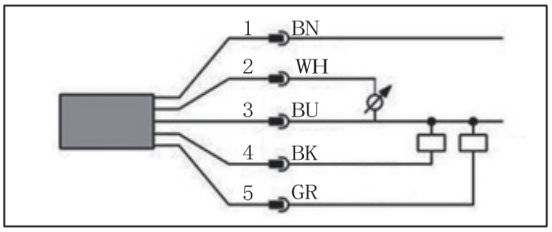
1. ISEN-DR60 The wiring method for the compact digital capacitive level gauge is as follows: 4-20 mA three-wire system + PNP and NPN switch outputs.

Core wire color	
BN	Brown
WH	White
BU	Blue
BK	Black
GR	Grey



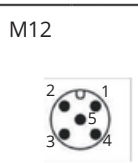


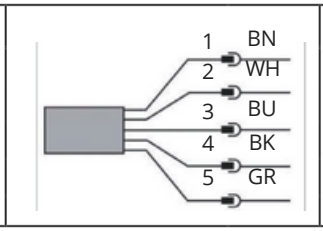


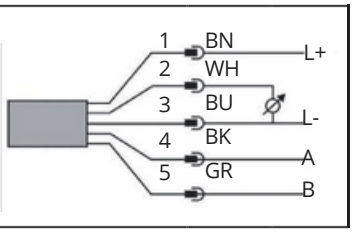


2. The wiring method for the aviation connector straight rod type capacitive level gauge is as follows: 4-20mA two-wire system and RS485 output.

Core wire color	
BN	Brown
WH	White
BU	Blue
BK	Black
GR	Grey



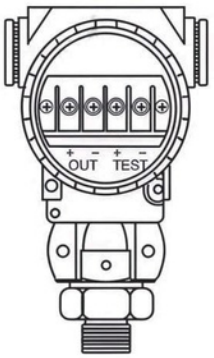


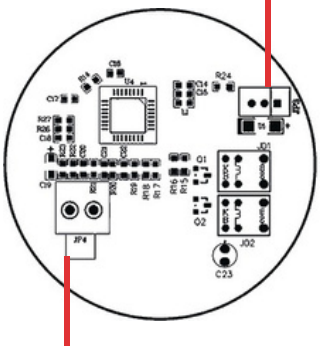


3. DR61(2088Table Header) The wiring method for the capacitivelevelgauge is as follows:

OUT+ Connect to positive terminal of power supply

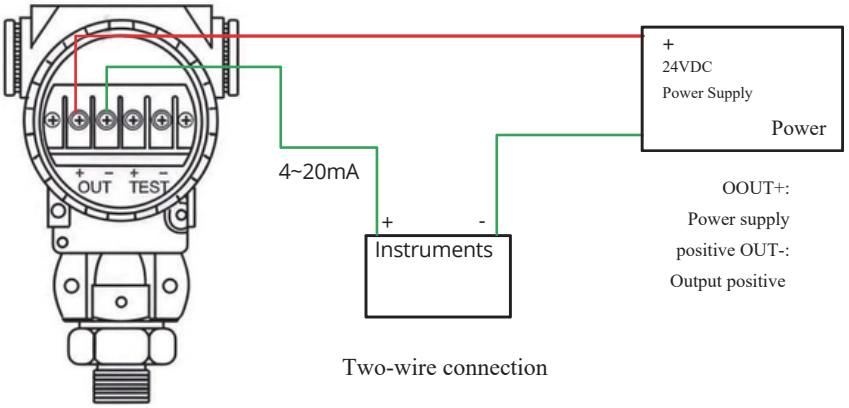
OUT- Connect to negative terminal of power supply





Power supply sequence Black Yellow Red corresponds to Ground Signal Power

Capacitor positive electrode

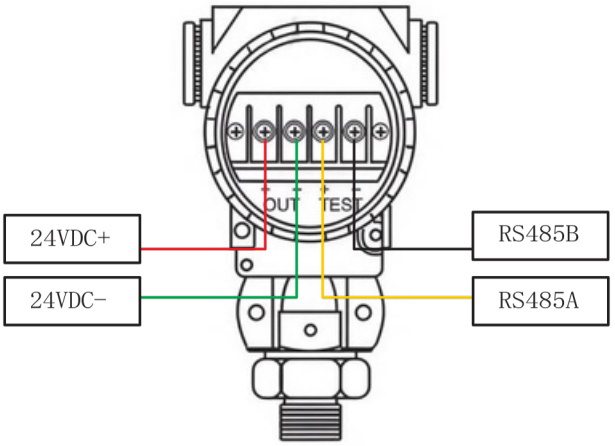


OOUT+: Power supply positive OUT-: Output positive

Two-wire connection

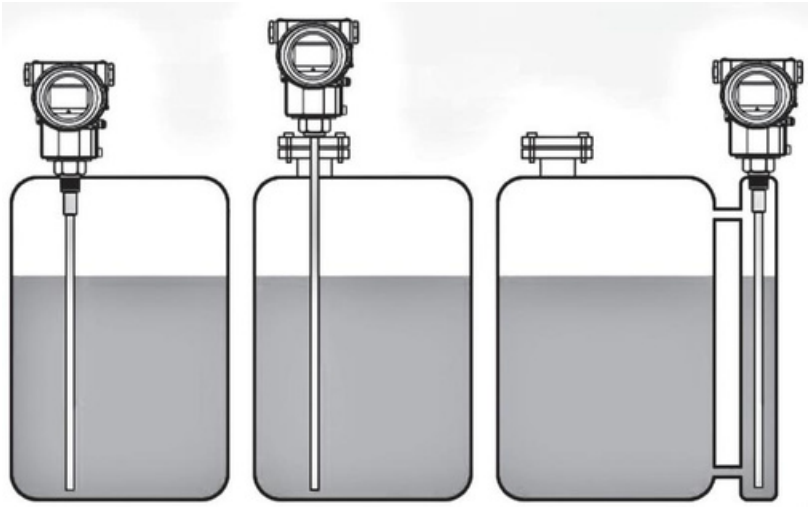
Electrical Wiring Diagram （Diagram)

RS485 protocol terminal block



RS485 protocol terminal block

Installation Notes



Threaded connection　　Flange connection　　Bypass pipe connection

1. Avoidinstallingnear feed inlets or material flow paths to prevent discharge impact on the sensing rod. If unavoidable, use coaxial type.
2. Keep theelectroderod/cable parallel to tank wall. Avoid proximity to walls/grounding rods to prevent material buildup errors.
3. For conductivemedia (water, carbon powder, etc.), use PTFE/PFA-covered rods/cables. Exposed electrodes won't work.
4. Ensure housingcontacts the tank wall. Do not ground the tank wall to signal indicator.
5. Provide separate24V power if the indicator lacks its own supply.
6. Cable distance limited by impedance: max loop impedance ≤ (Vs-22) × 50Ω.
7. Run cables in dedicated conduits. Avoid high-power cables (pumps, conveyors, solenoids). Verify wiring before power-on.
8. Use metal-shielded cables. Ground shield at the power panel only.
9. In environments with heaters/electrical devices, connect the equipment casing to tank to reduce EMI.

Selection Chart

Model	Product Name
ISEN-DR60/61	Capacitive Level Transmitter

Code	Measurement Range
1	0~500mm
2	0~1000mm
3	0~1500mm
Y	Custom specifications available

Code	Connection Method
S	Threaded Connection: 1. G1“ thread; 2. G3/4” thread; 3. G1-1/2“ thread; 4. 1” PT thread
F	Flange Connection: 1. DN25 flange; 2. DN32 flange; 3. DN40 flange; 4. DN50 flange; 5. DN65 flange; 6. DN80 flange
T	Chuck Connection: 1.Chuck 50.5mm; 2. Chuck 64mm
Y	Custom specifications available

Code	Probe Model
1	LCP601: Single Probe
2	LCW609: Flexible single probe
3	LCP607: Steel shaft probe
4	LCP627: Flange-type dual probe
5	LCP628: Flange-type dual probe
6	LCW616: Flexible dual probe (entirely made of Teflon)
7	LCW615: Flexible dual probe
8	LCW613: Flexible dual probe

Code	Probe Material
4	Stainless Steel SUS304 (for coaxial tubes)
6	Stainless Steel SUS316L (for coaxial tubes)
P	Steel with PP Coating
F	Steel with PTFE Coating

Code	Probe Rod Type
1	Single Rod
2	Dual Rod
3	Steel Cable Type

Code	Pressure Range
0	-0.1~0MPa
1	0~1.0MPa
2	1.0~2.5MPa
3	2.5~5.0MPa
4	5.0~10.0MPa
5	Above 10.0MPa

Code	Temperature Range
N	-40~80℃
T	-40~200℃
H	Above 200℃

Selection Chart （Continued）

	Code	Display Type
	0	No Display
	1	With Display

	Code	Output Signal
	1	4-20mA Output
	2	4-20mA Output + HART
	3	4-20mA Output + RS485 Communication
	4	RS485 Communication

	Code	Wiring Method
	2	Two-Wire System
	3	Three-wire system + PNP output/NPN output

	Code	Terminal box
	L	Die-cast aluminum
	4	Stainless steel SUS304
	6	Stainless steel SUS316
	A	Aviation connector

	Code	Power supply method
	D	24VDC

	Code	Explosion-proof
	P	Standard type
	E	Explosion-proof type

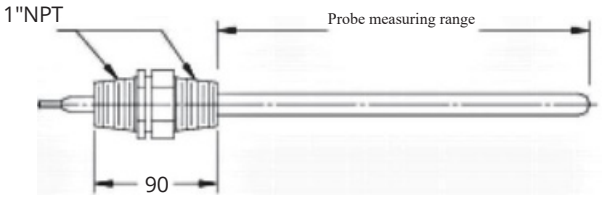
Selection Example

Example: ISEN-DR60-1S11412N1134DE, stainless steel capacitive level gauge, measurement range 0~500mm, threaded connection G1" thread, LCP601: single probe, probe material stainless steel SUS304 (for coaxial tubes), single rod, pressure range 1.0~2.5MPa, temperature range -40~80°C, with display, 4-20mA output, three-wire system + PNP output/NPN output, junction box made of stainless steel SUS304, powered by 24VDC, explosion-proof type.

Probe Model

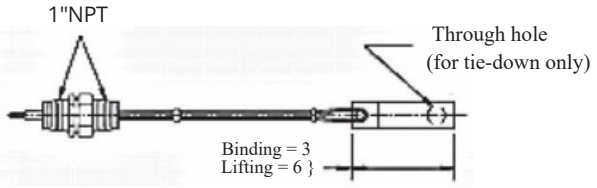
1、LCP601: Single Probe

For metal containers, can detect most liquids, probe is Teflon coated, corrosion resistant. Recommended for detecting conductive liquids.



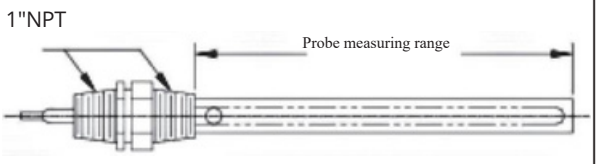
2、LCW609: Flexible single probe

The same application scenarios as above. Recommended for applications with a length of more than 4 meters. If there is agitation, it is recommended to fix the bottom.



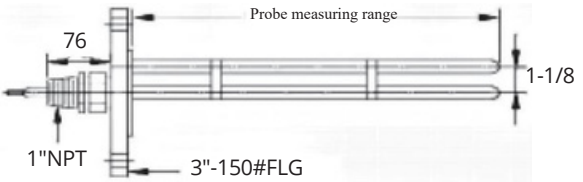
3、LCP607: Steel shaft probe

Detects low viscosity liquids. Such as gasoline, etc. (Recommended for mixing applications)



4、LCP627: Flange type dual probe

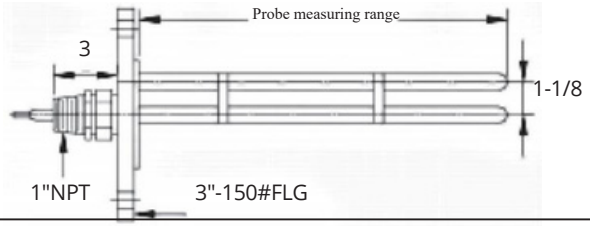
Applicable to various containers, can detect liquids and powders that are non-corrosive to 316 stainless steel.



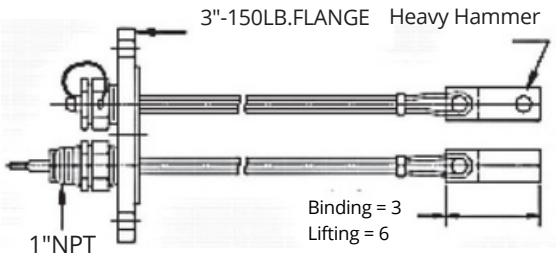
5、LCP628: Flange-type dual probe

Specially recommended for strong acid and alkali testing, all contact surfaces are

Teflon surfaces.

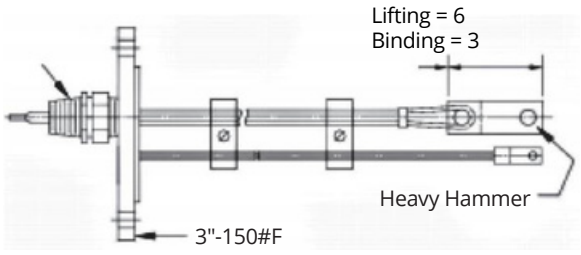


6、LCW616: Flexible dual probe (all Teflon) Recommended for strong acid and strong alkali detection. Length greater than 3.5m



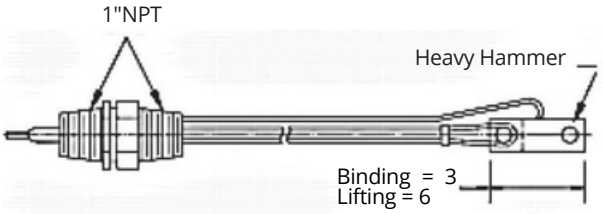
7、LCW615: Flexible dual probe

Recommended length is more than 3.5m, can be used to detect coal powder or cement



8、LCW613: Flexible dual probe

Suitable for various occasions, recommended for testing pure water, industrial wastewater, etc. or water-based solutions of pure water.



Note:LCP:A1mmthickTefloninsulatorisplacedon a stainless steel rod.

LCW: 0.3mm thick Teflon insulation materialisplatedonthesteel cable.

VALVE Link
All your process control needs

Website

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