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EC-70 Capacitive Level Meter

Principle of operation

The sensor probe of the capacitive level meter and the measured medium container form a capacitive sensor, as shown in Figure 1. The inner electrode 1 and the metal container 3 form a coaxial capacitor C_x , and its equivalent circuit principle is shown in Figure 2.

$$C_x = k_1 \cdot h_1 + k_2 \cdot h_2 \quad H = h_1 + h_2$$

$$C_x = k_1 \cdot h_1 + k_2 \cdot (H - h_1) = k_2 \cdot H + k_2 \cdot (k_1 - k_2) \cdot h_1 \dots\dots\dots$$

Where: h_1 is the liquid level height and h_2 is the gas phase height;
 K_1 , K_2 is a constant relate to that container structure and dielectric constant ϵ liquid and ϵ gas;
 $K_1 \cdot h_1$ is the coaxial capacitance formed by the liquid part;
 $K_2 \cdot h_2$ is the coaxial capacitance formed by the gas part;

It can be seen that the coaxial capacitance C_x between the probe 1 and the container 3 is proportional to the liquid level h_1 (because $k_1 > k_2$), and the height change of the liquid level can be measured by detecting the change of the probe capacitance C_x .

The actual capacitance sensor always has a small amount of hanging material when it works. The equivalent circuit of the sensor is shown in Figure 2. Capacitance C_g and resistance R_g produced by hanging materials are superimposed on the total output Z_x of the sensor, which makes the measurement produce false liquid level. The signal processor of liquid level meter adopts radio frequency admittance technology to improve the influence of hanging material on liquid level measurement, and the measurement accuracy is basically unaffected when hanging material slightly.

Functional performance

Directly measure the effective five-digit capacitance value of the sensor, which can be inserted and used by preset parameters in the factory.
 Digital filtering program, adjustable damping time, smooth and stable measurement.
 The zero and range parameters can be adjusted independently, which is convenient to correct the calibrated zero and range parameters and make the measurement more accurate.
 Corrosion-resistant structure, the liquid contact part is made of PFA, PTFE and stainless steel 316L.
 The maximum extension length of rod type is 5m, and that of cable type is 25m.
 Two-wire (4-20mA) loop current supply, low power consumption (20mA max.).
 Without measuring blind distance, it is a liquid level transmitter suitable for all kinds of barrels and troughs.

Product application

Widely used in the following processes, such as food, beverage, medicine, detergent, feed, etc.
 Suitable for liquid, solid, slurry, viscous (conductive or non-conductive) materials and harsh working conditions containing steam dust.
 Real-time monitoring of material height
 Can also be used as overflow protection, high and low liquid level alarm.
 Pump control or limit detection
 Anti-dry running or pump protection

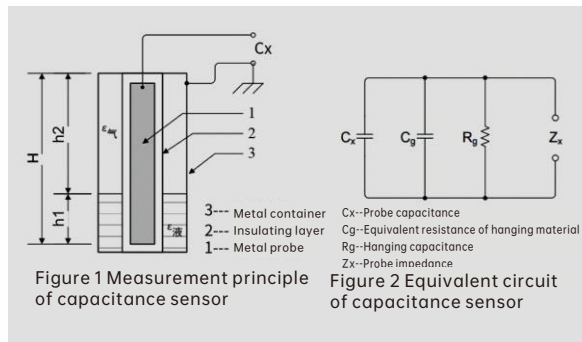





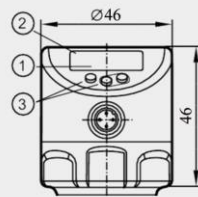
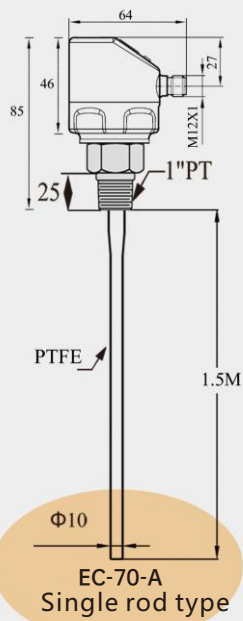
Figure 1 Measurement principle of capacitance sensor

Figure 2 Equivalent circuit of capacitance sensor

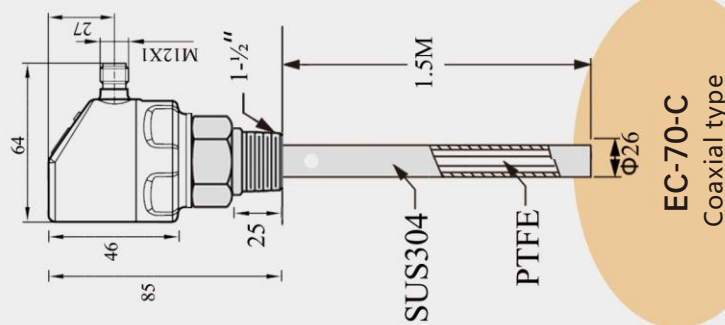
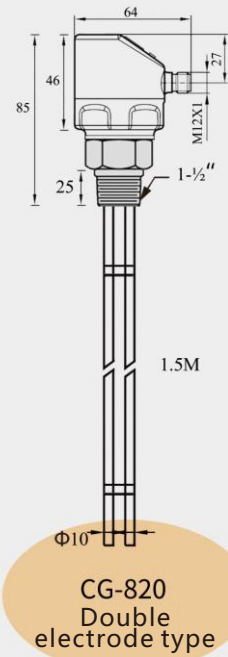
Product model

Model	EC-70-A	EC-70-B	EC-70-C
Product chart			
application	Application: small and medium-sized barrels Applicable materials: dielectric coefficient is greater than 4, Conductive medium	Application: small and medium-sized barrels Applicable materials: low moisture, non-conductive medium.	Application: small and medium-sized barrels Applicable material: non-conductive medium
measuring range	Max.1.5M(20~2000pF)	Max.1.5M(20~2000pF)	Max.1.5M(20~2000pF)
Induction material	SUS304+PTFE coating	SUS304	PFA/PTFE coating
Process connector	Thread, starting from 1/2"PT,1"PT,1-1/2"PT.	Thread, starting from 1/2"PT,1"PT,1-1/2"PT.	Thread, 1 "pt, starting from 1-1/2" pt
Process temperature	-40~120°C	-40~120°C	-40~120°C
Process pressure	-1~40BAR (-100~4000 KPA)	-1~40BAR (-100~4000 KPA)	-1~40BAR (-100~4000 KPA)
Measurement accuracy	±0.5%FS or ±0.5pF	±0.5%FS or ±0.5pF	±0.5%FS or ±0.5pF
Power Supply	18~30VDC	18~30VDC	18~30VDC
Signal output	4~20mA/HART/PNP/NPN/RS485	4~20mA/HART/PNP/NPN/RS485	4~20mA/HART/PNP/NPN/RS485
Temperature drift	<±0.2% FS/°C or 0.1pF/°C	<±0.2% FS/°C or 0.1pF/°C	<±0.2% FS/°C or 0.1pF/°C
Junction box material	SUS304	SUS304	SUS304
Authentication	CE/ATEX/ISO9001	CE/ATEX/ISO9001	CE/ATEX/ISO9001
The protection grades	IP66 /IP67	IP66 /IP67	IP66 /IP67

Size mm



- ① Alphanumeric displays 4 digits.
- ② LEDs display unit/switch status.
- ③ Programming button



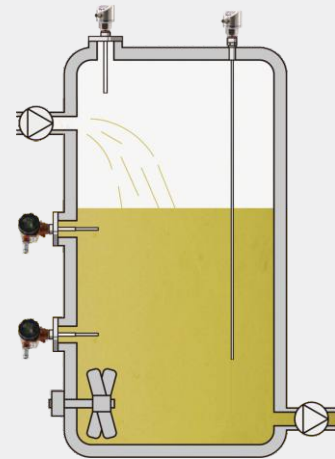
Application of EC-70 series in real scene

Capacitive level meter continuously measures the liquid level in the opening or pressure vessel, and converts the displacement of liquid level change into analog linear 4 ~ 20mA standard signal output. The level gauge can be connected with any indicator, recorder, regulator, DCS system and other instruments with an input of 4 ~ 20mA to realize the measurement, display and control of the level, which can be used to prevent overflow and dry operation, and can also be output with a relay to achieve more accurate and stable control.

When installing, it should be avoided to be installed near the inlet and avoid the material flow trajectory of liquid, so as to reduce the impact of blanking on the induction rod and cause interference. If it must be installed near the inlet, the coaxial CG-810 model can be used.

Advantage

- Insensitive to attachments
- Prevention of overflow and dry operation, maintenance-free.
- Continuous measurement of materials

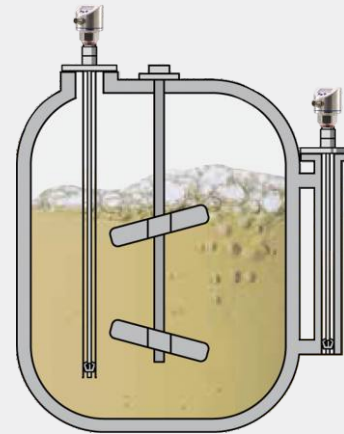


CG-810 coaxial type can be used in the working condition of stirring tank or dense foam, which can effectively avoid the interference caused by sputtering and fluctuation caused by stirring, and can also eliminate the false signal caused by dense foam, thus having obviously more reliable measurement function.

It can also work with bypass pipe. If it is a bypass pipe with a valve, it can be completely separated from the main container, so that the maintenance work can be completed without interrupting the operation process in the main container. Bypass pipes with different materials can be customized..

Advantage

- Materials with high chemical stability, maintenance-free.
- Wide application
- Convenient debugging

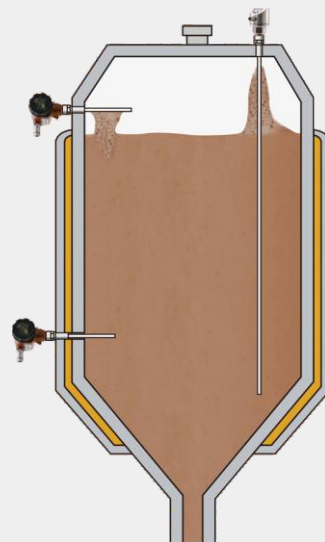


During installation, the electrode rod or steel cable must be parallel to the barrel wall and not too close to the barrel wall or grounding rod as far as possible, so as to avoid the material adhering between the electrode and the barrel groove and causing sensing errors. When the medium in the barrel is a conductor, it is necessary to use an inductive rod coated with PTFE and PFA, because the exposed electrode cannot work normally in the conductor (such as water, carbon powder, etc.).

It can also be used in non-conductive or conductive media that are easy to attach. Because it uses capacitance technology with reverse frequency shift technology, even an attachment with a thickness of only a few centimeters cannot distort the measurement results. Continuous material level measurement is used in liquids, slurries and solids, and can also be applied to viscous media (conductivity or insulation). It can even be used in severe working conditions such as steam or dust.

Advantage

- Simple installation
- Strong adhesion resistance
- Extremely strong structure, maintenance-free.



EC-70-Selection and composition

Type selection example **EC-70**

1	A	2	G	3	N	4	D	5	A	6	R	7	X
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1.Model	A	Single rod type
	B	Coaxial type
	C	Double electrode type
2.Output requirements	G	4~20mA
	H	4~20mA+PNP+NPN
	I	RS485 modbus
3.texture of wood	N	Metal probe /SUS304
	O	Metal probe /SUS316
	P	Shielding layer /PFA
	Q	Shielding layer /PTFE
4.Thread size (Flange type is not selected)	D	G1/2
	U	G1
	V	G1-1/2
	W	1/2NPT
	X	1NPT
	Y	1-1/2NPT
	Z	2NPT
	H	R1/2
	I	R1-1/2
	K	RZ
T()	Other specifications	
4.1.Flange size (Thread type is not selected)	N	DN15
	O	DN20
	P	DN25
	Q	DN32
	R	DN40
	S	DN50
	T	DN65
	U	DN80
	V	DN100
	W	DN125
	T()	Other flange sizes
4.2.Clamp connection	A	50.5mm
	B	64mm
	C	77.5mm

EC-70-Selection and composition

Type selection example **EC-70**



5.Pressure rating	A	150lbs
	B	300lbs
	C	PN10
	D	PN16
	E	PN25
	F	PN40
	T()	Special requirement
6.Correspondence	S	Without
	R	HART
7.length	X	50mm
	Y	100mm
	Z	150mm
	P	200mm
	G	250mm
	H	300mm
	J	350mm
	K	400mm
	N	450mm
	S	500mm

Instructions:

EC-70 type conductive capacitance level meter single rod type, output requirements 4~20mA, material metal probe /SUS304, thread size G1/2(4,4.4,4.2 as one of the three options), pressure grade 150lbs, communication HART, length 50mm

Product Certification

Compliance and approval; Rodwig flow meters meet key standards and certifications for process measurement technology; To ensure the highest reliability in such settings;