KJSWL-1700

KJSWL-1700 series capacitance level meter

Working principle

Capacitance level meter is composed of capacitive material level sensor and circuit checking capacitance,whose basic working principle is the change of converting material level into capacitance with capacitive materia level sensor,and then calculate the value of material level with the method of measuring capacitance. Capacitance level meter works based on the principle of cylinder capacitor, whose structure s similar to two cylindrical metal conductors with length of L, radiuses of R and r respectively;the middle is separated with insulating material and when the filled medium in the middle is the gas with dielectric constant of c1,the capacitance of two cylinders is:

$$C_1 = 2\pi e_1 L/R/(\ln R/r) \quad (1)$$

If the measured medium is conductive liquid,the electrode needs to be covered with insulator(such as polyethylene)as intermediate medium,while the liquid and external cylinder are as outer electrodes.Presume the dielectric constant of intermediate medium is z3 and the immersed length of electrode is 1,and then the capacitance of capacitor is:

$$C = 2\pi e L/R/(\ln R/r) \quad (3)$$

In which R and r are outer radius of insulating coating and outer radius of nner electrode As the c3 is constant, so C and l are in direct ratio.

If part of electrode is immersed by liquid(non-conductive)with dielectric constant ate2,and then there must be ncrease of capacitance C produced(becausec2>E1),now the capacitance between these two electrodes is $C=C1+\Delta C$. Presume the immersion ength of electrode is l,and hen the ncrease of capacitance is;

$$\Delta C = 2\pi e a L/R/(\ln R/r) \quad (2)$$

When z2, l,R,rkeep unchanged, the increase of capacitance C and immersed ength of electrodel are in direct ratio, therefore, the liquid level can be gotten after the value of capacitance increase is measured.

A few problems need to be paid attention to during the application of capacitance level meter

1.Selection

Due to the differences of measured medium,capacitance level meter has different models.

(1)When apply the capacitive level sensor of measuring non-conductive liquid to more dilute non-conductive liquid (such aslight oil),it can adopt one meta electrode and put a meta tube on external coaxial, mutually insulated and fixed, form coaxial sleeve type capacitor by taking measured medium as intermediate insulating material.

(2)For capacitive evel sensor of measuring non-conductive liquid. take container(rule) and liquid as one electrode of capacitor,the nserting meta electrode as another electrode, the insulating tube as intermediate medium,and these three compose cylindrical capacitor. When the container is non-conductve, it needs to add another earth electrode, whose battom part will be immersed to the bottom of the container and the top part willmake reliable electrical connection with installation flange to make one of the electrodes connected with earth and meter ground line and ensure the normal measurement of meter.

(3)

( ) (/ /),

2

8

(1)
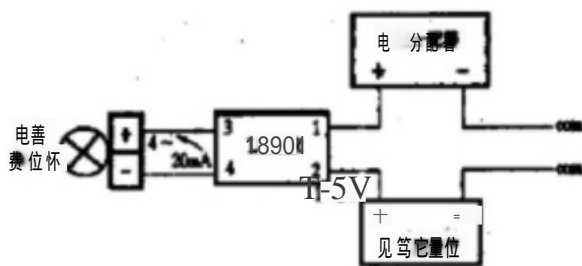
1
Pic.1 System wiring diagram with adoption of zenner diode safety barrier

(3)When measuring the materlal level of powder non-conductive solid and the liquid level of viscous non-conductive iquid, can adopt metal electrode to insert into the center of cylindrical container directly connect the ground line ol instrument with container and construct cylindrica capacitor by taking the container as outside electrode, material or liquid as nsulating medium.

So it should choose suitable capacitance level meter based on real site situation,that ls the property of measured medium (conductivity,viscosity)and ype of container(regular/irregular metal tank,regularlirregular non-metal tank).

2.Treatment of ground point in measurement circuit

Whether the ground point in meter measurement circuit is correct and reliable or no affects the measurement of measured parameters. Liquid monitoring for eight soda solution tank ol oil refining during overhaul.As the soda solution tank locates at explosion proof area, so it introduces zenner diode safety barrier in the initital design of measurement circuit (as shown in pic.1)
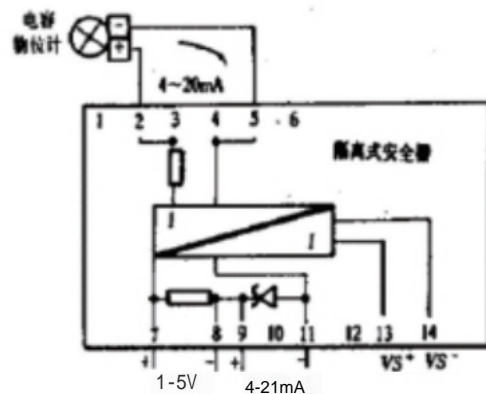

2
Pic.2 System wiring diagram adopting isolating safety barrier

2
23V, ( ) 0V,

COM
4mA, 2
0. 86V, 1. 6V, 7V,
COM

COM 24v

( )

2

It is found out during installation and debugging that the system can't work normally:voltage at two ends of safety barrier is as high as 23V,whle the power supply voltage of transmitter (capacitance level meter)is 0V,which means short circuit.After careful checking. it finds out that it is caused by the circuit structure of capacitance level meter The probe of capacitance level meter is one electrode of equlvalence capacitance,for the metal container with regular wal; the tank wall is another electrode of capacitance.Therefore. the signal of transmitter is negative ground, while zenner barrier s

grounded,which makes the transmitter become short circuit. Hang the grounding COM point and it is observed that at the beginning stage, the output of transmitter s 4 mA the voltage at two ends of safety barrier is 0.86V,and then changes into 1.6V,7V shortly.The transmitter works unsteadily, which is caused by hang of COM point and he system circuit is affected by external disturbance. Therefore, throw ofl safely barrier and COM plate, send 24V power to transmitter directly,string into standard current meter to examine the working condition of transmitter and the transmitter works normally, It can draw a conclusion that as the negative signal of capacitance level meter is connected with ground (wall of the tank). therefore, it can't adopt zenner diode safety barrier.After negotiation with manufacturer,select isolating.safety barrier, because capacitance leve meter and solating safety barrier have made joint forensics for system safety and explosion proof. Selecting isolating safety barrier system wiring is as shown in picture 2.Dueto the isolation among power, input and output signal of isolating safety barrier it avoids the mutual nterference between systems as well as multiple points grounding problem of system.

Technical parameters

Used for liquid leve measure for mediums of high tempersure, high pressure and strong corrosive characteristics and is widely applied in electric power, metallurgy,food,brewing,pharmaceutical,sewage treatment, boiler drum and other military and industrial occasions.

Product Model	KJS-1700
Neasuring Range	0~6m
Accuracy	0.5grade
Bearing Scope	Negative pressure, normal pressure, high pressure
Warking temperature	-50~240
Environmental temperature	-20-75
Applicable medium	Acid,alkali,salt,PTFE,any non-corrosive medium
Output signal	4-20 mAtwo-wire system
Power supply	Load resistance0-750 DC24V
Fixation method	Screw installation M20X1.5,M27X2Flange installation DN15,DN25,DN50,DN80 Speical specifications can be customized
Site display	Aluminum alloy

Used for liquid level measure for mediums of high tempersure, high pressure and strong corrosive characteristics and is widelyapplied n electric power,metallurgy.food,brewing.pharmaceutical, sewage treatment, boiler drum and other military and industrial occasions.

Product Model	KJS-1701
Measuring Range	6- 30m
Accuracy	0.5 grade
Bearing Scope	Negative pressure, normal pressure, high pressure
Working temperature	-50~240
Enwironmental temperature	-20~75
Applicable medium	Acid,alkali,salt PTFE,any non-corrosive medium
Output signal	4~20 mA two-wire system
Power supply	Load resistance 0~750 DC24V
Fixation method	Screw installation M20X1.5,M27X2Flange installation DN15,DN25,DN50,DN80 Speica specifications can be customized
Site display	Aluminum alloy

KJSWL-1700						
Output signal 4~20mA D Intelligent S 4~20 MA+HART E						
Installation interface M20*1.5 Ribbing M20*1.5 outside O 1/2NPT Ribbing 1/2NPT outside 1 DN25 FlangeDN25 2 DN40 FlangeDN40 3 DN50 FlangeDN50 4 DN80 FlangeDN80 5 Special 6						
	Sensor material 5 5 Soft cable C1 8 8 Soft cable C2 14 14 Soft cable C3 16 16 Soft cable C4 8 8 Soft rod high pressure C5 Special specification C6					
	Electrical interface 0 M20*1.5 within 1 1/2NPT within					
	explosion proof class Instrinsically safe model I + Instrinsically safe model +isolating explosion P					
length						