

## 产品款型信息 Product model information

### TKWL-1201



TKWL-1201

应 用 Application	过程条件简单，腐蚀性的液体、浆料、固体比如：污水储罐，酸碱储罐，浆料储罐，固体颗粒，小型储油罐 process conditions are simple, corrosive liquids, pastes and solids, such as sewage tank, acid storage tank, paste storage tank, solid particles, small oil storage tank
测量范围 Measurement range	20米 20 meters
过程连接 Process Connection	G11/2螺纹或11/2NPT G11/2 screw thread or 11/2NPT
介质温度 Medium Temperature	-40~120°C
过程压力 Process Pressure	~1.0~3bar
重复性 Repeatability	± 2mm
精度 Accuracy	< 0.1%
频率范围 Frequency Range	6.8GHz
防爆/防护等级 Explosion-proof/ protection Class	Exia IIC T6/IP67
信号输出 Signal Output	4~20mA/HART(两线) 4~20mA/HART (two-wire)



TKWL-1202

应 用 Application	存储或过程容器腐蚀性的液体、浆料、固体比如：水液储罐、酸碱储罐、浆料储罐、固体颗粒、小型储油罐 store or process container corrosive liquids, pastes and solids, such as water tank, acid storage tank, paste storage tank, solid particles and small oil storage tank
测量范围 Measurement range	20米 20 meters
过程连接 Process Connection	法兰 flange
介质温度 Medium Temperature	-40~150°C
过程压力 Process Pressure	~1.0~20bar
重复性 Repeatability	± 2mm
精度 Accuracy	< 0.1%
频率范围 Frequency Range	6.8GHz
防爆/防护等级 Explosion-proof/ protection Class	Exia IIC T6/IP67
信号输出 Signal Output	4~20mA/HART(两线) 4~20mA/HART (two-wire)

 <p>TKWL-1203</p>	应 用 Application	适应各种存储容器或过程计量环境，液体、浆料、固体，比如：原油、轻油储罐，原煤、粉煤仓位，挥发性液体储罐，焦炭料位，浆料储罐，固体颗粒 suitable for all kinds of storage containers or process measurement environment, liquids, pastes and solids, for example, crude oil, light oil tank, raw coal, pulverized coal position, volatile liquid storage tank, coke level, paste storage tank, solid particles.
	测量范围 Measurement range	35米 35 meters
	过程连接 Process Connection	法 兰 flange
	介质温度 Medium Temperature	-40~250℃
	过程压力 Process Pressure	-1.0~40bar
	重复性 Repeatability	± 2mm
	精度 Accuracy	< 0.1%
	频率范围 Frequency Range	6.8GHz
	防爆/防护等级 Explosion-proof/ protection Class	Exia IIC T6/IP67
	信号输出 Signal Output	4~20mA/HART(两线) 4~20mA/HART (two-wire)

 <p>TKWL-1202</p>	应 用 Application	适用于粉状料，固体颗粒，块状料的测量 suitable for the measurement of powder material, solid particles and bulk material
	测量范围 Measurement range	35米 35 meters
	过程连接 Process Connection	万向法兰 universal flange
	介质温度 Medium Temperature	-40~250℃
	过程压力 Process Pressure	-1.0~3bar
	重复性 Repeatability	± 2mm
	精度 Accuracy	< 0.1%
	频率范围 Frequency Range	6.8GHz
	防爆/防护等级 Explosion-proof/ protection Class	Exia IIC T6/IP67
	信号输出 Signal Output	4~20mA/HART(两线) 4~20mA/HART (two-wire)

 <p>TKWL-1205</p>	应用 Application	适用于低介电常数液体和带搅拌器的液体储罐测量 suitable for liquid storage tank measurement with low dielectric constant liquid and liquid with stirrer
	测量范围 Measurement range	0-30米可选 0-30 meters optional
	过程连接 Process Connection	法兰 flange
	介质温度 Medium Temperature	-40~250℃
	过程压力 Process Pressure	-1.0~20bar
	重复性 Repeatability	± 2mm
	精度 Accuracy	< 0.1%
	频率范围 Frequency Range	6.8GHz
	防爆/防护等级 Explosion-proof/ protection Class	Exia IIC T6/IP67
	信号输出 Signal Output	: 4~20mA/HART(两线) : 4~20mA/HART (two-wire)

 <p>TKWL-1206</p>	应用 Application	: 适用于高炉料位，较厚罐顶的储罐和安装短管较高的工况测量 : suitable for measurements for material level of blast furnace, storage tank with thicker tank roof and working conditions with higher short installation tube
	测量范围 Measurement range	: 35米 : 35 meters
	过程连接 Process Connection	: 法兰 : flange
	介质温度 Medium Temperature	: -40~250℃
	过程压力 Process Pressure	: -1.0~40bar
	重复性 Repeatability	: ± 2mm
	精度 Accuracy	: < 0.1%
	频率范围 Frequency Range	: 6.8GHz
	防爆/防护等级 Explosion-proof/ protection Class	: Exia IIC T6/IP67
	信号输出 Signal Output	: 4~20mA/HART(两线) : 4~20mA/HART (two-wire)





## 技术参数

### 基本参数

工作频率：6.8GHz  
波束角：24°RD51, Rd52  
20°RD53 带DN150法兰  
16°RD53 带DN200法兰  
14°RD53 带DN250法兰  
测量范围：0~35m  
重复性：±2mm  
分辨率：1mm  
采样：回波采样55次/s  
响应速度：>0.2s  
(根据具体情况而定)  
电流信号：4~20mA精度  
：<0.1%

### 天线材质

RD51：PP或PTFE  
RD52：PTFE  
RD53：Stainless steel

### 通讯接口 HART通讯协议

### 过程连接

RD51 (PP, PTFE棒式天线)：G11/2A或11/2NPT  
RD52 (PTFE棒式天线)：翻边法兰DN50、DN80、  
DN100、DN150、DN200、DN250  
RD53 (喇叭口形式天线)：法兰DN50、DN80、  
DN100、DN150、DN200、DN250

### 电源

电源：24V DC(±10%)，波纹电压：1Vpp  
耗电量：max22.5mA

### 环境条件

温度：-40℃~+70℃  
容器压力(表压)：-1~4MPa

### 防爆认证 Exia IIC T6

### 外壳保护等级 Ip67

### 两线制接线 供电和信号输出共用一根两芯导线

### 电缆入口 2个M20\*1.5或2个1/2NPT (电缆直径5...9mm)

## Technical parameter

### Basic parameters

Work frequency: 6.8GHz  
Beam angle: 24°RD51, Rd52  
20°RD53 with DN150 flange  
16°RD53 with DN200 flange  
14°RD53 with DN250 flange  
Measurement range: 0...35m  
Repeatability: ±2mm  
Resolution: 1mm  
Sampling: echo sampling 55 times/s  
Response speed: >0.2s  
(based on specific situations)  
Current signal: 4...20mA  
Accuracy: <0.1%

### Antenna material

RD51：PP or PTFE  
RD52：PTFE  
RD53：Stainless steel

### Communication interface HART communication protocol

### Process connection

RD51 (PP, PTFE rod antenna)：G11/2A or 11/2NPT  
RD52 (PTFE rod antenna)：flange DN50、DN80、DN100、  
DN150、DN200、DN250  
RD53 (horn form antenna)：flange DN50、DN80、DN100、  
DN150、DN200、DN250

### Power

Power: 24V DC(±10%), ripple voltage: 1Vpp  
Electricity consumption: max22.5mA

### Environmental condition

Environmental condition Temperature: -40℃...+70℃  
Container pressure (meter pressure)：-1...4MPa

### Certification of explosion proof Exia IIC T6

### Shell protection class Ip67

### Two-wire connection power supply and signal output use the same two-core wire

### Cable entrance 2 M20\*1.5 or 2 1/2NPT (cable diameter 5...9mm)

# 产品选型 Products Selection

## TKWL-1201

TKWL-1201								
量程 (mm) Measuring range								
编程器 Programmer								
带 with	B							
不带 without	X							
现场显示 Site display								
带 with	V							
不带 without	X							
电缆进线 cable entrance								
M20*1.5		M						
1/2NPT		N						
外壳/防护等级 Shell/protection class								
塑料/IP65 Plastic/IP65				P				
铝/IP67 Aluminum/IP67				L				
容器接管长度Length of container connection tube								
50mm				A				
100mm				B				
150mm				C				
200mm				D				
250mm				E				
特殊约定 Special agreement				Y				
过程连接Process connection								
螺纹 G1½A Screw thread G1½A						G		
螺纹 1½NPT Screw thread 1½NPT						N		
不锈钢法兰 DN50 PN16C型 Stainless steel flange DN50 PN16C model						A		
不锈钢法兰 DN80 PN16C型 Stainless steel flange DN80 PN16C model						B		
不锈钢法兰 DN100 PN16C型 Stainless steel flange DN100 PN16C model						C		
不锈钢法兰 DN150 PN16C型 Stainless steel flange DN150 PN16C model						D		
不锈钢法兰 DN200 PN16C型 Stainless steel flange DN200 PN16C model						E		
不锈钢法兰 DN250 PN16C型 Stainless steel flange DN250 PN16C model						F		
天线型式/材料/过程温度 Antenna type/material/process temperature								
SP 塑料棒/PP/-40~100℃ SP Plastic rod/PP/-40~100℃								
SF 塑料棒/PTFE/-40~120℃ SF Plastic rod/PTFE/-40~120℃								
防爆 Explosion proof								
标准型(非防爆) 电流信号输出(4~20mA)HART协议 Standard (non explosion proof) Current signal output agreement (4~20mA)HART								P
本安型 (Exia IIC T6) 电流信号输出(4~20mA)HART协议 Intrinsically safe type (Exia IIC T6) Current signal output agreement (4~20mA) HART								I
本安型+隔爆型 (Exd ia IIC T6) 电流信号输出(4~20mA)HART协议 Intrinsically safe type+ isolating explosion type (Exd ia IIC T6) Current signal output agreement (4~20mA) HART								D

TKWL-1202									
量程 (mm) Measuring range									
编程器 Programmer									
带 with	B								
不带 without	X								
现场显示 Site display									
带 with	V								
不带 without	X								
电缆进线 cable entrance									
M20*1.5				M					
½NPT				N					
外壳/防护等级 Shell/protection class									
塑料/IP65 Plastic/IP65					P				
铝/IP67 Aluminum/IP67					L				
密封温度 Seal temperature									
普通密封 -40~100℃						P			
High temperature seal -40-250℃ with radiator									
高温密封 /-40~150℃带散热片						G			
High temperature seal /-40~150℃ with cooling fin									
过程连接 Process connection									
万向节法兰 DN150 Universal flange DN150							D		
万向节法兰 DN200 Universal flange DN200							E		
万向节法兰 DN250 Universal flange DN250							F		
特殊约定 Special agreement							Y		
容器接管长度 Length of container connection tube									
50mm							A		
100mm							B		
150mm							C		
200mm							D		
250mm							E		
特殊约定 Special agreement							Y		
天线型式/材料/过程温度 Antenna type/material/process temperature									
SF 塑料棒/PTFE									
SF Plastic rod/PTFE									
防爆 Explosion proof									
标准型 (非防爆) 电流信号输出 (4~20mA) HART 协议									
Standard (non explosion proof) Current signal output agreement (4~20mA) HART									
本安型 (Exia IIC T6) 电流信号输出 (4~20mA) HART 协议									
Intrinsically safe type (Exia IIC T6) Current signal output agreement (4~20mA) HART									
本安型 + 隔爆型 (Exd ia IIC T6) 电流信号输出 (4~20mA) HART 协议									
Intrinsically safe type + isolating explosion type (Exd ia IIC T6) Current signal output agreement (4~20mA) HART									
								P	
								I	
								D	

TKWL-1203									
量程 (mm) Measuring range (mm)									
编程器 Programmer									
带 with		B							
不带 without		X							
现场显示 Site display									
带 with		V							
不带 without		X							
电缆进线 cable entrance									
M20*1.5				M					
½NPT				N					
外壳/防护等级/天线防护等级 Shell/protection class/antennaprotection class									
塑料/IP65					P				
塑料/IP65									
铝/IP67					L				
铝/IP67									
密封/过程温度 Seal/process temperature									
普通密封-40~100℃						P			
高温密封-40~250℃ with radiator									
高温密封-40~150℃带散热片						G			
高温密封-40~150℃带散热片									
天线延长管 Antenna extension tube									
无 No							1		
200mm							2		
300mm							3		
400mm							4		
天线型式/材料Antenna type/material									
导波管/不锈钢316L								A	
Stilling well/stainless steel 316L									
喇叭天线76mm/不锈钢316								B	
Horn antenna 76mm/stainless steel 316									
喇叭天线96mm/不锈钢316								C	
Horn antenna 96mm/stainless steel 316									
喇叭天线146mm/不锈钢316								D	
Horn antenna 146mm/stainless steel 316									
喇叭天线196mm/不锈钢316								E	
Horn antenna 196mm/stainless steel 316									
喇叭天线242mm/不锈钢316								F	
Horn antenna 242mm/stainless steel 316									
过程连接Process connection									
法兰DN50 PN16 C型								A	
Flange DN50 PN16 C model									
法兰DN80PN16 C型								B	
Flange DN80PN16 C model									
法兰DN100PN16 C型								C	
Flange DN100 PN16 C model									
法兰DN150PN16 C型								D	
Flange DN150 PN16 C model									
法兰DN200 PN16 C型								E	
Flange DN200 PN16 C model									
法兰DN250 PN16 C型								F	
Flange DN250 PN16 C model									
G21/2A								G	
特殊约定								Y	
Special agreement									
防爆 Explosion proof									
标准型(非防爆) 电流信号输出(4-20mA)HART协议								P	
Standard (non explosion proof) Current signal output agreement (4-20mA)HART									
本安型(Exia II C T6) 电流信号输出(4-20mA)HART协议								I	
Intrinsically safe type (Exia IIC T6) Current signal output agreement (4-20mA) HART									
本安型+隔爆型(Exd ia II C T6) 电流信号输出(4-20mA)HART协议								D	
Intrinsically safe type+ isolating explosion type (Exd ia IIC T6) Current signal output agreement (4-20mA) HART									

TKWL-1204									
量程 (mm) Measuring range									
编程器 Programmer									
带 with	B								
不带 without	X								
现场显示 Site display									
带 with	V								
不带 without	X								
电缆进线 cable entrance									
M20*1.5	M								
½NPT	N								
外壳/防护等级/天线防护等级 Shell/protection class/antennaprotection class									
塑料/IP65 Plastic/IP65	P								
铝/IP67 Aluminum/IP67	L								
密封温度 Seal temperature									
普通密封 -40~100°C High temperature seal -40~250°C with radiator	P								
高温密封 /-40~150°C带散热片 High temperature seal /-40~150°C with cooling fin	G								
天线延长管 Antenna extension tube									
无 No	A								
200mm	B								
300mm	C								
400mm	D								
过程连接 Process connection									
方向节法兰 DN150 Universal flange DN150	D								
方向节法兰 DN200 Universal flange DN200	E								
方向节法兰 DN250 Universal flange DN250	F								
特殊约定 Special agreement	Y								
防爆 Explosion proof									
标准型 (非防爆) 电流信号输出 (4~20mA) HART协议 Standard (non explosion proof) Current signal output agreement (4~20mA) HART	P								
本安型 (Exia II C T6) 电流信号输出 (4~20mA) HART协议 Intrinsically safe type (Exia IIC T6) Current signal output agreement (4~20mA) HART	I								
本安型+隔爆型 (Exd ia II C T6) 电流信号输出 (4~20mA) HART协议 Intrinsically safe type+isolating explosion type (Exd ia IIC T6) Current signal output agreement (4~20mA) HART	D								

TKWL-1205								
量程 (mm) Measuring range								
编程器 Programmer								
带 with	B							
不带 without	X							
现场显示 Site display								
带 with	V							
不带 without	X							
电缆进线 cable entrance								
M20*1.5	M							
1/2NPT	N							
外壳/防护等级/天线防护等级 Shell/protection class/antennaprotection class								
塑料/IP65 Plastic/IP65				P				
铝/IP67 Aluminum/IP67				L				
密封温度 Seal temperature								
普通密封 -40~100℃ High temperature seal -40~100℃ with radiator				P				
高温密封 /-40~150℃带散热片 High temperature seal /-40~150℃ with cooling fin				G				
天线型式/材料 Antenna type/material								
DN50导波管/不锈钢316 DN50 Stilling well / stainless steel 316				A				
DN80导波管/不锈钢316 DN80 Stilling well / stainless steel 316				B				
DN100导波管/不锈钢316 DN100 Stilling well / stainless steel 316				C				
过程连接 Process connection								
法兰DN50 PN16 C型 Flange DN50 PN16 C model				A				
法兰DN80 PN16 C型 Flange DN80 PN16 C model				B				
法兰DN100 PN16 C型 Flange DN100 PN16 C model				C				
特殊约定 Special agreement				D				
防爆 Explosion proof								
标准型(非防爆) 电流信号输出(4~20mA)HART协议 Standard (non explosion proof) Current signal output agreement (4~20mA)HART							P	
本安型 (Exia IIC T6) 电流信号输出(4~20mA)HART协议 Intrinsically safe type (Exia IIC T6) Current signal output agreement (4~20mA) HART							I	
本安型+隔爆型 (Exd ia IIC T6) 电流信号输出(4~20mA)HART协议 Intrinsically safe type+ isolating explosion type (Exd ia IIC T6) Current signal output agreement (4~20mA) HART							D	

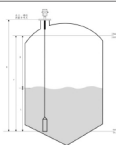
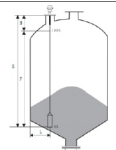
## TKWL-1206

TKWL-1206										
量程 (mm) Measuring range										
编程器 Programmer										
带 with	B									
不带 without	X									
现场显示 Site display										
带 with	V									
不带 without	X									
电缆接口 Cable interface										
M20*1.5	M									
½NPT	N									
外壳/防护等级/天线防护等级 Shell/protection class/antennaprotection class										
塑料/IP65 Plastic/IP65						P				
铝/IP67 Aluminum/IP67						L				
密封温度 Seal temperature										
普通密封-40~100℃ High temperature seal -40~250℃ with radiator						P				
高温密封-40~250℃带散热器 Common seal -40~250℃						G				
天线延长管 Antenna extension tube										
1000mm							1			
1500mm							2			
2000mm							3			
2500mm							4			
3000mm							5			
天线型式/材料 Antenna type/material										
喇叭天线146mm/不锈钢316 Horn antenna 146mm/stainless steel 316								D		
喇叭天线196mm/不锈钢316 Horn antenna 196mm/stainless steel 316								E		
喇叭天线242mm/不锈钢316 Horn antenna 242mm/stainless steel 316								F		
过程连接 Process connection										
法兰DN150 PN16 C型 Flange DN150 PN16 C model									A	
法兰DN200 PN16 C型 Flange DN200 PN16 C model									B	
法兰DN250 PN16 C型 Flange DN250 PN16 C model									C	
特殊约定 Special agreement									D	
防爆 Explosion proof										
标准型 (非防爆) 电流信号输出 (4~20mA) HART协议 Standard (non explosion proof) Current signal output agreement (4~20mA) HART										P
本安型 (Exia IIC T6) 电流信号输出 (4~20mA) HART协议 Intrinsically safe type (Exia IIC T6) Current signal output agreement (4~20mA) HART										I
本安型+隔爆型 (Exd ia IIC T6) 电流信号输出 (4~20mA) HART协议 Intrinsically safe type+ isolating explosion type (Exd ia IIC T6) Current signal output agreement (4~20mA) HART										D

# TKWL-1300系列导波雷达料位计

TKWL-1300 series guided wave radar material level meter


## 概述 Overview

<p><b>测量原理 Measuring principle</b></p> <p>导波雷达是基于时间行程原理的测量仪表，雷达波以光速运行，运行时间可以通过电子部件被转换成物位信号。探头发出高频脉冲并沿缆式探头传播，当脉冲遇到物料表面时反射回来被仪表内的接收器接收，并将距离信号转化为物位信号。</p> <p>Guided wave radar is a measuring instrument based on the principle of time travel, radar wave operates at the speed of light and the operation time can be converted into material level signal through electronic components. The probe sends out high-frequency pulse and transmit along with the cable type probe. When pulse reflected back after encountering material surface and received by receiver in the meter, it will convert the distance signal into material level signal.</p>	
<p><b>输入 Input</b></p> <p>反射的脉冲信号沿缆绳传导至仪表电子线路部分，微处理器对此信号进行处理，识别出微波脉冲在物料表面所产生回波。正确的回波信号识别由智能软件完成，距离物料表面的距离D与脉冲的时间行程T成正比：<math>D=C \times T/2</math> 其中C为光速。</p> <p>The reflected pulse signal transmits along the cable into the electronic circuit of meter; microprocessor will process this signal and identify the echo produced by microwave pulse on the surface of material. Correct echo signal identification is accomplished by intelligent software and the distance D to the surface of material and the time travel T of pulse are in the direct ratio: <math>D=C \times T/2</math>, in which C is speed of light.</p> <p>因空罐的距离E已知，则物位L为：<math>L = E - D</math></p> <p>As the distance of empty tank is known, and then the material level L is <math>L=E-D</math>.</p>	
<p><b>输出 Output</b></p> <p>通过输入空罐高度E(零点)，满罐高度F(=满量程)及一些应用参数来设定，应用参数将自动使仪表适应测量环境。对应于4~20mA输出。</p> <p>Through inputting the height of empty tank E (=zero point), the height of full tank F (=full measuring range) as well as some application parameters to set, adapt the meter to measuring environment based on parameters automatically, corresponding to 4~20mA output.</p>	
<p><b>测量范围 Measuring range</b></p> <p>测量范围 Measuring range F----测量范围 measuring range E----空罐距离 distance of empty tank B----顶部盲区 top blind area L----探头到罐壁的最小距离 minimum distance between probe to tank wall 顶部盲区是指物料最高料面与测量参考点之间的最小距离。 Top blind area refers to the minimum distance between the highest material surface and reference point of measurement. 底部盲区是指缆绳量底部附近无法精确测量的一段距离。 Bottom blind area refers to the distance at the bottom of cable which can't be measured accurately. 顶部盲区和底部盲区之间是有效测量距离。 Distance between top blind area and bottom blind area is effective measuring distance.</p> <p>注意：Attention: 只有物料处于顶部盲区和底部盲区之间时，才能保证罐内物位的可靠测量。 A reliable measurement for the material level in the tank can only be guaranteed when the material is located between top blind area and bottom blind area.</p>	




## 产品款型信息 Products Model Information


### TKWL-1301

 <p>TKWL-1301</p>	应用 Application	液体、固体颗粒 Liquids, solid particles
	测量范围 Measurement Range	30米 30 meters
	过程连接 Process Connection	螺纹、法兰 Screw thread, flange
	过程温度 Process Temperature	-40~250℃
	过程压力 Process Pressure	-0.1~2MPa
	精度 Accuracy±1mm	±1mm
	频率范围 Frequency Range	100MHz~1.8GHz
	防爆/防护等级 Protection Class	Exia IIC T6/IP67
	信号输出 Signal Output	4~20mA/HART(两线) (Two-wire)

### TKWL-1302

 <p>TKWL-1302</p>	应用 Application	液体、固体颗粒 Liquids, solid particles
	测量范围 Measurement Range	6米 6 meters
	过程连接 Process Connection	螺纹、法兰 Screw thread, flange
	过程温度 Process Temperature	-40~250℃
	过程压力 Process Pressure	-0.1~2MPa
	精度 Accuracy±1mm	±1mm
	频率范围 Frequency Range	100MHz~1.8GHz
	防爆/防护等级 Protection Class	Exia IIC T6/IP67
	信号输出 Signal Output	4~20mA/HART(两线) (Two-wire)

### TKWL-1303

 <p>TKWL-1303</p>	应用 Application	液体、固体颗粒 Liquids, solid particles
	测量范围 Measurement Range	6米 6 meters
	过程连接 Process Connection	螺纹、法兰 Screw thread, flange
	过程温度 Process Temperature	-40~250℃
	过程压力 Process Pressure	-0.1~2MPa
	精度 Accuracy±1mm	±1mm
	频率范围 Frequency Range	100MHz~1.8GHz
	防爆/防护等级 Protection Class	Exia IIC T6/IP67
	信号输出 Signal Output	4~20mA/HART(两线) (Two-wire)

### TKWL-1304



TKWL-1304

应用 Application	液体 Liquids
测量范围 Measurement Range	6米 6 meters
过程连接 Process Connection	螺纹、法兰 Screw thread, flange
过程温度 Process Temperature	-40~250°C
过程压力 Process Pressure	-0.1~2MPa
精度 Accuracy±1mm	±1mm
频率范围 Frequency Range	100MHZ-1.8GHZ
防爆/防护等级 Protection Class	Exia IIC T6/IP67
信号输出 Signal Output	4...20mA/HART (两线) (Two-wire)

### TKWL-1305



TKWL-1305

应用 Application	腐蚀性液体 Corrosive liquid
测量范围 Measurement Range	杆式6米/缆式20米 Rod type 6 meters/cable type 20 meters
过程连接 Process Connection	法兰 flange
过程温度 Process Temperature	-40~1200°C
过程压力 Process Pressure	-0.1~2MPa
精度 Accuracy±1mm	±1mm
频率范围 Frequency Range	100MHz~1.8GHz
防爆/防护等级 Protection Class	Exia IIC T6/IP67
信号输出 Signal Output	4~20mA/HART (两线) (Two-wire)

### TKWL-1306



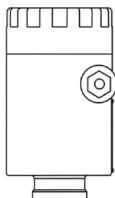
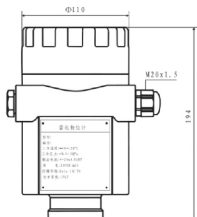
TKWL-1306

应用 Application	介电常数低或表面波动液体 Liquid with low dielectric constant or surface fluctuation
测量范围 Measurement Range	6米 6 meters
过程连接 Process Connection	法兰 flange
过程温度 Process Temperature	-40~250°C
过程压力 Process Pressure	-0.1~2MPa
精度 Accuracy±1mm	±1mm
频率范围 Frequency Range	100MHz~1.8GHz
防爆/防护等级 Protection Class	Exia IIC T6/IP67
信号输出 Signal Output	4~20mA/HART (两线) (Two-wire)

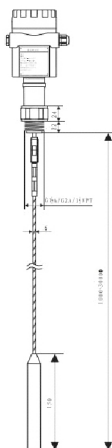
## 产品系列尺寸 Dimensions of products series

### 外壳 Shell

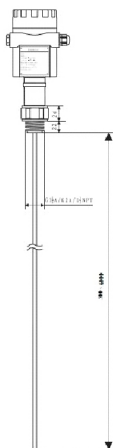
材质: AL/316L  
Material: AL/316L



### 缆式 Cable type



### 杆式 Bar type



## 技术参数 Technical Parameters

参数 Parameters	工作频率: 100MHz~1.8GHz Working efficiency: 100MHz~1.8GHz
	测量范围: 缆式: 0~30m; 杆式、双杆式、同轴管式: 0~6m; Working efficiency: 100MHz~1.8GHz
	重复性: $\pm 2\text{mm}$ Repeatability: $\pm 2\text{mm}$
	分辨率: 1mm Resolution: 1mm
	采样: 回波采样55次/s Sampling: echo sampling 55 times/s
	响应速度: $>0.2\text{S}$ (根据具体使用情况而定) Sampling: echo sampling 55 times/s
	输出电流信号: 4~20mA Output current signal: 4~20mA
	精度: $<0.1\%$ Accuracy: $<0.1\%$
	通讯接口: HART通讯协议 Accuracy: $<0.1\%$
	过程连接: G11/2A螺纹 Process connection: screw thread
	法兰 (flange) DN50, DN80, DN100, DN150, DN200, DN250
	过程压力: $-0.1\sim 2\text{MPa}$ Process pressure: $-0.1\sim 2\text{MPa}$
	电源: 24VDC ( $\pm 10\%$ ), 纹波电压: 1Vpp Power: 24VDC ( $\pm 10\%$ ), ripple voltage: 1Vpp
	耗电量: max 22.5mA Electricity consumption: max 22.5mA
	环境条件: 温度 $-40^{\circ}\text{C} \sim +70^{\circ}\text{C}$ Environmental condition: temperature $-40^{\circ}\text{C} \sim +70^{\circ}\text{C}$
	外壳防护等级: IP67 Environmental condition: temperature $-40^{\circ}\text{C} \sim +70^{\circ}\text{C}$
	防爆等级: EXia IIC T6 Explosion proof class: EXia IIC T6
	两线制接线: 仪表供电和信号输出共用一根两芯屏蔽电缆线 Two wire connection: power supply of meter and signal output use the same two-core cable.
	电缆入口: 2个M20*1.5或1/2NPT (电缆直径5~9mm) Cable entrance: 2 M20*1.5 or 1/2NPT (diameter of cable 5~9mm)

## 测量距离 Measuring distance

下表列出不同类别被测介质与测量距离的关系

The intelligent float liquid level meter is made up of a float, an indicator and a sensor, as shown in the figure:

介质分组 Medium Group	DK(ε)	固体颗粒 Solid particle	液体 Liquid	测量范围 Measuring Range
	1. 4~16		冷凝气, 如N2CO2 Condensing gas, such as N2CO2	3m (仅指同轴杆式探头) 3m(only refers to coaxial rod probe)
	1. 6~19	塑料带粒子 白灰石, 特种水泥 糖 Plastic belt particles Lime stone, special cement Sugar	液化气, 如丙烷 溶剂 氟利昂12/氟里昂 棕榈油 Liquefied petroleum gas, such as propane Solution Freon 12/Freon Palm oil	30m
	1. 9~25	普通水泥, 石膏 Common cement, gypsum	矿物油, 燃料 Mineral oil, fuel	30m
	2. 5~4	谷物种子 石头 砂粒 Grain, seed Stone Sand	苯, 苯乙烯, 甲苯 呋喃 萘 Benzene, styrene, toluene Furane naphthalene	30m
	4~7	潮湿的石头, 矿石 盐 Wet rock, ore Salt	含水液体 酒精 液氨 Liquid with water Alcohol Liquid ammonia 30m	30m
	>7	金属粉末 炭黑 煤炭 Metal powder Carbon black Coal	氯苯, 氯仿 纤维素喷雾 异氰酸盐, 本胺 Benzene, chloroform Cellulose spray ISO cyanide, the amine	30m

# 产品选型 Products Selection

## TKWL-1301

TKWL-1301										
<b>探头类型</b> <b>Probe Model</b> 6mm杆式探头 6mm cable type probe										
<b>最大量程</b> <b>Maximum Measuring Range</b> 30000mm										
<b>材质</b> <b>Material</b> 不锈钢 Stainless steel										
<b>探头长度( mm ) length of probe</b>										
<b>编程器 Programmer</b> 带 with 不带 without					B X					
<b>现场显示 Site display</b> 带 with 不带 without					V X					
<b>电缆接口 Cable interface</b> M20*1.5 1/2NPT					M N					
<b>外壳/防护等级/天线防护等级</b> <b>Shell/protection class/antennaprotection class</b> 塑料/IP65 Plastic/IP65 铝/IP67 Aluminum/IP67						P L				
<b>密封温度 Seal temperature</b> 普通密封-40~100℃ High temperature seal -40~250℃ with radiator 高温密封-40~250℃带散热器 Common seal -40~250℃						P G				
<b>一体化过程连接/材质</b> <b>Integrated process connection/material</b> 法兰DN50 PN16C 不锈钢 Flange DN50 PN16C Stainless Steel 法兰DN80 PN16C 不锈钢 Flange DN80 PN16C Stainless Steel 法兰DN100 PN16C 不锈钢 Flange DN100 PN16C Stainless Steel 法兰DN150 PN16C 不锈钢 Flange DN150 PN16C Stainless Steel 法兰DN200 PN16C 不锈钢 H Flange DN200 PN16C Stainless Steel 特殊约定 Special agreement								C D E F H Y		
<b>防爆 Explosion proof</b> 非防爆型 (普通型) 电流信号输出 (4~20mA) HART协议 Non explosion proof type (common type) Current signal output agreement (4~20mA) HART 本安防爆型 (Exia IIC T6) 电流信号输出 (4~20mA) HART协议 Intrinsically safe explosion proof type (Exia IIC T6) Current signal output agreement (4~20mA) HART D 本安型+隔爆型 (Exd ia IIC T6) 电流信号输出 (4~20mA) HART协议 D Intrinsically safe type+ isolating explosion type (Exd ia IIC T6) Current signal output agreement (4~20mA) HART									P I D	

TKWL-1302												
<b>探头类型</b> Probe Model 10mm杆式探头 10mm cable type probe												
<b>最大量程</b> Maximum Measuring Range 6000mm												
<b>材质</b> Material 不锈钢 Stainless steel												
<b>探头长度 (mm) length of probe</b>												
<b>编程器 Programmer</b>												
带 with						B						
不带 without						X						
<b>现场显示 Site display</b>												
带 with						V						
不带 without						X						
<b>电缆接口 Cable interface</b>												
M20*1.5								M				
½NPT								N				
<b>外壳/防护等级/天线防护等级</b> Shell/protection class/antennaprotection class												
塑料/IP65 Plastic/IP65									P			
铝/IP67 Aluminum/IP67									L			
<b>密封温度 Seal temperature</b>												
普通密封 -40~100℃ High temperature seal -40~250℃ with radiator										P		
高温密封 -40~250℃ 带散热器 Common seal -40~250℃										G		
<b>一体化过程连接/材质</b> Integrated process connection/material												
G1 1/2A 螺纹 screw thread 不锈钢Stainless Steel												G
N 1 1/2NPT 螺纹 screw thread 不锈钢Stainless Steel												N
C Flange 法兰 DN50 PN16C 不锈钢Stainless Steel												C
D Flange 法兰 DN80 PN16C 不锈钢Stainless Steel												D
E Flange 法兰 DN100 PN16C 不锈钢Stainless Steel												E
F Flange 法兰 DN150 PN16C 不锈钢Stainless Steel												F
特殊约定 Special agreement												Y
<b>防爆 Explosion proof</b>												
非防爆型 (普通型) 电流信号输出 (4~20mA) HART协议 Non explosion proof type (common type) Current signal output agreement (4~20mA) HART												P
本安防爆型 (Exia IIC T6) 电流信号输出 (4~20mA) HART协议 Intrinsically safe explosion proof type (Exia IIC T6) Current signal output agreement (4~20mA) HART												I
D 本安型+隔爆型 (Exd ia IIC T6) 电流信号输出 (4~20mA) HART协议 D Intrinsically safe type+ isolating explosion type (Exd ia IIC T6) Current signal output agreement (4~20mA) HART												D

TKWL-1303											
<b>探头类型</b> <b>Probe Model</b> 6mm杆式探头 6mm cable type probe											
<b>最大量程</b> <b>Maximum Measuring Range</b> 30000mm											
<b>材质</b> <b>Material</b> 不锈钢 (法兰安装) Stainless steel (flange installation)											
<b>探头长度 (mm) length of probe</b>											
<b>编程器 Programmer</b>  带 with B 不带 without X											
<b>现场显示 Site display</b>  带 with V 不带 without X											
<b>电缆接口 Cable interface</b>  M M20*1.5 M N 1/2NPT N											
<b>外壳/防护等级/天线防护等级</b> <b>Shell/protection class/antennaprotection class</b> P 塑料/IP65 P P Plastic/IP65 L 铝/IP67 L L Aluminum/IP67											
<b>密封温度 Seal temperature</b>  普通密封 -40~100°C High temperature seal -40~250°C with radiator P 高温密封 -40~250°C 带散热器 G Common seal -40~250°C											
<b>一体化过程连接/材质</b> <b>Integrated process connection/material</b>  D Flange 法兰DN80 PN16C 不锈钢Stainless Steel D E Flange 法兰DN100 PN16C 不锈钢Stainless Steel E Flange 法兰DN150 PN16C 不锈钢Stainless Steel F Flange 法兰DN200 PN16C 不锈钢Stainless Steel H Flange 法兰DN250 PN16C 不锈钢Stainless Steel K 特殊约定 Special agreement Y											
<b>防爆 Explosion proof</b>  非防爆型 (普通型) 电流信号输出 (4~20mA) HART协议 Non explosion proof type (common type) Current signal output agreement (4~20mA) HART P 本安防爆型 (Exia IIC T6) 电流信号输出 (4~20mA) HART协议 Intrinsically safe explosion proof type (Exia IIC T6) Current signal output agreement (4~20mA) HART I D 本安型+隔爆型 (Exd ia IIC T6) 电流信号输出 (4~20mA) HART协议 D intrinsically safe type+ isolating explosion type (Exd ia IIC T6) Current signal output agreement (4~20mA) HART D											



TKWL-1304											
<b>探头类型</b> <b>Probe Model</b> 10mm双杆式探头 10mm double rod type probe											
<b>最大量程</b> <b>Maximum Measuring Range</b> 6000mm											
<b>材质</b> <b>Material</b> 不锈钢 (法兰安装) Stainless steel (flange installation)											
<b>探头长度 (mm) length of probe</b>											
<b>编程器 Programmer</b>											
带 with						B					
不带 without						X					
<b>现场显示 Site display</b>											
带 with						V					
不带 without						X					
<b>电缆接口 Cable interface</b>											
M M20*1.5							M				
N ½NPT							N				
<b>外壳/防护等级/天线防护等级</b> <b>Shell/protection class/antennaprotection class</b> P 塑料/IP65 P Plastic/IP65 L 铝/IP67 L Aluminum/IP67									P		
<b>密封温度 Seal temperature</b>											
普通密封 -40~100°C											
High temperature seal -40~250°C with radiator										P	
高温密封 -40~250°C 带散热器										G	
Common seal -40~250°C											
<b>一体化过程连接/材质</b> <b>Integrated process connection/material</b> D Flange 法兰DN80 PN16C 不锈钢Stainless Steel E Flange 法兰DN100 PN16C 不锈钢Stainless Steel Flange 法兰DN150 PN16C 不锈钢Stainless Steel Flange 法兰DN200 PN16C 不锈钢Stainless Steel Flange 法兰DN250 PN16C 不锈钢Stainless Steel 特殊约定 Special agreement											D
											E
											F
											H
											K
											Y
<b>防爆 Explosion proof</b> 非防爆型 (普通型) 电流信号输出 (4~20mA) HART协议 Non explosion proof type (common type) Current signal output agreement (4~20mA) HART 本安防爆型 (Exia IIC T6) 电流信号输出 (4~20mA) HART协议 Intrinsically safe explosion proof type (Exia IIC T6) Current signal output agreement (4~20mA) HART D 本安型+隔爆型 (Exd ia IIC T6) 电流信号输出 (4~20mA) HART协议 D intrinsically safe type+ isolating explosion type (Exd ia IIC T6) Current signal output agreement (4~20mA) HART											P
											I
											D

TKWL-1305											
<b>探头类型</b> Probe Model 14mm双杆式探头 14mm double rod type probe											
<b>最大量程</b> Maximum Measuring Range 6000mm											
<b>材质</b> Material 不锈钢 (法兰安装) Stainless steel (flange installation)											
<b>探头长度 (mm) length of probe</b>											
<b>编程器 Programmer</b>											
带 with						B					
不带 without						X					
<b>现场显示 Site display</b>											
带 with							V				
不带 without							X				
<b>电缆接口 Cable interface</b>											
M M20*1.5								M			
N ½NPT								N			
<b>外壳/防护等级/天线防护等级</b> Shell/protection class/antennaprotection class P 塑料/IP65 P Plastic/IP65 L 铝/IP67 L Aluminum/IP67									P		
<b>密封温度 Seal temperature</b> 普通密封 -40~100°C Common seal -40~100°C									L		
<b>一体化过程连接/材质</b> Integrated process connection/material Flange法兰DN50 PN16C 不锈钢 Stainless steel Flange法兰DN80 PN16C 不锈钢 Stainless steel Flange法兰DN100 PN16C 不锈钢 Stainless steel Flange法兰DN150 PN16C 不锈钢 Stainless steel 特殊约定 Special agreement										C D E F Y	
<b>防爆 Explosion proof</b> 非防爆型 (普通型) 电流信号输出 (4~20mA) HART协议 Non explosion proof type (common type) Current signal output agreement (4~20mA) HART 本安防爆型 (Exia IIC T6) 电流信号输出 (4~20mA) HART协议 Intrinsically safe explosion proof type (Exia IIC T6) Current signal output agreement (4~20mA) HART D 本安型 + 隔爆型 (Exd ia IIC T6) 电流信号输出 (4~20mA) HART协议 D intrinsically safe type+ isolating explosion type (Exd ia IIC T6) Current signal output agreement (4~20mA) HART											P I D

TKWL-1306									
探头类型 Probe Model 同轴管式探头 Maximum Measuring Range									
最大量程 Maximum Measuring Range 6000mm									
材质 Material 不锈钢 (法兰安装) Stainless steel (flange installation)									
探头长度 (mm) length of probe									
编程器 Programmer  带 with B 不带 without X									
现场显示 Site display  带 with V 不带 without X									
电缆接口 Cable interface  M M20*1.5 M N ½NPT N									
外壳/防护等级/天线防护等级 Shell/protection class/antennaprotection class P 塑料/IP65 P P Plastic/IP65 L 铝/IP67 L L Aluminum/IP67									
密封温度 Seal temperature 高温密封-40~250°C带散热器 High temperature seal -40~250°C with radiator P 普通密封-40~100°C Common seal -40~100°C G									
一体化过程连接/材质 Integrated process connection/material Flange法兰DN50 PN16C 不锈钢 Stainless steel C Flange法兰DN80 PN16C 不锈钢 Stainless steel D Flange法兰DN100 PN16C 不锈钢 Stainless steel E Flange法兰DN150 PN16C 不锈钢Stainless steel F 特殊约定 Special agreement Y									
防爆 Explosion proof 非防爆型 (普通型) 电流信号输出 (4~20mA) HART协议 P Non explosion proof type (common type) Current signal output agreement (4~20mA) HART 本安防爆型 (Exia IIC T6) 电流信号输出 (4~20mA) HART协议 I Intrinsically safe explosion proof type (Exia IIC T6) Current signal output agreement (4~20mA) HART D 本安型+隔爆型 (Exd ia IIC T6) 电流信号输出 (4~20mA) HART协议 D D Intrinsically safe type+ isolating explosion type (Exd ia IIC T6) Current signal output agreement (4~20mA) HART									

# TKWL-1500射频导纳物位计

TKWL-1500 Radio Frequency Admittance Material level meter

## 概述

TKWL-1500系列为通用型物位仪表,用于连续物位测量,产品应用于工矿现场,适用于大多数应用场合。仪表由一个电路单元一套防爆外壳和杆式或缆式传感元件组成,传感器有很多型号可选,仪表可选整体或分体安装。

## 测量原理

射频导纳是一种从电容式发展起来的、防挂料,更可靠、更准确、适用性更广的新型物位控制技术,是电容式物位计的升级。所谓射频导纳,导纳的含义为电学中阻抗的倒数,它由电阻性成分,电容性成分,感性成分综合而成,而射频即高频无线电波谱,所以射频导纳可以理解为用高频无线电波测量导纳。仪表工作时,仪表传感器与罐壁及被测介质形成导纳值。物位变化时,导纳值相应变化。电路单元将被测导纳值转换成物位信号输出,实现物位测量。

## 特点

1. 通用性强:可测量液位及料位,可满足不同温度,压力,介质的测量要求,并可应用于腐蚀、冲击等恶劣场合。
2. 防挂料:独特的电路设计和传感器结构,使其测量可以不受传感器挂料影响,无需定期清洁,避免误测量。
3. 免维护:测量过程无活动部件,不存在机械部件损坏问题,无需维护。
4. 抗干扰:接触式测量,抗干扰能力强,可克服蒸汽,泡沫及搅拌对测量的影响。
5. 准确可靠:测量多样化,使测量更加准确,测量不受环境变化影响,稳定性高,使用寿命长。

## 典型应用

导电、绝缘液体-化工、油田、水及污水处理  
导电、绝缘浆体-造纸、制药、水及污水处理  
粉末:灰、粉-电厂、冶金、水泥  
颗粒:煤、粮食-电厂、冶金、粮食  
界面:不同两种液体-油田、化工

## 性能指标

输出: 4~20mA (两线制)+HART  
输出方式: 物位方式或距离方式  
精度: 0.5级  
环境温度: -40~70℃  
介质温度: -100~260℃  
最大负载: 24VDC350Ω  
负载影响: 0.2% (0-最大负载)  
响应时间: <0.5s (标准) 0.5~30s (可调)  
量程: 最大1500PF, 最大距离100m (不同传感器最大量程不同)  
火花防护 (对传感器): 内置火花防护电路  
电气接口: M20×1.5  
电缆: 分体式电子单元与传感器之间的专用连接电缆标准5m, 最长50m  
过程连接: NPT螺纹安装 (标准)  
法兰安装 (可选)  
外壳防护: IP66  
防爆: ExdIICT4

## Summary

TKWL-1500 series are universal material level meters used for continuous material level measurement, which have been widely applied to industrial and mining sites and also most application occasions. The meter is composed of one circuit unit, one set of explosion-proof shell and rod type or cable type sensing component; there are numerous sensor models for choice and the meter can be installed completely or partially.

## Measurement principle

Radio frequency admittance is a new material level control technology, developed from capacitor type, anti-hanging material, more reliable, more accurate and with more extensive applicability. For radio frequency admittance, the meaning of admittance is reciprocal of electrical impedance, which is composed of resistive component, capacitive component and perceptual component comprehensively, while the radio frequency refers to high-frequency radio wave frequency, so the radio frequency admittance can also be understood as using high-frequency radio wave to measure admittance. When meter works, meter sensor and tank wall as well as measured medium form admittance value. When material level changes, the admittance value will also change accordingly. Circuit unit converts the measured admittance value into material level signal and outputs it to realize measurement for material level.

## Characteristics

1. Strong generality: can measure liquid level and material level, can meet measurement requirements of different temperatures, pressures and mediums and can be applied to corrosion and attack and other severe situations.
2. Anti-hanging material: unique circuit design and sensor structure make the measurement not affected by hanging material of sensor; there is no need to clean regularly and avoid error measurement.
3. Maintenance free: there is no moving part during measurement process, problem of parts damage does not exist and no need to maintain.
4. Anti-interference: contact measurement, with strong interference ability, can get over the influence of steam, foam and stirring on measurement.
5. Accurate and reliable: Measurement diversification, which can make the measurement more accurate, the measurement is not affected by change of environment, make it with high stability and long using life.

## Classical Application

Electric conduction, insulating liquids-chemical, oil field, water and sewage treatment.  
Electric conduction, insulating paste-paper making, pharmacy, water and sewage treatment.  
Powder: ash, powder-power plant, metallurgy and cement.  
Particles: coal, food-power plant, metallurgy, food.  
Interface: two different liquids-oil field, chemical.

## Performance Index

Output: 4~20mA (two wire system)+HART  
Output method: way of material level or way of distance  
Accuracy: 0.5 grade  
Environmental temperature: -40~70℃  
Temperature of medium: -100~260℃  
Maximum loading: 24VDC350Ω  
Influence of loading: 0.2% (0-the maximum load)  
Response time: <0.5s (standard) 0.5~30s (adjustable)  
Measuring range: max 1500PF, max distance 100m (different sensors have different measuring distances)  
Spark protection (for sensor): built-in spark protection circuit  
Electrical interface: M20×1.5  
Cable: the standard cable for split electronic unit and sensor is 5m in length, max 50m.  
Process connection: NPT screw thread installation (standard)  
Flange installation (optional)  
Shell protection: IP66  
Explosion proof: ExdIICT4

## TKWL-1500系列订购信息 TKWL- 1500 series ordering information

TKWL-1500						
<b>探杆形式</b> Form of probe rod						
杆式 Rod type	1					
缆式 Cable type	2					
<b>测量介质</b> Measurement medium						
液体 Liquid		A				
固体 Solid		B				
<b>过程连接</b> Process Connection						
3/4NPT螺纹连接 screw thread connection			A			
其他螺纹连接 other crew thread connections			请注明 Please specify			
法兰连接 Flange connection						
<b>测量范围</b> Measurement range						
<b>传感器型号 (具体见下表)</b> Sensor models (as shown in following table)						
<b>安装形式</b> Forms of installation						
一体 Integrated					I	
分体 Split					R	
<b>防爆 Explosion proof</b>						
无防爆 Without explosion proof						E
带防爆 With explosion proof						F

## TK1300系列传感器选型 TK 1300 series ordering information

型号 Model	温度压力 Temperature /pressure	最大长度 Max. Length	传感器材质 Material of senso	传感器外型 Appearance of sensor	安装尺寸 Dimensions of installation	应用 Application
S21	230℃/3MPa	5m	304SS/TFE	杆式	3/4"NPT	中温中压 一般用导电液体及强腐蚀 介质浆体、颗粒。 Medium temperature and medium pressure, usually use conductive liquid and strong corrosive medium paste and particle
S22	200℃/3MPa	20m	304SS/FET	φ2.7mm缆式	3/4"NPT	大量程导电液体及强腐蚀介质、界面 Wide range conductive liquid and strong corrosive medium and interface
S23	200℃/2MPa	2m	2m304SS/FET	双电极	法兰	用于低介电常数的液体 Liquid used for low dielectric constant
S24	特殊规格定制 Customized special specifications					

备注：本系列超声波探头还可以根据客户需求定制：耐高压、耐高温、小口径、小盲区等特规探头。

Note: this series of ultrasonic probe can be customized based on customers' needs: high voltage resistance, high temperature resistance, small caliber, small blind area and other special probes.

<p>产品功耗 Product power consumption</p>	<p>分体式用24V电源供电，不带继电器功耗是100mA，带一个继电器是要120mA，2路继电器145mA，3路继电器要170mA，4路继电器要190mA。 The split model adopts 24V power supply; power consumption without relay is 100 mA and with relay is 120 mA; power consumption for 2-way relay is 145 mA, 3-way relay is 170 mA and 4-way relay is 190 mA. 具体功率如下： The specific powers are as following: 无继电器是<math>24 \times 100\text{mA}=2.4\text{W}</math>; Without relay is <math>24 \times 100\text{mA}=2.4\text{W}</math>; 1路继电器是<math>24 \times 120\text{mA}=2.9\text{W}</math>; 2路继电器是<math>24 \times 145\text{mA}=3.5\text{W}</math>; One-way relay is <math>24 \times 120\text{mA}=2.9\text{W}</math>; two-way relay is <math>24 \times 145\text{mA}=3.5\text{W}</math>; 3路继电器是<math>24 \times 170\text{mA}=4.1\text{W}</math>; 2路继电器是<math>24 \times 190\text{mA}=4.6\text{W}</math>; Three-way relay is <math>24 \times 170\text{mA}=4.1\text{W}</math>; two-way relay is <math>24 \times 190\text{mA}=4.6\text{W}</math>;</p>
<p>产品功耗 Product power consumption</p>	<p>一体式四线制用24V电源供电，不带继电器功耗是80mA，带一个继电器是要105mA，2路继电器130mA。 Integrated four-wire system adopts 24V power supply, power consumption without relay is 80 mA, with relay is 105 mA and two-way relay is 130 mA. 具体功率如下： The specific powers are as following: 无继电器是<math>24 \times 80\text{mA}=1.9\text{W}</math>; Without relay is <math>24 \times 80\text{mA}=1.9\text{W}</math>; 1路继电器是<math>24 \times 105\text{mA}=2.5\text{W}</math>; 2路继电器是<math>24 \times 145\text{mA}=3.1\text{W}</math>; One-way relay is <math>24 \times 105\text{mA}=2.5\text{W}</math>; two-way relay is <math>24 \times 145\text{mA}=3.1\text{W}</math>;</p>
<p>产品功耗 Product power consumption</p>	<p>一体式二线制用24V电源供电，不能带继电器，功耗是30mA。 具体功率如下： 无继电器是<math>24 \times 30\text{mA}=0.72\text{W}</math>; Integrated two-wire system adopts 24V power supply; the power supply without relay is 30mA. The specific power is as following: Without relay is <math>24 \times 30\text{mA}=0.72\text{W}</math>;</p>

# TKWL-1600系列超声波物位计

## TKWL-1600 series ultrasonic level meter

### 概述

超声波物位计（测量料位，液位），是一种非接触式、高可靠性、高性价比、易安装维护的物位测量仪器。它不必接触介质就能满足大部分物位测量要求，是我们公司经过多年努力开发，拥有完全自主知识产权的新一代超声波物位计。

### Summary

Ultrasonic level meter (measure material level and liquid level) is a non-contact measuring device for material level with high reliability, high cost performance and easy installation and maintenance. It can meet most of requirements for material level measuring without contacting medium, which is a new generation ultrasonic level meter of our company with completely independent property right after years of hardworking and development.

### 产品介绍 Introduction of products



TKWL-1600 一体式  
TKWL-1600 integrated model



TKWL-1600 分体式  
TKWL-1600 split model



TKWL-1600 一体式防爆式  
TKWL-1600 split model

### 技术参数 Technical parameters

功能 Functions	一体式 Integrated Model	分体式 Split model
量程 Measuring range	5米、10米、15米、20米、30米、40米、50米、60米 5m、10m、15m、20m、30m、40m、50m、60m	5米、10米、15米、20米、30米、40米、50米、60米、70米、 5m、10m、15m、20m、30m、40m、50m、60m、70m
	0.5%~1.0%	0.5%~1.0%
分辨率 Resolution	3mm或0.1%(取大者) 3mm or 0.1% (choose the bigger)	3mm或0.1%(取大者) 3mm or 0.1% (choose the bigger)
显示 Display	中文液晶显示 LCD in Chinese	中文液晶显示 LCD in Chinese
模拟输出 Analog output	4线制4~20mA/510 Ω 负载 4 wire system 4~20mA/510Ω loading 2线制4~20mA/250 Ω 负载 2 wire system 4~20mA/250Ω loading	4~20mA/510 Ω 负载 4~20mA/510 Ω loading
继电器输出 Relay output	可选配2组AC 250V/ 8A或DC 30V/ 5A 状态可编程 2 sets of AC 250V/8A or DC 30V/5A are optional, state is programmable	(可选配) 单通道为2组，双通道是4组AC 250V/ 8A或DC 30V/ 5A 状态可编程 2 sets of single channel are (optional), the double channel is 4 sets of AC 250V/8A or DC 30V/5A, state is programmable
供电 Power supply	标配24VDC Standard: 24VDC 可选 220V AC+15% 50Hz Optional: 220V AC+15% 50Hz	标配220V AC+15% 50Hz Standard: 220V AC+15% 50Hz 可选24VDC 120mA Optional: 24VDC 120m 定制12VDC或电池供电 Customized 12VDC or battery powered
环境温度 Environmental temperature	显示仪表-20~+60℃, Meter display -20~+60℃, 探头-20~+80℃ Probe -20~+80℃	显示仪表-20~+60℃, Meter display -20~+60℃, 探头-20~+80℃ Probe -20~+80℃
通信 Communication	可选485, 232通信 (厂家协议) Optional 485, 232 communication (manufacturer agreement)	可选485, 232通信 (厂家协议) Optional 485, 232 communication (manufacturer agreement)
防护等级 Protection class	显示仪表IP65, 探头IP68 Display meter IP65, Probe IP68	显示仪表IP65, 探头IP68 Display meter IP65, Probe IP68
探头电缆 Probe cable	无 No	可达100米, 标配10米 100m reachable, standard 10m
探头安装 Probe installation	根据量程和探头的选型 Selection based on measuring range and probe	根据量程和探头的选型 Selection based on measuring range and probe

## 产品选型 Product Selection

TKWL-1600		
01	结构型式及材料 structure and material	
FX	新的分体式壳体ABS材质 new split shell in ABS material	
FL	分体式增强型, 铸铝材质strengthened split model in cast aluminum material	
SK	一体式普通型(最大量程10米, 只有4~20mA输出, 不带继电器, 不带485通信) Integrated ordinary type (max measuring range 10m, with output of 4-20ma only, without relay and without 485 communication)	
TK68	Ip68防护等级的超声波液位计 Ultrasonic liquid level meter with IP68 protection class	
量程 Measuring range		
02	具体的量程, 用两位数表示, 例如: 05表示5米, 30表示30米。 Specific measuring range, expressed with two digits, such as 05 represents 5 meters and 30 represents 30 meters	
05	50米量程 50m measuring range	
70	70米量程 70m measuring range	
传感器外壳 sensor shell		
A	ABS做传感器外壳 sensor shell in ABS material	
F	Pe做传感器外壳 sensor shell in PE material	
F	聚四氟乙烯做传感器外壳sensor shell in PTFE material	
P	POM做传感器外壳 sensor shell in POM material	
V	PVDF做传感器外壳 sens shell in PVDF material	
S	不锈钢做传感器外壳sensor shell in stainless steel material	
T	特殊材质做传感器外壳 sensor shell in special material	
传感器的安装尺寸 installation dimensions of sensor		
A	Screw thread螺纹M48×2mm	
B	Screw thread螺纹M60×2mm	
C	Screw thread螺纹M78×2mm	
D	Screw thread螺纹M108×2mm	
E	Screw thread螺纹M98×2mm	
F	Screw thread螺纹G1-1/2A, Big diameter大径: Φ47.8mm	
G	Screw thread螺纹G2A Big diameter大径: Φ59.6mm	
H	Screw thread螺纹1-1/2"NPT Big diameter大径: Φ48.1mm	
I	Screw thread螺纹2"NPT Big diameter大径: Φ60.1mm	
T	特殊规格型 special specifications	
安装方式 installation method		
N	不是法兰安装 installed not with flange	
B	DN40法兰 flange	
C	DN50法兰 flange	
D		
E	DN80法兰 flange	
F	DN100法兰 flange	
G	DN125法兰 flange	



H	Dn150法兰flange	
I	Dn200法兰flange	
		加长型探头螺纹长度 length of screw thread of lengthened probe
		空白表示是标准探头，可以不写 blank refers to standard probe, can not write
100		含螺纹长度是100毫米 indicate the length of probe with screw thread is 100mm
	~	
999		表示探头含螺纹长度是999毫米 indicate the length of probe with screw thread is 999 mm
		电源、防爆种类 types of power and explosion proof
	DCSP	特殊供电12VDC、9VDC、电池供电 Special power supply 12VDC、9VDC and battery
	DC	4线制直流供电非防爆24VDC Four-wire DC power supply without explosion resistance 24VDC
	AC	4线制交流供电非防爆220VAC Four-wire AC power supply without explosion resistance 220VAC
	TC	2线制直流供电非防爆24VDC Two-wire DC power supply without explosion resistance 24VDC
	TCIA	2线制直流供电本安防爆型24VDC Two-wire DC power supply intrinsically safe explosion resistance model 24VDC
	TCDD	2线制直流供电隔离防爆型24VDC Two-wire DC power supply isolating explosion resistance model 24VDC
	DCIA	4线制直流供电本安防爆型24VDC Four-wire DC power supply intrinsically safe explosion resistance model 24VDC
	DCDD	4线制直流供电隔离防爆型24VDC Four-wire DC power supply isolating explosion resistance model 24VDC
	继电器数量 Quantity of relay	
	R0	没有继电器 without relay
	R1	1个继电器 one relay
	R2	2个继电器 two relays
	R3	3个继电器 three relays
	R4	4个继电器 four relays
	输出信号 output signal	
	MA	4~20ma
	C2	232通讯 communication
	C4	485通讯 communication
	C2MA	4~20ma+232通讯communication
	C4MA	4~20ma+485通讯communication
	HTMA	4~20ma+HART通讯communication
	RJ	RJ45网卡接口 network interface
	TS	特殊输出信号 special output signal
	变送器外壳材质 transmitter shell material	
	PL	ABS塑料壳体 ABS plastic shell
	Al	铸铝壳体 cast aluminum shell
	F4	聚四氟乙烯壳体 PTFE shell
	S4	304不锈钢壳体 304 stainless steel shell
	S6	316不锈钢壳体 316 stainless steel shell
	13	传感器电缆长度，00就是无配套电缆 Length of sensor cable, 00 indicates without
	01	传感器电缆01米 Sensor cable 01 meter
	~	
	200	传感器电缆200米 Sensor cable 200 meters

# TKWL-1700系列电容式物位计

## TKWL-1700 series capacitance level meter

### 工作原理

电容式物位计由电容式物位传感器和检测电容的线路组成。其基本工作原理是电容式物位传感器把物位转换为电容量的变化,然后再用测量电容量的方法求知物位数值。

电容式物位传感器是根据圆筒电容器原理进行工作的。其结构如同2个长度为L、半径分别为R和r的圆筒型金属导体,中间隔以绝缘物质,当中间所充介质是介电常数为 $\epsilon_1$ 的气体时,两圆筒的电容量为:

$$C_1 = 2\pi \epsilon_1 L / R / (\ln R/r) \quad (1)$$

如果被测介质为导电性液体时,电极要用绝缘物(如聚乙烯)覆盖作为中间介质,而液体和外圆筒一起作为外电极。假设中间介质的介电常数为 $\epsilon_3$ ,电极被浸没长度为l,则此时电容器所具有的电容量为:

$$C = 2\pi \epsilon_3 L / R / (\ln R/r) \quad (3)$$

其中:R和r分别为绝缘覆盖层外半径和内电极外半径。由于 $\epsilon_3$ 为常数,所以C与l成正比。

如果电极的一部分被介电常数为 $\epsilon_2$ 的液体(非导电性的)浸没时,则必须会有电容量的增量 $\Delta C$ 产生(因 $\epsilon_2 > \epsilon_1$ ),此时两电极间的电容量 $C = C_1 + \Delta C$ 。假如电极被浸没长度为l,则电容量增量为:

$$\Delta C = 2\pi \epsilon_3 L / R / (\ln R/r) \quad (2)$$

当 $\epsilon_2$ 、 $\epsilon_1$ 、R、r不变时,电容量增量 $\Delta C$ 与电极浸没的长度l成正比,因此测出电容增量数值便可知液位高度。

### 电容式物位计液位计在应用中应注意的几个问题

#### 1、选型

由于被测介质的不同,电容式物位传感器有不同的型式。

(1) 测量非导电液体的电容物位传感器,当用于较稀的非导电液体(如轻油等)时,可采用一金属电极,外部同轴套上一金属管,相互绝缘固定,以被测介质为中间绝缘物质构成同轴套筒形电容器。

(2) 测量导电液体的电容物位传感器,容器(规则)和液体作为电容器的一个电极,插入的金属电极作为另一电极,绝缘套管作为中间介质,三者组成圆筒形电容器。当容器为非导电液体时,需另加一个接地极,其下端浸至被测容器底部,上端与安装法兰有可靠的导电连接,以使二电极中有一个与大地及仪表地线相连,保证仪表正常测量。

### 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 material 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 is 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  $\epsilon_1$ , the capacitance of two cylinders is:

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  $\epsilon_3$  and the immersed length of electrode is l, and then the capacitance of capacitor is:

In which R and r are outer radius of insulating coating and outer radius of inner electrode. As the  $\epsilon_3$  is constant, so C and l are in direct ratio.

If part of electrode is immersed by liquid (non-conductive) with dielectric constant at  $\epsilon_2$ , and then there must be increase of capacitance  $\Delta C$  produced (because  $\epsilon_2 > \epsilon_1$ ), now the capacitance between these two electrodes is  $C = C_1 + \Delta C$ . Presume the immersion length of electrode is l, and then the increase of capacitance is:

When  $\epsilon_2$ ,  $\epsilon_1$ , R, r keep unchanged, the increase of capacitance  $\Delta C$  and immersed length of electrode l 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 as light oil), it can adopt one metal electrode and put a metal tube on external coaxial, mutually insulated and fixed, form coaxial sleeve type capacitor by taking measured medium as intermediate insulating material.

(2) For capacitive level sensor of measuring non-conductive liquid, take container (rule) and liquid as one electrode of capacitor, the inserting metal electrode as another electrode, the insulating tube as intermediate medium, and these three compose cylindrical capacitor. When the container is non-conductive, it needs to add another earth electrode, whose bottom part will be immersed to the bottom of the container and the top part will make 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) 当测量粉状非导电固体料位和粘滞性非导电液体液位时, 可采用金属电极直接插入圆筒型容器的中央, 将仪表地线与容器相连, 以容器作为外电极, 料或液体作为绝缘介质构成圆筒型电容器。

所以应根据现场实际情况, 即被测介质的性质(导电特性、粘滞性)、容器类型(规则/非规则金属罐、规则/非规则非金属罐), 选择合适的电容物位计。

## 2、测量回路中接地点的处理

仪表测量回路中接地点的正确、可靠与否直接影响被测参数的测量。电容物位计对油品精制8个碱液罐进行液面监控, 由于碱液罐位于防爆区, 所以最初设计测量回路中引入齐纳式输入安全栅(见图1)。

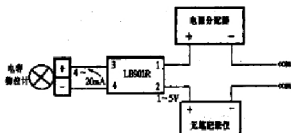


图1 采用齐纳式输入安全栅的系统接线图

Pic. 1 System wiring diagram with adoption of zener diode safety barrier

安装调试发现, 系统无法正常工作: 安全栅2端电压高达23V, 而变送器(电容物位计)供电电压为0V, 也就是说已短路。仔细查找原因, 发现是由于电容物位计的电路结构所致。电容物位计的探头为等效电容的一极, 对于外壁规则的金属容器, 其罐壁为电容的另一极。因此变送器信号负接地, 而齐纳栅也接地则变送器被短路。于是将接地COM点悬空, 观察到开始时变送器输出在4mA, 安全栅2端电压在0.86V, 不长时间变为1.6V, 7V, 变送器工作很不稳定, 这是由于COM点悬空, 系统回路受外部干扰所致。于是抛开安全栅与COM板, 将24V电源直接送到变送器, 串入标准电流表检测变送器工作情况, 变送器工作正常。得出结论: 由于电容物位计信号负与大地(罐壁)相连, 因此不能选用齐纳式安全栅。经与厂家协商, 选用隔离式安全栅, 因为电容物位计与隔离式安全栅已进行系统安全防爆联合取证。选用隔离式安全栅系统接线如图2所示。由于隔离式安全栅的电源、输入、输出信号三者隔离, 避免了系统间的相互干扰, 以及系统多点接地问题。

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

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

## 2. Treatment of ground point in measurement circuit

Whether the ground point in meter measurement circuit is correct and reliable or not affects the measurement of measured parameters. Liquid monitoring for eight soda solution tank of oil refining during overhaul. As the soda solution tank locates at explosion proof area, so it introduces zener diode safety barrier in the initial design of measurement circuit (as shown in pic.1)

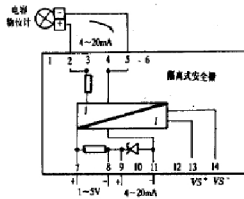


图2 采用隔离式安全栅的系统接线图

Pic. 2 System wiring diagram adopting isolating safety barrier


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, while 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 equivalence capacitance, for the metal container with regular wall; the tank wall is another electrode of capacitance. Therefore, the signal of transmitter is negative ground, while zener barrier is 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 is 4 mA, the voltage at two ends of safety barrier is 0.86V, and then changes into 1.6V, 7V shortly. The transmitter works unstably, which is caused by hang of COM point and the system circuit is affected by external disturbance. Therefore, throw off safety 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 zener diode safety barrier. After negotiation with manufacturer, select isolating safety barrier, because capacitance level meter and isolating safety barrier have made joint forensics for system safety and explosion proof. Selecting isolating safety barrier system wiring is as shown in picture 2. Due to the isolation among power, input and output signal of isolating safety barrier, it avoids the mutual interference between systems as well as multiple points grounding problem of system.

## 技术参数 Technical parameters

用于高温高压、强腐蚀等介质液位测量。在电力、冶金、食品、酿造、制药、污水处理、锅炉汽包等军工业场合广泛运用。  
Used for liquid level measure for mediums of high temperature, 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.

产品型号 Product Model	TK-1700	
测量范围 Measuring Range	0~6m	
精 度 Accuracy	0.5级 0.5 grade	
承受范围 Bearing Scope	负压、常压、高压 Negative pressure, normal pressure, high pressure	
工作温度 Working temperature	-50~240℃	
环境温度 Environmental temperature	-20~75℃	
适用介质 Applicable medium	酸、碱、盐或聚氟乙烯无腐蚀的任意介质 Acid, alkali, salt, PTFE, any non-corrosive medium	
输出型号 Output signal	4~20mA二线制 4~20 mA two-wire system	
供电电源 Power supply	负载电阻0~750Ω DC24V Load resistance 0~750 Ω DC24V	
固定方式 Fixation method	螺纹安装M20X1.5、M27X2，法兰安装DN15、DN25、DN50、DN80特殊规格可定制 Screw installation M20X1.5, M27X2 Flange installation DN15, DN25, DN50, DN80 Special specifications can be customized	
现场显示 Site display	铝合金 Aluminum alloy	

用于高温高压、强腐蚀等介质液位测量。在电力、冶金、食品、酿造、制药、污水处理、锅炉汽包等军工业场合广泛运用。  
Used for liquid level measure for mediums of high temperature, 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.

产品型号 Product Model	TK-1701	
测量范围 Measuring Range	6~30m	
精 度 Accuracy	0.5级 0.5 grade	
承受范围 Bearing Scope	负压、常压、高压 Negative pressure, normal pressure, high pressure	
工作温度 Working temperature	-50~240℃	
环境温度 Environmental temperature	-20~75℃	
适用介质 Applicable medium	酸、碱、盐或聚氟乙烯无腐蚀的任意介质 Acid, alkali, salt, PTFE, any non-corrosive medium	
输出型号 Output signal	4~20mA二线制 4~20 mA two-wire system	
供电电源 Power supply	负载电阻0~750Ω DC24V Load resistance 0~750 Ω DC24V	
固定方式 Fixation method	螺纹安装M20X1.5、M27X2，法兰安装DN15、DN25、DN50、DN80特殊规格可定制 Screw installation M20X1.5, M27X2 Flange installation DN15, DN25, DN50, DN80 Special specifications can be customized	
现场显示 Site display	铝合金 Aluminum alloy	

# TKWL-1700订购信息 Ordering information for TKWL-1700 capacitance level meter

TKWL-1700						
<b>输出信号</b> Output signal						
4~20mA	D					
智能 Intelligent	S					
4~20 MA+HART	E					
<b>安装接口 Installation interface</b>						
罗纹M20*1.5外 Ribbing M20*1.5 outside	0					
罗纹1/2NPT 外 Ribbing 1/2NPT outside	1					
法兰DN25 FlangeDN25	2					
法兰DN40 FlangeDN40	3					
法兰DN50 FlangeDN50	4					
法兰DN80 FlangeDN80	5					
特殊 Special	6					
<b>传感器材质 Sensor material</b>						
Φ5的软缆 Φ5 Soft cable		C1				
Φ8的软缆 Φ8 Soft cable		C2				
Φ14的软缆 Φ14 Soft cable		C3				
Φ16的软缆 Φ16 Soft cable		C4				
Φ8的软杆高压 Φ8 Soft rod high pressure		C5				
特殊规格 Special specification		C6				
<b>电气接口 Electrical interface</b>						
0:M20*1.5内 within						
1:1/2NPT内 within						
<b>防爆等级 explosion proof class</b>						
本安型 Intrinsically safe model					I	
本安型+隔爆 Intrinsically safe model+isolating explosion					P	
<b>长度 length</b>						

# TKWL-1800电动浮筒液位计

## TKWL-1800 Electric Float Liquid Level Meter



### 概述

智能浮筒液位计依据力平衡原理，在早期浮筒液位计的基础上采用最新的传感结构，使传感器与杠杆机构合二为一，可直接测量浮筒在液体中所受的浮力，很好地解决了静压的影响。本仪表具有耐高温、耐高压的突出特点，为解决高温高压容器内的液位测量提供了良好的方法，并且该仪表具有精度高、可靠性好、调整方便、测量范围广、经久耐用、性能价格比高等优点。适合工艺流程中敞口或带压容器内的液位、界位、密度的连续测量，广泛应用于石油、化工、电力、食品、水利、冶金、热力、水泥和污水处理等行业。该仪表符合二线制4~20mA传输协议，并有本安型、隔爆型、液晶指示型、电池型、Hart型以及多种安装形式，为用户提供了非常广阔的选择空间。另外高质量的电路及传感系统，保证了在各种应用场所的优良性能。

### 主要特点

1. 三行液晶数字显示。
2. 耐高温高压、抗振性能好、质量稳定、性能可靠。
3. 采用系列化设计，多种安装方式，实用面广，可装于各种储罐和过程罐，各种常压罐和压力容器。
4. 智能化结构设计，具有参数设定、标校及故障提示功能。
5. 标准的二线制4~20mA输出，无需专用二次仪表，并可与计算机连接。
6. 具有温度补偿和软件修正功能。
7. 具有去零功能及中间点标校功能。

### Overview

According to the principle of equilibrium, based on the earlier float liquid level meter, the intelligent float liquid level meter adopts the latest sensor structure to make the sensor and the leverage become one, which can directly measure the buoyancy of the float in the liquid, thus well solving the influence of static pressure. This instrument has outstanding features of high temperature and high pressure resistance, which provides a good method to deal with the liquid level measurement inside high-temperature and high pressure vessels. Besides, this instrument is of high precision, good reliability, simple adjustment, wide range of measurement, durable service and high cost performance. It is applicable to the continuous measurement of the liquid level, boundary and density inside the open or pressure vessels in the technological process, so it is widely applied to industries like petroleum, chemical engineering, electricity, food, water conservancy, metallurgy, heating power, cement and sewage treatment. This instrument accords with the two-wire system 4~20mA transport protocol, and it has multiple installation methods like intrinsic safety type, flame-proof type, liquid crystal indication type, battery type and Hart type, thus offering users a wide range of selections. Besides, the high-quality circuit and sensor system guarantees its good performance in various applications.

### Main Features

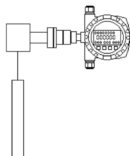
1. Three-line liquid crystal digital display.
2. High temperature and high pressure resistance, good resistance to shock, stable quality and reliable performance.
3. Serialized design, multiple installation methods and wide range of application; it can be installed to various storage tanks, processing tanks, various ordinary pressure tanks and pressure vessels.
4. Intelligent structure design, functions of parameter determination, calibration and malfunction prompt.
5. Standard two-wire 4~20mA output, no need of secondary meters, able to be connected to the computer.
6. Functions of temperature compensation and software revision.
7. Functions of zero-suppression and intermediate point calibration.

## 结构原理

### 结构

智能浮筒液位计由浮筒、指示器、传感器三部分组成，如图所示：

- (1) 液晶指示器
- (2) 传感器
- (3) 浮筒



### 工作原理

浮筒受到液体向上浮力  $F$  后通过浮力杆将浮力  $F$  作用到传感器上，如图二所示：传感器电压输出：即： $V \propto F$  因为浮筒浸没液体的高度与所受到的浮力成正比，因此，浮力的变化通过传感器电压输出就转换成对应的液体高度，并通过  $A/D \rightarrow CPU \rightarrow D/A$  转换成标准的  $4\sim 20\text{mA}$  电流输出，如图三所示：

## Structure Principle

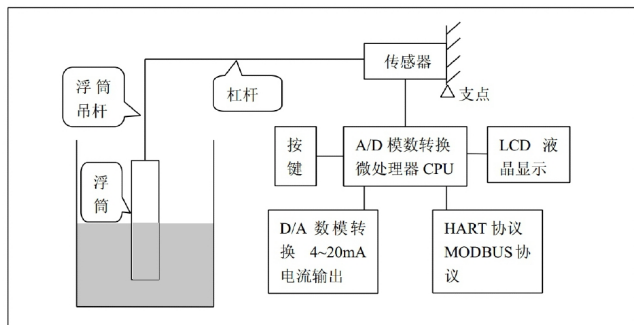
### Structure

The intelligent float liquid level meter is made up of a float, an indicator and a sensor, as shown in the figure:

- (1) Liquid crystal indicator
- (2) Sensor
- (3) Float

### Working Principle

Receiving the upward buoyancy  $F$  of the liquid, the float makes the buoyancy  $F$  work on the sensor through the buoyancy pole, as shown in figure 2: as to the sensor's voltage output, i.e.  $V \propto F$ , because of the direction proportion between the float's height of immersing in the liquid and the buoyancy it receives, the change of the buoyancy is converted to corresponding liquid height through the sensor's voltage output, which is then changed into standard  $4\sim 20\text{mA}$  current output through  $A/D \rightarrow CPU \rightarrow D/A$ , as shown in figure 3.



## 技术参数

测量范围: 0.3~6m (特殊尺寸可订购)  
精度等级: 1.0、0.5 (特殊型)  
输出信号: 4~20mA DC 二线制, 可带 HART 协议  
供电电源: 标准型: 24VDC 二线制 4~20mA (12VDC~32VDC)  
电池型: 3.6V@19AH 锂电池, 可连续使用一年  
公称压力: 最大 16MPa (特殊规格可订购)  
环境温度: -40℃~+85℃ (液晶不会损坏)  
液晶正常工作 -30℃~+80℃  
介质温度: 常温 -40℃~100℃ (无散热片)  
高温 100℃~200℃ (带散热片)  
超高温 200~450 (带散热片及夹套装置)  
介质密度: 液位  $p \geq 0.4g/cm^3$   
界面  $p_1 - p_2 \geq 0.1g/cm^3$   
接液材质: 测量室为碳钢或 1Cr18Ni9Ti 其余为 1Cr18Ni9Ti  
外壳材质: 铸铝  
连接法兰: 内浮筒 DN30 PN4.0 法兰标准 DIN2501  
外浮筒侧法兰 DN50 PN4.0 主体法兰 DN50 PN4.0 法兰标准 DIN2501  
特殊型: 由用户选择  
电缆接口: 隔爆型为 1/2NPT 内螺纹, 其它 M20\*1.5 内螺纹  
液晶显示: 主屏液位显示数值范围: 0~50000 (可带小数点) 付屏百分比显示保留一位小数  
防爆标志: 本安型 iaI CT5 隔爆型 dIBT6  
防护等级: Ip65  
负载特性:  $R_{\max} = 50^{\circ}(\text{电源电压} - 12)\Omega = 600\Omega @ 24V$

## Technical Parameters

Measurement range: 0.3~6m (special sizes can be customized)  
Accuracy grade: 1.0, 0.5 (special type)  
Output signal: 4~20mA DC two-wire system, which can be equipped with HART protocol  
Power supply: standard: 24VDC two-wire system 4~20mA (12VDC~32VDC)  
Battery type: 3.6V@19AH lithium battery, which can be continuously used for a year  
Nominal pressure: 16MPa at the maximum (special grades can be customized)  
Environment face: flame-proof type adopts 1/2NPT internal thread, others adopt M20\*1.5 internal thread  
Liquid crystal display: number range of liquid level dt temperature: -40℃~+85℃ (the liquid crystal can't be damaged), liquid crystal's normal operation -30℃~+80℃  
Medium temperature: normal temperature -40℃~100℃ (no cooling fin)  
High temperature: 100℃~200℃ (with cooling fin)  
Superhigh temperature 200~450 (with cooling fin and jacket device)  
Medium density: liquid level  $p \geq 0.4g/cm^3$   
boundary  $p_1 - p_2 \geq 0.1g/cm^3$   
Connecting liquid material: the measuring room uses carbon steel or 1Cr18Ni9Ti. Others use 1Cr18Ni9Ti  
Shell material: cast aluminium  
Connecting flange: internal float DN30 PN4.0 Flange standard DIN2501  
External float side flange DN50 PN4.0 Body flange DN50 PN4.0 Flange standard DIN2501  
Special type: chosen by users  
Cable intelsplay on the main screen: 0-50000 (with decimal point) the percentage display of the secondary screen reserves a decimal  
Explosion-proof sign: intrinsic safety type iaI CT5 Flame-proof type dIBT6  
Protection grade: Ip65  
Load characteristics:  $R_{\max} = 50^{\circ}(\text{supply voltage} - 12)\Omega = 600\Omega @ 24V$



**TKWL-1800订购信息**  
**Order Information of TKWL-1800r**

TKWL-1800									
<b>接液材质</b> <b>Connecting liquid material</b> 304 B 316 C 其他 Z(并注明) Others (noted)									
<b>精度等级</b> <b>Accuracy grade</b> ±1%F.SXP ±0.5%F.S SP									
<b>过程连接</b> <b>Process connection</b> 不锈钢法兰DN50 PN16 A Stainless steel flange DN50 Pn16 不锈钢法兰DN50 PN16 B Stainless steel flange DN50 Pn16 其他 C Others									
<b>测量范围</b> <b>Measurement range</b> 0.3-6m (订货请注明) Measurement range									
<b>介质温度</b> <b>Medium temperature</b> -40~100℃ A 100~200℃ B 200~450℃ C									
<b>介质密度</b> <b>Medium density</b> 液位 $\rho \geq 0.4\text{g/cm}^3$ Liquid level $\rho \geq 0.4\text{g/cm}^3$ 界位 $\rho 1\text{-}p2 \geq 0.1\text{g/cm}^3$ Boundary $p1\text{-}p2 \geq 0.1\text{g/cm}^3$		订货时注明(界位注明两项密度) Please specify when ordering (density of the two items should be specified at the boundary)							
<b>电气接口</b> <b>Electrical interface</b> M20×1.5 M 1/2NPT N									
<b>现场显示</b> <b>Status display</b> 带 V With 不带 X Without									
<b>防爆形式</b> <b>Anti-explosion type</b> 标准型(非防爆)电流信号输出(4~20mA) HRAT协议24VDC Standard type (not explosion proof) Current signal output (4~20mA), HRAT protocol 24VDC 本安型(ExiallCT6)电流信号输出(4~20mA) HRAT协议24VDC Standard type (not explosion proof) Current signal output (4~20mA), HRAT protocol 24VDC 本安型+隔爆型(Exd iallCT6)电流信号输出(4~20mA) HRAT协议24VDC Standard type (not explosion proof) Current signal output (4~20mA), HRAT protocol 24VDC								P I D	
<b>防护等级</b> <b>Protection grade</b> IP65 E IP67 F									

# TKWL-1900系列射频导纳物位开关

## TKWL-1900 series RF admittance level switch



### 产品概述

射频导纳是一种从电容式技术发展起来的、防挂料、更可靠、更准确、适用性更广的物位控制技术，射频导纳中的导纳的含义为电学中阻抗的倒数，它由电阻成份、电容性成份、电感性成份综合而成。而射频即发射高频无线电波，所以射频导纳物位控制技术是通过用高频无线电波测量被测介质导纳值来实现物位测量。

射频导纳技术与电容式技术最重要的区别在于测量的多样化和三电极技术。射频导纳测量的多样化在于不止是测电容量，测量的还有电阻和电感量，使测量更加准确。三电极技术包括电子单元和传感器，在测量电极和地极之间加入屏蔽电极，将测量电极保护起来，不受挂料影响。

### 技术参数

- ◆ 电源要求：交流系统：标准：185~255VAC 50/60Hz  
5W (最大)  
直流系统：24VDC系统：19~29VDC输入  
3W (最大)
- ◆ 输出：DPDT继电器 (双刀双掷)  
触点容量 220VAC 3A  
环境温度：-40~75℃  
介质温度：-40~600℃ (高温场合需选高温型)
- ◆ 延时：1~55s (可选)
- ◆ 分辨率：<0.5PF
- ◆ 高低位报警：现场可设置为高位报警方式或低位报警方式
- ◆ 温度影响：0.15pF/30℃
- ◆ 稳定性：0.1pF/6个月(最大漂移)
- ◆ 火花防护：内置火花防护电路
- ◆ 传感元件安装：NPT螺纹或法兰安装 (规格可选)
- ◆ 插入长度：标准450mm (插入长度IL)~250mm (屏蔽CSL长度)  
也可依用户要求提供，最大6m最小0.1m
- ◆ 电气接口：M20\*1.5
- ◆ 分体电缆：标准长度为5米，最长20米(仅对分体)
- ◆ 重复性：<1mm (导电介质) <10mm (绝缘介质)
- ◆ 响应时间：<0.5S

### Products summary

Radio frequency admittance is a material level control technology, developed from capacitor technology, anti-hanging material, more reliable, more accurate and with more extensive applicability. For radio frequency admittance, the meaning of admittance is reciprocal of electrical impedance, which is composed of resistive component, capacitive component and perceptual component comprehensively, while the radio frequency can be understood as emitting high-frequency radio wave, so the RF admittance level control technology realizes measurement for material level by measuring the admittance of measured medium with high-frequency radio wave.

The most important difference between RF admittance technology and capacitive technology is diversified measurement and three-electrode technology. The diversification of RF admittance measurement lies in not only measuring capacitance but also resistance and inductance, which make the measurement more accurate. Three-electrode technology includes electronic unit and sensor, add shield electrode between measured electrode and ground electrode, protect measured electrode and not affected by hanging material.

### Technical parameters

- ◆ Requirement of power:  
AC system: standard: 185~255VAC 50/60Hz 5W (max)  
DC system: 24VDC system: 19~29VDC input 3W (max)
- ◆ Output: DPDT relay (DPDT)  
Capacity of touch point 220VAC 3A  
Environmental temperature: -40~75℃  
Medium temperature: -40~600℃  
(select high-temperature model for high temperature occasions)
- ◆ Time delay: 1~55s (optional)
- ◆ Resolution: <0.5PF
- ◆ High-low level alarm: the site can be set as high level alarm method or low level alarm method
- ◆ Temperature influence: 0.15pF/30℃
- ◆ Stability: 0.1pF/6 months (max shift)
- ◆ Spark protection: built-in spark protection circuit
- ◆ Sensor installation: NPT screw thread or flange installation (specifications are optional)
- ◆ Inserting length: standard 450mm (inserting length IL)-250mm (shield length CSL)  
Can also be customized based on requirements of users, max 6m and min 0.1m
- ◆ Electrical interface: M20\*1.5
- ◆ Split cable: standard length is 5 meters, 20 meters at maximum (only for split model)
- ◆ Repeatability: <1mm (conductive medium) <10mm (insulating medium)
- ◆ Response time: <0.5S

**TKWL-1900射频导纳物位开关订购信息**  
**Ordering information of TKWL-1900 RF admittance level switch**

TKWL-1900						
<b>防爆</b> <b>Explosion proof</b> 普通型 Ordinary model P 隔爆型 Isolating explosion model D						
<b>探头材质</b> <b>Material of probe</b> 316L+陶瓷 ceramic A 316L+ B						
<b>过程连接</b> Process connection 3/4NPT螺纹连接 screw thread connection M 其他螺纹连接 other screw thread connections 法兰连接 Flange connection 请注明 Please specify						
<b>供电电源</b> Power supply 24V 2 220V 3						
<b>电气接口</b> Electrical interface M20×1.5 M 1/2NPTN N						
<b>安装类型</b> Installation type 一体式Integrated model A 分体式Split model B						
<b>插深</b> Deep inserting						请注明 Please specify

# TKWL-2100系列音叉物位开关

TKWL-2100 series tuning fork material level switch



## 产品简介

TK2100系列音叉物位开关是通过电晶体的谐振来引起其振动的,当受到物料阻尼作用时,振幅急剧降低且频率和相位发生明显变化,这些变化会被内部电子电路检测到,经过处理后,转换成开关信号输出。该产品可以对料罐的高低位进行监测、控制和报警,适用于各种液体、粉末、颗粒状固体。它实用简单、运行可靠、适应性强基本上是面维护的、音叉和输出均有工作状态,均用发光二极管指示,可依据习惯调整状态指示,并配有三种输入方式(直流24V、交流110V和交流220V)和多种输出方式(直流电流输出型、继电器接点输出型、直流电压输出型)。所有类型均有高或低故障报警模拟和可选择的仪表开关灵敏度。

## 产品特点

- ◆运行真正免受流动、湍流、气泡、泡沫、振动、固体含量、涂层、液体特性以及产品变化的影响
- ◆不需要标定而且所需要的安装工序最少
- ◆极性不敏感而且具有短路保护功能
- ◆无活动零件或缝隙真正实现免维护
- ◆发光二极管指示,可依据习惯调整状态指示
- ◆“快速滴落”的音叉设计对于粘性液体具有更快的响应时间
- ◆卫生连接件

## 测量原理

本产品是一种采用音叉原理设计的液点液位开关。使用压电晶体以音叉的固有频率对音叉进行振动。对于这种频率的变化,可进行连续监控。当产品用于低报警用途时,容器内的液体向下排放流经音叉,引起固有频率的变化,这一变化被电子元件检测,从而切换输出状态。当用于高报警用途时,容器内的液体上升并与音叉接触,又可切换输出状态。

## Brief introduction of products

TK2100 series tuning fork material level switch produces vibration through resonance of transistor. When affected by material damping, the vibration amplitude decreases dramatically and the frequency and phase change obviously, which can be examined by internal electric circuit and convert into switch signal for outputting after treatment. This product can monitor, control and report the high-low level of the material tank and is applicable for various kinds of liquids, powders and particle solid. It is simple in use, reliable in operation and strong in adaptability, which is basically surface maintenance and both the tuning fork and output are with working state and both adopt LED indicator, can adjust the status indicator based on habits and equipped with three kinds of output methods (DC24V, AC110V and AC220V) and various output methods (DC current output type, relay contact point output type and DC voltage output type). All types have high or low analog fault alarm and optional instrument switch sensitivity.

## Product characteristics

- ◆ Operation is not affected by flow, turbulence, air bubble, foam, vibration, solid content, coating, liquid property as well as change of products in a genuine way.
- ◆ No need calibration and require the least installation process
- ◆ Polarity insensitive and with short circuit protection function
- ◆ No moving parts or gap, realize maintenance free in a genuine way
- ◆ LED indicator and the status indicator can be adjusted based on habits
- ◆ "Rapid drip" tuning fork design has more rapid response time for viscous liquid.
- ◆ Sanitary connecting piece

## Principle of measurement

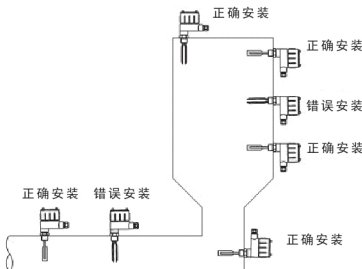
This product is liquid level switch adopting tuning fork principle design and adopts piezoelectric crystal to make vibration for tuning fork with the fixed frequency of tuning fork. It can make continuous monitoring for this kind of frequency change. When the product is used for low alarm, the liquid in the container will flow downward through tuning fork and cause the change of fixed frequency. This change is examined by electronic components and then switches output status. When applied to high alarm, the liquid in the container will rise and contact with tuning fork and also switches output status.

## 技术参数

- ※ 介质温度范围:  $-20^{\circ}\text{C}\sim 80^{\circ}\text{C}$
- ※ 环境温度:  $-20^{\circ}\text{C}\sim 60^{\circ}\text{C}$
- ※ 环境湿度:  $\leq 95\%\text{RH}$
- ※ 被测介质: 液体、粉末或颗粒状固体
- ※ 被测介质密度: 固体  $\geq 0.1\text{g/cm}^3$ ;  
液体  $\geq 0.7\text{g/cm}^3$ ;
- ※ 被测固体颗粒尺寸:  $\leq 10\text{mm}$
- ※ 最大液体粘度:  $< 1000\text{mm}^2/\text{S}$
- ※ 被测介质安息角:  $\geq 200$
- ※ 压力范围:  $\leq 1\text{MPa}$
- ※ 壳体材料: 压铸铝合金
- ※ 叉体材料: 1Cr18Ni9Ti
- ※ 外壳防护等级: IP65
- ※ 连接方式: G1螺纹
- ※ 法兰 (用户选定)
- ※ 电气参数:
  1. 供电电压: DC24V/AC220V 50HZ
  2. 输出信号: 继电器输出: 5A 220V AC  
3A 24V DC
  3. 电源功耗:  $\leq 2\text{W}$
- ※ 音叉振动频率:  $300\pm 50\text{HZ}$
- ※ 环境振动等级: V.L.4加速度不大于  $1\text{g}$
- ※ 开关信号动作时间:  $1\sim 60\text{S}$

## 安装方法

1. 仪表一般为叉端向下垂直安装、水平安装或叉端向下倾斜安装 (物料粘附性强时, 建议采用叉端向下垂直安装)。
  2. 仪表不允许仰装方式, 即叉端向上的安装方式。
  3. 对物料中混有块状或坚硬颗粒时建议采用垂直或倾斜安装方式。
  4. 在安装到设备上之前, 建议用少量的介质样品检测校准灵敏度。例如: 将仪表浸入一个安装有介质的容器内检测开关的可靠性。
  5. 实际安装时一般又分顶部安装 (对介质进行高位监测)、侧壁安装 (对介质进行高位或低位监测)、管道安装 (对料泵进行空流监测)。
- 如下图所示:



## Technical parameters

- ※ Temperature range of medium:  $-20^{\circ}\text{C}\sim 80^{\circ}\text{C}$
- ※ Environmental temperature:  $-20^{\circ}\text{C}\sim 60^{\circ}\text{C}$
- ※ Environmental humidity:  $\leq 95\%\text{RH}$
- ※ Examined medium: liquid, powder or particle solid
- ※ Density of examined medium: solid  $\geq 0.1\text{g/cm}^3$ ;  
liquid  $\geq 0.7\text{g/cm}^3$ ;
- ※ Size of examined solid particle:  $\leq 10\text{mm}$
- ※ Max liquid viscosity:  $< 1000\text{mm}^2/\text{S}$
- ※ Angle of repose of examined medium:  $\geq 200$
- ※ Pressure range:  $\leq 1\text{MPa}$
- ※ Material of shell: die-casting aluminium
- ※ Material of fork: 1Cr18Ni9Ti
- ※ Shell protection class: IP65
- ※ Connection method: G1 screw thread
- ※ Flange (selected by user)
- ※ Electrical parameters:
  1. Power supply: DC24V/AC220V 50HZ
  2. Signal output: relay output: 5A 220V AC  
3A 24V DC
  3. Power consumption:  $\leq 2\text{W}$
- ※ Vibration frequency of tuning fork:  $300\pm 50\text{HZ}$
- ※ Environmental vibration class: V.L.4, acceleration no bigger than  $1\text{g}$
- ※ Action time of switch signal:  $1\sim 60\text{S}$

## Installation Methods:

1. There are vertical installation with fork end downward, horizontal installation and tilting installation with fork end downward for meter. (it is suggested to chose vertical installation with fork end downward when material is with strong adhesion)
  2. Upturned installation that is installation method with fork end upward is not allowed.
  3. When the material is mixed with lump or hard particle, it is suggested to choose vertical or tilting installation methods.
  4. Before installing onto device, it is suggested to use a small amount of medium sample to examine the sensitivity calibration. For example, immerse the meter into a container installed with medium to examine the reliability of switch.
  5. During practical installation, there are top installation (making high monitoring for medium), side wall installation (making high or low monitoring for medium) and pipe installation (making air flow monitoring for material pump).
- As indicated in the following picture:

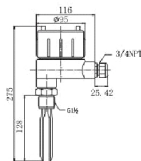
## 注意事项

1. 避免因物料粘结，阻止齿叉的振动。
2. 结垢场合下，齿叉与罐壁之间应留足空间。
3. 用于液位监测的仪表，检测点按所需监视或控制的高度确定。
4. 对于低粘度液体，音叉头能够自由的二和过程介质分开，就可以按上图所示的任何位置安装。
5. 对于高粘度液体，音叉头不能够自由的和过程介质分开，建议只能叉端向下垂直安装。
6. 用于料位监测的仪表，对于立式圆筒容器或与之近似的容器，安装位置不仅取决于需要监视或控制的料位高度，同时还需考虑物料的安息角和进料位置。水平安装时，叉端宜处在距离容器内壁三分之一容器半径处；两叉股应在同一水平面内。垂直安装在容器顶部时，安装中心与容器内壁间的距离应选在容器半径的三分之一处。仪表安装位置应尽量避免物料流的直接冲击或飞溅，以免引起错误动作及磨损，如果无法避免物料的冲击或飞溅，可以在仪表安装位置的上方安装防护檐，防护檐的有效宽度应大于叉端宽度，其长度应大于仪表实际渗入料仓的尺寸。

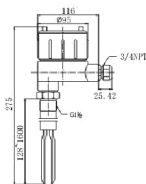
## 警告！

安装使用时，不得用手抓握仪表叉股或敲击碰撞叉股，以免叉股受力变形，甚至造成内部压电元件损坏。

## 尺寸图

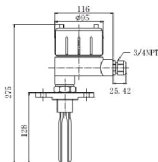


普通型

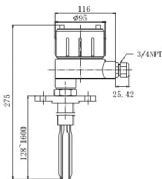


加长型

## 螺纹安装



普通型



加长型

## 法兰安装

## Attentions

1. Avoid the prevention of fork vibration caused by material bonding.
2. Under scar occasion, it should keep enough space between fork and tank wall.
3. Meters for liquid monitoring, the check points are determined by the height of needed monitoring or control.
4. For liquid with low viscosity, the fork head can be separated from process medium freely and can be installed on any location based on above picture.
5. For liquid with high viscosity, the fork head can't be separated from process medium and it is suggested to make vertical installation with fork downwards.
6. Meters used for monitoring of material level, for vertical cylindrical container or containers in similar shape, the installation position is not only determined by the height of material level for monitoring or control, at the same time, it also needs to consider about the repose angle and feed position of material. During horizontal installation, the fork end is better positioned at the diameter place with 1/3 distance to container wall; the two forks should in the same level. When vertically installed at the top of the container, the distance between installation center and inner container wall should be positioned at 1/3 of container diameter. The installation position of the meter should try to avoid direct attack or splash of material flow to avoid wrong action and abrasion; if unable to avoid the attack or splash of material, it can install protective canopy above the installation position of meter; the effective width of canopy should be bigger than the width of fork and its length should be bigger than the real size of meter penetrating into the material warehouse.

## Warnings!

During installation and usage, grasping of meter fork with hands or knocking and touching fork is forbidden to avoid deformation of fork or even the damage of internal piezoelectric components.

## Dimensions

**TKWL-1700订购信息**  
**Ordering information for TKWL-1700 capacitance level meter**

TKWL-1700					
SC	音叉式液位开关 turning fork type liquid level switch				
SG	音叉式液位开关 turning fork type liquid level switch				
	0	两线制串继电器或负载 Two wire system relay or loading		输出方式 Output mode	
	1	继电器输出 Relay output			
	0	标准型 standard model			叉体形式 Fork form
		□	延长型，数字为叉体长度，范围： Extension model, the number is the length of fork, ranging 200~2000mm		
			1	固定螺纹G1" Fixed screw thread G1	
		2	固定法兰DN32 Fixed flange DN32		
		3	活动螺纹G1" Movable screw thread G1		
		4	法兰DN32 Flange DN32		
		N	N普通型 Normal type		防爆选项 Option of explosion proof
		D	隔爆型（MSG型无） Isolating explosion model (exclude MSG model)		
		E	本安型（MSG型无） Intrinsically safe model (exclude MSG model)		
		S	标准型 Standard model		工作温度 Working temperature
			M	中温型 Medium temperature model	