TKWL-1400系列80GHz调频雷达物位计

TKWL-1400 Series 80GHz Radar Level Gauge

产品概述

Product Overview

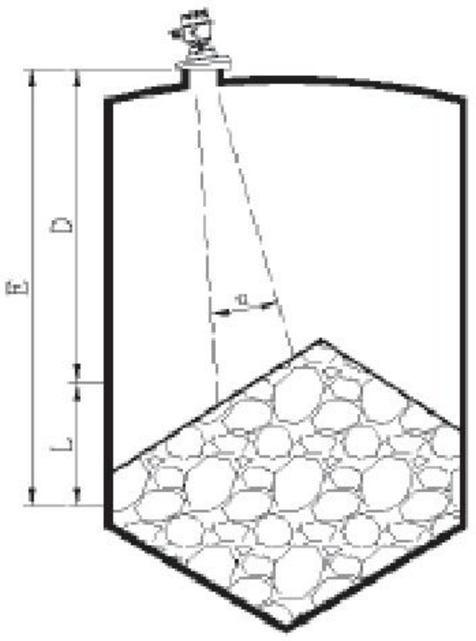
TKWL-1400系列80GHz调频雷达物位计指工作在W波段（76-81GHz）的调频连续波（FMCW）雷达产品，支持四线制和两线制应用。输出4~20Ma模拟信号，测量最大距离可达120米。由于它工作频率更高，波长更短，所以尤其适合固体应用，通过透镜发射接收电磁波的工作方式，在高粉尘，恶劣温度环境下具有独特的优势。仪表提供法兰或者螺纹的固定方式，使得安装便捷简易。

The TKWL-1400 series is an 80GHz radar level gauge that operates in the W-band frequency range (76-81GHz) using Frequency Modulated Continuous Wave (FMCW) radar technology. It supports both four-wire and two-wire applications and provides a 4-20mA analog output signal. It can measure distances up to 120 meters. With its higher operating frequency and shorter wavelength, it is particularly suitable for solid applications. The gauge utilizes a lens to emit and receive electromagnetic waves, providing unique advantages in high-dust and harsh temperature environments. The instrument offers flange or threaded mounting options, ensuring convenient and easy installation.

产品原理

Product Principle

80GHz调频雷达物位计是基于调频连续波技术的先进测量系统。雷达物位计通过天线传感器发射连续的微波信号，该发射信号的频率由锯齿波进行线性调制。连续发射的微波信号遇到被测介质表面时，由于介电常数发生突变，微波信号的部分能量被连续的反射回来，并被透镜天线系统所接收。



接收信号的频率与发射信号的频率总是存在差值的，而该差值与雷达天线到被测介质表面的距离成正比，越大的频率差值代表着越远的物料距离。由式（1）即可计算出被测介质到仪表法兰的距离。

$$D=1/2\cdot c\cdot(\Delta F/R) \quad (1)$$

其中D为测量参考面到被测介质的距离，c为光（电磁波）在真空中的传播速度，ΔF为接收信号与发射信号的频率差，R为发射信号频率随时间的变化率。

然后根据用户设定的空料位位置，由式（2）即可计算出物料高度。

$$L=E-D \quad (2)$$

其中E为测量参考面到用户设定的空料位位置，D为测量参考面到被测介质的距离，L为物料高度。

The 80GHz radar level gauge operates on the principle of Frequency Modulated Continuous Wave (FMCW) technology, which is an advanced measurement system. The gauge emits continuous microwave signals through the antenna sensor, with the frequency of the transmitted signal being linearly modulated by a sawtooth waveform. When the emitted microwave signal encounters the surface of the measured medium, a portion of its energy is reflected back continuously due to the abrupt change in the dielectric constant. These reflected signals are then received by the lens antenna system.

The frequency of the received signal always exhibits a difference compared to the frequency of the transmitted signal. This frequency difference, known as the frequency shift, is directly proportional to the distance between the radar antenna and the surface of the measured medium. A larger frequency shift corresponds to a greaterdistance of the material being measured. The distance from the reference point of measurement to the

instrument flange can be calculated using Equation (1): D = (c * ΔF) / (2 * R) (1)
Where: D is the distance from the reference point to the surface of the measured medium. c is the speed of light (electromagnetic waves) in a vacuum. ΔF is the frequency difference between the received and transmitted signals. R is the rate of change of the transmitted signal frequency over time.
Subsequently, based on the user-defined empty level position, the material height can be determined using Equation (2): L = D - E (2)
Where: E is the distance from the reference point to the user-defined empty level position. D is the distance from the reference point to the surface of the measured medium. L represents the material height.

产品特点

Product Features

1、显示界面简单易懂，快速设置菜单便于用户操作；
2、非接触测量，无磨损，无污染；
3、波长更短，在固体表面具有更好的反射特性；
4、仪表信噪比高，盲区小，可实现小型容器精确测量；
5、最窄3°天线波束角，安装环境中的干扰对仪表的影响更小，安装更为便捷；
6、几乎不受腐蚀、泡沫影响；
7、几乎不受大气中水蒸气、温度和压力变化影响；
8、5GHz工作带宽，使产品拥有更高的测量分辨率与测量精度；
9、80GHz频率，是测量固体和低介电常数介质的最佳选择。

1. User-friendly display interface with quick setup menu for easy operation.
2. Non-contact measurement, no wear and no contamination.
3. Shorter wavelength providing better reflection characteristics on solid surfaces.
4. High signal-to-noise ratio and small blind zone, enabling precise measurement in small containers.
5. Narrow 3° antenna beam angle, minimizing the impact of environmental interference and facilitating convenient installation.
6. Minimal impact from corrosion and foam.
7. Insensitive to changes in water vapor, temperature, and pressure in the atmosphere.
8. 5GHz operating bandwidth for higher measurement resolution and accuracy.
9. 80GHz frequency, making it the optimal choice for measuring solids and low dielectric constant media.

产品信息

Product Information

TKWL-1401

应用：液体 轻微腐蚀性液体 测量范围：120m 测量精度：±1mm 过程温度：-40~100℃/-40~1000℃ 过程压力：常压/-0.1~1.0MPa 频率：80G 输出信号：4-20mA/HART/Modbus 电源：两线制（DC24V） 四线制（DC24V/AC220V） 现场显示：标配 过程连接：螺纹/法兰/支架 天线：透镜 防爆标志：ExdbIICT6 Gb ExiaIICT6 Ga ExdbIIBT4 Gb Extb IIICT80℃ Db	Application: Measurement of liquids, mildly corrosive liquids Measurement range: 120m Measurement accuracy: ±1mm Process temperature: -40 to 100°C/-40 to 1000°C Process pressure: Atmospheric pressure/-0.1 to 1.0MPa Frequency: 80GHz Output signal: 4-20mA/HART/Modbus Power supply: Two-wire system (DC24V), Four-wire system (DC24V/AC220V) On-site display: Standard Process connection: Thread/Flange/Bracket Antenna: Lens Explosion-proof marking: ExdbIICT6 Gb ExiaIICT6 Ga ExdbIIBT4 Gb Extb IIICT80℃ Db

 TKWL-1402	应用：液体 过程条件复杂的强腐蚀性液体 测量范围：120m 测量精度：±1mm 过程温度：-40~120℃/-40~200℃ 过程压力：常压/-0.1~4.0MPa 频率：80G 输出信号：4-20mA/HART/Modbus 电源：两线制（DC24V） 四线制（DC24V/AC220V） 现场显示：标配 过程连接：法兰 天线：透镜 防爆标志：ExdbIICT6 Gb ExiaIICT6 Ga ExdbIIBT4 Gb Extb IIICT80℃ Db	Application: Measurement of liquids, highly corrosive liquids with complex process conditions Measurement range: 120m Measurement accuracy: ±1mm Process temperature: -40 to 120°C /-40 to 200°C Process pressure: Atmospheric pressure /-0.1 to 4.0MPa Frequency: 80GHz Output signal: 4-20mA/HART/Modbus Power supply: Two-wire system (DC24V), Four-wire system (DC24V/AC220V) On-site display: Standard Process connection: Flange Antenna: Lens Explosion-proof marking:ExdbIICT6 Gb ExiaIICT6 Ga ExdbIIBT4 Gb Extb IIICT80℃ Db
 TKWL-1403	应用：固体 存储容器、过程容器或强粉尘易结晶、结露场合 测量范围：120m 测量精度：±1mm 过程温度：-40~200℃ 过程压力：常压/-0.1~4.0MPa 频率：80G 输出信号：4-20mA/HART/Modbus 电源：两线制（DC24V） 四线制（DC24V/AC220V） 现场显示：标配 过程连接：法兰 天线：透镜 防爆标志：ExdbIICT6 Gb ExiaIICT6 Ga ExdbIIBT4 Gb Extb IIICT80℃ Db	Application: Measurement of solids in storage vessels, process containers, or environments with heavy dust, crystallization, or condensation Measurement range: 120m Measurement accuracy: ±1mm Process temperature: -40 to 200°C Process pressure: Atmospheric pressure / -0.1 to 4.0MPa Frequency: 80GHz Output signal: 4-20mA/HART/Modbus Power supply: Two-wire system (DC24V), Four-wire system (DC24V/AC220V) On-site display: Standard Process connection: Flange Antenna: Lens Explosion-proof marking:ExdbIICT6 Gb ExiaIICT6 Ga ExdbIIBT4 Gb Extb IIICT80℃ Db

选型指南

Selection Handbook

TKWL-1401						

电气接口
Electrical Entry

M20*1.5	M
1/2NPT	N
特殊定制	X
Special Customization	

外壳材质
Enclosure Material

铸铝	L
Cast Aluminum	
不锈钢	Q
Stainless Steel	

电子组件
Electronic Components

4-20mA/HART/24V DC 两线制	A
4-20mA/HART/24V DC Two-wire system	
4-20mA/HART/24V DC 四线制	B
4-20mA/HART/24V DC Four-wire system	
4-20mA/HART /220V AC四线制	C
4-20mA/HART/220V AC Four-wire system	
特殊定制	X
Special Customization	

密封温度
Sealing Temperature

普通密封-40-100℃	P
Standard sealing, -40 to 100°C	
高温密封-40-1000℃带散热器	G
High-temperature sealing with radiator, -40 to 1000°C	

过程连接
Process Connection

G1-1/2螺纹	A
G1-1/2 Threaded	
G3-1/2螺纹	B
G3-1/2 Threaded	

DN50法兰 DN50 Flange	C	
DN80 法兰 DN80 Flange	D	
DN100 法兰 DN100 Flange	E	
DN125 法兰 DN125 Flange	F	
DN150 法兰 DN150 Flange	G	
特殊定制 Special Customization	Z	

防爆形式 **Explosion Protection Type**	
普通型 Ordinary Type	P
防爆型 Explosion-proof Type	D

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TKWL-1402						

电气接口
Electrical Entry

M20*1.5	M
1/2NPT	N
特殊定制 Special Customization	X

外壳材质
Enclosure Material

铸铝 Cast Aluminum	L
不锈钢 Stainless Steel	Q

电子组件
Electronic Components

4-20mA/HART/24V DC 两线制 4-20mA/HART/24V DC Two-wire system	A
4-20mA/HART/24V DC 四线制 4-20mA/HART/24V DC Four-wire system	B
4-20mA/HART /220V AC四线制 4-20mA/HART/220V AC Four-wire system	C
特殊定制 Special Customization	X

密封温度 Sealing Temperature

普通密封-40-120℃ Standard sealing, -40 to 120°C	P
高温密封-40-200℃带散热器 High-temperature sealing with radiator, -40 to 200°C	G

天线材料/过程连接
Antenna Material/Process Connection

不锈钢复合PTFE法兰 DN50 Stainless Steel with PTFE Composite Flange DN50	A
不锈钢复合PTFE法兰 DN65 Stainless Steel with PTFE Composite Flange DN65	B
不锈钢复合PTFE法兰 DN80 Stainless Steel with PTFE Composite Flange DN80	C
不锈钢复合PTFE法兰 DN100 Stainless Steel with PTFE Composite Flange DN100	D
不锈钢复合PTFE法兰 DN125 Stainless Steel with PTFE Composite Flange DN125	E
不锈钢复合PTFE法兰 DN150 Stainless Steel with PTFE Composite Flange DN150	F
特殊定制 Special Customization	X

防爆形式 **Explosion Protection Type**	
普通型 Ordinary Type	P
防爆型 Explosion-proof Type	D

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TKWL-1403					

电气接口
Electrical Entry

M20*1.5	M
1/2NPT	N
特殊定制 Special Customization	X

外壳材质
Enclosure Material

铸铝 Cast Aluminum	L
不锈钢 Stainless Steel	Q

电子组件
Electronic Components

4-20mA/HART/24V DC 两线制 4-20mA/HART/24V DC Two-wire system	A
4-20mA/HART/24V DC 四线制 4-20mA/HART/24V DC Four-wire system	B
4-20mA/HART /220V AC四线制 4-20mA/HART/220V AC Four-wire system	C
特殊定制 Special Customization	X

过程连接
Process Connection

DN80 法兰 DN80 Flange	A
DN100 法兰 DN100 Flange	B
DN125 法兰 DN125 Flange	C
DN150 法兰 DN150 Flange	D
特殊定制 Special Customization	Z

防爆形式
Explosion Protection Type

普通型 Ordinary Type	P
防爆型 Explosion-proof Type	D