Wireless Top-Mounted

Ultrasonic Level Sensor

Wireless Sensor Network Based on LoRa Technology

R718PE01

Data Sheet

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Introduction

R718PE01 is a wireless communication device that uses ultrasonic waves to measure distance. The ultrasonic transmission medium of the R718PE01 ultrasonic sensor is air, so the measured object can be any liquid or solid with a certain plane, which can be used for liquid-level detection, material-level detection, etc. The detection angle of R718PE01 is about 20 °, which has a stronger transmission signal and is more suitable for the detection of objects such as grain heaps and sand. The R718PE01 body and the ultrasonic ranging sensor communicate through UART serial port, and the detected data is transmitted to other devices for display through the wireless network, which adopts the wireless communication mode in line with the LoRa™ protocol standard.

Operating Principle

Module R100H (R100L) and ultrasonic liquid level sensor communicate through UART serial port.

The principle of ultrasonic distance measurement is that the ultrasonic wave is sent out by the ultrasonic transmitter, which is based on the time difference when the receiver receives the ultrasonic wave. The ultrasonic transmitter emits ultrasonic waves in a certain direction and starts timing at the same time as the launch time. When the ultrasonic waves are propagating in the air, they will return immediately when they encounter obstacles on the way, and the ultrasonic receiver will stop timing immediately after receiving the reflected waves. (the propagation speed of ultrasonic waves in the air is 340m/s. According to the time t (seconds) recorded by the timer, the distance (s) between the starting point and the obstacle can be calculated, that is, s=340t/2)

Main Characteristic

- Adopt SX1276 wireless communication module
- Compatible with LoRaWAN™ Class A
- 2 x ER14505 batteries AA size (3.6V/ section) supply power in parallel
- Protection grade: device body - IP65/IP67 (optional); ultrasonic probe - IP67
- Frequency hopping spread spectrum (FHSS)
- UART serial communication
- Configuration parameters can be configured through third-party software platforms, data can be read and alarms can be set via SMS text and email (optional)
- Applicable to the third-party platforms: Actility/ThingPark, TTN, MyDevices/Cayenne
- Low power consumption and long battery life

Note:

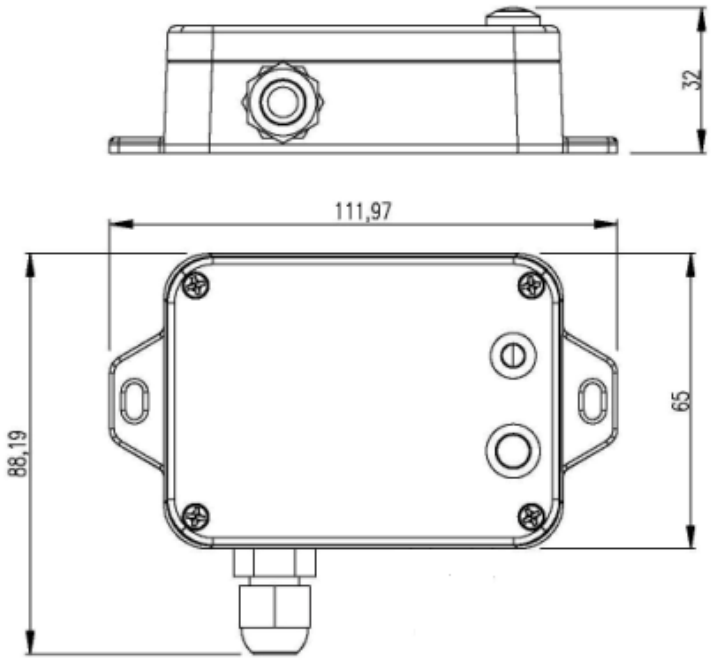
Battery life is determined by the sensor reporting frequency and other variables, please refer to http://www.netvox.com.tw/electric/electric_calc.html

On this website, users can find the battery life of various models in different configurations.

Application

- Material level detection
- Others

Dimension



Electric

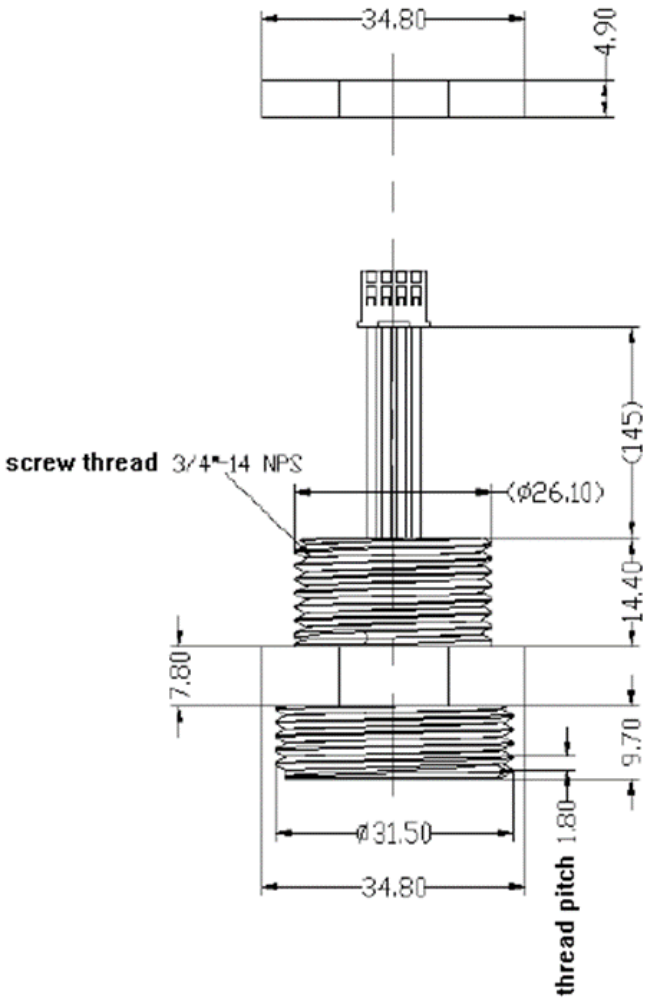
Power Supply Mode	2 x ER14505 lithium batteries connected in parallel (3.6V, 2400mAh/ section)
Battery Life	About 2.6 years (Conditions: ambient temperature 25 ℃, 15min report once, txpower=20dbm, LoRa spread spectrum factor SF=10)
Sleeping Current	< 30uA
Wake-up Current	Wake up current (when there is no LoRa transmitting and receiving data) Range value: 0.8mA-20mA
Battery Low Voltage Alarm Value	3.2V
Battery Measurement Accuracy	±0.1V

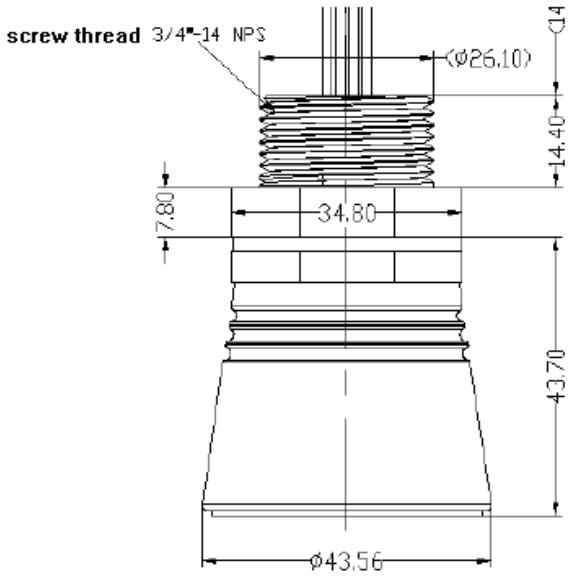
R100H Module

Wake-up Current	(0.8mA-8mA)/ 3.3V
RF Receiving Current	11mA/ 3.3V
RF Transmission Current	120mA/ 3.3V

*The specific electrical characteristics will vary according to the power supply voltage.

A08A Ultrasonic Distance Sensor

Working Current	< 15mA
Measuring Range	0.25-8m
Measurement Blind Area	0-0.25m
Detection Angle	About 20°
Measurement Accuracy	±(1+S*0.3%) cm (S is the current measured length and the measured object is a plane)
Size (the connecting line is subject to the real object)	

	
Length of Connecting Line	50 cm
Working Temperature	-15℃ ~ 55℃
Working Humidity	<80% RH
*Installation Method	Top mount

Frequency

Frequency Range	863MHz-928MHz 470MHz-510MHz
TX Power	US915 20dbm; AS923 16dbm; AU915 20dbm; CN470 19.15dbm; EU868 16dbm; KR920 14dbm; IN865 20dbm;
Receiving Sensitivity	-136 dBm (LoRa, Spreading Factor=12, Bit Rate = 293bps) -121 dBm (FSK, Frequency deviation=5kHz, Bit Rate=1.2kbps)
Antenna Type	Built-in antenna

Communication Distance	10 km (Visible linear obstacle-free transmission distance, actual transmission distance depending on the environment.)
Data Transfer Rate	0.3kbps ~ 50kbps (LoRa) 1.2kbps ~ 300kbps (FSK)
Modulation	LoRa / FSK (Note: choose one of them)
Supportable LoRaWAN Frequency	EU863-870, US902-928, AU915-928, KR920-923, AS923-1, AS923-2, AS923-3, IN865-867,CN470-510 (Note: The frequency band is optional and needs to be configured before shipment.)

Physical

Dimension	L: 112 mm x W: 88.19 mm x H: 32 mm
Weight	0.24 kg (Including the batteries)
Environment Humidity Range	<90 %RH (No condensation)
Operating Temperature	-15°C to 55 °C
Storage Temperature	-25°C to 70 °C

The installation method for reference

According to the actual application scenario, the installation of the main part can be fixed with screws (two) and screw fixing seats (two plastic bolts), or fixed with 3M glue.

The picture below is for reference only.

The actual installation position of the ultrasonic sensor can be installed at the middle position of the top of the container or at the flat position of the top of the container to ensure that the ultrasonic detection direction is perpendicular to the plane of the tested object to ensure the accuracy of measurement.

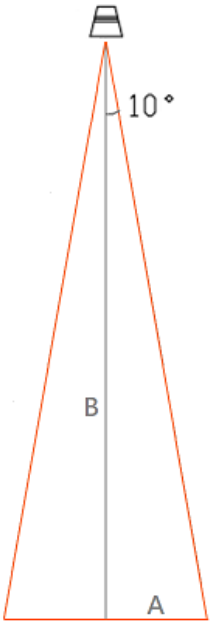
1. When the measured object is in peak or valley shape, the data returned by the device is the position distance value that meets the detection requirements of the ultrasonic sensor within the measurement range.

In addition, the following formula can be used to calculate whether the container is applicable:

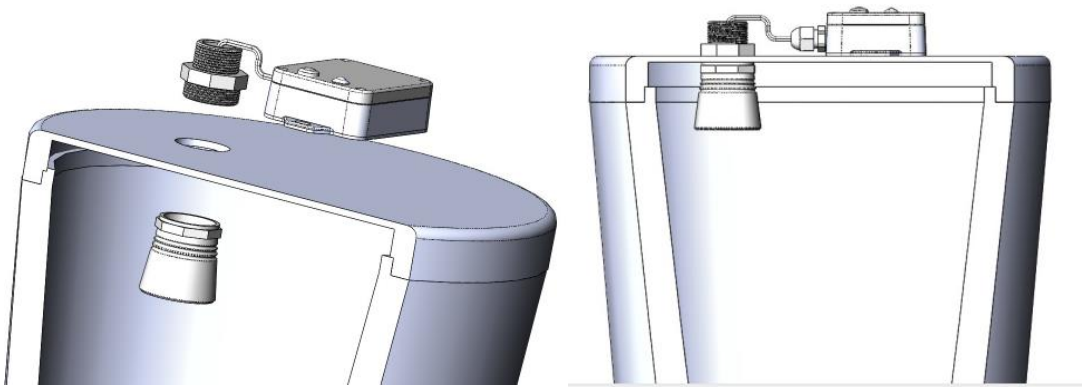
A is the radius of the water tower

B is the height of the container

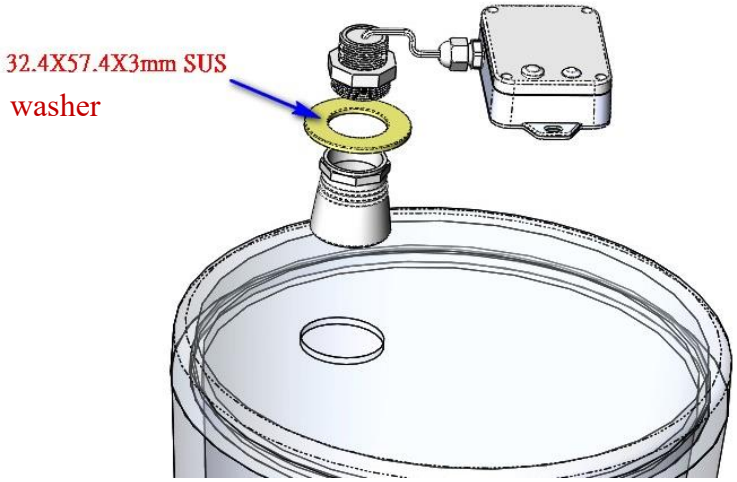
Calculate **tan10 ° =A / B** according to the Pythagorean theorem

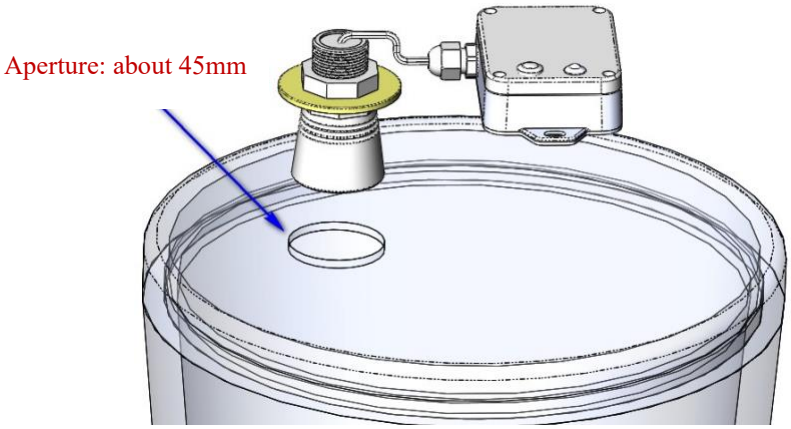


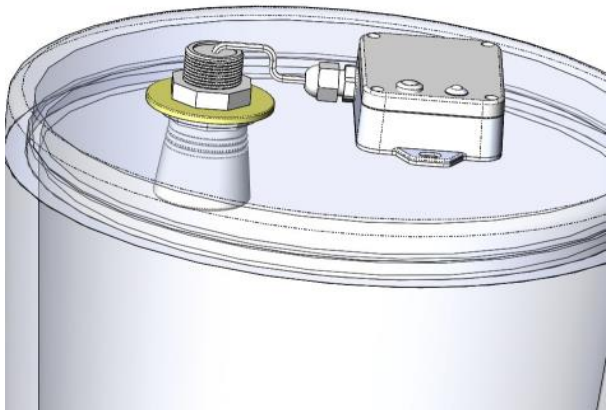
1. The container has an upper cover that can be opened (the thickness is not more than 3mm), and a round hole with a diameter of 32mm is opened on the upper cover, as shown in the figure for reference.



2. The container has no upper cover that can be opened. A circular hole with a diameter of about 45mm must be opened at the top of the container. A 32.4*57.4*3mm gasket is added between the ultrasonic probe and the bell mouth, as shown in the figure for reference.





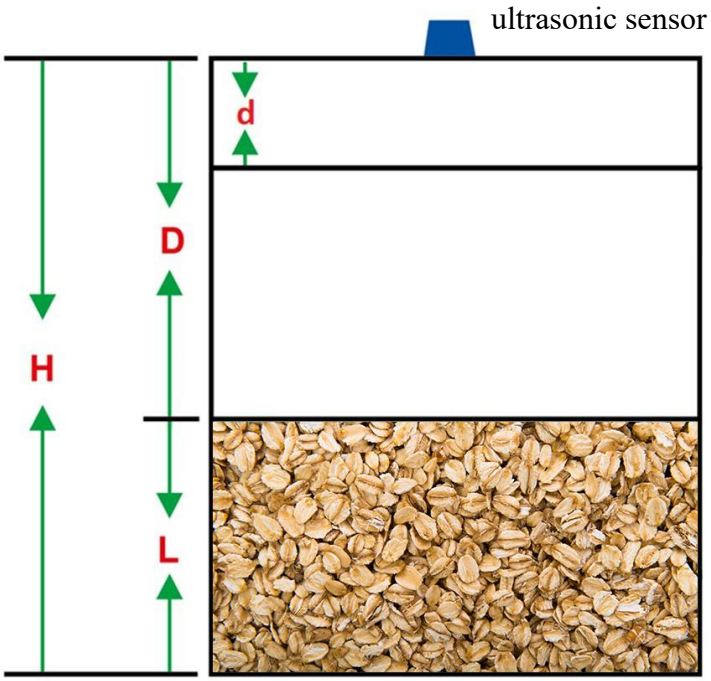


Installation precautions:

1. The position directly below the ultrasonic probe should be avoided as far as possible to avoid the sharp fluctuation of the material level such as the inlet and outlet or to block the position of the probe, so as to reduce the impact on the measurement accuracy

2. There shall be no obstacles within the range radiated by the ultrasonic beam to avoid affecting the measurement.

3. The installation site should be as far away as possible from the device that produces strong electromagnetic interference.



Note:

In the above figure, H represents the total height of the container, D represents the measured value of the ultrasonic sensor, and L represents the height of the material level, so L=H-D. d means the blind area of the ultrasonic sensor is 0~25cm.

Comparison between R718PE & R718PE01 & R718PE02

Model	R718PE	R718PE01	R718PE02
Sensor type	Ultrasonic Level Sensor	Ultrasonic Level Sensor	LiDAR Material Level Detection Sensor
Measurement range	0.25-8m	0.25-8m	90% Reflectivity 0Klux，0.1-25m； 10% Reflectivity 0Klux，0.1-12m； 90% Reflectivity 100Klux，0.1-25m； 10% Reflectivity 0Klux，0.1-12m；
Measurement dead zone	0-0.25m	0-0.25m	0-0.1m
Detect angle	about 15°	about 20°	3º
Sensor probe waterproof level	IP67	IP67	IP5X Not waterproof
Application	Liquid-level detection	Plane and material level detection.	Material level detection.
Note	It is not suitable for scenarios where the liquid level fluctuates greatly or the measured object is uneven, nor is it suitable for high temperature, high pressure, and vacuum environments, and its performance is susceptible to electromagnetic interference and crosstalk.		Advantages: Accurate measurement, not affected by the surface state of the detected object, and can be used for slope measurement. Disadvantages: Susceptible to dust, and steam. Unable to measure transparent liquids.