Wireless Bottom-Mounted Ultrasonic Liquid Level Sensor

R718PA22
User manual

Table of Contents

1. Introduction 2

2. Appearance 3

3. Features 3

4. Setup Instructions 4

5. Data Report 5

5.1 Example of ReportDataCmd 5

5.2 Example of ConfigureCmd 7

5.3 Example of Set/GetSensorAlarmThresholdCmd 9

5.4 Example of NetvoxLoRaWANRejoin 10

6. Installation 13

7. Important Maintenance Instructions 15

1. Introduction

R718PA22 is a wireless liquid level and surface temperature (the temperature of the contact surface between the container and the sensor) detection device of netvox Class A device based on LoRaWAN open protocol. The liquid currently required to be measured can be configured through LoRaWAN command, and the measurable liquid includes water, gasoline and diesel oil.

LoRa Wireless Technology

LoRa is a wireless communication technology dedicated to long distance and low power consumption. Compared with other communication methods, LoRa spread spectrum modulation method greatly increases to expand the communication distance. Widely used in long-distance, low-data wireless communications. For example, automatic meter reading, building automation equipment, wireless security systems, industrial monitoring. Main features include small size, low power consumption, transmission distance, anti-interference ability and so on.

LoRaWAN

LoRaWAN uses LoRa technology to define end-to-end standard specifications to ensure interoperability between devices and gateways from different manufacturers.

2. Appearance

3. Features

- SX1276 wireless communication module
- DC 12V adapter power supply
- Main body: IP65/IP67 (optional); ultrasonic probe: IP67
- RS485 communication
- Magnetic base
- Compatible with LoRaWAN™ Class A
- Frequency hopping spread spectrum technology
- Applicable to third-party platforms: Actility / ThingPark / TTN / MyDevices / Cayenne

4. Setup Instructions

On/Off

Power on	DC12V power supply
Turn on	The green light flashes once.
Turn off (Factory resetting)	Press and hold the function key for 5 seconds until the green indicator flashes 20 times.
Power off	Unplug the power adapter.
Note	a. Five seconds after the device is powered on, it will be in engineering test mode. b. The on/off interval should be 10 seconds long to avoid the interference of capacitor inductance and other energy storage components.

Network Joining

Never joined the network	Turn on the device to search the network. The green indicator stays on for 5 seconds: Success The green indicator remains off: Fail
Had joined the network (without factory resetting)	Turn on the device to search the previous network. The green indicator stays on for 5 seconds: Success The green indicator remains off: Fail
Fail to join the network	Please check the device verification information on the gateway or consult your platform server provider.

Function Key

Press and hold for 5 seconds	Restore to factory setting / Turn off The green indicator flashes for 20 times: Success The green indicator remains off: Fail
Press once	The device is in the network: The green indicator flashes once. The device is not in the network: The green indicator remains off.

5. Data Report

When the device is powered on, it will immediately send a version report and the liquid level status.

Before any configuration, the device sends data according to the default configuration.

Default setting:

Max time: Max Interval = 0x0384 (900s)

Minimum time: Min Interval = 0x0384 (900s) (detect the voltage every Min Interval by default)

Battery Voltage Change: 0x01 (0.1V) // 0x00 = The device is powered by DC/AC power source.

Depth Change: 0x01 (1mm)

Note: a. The cycle of the device sending the data report is according to the default.

b. The interval between two reports must be the minimum time.

c. Please refer Netvox LoRaWAN Application Command document and Netvox Lora Command Resolver http://www.netvox.com.cn:8888/cmddoc to resolve uplink data.

Data report configuration and sending period are as follows:

Min. Interval (Unit: second)	Max. Interval (Unit: second)	Reportable Change	Current Change≥ Reportable Change	Current Change＜ Reportable Change
Any number between 1–65535	Any number between 1–65535	Cannot be 0	Report per Min. Interval	Report per Max. Interval

5.1 Example of ReportDataCmd

FPort: 0x06

Bytes	1	1	1	Var (Fix = 8 bytes)
	Version	DeviceType	ReportType	NetvoxPayLoadData

Version—1 byte – 0x01——the Version of NetvoxLoRaWAN Application Command Version

DeviceType—1 byte – Device Type of Device

The devicetype is listed in Netvox LoRaWAN Application Devicetype doc

ReportType—1 byte – the presentation of the NetvoxPayLoadData, according to the devicetype

NetvoxPayLoadData—Fixed bytes (Fixed = 8 bytes)

Tips

1. Battery Voltage

When the battery = 0x00, the device is powered by a DC power source.

2. Version Packet

When Report Type=0x00 is the version packet, such as 019B000A02202302250000, the firmware version is 2023.02.25.

3. Data Packet

When Report Type=0x01 is data packet.

Device	Device Type	Report Type	NetvoxPayLoadData					
R718PA22	0x9B	0x00	SoftwareVersion (1 byte) e.g.0x0A—V1.0		HardwareVersion (1 byte)	DateCode (4 bytes, e.g. 0x20170503)		Reserved (2 bytes, fixed 0x00)
		0x01	Battery (1 byte, unit: 0.1V)	Depth (2 bytes, Unit: 1mm)	Temperature (Signed 2 bytes, Unit: 1°C)	InstallStatus (1 byte, 0x00_sucess, 0x01_failure)	ThresholdAlarm (1 byte, Bit0_Low Depth Alarm, Bit1_High Depth Alarm, Bit4-7: Reserved)	Reserved (1 byte, fixed 0x00)

Example of Uplink: 019B010000FAFFFFFF0000

1st (01): Version

2nd (9B): DeviceType — R718PA22

3rd (01): ReportType

4th (00): Battery — 0V DC power supply

5th – 6th (00FA): Depth — 250mm 00FA (H_{ex}) = 250 (D_{ec}), 250* 1mm = 250mm

7th – 8th (FFFF): Temperature — N/A

9th (FF): InstallStatus — N/A

10th (00): ThresholdAlarm — No alarm 0x00 = 0000 0000 (B_{in})

11th (00): Reserved

Note: R718PA22 does not support Temperature and InstallStatus detection.

5.2 Example of ConfigureCmd

FPort: 0x07

Bytes	1	1	Var (Fix = 9 bytes)
	CmdID	DeviceType	NetvoxPayLoadData

CmdID– 1 byte

DeviceType– 1 byte – Device Type of Device

NetvoxPayLoadData– var bytes (Max = 9 bytes)

Description	Device	Cmd ID	Device Type	NetvoxPayLoadData					
ConfigReport Req	R718PA22	0x01	0x9B	MinTime (2 bytes, Unit: s)	MaxTime (2 bytes, Unit: s)	BatteryChange (1 byte, Unit: 0.1v)	DepthChange (2 bytes, Unit: 1mm)	Temperature Change (1 byte, Unit:1℃)	Reserved (1 bytes, Fixed 0x00)
ConfigReport Rsp		0x81		Status (0x00_success)		Reserved (8 Bytes, Fixed 0x00)			
ReadConfigReportReq		0x02		Reserved (9 Bytes, Fixed 0x00)					
ReadConfigReportRsp		0x82		MinTime (2 bytes, Unit: s)	MaxTime (2 bytes, Unit: s)	BatteryChange (1 byte Unit: 0.1v)	DepthChange (2 bytes, Unit: 1mm)	Temperature Change (1 byte, Unit: 1℃)	Reserved (1 Bytes, Fixed 0x00)
SetMeasureTypeReq		0x03		Measure type (1 byte) 0x01_water, 0x02_ oil		Reserved (8 bytes, Fixed 0x00)			
SetMeasureTypeRsp		0x83		Status (0x00_success)		Reserved (8 bytes, Fixed 0x00)			
GetMeasureTypeReq		0x04		Reserved (9 Bytes, Fixed 0x00)					
GetMeasureTypeRsp		0x84		Measure type (1 byte) 0x01_water, 0x02_ oil		Reserved (8 bytes, Fixed 0x00)			

(1) Configure device parameters MinTime = 0x003C (1min), MaxTime = 0x003C (1min), BatteryChange = 0x01 (0.1V), Depth Change = 0x0001 (1mm), TemperatureChange = 1℃

Downlink: 019B003C003C0100010100

Response: 819B0000000000000000 (Configuration succeeded)

819B0100000000000000 (Configuration failed)

Note: Though R718PA22 is a DC-powered device (BatteryChange is invalid), the BatteryChange = 0x01 because of the software limitation.

(2) Read device configuration parameters

Downlink: 029B0000000000000000

Response: 829B003C003C0100010100 (current parameters)

(3) Configure device Measure Type 0x02_oil

Downlink: 039B0200000000000000

Response: 839B0000000000000000 (Configuration succeeded)

839B0100000000000000 (Configuration failed)

(4) Read device configuration parameters

Downlink: 049B0000000000000000

Response: 849B0200000000000000 (current parameters)

5.3 Example of Set/GetSensorAlarmThresholdCmd

FPort: 0x10

CmdDescriptor	CmdID (1 byte)	Payload (10 bytes)			
SetSensorAlarmThresholdReq	0x01	Channel (1 byte, 0x00_Channel1, 0x01_Chanel2, 0x02_Channel3, etc.)	SensorType (1 byte, 0x00_Disable ALL SensorthresholdSet 0x2D_ Depth,)	SensorHighThreshold (4 bytes, Unit: mm)	SensorLowThreshold (4 bytes, Unit: mm)
SetSensorAlarmThresholdRsp	0x81	Status (0x00_success)	Reserved (9 Bytes, Fixed 0x00)		
GetSensorAlarmThresholdReq	0x02	Channel (1 byte, 0x00_Channel1, 0x01_Chanel2, 0x02_Channel3, etc.)	SensorType (1 byte, 0x00_Disable ALL SensorthresholdSet 0x2D_ Depth)	Reserved (8 bytes, Fixed 0x00)	
GetSensorAlarmThresholdRsp	0x82	Channel (1 byte, 0x00_Channel1, 0x01_Chanel2, 0x02_Channel3, etc.)	SensorType (1byte, 0x00_Disable ALL SensorthresholdSet 0x2D_ Depth)	SensorHighThreshold (4 bytes, Unit: mm)	SensorLowThreshold (4 bytes, Unit: mm)

Depth = 0x00_Channel1, HighThreshold = 0x000000C8 (200mm), LowThreshold = 0x00000064 (100mm)

(1) SetSensorAlarmThresholdReq:

(When the depth is higher than the HighThreshold or lower than the LowThreshold, the bit = 1.)

Downlink: 01002D000000C800000064

Response: 810000000000000000000

(2) GetSensorAlarmThresholdReq:

Downlink: 02002D0000000000000000

Response: 82002D000000C800000064

Disable all Sensor thresholds (set SensorType = 0)

Downlink: 0100000000000000000000

Response: 810000000000000000000

Note: a. The last configuration would be kept as user reset the device back to the factory setting.

b. Set SensorHigh/LowThreshold as 0xFFFFFFFF to disable threshold.

5.4 Example of NetvoxLoRaWANRejoin

(NetvoxLoRaWANRejoin command is to check if the device is still in the network. If the device is disconnected, it will automatically rejoin back to the network.)

Fport: 0x20

CmdDescriptor	CmdID (1 byte)	Payload (5 bytes)	
SetNetvoxLoRaWANRejoinReq	0x01	RejoinCheckPeriod (4 bytes, Unit: 1s 0XFFFFFFFF Disable NetvoxLoRaWANRejoinFunction)	RejoinThreshold (1 byte)
SetNetvoxLoRaWANRejoinRsp	0x81	Status (1 byte, 0x00_success)	Reserved (4 bytes, Fixed 0x00)
GetNetvoxLoRaWANRejoinReq	0x02	Reserved (5 bytes, Fixed 0x00)	
GetNetvoxLoRaWANRejoinRsp	0x82	RejoinCheckPeriod (4 bytes, Unit: 1s)	RejoinThreshold (1 byte)

(1) Configure parameters

RejoinCheckPeriod = 0x00000E10 (60min); RejoinThreshold = 0x03 (3 times)

Downlink: 0100000E1003

Response: 810000000000 (configuration succeed)

810100000000 (configuration fail)

(2) Read configuration

Downlink: 020000000000

Response: 8200000E1003

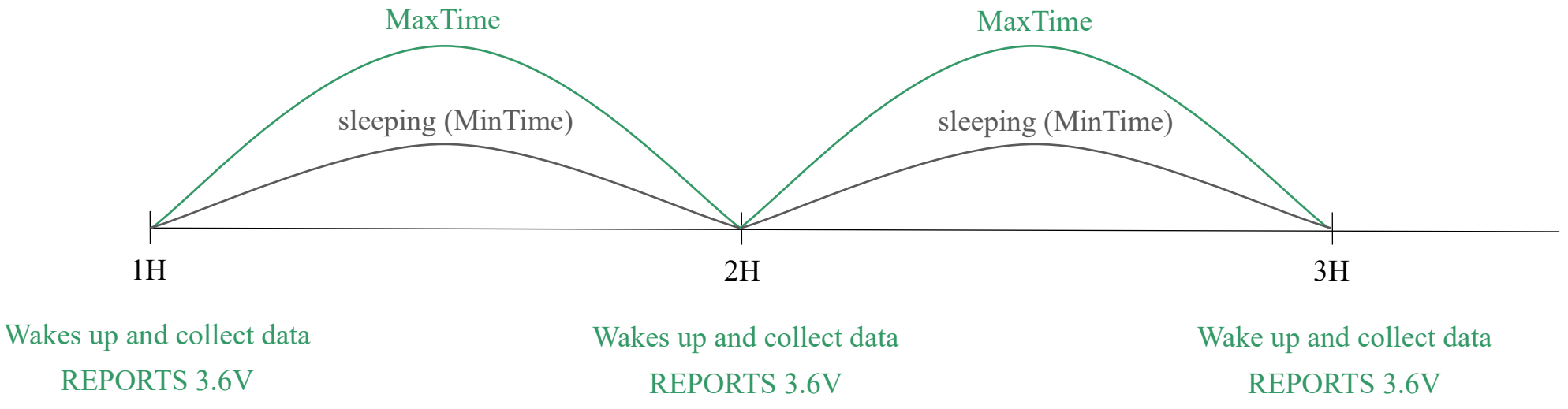
Note: a. Set RejoinCheckThreshold as 0xFFFFFFFF to stop the device from rejoining the network.

b. The last configuration would be kept as user reset the device back to the factory setting.

c. Default setting: RejoinCheckPeriod = 2 (hr) and RejoinThreshold = 3 (times)

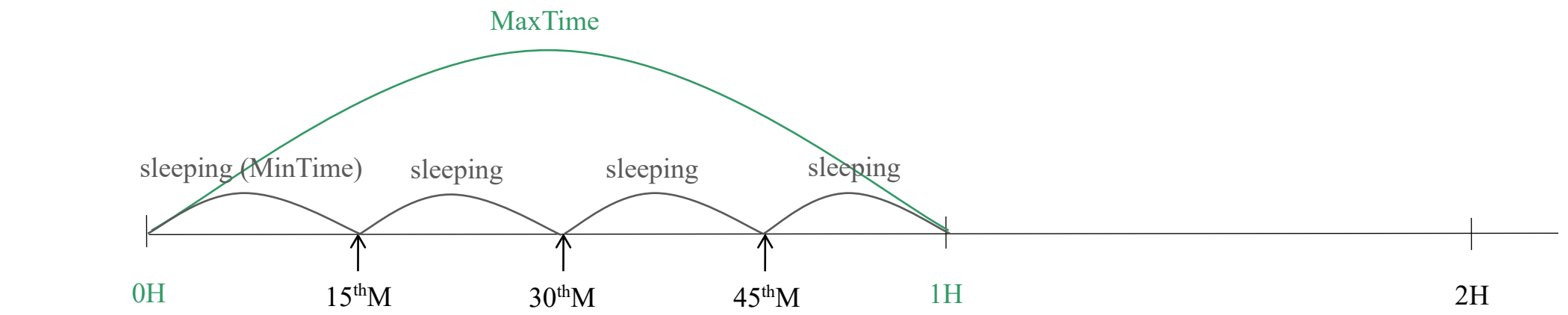
Example for MinTime/MaxTime logic:

Example#1 based on MinTime = 1 Hour, MaxTime= 1 Hour, Reportable Change i.e. BatteryVoltageChange=0.1V

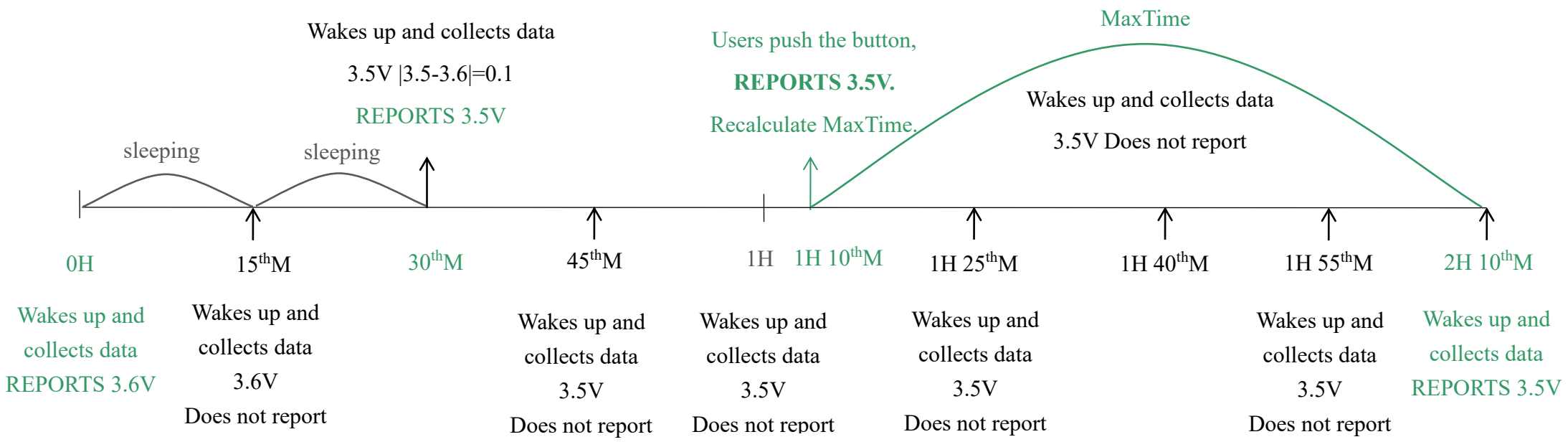


Note: MaxTime=MinTime. Data will only be report according to MaxTime (MinTime) duration regardless BtteryVoltageChange value.

Example#2 based on MinTime = 15 Minutes, MaxTime= 1 Hour



Example#3 based on MinTime = 15 Minutes, MaxTime= 1 Hour



Notes:

(1) The device only wakes up and performs data sampling according to MinTime Interval. When it is sleeping, it does not collect data.

(2) The data collected is compared with the last data reported. If the data variation is greater than the ReportableChange value, the device reports according to MinTime interval. If the data variation is not greater than the last data reported, the device reports according to MaxTime interval.

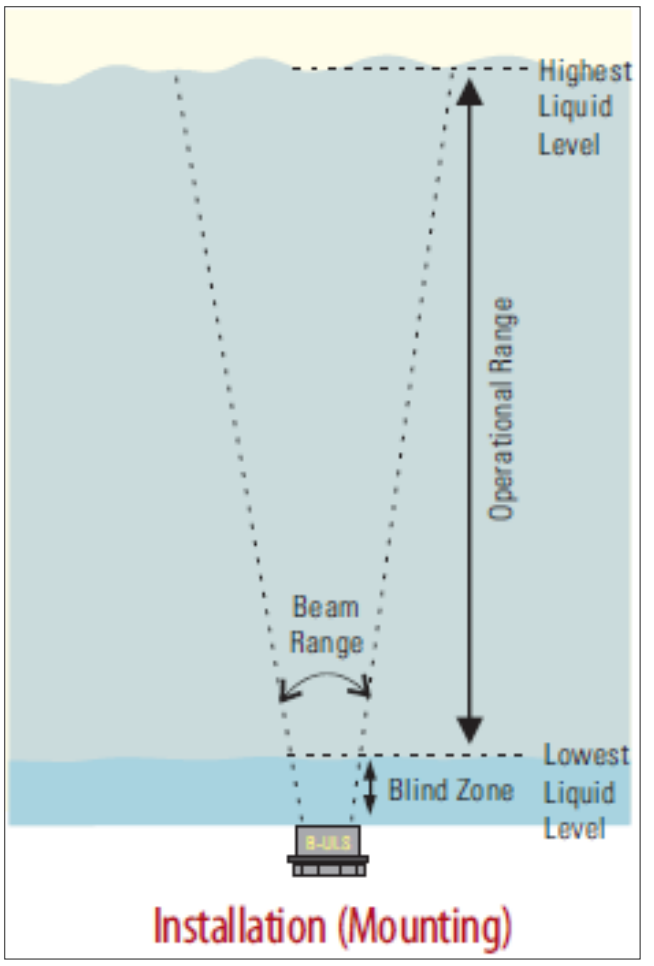
(3) We do not recommend to set the MinTime Interval value too low. If the MinTime Interval is too low, the device wakes up frequently and the battery will be drained soon.

(4) Whenever the device sends a report, no matter resulting from data variation, button pushed or MaxTime interval, another cycle of MinTime/MaxTime calculation is started.

6. Installation

- Measurement Range: 80 – 2200mm
- Blind Zone: ≤ 80mm
- Container Thickness: 4 – 7mm
- Container Types: metal, plastic, etc.
- Liquid Types: water, diesel, etc.

Measurement Result = Container Thickness + Liquid Level



Installation (Mounting)

When Installing R718PA22 on a fuel tank, …

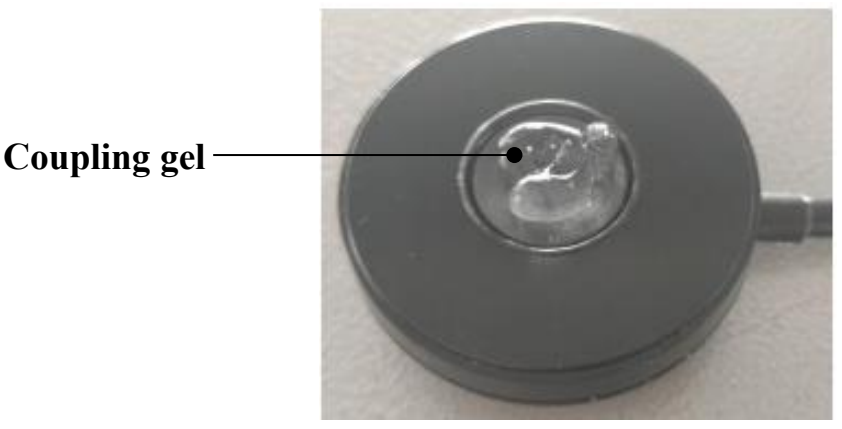
To ensure the accuracy of measurement results, the sensor should be installed on an even surface without obstacles around it. Installing it near a tube or fuel sender could cause measurement errors.

Step 1. Ensure the liquid level is not below 200mm (lowest liquid level).

Step 2. Park the car on an even ground and choose a suitable place to install the sensor.

Step 3. Polish the place with sandpaper and wipe the dirt off.

Step 4. Apply coupling gel to the middle of the sensor. (Coupling gel should be placed higher than the dent.)



Step 5. Tap the sensor on the surface of the container and test if it reports data.

Step 6. Polish the surface and start to install the holder.

Step 7. Mix the AB glue with a ratio of 1:1.

Step 8. Apply the AB glue to the bottom of the holder.

Step 9. Fix the holder by pressing it for 20 seconds and wait 3 minutes.

Step 10. Clean the dirt or coupling gel on the surface of the probe.

Step 11. Apply 6 to 7g of sealant on the center of the probe.

Step 12. Press the lid on the probe until the sealant overflows.

Step 13. Install and cross spring hooks on the lid.

Step 14. Test and check if data are successfully sent.

Step 15. Fix the cable with cable ties.

7. Important Maintenance Instructions

Kindly pay attention to the following to achieve the best maintenance of the product:

- Keep the device dry. Rain, moisture, or any liquid might contain minerals, thus corroding electronic circuits. If the device gets wet, please dry it completely.
- Do not use or store the device in a dusty or dirty environment. It might damage its detachable parts and electronic components.
- Do not store the device under extremely hot conditions. High temperatures can shorten the life of electronic devices, destroy batteries, and deform or melt some plastic parts.
- Do not store the device in places that are too cold. Otherwise, moisture inside the device will damage the board when the temperature rises.
- Do not throw, knock, or shake the device. Rough handling of equipment can destroy internal circuit boards and delicate structures.
- Do not clean the device with strong chemicals, detergents, or strong detergents.
- Do not apply the device with paint. Smudges might block the device and affect the operation.
- Do not throw the battery into the fire, or the battery will explode. Damaged batteries may also explode.

All of the above applies to your device, battery, and accessories. If any device is not operating properly, please take it to the nearest authorized service facility for repair.