

Wireless Capacitive Proximity Sensor

R718VB

User Manual

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1. Introduction

R718VB can detect the toilet water level, hand sanitizer level, presence or absence of toilet paper, it may also be applied to non-metallic pipes (pipe major diameter $D \geq 11\text{mm}$) liquid level detector.

This device is connected with a non-contact capacitive sensor which can be mounted to the exterior of the container, without direct contact with the object to be detected, which may detect the current position of liquid level, or the presence or absence of liquid soap, toilet paper; the detected data is transmitted to other devices through the wireless network. It uses the SX1276 wireless communication module .

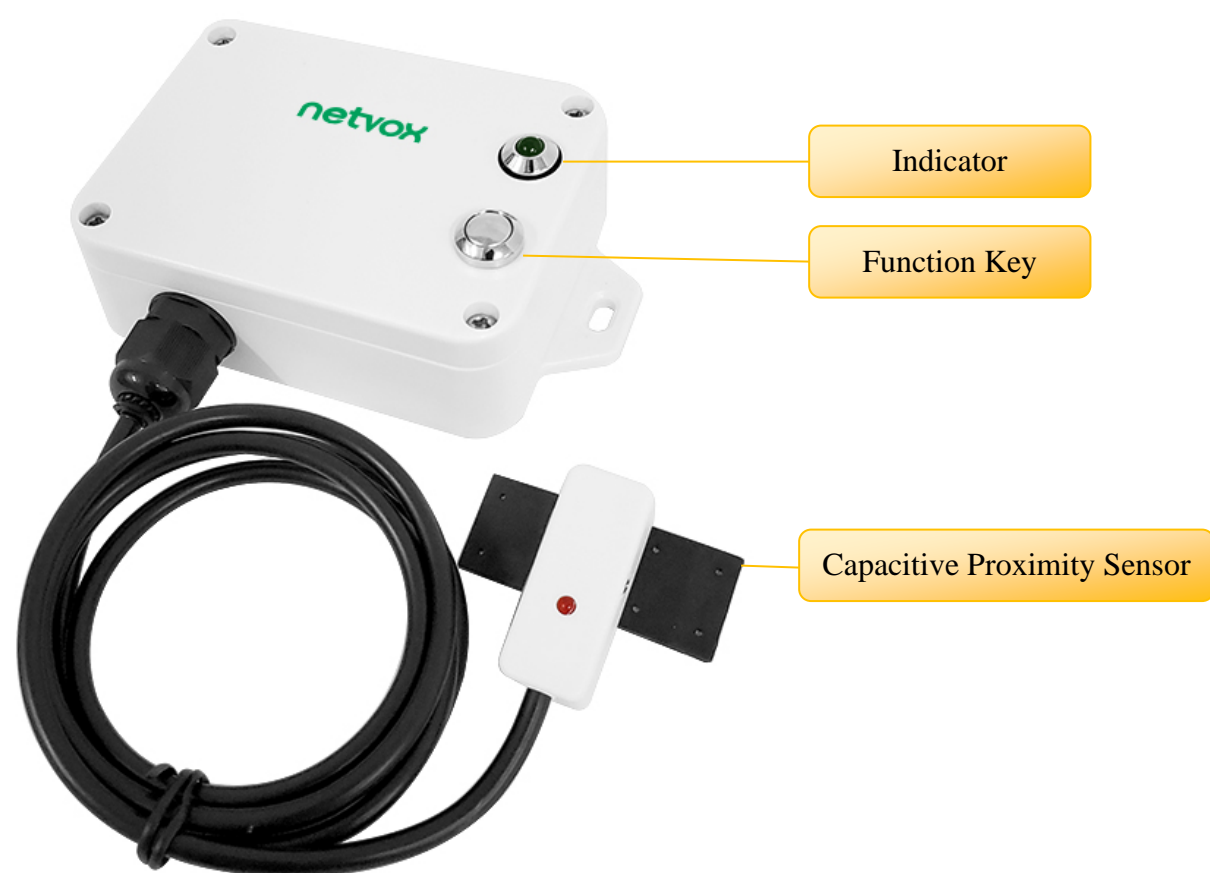
LoRa Wireless Technology:

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. Main Features

- Adopt SX1276 wireless communication module
- 2 ER14505 battery AA SIZE (3.6V / section) parallel power supply
- Non-contact capacitive sensor
- The main protection level of the equipment is IP65/IP67 (optional), and the protection level of the sensor probe is IP65
- The base is attached with a magnet that can be attached to a ferromagnetic material object
- Compatible with LoRaWAN™ Class A
- Frequency hopping spread spectrum technology
- Configuration parameters can be configured through third-party software platforms, data can be read and alerts can be set via SMS text and email (optional)
- Applicable to 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 various types of battery lifetime in different configurations.

4. Application

- The water level of the toilet tank
- The level of hand sanitizer
- Presence or absence of toilet paper

5. Set up Instruction

On/Off

Power on	Insert batteries. (users may need a flat blade screwdriver to open)
Turn on	Press and hold the function key for 3 seconds till the green indicator flashes once.
Turn off (Restore to factory setting)	Press and hold the function key for 5 seconds till the green indicator flashes for 20 times.
Power off	Remove Batteries.
Note:	<ol style="list-style-type: none"> 1. Remove and insert the battery; the device is at off state by default. Please turn on the device to use again. 2. On/off interval is suggested to be about 10 seconds to avoid the interference of capacitor inductance and other energy storage components. 3. At 1st to 5th second after power on, the device will be in engineering test mode.

Network Joining

Never joined the network	<p>Turn on the device to search the network to join.</p> <p>The green indicator stays on for 5 seconds: success</p> <p>The green indicator remains off: fail</p>
Had joined the network (Not yet restore to factory setting)	<p>Turn on the device to search the previous network to join.</p> <p>The green indicator stays on for 5 seconds: success</p> <p>The green indicator remains off: fail</p>
Fail to join the network (when the device is on)	<p>First two mins: wake up every 15 seconds to send request.</p> <p>After two mins: enter sleeping mode and wake up every 15 minutes to send request.</p> <p>Note: Suggest to remove batteries if the device is not used to save power.</p> <p>Suggest to check the device verification information on the gateway or consult your platform server provider.</p>

Function Key

Press and hold for 5 seconds	<p>Restore to factory setting / Turn off</p> <p>The green indicator flashes for 20 times: success</p> <p>The green indicator remains off: fail</p>
Press once	<p>The device is in the network: the green indicator flashes once and sends a report</p> <p>The device is not in the network: the green indicator remains off</p>

Sleeping Mode

The device is on and in the network	<p>Sleeping period: Min Interval.</p> <p>When the reportchange exceeds setting value or the state changes: send a data report according to Min Interval.</p>
The device is on but not in the network	<p>First two mins: wake up every 15 seconds to send request.</p> <p>After two mins: enter sleeping mode and wake up every 15 minutes to send request.</p> <p>Note: Suggest to remove batteries if the device is not used.</p> <p>Suggest to check the device verification information on the gateway or consult your platform server provider.</p>

Low Voltage Warning

Low Voltage	3.2V
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6. Data Report

The device will immediately send a version packet report along with an uplink packet including liquid level status, battery voltage.

The device sends data in the default configuration before any configuration is done.

Default Setting:

Maximum time: 15min

Minimum time: 15min (Detect the current voltage value and liquid level status by default setting)

BatteryVoltageChange: 0x01 (0.1V)

R718VB detection status:

The distance between liquid level and sensor reaches the threshold will report, and the threshold can adjust sensitivity

The device will detect the status regularly at the MinTime interval.

When the device detects liquid level, status = 1

When the device does not detect liquid level, status = 0

There are two conditions in which the device will report the status of the detected liquid and the battery voltage at MinTime interval:

- a. When the liquid level changes from where the device can detect to where the device cannot detect. (1→0)
- b. When the liquid level changes from where the device cannot detect to where the device can detect. (0→1)

If none of the above conditions is met, the device will report at the MaxTime interval.

For the analysis of the data command reported by the device, refer to the Netvox LoRaWAN Application Command document and

<http://www.netvox.com.cn:8888/page/index>.

Note:

The device send data cycle depends on real programming configuration according to the customer's inquiry.

The interval between two reports must be the minimum time.

Example for Report Configuration:

Fport: 0x07

Description	Device	CmdID	DeviceType	NetvoxPayLoadData			
ConfigReportReq	R718VB	0x01	0x9F	MinTime (2bytes Unit:s)	MaxTime (2bytes Unit:s)	BatteryChange (1byte Unit:0.1v)	Reserved (4Bytes,Fixed 0x00)
ConfigReportRsp		0x81		Status (0x00_success)		Reserved (8Bytes,Fixed 0x00)	
ReadConfigReportReq		0x02		Reserved (9Bytes,Fixed 0x00)			
ReadConfigReportRsp		0x82		MinTime (2bytes Unit:s)	MaxTime (2bytes Unit:s)	BatteryChange (1byte Unit:0.1v)	Reserved (4Bytes,Fixed 0x00)

(1) Configure the device report parameters MinTime = 1min, MaxTime = 1min, BatteryChange = 0.1v

Downlink: 019F003C003C0100000000

The device returns:

819F00000000000000000000 (The configuration succeeded)

819F01000000000000000000 (The configuration failed)

(2) Read the device configuration parameters

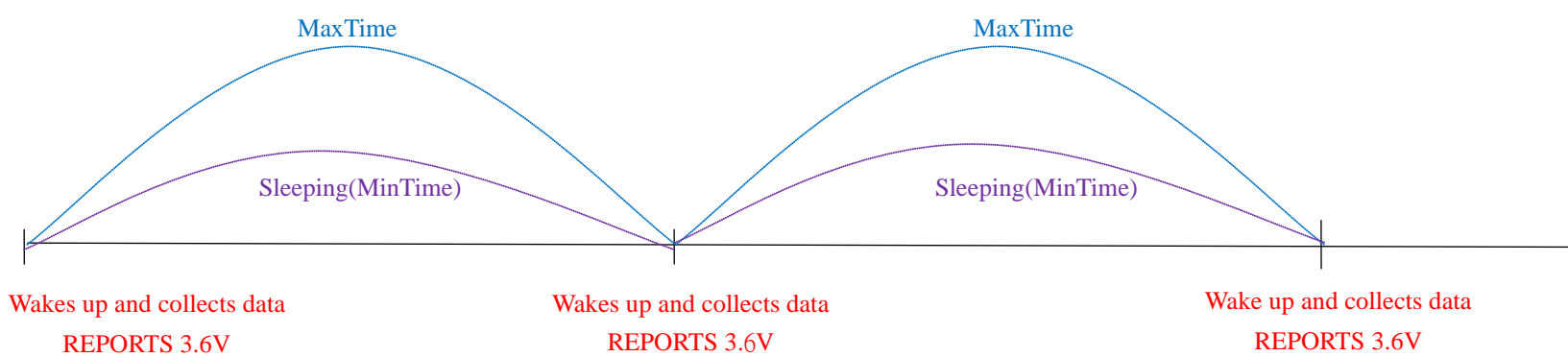
Downlink: 029F00000000000000000000

The device returns:

829F003C003C0100000000 (current configuration parameters)

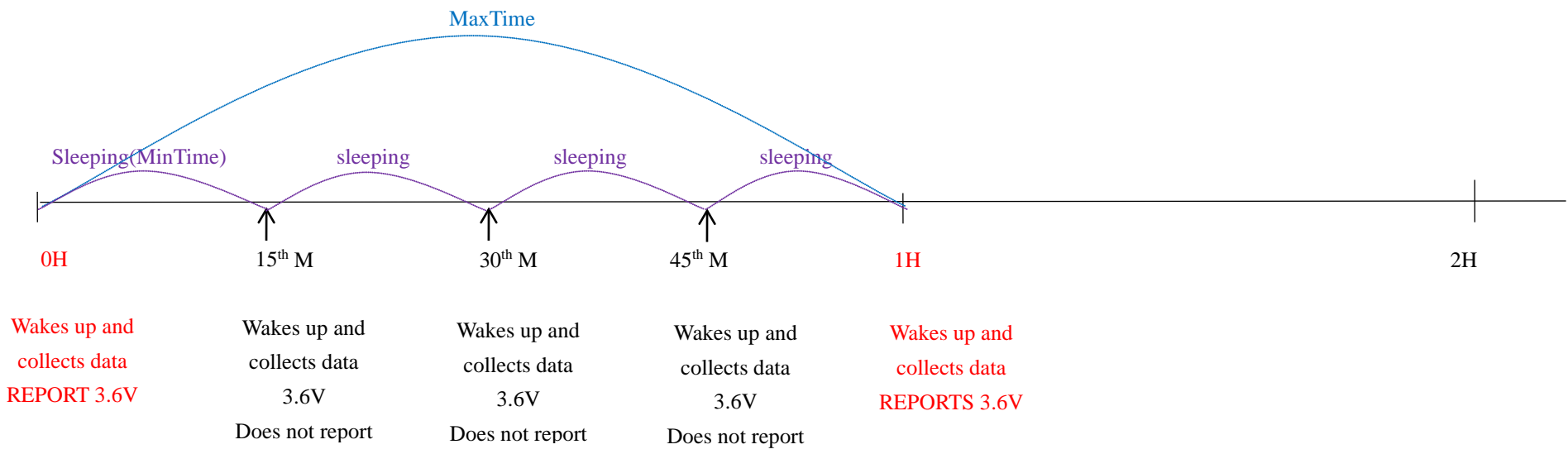
Example for MinTime/MaxTime logic:

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

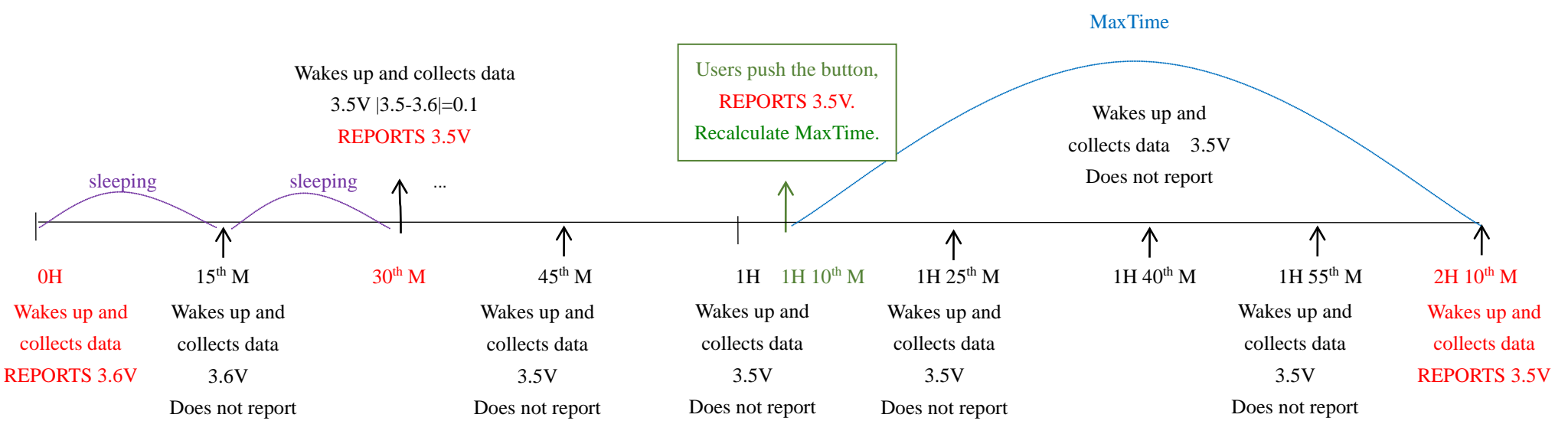


Note: MaxTime=MinTime. Data will only be report according to MaxTime (MinTime) duration regardless BatteryVoltageChange value.

Example#2 based on MinTime = 15 Minutes, MaxTime= 1 Hour, Reportable Change i.e. BatteryVoltageChange= 0.1V.



Example#3 based on MinTime = 15 Minutes, MaxTime= 1 Hour, Reportable Change i.e. BatteryVoltageChange= 0.1V.



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.

7. Application Scenario

When the use case is for detecting the water level of the toilet tank, please install the device at a desired level of the toilet tank.

Turn on the device after it is fixed to the toilet tank and powered.

The device will detect the status regularly at the MinTime interval.

There are two conditions in which the device will report the status of the detected liquid and the battery voltage at MinTime interval:

- a. When the liquid level changes from where the device can detect to where the device cannot detect
- b. When the liquid level changes from where the device cannot detect to where the device can detect

If none of the above conditions is met, the device will report at the MaxTime interval.

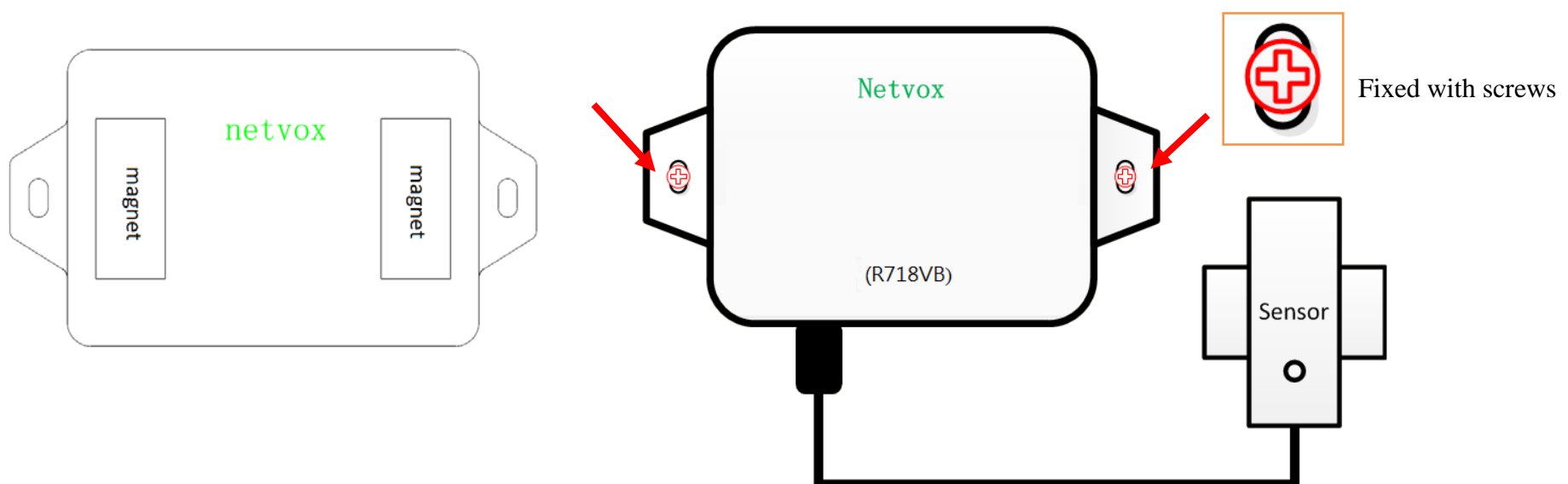
8. Installation

Wireless Capacitive Proximity Sensor (R718VB) has two magnets on back.

When using it, the back of it can be adsorbed a ferromagnetic material object, or the two ends can be fixed to the wall with screws (should be purchased)

Note:

Do not install the device in a metal shielded box or other electrical equipment around it to avoid affecting the wireless transmission of the device.



8.1 Measured liquid medium viscosity

8.1.1 Dynamic viscosity:

- A. Less Than 10mPa·s when the normal measurement.
- B. $10\text{mPa} < \text{Dynamic viscosity} < 30\text{mPa}\cdot\text{s}$ would affect the detection
- C. Greater than 30mPa·s due to a large amount of liquid attached to the container wall, cannot be measured.

Note:

With the temperature rise viscosity decreases, most of the high viscosity of the liquid by the temperature is more obvious, so when measuring the viscosity of the liquid when the liquid temperature attention.

8.1.2 Dynamic (absolute) viscosity Explanation:

Dynamic (absolute) viscosity is the tangential force per unit area required to move one horizontal plane with respect to an other plane - at an unit velocity - when maintaining an unit distance apart in the fluid.

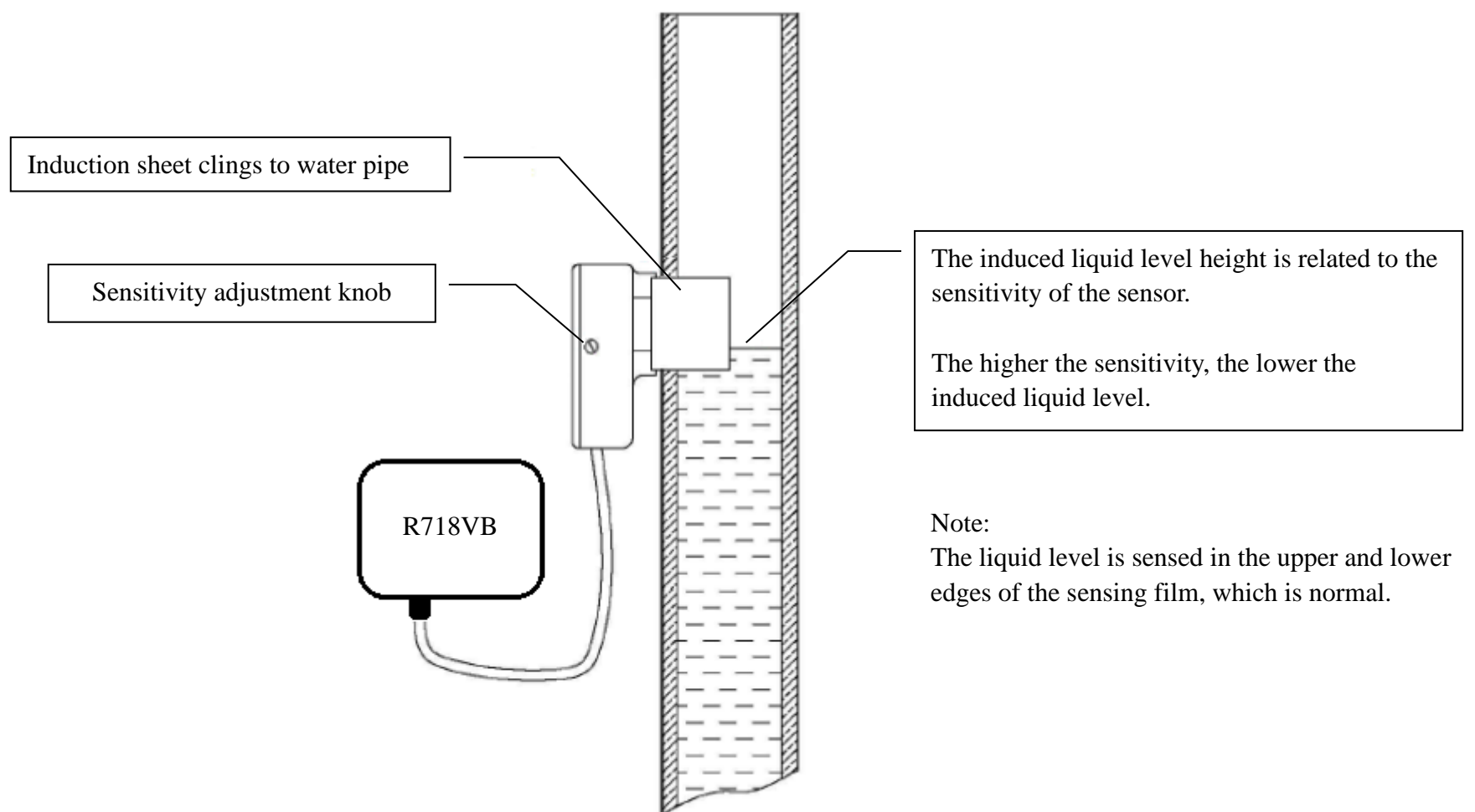
8.1.3 Common substances

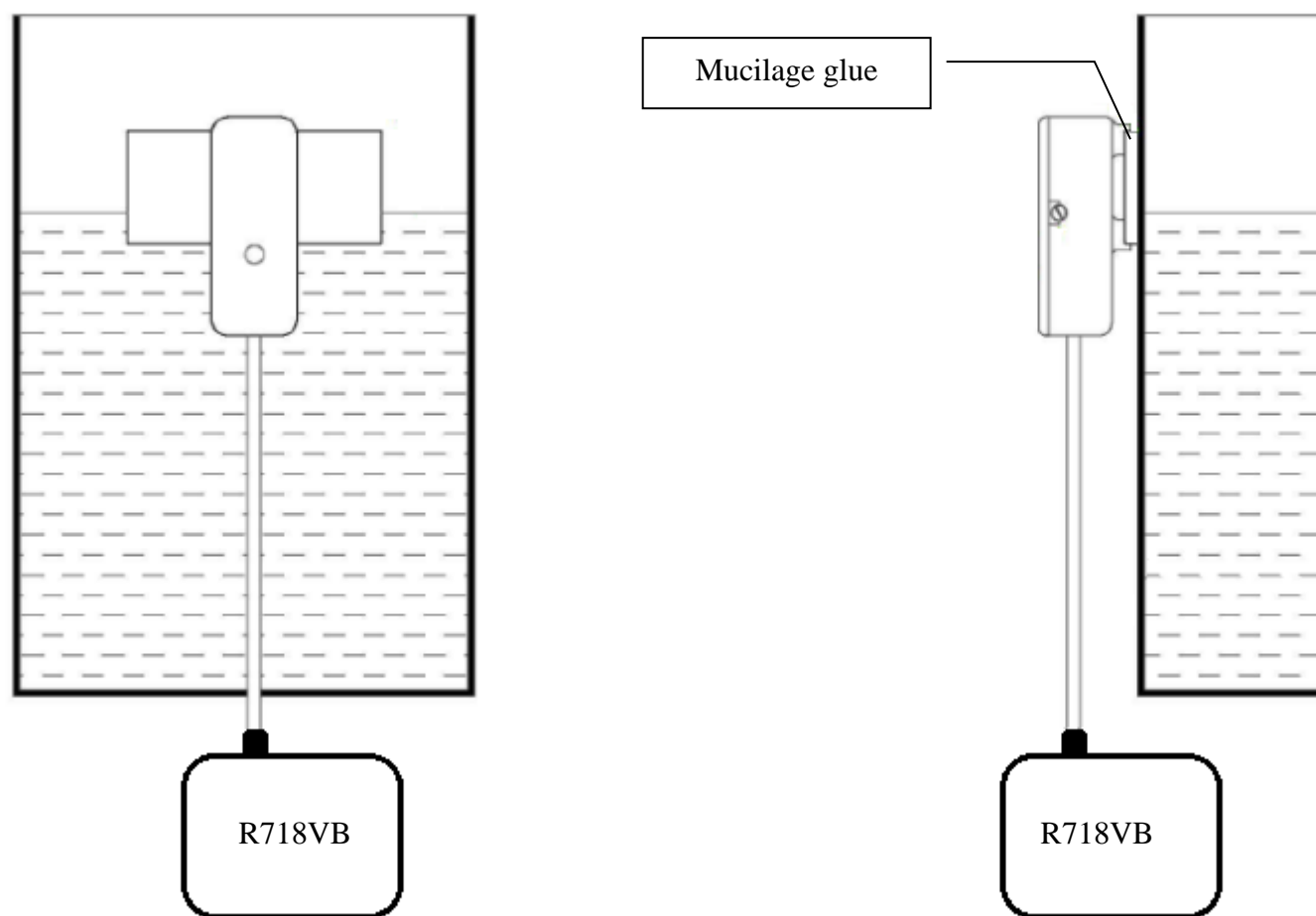
Substance	Viscosity (mPa·s)	Temperature (°C)
Benzene	0.604	25
Water	1.0016	20
Mercury	1.526	25
Whole milk	2.12	20
Olive oil	56.2	26

Reference source: <https://en.wikipedia.org/wiki/Viscosity>

8.2 Requirements of container and Installation Instruction

1. Could either glue the probe or use a support to fix the probe on the outside of the container.
2. Avoid metal materials at the probe mounting site so as not to affect the detection.
3. The place where the probe is installed should avoid the liquid and the flow path of the liquid.
4. There should be no silt or other debris inside the container where the low-level probe is directly facing, so as not to affect the detection.
5. Containers made of non-metallic materials with flat surface, uniform thickness, tight material and good insulation performance; such as glass, plastic, non-absorbent ceramic, acrylic, rubber and other materials or their composite materials.

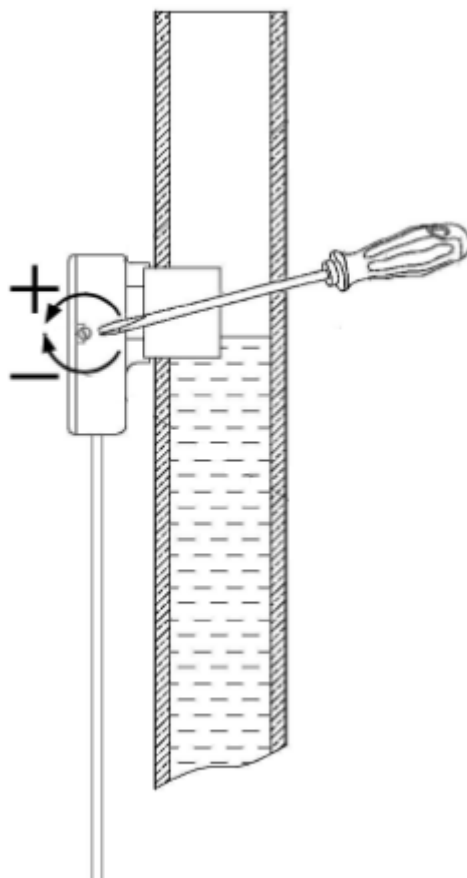




Example of the installation method of the sensor with the square or flat non-metallic container

8.3 Adjust sensitivity

Adjust the sensitivity knob with a small screwdriver, rotate counterclockwise to increase the sensitivity, and rotate clockwise to decrease the sensitivity (sensitivity from high to low 12 cycles in total.)



8.4 Precautions for battery use

Because the passivation of the ER battery electrode surface is an inherent characteristic of lithium thionyl chloride batteries, before using the ER14505 3.6V 2400mAh lithium thionyl chloride battery, the user can use a 33 ohm resistor to activate the battery for 1 minute to actively eliminate the battery hysteresis.

9. Important Maintenance Instruction

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

- Keep the device dry. Rain, moisture, or any liquid, might contain minerals and thus corrode electronic circuits. If the device gets wet, please dry it completely.
- Do not use or store the device in dusty or dirty environment. It might damage its detachable parts and electronic components.
- Do not store the device under excessive heat condition. High temperature 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, when the temperature rises to normal temperature, moisture will form inside, which will destroy the board.
- 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 in 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 working properly, please take it to the nearest authorized service facility for repair.