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netvox R718B Series Wireless Temperature Sensor User Manual

Contents

netvox R718B Series Wireless Temperature Sensor

Specifications

- **Model:** R718B Series
- **Communication Module:** SX1276 wireless
- **Batteries:** 2* ER14505 lithium batteries in parallel
- **Protection Rating:** IP65/67 (main body)
- **Wireless Technology:** LoRaWANTM Class A
- **Frequency Technology:** Spread spectrum
- **Compatible Platforms:** Actility/ThingPark, TTN, MyDevices/Cayenne
- **Power Consumption:** Low with long battery life

Product Usage Instructions

Set up Instructions

- **Power On:** Insert batteries. Press and hold the function key for 3 seconds until the green indicator flashes once.
- **Power Off (Factory Resetting):** Press and hold the function key for 5 seconds until the green indicator flashes 20 times. Remove batteries.

Network Joining

- **Never Joined the Network:** Turn on to search the network to join. The green indicator stays on for 5 seconds for success, and off for failure.
- **Had Joined the Network (Without Factory Resetting):** Turn on to search the previous network to join. The green indicator stays on for 5 seconds for success, and off for failure.

Function Key

- **Press and Hold for 5 Seconds:** Sleeping Mode, Low Voltage Warning, Factory Resetting/Turn Off.

Data Report

- The device will immediately send a version packet report with an uplink packet including temperature and battery voltage. It sends data in the default configuration before any other configuration is done.

Frequently Asked Questions

- **Q: How do I know if the device successfully joined the network?**
  - **A:** When turning on to search the network to join, the green indicator staying on for 5 seconds indicates success, while remaining off indicates failure.
- **Q: What should I do if the device fails to join the network?**
  - **A:** If the device fails to join the network, please check the device verification information on the gateway or consult your platform server provider.

Introduction

- The R718B series is a wireless resistance temperature detector for Netvox Class A-type devices based on the LoRaWAN open protocol and is compatible with the LoRaWAN protocol.
- It connects an external resistance temperature detector (PT1000) to measure the temperature.

LoRa Wireless Technology

- LoRa is a wireless communication technology dedicated to long-distance and low power consumption.
- Compared with other communication methods, the 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, and industrial monitoring.
- The 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.

Appearance

Indicator

Function key

Probe

Round Head

Needle

Magnetic

Clamp

Patch

R718B series

R718B120 - Round head probe

-70° to 200°C

R718B121 - Needle probe

-70° to 200°C

R718B140 - Round head probe

-40° to 375°C

R718B141 - Needle probe

-40° to 375°C

R718B150 -Round head probe
-40° to 500°C

R718B151 - Needle probe
-40° to 500°C

R718B122 - Magnetic probe
-50° to 180°C

R718BC - Clamp probe
-50° to 150°C

R718BP - Patch probe
-50° to 150°C

Features

- SX1276 wireless communication module
- 2* ER14505 lithium batteries in parallel
- IP65 / 67 (main body)
- Magnetic base
- Compatible with LoRaWANTM Class A
- Frequency spread spectrum technology
- Applicable to third-party platforms: Actility / ThingPark, TTN, MyDevices / Cayenne
- Low power consumption and long battery life
- **Note:** Please visit **http://www.netvox.com.tw/electric/electric_calc.html** for more information on battery lifespan.

Set up Instructions

On/Off

Power on	Insert batteries. (Users may need a screwdriver to open the battery cover.)
Turn on	Press and hold the function key for 3 seconds until the green indicator flashes once.
Turn off (Factory resetting)	Press and hold the function key for 5 seconds until the green indicator flashes 20 times.
Power off	Remove Batteries.
Note	1. Remove and insert the battery; the device is off by default. 2. The on/off interval should be about 10 seconds to avoid the interference of capacitor inductance and other energy storage components. 3. 5 seconds after powering on, the device will be in engineering test mode.

Network Joining

Never joined the network	Turn on to search the network to join. The green indicator stays on for 5 seconds: success The green indicator remains off: fail
Had joined the network (without factory resetting)	Turn on to search the previous network to join. The green indicator stays on for 5 seconds: success The green indicator remains off: fail
Fail to join the network	1. Please remove batteries if the device is not in use. 2. Please check the device verification information on the gateway or consult your platform server provider.

Function Key

Press and hold for 5 seconds	Factory resetting / Turn off The green indicator flashes 20 times: success The green indicator remains off: fail
Press once	The device is in the network: the green indicator flashes once and sends a report. The device is not in the network: the green indicator remains off

Sleeping Mode

The device is on and in the network	**Sleeping period:** Min Interval. When the report change exceeds the setting value or the state changes: send a data report according to Min Interval.

Low Voltage Warning

- Low Voltage 3.2V

Data Report

- The device will immediately send a version packet report with an uplink packet including temperature and battery voltage.
- It sends data in the default configuration before any configuration is done.

Default setting:

- **Max Interval:** 0x0384 (900s)
- **Min Interval:** 0x0384 (900s)
- **BatteryChange:** 0x01 (0.1V)
- **TemperatureChange:** 0x0064 (10°C)

Note:

- **a.** The device report interval will be programmed based on the default firmware which may vary.
- **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://cmddoc.netvoxcloud.com/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

Example of Report Data Cmd

- **FPort:** 0x06

Bytes	1	1	1	Var (Fix = 8 bytes)
	Version	Device Type	Report Type	Netvox Pay Load Data

- **Version–** 1 byte –0x01——the Version of NetvoxLoRaWAN Application Command Version
- **DeviceType–** 1 byte – Device Type of Device
- The device type is listed in the Netvox LoRaWAN Application Devicetype doc
- **ReportType** – 1 byte –the presentation of the NetvoxPayLoadData according to the device type
- **NetvoxPayLoadData–** Fixed bytes (Fixed = 8 bytes)

Tips

1. **Battery Voltage:**
    - **The voltage value is bit 0** ~ bit 6, bit 7=0 is normal voltage and bit 7=1 is low voltage.
    - **Battery=**0xA0, binary=1010 0000, if bit 7= 1, it means low voltage.
    - The actual voltage is 0010 0000 = 0x20 = 32, 32*0.1v =3.2v
2. **Version Packet:**
    - **When Report Type =** 0x00 is the version packet, such as 0195000A03202312180000, the firmware version is 2023.12.18.
3. **Data Packet:**
    - When Report Type=0x01 is a data packet.
4. **Signed Value:**
    - When the temperature is negative, 2's complement should be calculated.

Device	Device Type	Report Type	Netvox Pay Load Data			
R718Bseries	0x95	0x00	Software Version (1 byte) e.g.0x0A—V1.0	Hardware Version (1 byte)	Date Code (4 bytes, e.g. 0x20170503)	Reserved (2 bytes, fixed 0x00)
		0x01	Battery (1 byte, unit:0.1V)	Temperature 1 (Signed 2 bytes, unit: 0.1°C)	Thres hold Alarm (1 byte) Bit0_Low Temperature Alarm, Bit1_High Temperature Alarm, Bit2-7: Reserved)	Reserved (4 bytes, fixed 0x00)

Example 1 of Uplink: 0195019FFE050000000000

1. **1st byte (01):** Version
2. **2nd byte (95):** DeviceType 0x95 R718B series
3. **3rd byte (01)**: ReportType
4. **4th byte (9F):** Battery 3.1V (low voltage), 9F (Hex) = 31 (Dec), 31* 0.1V = 3.1V
5. **5th6th byte (FE05):** Temperature -50.7oC , FE05 (Hex) = -507 (Dec), -507* 0.1℃ = -50.7℃
6. **7th byte (00):** ThresholdAlarm No alarm
7. **8th-11th byte** (00000000): Reserved

Example of Report Configuration

FPort: 0x07

Bytes	1	1	Var (Fix = 9 bytes)
	CmdID	Device Type	Netvox Pay Load Data

- **CmdID–** 1 byte
- **DeviceType–** 1 byte – Device Type of Device
- **NetvoxPayLoadData–** var bytes (Max = 9 bytes)

Description	Device	Cmd ID	Device Type	Netvox Pay Load Data				
Config ReportReq	R718B series	0x01	0x95	Min Time (2 bytes, Unit: s)	Maxime (2 bytes, Unit: s)	Battery Change (1 byte, Unit: 0.1 v)	Temperature change (2 bytes, Unit: 0.1°C)	Reserved (2 bytes, Fixed 0x00)
Config ReportRsp		0x81		Status (0x00_success)		Reserved (8 bytes, Fixed 0x00)		
Read Config ReportReq		0x02		Reserved (9 bytes, Fixed 0x00)				
Read Config ReportRsp		0x82		MinTime (2 bytes, Unit: s)	Maxime (2 bytes, Unit: s)	Battery Change (1 byte, Unit: 0.1 v)	Temperature change (2 bytes, Unit: 0.1°C)	Reserved (2 bytes, Fixed 0x00)

1. **Configure device parameters**
   - **MinTime** = 0x003C (1 min), MaxTime = 0x003C (1 min), BatteryChange = 0x01 (0.1V), Temperature change = 0x0001 (0.1°C)
   - **Downlink:** 0195003C003C0100010000
   - **Response:** 8195000000000000000000 (configuration succeed)

8195010000000000000000 (configuration fail)

2. **Read device parameters**
   - **Downlink:** 0295000000000000000000
   - **Response:** 8295003C003C0100010000 (current parameters)

Set/Get Sensor Alarm Threshold Cmd

FPort: 0x10

Cmd Descriptor	CmdID (1 byte)	Payload (10 bytes)			
Set Sensor Alarm Thres hold Req	0x01	Channel (1 byte, 0x00_Channel1, 0x01_Chanel2, 0x02_Channel3, etc.)	Sensor Type (1 byte, 0x00_Disable ALL Sensor thres hold Set0x01_Temperature)	Sensor High Threshold (4 bytes, unit: 0.1°C)	Sensor Low Threshold (4 bytes, unit: 0.1°C)
Set Sensor Alarm Thres hold Rsp	0x81	Status(0x00_success)		Reserved (9 bytes, Fixed 0x00)	
Get Sensor Alarm Thres to hold Req	0x02	Channel (1 byte, 0x00_Channel1, 0x01_Chanel2, 0x02_Channel3, etc.)	SensorType (1 byte, 0x00_Disable ALL SensorthresholdSet 0x01_Temperature)	Reserved (8 bytes, Fixed 0x00)	
Get Sensor Alarm Thresholds	0x82	Channel (1 byte, 0x00_Channel1, 0x01_Chanel2, 0x02_Channel3, etc.)	Sensor Type (1 byte, 0x00_Disable ALL Sensorthres hold Set 0x01_Temperature)	Sensor High Threshold (2 bytes, unit: 0.1°C)	Sensor Low Threshold (2 bytes, unit: 0.1°C)

Default: Channel = 0x00_Temperature1

1. **Set SensorAlarm Threshold Req**
   - Configure Channel = 0x00 (Temperature1), HighThreshold = 0x0000012C (30°C), and LowThreshold = 0x00000064 (10°C)
   - Downlink: 0100010000012C00000064
   - Response: 8100000000000000000000
2. **Get Sensor Alarm Threshold Req**
   - **Downlink:** 0200010000000000000000
   - **Response:** 8200010000012C00000064
3. **Clear all thresholds (Set SensorType = 0)**
   - **Downlink:** 0100000000000000000000
   - **Response:** 8100000000000000000000

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

Cmd Descriptor	CmdID (1 byte)	Payload (5 bytes)	
Set NetvoxLoRaWAN Rejoin Req	0x01	Rejoin Check Period (4 bytes, Unit: 1s 0XFFFFFFFF Disable NetvoxLoRaWAN Rejoin Function)	Rejoin Threshold (1 byte)
Set NetvoxLoRaWAN Rejoin Rsp	0x81	Status (1 byte, 0x00_success)	Reserved (4 bytes, Fixed 0x00)
Get NetvoxLoRaWAN Rejoin Req	0x02	Reserved (5 bytes, Fixed 0x00)	
Get Netvox LoRaWAN Rejoin Rsp	0x82	Rejoin Check Period (4 bytes, Unit:1s)	Rejoin Threshold (1 byte)

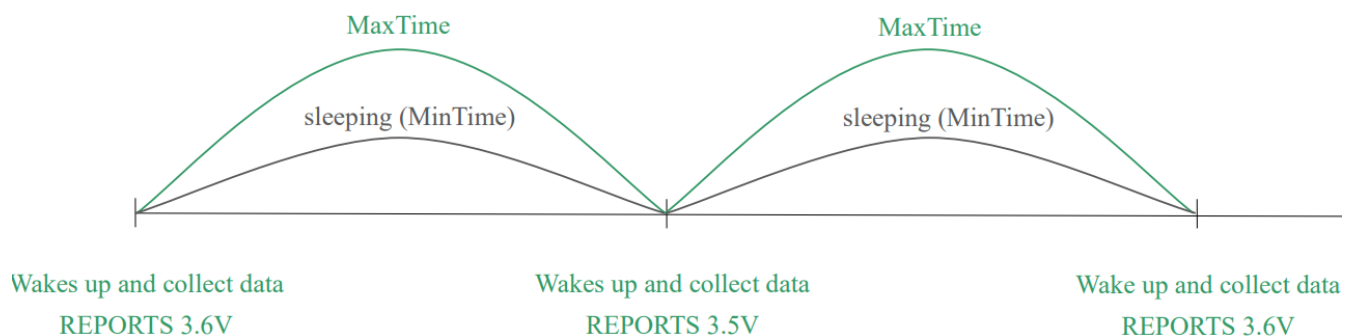1. **Configure parameters**
   - **Rejoin Check Period** = 0x00000E10 (60min); Rejoin Threshold = 0x03 (3 times)
   - **Downlink:** 0100000E1003
   - **Response:** 810000000000 (configuration succeed) 810100000000 (configuration fail)
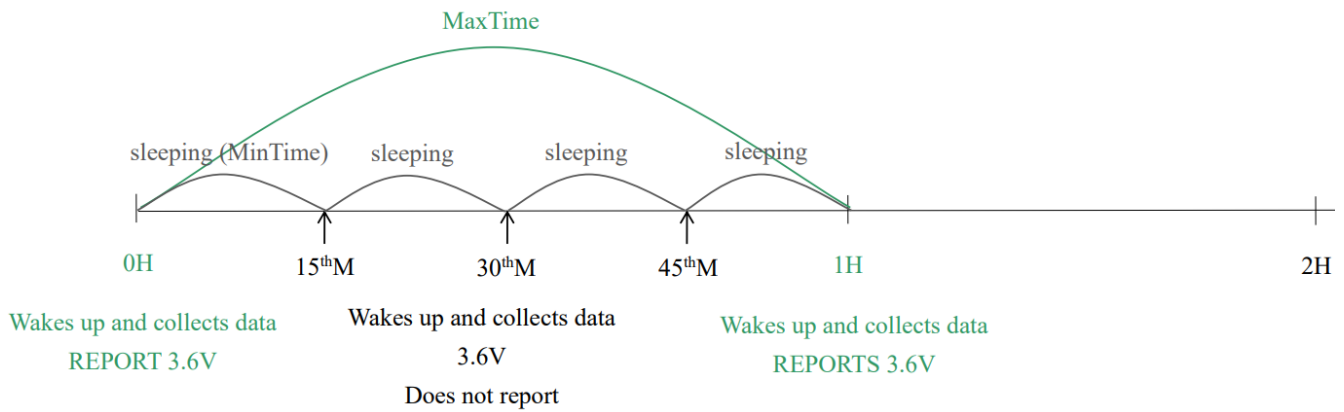2. **Read configuration**
   - **Downlink:** 020000000000
   - **Response:** 8200000E1003
   - **Note:** a. Set RejoinCheckThreshold as 0xFFFFFFFF to stop the device from rejoining the network.
   - **b.** The last configuration would be kept as the device is factory reset.
   - **c. Default** setting: Rejoin Check Period = 2 (hr) and Rejoin Threshold = 3 (times)

Example for Min Time/Max Time logic

- **Example#1** based on Min Time = 1 Hour, Max Time= 1 Hour, Reportable Change i.e. Battery Voltage Change=0.1V

MaxTime	MaxTime
sleeping (MinTime)	sleeping (MinTime)

Wakes up and collect data	Wakes up and collect data	Wake up and collect data
REPORTS 3.6V	REPORTS 3.5V	REPORTS 3.6V

- **Note:** Max Time = Min Time. Data will only be reported according to Max Time (MinTime) duration regardless of Battery Voltage Change value.
- Example#2 based on Min Time = 15 Minutes, Max Time 1 Hour, Reportable Change i.e. Battery Voltage Change= 0.1V.

MaxTime

sleeping (MinTime)   sleeping   sleeping   sleeping

0H   15ᵗʰM   30ᵗʰM   45ᵗʰM   1H   2H

Wakes up and collects data   Wakes up and collects data   Wakes up and collects data
REPORT 3.6V   3.6V   REPORTS 3.6V
                                              Does not report

- **Example#3** based on Min Time = 15 Minutes, Max Time 1 Hour, Reportable Change i.e. Battery Voltage Change 0.1V.

Wakes up and collects data
3.5V |3.5-3.6|=0.1
REPORTS 3.5V

Users push the button,
REPORTS 3.5V.
Recalculate MaxTime.

MaxTime

Wakes up and collects data
3.5V Does not report

sleeping   sleeping

0H   15ᵗʰM   30ᵗʰM   45ᵗʰM   1H 1H 10ᵗʰM   1H 25ᵗʰM   1H 40ᵗʰM   1H 55ᵗʰM   2H 10ᵗʰM

Wakes up and   Wakes up and   Wakes up and   Wakes up and   Wakes up and   Wakes up and   Wakes up and
collects data   collects data   collects data   collects data   collects data   collects data   collects data
REPORTS 3.6V   3.6V   3.5V   3.5V   3.5V   3.5V   REPORTS 3.5V
                        Does not report   Does not report   Does not report   Does not report   Does not report

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 Reportable Change value, the device reports according to the MinTime interval.
    - If the data variation is not greater than the last data reported, the device reports according to the MaxTime interval.
3. We do not recommend setting 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.

Installation

1. The Wireless Resistance Temperature Detector (R718B series) has a built-in magnet. When installed, it can be attached to the surface of an object with iron which is convenient and quick.
    - To make the installation more secure, use screws (purchased) to fix the unit to a wall or other surface.
    - **Note:** Do not install the device in a metal-shielded box or in an environment with other electrical equipment around it to avoid affecting the wireless transmission of the device.
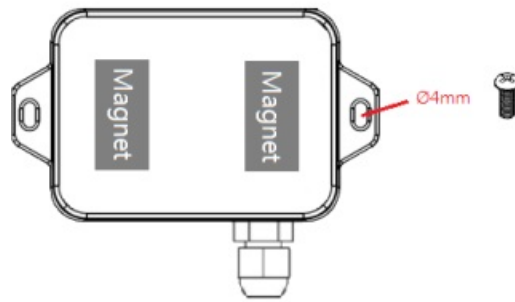
- **Screw hole diameter:** Ø4mm

2. When the R718B series is compared with the last reported values, if the temperature change is exceeded 0.1°C (default), it will report values at the MinTime interval; If does not exceed 0.1°C (default), it will report values at the MaxTime interval.

3. Do not put the whole stainless probe into the liquid. Sinking the probe into the liquid could damage the sealing compound and thus cause the liquid to get inside the PCB.

- **Note:** Do not sink the probe into chemical solutions, such as alc14o hol, ketone, ester, acid, or alkali.

Applications:

- Oven
- Industrial control equipment
- Semiconductor industry

R718BC

- When installing R718BC, a user needs to fix the clamp probe on the surface of a tube and tighten the screw with a slotted screwdriver.

- Range of diameter of post for mounting Ø21mm~Ø38mm

R718BP

- When installing R718BP, user needs to …
- **a.** Remove the liner of the double-sided tape on the back of the patch probe.
- **b.** Put the patch probe on the surface of an object.
- **c.** Fix the patch probe with PTFE tape.

Patch Probe (front)   PTFE Tape
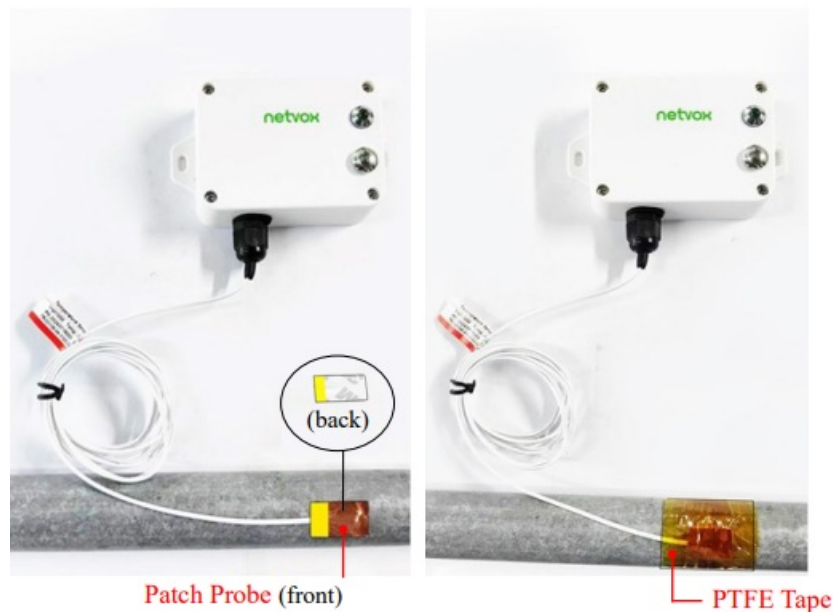
Note:

- **a.** Please do not disassemble the device unless the batteries are required to be replaced.
- **b.** Do not touch the waterproof gasket, LED indicator light, or function keys when replacing the batteries.
- Please use a suitable screwdriver to tighten the screws (if using an electric screwdriver, it is recommended to set the torque as 4kgf) to ensure the device is impermeable.

Information about Battery Passivation

- Many Netvox devices are powered by 3.6V ER14505 Li-SOCl2 (lithium-thionyl chloride) batteries that offer many advantages including low self-discharge rate and high energy density.
- However, primary lithium batteries like Li-SOCl2 batteries will form a passivation layer as a reaction between the lithium anode and thionyl chloride if they are in storage for a long time or if the storage temperature is too high.
- This lithium chloride layer prevents rapid self-discharge caused by continuous reactions between lithium and thionyl chloride, but battery passivation may also lead to voltage delay when the batteries are put into operation, and our devices may not work correctly in this situation.
- As a result, please make sure to source batteries from reliable vendors, and it is suggested that if the storage period is more than one month from the date of battery production, all the batteries should be activated.
- If encountering the situation of battery passivation, users can activate the battery to eliminate the battery hysteresis.

ER14505 Battery Passivation:

To determine whether a battery requires activation

- Connect a new ER14505 battery to a resistor in parallel and check the voltage of the circuit.
- If the voltage is below 3.3V, it means the battery requires activation.

How to activate the battery

- **a.** Connect a battery to a resistor in parallel
- **b.** Keep the connection for 5~8 minutes
- **c.** The voltage of the circuit should be ≧3.3, indicating successful activation.

Brand	Load Resistance	Activation Time	Activation Current
NHTONE	165 Ω	5 minutes	20mA
RAMWAY	67 Ω	8 minutes	50mA
EVE	67 Ω	8 minutes	50mA
SAFT	67 Ω	8 minutes	50mA

- **Note:** If you buy batteries from other than the above four manufacturers, then the battery activation time, activation current, and required load resistance shall be mainly subject to the announcement of each manufacturer.

Relevant Products

Model		Temperature Range	Wire Material	Wire Length	Probe Type	Probe Material	Probe Dimension	Probe IP Rating
R718B120	One-gang	-70° to 200°C	PTFE + silicone	2m	Round head	316 stainless steel	Ø5mm*30mm	IP67
R718B220	Two-gang							
R718B121	One-gang				Needle		Ø5mm*150mm	
R718B221	Two-gang							
R718B122	One-gang	-50° to 180°C			Magnetic	NdFeB magnet + stainless steel spring	Ø15mm	
R718B222	Two-gang							
R718B140	One-gang	-40° to 375°C	Braided Fiberglass		Round head	316 stainless steel	Ø5mm*30mm	IP50
R718B240	Two-gang							
R718B141	One-gang				Needle		Ø5mm*150mm	
R718B241	Two-gang							
R718B150	One-gang	-40° to 500°C			Round head		Ø5mm*30mm	
R718B250	Two-gang							
R718B151	One-gang				Needle		Ø5mm*150mm	
R718B251	Two-gang							
R718BC	One-gang	-50° to 150°C	PTFE + silicone		Clamp		Ø Range: 21 to 38mm	IP67
R718BC2	Two-gang							
R718BP	One-gang	-50° to 150°C	PTFE		Patch	Copper	15mm x 20mm	IP65
R718BP2	Two-gang							

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.

Precautions for Outdoor Installation

- According to the Enclosure Protection Class (IP code), the device is compliant with the GB 4208-2008 standard, which is equivalent to IEC 60529:2001 degrees of protection provided by enclosures (IP Code).

IP Standard Test Method:

- **IP65:** spray the device in all directions under 12.5L/min water flow for 3min, and the internal electronic function is normal.
- **IP65** is dustproof and able to prevent damage caused by water from nozzles in all directions from invading electrical appliances.
- It can be used in general indoor and sheltered outdoor environments. Installation in extreme weather conditions or direct exposure to sunlight and rain could damage the components of the device.
- Users may need to install the device under an awning (fig. 1) or face the side with an LED and function key downwards (fig. 2) to prevent malfunction.
- **IP67:** the device is immersed in 1m deep water for 30 minutes, and the internal electronic function is normal.

Fig 1. Install under an awning

Fig 2. Install with LED and function key faced downwards.

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Documents / Resources

netvox R718B Series Wireless Temperature Sensor [pdf] User Manual
R718B120, R718B Series Wireless Temperature Sensor, R718B Series, Wireless Temperature Sensor, Temperature Sensor, Sensor

References

- 🌐 **Netvox LoRaWAN Application Command**
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- **User Manual**