



netvox R718N3 Series Wireless 3-Phase Current Meter User Manual

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netvox R718N3 Series Wireless 3-Phase Current Meter



Product Information

The Wireless 3-Phase Current Meter R718N3 Series is a device that measures and reports electrical current in real-time. It uses LoRa technology and follows standard specifications to ensure interoperability between devices and gateways from different manufacturers. The device comes with a CT (Current Transformer) and has a battery life that varies depending on the sensor reporting frequency and other variables. Users can find the battery life for different configurations on the website.

Product Usage Instructions

Set up Instruction

- **Power On:** Turn on the device.
- **Power Off:** Turn off the device.
- **Restore to Factory Setting:** Turn off the device and restore it to factory settings.
- **Network Joining:** Press and hold the function key for 5 seconds to join the network. The green indicator light flashes 20 times for success, and remains off for failure. If the device is in the network, the green indicator light flashes once and sends a report. If the device is not in the network, the green indicator light remains off.
- **Sleeping Mode:** The device is turned on and in the network.
- **Low Voltage Warning:** The device will be set to default and turned off when the voltage drops below 3.2V.

Data Report

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

reports and sending periods as per their requirements. The device sends a version packet report along with two uplink packets including 3 currents, 3 multipliers, and battery voltage. Users can refer to the Netvox LoRaWAN Application Command document and Netvox Lora Command Resolver to resolve uplink data.

- **Min. Interval:** Users can set any number between 20-65535 seconds.
- **Max. Interval:** Users can set any number between Min.-65535 seconds.
- **Reportable Change:** Cannot be 0.
- **Current Change Reportable Change:** Report per Min. Interval.
- **Current Change Reportable Change:** Report per Max. Interval.

Example of ReportDataCmd

The uplink data is sent in two packets:

- **Data #1:** Version, DeviceType, ReportType, Battery (3.6V), Current1 (1100mA), Current2 (2200mA).
- **Data #2:** SoftwareVersion, Hardware, DateCode, Reserved.

The real current values should be converted with the respective multipliers.

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Introduction

- The R718N3 series is a 3-Phase Current Meter device for Netvox Class A type devices based on the LoRaWAN open protocol and is compatible with the LoRaWAN
- protocol. R718N3 series have different measuring ranges for different varieties of CT. It is divided into:
- R718N3Wireless 3-Phase Current Meter with 3 x 50A Solid Core CT (Range:100mA-50A , Accuracy: $\pm 1\%$ (300mA-50A))
- R718N37Wireless 3-Phase Current Meter with 3 x 75A Clamp-On CT (Range:100mA-75A , Accuracy: $\pm 1\%$ (300mA-75A))
- R718N315Wireless 3-Phase Current Meter with 3 x 150A Clamp-On CT (Range:1A-150A $\pm 1\%$)
- R718N325Wireless 3-Phase Current Meter with 3 x 250A Clamp-On CT (Range:1A-250A $\pm 1\%$)
- R718N363Wireless 3-Phase Current Meter with 3 x 630A Clamp-On CT (Range:10A-630A $\pm 1\%$)
- R718N3300Wireless 3-Phase Current Meter with 3 x 3000A Clamp-On CT (Range:150A-3000A $\pm 1\%$)
- When the current of the device that is 75A or below is less than 100mA, the current is reported as 0.
- When the current of the device that is above 75A is less than 1A, the current is reported as 0.

LoRa Wireless Technology

LoRa is a wireless communication technology famous for its long-distance transmission and low power consumption. Compared with other communication methods, LoRa spread spectrum modulation technique greatly extends the communication distance. It can be widely used in any use case that requires long-distance and low-data wireless communications. For example, automatic meter reading, building automation equipment, wireless

security systems, and industrial monitoring. It has features like small size, low power consumption, long transmission distance, strong 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



Main Features

- Adopt SX1276 wireless communication module.
- 2 x ER14505 lithium battery in parallel (3.6V/section)
- 3-phase current meter detection.
- The base is attached to a magnet that can be attached to a ferromagnetic material object.
- IP rating: Main body – IP53, CT – IP30
- LoRaWANTM Class A compatible
- Frequency Hopping Spread Spectrum (FHSS)
- Available third-party platforms: Actility/ThingPark, TTN, MyDevices/Cayenne
- Low power consumption and long battery life
- Battery Life: Please refer to the web: http://www.netvox.com.tw/electric/electric_calc.html
- On this website, users can find battery lifetime for various models at different configurations.

1. The actual range may vary depending on the environment.

2. Battery life is determined by sensor reporting frequency and other variables.

Set up Instruction

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 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 20 times.
Power off	Remove Batteries.
Note	<p>1. The device will be off in default after removing the battery and inserting it again.</p> <p>2. It is suggested to wait for at least 10 seconds between turning the device on and off. 3. At the 1st -5th second after power on, the device will be in engineering test mode.</p>
Network Joining	
Never joined the network	<p>Turn on the device, and it will search for the network to join.</p> <p>The green indicator light stays on for 5 seconds: and joins the network successfully The green indicator light remains off: fails to join the network</p>
Had joined the network (not restore to factory setting)	<p>Turn on the device, and it will search for the previous network to join.</p> <p>The green indicator light stays on for 5 seconds: and joins the network successfully The green indicator light remains off: and fails to join the network</p>
Fail to Join the Network	<p>Suggest checking the device verification information on the gateway or consulting your</p> <p>platform server provider.</p>
Function Key	
Press the function key and hold the press for 5 seconds	<p>The device will be set to default and turned off</p> <p>The green indicator light flashes 20 times: success The green indicator light remains off: fail</p>

Press the function key once	<p>The device is in the network: green indicator light flashes once and sends a report</p> <p>The device is not in the network: the green indicator light remains off</p>
Sleeping Mode	
The device is turned on and in the network	<p>Sleep period: Min Interval.</p> <p>When the report change exceeds the setting value or the state changes: send a data report according to Min Interval.</p>

Low Voltage Warning

Low Voltage	3.2V
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Data Report

- The device will immediately send a version packet report along with two uplink packets including 3 current, 3 multiplier and battery voltage.
- The device sends data in the default configuration before any configuration is done.

Default setting

- Max Interval = 0x0E10 (3600 s)
- Min Interval = 0x0E10 (3600 s)
- CurrentChange = 0x0064 (100 mA)
- The interval between min time and max time must be greater than 20 seconds.

Note

1. The device report interval will be programmed based on the default firmware which may vary.
2. If the MinTime configuration is less than 20 seconds, it will configure 20 seconds.
3. R718N3 series would take about 3 seconds for the CT to sample and process the collected value. If the current changes frequently, the sampling result might be wrong.

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 n 20~65535	Any number between n Min.~65535	Can not be 0	Report per Min. Interval	Report per Max. Interval

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 device type is listed in Netvox LoRaWAN Application Devicetype .doc
- ReportType – 1 byte –the presentation of the NetvoxPayloadData, according to the device type
- NetvoxPayloadData– Fixed bytes (Fixed =8bytes)

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 014A000A0B202005200000, the firmware version is 2020.05.20

3. Data Packet:

When Report Type=0x01 is a data packet; If the device data exceeds 11 bytes or there are shared data packets, the Report Type will have different values.

Device	DeviceType	Report Type	NetvoxPayloadData				
R718N3	0x4A	0x00	SoftwareVersion (1Byte) Eg.0x0A—V1.0	Hardware Version (1Byte)	DateCode (4Bytes, eg 0x20170503)	Reserved (2Bytes, fixed 0x00)	
		0x01	Battery (1Byte, unit:0.1V)	Current1 (2 Bytes, Unit:1 mA)	Current2 (2 Bytes, Unit:1mA)	Current3 (2 Bytes, Unit: 1mA)	Multiplier1 (1Byte), the real current1 should convert with Current* Multiplier
		0x02	Battery (1Byte, unit: 0.1V)	Multiplier2(1Byte), the real current2 should convert with Current* Multiplier	Multiplier3(1Byte), the real current3 should convert with Current* Multiplier	Reserved (5Bytes, fixed 0x00)	

- Uplink: Data # 1: 014A0124006400C81B5801
- Data # 2: 014A0224010A0000000000
- 1st byte (01): Version
- 2nd byte(4A): DeviceType 0x4A R718N3 Series
- 3rd byte (01): ReportType
- 4th byte(24): Battery 3.6V, 24 (Hex)= 36 (Dec), $36 \times 0.1 = 3.6$ V
- 5th 6th byte(0064): Current 1 100mA , 0064(Hex)= 100 (Dec)
- 7th 8th byte(00C8): Current 2 200mA , 0064(Hex)= 200 (Dec)
- 9th 10th byte(1B58): Current 3 70000mA , 1B58(Hex)= 7000 (Dec), $7000 \times \text{Multiplier } 10 = 70000$
- 11th byte(01): Multiplier 1

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=9bytes)

Description	Device	CmdID	Device Type	NetvoxPayLoadData			
Config ReportReq	R718N3	0x01	0x4A	MinTime (2bytes Units:s)	Maxime (2bytes Unit:s)	CurrentChange (2byte Unit:1mA)	Reserved (3Bytes,Fixed 0x00)
Config ReportRsp		0x81		Status (0x00_success)		Reserved (8Bytes,Fixed 0x00)	
ReadConfig ReportReq		0x02		Reserved (9Bytes,Fixed 0x00)			
ReadConfig ReportRsp		0x82		MinTime (2bytes Units:s)	Maxime (2bytes Units:s)	CurrentChange (2byte Unit:1mA)	Reserved (3Bytes,Fixed 0x00)

1. Configure device parameters MinTime = 1min, MaxTime = 1min, CurrentChange = 100mA

- Downlink: 014A003C003C0064000000
- The device returns:
- 814A000000000000000000 (Configuration successful)
- 814A010000000000000000 (Configuration failed)

2. Read device configuration parameters

- Downlink: 024A000000000000000000
- The device returns:
- 824A003C003C0064000000 (Current device configuration parameters)

Note

- Press and hold the function key for 5 seconds, and the device will turn off and restore the original factory mode.
- If you want to change the value of MinTime/MaxTime and want to keep the changed value when the device is powered off, please remove the battery directly without long pressing the function key.

Example of SetRportType

The R718N3 series defaults to return two packets, which can be changed to one by the following command.
(Supported after firmware 2022.8.XX)

Description	Device	CmdID	Device Type	NetvoxPayLoadData	
SetRportTypeReq	R718N3	0x03	0x4A	ReportTypeSet (1Byte,0x00_reporttype1&2,0x01_reporttype3)	Reserved (8Bytes,Fixed 0x00)
SetRportTypeResp		0x83		Status (0x00_success)	Reserved (8Bytes,Fixed 0x00)
GetRportTypeReq		0x04		Reserved (9Bytes,Fixed 0x00)	
GetRportTypeResp		0x84		ReportTypeSet (1Byte,0x00_reporttype1&2,0x01_reporttype3)	Reserved (2Bytes,Fixed 0x00)

- Configure ReportTypeSet =0x01_reporttype3
 - Downlink: 034A01000000000000000000 // 0x01 Uplink return one packet.
 - The device returns:
 - 834A00000000000000000000 (Configuration successful)
 - 834A01000000000000000000 (Configuration failed)
- Read device configuration parameters.

- Downlink: 044A0000000000000000
- The device returns:
- 844A010000000000000000 (Current device configuration parameters)

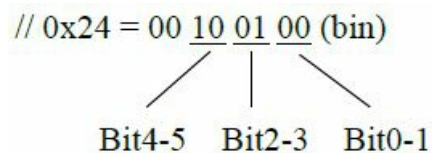
The format of one packet

Device	Device Type	Report Type	NetvoxPayloadData				
							Multiplier(1Byte)
							BIT0-1: Multiplier1
							0b00_1
							0b01_5
							0b10_10
							0b11_100
							BIT2-3: Multiplier2
			Battery	Current1	Current2	Current3	0b00_1
R718N3							
	0x4A	0x03	(1Byte)	(2Bytes)	(2Bytes)	(2Bytes)	0b01_5
Series							
			Unit:0.1V	Unit:1mA	Unit:1mA	Unit:1mA	0b10_10
							0b11_100
							BIT4-5: Multiplier3
							0b00_1
							0b01_5
							0b10_10
							0b11_100
							BIT6-7: Reserved

Uplink: 014A032405DC36B080E824

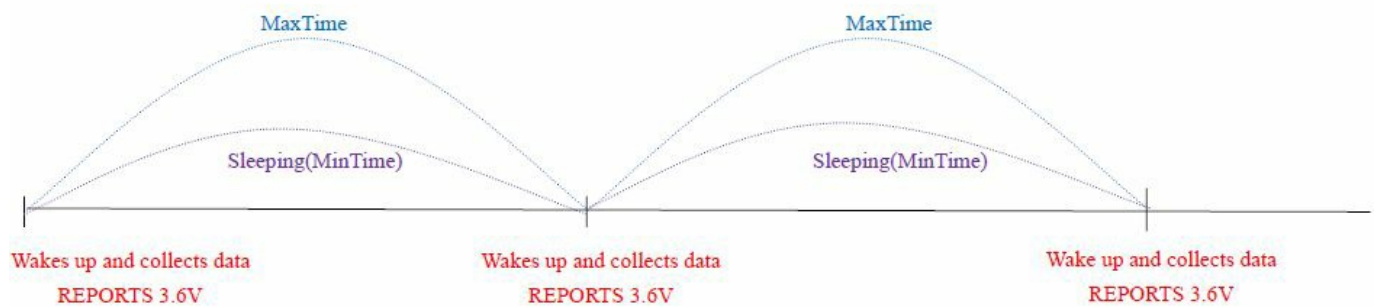
- 1st byte (01): Version
- 2nd byte(4A): DeviceType 0x4A R718N3 Series
- 3rd byte (03): ReportType
- 4th byte(24): Battery 3.6V, 24 (Hex)= 36 (Dec), $36 \times 0.1 = 3.6$ V
- 5th 6th byte(05DC): Current 1 05DC Hex=1500 Dec, $1500 \times 1 = 1500$ mA (1.5A)
- 7th 8th byte (36B0): Current 2 Current 2 36B0 Hex=14000 Dec , $14000 \times 5 = 70000$ mA (70A)
- 9th 10th byte (80E8): Current 3 Current 3 80E8 Hex=33000 Dec , $33000 \times 10 = 330000$ mA (330A)

- 11th byte (24): Multiplier1=1, Multiplier2=5, Multiplier3=10



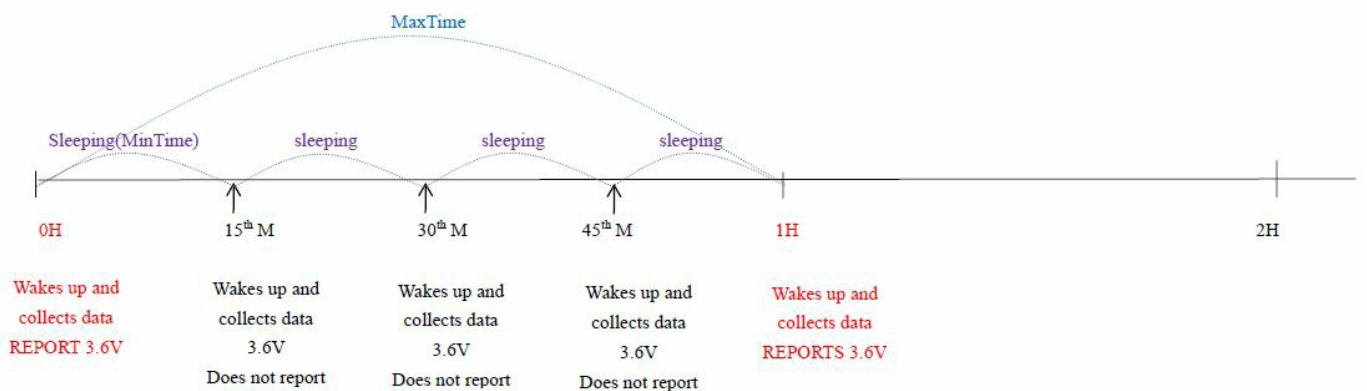
Example for MinTime/MaxTime logic

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

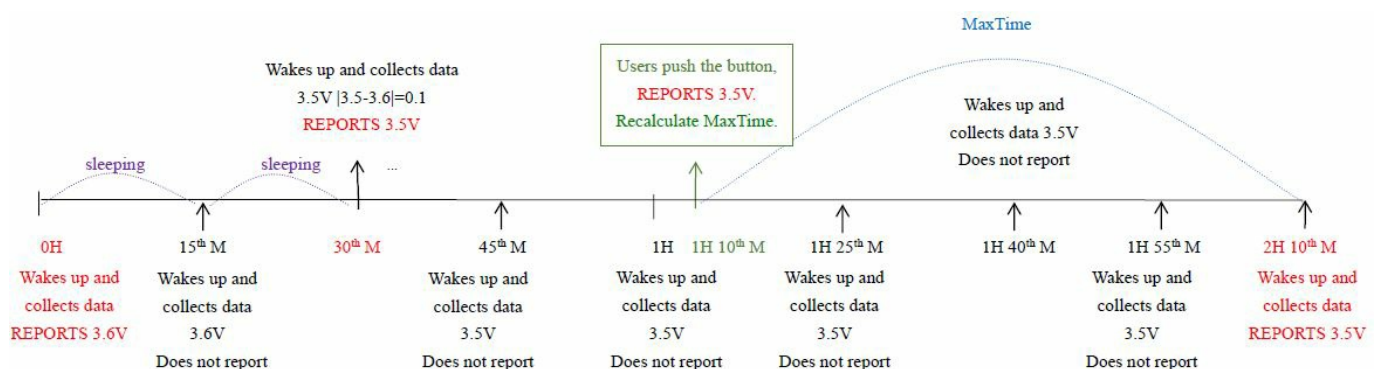


Note: MaxTime=MinTime. Data will only be reported according to MaxTime (MinTime) duration regardless BatteryVoltageChange value.

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.



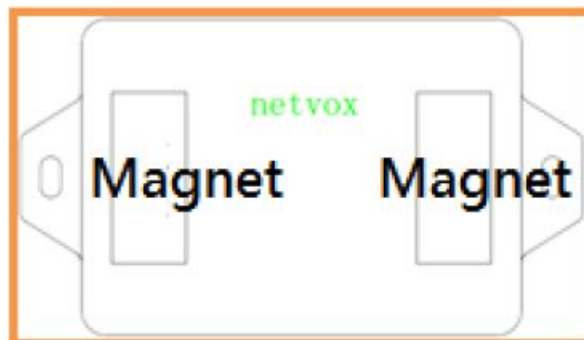
Notes

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 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 3-phase current meter (R718N3) has a built-in magnet (see Figure 1 below). It can be attached to the surface of an object with iron during installation, which is convenient and quick.
To make the installation more secure, please use screws (purchased separately) to fix the device to the wall or other objects (such as the installation diagram).

Note: Do not install the device in a metal-shielded box or in an environment surrounded by other electrical equipment to avoid affecting the wireless transmission of the device.



2. Open the clamp-on current transformer, and then pass the live wire through the current transformer according to the installation.

Note:

“L←K” is marked on the bottom of the CT.

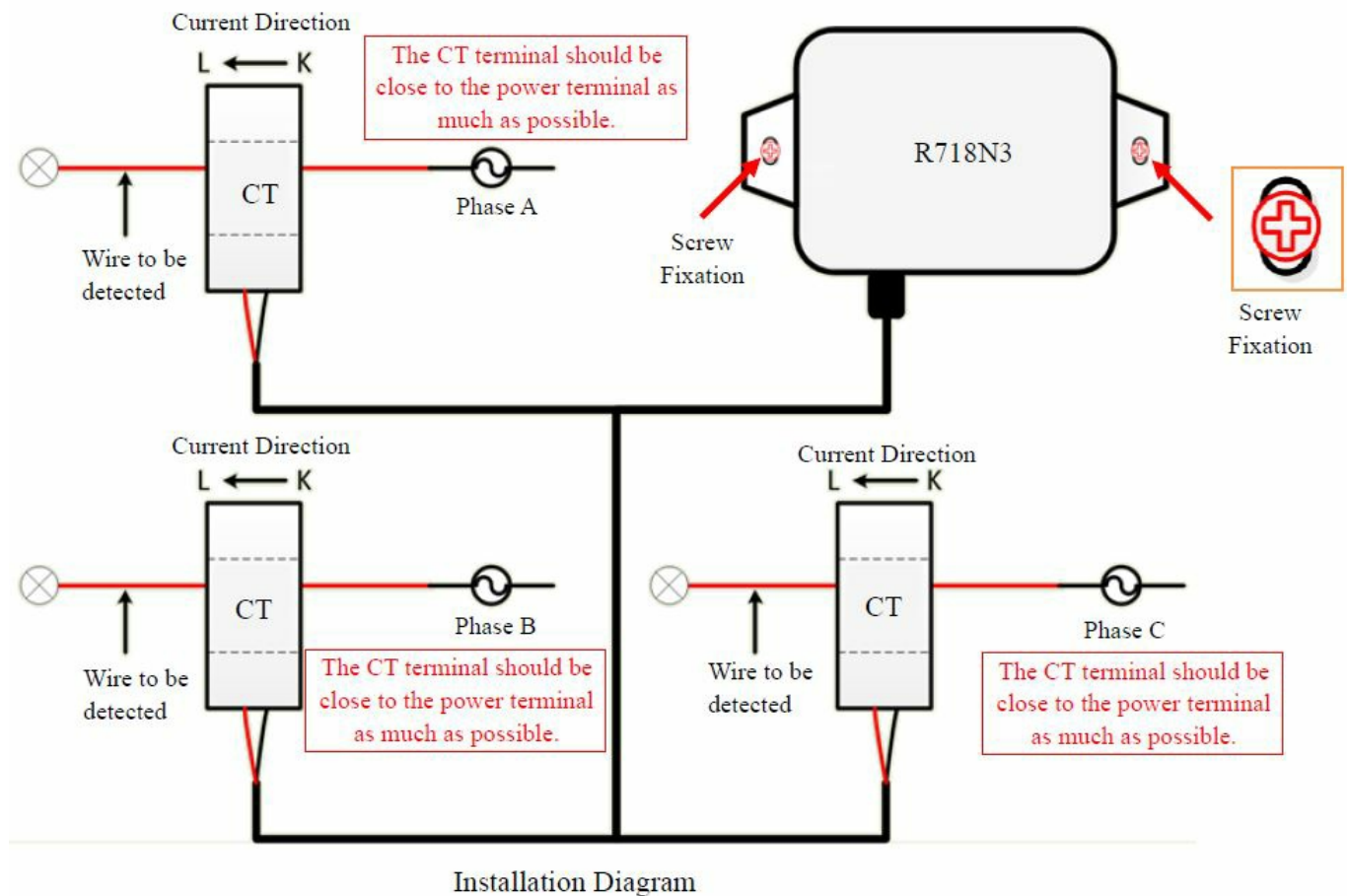
3. Precautions:
 - Before using, the user must check whether the appearance is deformed; otherwise, the test accuracy will be affected.
 - The using environment should be kept away from strong magnetic fields, so as not to affect the test accuracy. It is strictly forbidden to use in humid and corrosive gas environments.
 - Before installation, please confirm the current value of the load. If the current value of the load is higher than the measurement range, select a model with a higher measurement range.
4. The 3-phase current meter (R718N3) samples the current according to MinTime. If the current value sampled this time relatively exceeds the set value (the default is 100mA) more than the current value reported last time, the device will immediately report the current value sampled this time. If the current variation does not exceed the default value, the data will be reported regularly according to MaxTime.
5. Press the [Key] of the device to start sampling data and report the data after 3 to 5 seconds.

Note: MaxTime must be set greater than Min Time.

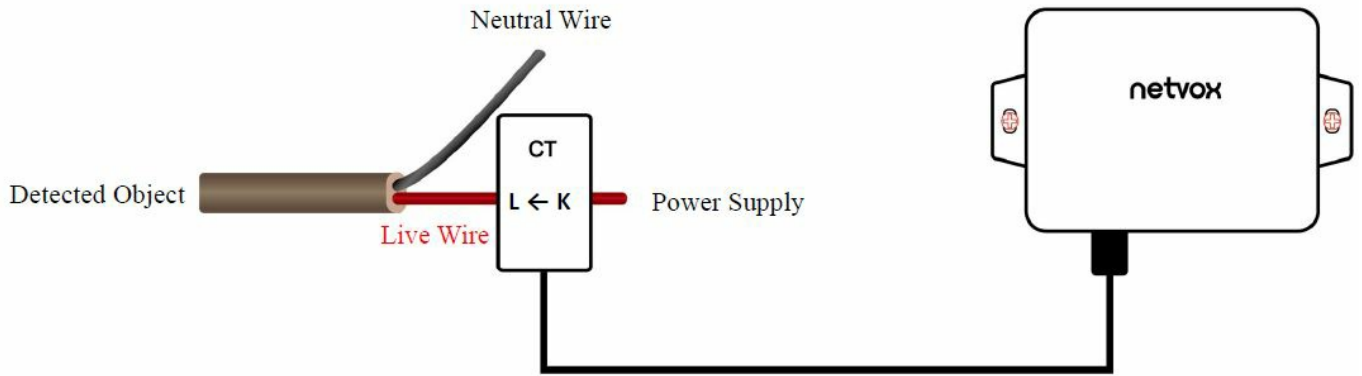
The three-phase current detector (R718N3) is suitable for the following scenarios:

- School
- Factory
- Shopping mall
- Office building
- Smart building

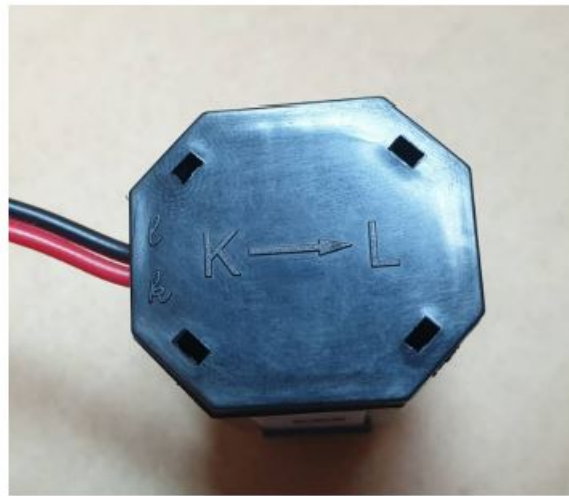
Where the electrical data of the device with the three-phase electricity needs to be detected.



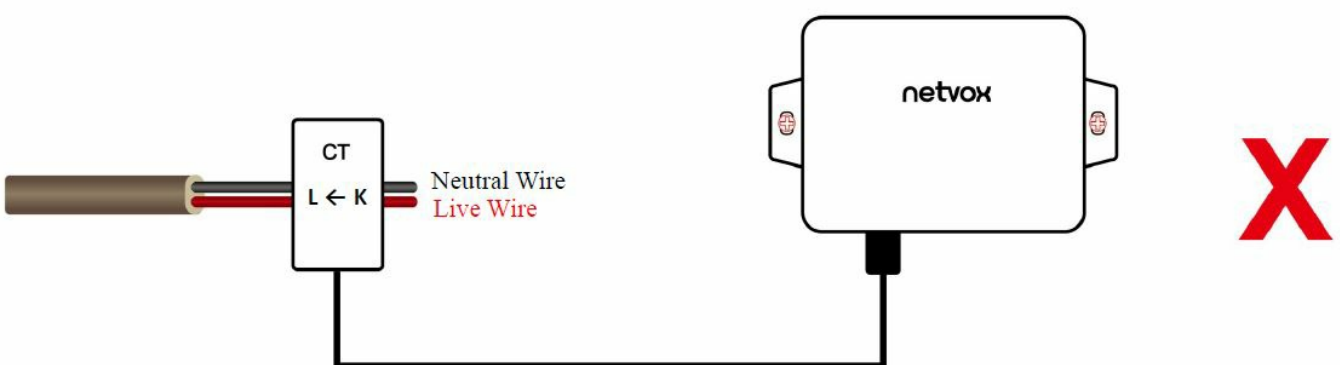
1. When using it, the back of it can be adsorbed on the iron surface, or the two ends can be fixed to the wall with screws.
2. When installing the R718N3 series current transformer, please separate the live and neutral wires of the wire to be detected, and only take the live wire through the current transformer and start the measurement according to the wiring below:



CT Wiring Schematic Diagram (Current direction K→L)



- If the live wire and the neutral wire are connected together at the same time, they will offset each other and the measurement is 0.



Note

Please do not disassemble the device unless it is required to replace the batteries. 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 of 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

- Connect a battery to a resistor in parallel
- Keep the connection for 5~8 minutes
- 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.

Important Maintenance Instruction

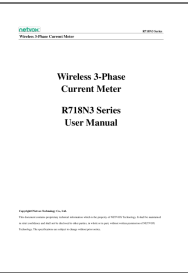
Kindly pay attention to the following in order to achieve the best maintenance of the product:

- 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 a dusty or dirty environment. It might damage its detachable parts and electronic components.
- Do not store the device under excessively 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, 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 the device 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 its 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.

Documents / Resources

	netvox R718N3 Series Wireless 3-Phase Current Meter [pdf] User Manual R718N3 Series Wireless 3-Phase Current Meter, R718N3 Series, Wireless 3-Phase Current M eter, 3-Phase Current Meter, Current Meter, Meter
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References

- [🌐 Netvox LoRaWAN Application Command](#)
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