Wireless Light Sensor and 1-Phase Current Meter

R718NL1 series
User Manual

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1. Introduction

The R718NL1 series is a Wireless Light Sensor and 1-Phase Current Meter device for Netvox ClassA type devices based on the LoRaWAN open protocol and is compatible with the LoRaWAN protocol.

R718NL1 series have different measurement range for different variety of CT.

It is divided into:

R718NL1 Wireless Light Sensor and 1-Phase Current Meter with 1 x 30A Solid Core CT   (Range:100mA-30A ±1%)

R718NL13 Wireless Light Sensor and 1-Phase Current Meter with 1 x 30A Clamp-On CT   (Range:100mA-30A ±1%)

R718NL17 Wireless Light Sensor and 1-Phase Current Meter with 1 x 75A Clamp-On CT   (Range:100mA-75A ±1%)

R718NL115 Wireless Light Sensor and 1-Phase Current Meter with 1 x 150A Clamp-On CT   (Range:1A-150A ±1%)

R718NL125 Wireless Light Sensor and 1-Phase Current Meter with 1 x 250A Clamp-On CT   (Range:1A-250A ±1%)

R718NL163 Wireless Light Sensor and 1-Phase Current Meter with 1 x630A Clamp-On CT   (Range:5A-630A ±1%)

*The three CT current models -- R718NL115, R718NL125, and R718NL163 report 0A when the current is less than 1A.

All other R718NL1 models report 0A when the current is less than 0.1A.

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 extend 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, 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.
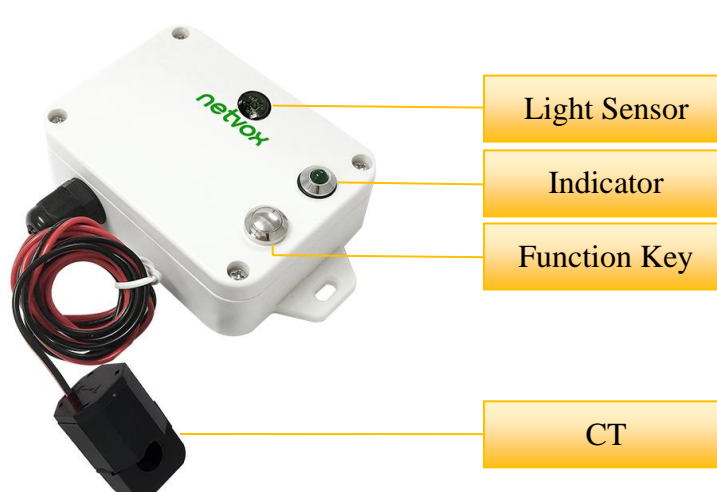
2. Appearance

| Light Sensor |
| Indicator |
| Function Key |

| CT |

R718NL1   R718NL13   R718NL17

R718NL115   R718NL125   R718NL163

3. Main Features

● Compatible with LoRaWAN protocol

● 2 sections ER14505 3.6V Lithium AA battery

● Protection level : Main body IP53, Sensor IP30

● Compatible with LoRaWAN^{TM} Class A

● Frequency hopping spread spectrum technology

● 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)

● Available third-party platform: 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 battery life time for varied models at different configurations.

4. Set up Instruction

On/Off

Power on	Insert batteries. (users may need a 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 green indicator flashes for 20 times.
Power off	Remove Batteries.
Note	1.The device will be off after removing the battery and insert it again. 2.It is suggested to wait for at least 10 seconds between turning the device on and off. 3.At 1st -5th second after power on, the device will be in engineering test mode.

Network Joining

If the device has never joined the network	Turn on the device, and it will search for the network to join. The green indicator light stays on for 5 seconds: joins the network successfully The green indicator light remains off: fail to join the network
If the device has joined the network and it is not set to default	Turn on the device, and it will search for the previous network to join. The green indicator light stays on for 5 seconds: joins the network successfully The green indicator light remains off: fail to join the network
If the device fails to join the network (when the device is turned on)	For the first two minutes: the device will wake up every 15 seconds to send a join request. After two minutes: the device will enter sleep mode and wake up every 15 minutes to send a join request. Note: It is suggested to remove the batteries if the device is not in use to save power. It is suggested to check the device verification information on the gateway or consult your platform server provider when the device fails to join the network.

Function Key

Press the function key and hold the pressing for 5 seconds	The device will be set to default and turned off The green indicator light flashes for 20 times: success The green indicator light remains off: fail
Press the function key once (press the key briefly and release the key within 500ms)	The device is in the network: green indicator light flashes once and sends a report The device is not in the network: green indicator light remains off

Sleeping Mode

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

Low Voltage Warning

Low Voltage	3.2 V

5. Data Report

The device will immediately send a version packet report along with an uplink packet including current, illuminance and battery voltage.

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

Default setting:

    Maximum time: Max Interval =30 min (1800 s)

    Minimum time: Min Interval =30 min (1800 s)　　　　　*Please configure more than 30 seconds

    CurrentChange:0x0064 (100 mA)

    IlluminanceChange: 0x0064 (100 Lux)

Light sensor support 3 ranges of Illuminance:

    0x00, 3~65000 Lux　(default)

    0x01, 3~130000 Lux

    0x02, 3~220000 Lux

Note:

    (1) The device report interval will be programmed based on the default firmware which may vary.

    (2) The interval between two reports must be the minimum time.

    (3) If MinTime configuration less than 30 seconds, it will configure 30 seconds.

    (4) R718NL1 series would take about 15 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 following:

Min. Interval (Unit:second)	Max. Interval (Unit:second)	Reportable Change	Current Change≥ Reportable Change	Current Change＜ Reportable Change
Any number between 30~65535	Any number between Min.~65535	Can not be 0.	Report per Min. Interval	Report per Max. Interval

Example of Report configuration

Bytes	1 Byte	1 Byte	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				
ConfigReportReq		0x01		MinTime (2bytes Unit:s)	MaxTime (2bytes Unit:s)	CurrentChange (2byte Unit:1mA)	Illuminancechange (2bytes Unit:1Lux)	Reserved (1Bytes,Fixed 0x00)
ConfigReportRsp	R718NL1	0x81	0x98	Status (0x00_success)			Reserved (8Bytes,Fixed 0x00)	
ReadConfig ReportReq		0x02		Reserved (9Bytes,Fixed 0x00)				
ReadConfig ReportRsp		0x82		MinTime (2bytes Unit:s)	MaxTime (2bytes Unit:s)	CurrentChange (2byte Unit:1mA)	Illuminancechange (2bytes Unit:1Lux)	Reserved (1Bytes,Fixed 0x00)

(1) Configure report parameters MinTime = 1min, MaxTime = 1min, CurrentChange=100mA, IlluminanceChange= 100Lux

Downlink: 0198003C003C0064006400

The device returns:

8198000000000000000000 (Configuration succeeded)

8198010000000000000000 (Configuration failed)

(2) Read device configuration parameters

Downlink: 0298000000000000000000

The device returns:

8298003C003C0064006400 (current device configuration parameters)

Report Current and Illuminance Data Example

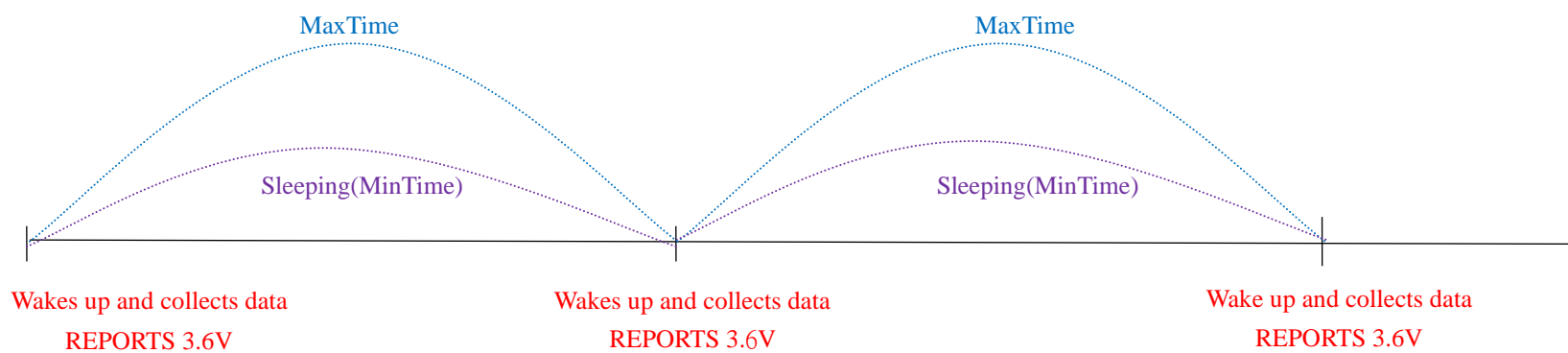| R718NL1	0x98	0x01	Battery (1Byte, unit:0.1V)	Current (2Bytes, Unit:1ma)	Multiplier(1Byte), the real current should convert with Current* Multiplier	Illuminance (4Bytes, unit:1Lux)

FPort:6 Report Data: 01980124 03E8 01 00000003

Actual Current Value = Current*Mulitplier

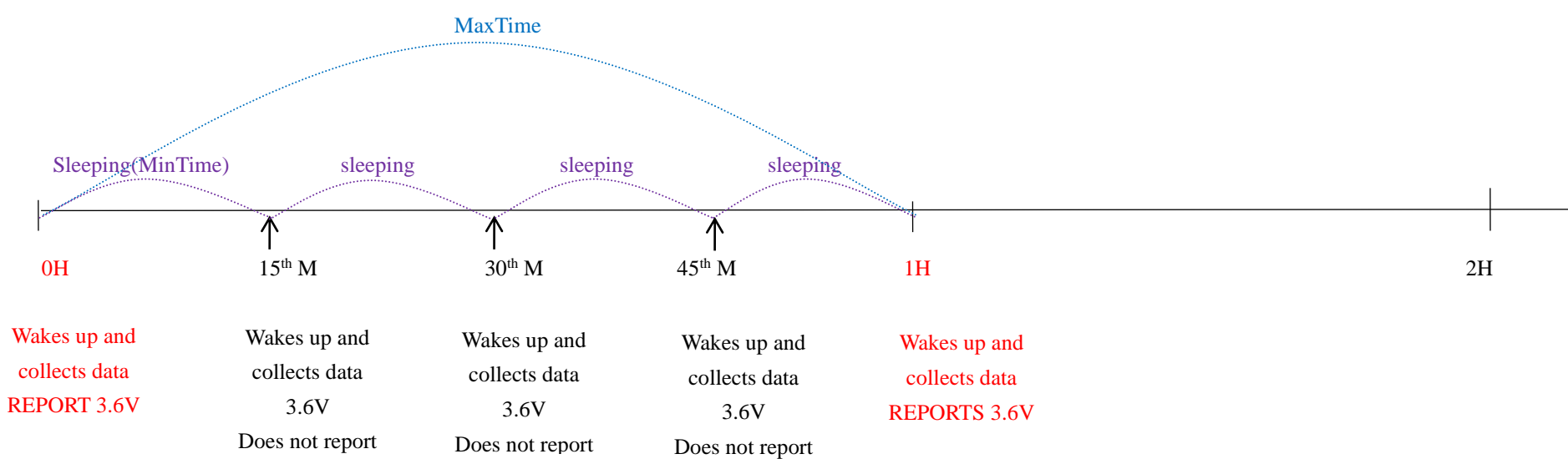When illuminance less than 3 lux, the reported value is 3 lux.

Example for MinTime/MaxTime logic

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

MaxTime

Sleeping(MinTime)

MaxTime

Sleeping(MinTime)

Wakes up and collects data
REPORTS 3.6V

Wakes up and collects data
REPORTS 3.6V

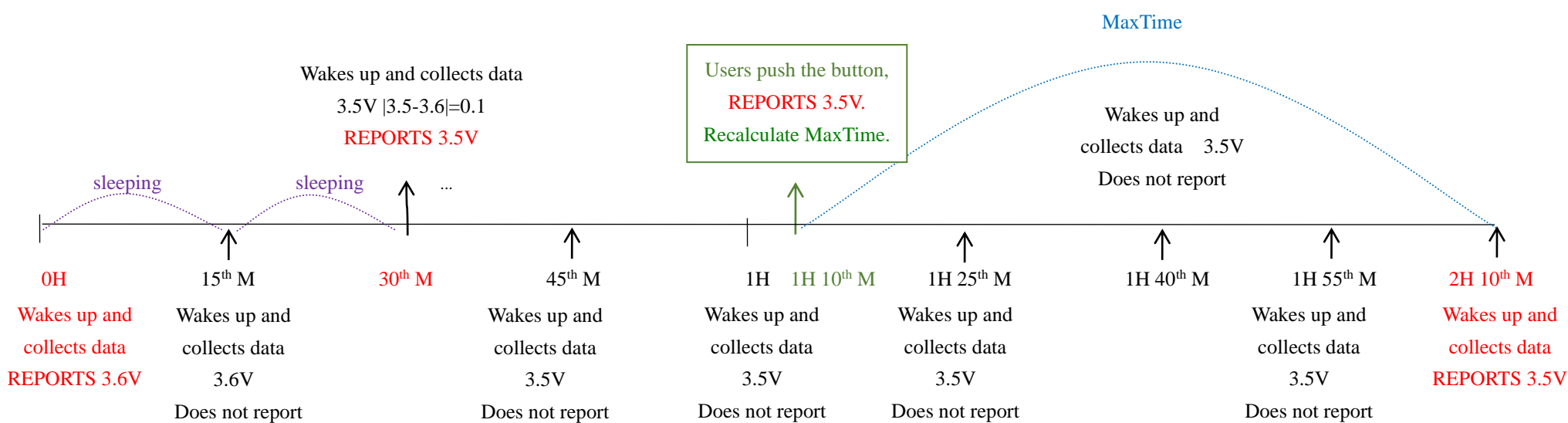Wake up and collects data
REPORTS 3.6V

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.

MaxTime

Sleeping(MinTime)   sleeping   sleeping   sleeping

0H   15th M   30th M   45th M   1H   2H

Wakes up and collects data
REPORT 3.6V

Wakes up and collects data
3.6V
Does not report

Wakes up and collects data
3.6V
Does not report

Wakes up and collects data
3.6V
Does not report

Wakes up and collects data
REPORTS 3.6V

Example#3 based on MinTime = 15 Minutes, MaxTime= 1 Hour, Reportable Change i.e. BatteryVoltageChange= 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   15th M   30th M   45th M   1H   1H 10th M   1H 25th M   1H 40th M   1H 55th M   2H 10th M

Wakes up and collects data
REPORTS 3.6V

Wakes up and collects data
3.6V
Does not report

Wakes up and collects data
3.5V
Does not report

Wakes up and collects data
3.5V
Does not report

Wakes up and collects data
3.5V
Does not report

Wakes up and collects data
3.5V
Does not report

Wakes up and collects data
REPORTS 3.5V

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 <u>reported</u>. 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.
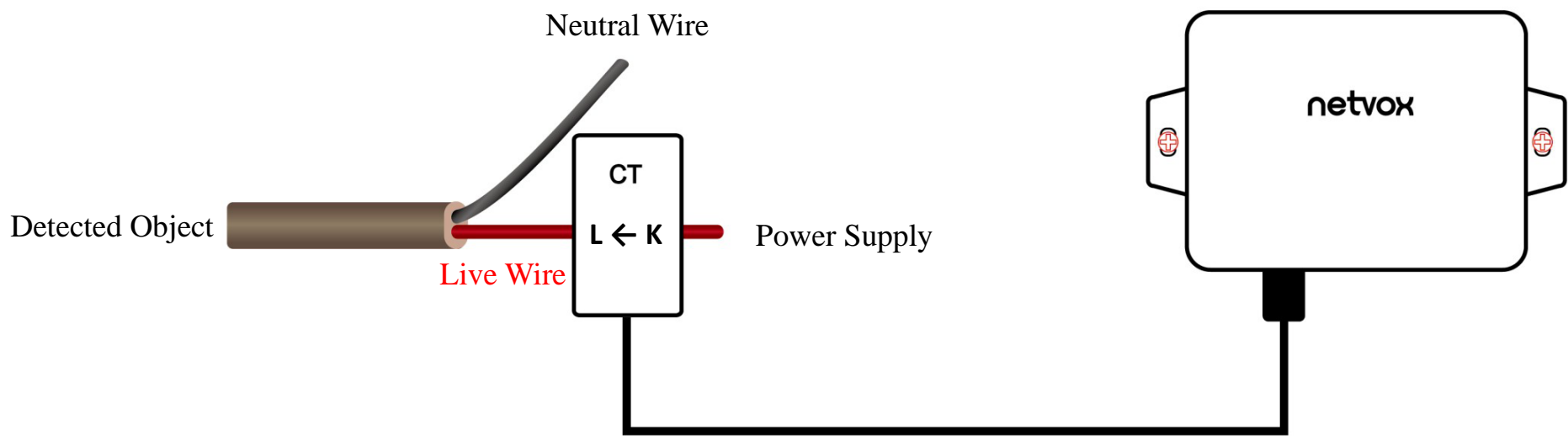
6. Installation

This product comes with waterproof function.

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.
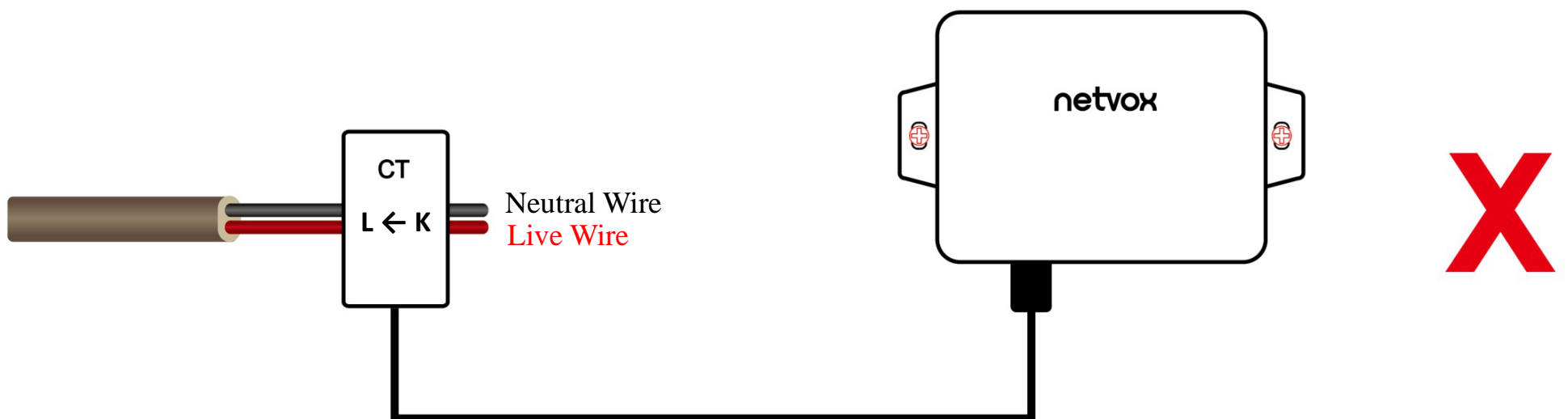
When installing the current transformer, separate the live and neutral wires, and take out the live wire separately and start the measurement according to the wiring below.


CT Wiring Schematic Diagram (Current direction K→L)
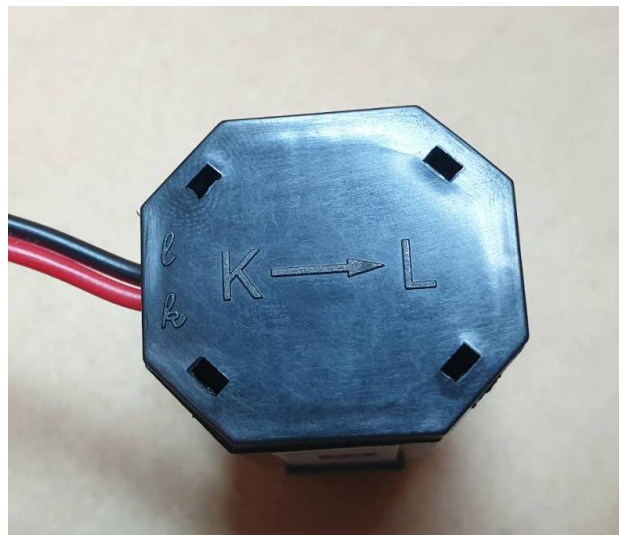
If the live wire and the neutral wire are connected together at the same time, they will offset each other and the measurement is 0.

1.The single-phase current detector (R718NL1) has a built-in magnet (as the figure 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.
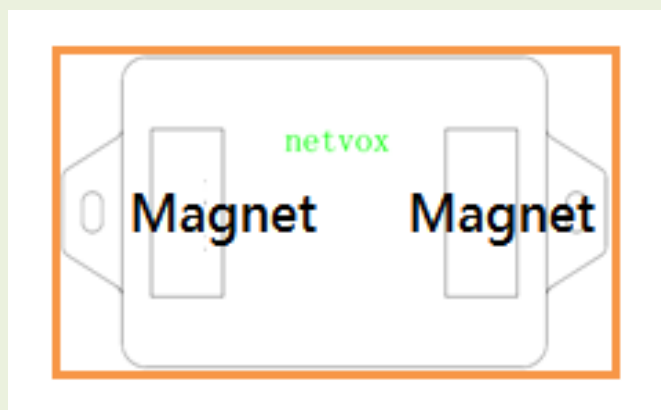
2. Open the split current transformer, and then pass the live wire through the current transformer according to the installation.

Note:

"L←K" is marked on the bottom of the CT.

3. Precautions:

- Before using, 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 single-phase current detector (R718NL1) takes 15 seconds to sample the current, that is, the device starts sampling 15 minutes before the arrival of MinTime. If the current value of the sample is relatively compared with the current value reported last time, it exceeds the set value (default value 100mA), when the MinTime is reached, the current value of the current sample is immediately reported. If the current change does not exceed the default value, the data will be reported regularly according to Maxtime.
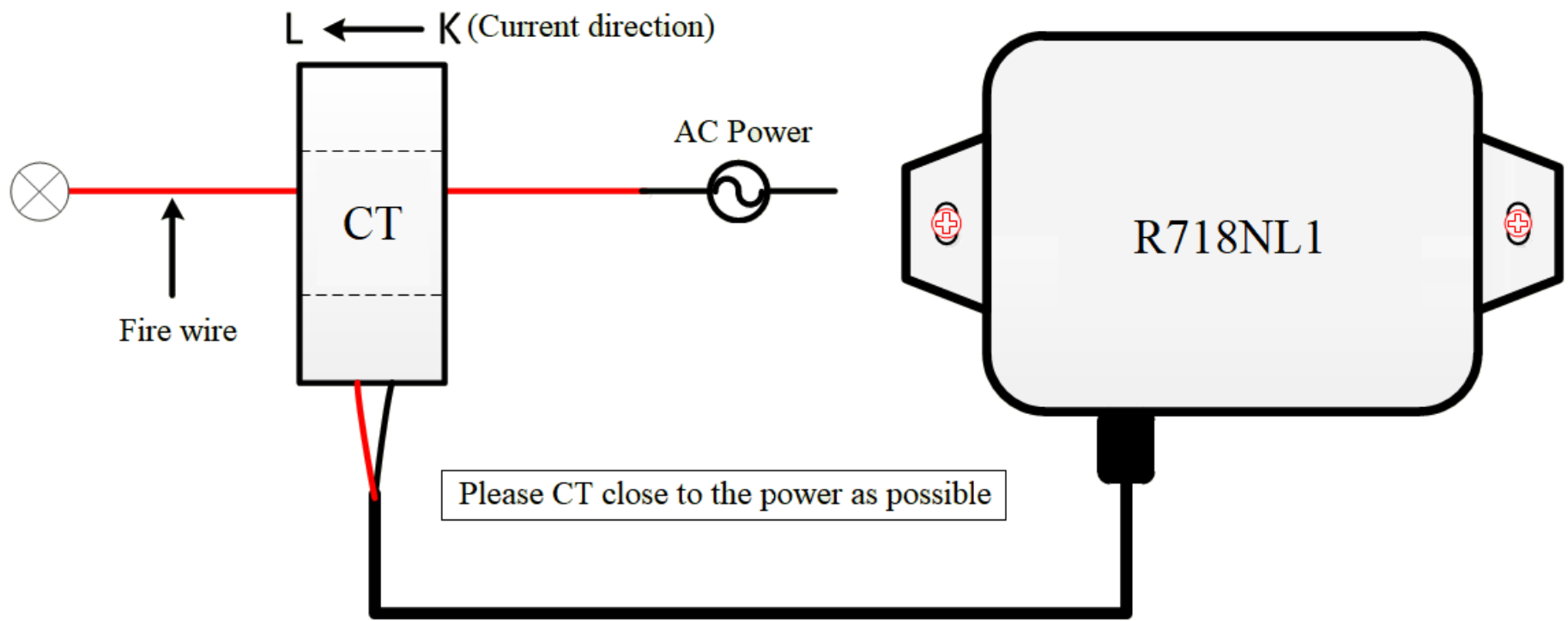
Short press the [Key] of the device to start sampling data and report the data about 15 seconds after pressing the key.

Note: MinTme cannot be set less than 30 seconds. MaxTime must be set greater than Min Time.

The single-phase current detector (R718NL1) is suitable for the following scenarios:

- School
- Factory
- The mall
- Office building
- Smart building

Where the electrical data of the equipment needs to be detected.

L ← K (Current direction)

CT

AC Power

Fire wire

Please CT close to the power as possible

R718NL1

Note:

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

Do not touch the waterproof gasket, LED indicator light, function keys when replacing the batteries. Please use 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.

7. 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 reaction 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:

7.1 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.

7.2 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.

8. 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.