Wireless Three-phase Current Detection

R718N3xxxD(E) Series User Manual

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1. Introduction

The R718N3xxxD/DE series is 3-Phase Current Meter device for Netvox Class C type devices based on the LoRaWAN open protocol and is compatible with the LoRaWAN protocol. R718N3xxxD/DE series have different measuring range for different variety of CT. It is divided into:

R718N3D Wireless 3-Phase Current Meter with 3 x 60A Solid Core CT (undetachable cable)

R718N33D Wireless 3-Phase Current Meter with 3 x 30A Clamp-On CT (undetachable cable)

R718N37D Wireless 3-Phase Current Meter with 3 x 75A Clamp-On CT (undetachable cable)

R718N315D Wireless 3-Phase Current Meter with 3 x 150A Clamp-On CT (undetachable cable)

R718N325D Wireless 3-Phase Current Meter with 3 x 250A Clamp-On CT (undetachable cable)

R718N363D Wireless 3-Phase Current Meter with 3 x 630A Clamp-On CT (undetachable cable)

R718N3300D Wireless 3-Phase Current Meter with 3 x 3000A Clamp-On CT (detachable cable)

R718N3DE Wireless 3-Phase Current Meter with 3 x 60A Solid Core CT (detachable cable)

R718N33DE Wireless 3-Phase Current Meter with 3 x 30A Clamp-On CT (detachable cable)

R718N37DE Wireless 3-Phase Current Meter with 3 x 75A Clamp-On CT (detachable cable)

R718N315DE Wireless 3-Phase Current Meter with 3 x 150A Clamp-On CT (detachable cable)

R718N325DE Wireless 3-Phase Current Meter with 3 x 250A Clamp-On CT (detachable cable)

R718N363DE Wireless 3-Phase Current Meter with 3 x 630A Clamp-On CT (detachable cable)

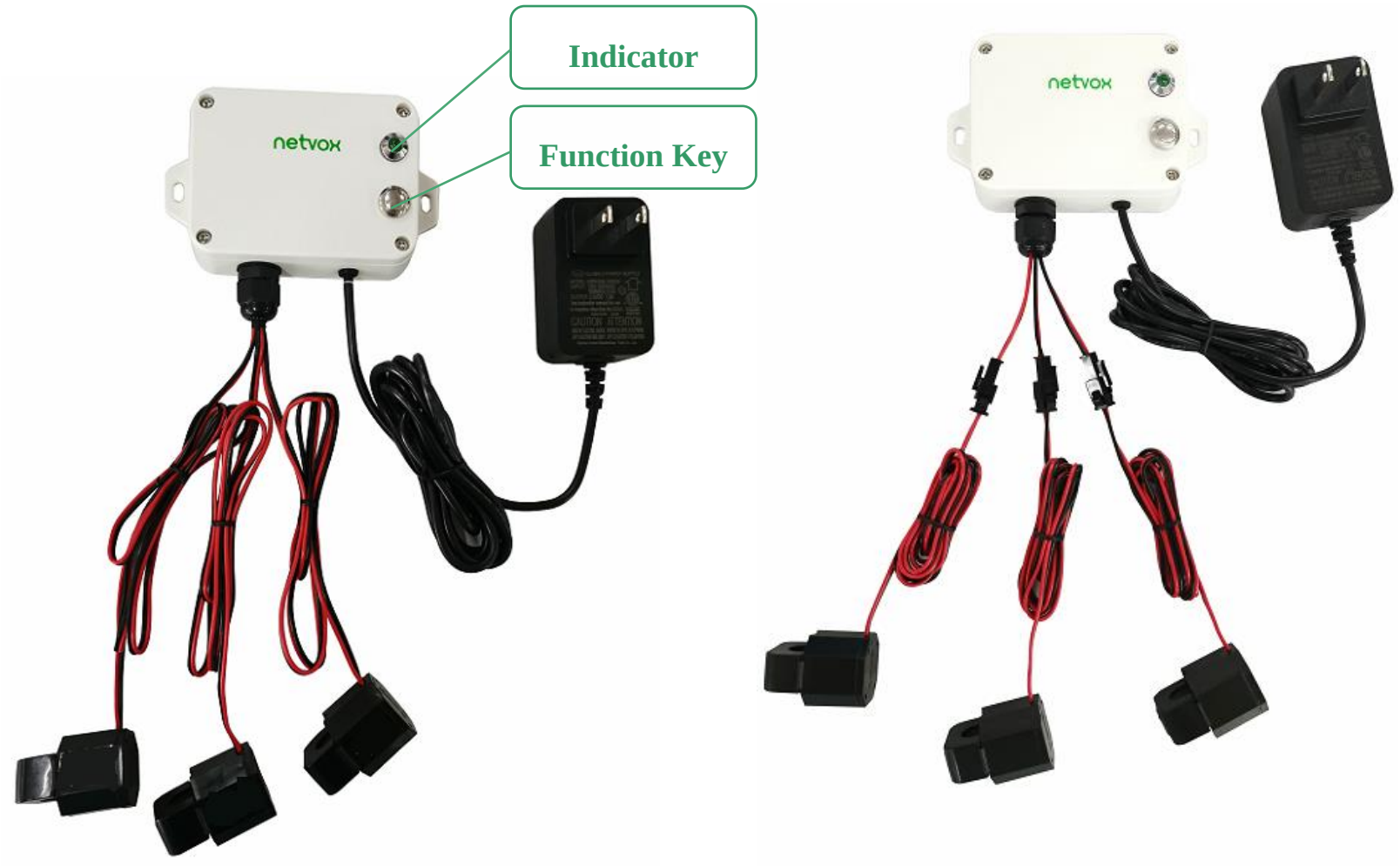
LoRa Wireless Technology:

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



R718N37D (undetachable cable)

R718N37DE (detachable cable)

3. Features

- Adopt SX1276 wireless communication module.
- DC power supply (3.3V/1A)
- 3-phase current meter detection
- The base is attached with a magnet that can be attached to a ferromagnetic material object.
- IP30 rating
- LoRaWAN™ Class C compatible
- Frequency Hopping Spread Spectrum (FHSS)
- Configuring parameters and reading data via third-party software platforms, and set alarms via SMS text and email (optional)
- Available third-party platform: Actility/ThingPark, TTN, MyDevices/Cayenne

4. Set up Instruction

4.1 On/Off

Power On	Connect the power supply
Factory Reset and Restart	Press and hold the function key for 5 seconds until green indicator flashes 20 times.
Power Off	Disconnecting the power supply
Note	1. The device will be off in default after disconnecting the power supply. 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.

4.2 Network Joining

Never Joined the Network	Turn on the device, and it will search for the network to join. The green indicator remains on joins the network successfully The green indicator light remains off: fail to join the network
Had Joined the Network (Not Back to Factory Setting)	Turn on the device, and it will search for the previous network to join. The green indicator remains on: joins the network successfully The green indicator light remains off: fail to join the network
Fail To Join the Network	Check the device verification information on the gateway or consult your platform server provider.

4.3 Function Key

Press the Function Key for 5 Seconds	The device will be set to default and restart. The green indicator light flashes 20 times: success The green indicator light remains off: fail
Press the Function Key Once	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 flashes 3 times

4.4 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.

5. 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: 0x0384 (900s)

Min Interval: 0x0002 (2s) (detect per Min Interval)

CurrentChange: 0x0064 (100 mA)

Note:

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

R718N3xxxD default Max Interval = 900s, Min Interval = 2s. (could be customized)

3-Phase Current Detection:

Push the function key to send report and back to 3-phase current data.

While configuring, the device would detect and back to current data.

Range and Accuracy

R718N3D(E): Solid Core CT Range: 100mA~50A（Accuracy: ±1% (300mA~50A)）

R718N37D(E): Clamp-On CT Range: 100mA~75A（Accuracy: ±1%(300mA~75A)）

R718N315D(E): Clamp-On CT Range: 1A---150A (±1%)

R718N325D(E): Clamp-On CT Range: 1A---250A (±1%)

R718N363D(E): Clamp-On CT Range: 10A---630A (±1%)

R718N3300D: Clamp-On CT Range: 150A---3000A (±1%)

Note:

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.

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 2 to 65535	Any number between 2 to 65535	Can not 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 the devicetype

NetvoxPayLoadData– Var (Fix =8bytes)

Tips

1. **Battery Voltage:**

   If the battery is equal to 0x00, it means that the device is powered by a DC power supply.

2. **Version Packet:**

   When Report Type=0x00 is the version packet, such as 014A000A02202306080000, the firmware version is 2023.06.08.

3. **Data Packet:**

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

Device	Device Type	Report Type	NetvoxPayLoadData			
R718N3 XXXD Series	0x4A	0x00	SoftwareVersion(1 Byte) Eg.0x0A-V1.0	HardwareVersion (1 Byte)	DateCode(4 Byte) eg 0x20170503	Reserved (2 Byte)
		0x01	Battery (1Byte, unit:0.1V)	Current1 (2Bytes,Unit:1mA)	Current2 (2Bytes,Unit:1mA)	Current3 (2Bytes,Unit:1A)	Mulitplier1 (1Byte)
		0x02	Battery (1Byte, unit:0.1V)	Mulitplier2 (1Byte)	Mulitplier3 (1Byte)	Reserved (5Bytes,fixed 0x00)

		0x03	Battery (1Byte, unit:0.1V)	Current1 (2Bytes,Unit:1mA)	Current2 (2Bytes,Unit:1mA)	Current3 (2Bytes,Unit:1mA)	Multiplier (1Byte) BIT0-1: Multiplier1 0b00_1, 0b01_5, 0b10_10, 0b11_100 BIT2-3: Multiplier2 0b00_1, 0b01_5, 0b10_10, 0b11_100 BIT4-5: Multiplier3 0b00_1 0b01_5, 0b10_10, 0b11_100 BIT6-7: Reserved
		0x04	Battery (1Byte, unit:0.1V)	ThresholdAlarm (1Byte, Bit0_LowCurrent1Alarm, Bit1_HighCurrent1Alarm, Bit2_ LowCurrent2Alarm, Bit3_ HighCurrent2Alarm, Bit4_ LowCurrent3Alarm, Bit5_ HighCurrent3Alarm, Bit6-7:Reserved)	Reserved (5Bytes,fixed 0x00)		

The real current should convert with Current Multiplier

The format of two packets (ReportType=0x01 & 0x02)

Default uplink Report type as 0x01 and 0x02 packet (configured by commands for one packet)

Example of Uplink: 014A010005DD05D405DE01

1st byte (01): Version

2nd byte (4A): DeviceType 0x4A R718N3XXXD

3rd byte (01): ReportType

4th byte (00): 3.3 V DC power supply

5th 6th byte (05DD): Current1 - 05DD (Hex) = 1501 (Dec), 1501*1mA=1501mA //The real Current1=Current1*Mulitplier1

7th 8th byte (05D4): Current2 - 05D4 (Hex) = 1492 (Dec), 1492*1mA=1492mA //The real Current2=Current2*Mulitplier2

9th 10th byte (05DE): Current3 - 05DE (Hex) = 1502 (Dec), 1502*1mA=1502mA //The real Current3=Current3*Mulitplier3

11th byte (01): Multiplier1

Example of Uplink2: 014A020001010000000000

1st byte (01): Version

2nd byte (4A): DeviceType 0x4A R718N3XXXD

3rd byte (01): ReportType

4th byte (00): 3.3 V DC power supply

5th byte (01): Multiplier2

6th byte (01): Multiplier3

7th -11th byte (0000000000): Reserved

The format of one packet (ReportType=0x03)

Example of Uplink3: 014A030005C705D405F000

1st byte (01): Version

2nd byte (4A): DeviceType 0x4A R718N3XXXD

3rd byte (03): ReportType

4th byte (00): 3.3 V DC power supply

5th 6th byte (05C7): Current1 05C7 (Hex) = 1479 (Dec), 1479*1mA=1479mA // The real Current1=Current1*Mulitplier1

7th 8byte (05D4): Current2 05D4 (Hex) =1492 (Dec), 1492*1mA=1492mA // The real Current2=Current2*Mulitplier2

9th 10th byte (05F0): Current3 05F0 (Hex) =1520 (Dec), 1520*1mA=1520mA // The real Current3=Current3*Mulitplier3

11th byte (00): Multiplier // Multiplier1 = Multiplier2 = Multiplier3 =1

Example of Uplink4: 014A040001000000000000

1st byte (01): Version

2nd byte (4A): DeviceType 0x4A R718N3XXXD

3rd byte (03): ReportType

4th byte (00): 3.3 V DC power supply

5th byte (01): ThresholdAlarm - LowCurrent1Alarm (bit0 =1)

6th-11th byte (000000000000): Reserved

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=9bytes)

Description	Device	Cmd ID	Device Type	NetvoxPayLoadData			
Config ReportReq	R718N3 XXXD Series	0x01	0x4A	MinTime (2bytes Unit:s)	MaxTime (2bytes Unit:s)	CurrentChange (2byte Unit:1mA)	Reserved (2Bytes,Fixed0x00)
Config ReportRsp		0x81		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)	Reserved (2Bytes,Fixed 0x00)

(1) Configure R718N3XXXD Series report parameters:

MinTime = 1min (0x003C), MaxTime = 1min (0x003c), CurrentChange = 100 mA (0x0064)

Downlink: 014A003C003C0064000000

Response:

814A000000000000000000 (Configuration success)

814A010000000000000000 (Configuration failure)

(2) Read Configuration:

Downlink: 024A000000000000000000

Response:

824A003C003C0064000000 (Current configuration)

5.3 Example of SetRportType

Description	Device	CmdID	Device Type	NetvoxPayLoadData	
SetRportTypeReq (REMAIN Lastconfig when resettofac)	R718 N3XXX D Series	0x03	0x4A	ReportTypeSet (1Byte,0x00_reporttype1&2, 0x01_reporttype3)	Reserved (8Bytes,Fixed 0x00)
SetRportTypeRsp (REMAIN Lastconfig when resettofac)		0x83		Status(0x00_success)	Reserved (8Bytes,Fixed 0x00)
GetRportTypeReq		0x04		Reserved (9Bytes,Fixed 0x00)	
GetRportTypeRsp		0x84		ReportTypeSet (1Byte,0x00_reporttype1&2, 0x01_reporttype3)	Reserved (8Bytes,Fixed 0x00)

(3) Configure ReportType =0x01

Downlink: 014A010000000000000000

Response:

834A000000000000000000 (Configuration success)

834A010000000000000000 (Configuration failure)

(4) Read device configuration parameters.

Downlink: 044A000000000000000000

Response:

844A010000000000000000 (Current device configuration parameters)

5.4 Set/GetSensorAlarmThresholdCmd

Fport:0x10

CmdDescriptor	CmdID (1Byte)	Payload (10Bytes)			
SetSensorAlarmThresholdReq	0x01	Channel(1Byte, 0x00_Channel1, 0x01_Chanel2, 0x02_Channel3,etc)	SensorType(1Byte, 0x00_Disable ALL SensorthresholdSet 0x27_Current,	SensorHighThreshold (4Bytes,Unit:same as reportdata in fport6, 0Xffffffff_DISALBLE HighThreshold)	SensorLowThreshold (4Bytes,Unit:same as reportdata in fport6, 0Xffffffff_DISALBLE HighThreshold)
SetSensorAlarmThresholdRsp	0x81	Status (0x00_success)		Reserved (9Bytes,Fixed 0x00)	
GetSensorAlarmThresholdReq	0x02	Channel(1Byte, 0x00_Channel1, 0x01_Chanel2, 0x02_Channel3,etc)	SensorType (1Byte,Same as the SetSensorAlarmThresholdReq's SensorType)	Reserved (8Bytes,Fixed 0x00)	
GetSensorAlarmThresholdRsp	0x82	Channel(1Byte, 0x00_Channel1, 0x01_Chanel2, 0x02_Channel3,etc)	SensorType (1Byte,Same as the SetSensorAlarmThresholdReq's SensorType)	SensorHighThreshold (4Bytes,Unit:same as reportdata in fport6, 0Xffffffff_DISALBLE HighThreshold)	SensorLowThreshold (4Bytes,Unit:same as reportdata in fport6, 0Xffffffff_DISALBLE HighThreshold)

Channel - 1byte

0x00_ Current1, 0x01_ Current2, 0x02_ Current3 // When restoring factory settings, the last set value will be retained.

(1) SetSensorAlarmThresholdReq: (Set Current HighThresholdt to 500mA; LowThreshold to 100mA)

Downlink: 010027000001F400000064 //1F4 (Hex) = 500 (Dec), 500* 1mA = 500mA;

64 (Hex) = 100 (Dec), 64* 1mA = 64mA

Response: 810000000000000000000

(2) GetSensorAlarmThresholdReq:

Downlink: 020027000000000000000

Response: 820027000001F400000064

(3) Disable all sensor thresholds. (Configure the Sensor Type to 0)

Downlink: 010000000000000000000

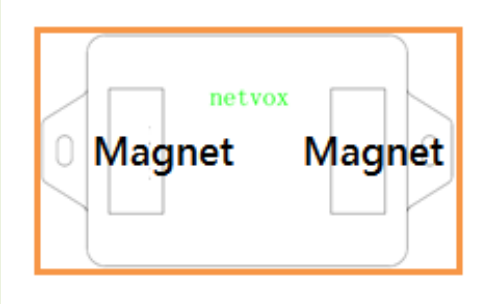
Response: 810000000000000000000

6. Installation

1. The 3-phase current meter R718N3XXXD(E) 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, 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.

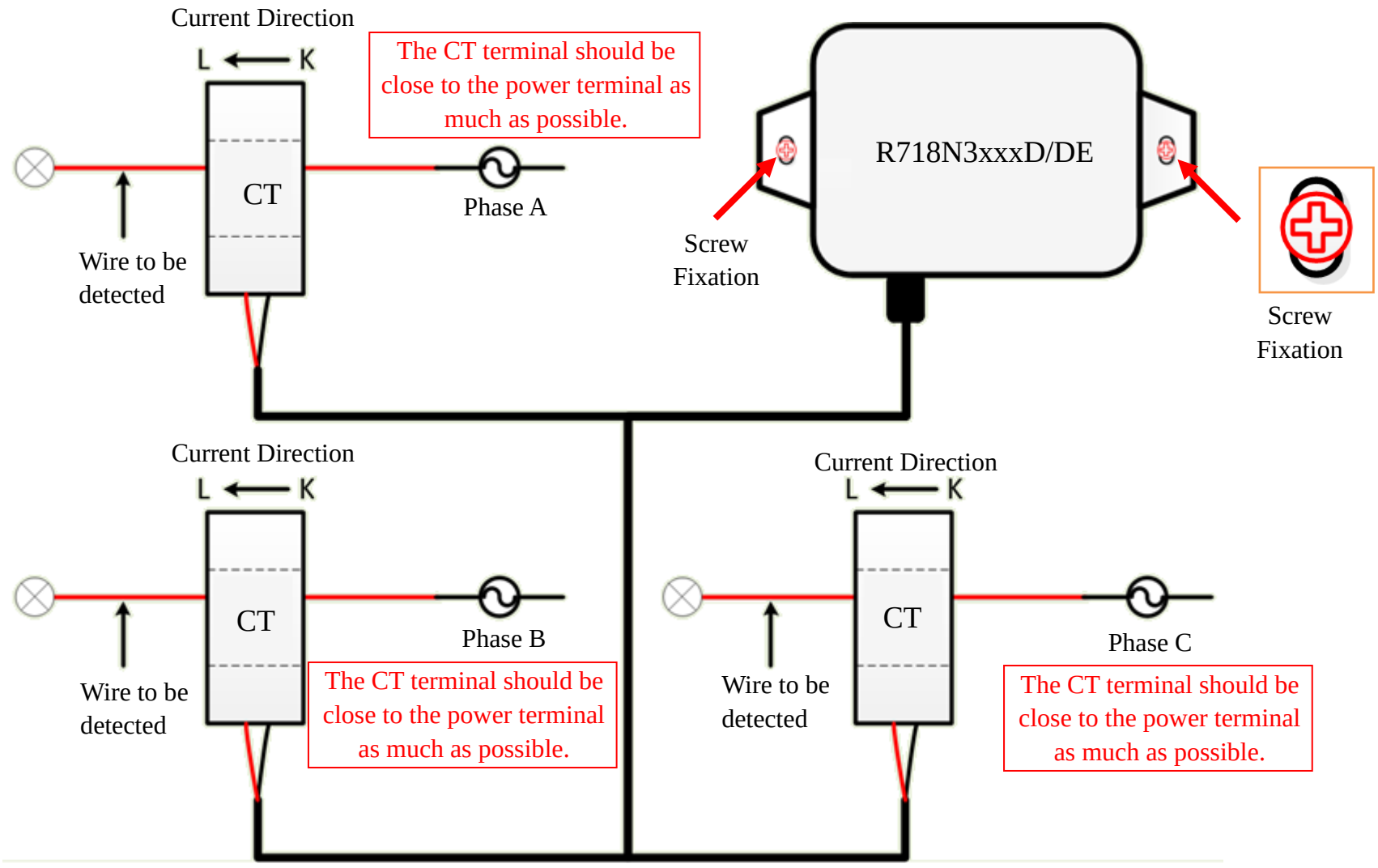
4. The 3-phase current meter R718N3XXXD(E) samples the current according to MinTime. If the current value sampled this time relatively exceeds the set value (the default is 100mA) more than the current value reported last time, the device will immediately report the current value sampled this time. If the current variation does not exceed the default value, the data will be reported regularly according to MaxTime.
5. Press the function 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 R718N3XXXD(E) 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.



Installation Diagram

7. 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 hot 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 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 in the device and affect the operation.

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.