Wireless Miniature Circuit Breaker with Power Meter

RP02RH Series
User Manual

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1. Introduction

RP02RH series is a class C smart Miniature Circuit Breaker with Power Meter based on LoRaWAN open protocol. It can monitor the status of all external circuit breakers in real time. (connect up to 9 poles). When the power line is abnormal (such as undervoltage, overvoltage, overload, leakage, etc.), the system will automatically give early warning, alarm and power off to prevent electrical fire to the greatest extent. At the same time, it can periodically monitor the temperature, electric quantity, current, voltage, power, leakage current, circuit breaker status and other data information of all external circuit breakers and report to the gateway platform. With the system, it can be controlled remotely and regularly, can be switched regularly, and can automatically conduct monthly leakage self-inspection, with limited power and electric quantity. It has the function of local self-inspection and reports the detection information to the gateway platform to make the hidden danger disappear.

At the same time, it can be switched to serial port transparent transmission mode, and can reply 128 bytes of data at most (depending on the current communication rate). Serial port transparent transmission only supports RS-485 protocol.

The number of poles corresponding to each circuit breaker type:

Circuit Breaker Type	Number of Poles
1PN / 1PNL / 2P	2
3PN / 3PNL / 4P	4

For example, a LoRa / LoRaWAN Radio Module can connect to:

(a) 4 x 1PN/1PNL/2P (8 poles in total)

(b) 2 x 3PN/3PNL/4P (8 poles in total)

(c) 2 x 1PN/1PNL/2P + 1 x 3PN/3PNL/4P (8 poles in total)

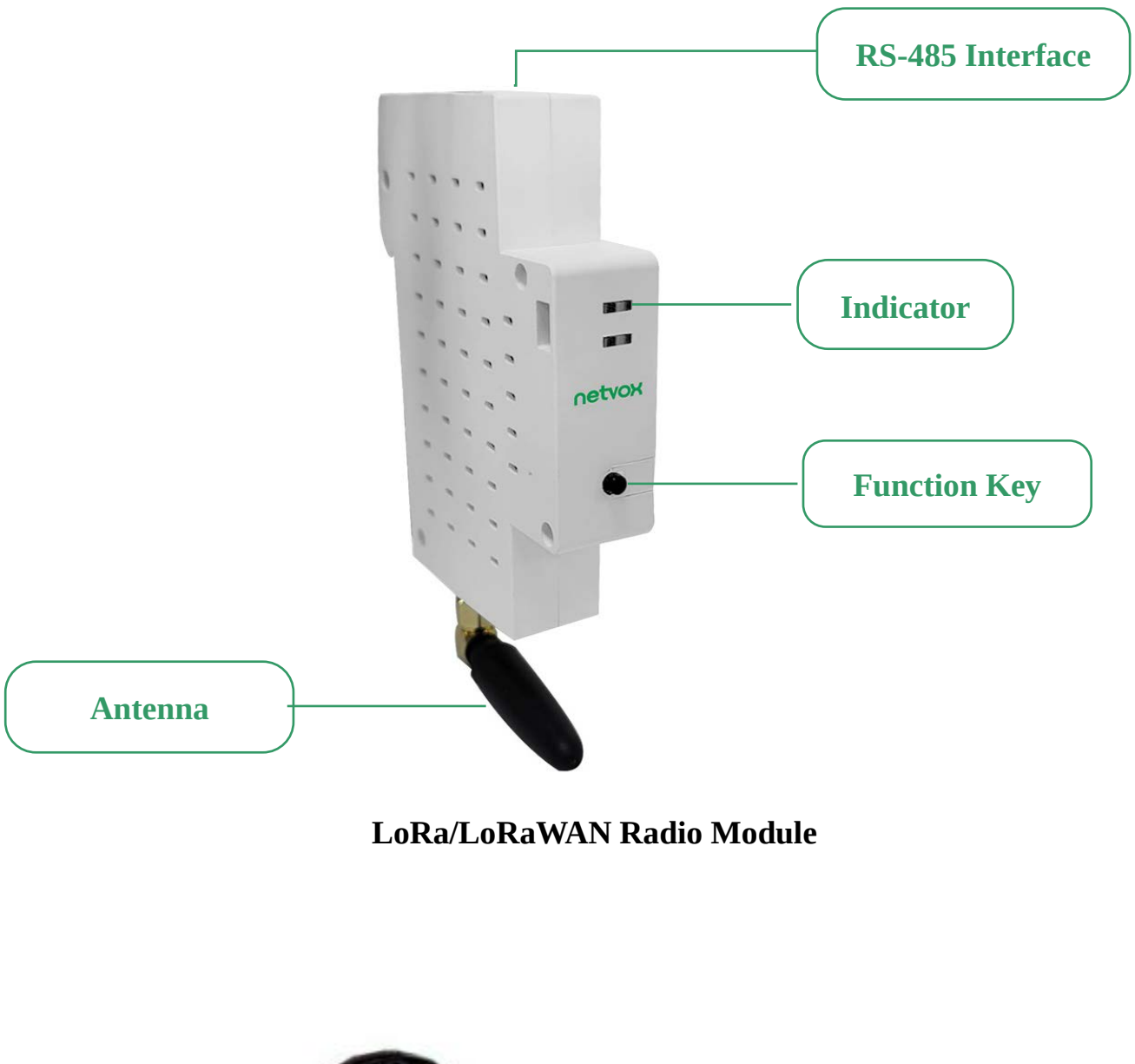
LoRa Wireless Technology:

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 device, wireless security systems, industrial monitoring. It has features like small size, low power consumption, long transmission distance, strong anti-interference ability and so on.

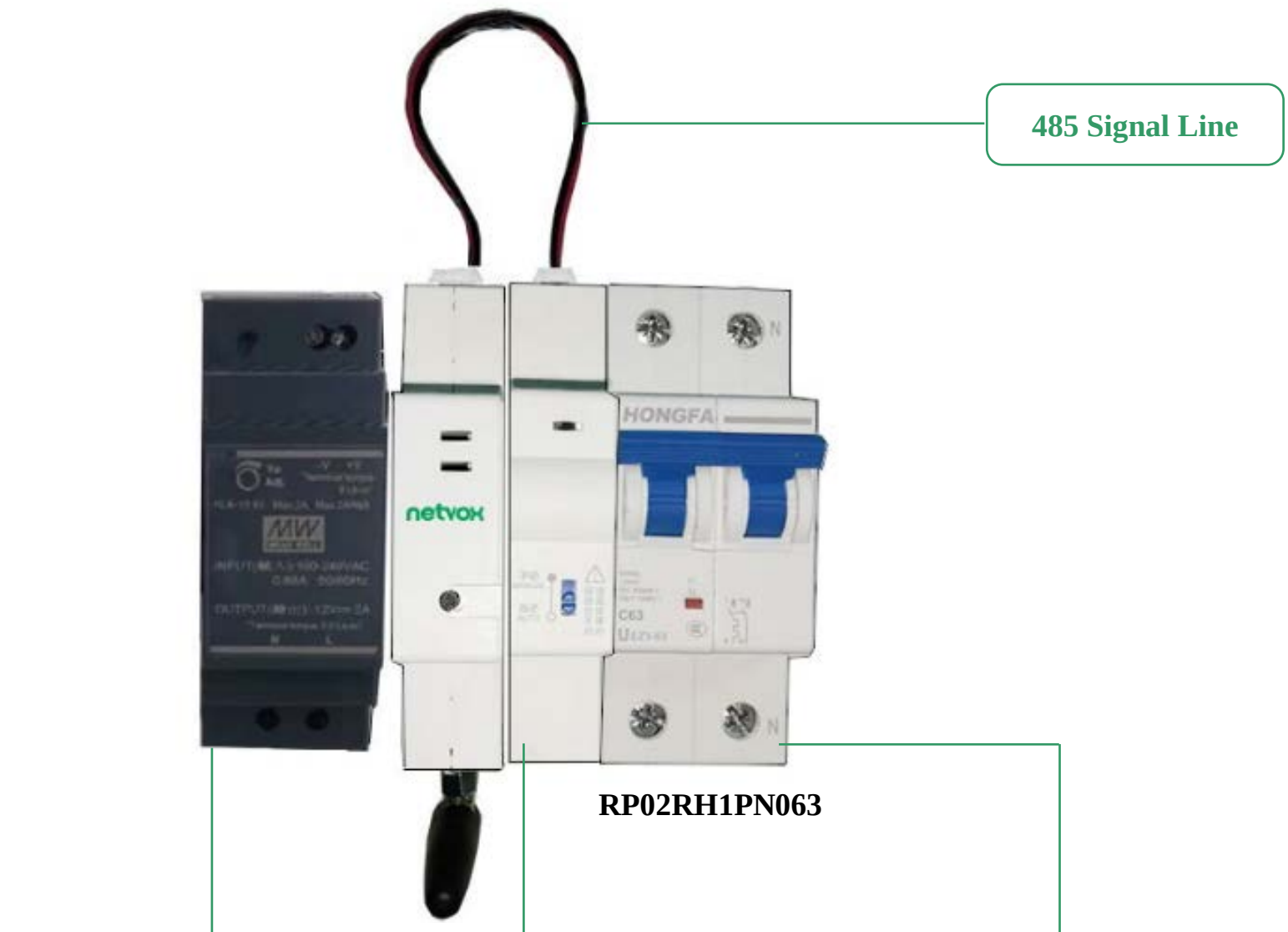
LoRaWAN:

LoRaWAN uses LoRa technology to define end-to-end standard specifications to ensure interoperability between devices and gateways from different manufacturers.

2. Appearance



LoRa/LoRaWAN Radio Module



RP02RH1PN063

Power Module + **LoRa/LoRaWAN Radio Module** + **External Circuit Breaker**

3. Features

- Compatible with LoRaWAN™
- Support RS485 serial port transparent transmission.
- Circuit breaker attribute value collection.
- Multiple circuit breaker protection.
- Simple operation and setting.

4. Combination List

RP02RH1PN063 Wireless 1P+N Miniature Circuit Breaker with Power Meter

RP02RH1PNLB063 Wireless 1P+N Miniature Circuit Breaker with Power Meter and Leak Detection

RP02RH3PN063 Wireless 3P+N Miniature Circuit Breaker with Power Meter

RP02RH3PNLB063 Wireless 3P+N Miniature Circuit Breaker with Power Meter and Leak Detection

RP02RH2P100 Wireless 2P Miniature Circuit Breaker with Power Meter, 100A

RP02RH4P100 Wireless 4P Miniature Circuit Breaker with Power Meter, 100A

RP02RH3P250 Wireless 3P Miniature Circuit Breaker with Power Meter, 250A

RP02RH4P250 Wireless 4P Miniature Circuit Breaker with Power Meter, 250A

5. Set up Instruction

On/Restore to factory setting

Power on	Power supply of power module
Turn on	Power supply of power module. The green light flashes once: Success
Turn off (Restore to factory setting)	Press and hold the function key for 5 seconds until green indicator flashes for 20 times.
Power off	Disconnect the DC12V power supply
Note:	1. 5 seconds after power on, the device will be in engineering test mode. 2. The interval between two power outages and power on shall be about 10 seconds to avoid the interference of energy storage elements such as capacities and inductors.

Network Joining

Never joined the network	Turn on the device to search the network. The green indicator stays on for 5 seconds: Success The green indicator remains off: Fail
Had joined the network (Not restore to factory setting)	Turn on the device to search the previous network. The green indicator stays on for 5 seconds: Success The green indicator remains off: Fail

Fail to join the network	When the network cannot be added, it is recommended to check the device registration information on the gateway or consult your platform server provider.

Function Key

Press and hold for 5 seconds	Restore to factory setting The green indicator flashes for 20 times: Success The green indicator remains off: Fail
Press once	The device is in the network: green indicator flashes once and sends a report Rreport format: 87 + ReceiveData (ReceiveData is the latest received data) The device is not in the network: green indicator remains off

Baud Rate Configuration

Default Baud Rate	9600
Collocation Method	Issue command through LoRaWAN
Baud Rate Options	00 Baudrate = 115200 01 Baudrate = 57600 02 Baudrate = 38400 03 Baudrate = 28800 04 Baudrate = 19200 05 Baudrate = 9600 06 Baudrate = 4800 07 Baudrate = 2400

6. Data Report

When the device is powered on, it will immediately send a version package report.

Default setting:

1. Acquisition Mode

ReportMaxTime: 0x0384 (900s) // Subject to factory settings

ReportMinTime: 0x000A (10s) // Netvox LoRa private default is 30s

// MinTime ≥ 120 seconds when the frequency band is EU868.

2. Serial Port Transparent Transmission Mode

(1) The device has no operation before any configuration.

(2) The device sends instructions through LoRaWAN to configure the data to be sent through RS485, and reports the data received by RS485 to the gateway at the same time.

(3) The device sends instructions through LoRaWAN to configure the time of sending the data periodically.

When the RS485 interface of LoRa/LoRaWAN Radio Module receives the serial port data sent by the RS485 device connected with it, it will actively report the received data to the gateway in the format of 87 + Receive Data.

Note:

(1) The data transmission cycle of the device shall be subject to the burning configuration.

(2) Please refer Netvox LoRaWAN Application Command document and Netvox Lora Command Resolver http://cmddoc.netvoxcloud.com/cmddoc to resolve uplink data.

6.1 Default Value of Protection Parameters

RP02 Default Value of Protection Parameters									
Protection (Command)	**Circuit Breaker Type**	**Hardware Protection**	**Software Protection**	**Alarm**	**Parameter**			**Default**	**Configuration** (Through LoRaWAN commands)
					Alarm Value	**Action Value**	**Time Coefficient**	0x00 None 0x01 Alarm 0x02 Trip 0x03Alarm+ Trip	
Overload Protection (0x00)	MCB		✓	✓	113% Ir	125% Ir (1PN, 1PNL) 120% Ir (3PN, 3PNL)	15s	2 - Trip	✓
	MCCB		✓	✓	80% Ir	Ir (Ir=250A)	12s	3 – Alarm and Trip	
Under Low-voltage Protection (0x01)	MCB		✓	✓	180 V	160 V	3s	2 - Trip	✓
	MCCB		✓	✓	180V (3P: 310V)	165V (3P: 285V)	10s	0 - None	
Overvoltage Protection (0x02)	MCB		✓	✓	260 V	270 V	6s	2 - Trip	✓
	MCCB		✓	✓	260V (3P: 450V)	275V (3P: 475V)	10s	0 - None	
Leakage Protection (0x03)	MCB MCCB	✓			-	30 mA	-	2-Trip (cannot be configured)	Hardware Protection cannot be configured
Temperature Protection (0x04)	MCB		✓	✓	75 ℃	80 ℃	30s	0 - None	✓
	MCCB		✓	✓	100℃	110℃	20s	1 - Alarm	
Short Circuit Protection (0x05)	All	✓			-	-	-	2-Trip (cannot be configured)	Hardware Protection cannot be configured
Phase Failure Protection (0x06) (3PN, 3PNL support)	All		✓	✓	70%	80%	10s	0 - None	✓
Overpower Protection (0x07) (1PN, 1PNL support)	Smart MCB		✓	✓	110% P	150%P P = rated voltage* setting current	30s	0 - None	✓

Note:

(1) MCB refers to miniature circuit breaker. (2) MCCB refers to molded-case circuit breaker.

6.2 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

ReportType – 1 byte –the presentation of the NetvoxPayLoadData，according the DeviceType

NetvoxPayLoadData– Fixed bytes (Fixed =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 01C9000A02202306210000, the firmware version is 2023.06.21.

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.)

4. **Signed Value:**

   When the temperature is negative, 2's complement should be calculated.

6.2.1 1PN/1PNL Report Data

ReportType = 0x01 – 0x04

Device	Device Type	Report Type	NetvoxPayLoadData								
RP02RH Series	0xC9	0x00	SoftwareVersion (1Byte) Eg.0x0A—V1.0		HardwareVersion (1Byte)		DateCode (4Bytes,eg 0x20170503)			Reserved(2Bytes,fixed 0x00)	
		0x01	Breaker RS485Addr (1Byte)	BreakerType (1Byte) 1:1P 2:1PN 3:1PNL 4:3P 5:3PN 6:3PNL 16:4P	BreakerProtect StatusBits (1Byte) Bit0:Alarm, Bit1:Pre-Trip Bit2:Trip Bit3-Bit7: Reserved	AlarmStatusBits (1Byte) Bit0:OverLoad Bit1:Reserved Bit2:CreepAge Bit3:UnderVol Bit4:OverVol Bit5:Temperature Bit6:Other Bit7:OverPower	Pre-TripStatusBits (1Byte) Bit0:OverLoad Bit1: Other Bit2:CreepAge Bit3:UnderVol Bit4:OverVol Bit5:Temperature Bit6:Other Bit7:OverPower	TripStatusBits (1Byte) Bit0:OverLoad Bit1: Other Bit2:CreepAge Bit3:UnderVol Bit4:OverVol Bit5: HighOverVo Bit6: Temperature Bit7: Other	HandOrAuto ControlAnd SelfTestStaus (1Byte) 0x00_Auto 0x01_Hand 0x03_RemoteSelf Test	OnOffStatus (1Byte) 0x00_Off 0x01_On
		0x02	BreakerRS485Addr (1Byte)	Current (2Bytes,Unit:10mA)	Voltage (2Bytes,Unit:1V)	Power (2Bytes,Unit:1w)	Temperature (1Byte) Signed, Unit:1°C				
		0x03	BreakerRS485Addr (1Byte)	Energy (4Bytes, unit:1wh)	Frequency (1Byte,Unit:1HZ)	PowerFactor (1Byte,Range:0-100)	Reserved (1Byte,fixed 0x00)				
		0x04	BreakerRS485Addr (1Byte)	LeakageCurrent (2Bytes, Unit:0.01mA)	OnOffTotalCount (4Bytes)		Reserved (1Byte,fixed 0x00)				

Example of 1PN / 1PNL

#Packet 1: 01C9010203010800000100

1st byte (01): Version

2nd byte (C9): DeviceType － RP02RH Series

3rd byte (01): ReportType

4th byte (02): Breaker RS485Addr－2

5th byte (03): Breaker Type－3: 1PNL

6th byte (01): BreakerProtectStatusBits－Alarm, 0x01=00000001 (bit 0=1)

7th byte (08): AlarmStatusBits－UnderVol (Low voltage alarm) , 0x08 = 00001000 (bit3=1)

8th byte (00): Pre-TripStatusBits－NULL

9th byte (00): TripStatusBits－NULL

10th byte (01): HandOrAutoControlAndSelfTestStaus－Hand

11th byte (00): OnOffStatus－Off

#Packet 2: 01C902020000009500001B

1st byte (01): Version

2nd byte (C9): DeviceType －RP02RH Series

3rd byte (02): ReportType

4th byte (02): Breaker RS485Addr－2

5th – 6th byte (0000): Current－0mA

7th – 8th byte (0095): Voltage－149V, 0095 (HEX) = 149 (DEC), 149* 1V = 149V

9th – 10th byte (0000): Power－0 w

11th byte (1B): Temperature－27℃, 1B (HEX) = 27 (DEC), 27* 1℃ = 27℃

#Packet 3: 01C9030200000038310000

1st byte (01): Version

2nd byte (C9): DeviceType － RP02RH Series

3rd byte (03): ReportType

4th byte (02): Breaker RS485Addr－2

5th -8th byte (00000038): Energy－56wh, 00000038 (HEX) = 56 (DEC), 56* 1wh = 56wh

9th byte (31): Frequency－49 Hz, 31 (HEX) = 49 (DEC), 49* 1HZ = 49HZ

10th byte (00): PowerFactor－0

11th byte (00): Reserved

#Packet 4: 01C9040200000000007100

1st byte (01): Version

2nd byte (C9): DeviceType － RP02RH Series

3rd byte (04): ReportType

4th byte (02): Breaker RS485Addr－2

5th 6th byte (0000): LeakageCurrent－0

7-10th byte (00000071): OnOffTotalCount－113, 71 (HEX) = 113 (DEC)

11th byte (00): Reserved

6.2.2 3PN/3PNL Report Data

Report Type=0x11-0x18

Device	Device Type	Report Type	NetvoxPayLoadData				
RP02H Series	0xC9	0x11	BreakerRS485Addr (1Byte)	BreakerType (1Byte) 1:1P 2:1PN 3:1PNL 4:3P 5:3PN 6:3PNL 16:4P	BreakerProtectStatusBit (2Bytes) Bit0:Alarm Bit1:Pre-Trip Bit2:Trip Bit3:OffLine Bit4-Bit15: Reserved	AlarmStatusBit (2Bytes) Bit0:APhaseOverLoad Bit1:BPhaseOverLoad Bit2:CPhaseOverLoad Bit3:NPhaseOverLoad Bit4-5:Reserved Bit6: CreepAge Bit7:APhaseUnderVol Bit8:BPhaseUnderVol Bit9:CPhaseUnderVol Bit10:APhaseOverVol Bit11:BPhaseOverVol Bit12:CPhaseOverVol Bit13:Temperature Bit14:Reserved Bit15:LeakingPhase	Pre-TripStatusBits (2Bytes) Bit0:APhaseOverLoad Bit1:BPhaseOverLoad Bit2:CPhaseOverLoad Bit3:NPhaseOverLoad Bit4-5:Reserved Bit6: CreepAge Bit7:APhaseUnderVol Bit8:BPhaseUnderVol Bit9:CPhaseUnderVol Bit10:APhaseOverVol Bit11:BPhaseOverVol Bit12:CPhaseOverVol Bit13:Temperature Bit14:Reserved Bit15:LeakingPhase
		0x12	BreakerRS485Addr (1Byte)	TripStatusBits (2Bytes) Bit0:A/NPhaseOverLoad Bit1:BPhaseOverLoad Bit2:CPhaseOverLoad Bit3:APhaseInstantTrip Bit4:BPhaseInstantTrip Bit5:CPhaseInstantTrip Bit6: CreepAge Bit7:APhaseUnderVol Bit8:BPhaseUnderVol Bit9:CPhaseUnderVol Bit10:APhaseOverVol Bit11:BPhaseOverVol Bit12:CPhaseOverVol Bit13:Temperature Bit14:RemoteSelfTest Bit15:LeakingPhase	APhaseCurrent (2Bytes,Unit:10mA)	BPhaseCurrent (2Bytes,Unit:10mA)	Reserved (1Byte,fixed 0x00)
		0x13	BreakerRS485Addr (1Byte)	CPhaseCurrent (2Bytes,Unit:10mA)	APhaseVoltage (2Bytes,Unit:1V)	BPhaseVoltage (2Bytes,Unit:1V)	Temperature (1Byte Signed,Unit:1°C)
		0x14	BreakerRS485Addr (1Byte)	CPhaseVoltage (2Bytes,Unit:1V)	APhasePower (2Bytes,Unit:1w)	BPhasePower (2Bytes,Unit:1w)	Frequency (1Byte,Unit:1HZ)
		0x15	BreakerRS485Addr (1Byte)	CPhasePower (2Bytes,Unit:1w)	APhaseEnergy (4Bytes, unit:1wh)	Reserved (1Byte,fixed 0x00)	
		0x16	BreakerRS485Addr (1Byte)	BPhaseEnergy (4Bytes, unit:1wh)	APhasePowerFactor (1Byte,Range:0-100)	BPhasePowerFactor (1Byte,Range:0-100)	CPhasePowerFactor (1Byte,Range:0-100)
		0x17	BreakerRS485Addr (1Byte)	CPhaseEnergy (4Bytes, unit:1wh)	HandOrAuto ControlStaus (1Byte) 0x00_Auto 0x01_Hand	OnOffStatus (1Byte) 0x00_Off 0x01_On	Reserved (1Byte,fixed 0x00)
		0x18	BreakerRS485Addr (1Byte)	LeakageCurrent (2Bytes,Unit:0.01mA)	OnOffTotalCount (4Bytes)	Reserved (1Byte,fixed 0x00)	

Note: Please refer to the above NetvoxPayLoadData description for the specific reported data. If no related alarm is set, all alarm related information bits are set to 0.

#Packet 1: 01C91101050001038000000

1st byte (01): Version

2nd byte (C9): DeviceType

3rd byte (11): ReportType

4th byte (01): BreakerRS485Addr –Alarm

5th byte (05): BreakerType–3PN

6th – 7th byte (0001): BreakerProtectStatusBits(3P)

8th – 9th byte (0380): AlarmStatusBits(3P) — UnderVol (Low voltage alarm), 896 (DEC) = 0011 1000 0000 (BIN) bit7–bit9=1

10th – 11th byte (0000): Pre-TripStatusBits(3P)

#Packet 2:01C9120100000000000000

1st (01): Version

2nd (C9): DeviceType

3rd (12): ReportType

4th (01): BreakerRS485Addr

5th – 6th (0000): TripStatusBits(3P)

7th – 8th (0000): APhaseCurrent – 0mA

9th – 10th (0000): BPhaseCurren – 0mA

11th (00): Reserved

#Packet 3:01C91301000000000000020

1st (01): Version

2nd (C9): DeviceType

3rd (13): ReportType

4th (01): BreakerRS485Addr

5th – 6th (0000): CPhaseCurrent – 0mA

7th – 8th (0000): APhaseVoltage – 0V

9th – 10th (0000): BPhaseVoltage – 0

11th (20): Temperature – 32℃ 20(HEX)=32(DEC),32*1℃=32℃

#Packet 4:01C9140100950000000032

1st (01): Version

2nd (C9): DeviceType

3rd (14): ReportType

4th (01): BreakerRS485Addr

5th – 6th (0095): CPhaseVoltage – 149V 0095 (HEX) = 149 (DEC), 149* 1V = 149V

7th – 8th (0000): APhasePower– 0W

9th – 10th (0000): BPhasePower – 0

11th (32): Frequency – 50HZ 32 (HEX) = 50 (DEC), 50* 1HZ = 50HZ

#Packet 5:01C9150100000000000000

1st (01): Version

2nd (C9): DeviceType

3rd (15): ReportType

4th (01): BreakerRS485Addr

5th – 6th (0000): CPhaseVoltage – 149V 0095 (HEX) = 149 (DEC), 149* 1V = 149V

7th – 10th (00000000): APhaseEnergy–0wh

11th (00): Reserved

#Packet 6:01C9160100000000000000

1st (01): Version

2nd (C9): DeviceType

3rd (16): ReportType

4th (01): BreakerRS485Addr

5th – 8th (00000000): BPhaseEnergy –0w

9th (00): APhasePowerFactor

10th (00): BPhasePowerFactor

11th (00): CPhasePowerFactor

#Packet 7:01C917010000000C010000

1st (01): Version

2nd (C9): DeviceType

3rd (17): ReportType

4th (01): BreakerRS485Addr

5th – 8th (0000000C): CPhaseEnergy –12wh 0000000C (HEX) = 12 (DEC), 12* 1wh = 12wh

9th (01): HandOrAutoControlStaus

10th (00): OnOffStatus – off

11th (00): Reserved

#Packet 8:01C91801FFFF000003D900

1st (01): Version

2nd (C9): DeviceType

3rd (18): ReportType

4th (01): BreakerRS485Addr

5th – 6th (FFFF): LeakageCurrent –FFFF(N/A)

7th–10th (000003D9): OnOffTotalCount –985 3D9 (HEX) = 985 (DEC)

11th (00): Reserved

6.3 Example of ConfigureCmd by Acquisition Mode

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	RP02RH Series	0x01	0xC9	MinTime (2bytes Unit:s)	MaxTime (2bytes Unit:s)	Reserved (5Bytes,Fixed 0x00)
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)	Reserved (5Bytes,Fixed 0x00)

(1) Configure RP02RH Series parameters MinTime=10s (0x000A), MaxTime=3600s (0x0E10)

Downlink: 01C9000A0E100000000000

Device return: 81C9000000000000000000 (configuration successful)

81C9010000000000000000 (configuration failed)

(2) Read the RP02RH Series parameter

Downlink: 02C9000000000000000000

Device return: 82C9000A0E100000000000 (device current parameter)

Note:

(1) Number of report packet:

1PN/1PNL: 1PNreportcount = 4 (0x01–0x04); 3PN/3PNL: 3PNreportcount = 8 (0x11–0x18)

ReportMaxTime shall be configured based on the type and number of the connected circuit breaker.

(2) Example

When Two 1PN/1PNL and one 3PN/3PNL are connected to RP02RH series, …

(a) ReportMaxTime shall be greater than （2* 1PNreportcount + 1* 3PNreportcount）* MinTime

(b) MinTime ≥ 120 seconds when the frequency band is EU868.

6.4 Remote Control Circuit Breaker

FPort：0x07

(The DIP switch must be set to automatic mode.)

Description	Device	CmdID	Device Type	NetvoxPayLoadData	
Off	RP02RH Series	0x90	0xC9	BreakerRS485Addr (1Byte)	Reserved (8Bytes,Fixed 0x00)
On		0x91		BreakerRS485Addr (1Byte)	Reserved (8Bytes,Fixed 0x00)
ClearEnergy		0x93		BreakerRS485Addr (1Byte)	Reserved (8Bytes,Fixed 0x00)
LeakageCurrent SeftTest		0x95		BreakerRS485Addr (1Byte)	Reserved (8Bytes,Fixed 0x00)

(1) Control address 1 circuit breaker off

Downlink: 90C9010000000000000000

(2) Control address 1 circuit braker on

Downlink: 91C9010000000000000000

(3) Clear the circuit breaker of address 1 and clear the electric energy

Downlink: 93C9010000000000000000

(4) Control address 1 circuit breaker leakage self-test // Does not support 250A MCCB

Downlink: 95C9010000000000000000

6.5 Protection Parameters

FPort：0x07

Description	Device	Cmd ID	Device Type	NetvoxPayLoadData			
SetProtection Req	RP02RH Series	0x05	0xC9	BreakerRS485Addr (1Byte)	ProtectionType (1Byte) 0x00_OverLoad 0x01_UnderVoltage 0x02_OverVoltage 0x04_Temperature 0x06_ LeakingPhase 0x07_OverPower	ProtectionAction (1Byte) 0x00_None 0x01_Alarm 0x02_Trip 0x03_Alarm and Trip	Reserved (6Bytes, Fixed 0x00)
SetProtection Rsp		0x85		Status(0x00_success)		Reserved (8Bytes,Fixed 0x00)	

(1) Configure the BreakerRS485Addr = 0x01; ProtectionType = 0x04_Temperature; ProtectionAction = Alarm and Trip

Downlink: 05C90104030000000000

Response: 85C90000000000000000

Note:

The rated current of the circuit breaker can be set as 6A /10A /16A /20A /25A /32A /40A /50A /63A.

The setting value could not exceed the supported value of hardware. Please check CircuitBreakerConfigTool and its user manual for configuration and detailed information.

6.6 Mode Switching

FPort：0x07

Description	Device	CmdID	Device Type	NetvoxPayLoadData	
SetPassThroughModeReq	RP02RH Series	0x03	0xC9	PassThroughModeOn(1Byte) 0x00_Off 0x01_On	Reserved (8Bytes,Fixed 0x00)
SetPassThroughModeRsp		0x83		Status (0x00_success)	Reserved (8Bytes,Fixed 0x00)
GetPassThroughModeReq		0x04		Reserved (9Bytes,Fixed 0x00)	
GetPassThroughModeRsp		0x84		PassThroughModeOn(1Byte) 0x00_Off 0x01_On	Reserved (8Bytes,Fixed 0x00)

(1) The configuration mode is acquisition mode

Downlink: 03C900000000000000000

Device return: 83C9000000000000000000 (configuration successful)

83C9010000000000000000 (configuration failed)

(2) Get current device mode

Downlink: 04C900000000000000000

Device return:84C9000000000000000000 (acquisition mode)

84C9010000000000000000 (transparent transmission mode)

6.7 Example of Configurecmd By Transparent Transmission Mode

FPort：0x0A

Description	Device	CmdID	NetvoxPayLoadData
SetPollSensorRawCmdReq	RP02RH Series	0x05	SensorRawCmd
SetPollSensorRawCmdRsp		0x85	Status (0x00_success)
SensorRawCmdIndication		0x87	SensorRawCmd (Var bytes,according sensor datasheet)

If the protocol format of the external RS485 device is, …

Transmission frame: 010400100002700E

Return frame: 01040440C5D2F2235C

(1) Configure device SensorRawCmd

Downlink: 0501040010000270E

Device return: 8500 (configuration succeed)

8501 (configuration fail)

(2) Report after 5 seconds: 8701040440C5D2F2235C

7. Applications

Smart Home

Problems:

- Unclear reason for the rise in electricity charges
- Unclear cause of electrical failure
- The waste of electric energy cannot be treated
- Electrical hazards cannot be eliminated in time

Solutions:

- Effective energy saving: Master the power consumption information at home, reduce unconscious waste and standby power consumption
- Remote control: Close the loop remotely, realize the one key disconnection function, and limit the time and power
- Ensure safety: Realize multiple protection and self-inspection of protection function
- Strengthen prevention: Push line fault and remind users in time to ensure personal safety

School

Problems:

- Students use high-power electrical appliances in violation of regulations, which has great hidden dangers to cause fire
- Accidental contact of students and fire caused by electric leakage accident
- Complex power environment, high personnel destiny and poor strain capacity
- Serious waste of electric energy

Solutions:

- Safety protection: Set rated power, over limit alarm, limit malignant load and ensure power safely
- Remote control: Timing control, energy saving and consumption reduction, realizing people walking lights off and device power off
- Fault energy warning: Power off and maintain the lines with electrical hazards in advance to prevent accidents
- Cost reduction: Students’ dormitories realize remote meter reading charges and reduce management costs

Intelligent Building

Problems:

- Complex power environment, high personnel density and poor strain capacity
- Serious waste of electric energy
- Personnel use high-power electrical appliances in violation of regulations, which has great hidden dangers to cause fire
- Accidental electric shock and electric leakage accident cause fire

Solutions:

- Safety protection: Set rated power, over limit alarm, limit malignant load and ensure power safety
- Remote control: Timing control, energy saving and consumption reduction, realizing people walking lights off and device power off
- Fault early warning: Power off and maintain the lines with electrical hazards in advance to prevent accidents
- Cost reduction: The meter can realize remote meter reading and charging, and reduce the management cost

Public Places

Problems:

- Lack of effective power safely solutions
- Few professional managers and difficult management of many electric devices
- Poor safety awareness and failure to trouble shooting
- Electrical fire occurs frequently

Solutions:

- Fault analysis: Accurately analyze fault types and give solutions in time
- Intelligent supervision: Real-time online monitoring of fire hazards, like a 24-hour close doctor using electricity
- Remote control: Timely power-off protection shall be provided for the fault line to master the power safely
- Fire prevention: Comply with the national fire safety management for dense places

Fire protection and security

Problems:

- Traditional firefighting emphasizing fire elimination and neglecting prevention’’
- Electrical hazards cannot be eliminated in advance, causing major personal injury in case of fire
- Insufficient supervision investment and poor basic control ability
- Poor realization of fire protection design and no self-inspection function

Solutions:

- Eliminate potential fire hazards: Overload, short circuit, real time monitoring of electric leakage, over temperature and ignition to eliminate the fire at the source
- Reduce fire: The system is based on real-time acquisition, regular self-inspection and data processing, realize intelligent electrical fire early reduce the occurrence of electrical fire hazards

Information communication

Problems:

- High requirements of power supply continuity
- Difficult regional maintenance and high fault maintenance cost
- Unclear cause of electrical fault
- Failure to supply power in time

Solutions:

- Automatic reclosing: Use the automatic reclosing function to restore the power supply to the unattended base station in time
- Fault warning: Power off and maintain the lines with electrical hazards in advance to prevent them from happening
- Fault analysis: Statistics and analysis of fault categories, and targeted maintenance and repair.
- Cost reduction: Reduce the operation cost and device maintenance labor caused by power failure

Charging Pile

Problems:

- The traditional leakage circuit breaker + guide rail meter + contactor scheme has large volume and high space occupancy
- High frequency of electric shock and fire accidents
- Low safety, frequent failures and low durability

Solutions:

- Small volume and low cost: Intelligent miniature circuit breaker= traditional leakage circuit breaker + guide rail meter + contractor
- Intelligent control: Restore power supply in time in case of accidental power failure
- Fault alarm: Electrical fault alarm and leakage self-inspection to ensure the safe use of the device
- Fault analysis: Statistics and analysis of fault categories, and targeted maintenance and repair.

8. Installation

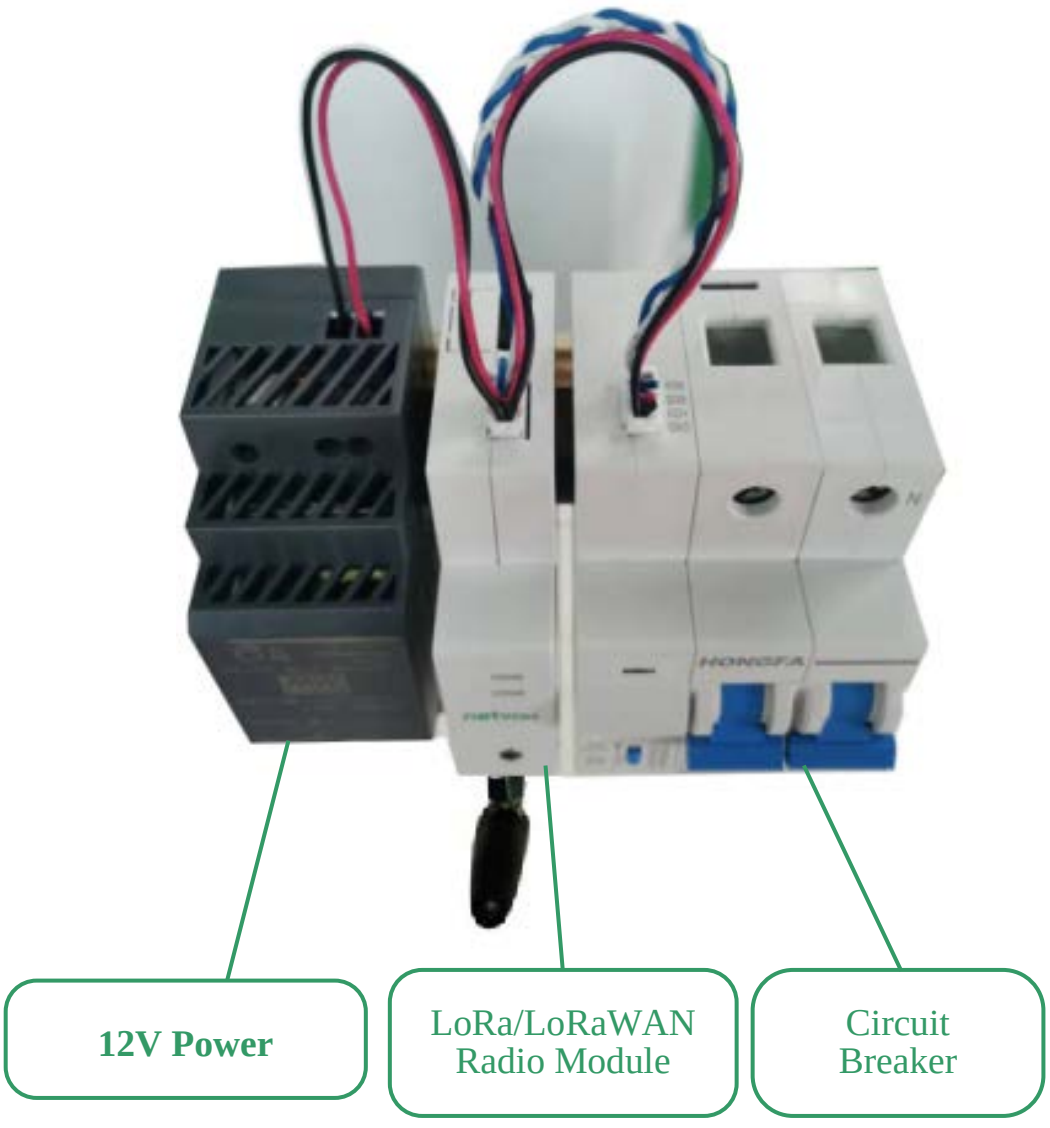
Danger

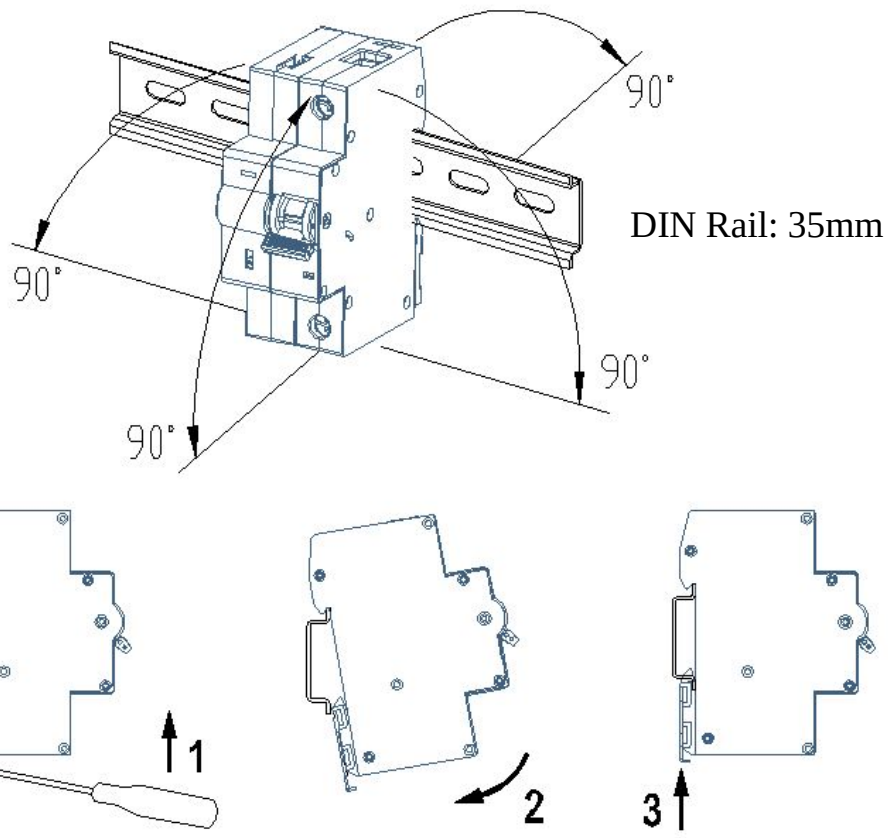
- There may be danger of electric shock, explosion and electric arc burn.
- When working on this power device, please cut off all power supplies first.
- Violation of these instructions may result in serious personal injury.

Note

- It is forbidden to forcibly prevent the automatic opening and closing of the circuit breaker by external force.
- Before wiring the circuit breaker, please confirm whether the current power supply is consistent with the rated voltage on the circuit breaker mark, and determine the position of phase line and N line to keep the phase sequence correct.
- When overhauling the device at the back end of the circuit breaker outgoing line, be sure to turn the manual automatic switch to the manual gear.
- Wiring in strict accordance with the "up in and down out" mode. Reverse wiring will cause damage to product components and abnormal performance.
- This product is suitable for personnel with power installation qualification. The company is not responsible for problems outside its normal scope.

8.1 Circuit Breaker Installation





1: The 12VDC power module, LoRa/LoRaWAN Radio Module and circuit breaker are arranged in the order shown in the figure above.

2: Clamp the 12VDC power module, LoRa/LoRaWAN Radio Module and circuit breaker back hooks on the guide rail, and then release the clips.

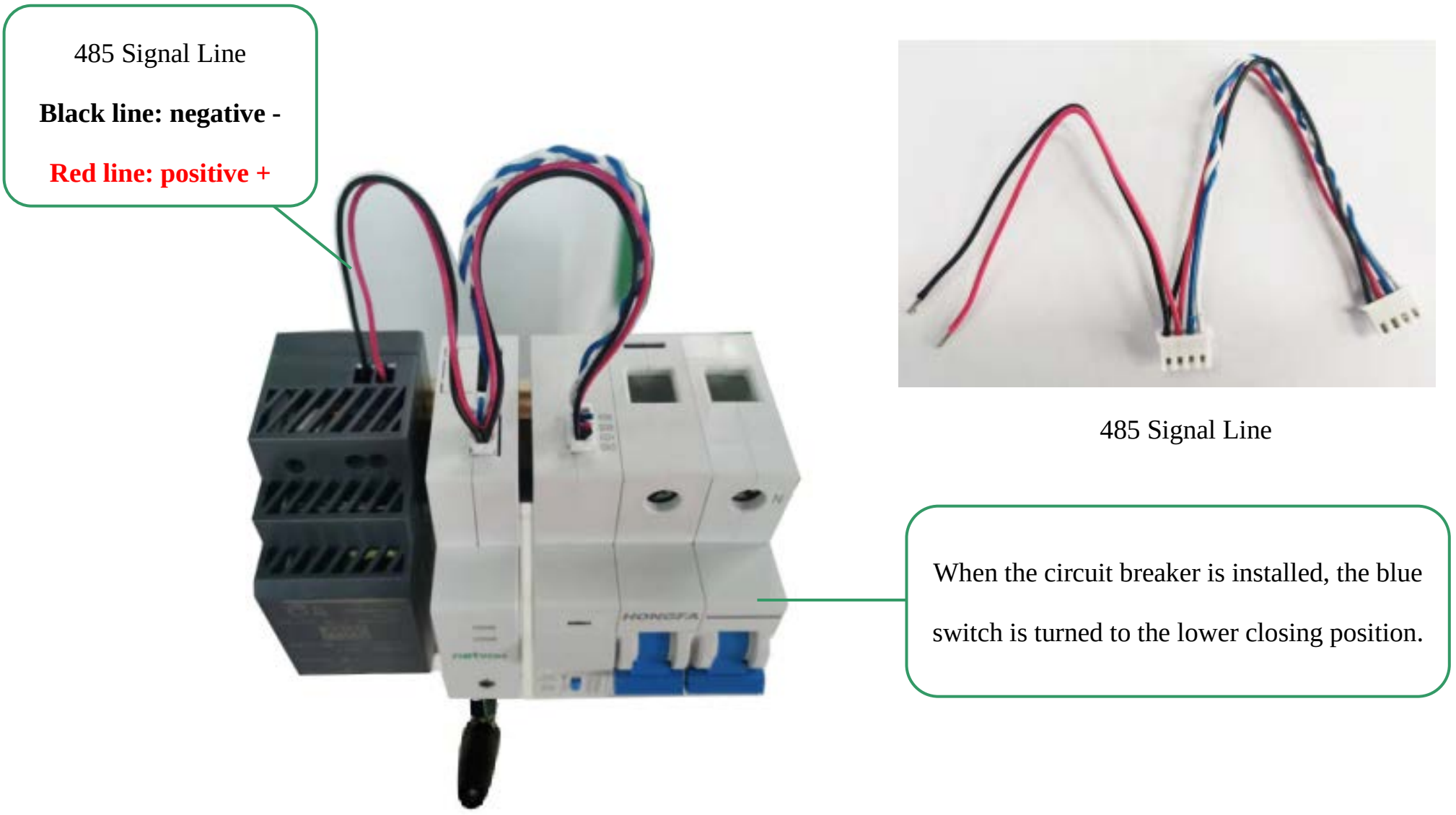
3: Insert the bare wires part of 485 signal line (two plugs connected in parallel) into the 12VDC power module interface (Red line connects to positive; black line connects to negative). For the rest two plugs, please connect the middle plug to LoRa/LoRaWAN Radio Module, and the other one to circuit breaker interface, as shown in the figure below.

Note:

(1) When the circuit breaker is installed, the blue switch is turned to the lower closing position

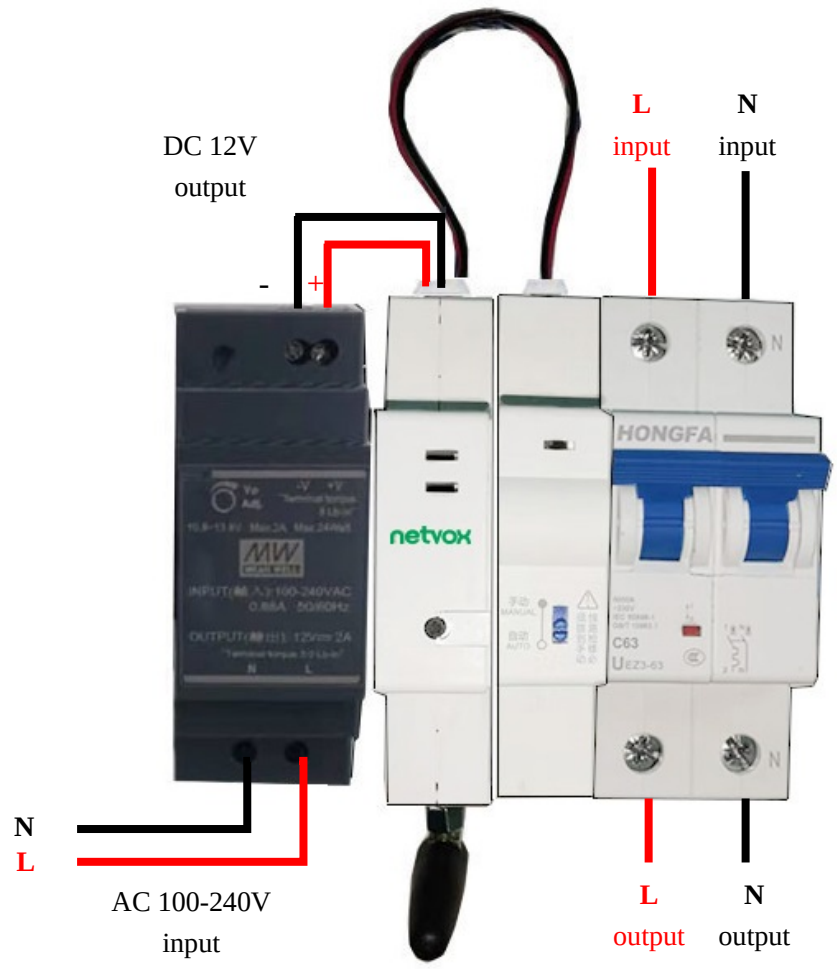
(2) The interface has a fool proof function, and if the signal line is inserted reversely, it cannot be inserted.

(3) The red bare wire of 485 signal line must be connected to the positive pole, and the black one must be connected to the negative pole.



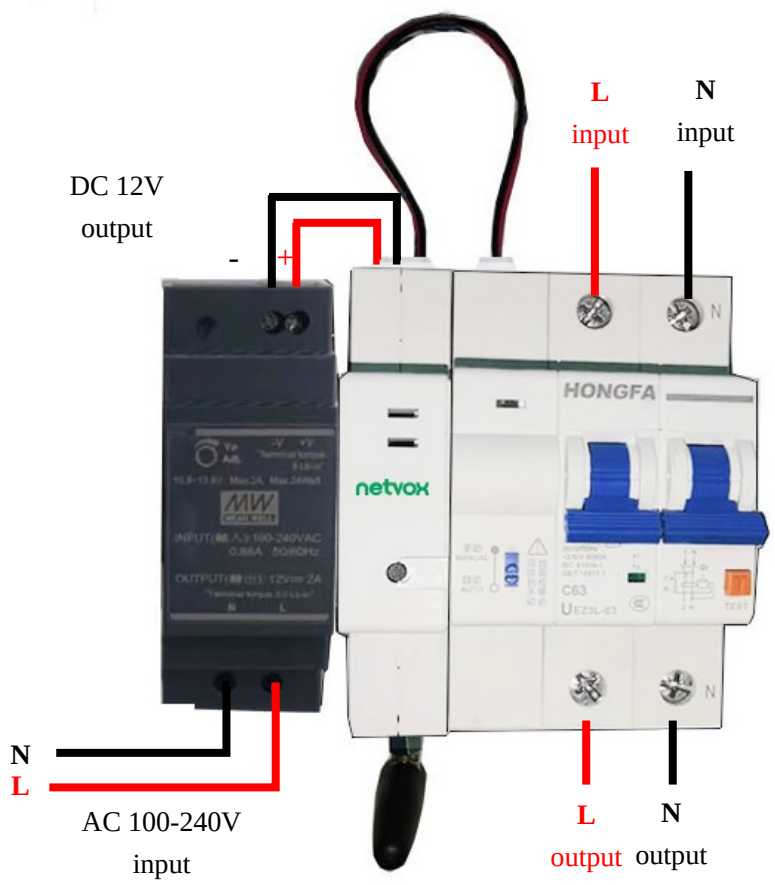
485 Signal Line

4. The wiring diagram of 12VDC power module, LoRa/LoRaWAN Radio Module, circuit breaker and load are as follows:



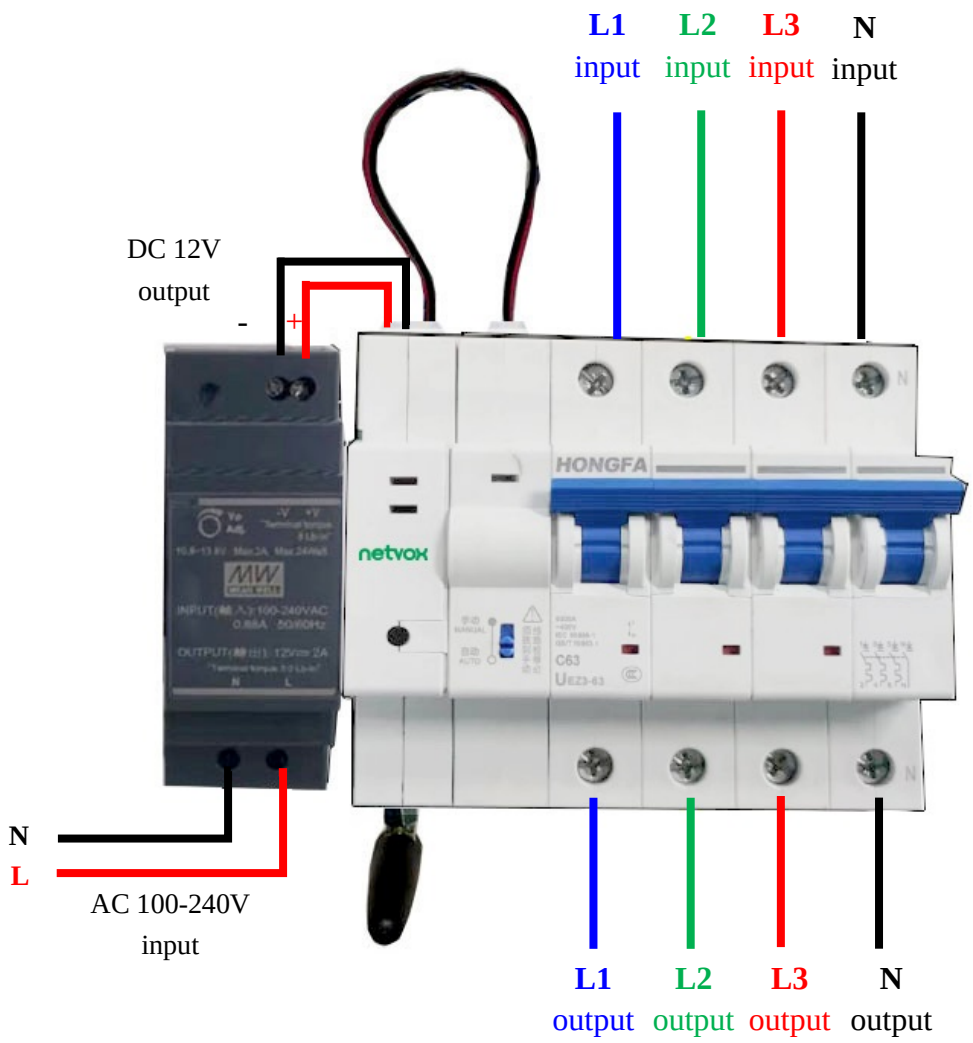
RP02RH1PN063

(Power Module + LoRa/LoRaWAN Radio Module + 1PN Circuit Breaker)



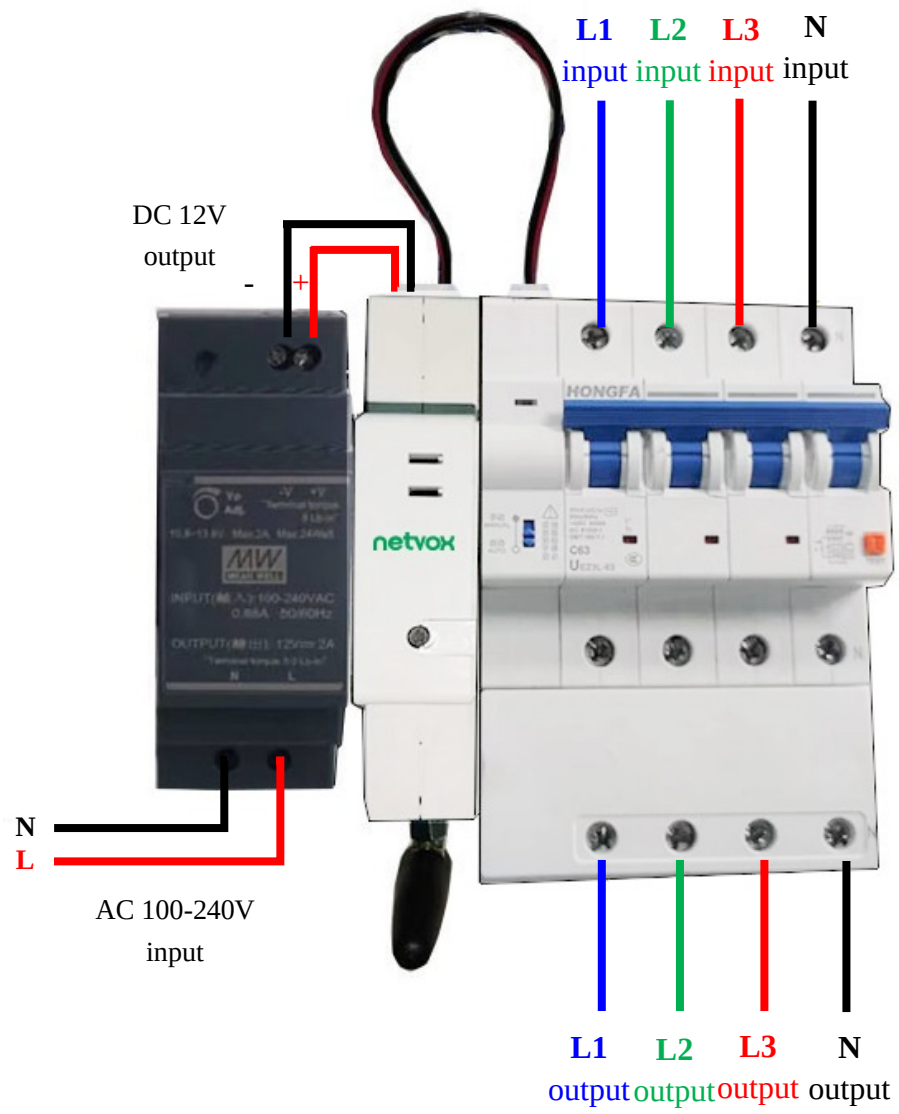
RP02RH1PNLB063

(Power Module + LoRa/LoRaWAN Radio Module + 1PNL Circuit Breaker)



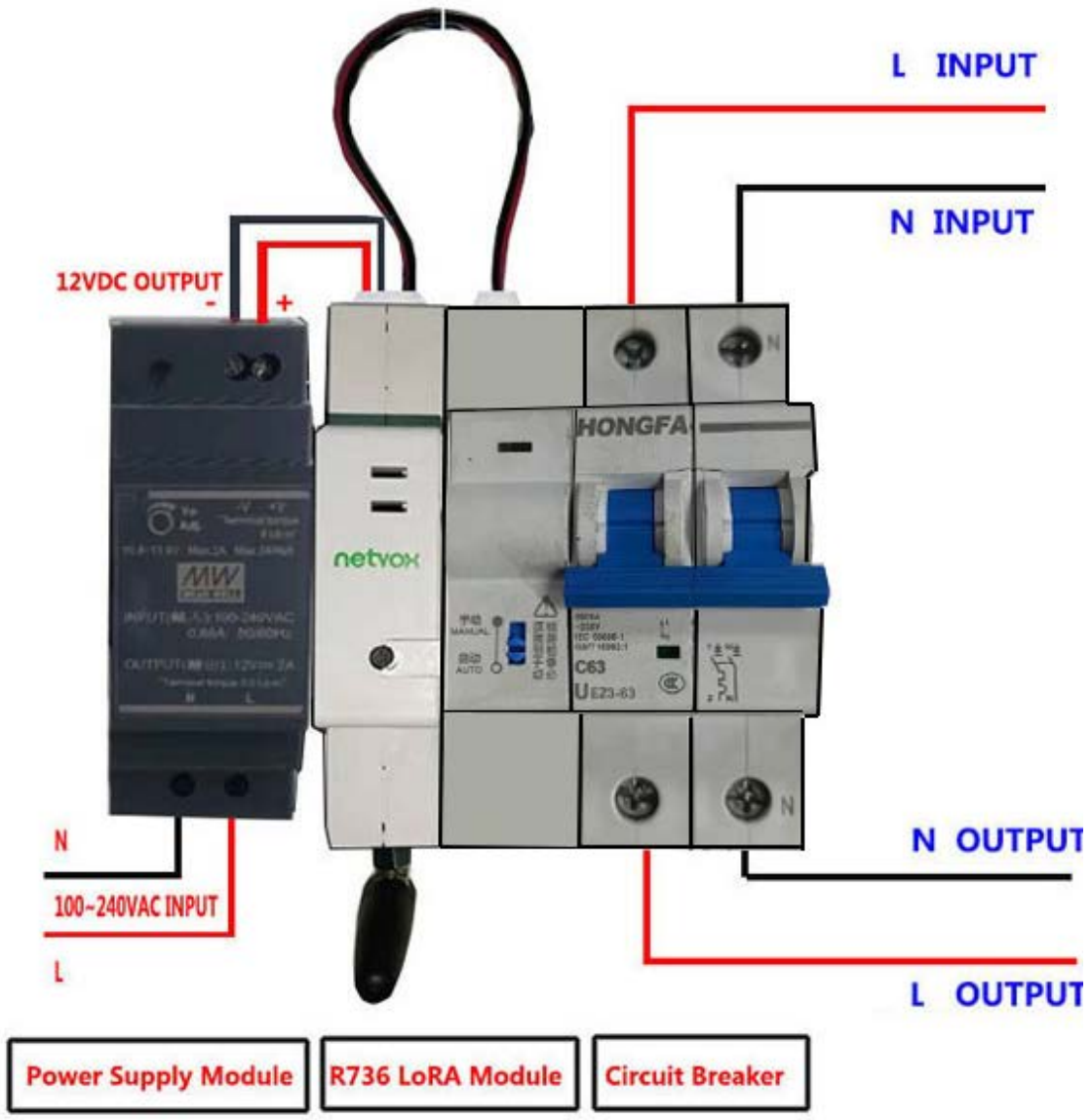
RP02RH3PN063

(Power Module + LoRa/LoRaWAN Radio Module + 3PN Circuit Breaker)



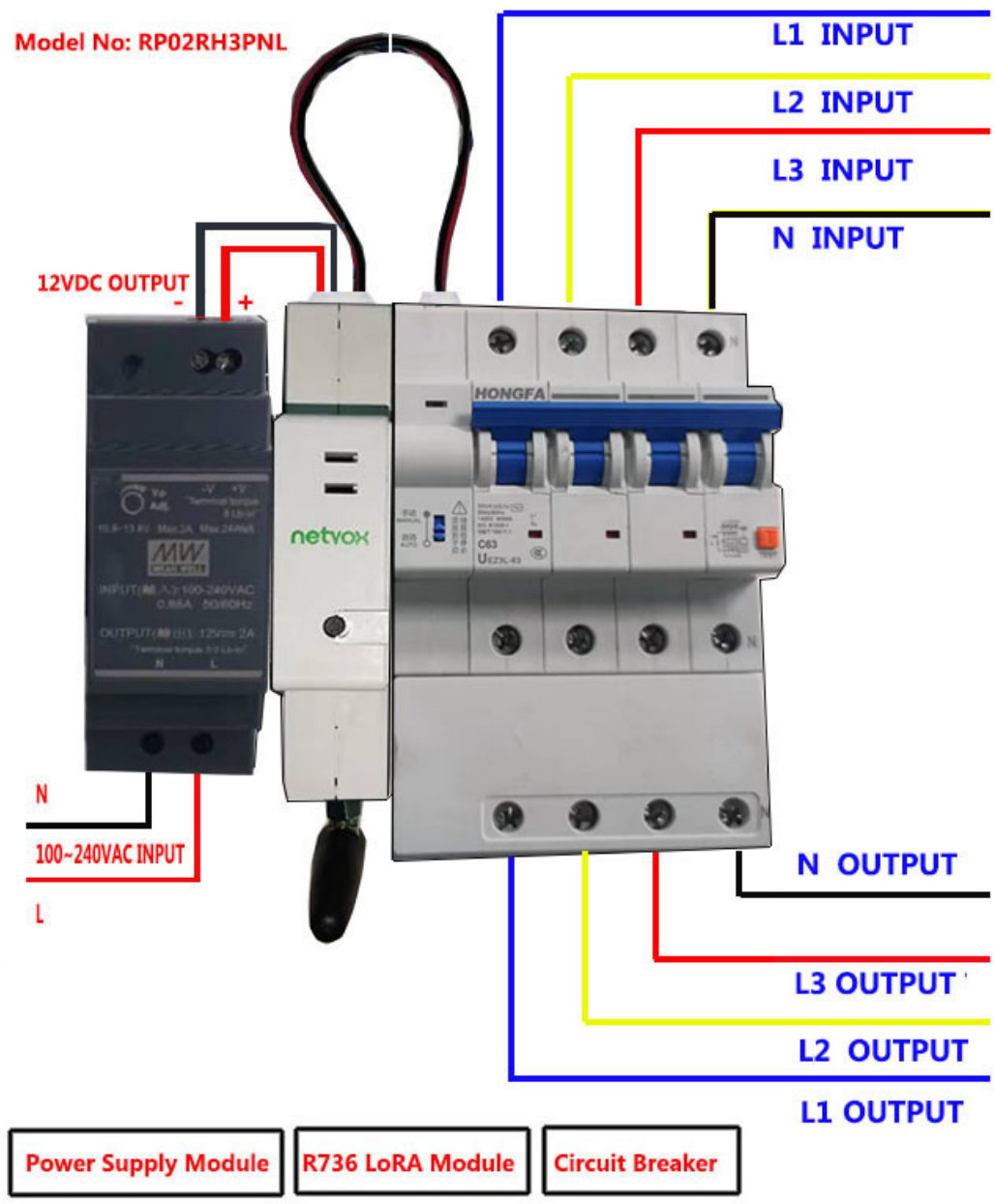
RP02RH3PNLB063

(Power Module + LoRa/LoRaWAN Radio Module + 3PNL Circuit Breaker)



RP02RH2P100

(RP02 + Power Module + **2P** 100A Circuit Breaker)

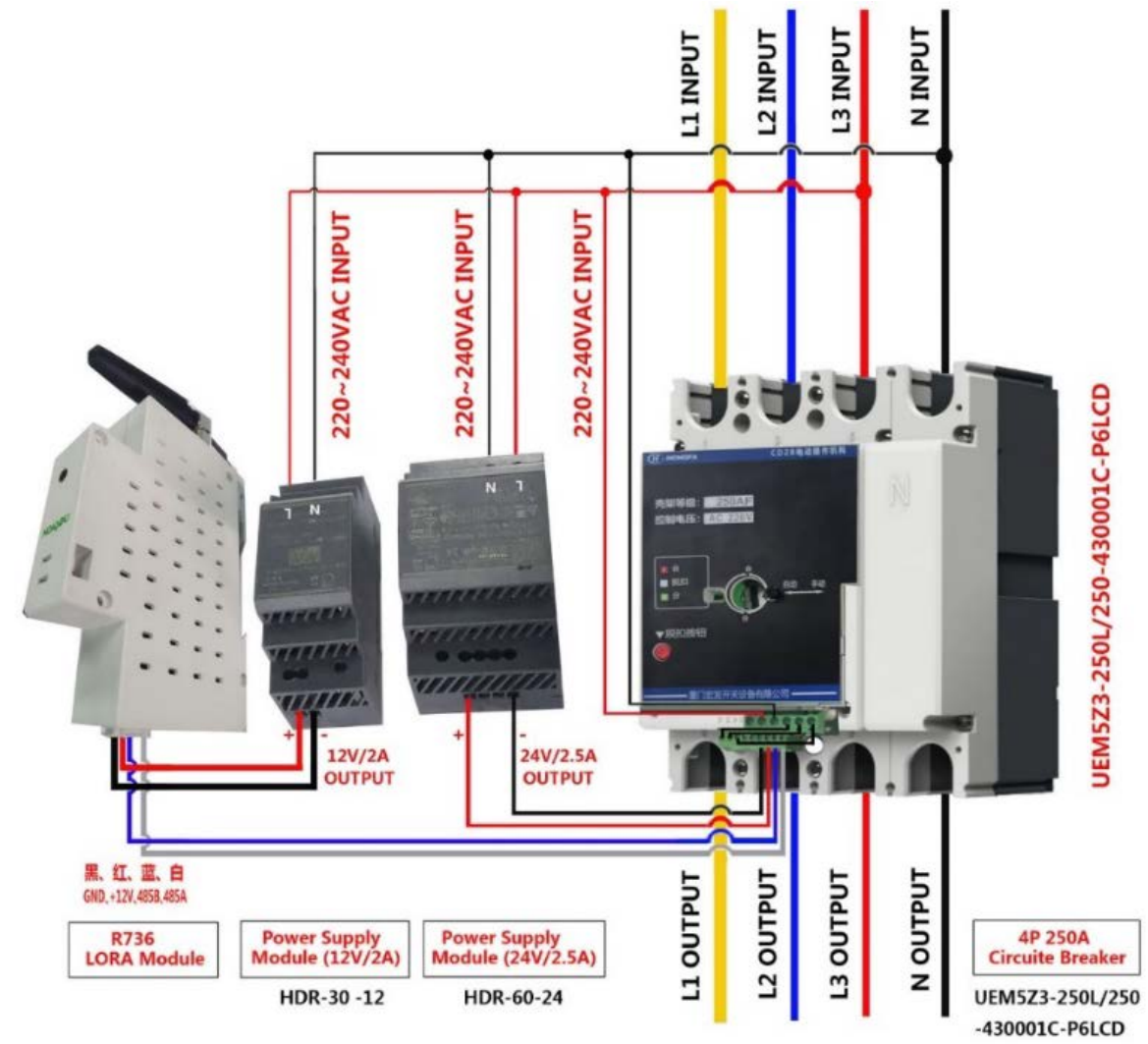


RP02RH4P100

(RP02 + Power Module + **4P** 100A Circuit Breaker)

RP02RH3P250

RP02 + LoRa Power Module + Breaker Power Module + **3P** 250A Circuit Breaker



RP02RH4P250

RP02 + LoRa Power Module + Breaker Power Module + **4P** 250A Circuit Breaker

Ensure that the device is powered on after the above installation is correct, and the status after power on:

1: The power on indicator of LoRa/LoRaWAN Radio Module flashes once, then the indicator remains off, and the indicator does not respond when pressing the key.

2: The power module indicator is always on after the power module is powered on.

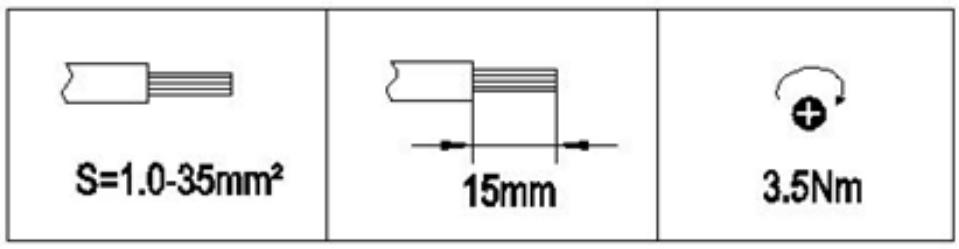
3: The circuit breaker is not closed after power on (the blue switch is turned to the bottom), and the red indicator light of the circuit breaker is always on, After closing (the blue switch is turned to the top), the green indicator of the circuit breaker is always on, and the alarm is that the red indicator of the circuit breaker flashes.

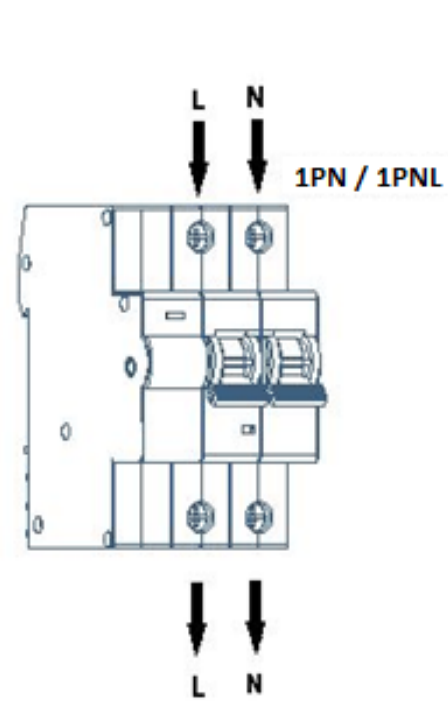
4: After the above functions are normal, perform screening and operation according to the operating instructions.

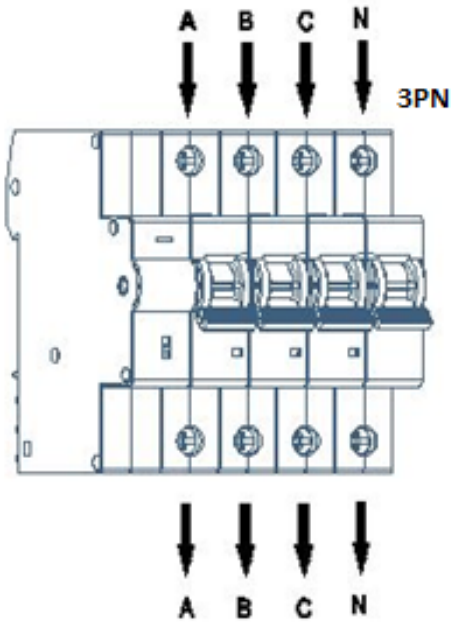
8.2 Wiring

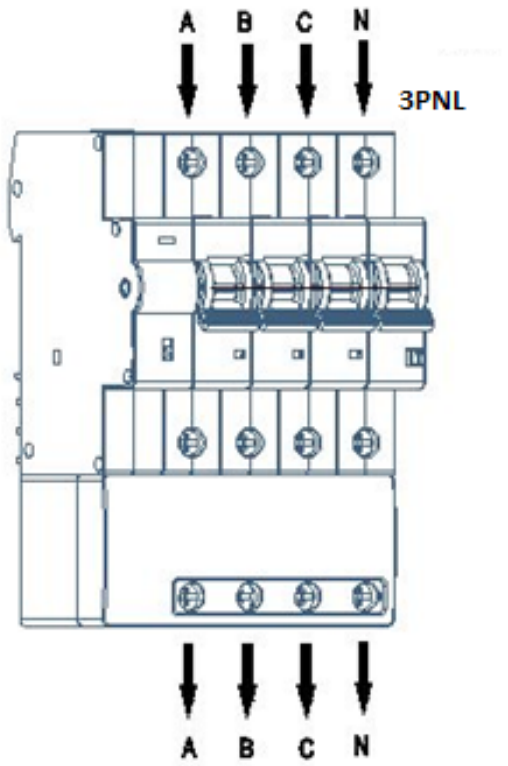
According to the actual distribution management and line laying design requirements, select and use products that meet the requirements.

The following installation and wiring diagram is for reference only.

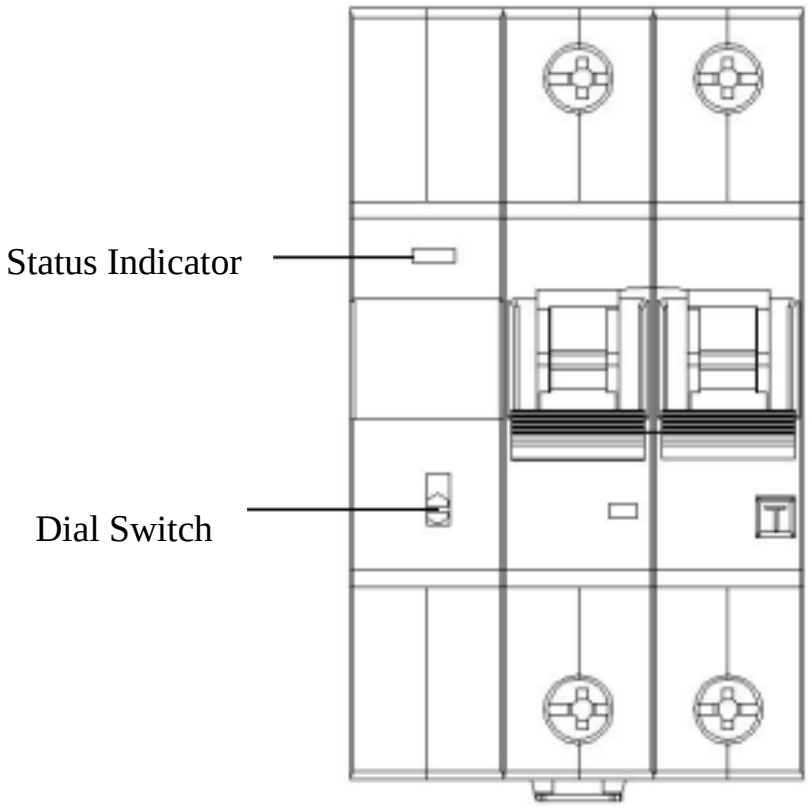








8.3 Dial Switch



Status Indicator:

Closing indication: The indicator is green.

Opening indication: The indicator is red.

Fault indication: The indicator is flashing red.

Fault to be closed: The indicator is flashing green.

Manual state: The indicator is flashing red and green alternately.

Dial switch:

Operate the manual and automatic state of the control module.

(See the description of Dial Switch Description)

Dial Switch Description:

1. The dial switch is in <u>automatic state</u>:

When 90 and 91 commands are issued, the relay can perform the corresponding opening and closing operation. It can also be opened and closed manually.

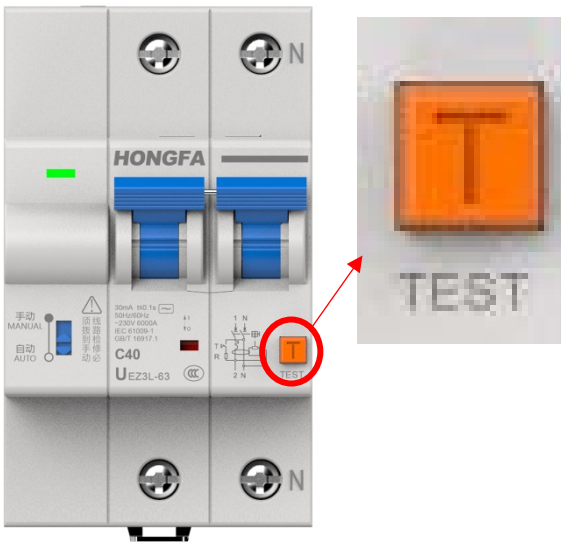
1P/2P/3P/4P: When the 92 command is issued, the relay performs opening operation and cannot be closed manually later. (The manual opening and closing can be continued only after the 91 command is sent to close the relay.)

250A MCCB: When the 92 command is issued, the relay performs opening operation and can be closed manually later.

2. When the dial switch is in <u>manual state</u>: the command is issued without operation, and the opening and closing can be carried out manually.

Note: Manual closing is not allowed (except for 250A MCCB) after sending 92 command in automatic state, no matter what state the dial switch is in.

8.4 Manual/ Automatic Self Inspection Function (For 1PNL, 3PNL)



Orange T button is a test button.

Press it once a month to test whether the leakage protection function is normal.

The circuit breaker is connected to the circuit.

If the leakage protection is normal, press the test button and the circuit breaker trips.

If the leakage protection fails, press the test button, the circuit breaker will not trip,

and the circuit breaker needs to be replaced.

The circuit breaker has remote self-test function, and can realize monthly periodic and regular self-test through platform or APP.

8.5 Combination of Power Modules and Circuit Breakers

Because the external circuit breaker will be limited by the power module, the currently provided power module (with an output power of 24W) can be externally connected to a circuit breaker with a maximum of 9 poles.

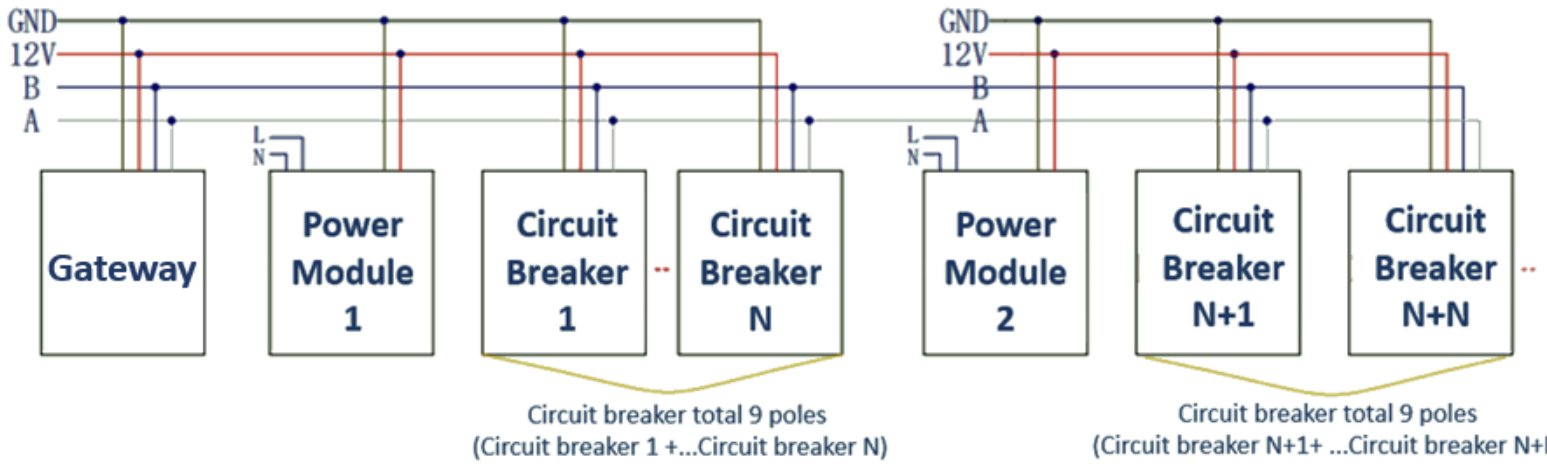
If the circuit breaker with more than 9 poles is connected, it needs to be expanded through the power supply, but the LoRa/LoRaWAN Radio Module device can connect up to 32 circuit breakers.

Each 1PN/1PNL circuit breaker has 2 poles, and each 3PN/3PNL circuit breaker has 4 poles.

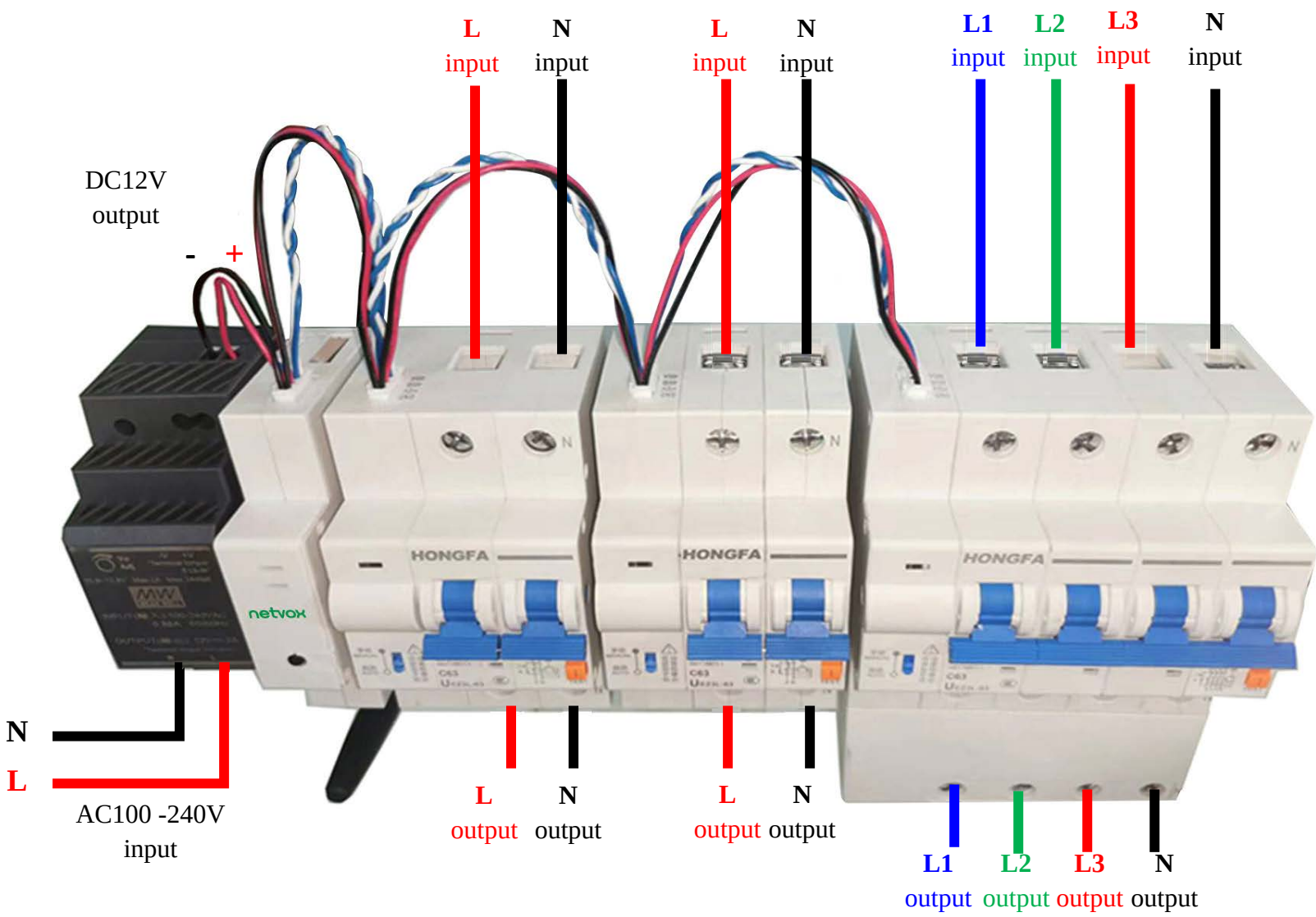
A power module can be connected with a maximum of several circuit breakers, the configuration is as follows:

1. Fully connected 1PN/1PNL can be connected to 4
2. Fully connected 3PN/3PNL can be connected to 2
3. Can be connected to 2 1PN/1PNL + 1 3PN/3PNL

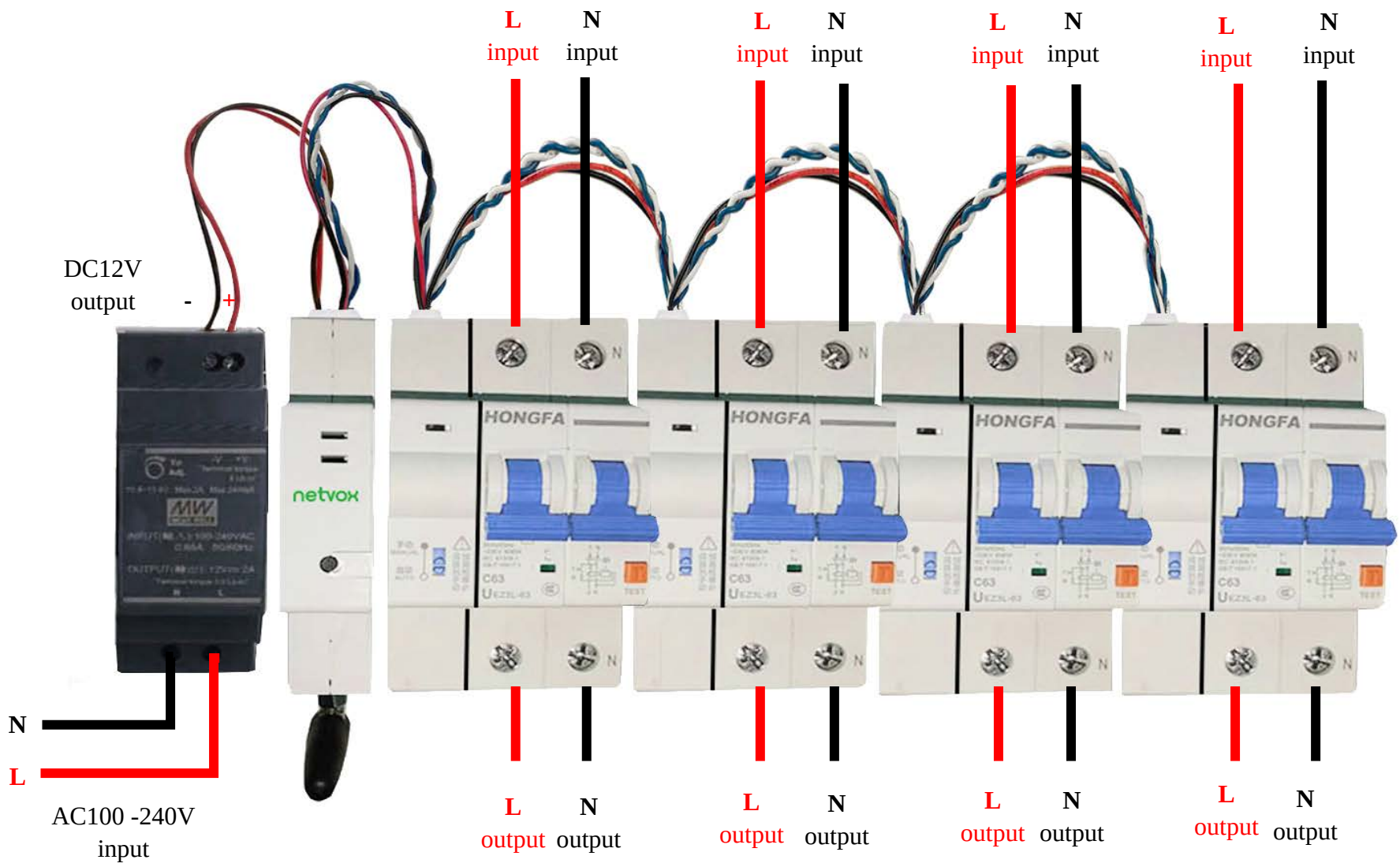
The schematic diagram of LoRa/LoRaWAN Radio Module connecting more than 9 pole circuit breakers is as follows:



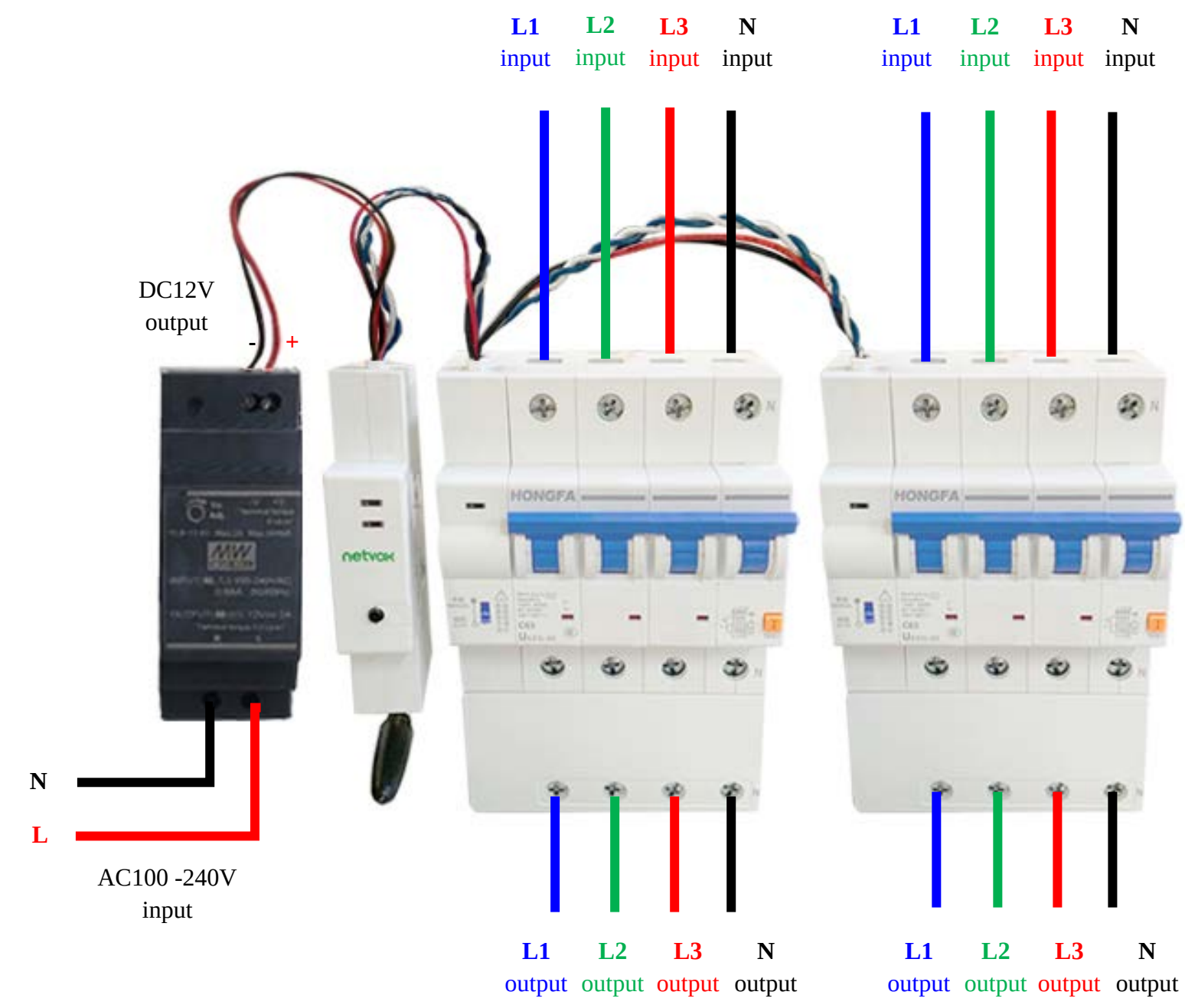
The output power of the power module is 24W, and the combined wiring diagram of the number of circuit breakers that can install the load is as follows:



(a) Power Module + LoRa/LoRaWAN Radio Module + 1PNL*2 + 3PNL Breaker



(b) Power Module + LoRa/LoRaWAN Radio Module + 1PNL*4



(c) Power Module + LoRa/LoRaWAN Radio Module + 3PNL*2

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 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.
- 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.