

Wireless Multi-Sensor Interface for 0-24V ADC, Dry Contact and 4-20mA Sensors

R718IJK User Manual

Copyright©Netvox Technology Co., Ltd.

This document contains proprietary technical information which is the property of NETVOX Technology. It shall be maintained in strict confidence and shall not be disclosed to other parties, in whole or in part, without written permission of NETVOX Technology. The specifications are subject to change without prior notice.

Table of Content

1. Introduction	2
2. Appearance	3
3. Main Feature.....	3
4. Set Up Instruction.....	4
5. Data Report.....	5
5.1 Example of ReportDataCmd.....	5
5.2 Example of ConfigureCmd	7
5.3 ConfigDryContactINTriggerTime	8
5.4 Example for MinTime/MaxTime logic.....	8
6. Installation	10
7. Information about Battery Passivation.....	13
7.1 To determine whether a battery requires activation.....	13
7.2 How to activate the battery	13
8. Important Maintenance Instruction	14

1. Introduction

R718IJK is a multi-interface detection device that is a Class A device based on the LoRaWAN open protocol and is compatible with the LoRaWAN protocol. The device is suitable for detecting 4mA to 20mA current, 0V to 24V voltage, and dry contact detection.

R718IJK is compatible with LoRaWAN protocol.

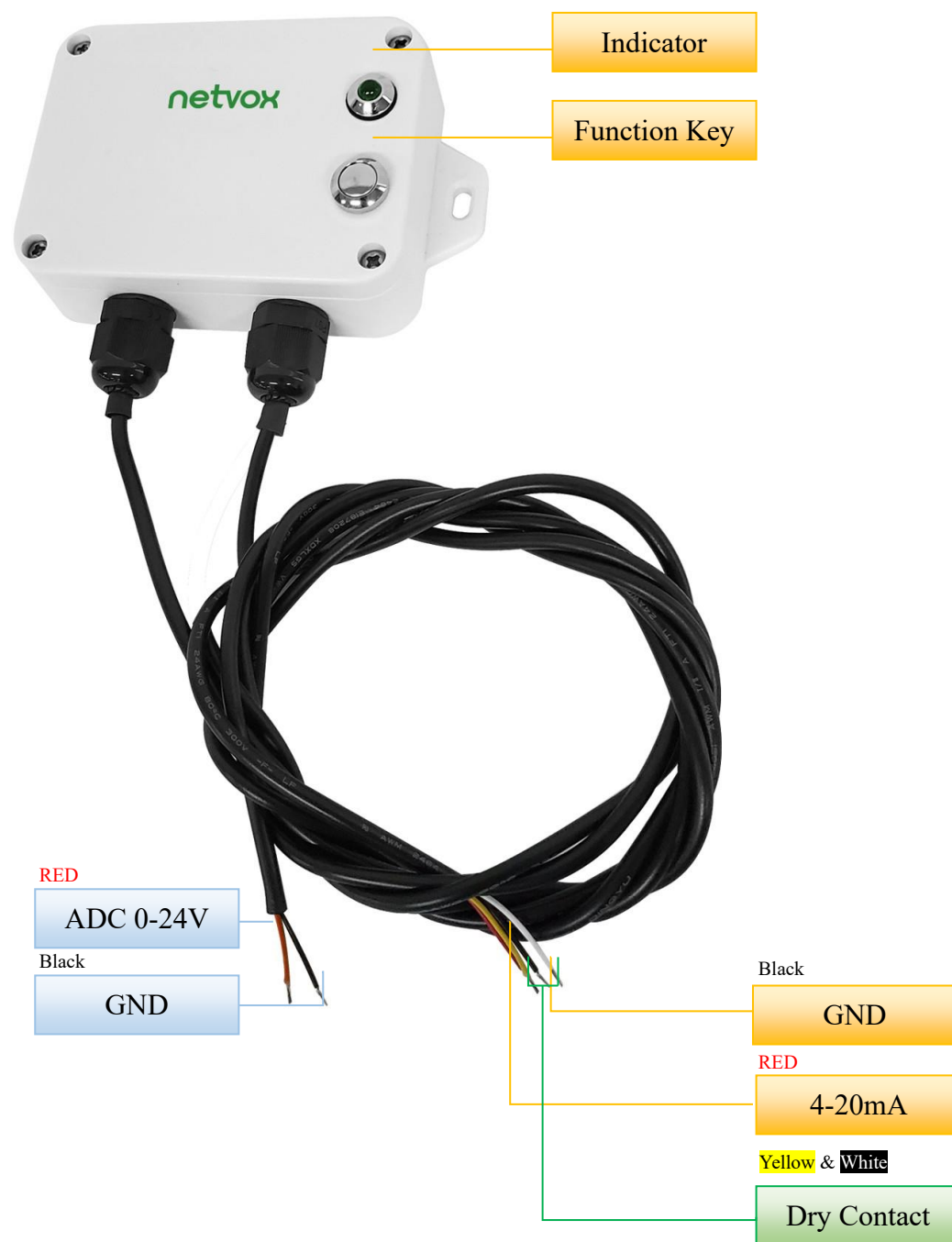
LoRa Wireless Technology:

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



3. Main Feature

- Adopt SX1276 wireless communication module
- 2 sections of ER14505 battery in parallel (AA size 3.6V / section)
- 0V to 24V voltage detection
- 4mA to 20mA current detection
- Dry contact detection
- Protection level IP65/ IP67 (optional)
- Compatible with LoRaWAN™ Class A
- Frequency hopping spread spectrum
- Applicable to third-party platforms: Actility/ThingPark, TTN, MyDevices/Cayenne
- Low power consumption and long battery life

Battery Life:

- Please refer to web: http://www.netvox.com.tw/electric/electric_calc.html
- At this website, users can find battery life time for variety models at different configurations.

4. Set Up Instruction

On/Off

Power on	Insert batteries (User 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 20 times
Power off	Remove Batteries
Note	<ol style="list-style-type: none"> 1. Remove and insert the battery, and the device is in turn-off state by default 2. On/off interval is suggested to be about 10 seconds to avoid the interference of capacitor inductance and other energy storage components 3. In the first 5 seconds after power on, the device is in engineering test mode

Network Joining

Never join the network	<p>Turn on the device to search the network.</p> <p>The green indicator stays on for 5 seconds: success</p> <p>The green indicator remains off: fail</p>
Had joined the network (Not restore to the factory setting)	<p>Turn on the device to search the previous network.</p> <p>The green indicator stays on for 5 seconds: success</p> <p>The green indicator remains off: fail</p>
Fail to Join the Network	Suggest to check the device verification information on the gateway or consult your platform server provider.

Function Key

Press and hold for 5 seconds	<p>Restore to factory setting / Turn off</p> <p>The green indicator flashes 20 times: success</p> <p>The green indicator remains off: fail</p>
Press once	<p>The device is in the network: green indicator flashes once and sends a report</p> <p>The device is not in the network: green indicator remains off</p>

Sleeping Mode

The device is on and in the network	<p>Sleeping period: Min Interval</p> <p>When the reportchange exceeds setting value or the state changes, the device send a data report according to Min Interval.</p>
-------------------------------------	--

Low Voltage Warning

Low Voltage	3.2V
-------------	------

5. Data Report

The device will immediately send a version packet report and the data of attribute report.

The device sends data according to the default configuration before any other configuring.

Default Setting:

MaxTime = 0x0384 (900s)

MinTime = 0x0384 (900s) // By default, the current voltage is detected every MinTime.

BatteryVoltageChange = 0x01 (0.1v)

ADC Raw Value Change = 0x0064 (100 mV) // Configuration need to greater than 0x50 (80 mV)

Current Change = 0x02 (2 mA)

Note:

1. The cycle of the device sending the data report is according to the default.
2. The interval between two reports must be the MinTime.
3. If there are special customized shipments, the setting will be changed according to customer's requirements.)

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 \geq Reportable Change	Current Change $<$ Reportable Change
Any number between 1~65535	Any number between 1~65535	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– 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 015C000A0B202005200000, the firmware version is 2020.05.20

3. Data Packet:

When Report Type=0x01 is data packet.

Device	Device Type	Report Type	NetvoxPayloadData					
R718IJK	0x5C	0x00	SoftwareVersion(1Byte) Eg.0x0A—V1.0		HardwareVersion (1Byte)	DateCode (4Bytes, eg0x20170503)		Reserved (2Bytes, fixed 0x00)
		0x01	Battery (1Byte) unit:0.1V	Status (1Byte) 0:off 1:on	Current (1Byte) unit:1mA	ADCRawValue (2Bytes) unit:1mv	FineCurrent (1Byte) unit:0.1mA	Reserved (2Bytes) fixed 0x00

Example of Uplink: 015C012400072EE04C0000

1st byte (01): Version

2nd byte (5C): DeviceType 0x5C—R718IJK

3rd byte (01): ReportType

4th byte (24): Battery—3.6V, 24(HEX)=36(DEC),36*0.1v=3.6v

5th byte (00): Status—off

6th byte (07): Current— 7mA

7th 8th byte (2EE0): ADCRawValue, 2EE0(HEX)=12000(DEC),12000*1mv=12000mv

9th byte (4C): FineCurrent—7.6mA, 4C(HEX)=76(DEC),76*0.1mA=7.6mA

10th 11th byte (0000): 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	R718IJK	0x01	0x5C	MinTime (2bytes Unit: s)	MaxTime (2bytes Unit: s)	BatteryChange (1byte Unit:0.1v)	ADCRawValueChange (2byte Unit: 1mV)	CurrentChange (1byte Unit: 1mA)	Reserved (1Byte,Fixed0x00)
Config ReportRsp		0x81		Status (0x00_success)			Reserved (8Bytes, Fixed 0x00)		
ReadConfigReportReq		0x02		Reserved (9Bytes, Fixed 0x00)					
ReadConfigReportRsp		0x82		MinTime (2bytes Unit: s)	MaxTime (2bytes Unit: s)	BatteryChange (1byte Unit: 0.1v)	ADCRawValueChange (2byte Unit: 1mV)	CurrentChange (1byte Unit: 1mA)	Reserved (1Byte, Fixed0x00)

(1) Configure R718IJK device parameter

MinTime = 1min, MaxTime = 1min, BatteryChange = 0.1v, ADC Raw Value Change=100mV, Current Change =2mA

Downlink: 015C003C003C0100640200

Device Return:

815C00000000000000000000 (configuration success)

815C01000000000000000000 (configuration failure)

(2) Read R718IJK device parameter

Downlink: 025C00000000000000000000

Device Return: 825C003C003C0100640200 (device current parameter)

5.3 ConfigDryContactINTriggerTime

FPort: 0x0F

Remain last config when reset to factory.

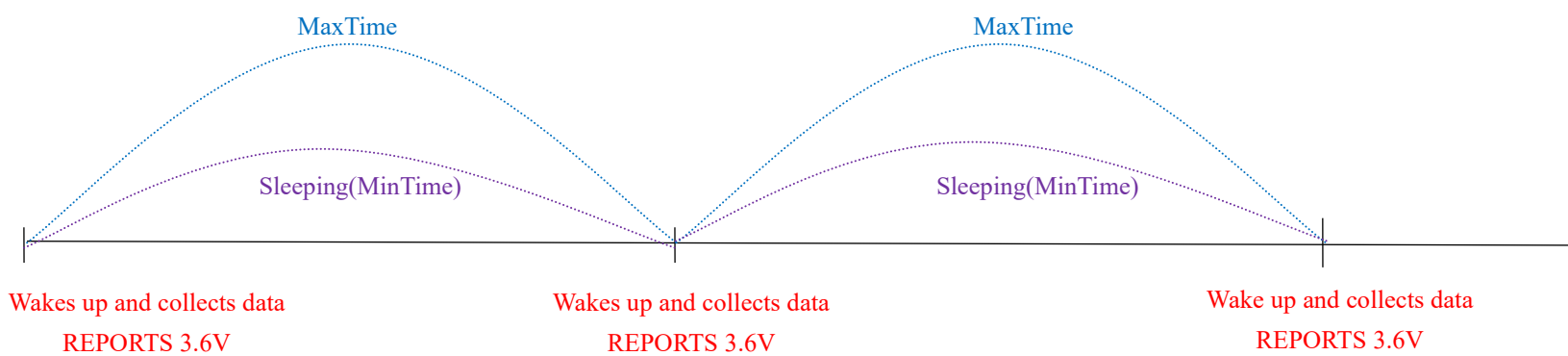
Description	CmdID	PayLoad(Fix byte,2byte)	
SetDryContactINTriggerTimeReq	0x01	MinTriggeTime(2bytes) (Unit:1ms,Default 50ms)	
SetDryContactINTriggerTimeRsp	0x81	Status (0x00_Success 0x01_Failure)	Reserved (1Byte,Fixed 0x00)
GetDryContactINTriggerTimeReq	0x02	Reserved (2Byte,Fixed 0x00)	
GetDryContactINTriggerTimeRsp	0x82	MinTriggeTime (2bytes) (Unit:1ms,Default 50ms)	

Downlink: 010064 // 100ms

Device Return: 810000

5.4 Example for MinTime/MaxTime logic

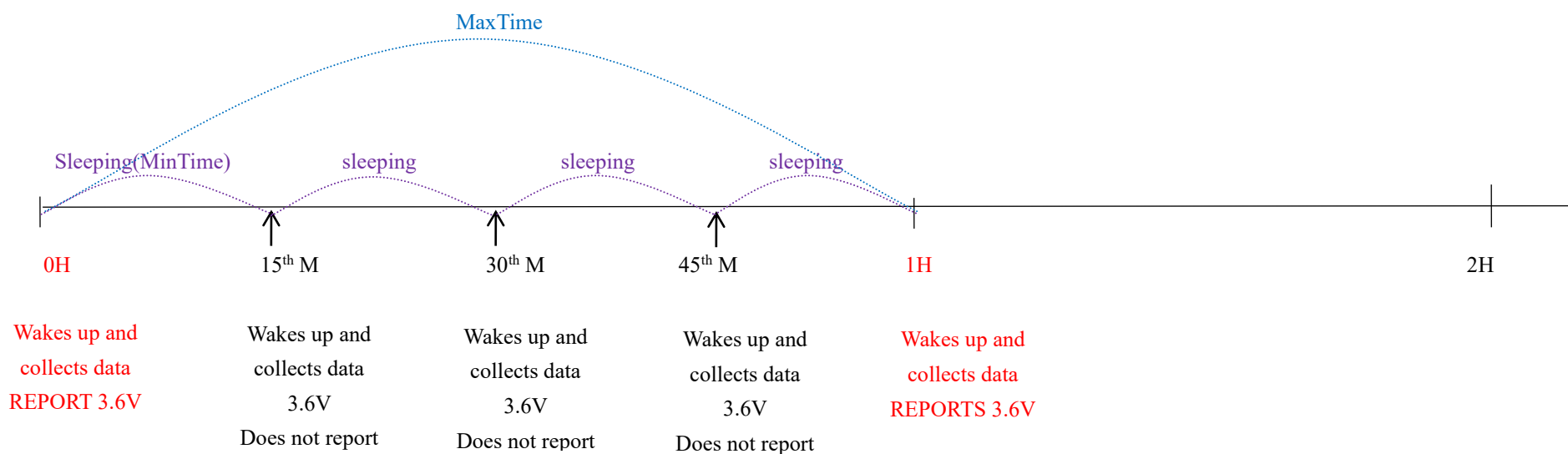
Example#1 based on MinTime = 1 Hour, MaxTime= 1 Hour, Reportable Change i.e. BatteryVoltageChange=0.1V



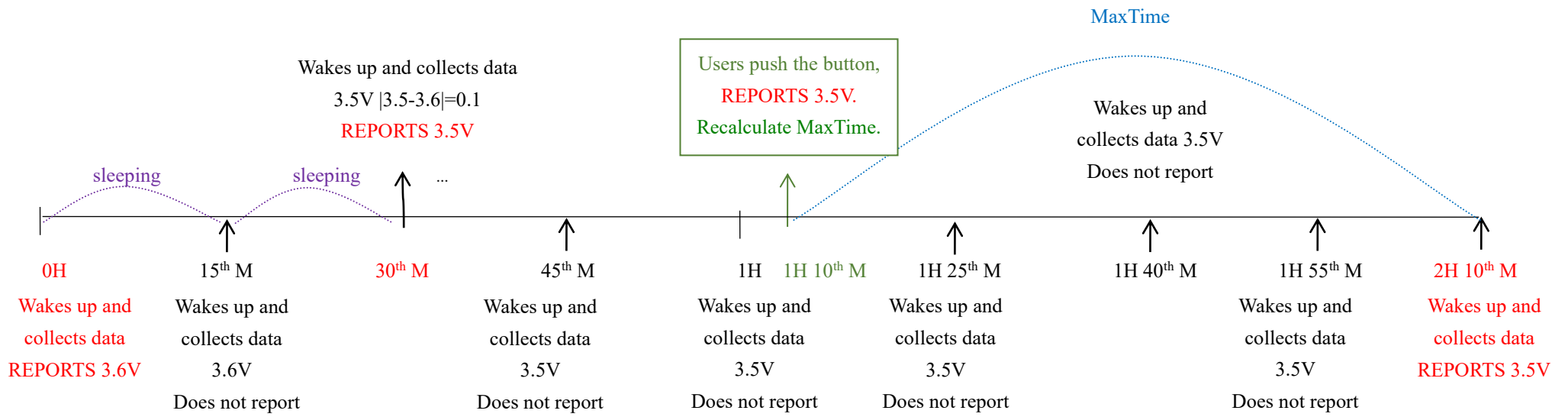
Note:

MaxTime=MinTime. Data will only be 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.



Example#3 based on MinTime = 15 Minutes, MaxTime= 1 Hour, Reportable Change i.e. BatteryVoltageChange= 0.1V.



Note:

- 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 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.

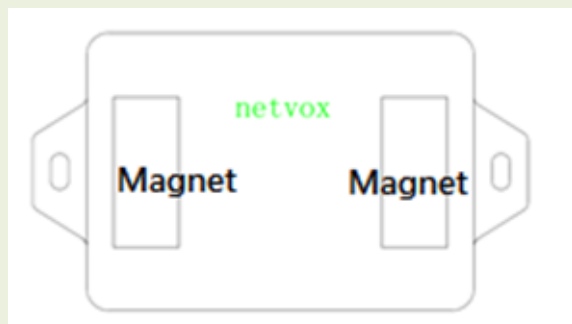
6. Installation

1. R718IJK has the built-in magnet (as the figure below). When installed, it can be attached to the surface of an object with iron which is convenient and quick.

To make the installation more secure, use screws (purchased) to secure the unit to a wall or other surface (as the figure below).

Note:

Do not install the device in a metal shielded box or in an environment with other electrical equipment around it to avoid affecting the wireless transmission of the device.



1. The ADC sampling line, dry contact sampling, and current sampling line of R718IJK are respectively connected according to the wiring method of Fig. 1, Fig. 2, Fig. 3 and Fig. 4.

2. R718IJK detects the battery voltage of the device, the voltage of the ADC sampling line, and the current of the current sampling line according to the MinTime, and compares the values with the last reported battery voltage value, ADC voltage value, and current value. When the default variation is exceeded (the default variation of battery voltage is 0.1V), the currently detected data is sent immediately. Otherwise, the device will report data regularly according to MaxTime. Data can also be reported by pressing the button.

3. Dry contact sampling line will report data immediately after detecting the change of dry contact status.

Note:

- When the dry contact is connecting, the data status bit is “1”. When the dry contact is disconnecting, the data status bit is “0”.
- The wiring method of current detection is divided into 2-wire wiring method and 3-wire wiring method. As Fig. 3 and Fig. 4 below.

The **ADC detection** function of R718IJK is suitable for the following scenarios:

- Signal isolation and amplification in industrial field
- Linear actuator for solenoid valve and proportional valve
- Linear controller with magnetic switch
- Electromagnetically driven coil or high-power load
- Ground wire interference suppression

The signal isolation transmitter with output signal 0-24V.

The **dry contact** function of R718IJK can be used in the following scenarios:

- Various switches and buttons
- Dry contact output of sensor
- The operating status of the equipment
- Door and window condition monitoring for home or business

The occasion is necessary to judge the sensor state by dry contact signal.

The **current detection** function of R718IJK is suitable for the following scenarios:

- Pressure transmitter
- Differential pressure transmitter
- Level transmitter
- Flowmeter

Such as transmitters with output signal 4-20mA.

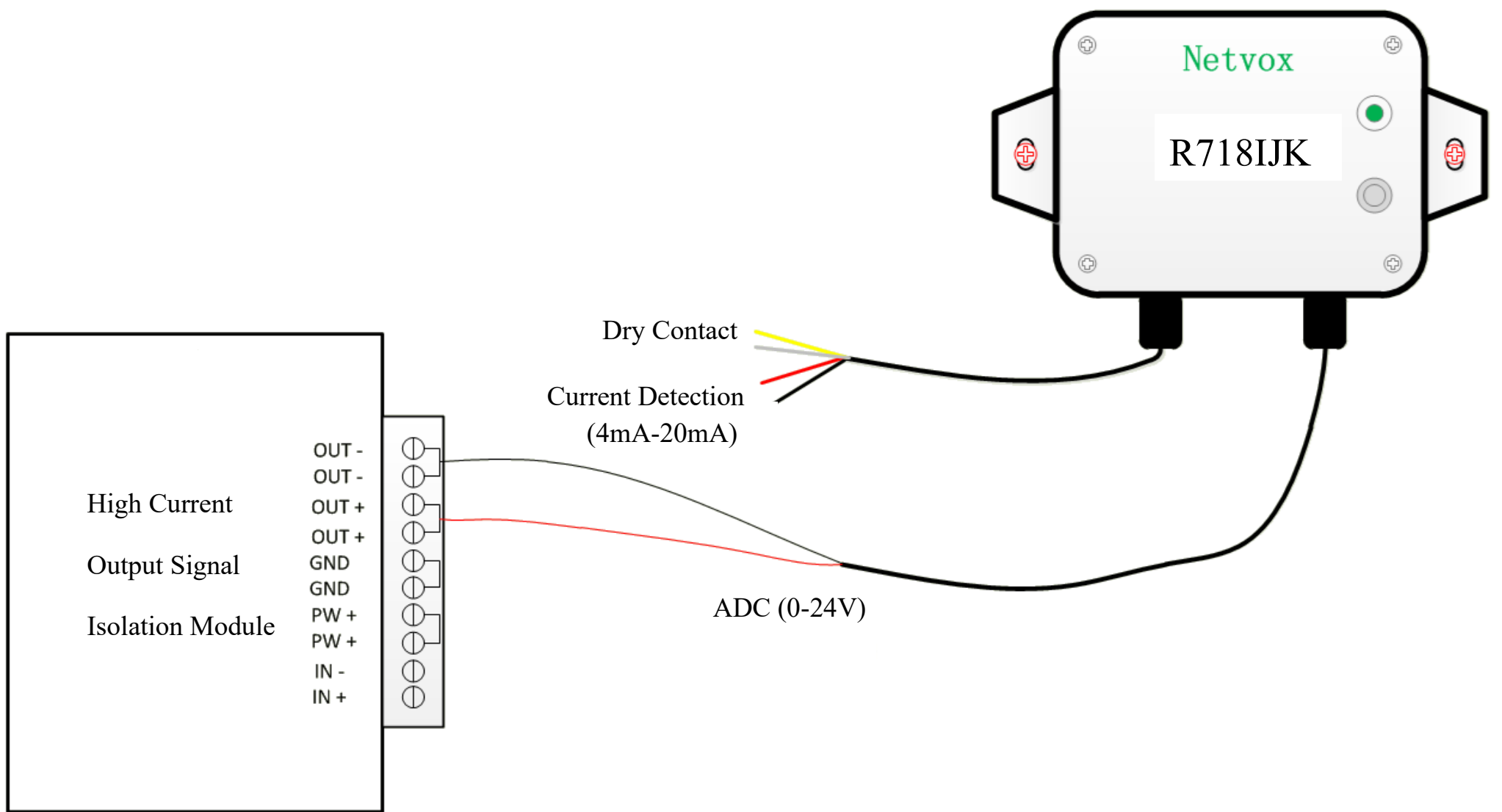


Fig. 1. ADC (0-24V) Detection Wiring Diagram

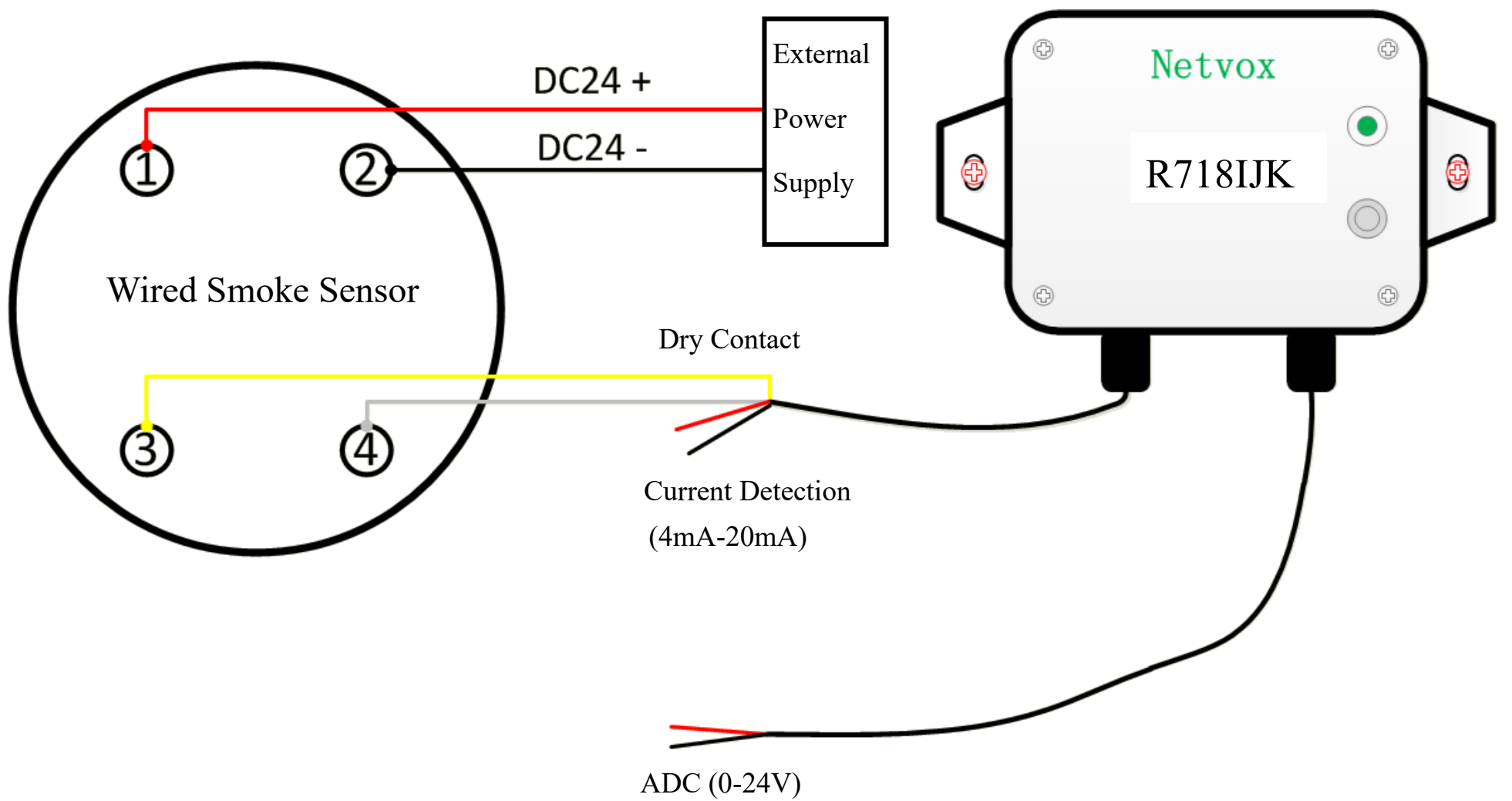


Fig. 2. Dry Contact Wiring Diagram

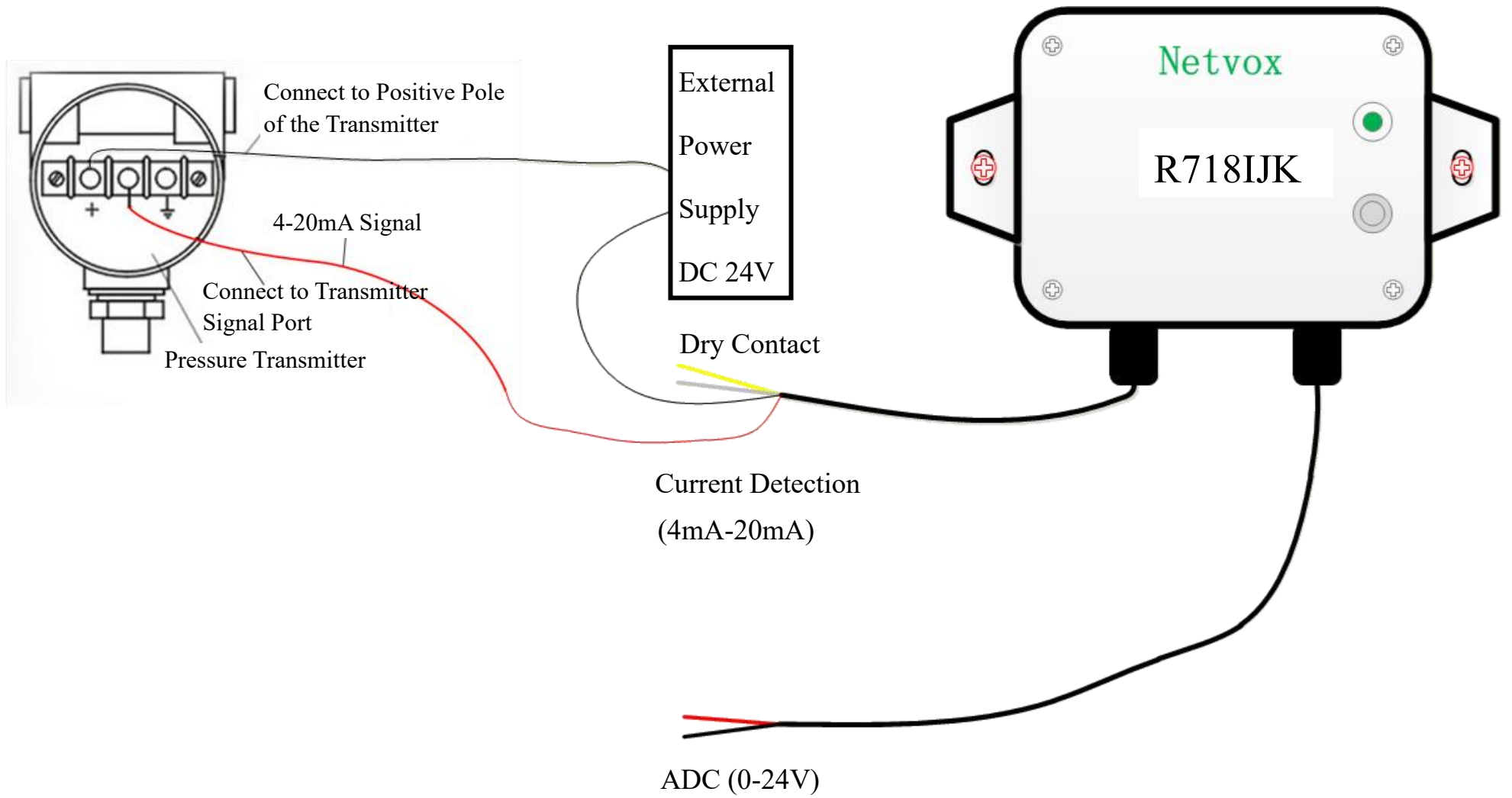


Fig. 3. Current Detection 2-Wire Wiring Diagram

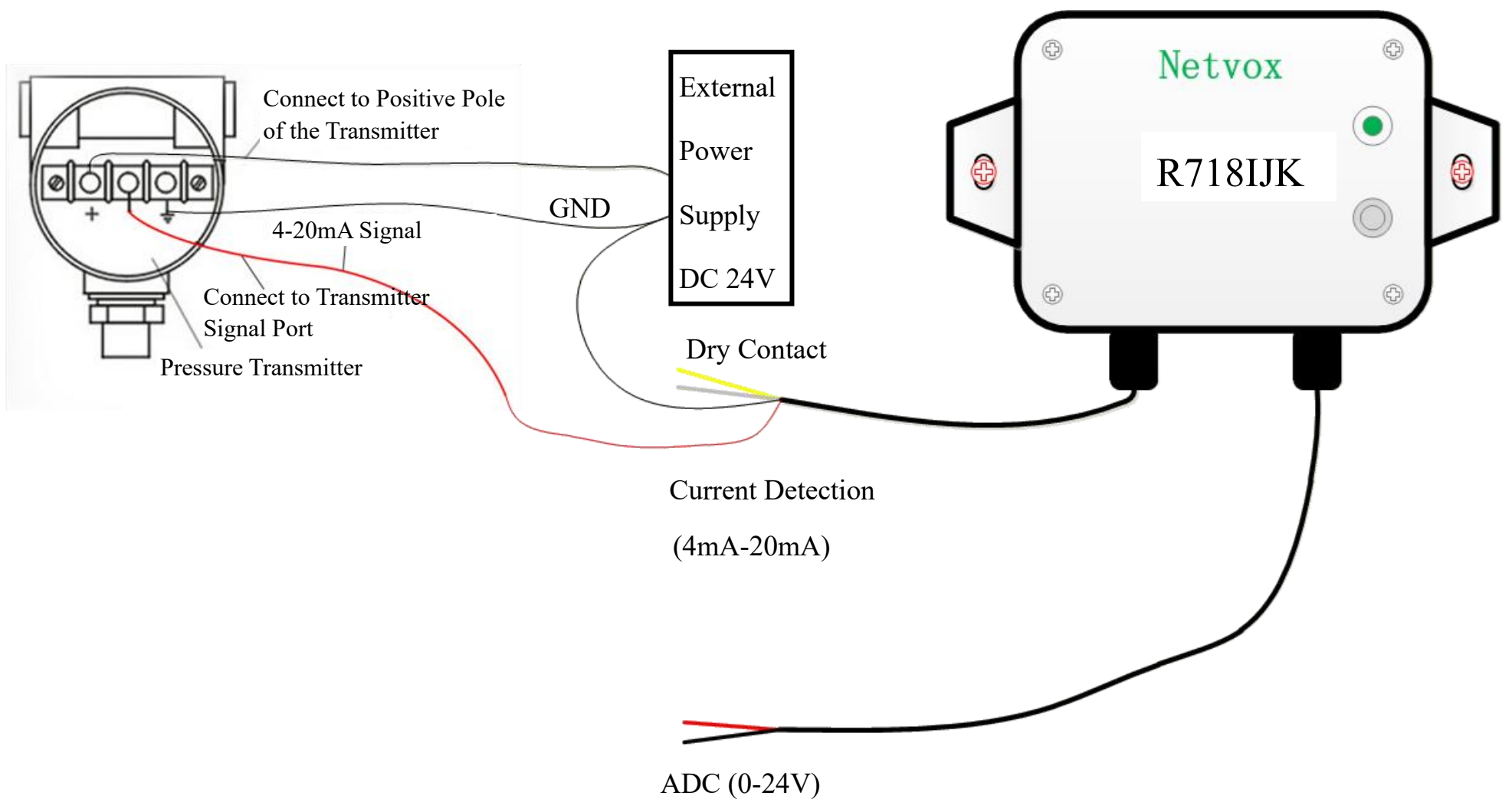


Fig. 4. Current Detection 3-Wire Wiring Diagram

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 equipment dry. Rain, moisture and various liquids or water may contain minerals that can corrode electronic circuits. In case the device is wet, please dry it completely.
- Do not use or store in dusty or dirty areas. This way can damage its detachable parts and electronic components.
- Do not store in excessive heat place. High temperatures can shorten the life of electronic devices, destroy batteries, and deform or melt some plastic parts.
- Do not store in excessive cold place. 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. Treating equipment roughly can destroy internal circuit boards and delicate structures.
- Do not wash with strong chemicals, detergents or strong detergents.
- Do not paint the device. Smudges can make debris block detachable parts up and affect normal operation.
- Do not throw the battery into the fire to prevent the battery from exploding. Damaged batteries may also explode.

All the above suggestions apply equally to your device, batteries and accessories.

If any device is not operating properly, please take it to the nearest authorized service facility for repairing.