Wireless Soil NPK Sensor

R72632A01
User Manual

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1. Introduction

R72632A01 is a netvox Class A type device based on LoRaWAN open protocol, which is compatible with LoRaWAN protocol.

R72632A01 can be externally connected with NPK (485 type) soil sensor to report the soil nitrogen, phosphorus and potassium content collected by the sensor to the corresponding gateway.

The external sensor of R72632A01 has high precision, fast response and stable output, it is less affected by the salt content of soil and is suitable for all kinds of soil. It can be buried in the soil for a long time. It is resistant to long-term electrolysis, corrosion, vacuuming and potting. It is completely waterproof, which greatly facilitates the customer's systematic evaluation of soil conditions

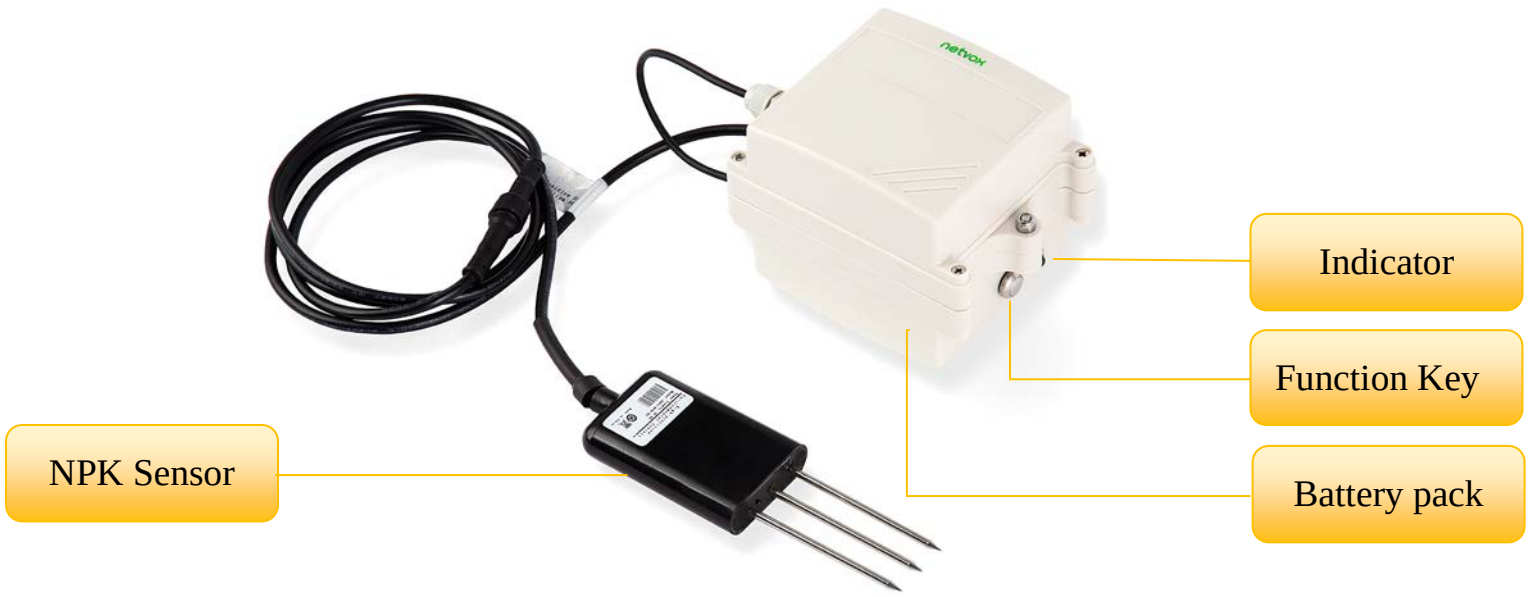
LoRa Wireless Technology:

LoRa is a wireless communication technology dedicated to long distance and low power consumption. Compared with other communication methods, LoRa spread spectrum modulation method greatly increases to expand the communication distance. Widely used in long-distance, low-data wireless communications. For example, automatic meter reading, building automation equipment, wireless security systems, industrial monitoring. Main features include small size, low power consumption, transmission distance, 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 Features

- Apply SX1276 wireless communication module
- 8 ER14505 lithium batteries, total battery capacity is 9600mAh
- Detect the content of nitrogen, phosphorus and potassium in soil
- Protection Class: Main body-IP65, NPK Sensor IP68
- Compatible with LoRaWAN™ Class A
- Frequency hopping spread spectrum
- Configuration parameters can be configured via a third-party software platform, data can be read and alerts can be set via SMS text and email (optional)
- Applicable to third-party platforms: 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 lifetime for varied models at different configurations.

4. Set up Instruction

On/Off

Power On	Connect to battery pack
Turn On	Connect the battery pack directly to boot
Turn Off (Restore to factory setting)	Press and hold the function key for 5 seconds and the green indicator flashes 20 times.
Power Off	Remove battery pack

Network Joining

Never Join 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	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	Suggest to check the device verification information on the gateway or consult your platform server provider.

Function Key

Press and hold for 5 seconds	Restore to factory setting / Turn off The green indicator flashes 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 The device is not in the network: green indicator remains off

Sleeping Mode

The device turns on and joins in the network	Sleeping period: Min Interval When the reportchange exceeds setting value or the state changes, send a data report according to Min Interval

Low Voltage Threshold Alarm

Low Voltage	6.8 V

5. Data Report

After the device is powered on and connected to the network, a version package will be sent immediately. After the collection of the preheating sensor is completed (about 20s), a report data containing the current battery power and soil nitrogen, phosphorus and potassium content will be reported immediately.

Default setting:

Report MaxTime: 3600s (The MaxTime should be ≥ 60 seconds.)

Report MinTime: The R72632A01 device does not support the ReportChange function

(That is, the configuration of ReportMinTime is invalid), and the report data string sent is always sent according to the ReportMaxTime cycle.

The data reported by the R72632A01:

Soil nitrogen content (N), soil phosphorus content (P) and soil potassium content (K).

Detection range of soil NPK: 0 to 1999 mg/kg, unit: 1mg / kg

Note

1. Before any configuration, the device sends data according to the default configuration.
2. The data transmission cycle of the device is subject to the burning configuration, and there is no minimum time. The value of ReportMaxTime should be greater than or equal to 60 seconds.
3. In order to make the NPK soil sensor work stably, it is required to send the report data information 20 seconds after the power on and network.
4. After briefly pressing the key, the device needs a period of time to warm up and process the sensor information. Please wait patiently.

The device reported data parsing please refer to Netvox LoRaWAN Application Command document and Netvox Lora Command Resolver http://loraresolver.netvoxcloud.com:8888/page/index

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)

Device	Device Type	Report Type	NetvoxPayLoadData				
R72632A01	0x09	0x0F	Battery (1Byte, Unit:0.1V)	Nitrogen (2Bytes,Unit:1mg/kg)	Phosphorus (2Bytes,Unit:1mg/kg)	Potassium (2Bytes,Unit:1mg/kg)	Reserved (1Byte,Fixed 0x00)

Uplink: 01090f450014001c004100

Byte	Value	Attribute	Result	Resolution
1st	01	Version	01	-
2nd	09	DeviceType	09	-
3rd	0F	ReportType	0F	-
4th	45	Battery	6.9v	45(HEX)=69(DEC),69*0.1v=6.9v
5th~6th	0014	Nitrogen(N)	20mg/kg	0014(HEX)=20(DEC),20*1mg/kg=20mg/kg
7th~8th	001C	Phosphorus(P)	28mg/kg	001C(HEX)=28(DEC),28*1mg/kg=28mg/kg
9th~10th	0041	Potassium(K)	65mg/kg	0041(HEX)=65(DEC),65*1mg/kg=65mg/kg
11th	00	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)

Example of report MaxTime configuration:

Description	Device	CmdID	DeviceType	NetvoxPayLoadData		
ConfigReportReq	R72632A01	0x01	0x09	Reserved (2bytes Unit:s)	MaxTime (2bytes Unit:s)	Reserved (5Bytes,Fixed 0x00)
ConfigReportRsp		0x81		Status (0x00_success)	Reserved (8Bytes,Fixed 0x00)	
ReadConfigReportReq		0x02		Reserved (9Bytes,Fixed 0x00)		
ReadConfigReportRsp		0x82		Reserved (2bytes Unit:s)	MaxTime (2bytes Unit:s)	Reserved (5Bytes,Fixed 0x00)

(1) Configure device parameter MaxTime = 2min

Downlink: 0109000000780000000000 // 78 (HEX) = 120 (DEC),

Device return:

810900000000000000000000 (configuration successful)

810901000000000000000000 (configuration failed)

(2) Read device parameters

Downlink: 020900000000000000000

Device return:

820900000780000000000 (current parameters of device)

6. Installation

The device is suitable for measuring ordinary yellow-cinnamon soil, black soil, and terra rossa. It is not applicable to saline-alkali land, sandy land, or other powdery objects with high salinity. The soil humidity shall be more than 25%

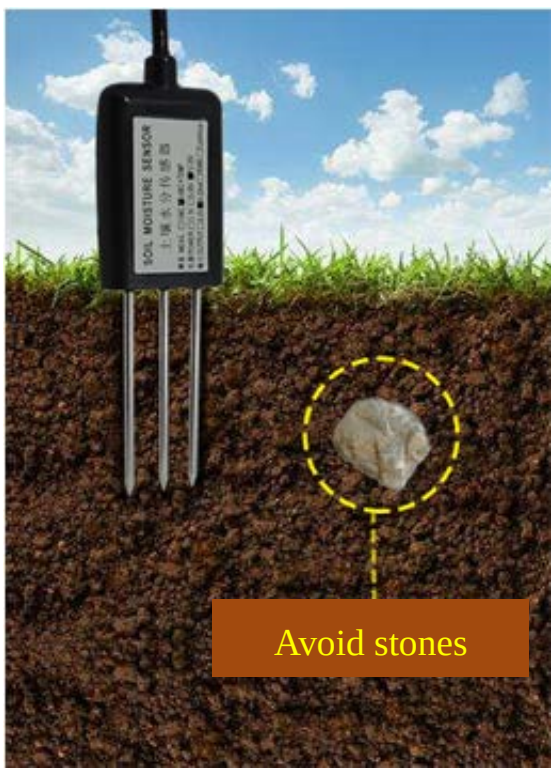
Installation and use method of sensor:

1. Quick test method:

Select a suitable measurement location, avoid stones, and ensure that the steel needle will not touch hard objects. Throw away the topsoil according to the required measurement depth, maintain the original tightness of the soil below, hold the sensor tightly and insert it vertically into the soil. When inserting, do not shake left and right. It is recommended to measure multiple times to obtain the average value within a small range of a measurement point.

2. Buried measurement method:

Dig a pit with a diameter of >20cm vertically, insert the sensor steel needle horizontally into the pit wall at a given depth, and fill the pit tightly. After it is stable for a period of time, it can be measured and recorded for consecutive days, months or even longer.



Installation precautions:

1. When measuring, the steel needle must be completely inserted into the soil.
2. Avoid high temperature caused by strong sunlight directly shining on the sensor. Pay attention to lightning protection for field use.
3. Don't bend the steel needle violently, don't pull the sensor lead wire forcibly, and don't beat or hit the sensor violently.
4. The protection grade of soil sensor is IP68, which can soak the whole soil sensor in water.
5. Due to the existence of RF electromagnetic radiation in the air, it is not suitable to be energized in the air for a long time.

Assembly precautions:

Users only need to disassemble and assemble the new battery when installing it. Please do not disassemble and assemble it without authorization in other cases. Please do not touch the waterproof rubber strip, waterproof fixing head, waterproof LED lamp and waterproof key during the process of assembling the battery. After the installation of the battery, you must use an electric screwdriver with a torque set to 4kgf to assemble the housing screws (if there is no electric screwdriver, please use a cross screwdriver with suitable screws to assemble and lock to ensure that the upper cover and the lower cover are assembled tightly), otherwise the air tightness after assembly will be affected

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

The device is a product with superior design and craftsmanship and should be used with care.

The following suggestions will help you use the warranty service effectively.

- 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 an excessively 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 repair.