

LW503 LoRaWAN Soil NPK Sensor User Manual



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1. Overview

LoRaWAN soil nitrogen phosphorus potassium (NPK) sensor, specially designed for precision agriculture. It can penetrate deep into the soil and detect nitrogen, phosphorus, and potassium content in real-time and accurately, with minimal measurement errors. With LoRaWAN long-distance low-power communication technology, stable data transmission can be achieved in remote farmland without frequent battery replacement. Farmers can grasp the soil nutrient status at any time and apply fertilizers reasonably through supporting software, which not only reduces costs but also improves crop yield and quality, helping agriculture move towards intelligence and efficiency.

Power Supply	5-28 VDC			
Weight	150g			
Operating Emperature	0°℃~55°℃			
Measuring Range	0-1999 mg/kg(mg/L) 0-2999 mg/kg(mg/L)			
Measurement Error	≤5%			
Resolution Ratio	1 mg/kg(mg/L)			
Sensor External Dimensions	45*15*123mm			
Steel Needle Material	Stainless Steel			
Sealing Material	Black flame retardant epoxy resin			
Transmitter Line length	Default 2m (other lengths can be customized)			
Frequency	CN470/IN865/EU868/RU864/US915/AU915/ KR920/AS923-1&2&3&4			
Mode	OTAA Class C			

2. Technical Parameters



Reporting cycle	5min(Default)
Communication Protocol	LoRaWAN
	AppEUI: 0000000000000001
Equipment information	DevEUI: aaaa202404150001
(Reference)	AppKey: 00001111222233334444555566667777
	MAC Version: LoRaWAN 1.0.3

2.1 Product List

- LW503 LoRaWAN Terminal 1 piece
- TYPE-C data cable 1 piece
- Soil NPK Transmitter 1piece(individual packing)



3. Configuration and Installation

3.1 LW503 Interface Description



- 1. **DC Power Interface:**DC5.5 * 2.1 female socket, power supply interface, 5-28VDC.
- 2. **TYPE-C Interface:**Used for device serial port configuration.
- Transmitter Interface: Used for connecting integrated NPK Transmitter
 1.RD: VCC 2.BK: GND 3.YL: RS485A 4.BLU: RS485B



3.2 LW503 Parameter Configuration Instructions

Configuration preparation:

- USB Type-C data cable
- Computer (Windows system)
- Configuration Tool Toolbox

Download: http://www.zonewu.com/en/Configuration-Tools.html

1. Install serial port driver program.CH340 USB to serial port .

2. Connect the LW50X to the PC using a USB cable and check if there is a COM port. If not, please recheck the equipment wiring and driver installation.

3. Open the configuration tool LoRa_config SLoRa_config V1.0.0 .open the corresponding COM port .

Port default parameters:

BaudRate	115200bit/s
Parity	None
DataBits	8
StopBits	1

As follows:

LoRa_Cont	fig V1.0.0								(<u>)</u>		×
Calculate	or Contact	Us Upgrade									
Port CO	om17 \sim	Version					✓ Timestamp	⊖ Hex ●	ASCII	SAVE	
BaudRate 1	15200 🗸	DEVSNNM				LOGLVL	~				
Parity No	one 🗸	LoRa In	terface Config								
DataBits 8	\sim	LoRaWA	N								
StopBits 1	~		DEVEUI								
	关闭串口		APPEUL								
]							
		1.000									
		F	REQBANDMASK		CONFIRM	~					
Enter	Load Parans		ULDLMODE	~	ADR	~					
		_	JOINMODE	~	MODE	~					
Restore Factory	Write Params	Parame									
		1 arams									
Reboot De v ice	Exit		Reporting Cycle	S							
		1									
	Sending										~

4. 1.Enter Config → 2.Load Params → 3.LoRaWAN → 4.Write Params → 5.Reboot Device



LoRa_Confi	ig V1.0.0							-		X
Calculato	r Contact	Us Upgra	ade							
Port CO	M17 ~	Versio	n				Timestamp () Hex	() ASCIT	SAVE	
BaudRate 11	5200 🗸	DEVSNN	M			LOGLVL		0		_
Parity No	ne v	LoRa	Interface Config		3					^
DataBits 8		LoRa	WAN		5					
StopBits 1	×		DEVEUI							
	关闭串口		APPEUI							
			APPKEY							
1	2		FREQBANDMASK		CONFIRM	~				
Enter Config	Load Parans		ULDLMODE	~	ADR	~				
			JOINMODE	~	MODE	~				
Restore Factory	Vrite Parans	4 Paran	ns							
Reboot Device	Ezit		Reporting Cycle	S						
5										
	Sending									~

LoRa	aWAN				
	DEVEUI	BF01240726D00001			
	APPEUI	331341E186891989			
	APPKEY	5572404c696e6b4c6f	52613230313	823	
	FREQBANDMASK	0002	CONFIRM	Close ACK	~
	ULDLMODE	Abnormal Freq Mo \sim	ADR	Close	~
			MODE	ClassC	~
Para	Reporting Cycle	600 s			

LoRaWAN Interface:

Item	Describe	Notes
DevEUI	Node's globally unique identifier code	64bit
AppEUI	Node's application identifier code	64bit
АррКеу	Assigned to the terminal by the application owner.	128bit

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FREQBANDMASK	Set frequency group mask	
	Set up uplink and downlink same frequency but	
ULDLMODE	different frequency	
CONFIRM	Set uplink transmission type	
ADR	Set adaptive speed	
MODE Set device working mode		

The device will be configured with ternary parameters by default when it leaves the factory:

DevEUI: BF05240726D00001

AppEUI: 331341E186891989

AppKey: 5572404c696e6b4c6f52613230313823

NOTE: All sensors are shipped with AppEUI and AppKey default to

331341E186891989 and 5572404c696e6b4c6f526132330313823.

Users can customize according to their own applications

FREQBANDMASK: The frequency group mask for LoRaWAN operation, with 16 bits corresponding to 16 frequency groups. Default is 0001.Users need to configure it according to the actual application region.

Params Interface:

Item	Describe				
Reporting cycle	adjustable range 1-65535, default is 3600s (60min)				

Printing logs of device startup and network connection:

Port	com17 ~	Version	ZW_LW100_W2.0	_0_Private_RS_V2.0.0_			☐ Timestamp ○ Hex ● ASCII SAVE			
BaudRate	115200 ~	DEVSNNM	0038004935000	0054E574E52		LOGLVL 2	○ [2024/7/31 10:32:39] 4友<- Version:			
Parity DataBits	None ~	LoRa Ir	nterface Config				+CGMR=release/V4.18_P1.4.2 LoRaWAN for CN470 OK			
StopBits	- 1 ~ 打开串口	LORAWAN OA ASR6601:"# MT DeVEUI BF01240726D00001 MT AppEui Set ok! MT AppEui 331341E186891989 [0004/7/31 10:93:40] kHc. MT AppEui Set ok!								
		F	APPKEY REQBANDMASK	5572404c696e6b4c6f	52613230313 CONFIRM	Close ACK ~	oki MTCLass Set ok! MTChannelMask Set ok! MTConfirms Set ok! MTUDIMode Set ok!			
Enter Config	Load Parans		ULDLMODE	Abnormal Freq Mo ~	ADR MODE	Close ~ ClassC ~	[2024/7/31 10:32:40] 收<- MT join start! [2024/7/31 10:32:41] 收<- Regi Cnt:1			
Restore Factory	e Vrite 7 Params	Params	Params added to the network [2024/7/31 10:32:42] 收< Regi Cnt:2 [2024/7/31 10:32:42] 收< Regi Cnt:2							
Reboot Device	Exit		Reporting Cycle	600 sec			[2024/7/31 10:32:44] 收<- Regi Cnt:4 [2024/7/31 10:32:45] 收<- Regi Cnt:5			
		2.The de	evice is suc	cessfully added	to the i	network	[2024/7/31 10:32:46] 收<- Join OK [2024/7/31 10:32:47] 收<- data Report MT Tx ok!			
	Sending									

The device is equipped with a built-in LED indicator light, which is located next Website: <u>http://www.zonewusensor.com</u> 第 8 页 Mobile: +8618146178586 E-mail: <u>gui@zonewu.com</u>



to the antenna interface and can be seen as a green light through the casing.

LED	Status	Describe
Croop indicator light	Light	Wake up
Green indicator light	Extinguish	Enter sleep mode

Firmware upgrade:

CoRa_C	Config V1.0.0		- 🗆 X
Calcul	ator Contact	Js Upgrade	
Port	сом20 ~	Version	☑ Timestamp ◯ Hex ● ASCII SAVE
BaudRate	115200 ~	DEVSNNM	rade – 🗆 X
Parity	None \vee	LoRa Interface Config	
DataBits	8 ~	LORAWAN	
StopBits	1 ~	DEVEUI	rt romo
	Open	APPEUI Baud	late 115200 V
~			Open Upgrade
Enter Config	Load Params	ULDLMODE	MODE V
Restore Factory	e Vrite Params	Params	
Reboot De v ice	Exit	Reporting Cycle sec	
	Sending		· · · · · · · · · · · · · · · · · · ·

Click to upgrade \rightarrow Pop up upgrade window





Upgrade		<u></u>		×
Browse C:\Users\A	.dministı	ator\Des	<top\lora< td=""><td>LW1</td></top\lora<>	LW1
Port COM17	~ 📢	acket lei	agth 4096	~
BaudRate 115200	~	2.sel	ect th	e
Close		com	port	ř 🛛
Please click t	o upgi	rade		- 20
				-10
) Upgrade		21 <u>—</u> 25		\times
Browse C:\Users\A	dminist	rator\Des	ktop\lor	a\LW1
Browse C:\Users\A	dministr nen	rator\Des	ktop\lor	a\L₩1
Browse C:\Users\A Port COM17	dministr	rator\Des	ktop\lor click	a\L₩1 16 ~
Browse C:\Users\A Port COM17 3.C	dministr ppen grac	rator\Des port acket le	ktop\lor click	a\L₩1 16 ~
Browse C:\Vsers\Ad Port COM17 3.C BaudRate 115200	dministr openj ograc	rator\Des 	ktop\lor click ngth 409	a\L₩1 96 ~
Browse C:\Vsers\A Port COM17 3.C BaudRate 115200	^{dministr}	rator\Des port acket le le		a\L₩1 6 ∨
Browse C:\Vsers\A Port COM17 3.C BaudRate 115200 Close	dministr open ograc	nator\Des port acket 1e le U	ktop\lor clicko ngth 109	a\L₩1 6 ↓
Browse C:\Users\Ad Port COM17 3.C BaudRate 115200 Close Please click t		rator\Des port le U rade	ktop\lor clickon hgth	a\LW1 16 ↓ e
Browse C:\Users\A Port COM17 3.C BaudRate 115200 Close Please click t	dministr ppen grac	rator\Des port de U rade	ktop\lor clicko ngth 409	a\LW1 6 ↓
Browse C:\Users\A Port COM17 3.C BaudRate 115200 Close Please click t	dministr open ograc	rator\Des acket le le U rade	ktop\lor clickog hgth	a\LW1 % ∽

Browse	C:\Users\Adminis	trator\Des	ktop\lor:	a/LW
Port A BaudRate	com17	Packet ler	ngth 409 r sup	⁶ pl
	Close	U	ograd	e
Please	e reset the p	ower sup	ply	





If there is an upgrade error during the upgrade process, you can close and reopen the upgrade window and follow the instructions to upgrade again.



3.3 LW503 Size and Installation



Installation instructions

Website: <u>http://www.zonewusensor.com</u> 第 12 页 E-mail: <u>qui@zonewu.com</u>



3.4 Soil NPK Transmitter Size



3.4.1 Precautions

1. The steel needle must be fully inserted into the soil during measurement.

2. Avoid direct exposure of strong sunlight to the equipment, which may cause excessive temperature. Pay attention to lightning protection when using outdoors.

3. Do not forcefully bend the steel needle, do not forcefully pull or pull the equipment lead wire, and do not hit or violently impact the equipment.

4. The device has a protection level of IP68 and can be fully submerged in water.

5. Due to the presence of radio frequency electromagnetic radiation in the air, it is not advisable to be in an electrified state for a long time.



4. Protocol Description

4.1 Data Format

The up/down data of the device is based on hexadecimal format. High position in front, low position in back.

address	code	length	data		
1 byte	1 byte	1 byte	2 byte	2 byte	2 byte

4.2 Upward Data

The device information is reported once during network access or restart.

050306002000250030							
Sensor	Instruction	Data	DATA				
address	type	Length	N	Р	К		
05	03	06	0020	0025	0030		
5	3	6	32	37	48		

Note: If the received data is FFFF FFFF, it indicates that the sensor is not connected or the sensor is abnormal.

4.2.1 Register Address Description

Register address	0001H	0002H	0003H
Parameter	N	Р	K
Unit	mg/kg	mg/kg	mg/kg
Range	0-2999	0-2999	0-2999
Data Type	uint16	uint16	uint16
Sample Value	-	-	-
Operate	Read/Write	Read/Write	Read/Write

4.3 Downward data

Support configuring devices through downstream commands. When the Website: <u>http://www.zonewusensor.com</u> 第 14 页 Mobile: +8618146178586 E-mail: <u>gui@zonewu.com</u>



downlink command is in confirmation packet mode, the device will immediately send a reply packet after executing the command.

4.3.1 Restart the device

Starting byte	Instruction type	Trail byte
(1byte)	(1byte)	(1byte)
0xFE	01	0xEF

Response:

Starting byte (1byte)	Instruction type (1byte)	Trail byte (1byte)
0xEF	01	0xFE

4.3.2 Set Reporting cycle

Starting byte	Instruction type	Reporting cycle (2byte)	Trail byte
(1byte)	(1byte)		(1byte)
0xFE	02	Х	0xEF

Response:

Starting byte	Instruction	Reporting	Trail byte
(1byte)	type (1byte)	cycle (2byte)	(1byte)
0xEF	02	X	0xFE