

# Product Operation Instruction

Wireless Node BH306

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# 1. Product Description

## 1. 1. Product Features

The BH306 Wireless Node (hereinafter referred to as the sensor) is a new type of data acquisition node with X, Y, Z three-axis vibration measurement points and one temperature measurement point. The system is based on the BeeLPW protocol and can self-organize to form a star network topology.

The sensor vibration acquisition unit adopts MEMS sensor chip, which is a new type of sensor intelligently manufactured by microelectronics and micro-machining technology, which has the characteristics of low power consumption, easy integration, and high reliability. The sensor temperature acquisition unit uses PT1000 platinum resistance, which has the characteristics of accurate measurement and good stability.

The sensor is simple and convenient to use. The wireless digital signal transmission method eliminates the noise interference caused by long cable transmission. The entire measurement system has extremely high measurement accuracy and anti-interference ability. Wireless sensor sensors can form a huge wireless sensor network, which supports simultaneous testing of hundreds of measuring points.

The sensor is compact in structure, small in size and easy to install. The collected data can be wirelessly transmitted to the computer in real time. The maximum air transmission rate of the sensor can reach 250Kbps, and the effective outdoor communication distance can reach 100m.

## 1. 2. Applicable Scope

The sensor has X, Y, Z three-axis vibration measuring points and one temperature measuring point, which is suitable for installation on the surface of electromechanical equipment to monitor the vibration and temperature of electromechanical equipment.

## 1. 3. Environmental Conditions

Ambient temperature: 0°C~+40°C;

Environmental humidity: ≤95%RH (+25°C);

Atmospheric pressure: 80kPa~106kPa;

Dangerous places with explosive gas mixtures of coal dust;

Locations where there is no steam or corrosive gas that destroys metals and insulating materials;

## 1. 4. Storage and Transportation Conditions

High temperature: +60°C;

Low temperature: -40°C;

Humidity: ≤ 95%RH (+25°C);

Vibration: 50m/s<sup>2</sup> ;

Impact: 500m/s<sup>2</sup> ;

## 2. Working Principle

The MEMS acceleration sensor chip used in the acquisition unit of the BH306 Wireless Node. The sensitive element of the MEMS piezoresistive acceleration sensor is composed of an elastic beam, a mass, and a fixed frame. When acceleration  $a$  acts on the sensor, the inertial mass of the sensor will generate an inertial force:  $F=ma$ , this inertial force  $F$  acts on the elastic beam of the sensor, and a strain proportional to  $F$  will be generated. At this time, the varistor on the elastic beam will also produce a change  $\Delta R$  accordingly, and the Wheatstone bridge composed of the varistor outputs a voltage signal  $V$  proportional to  $\Delta R$ .

The wireless communication unit of the BH306 Wireless Node uses a low-power zigbee wireless communication technology with a communication frequency of 2.4GHz. ZigBee is a new type of short-distance, low-rate wireless communication technology. The bottom layer is based on the IEEE 802.15.4 standard specification. Media access layer and physical layer, it is a technical solution between wireless long-distance technology and Bluetooth. The ZigBee protocol is an advanced communication protocol. It is based on the 802 protocol formulated by the IEEE Association in the world. It mainly restricts the wireless protocol, communication protocol, security protocol and application requirements of the network. Its effective broadcast rate can reach 300Kbps.

### 3. Product Using

#### 3. 1. Product Appearance



#### 3. 2. Power Supply

There is an insulating gasket between the battery board of the BH306 Wireless Node and the acquisition board. After opening the upper cover and removing the gasket, the sensor is powered on and works normally.

#### 3. 3. Debug Button

In order to facilitate debugging, a debugging button is added to the BH306 Wireless Node. Each time the debugging button is pressed, the BH306 Wireless Node will send a packet of data to shorten the debugging time.

#### 3. 4. Indicator Light

State	Red light	Green light
Successfully connected	/	3 flashes
Send feature value successfully	/	1 flashes
Wave data sent successfully	/	3 flashes
Failed to enter the network	3 flashes	/
RF module failed to wake up	5 flashes	/

## 4. Installation and Debugging

### 4. 1. Installation Instructions

Before installation, check whether the accessories are complete and whether the firmware is loose.

At the location that needs to be tested, make the installation position and confirm the test direction

After installation, power on and start the wireless sensor. (Non-workers are prohibited from disassembling the equipment)

### 4. 2. Communication Distance

#### 4. 2. 1. Antenna Instructions

antenna parameters:

Receiving sensitivity	-123 dBm
Transmit output power	<15 dBm
Transmit built-in antenna gain	0 dBi

#### 4. 2. 2. Factors Affecting Communication Distance

Factors that may affect the communication distance include: terrain characteristics, obstacles, antenna gain, antenna height, direction, other radio interference, weather conditions and many other aspects (the factors listed here do not represent all).

Based on actual measurement and use, we have summarized several methods to improve communication quality. The suggestions are as follows:

- (1) Make the antenna of the transmitting sensor face the antenna of the receiving sensor or gateway.
- (2) Try to ensure that there are no direct obstacles between the acquisition sensors, and try to keep the acquisition sensors in a high and unobstructed position.
- (3) Elevate the sensor as much as possible to prevent the antenna from receiving attenuation from the ground or other planes.

## 5. Technical Parameter

Model	BH306	
Protection	Explosion-proof type	Ex ia IIC T4 Ga
	IP Protection level	IP66/IP67
	Explosion-proof certificate number	CCRI 18.2107
Acceleration and velocity characteristics	Measurement channel	3-axis X、Y、Z
	Acceleration measurement range	5m/s <sup>2</sup> ~ 200m/s <sup>2</sup>
	Acceleration frequency range	10Hz ~ 2000Hz
	Linearity	1%
	Lateral sensitivity	<5%
Temperature characteristics	Measuring range	0°C ~ 100°C
	Number of channels	1
	Input	PT1000 analog input
	Measurement error	±2°C
	Resolution	0.1°C
	Balance range	±100% measuring range
RF characteristics	RF frequency	2.4GHz ± 10Hz
	Communication distance	0m ~ 100m (Unobstructed)
	Transmit power	<15dBm
	Maximum data transfer rate in the air	250K bps
Electrical characteristics	Battery	3.6V lithium battery
	Working current	emission 150mA idle 12 μ A
	Continuous working time	>1 year
Mechanical Dimensions	Shell	Aluminum alloy + ABS plastic
	Size	Φ 43mm × 111mm
	Weight	< 230g

## 6. Diagnosis and Troubleshooting of Common Faults

- (1) The monitoring server cannot collect the measured value of the sensor.

If all sensors in a certain area do not display data, there may be a problem with the wireless gateway in that area. Please check whether the power supply of the wireless gateway in this area is properly connected, and confirm that the power supply of the gateway is normal.

- (2) The measurement values of all sensors are not displayed on the monitoring server.

Under normal circumstances, the measured data of each sensor is transmitted to the monitoring server through the forwarding gateway and wireless network.

If the data of all the sensors on the monitoring server are not displayed, it may be a problem with the monitoring server. At this time, it is recommended to unplug the monitoring server and then plug it in again. After the server restarts, check whether it is normal.

- (3) For other questions, please call technical support.

## 7. Precautions

- (1) It is forbidden for users to disassemble and assemble by themselves.
- (2) For products that have passed the explosion-proof inspection, they must not replace components or change the structure at will.
- (3) Do not throw the product into the fire.
- (4) During use, if the product has been in a low temperature or high temperature environment, the normal working life of the sensor will be shortened. When the product is not used for a long time, please put it in a cool and dry place.
- (5) Avoid installing this product in a fully enclosed metal cabinet.
- (6) It is strictly forbidden to replace the battery in an explosion-hazardous area! Please wipe with a damp cloth when cleaning!

## 8. Product Maintenance

This product is a precision measurement product. After power-on, it should be ensured that it is not greater than the maximum acceleration value that it can withstand, so as to avoid excessive internal acceleration voltage causing abnormal output signals.

The product must be kept properly. When not in use, it should be placed in a dry place. When in use, it should be prevented from falling or being impacted by external intrusions.

When the product is not used for a long time, there is an insulating gasket between the battery board and the acquisition board to cut off the power supply.

Under any circumstances, users are not allowed to disassemble the product by themselves.

This product should not be used under the conditions specified in the technology of this manual.

## 9. Transportation and Storage

The packaged sensor is suitable for road, rail, and water transportation, and it is required to prevent rain and drop during transportation.

After the equipment is packaged, it should be stored in a dry, non-corrosive warehouse with an ambient temperature of  $-40^{\circ}\text{C} \sim +60^{\circ}\text{C}$  for no more than 12 months.

## 10. Service Commitment

This product is guaranteed for 12 months free of charge.

During the free warranty period, the company will be responsible for free maintenance or free replacement services for product quality problems that occur under normal use.

The following conditions are not covered by the free warranty:

- (1) Products beyond the warranty period.
- (2) Force majeure, such as all natural disasters such as earthquakes and fires or accidents (theft, loss, etc.) caused by force majeure factors such as products cannot work normally.
- (3) Man-made damaged products.

## FCC Warning:

Any Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference, and
- (2) this device must accept any interference received, including interference that may cause undesired operation.

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

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