brospower TECH

LoRaWAN BPT-TL3
Long-distance wireless inclinometer
Technical Manual

V1.1

LoRaWAN Series
Long-distance wireless transmission inclinometer

Introduction

LoRaWAN LoRaWAN BPT-TL3 high speed wireless transmission inclination sensor is a compact and intelligent digital inclination sensor designed for structure health monitoring. Using disposable lithium sub-battery, the longest working time is over 10 years (upload frequency 1h1 time), also can choose to work with external dedicated power supply. Can meet the needs of high precision and high frequency monitoring. With remote control and management function, connect LoRaWAN gateway to transfer data to the web server.

In terms of network connection, the sensor has an automatic drop reconnection function, effectively avoiding problems caused by network abnormalities and server maintenance and other factors resulting in the loss of connection. The sensitive mechanism adopts the latest technology, the micro-electro-mechanical production process of the inclination unit, small size, low power consumption, consistency and stability is very high, because it is a digital inclination sensing module, linearity is more easily corrected. The product shell is made of ABS + 30% glass fiber material, the life can be guaranteed for 8 years, and the working temperature reaches industrial level -40℃ ~ +85℃.

Main Feature

- Accuracy: 0.005°
- LoRaWAN Wireless network, star network
- Can be used for up to 10 years
- Magnetic Switch
- Resolution 0.001°
- Dual axis inclination measurement, range ±60°
- More user-friendly design, more in line with actual deployment requirements on site

Function Feature

- Working frequency 868/915/932MHz for optional
- Support data transparent transmission
- Power output
- Automatic sleep

Note: * means under laboratory conditions

- Small size, light weight, easy installation
- Connected to the Internet through a data LoRaWAN gateway, and data is transmitted to the cloud
- Wireless signal interference monitoring
- Temperature output

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Application

- Dangerous housing monitoring
- Bridge tower inclination measurement
- Dam monitoring
- Slope disaster prevention
- Ancient building protection monitoring
- Tunnel monitoring
- Foundation pit monitoring
- Tower tilt monitoring

Product Feature

Mechanical Index

Connector	Aviation connector
Protection level	IP68(1 m water depth, 24 hours continuous test)
Shell material	ABS+30% glass fiber + magnesium aluminum alloy anodized base
Installation	Four M6 screws

Performance Index

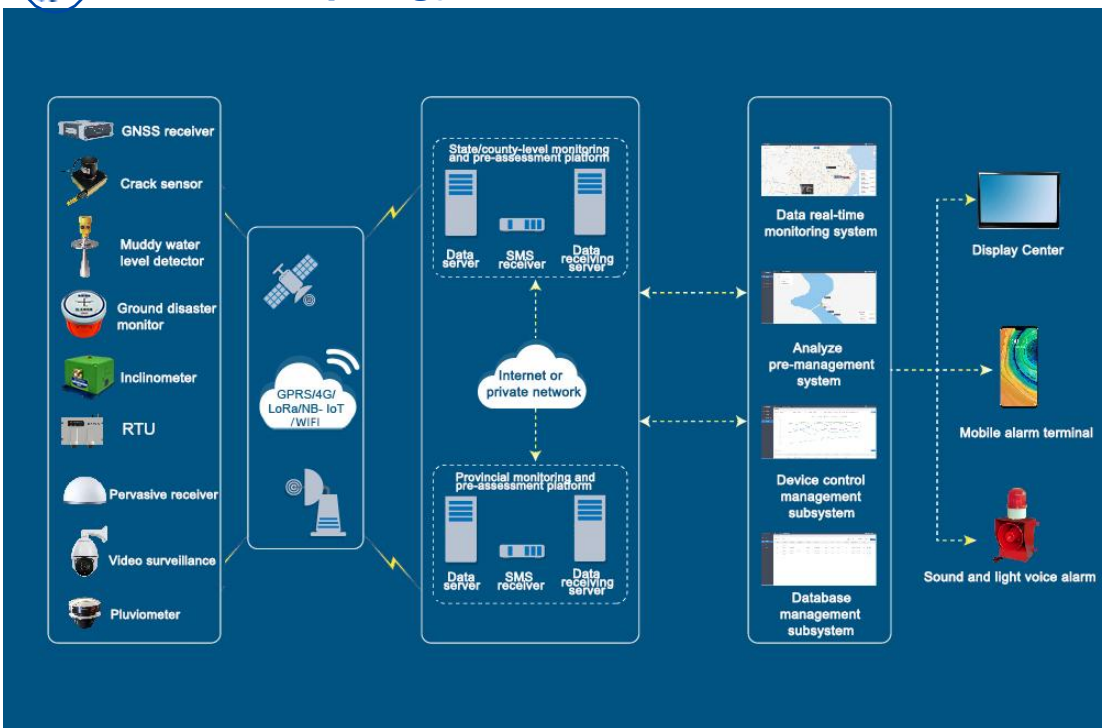
Measuring range(°)		≤5	5~15	30~60
Measuring axis		X-Y	X-Y	X-Y
Accuracy(°)	At room temperature	0.005	0.008	0.01
Resolution(°)	Completely stationary	0.001	0.001	0.001
Zero temperature drift(°/℃)	-40∽+85℃	±0.001	±0.001	±0.001
Cross-axis error(°)	25℃	0.005	0.008	0.01
O tput frequency（Hz		Up to 50（Connect APP or PC), Up to 0.1(LoRaWAN)		
Auto-sleep mode	Support			
Timed Wake-up	Support			
Moveme t Detected Wake-up	Support			
Mean Time Between Failure	≥100000 hours			
Electromagnetic compatibility	Accordance to GBT17626			
Insulation resistance	≥100 MΩ			
Impact-resistant	2000g，0.5ms，3Times/axis			
Size（mm）	L116*W89*H57mm (without antenna)			
Weight（g）	550（±10）			

Resolution: The smallest change value of the measured value that the sensor can detect and distinguish within the measurement range.
Accuracy: The root mean square error of the actual angle and the sensor measuring angle for multiple (≥16 times) measurements.

Electrical index

Power connector	Power voltage	4.2VDC
	Disposable dry cell voltage	3.6VDC
	Working current	50mA (Average value)
	Stand-by current	6μA(Typical values)
	Rechargeable battery capacity	6000mAH
	Disposable dry cell battery capacity	19000mAH
Communication distance	Maximum: 5Km	
Limited Data	Every frame 20Byte	
Reliability	The mean time between failures (MTBF) is not less than 50,000 hours Ultra-low power consumption design, including automatic sleep mode, timing wake-up, sports wake-up	

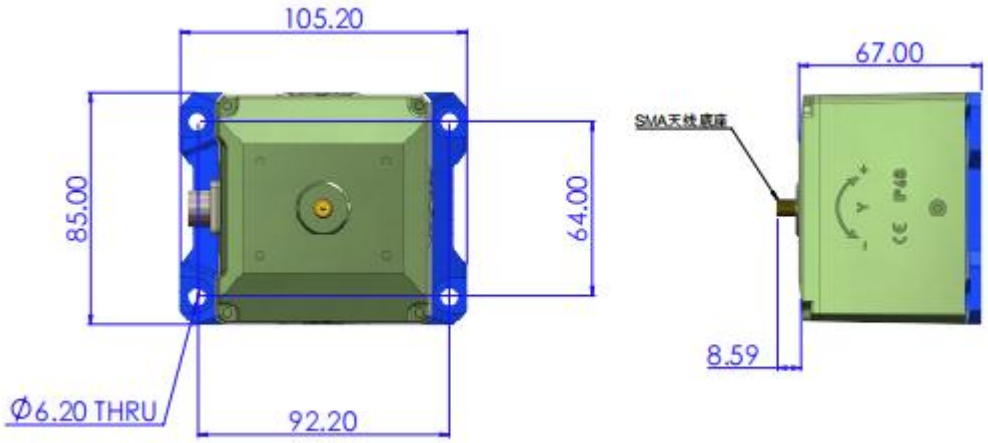
Network topology



Package product size

Product size: (Antenna not included) L105.2*W85*H76 (mm) , the length and width may be a 1mm error, please refer to the actual product

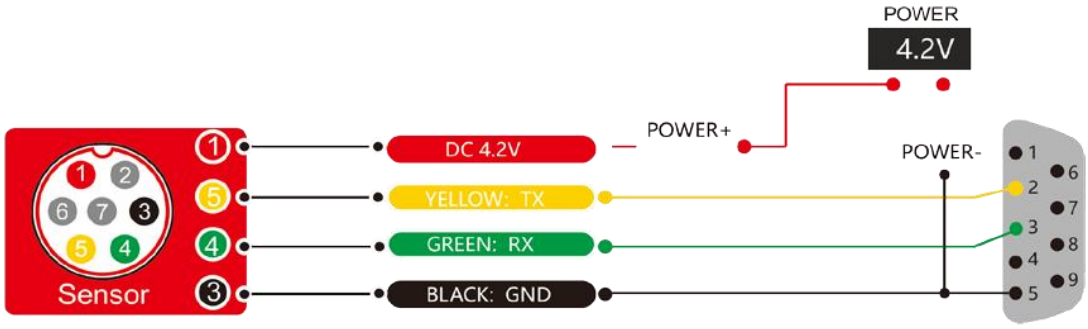
Standard antenna height: 45mm (this product without antenna cap)



Electrical connections

Aviation plug wiring definition

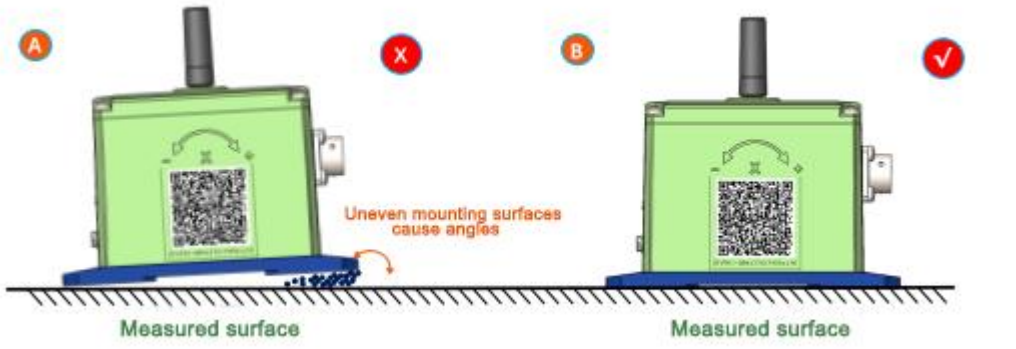
Wiring color	RED	BLACK	GREEN	YELLOW
function	1	3	4	5
	4.2V	GND	RXD	TXD

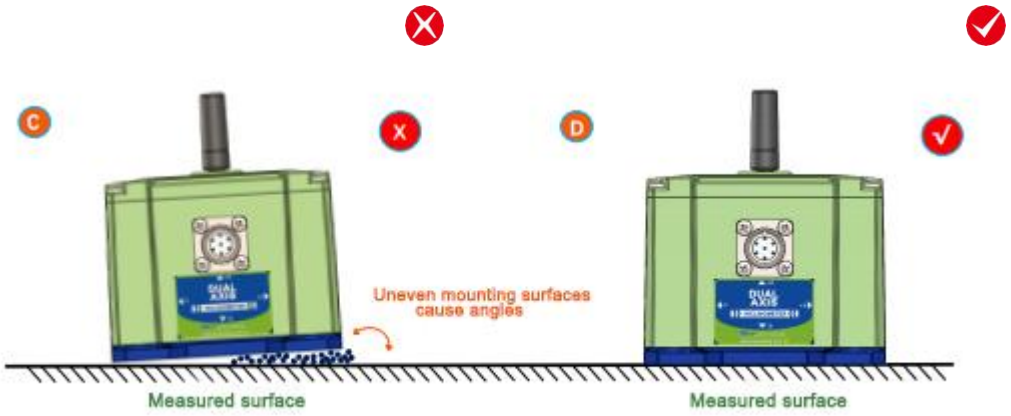


Installation

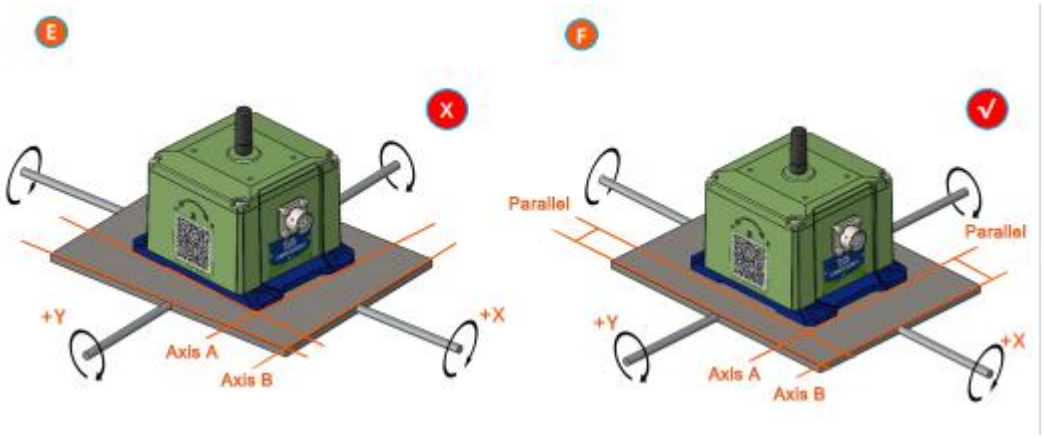
This series of products can only be installed vertically (pendulum type measurement), not horizontally. The correct installation method can avoid measurement errors. The following points should be done when installing the sensor:

First of all, make sure that the sensor mounting surface is completely close to the measured surface, and the measured surface should be as level as possible, and there should be no included angles as shown in Figure A and Figure C. The correct installation method is shown in Figure B and Figure D.





Secondly, the bottom line of the sensor and the axis of the measured object cannot have an angle as shown in Figure E, and the bottom line of the sensor should be kept parallel or orthogonal to the axis of rotation of the measured object during installation. This product can be installed horizontally or vertically (vertical installation needs to be customized), and the correct installation method is shown in Figure F.



Finally, the mounting surface of the sensor and the surface to be measured must be tightly fixed, smooth in contact, and stable in rotation, and measurement errors due to acceleration and vibration must be avoided.

Executive standard

- Enterprise Quality System Standard: ISO9001:2015 Standard (Certificate No.064-21-Q-3290-RO-S)
- CE certification (certificate number: M.2019.103. U Y1151)
- ROHS (certificate Number: G 190930099)
- GB/T 191 SJ 20873-2003 General specification for inclinometer and level
- GBT 18459-2001 The calculation method of the main static performance index of the sensor
- JJF 1059.1-2012 Evaluation and expression of measurement uncertainty
- GBT 14412-2005 Mechanical vibration and shock Mechanical installation of accelerometer
- GJB 450A-2004 General requirements for equipment reliability
- GJB 909A Quality control of key parts and important parts
- GJB899 Reliability appraisal and acceptance test
- GJB150-3A High temperature test
- GJB150-4A Low temperature test
- GJB150-8A Rain test
- GJB150-12A Sand and dust experiment
- GJB150-16A Vibration test
- GJB150-18A Impact test
- GJB150-23A Tilt and rock test
- GB/T 17626-3A Radio frequency electromagnetic field radiation immunity test
- GB/T 17626-5A Surge (impact) immunity test
- GB/T 17626-8A Power frequency magnetic field immunity test
- GB/T 17626-11A Immunity to voltage dips, short-term interruptions and voltage changes
- GB/T 2423.22-2012 Environmental Test Part 2: Test Method Test N: Temperature Change (IEC 60068-2-14:2009, IDT)
- GB/T 10125-2012 Artificial atmosphere corrosion test Salt spray test (ISO 9227:2006,IDT)

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