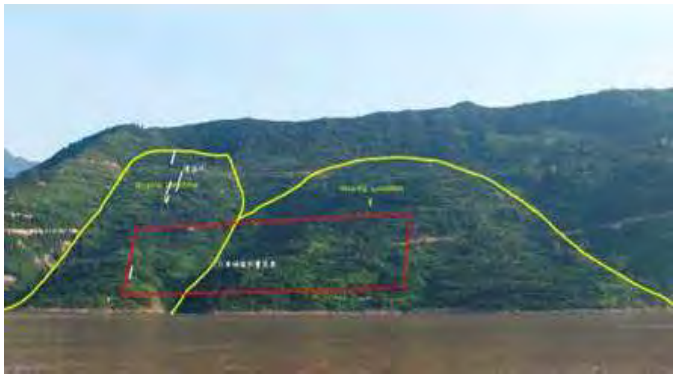
BWN467

Cost-effective Dual-Axis Digital Output with Modbus Inclinometer

Technical Manual

BWN 467

Cost-effective Dual-Axis Digital Output with Modbus Inclinometer



Introduction

BWN467 is a cost-effective digital dual-axis inclination sensor bare board launched by Bewis Sensing Technology LLC. The output mode is RS485 and TTL optional. It can be used vertically or horizontally. The product adopts the latest technology micro-electromechanical production technology inclination unit, small size, low power consumption, high consistency and stability, because it is a digital inclination sensor, the linearity is easier to be corrected. The working temperature reaches industrial level -40℃ ~ +85℃, it is a very cost-effective inclination sensor.

When multiple sections are used in cascade, our company provides a multi-section tilt measurement algorithm, which can achieve accurate displacement measurement of larger length and deeper depth, and provides an automatic calibration algorithm.

Features

- Biaxial inclination measurement
- Range: ±30°
- Accuracy: 0.01°
- Wide voltage input: 9 ~ 35VDC
- Output mode: RS485/TTL optional with Modbus
- Multi-section cascade can be used
- Wide temperature work:-40℃ ~ +85℃
- High vibration resistance>2000g
- Resolution: 0.001°
- Bare board volume: 67×20×8mm

Applications

- Foundation pit monitoring
- Soil monitoring
- Dam tailings monitoring
- Exploration well
- Slope monitoring
- High-speed rail foundation monitoring
- Piling monitoring
- Deep displacement

Specifications

Electrical Specifications

Parameters	Conditions	Min	Typical	Max	Units
Power supply(DC)		9	12	35	V
Operating current	Non-loaded	20	30	40	mA
Operating temperature		-40	25	+85	℃
Store temperature		-55	25	+100	℃

Performance Specifications

Parameters	Conditions	BWM467	Units
Measuring range		±30	°
Measuring axis		X-Y	
Accuracy	Indoor	0.01	°
Resolution		0.001	°
Zero temperature drift	-40~+85℃	±0.001	°/℃
Cross axis error	25℃	0.01	°
Frequency response	Max	100	Hz
Shock resistance	2000g,0.5ms,3times/axis		
MTBF	≥100000 h		
Electromagnetic compatibility	According to GBT17626		
Insulation resistance	≥100 MΩ		

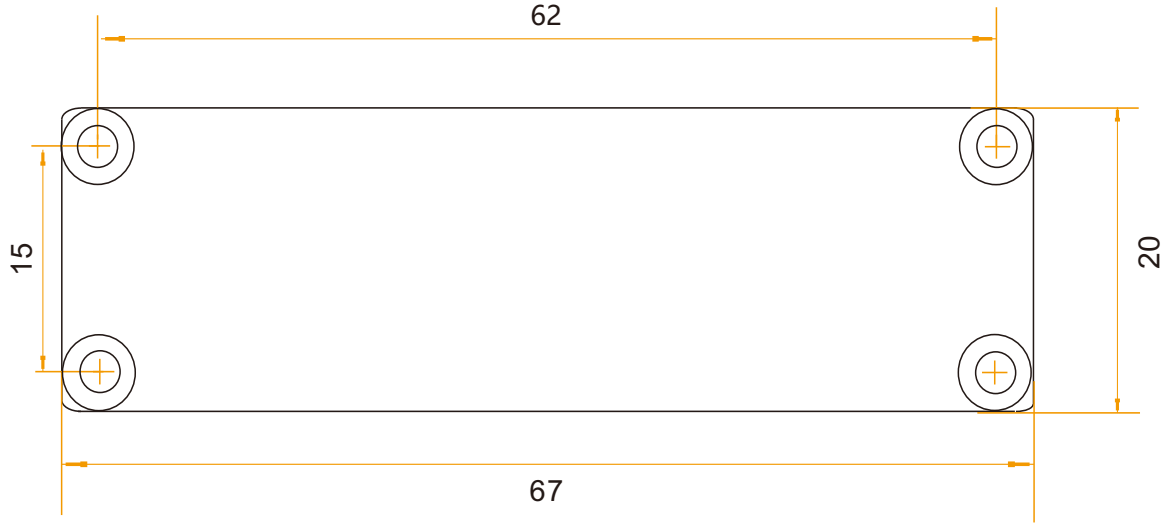
Resolution: The measured minimum change value that the sensor can detect and resolve within the measurement range.
Accuracy: The error between the actual angle and the Root mean square(RMS) of the measured angle of the sensor (≥16 times).

Mechanical Characteristic

Connector	Line hole
Protection level	Bare board
Shell material	Bare board
Installation	Four M2 screws

Package size

Product Size: L62*W20*H8（mm）

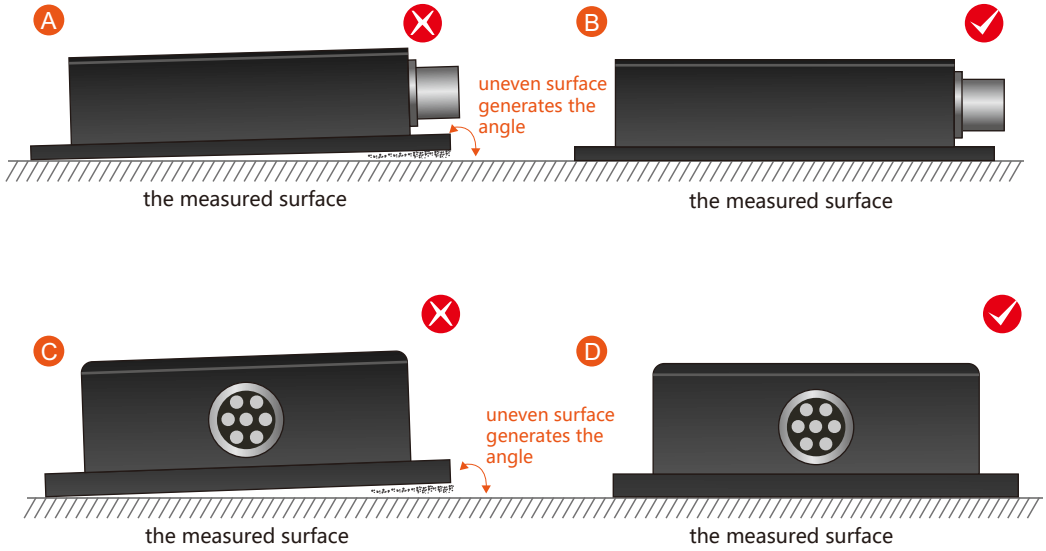


Circuit board schematic

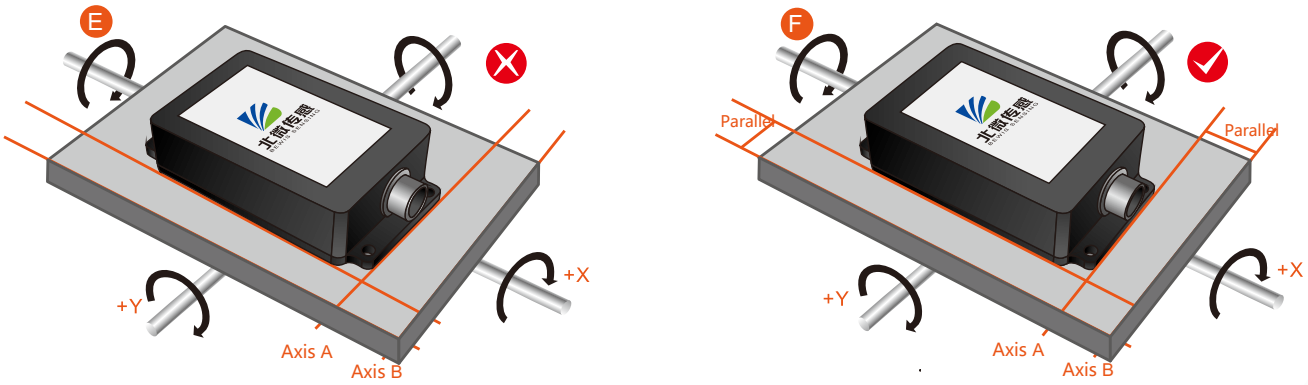
Installation direction

The correct installation method can avoid measurement error. The following points should be made when installing the sensor:

First of all, to ensure that the sensor mounting surface and the measured surface completely close, the measured surface should be as horizontal as possible, can not have the angle shown in Figure A and Figure C, the correct installation is shown in Figure B and Figure D.



Secondly, the bottom cable of the sensor and the axis of the measured object shouldn't generate the angle shown in E. When installing, the bottom cable of the sensor should be kept parallel or orthogonal to the rotation axis of the measured object. This product can be installed horizontally or vertically (vertical installation requires customization). The correct installation method is shown in Figure F.

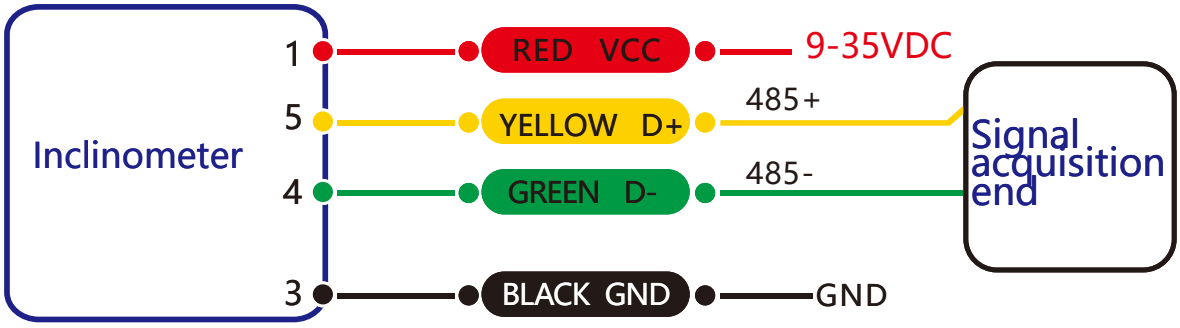


Finally, the installation surface of the sensor must be fixed with the measured surface tightly and smoothly, to avoid measurement error that may be caused by the acceleration and vibration.

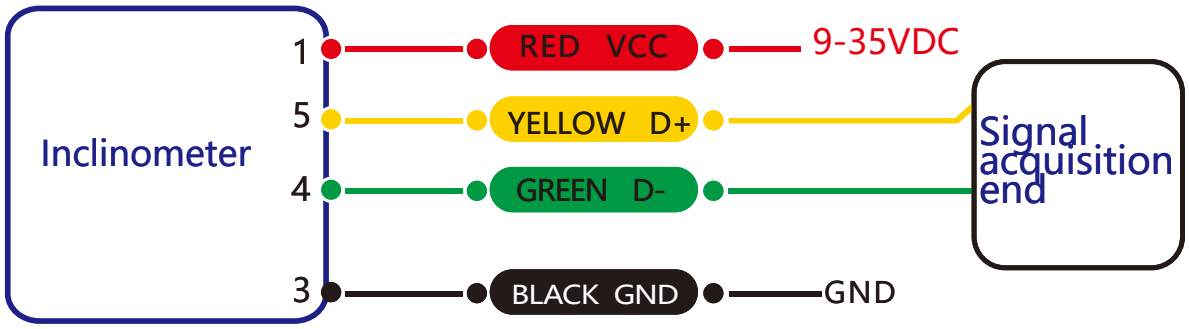
Electrical connections

RS 485 wiring definition

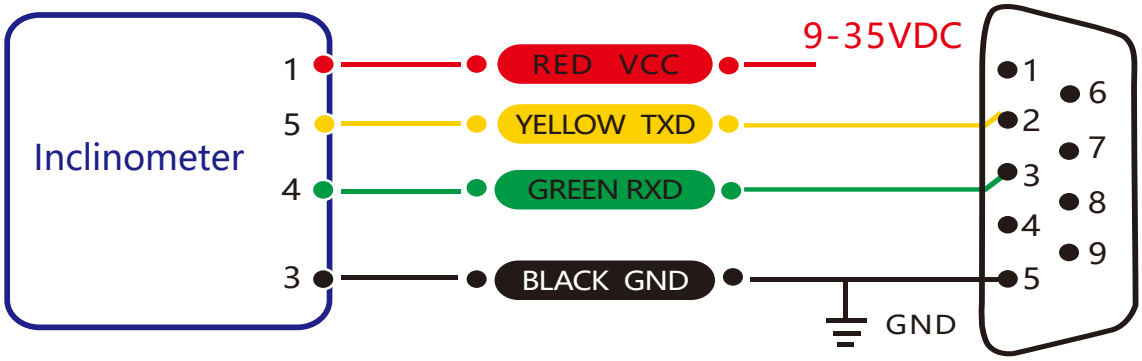
Cable color & Function	RED	BLUE	BLACK	GREEN	YELLOW
	1	2	3	4	5
	VCC 9-35VDC	NC	GND	RXD (485-)	TXD (485+)



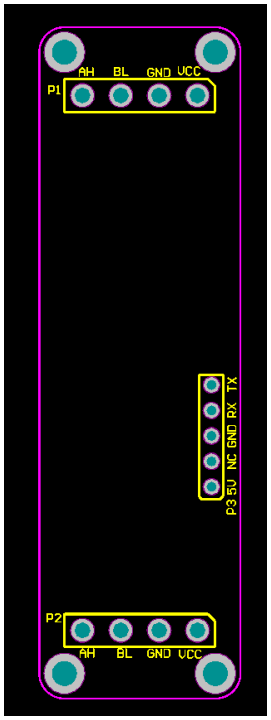
RS 485 wiring diagram



TTL wiring diagram



RS 232 wiring diagram



Note: P1 and P2 correspond to the same number wiring, RX and TX of P3 are the receiving and sending ends of TTL.
When RS485 is selected, VCC (9~35V), GND, AH (485+), BL (485-) of P1 or P2 can be connected;
When TTL is selected, connect VCC (9~35V) of P1 or P2, GND, and RX and TX of P3. The TX (transmitting end) of the collecting end is connected to the RX (receiving end) of the sensor P3, and the RX (receiving end) of the collecting end is connected to the sensor. P3 TX (transmitter)

Debug software

Users can directly download serial assistant on official website (Supports-Download). You can also use more convenient and intuitive PC software.
BWM467 supporting serial debugging software can be connected to the inclinometer on the computer for angle display. The software debugging interface is as shown in the figure below. Using the debug software, it can conveniently display the current X-direction tilt angle, and you can also modify and set other parameters by yourself.

Software use steps:

1. Correctly connect the inclinometer serial port hardware and connect the power supply.
2. Choose the correct device model. Select the computer serial port and baud rate and click
3. connect Serial Port.
4. Click Start and the tilt angle of the tilter in the X direction will be displayed on the screen.

Protocol

1 Data Frame Format: (8 data bits, 1 stop bit, non verification, default rate 9600)

Address Code (1byte)	Function Code (1byte)	The first high address register (1byte)	The first low address register (1byte)	High register number (1byte)	Low register number (1byte)	Checksum (2byte)
0x01	0x03 (read) 0x06 (write)	xx	xx	xx	xx	xxxx

Data format: Hexadecimal
Address code: Default 01 (**note:** it should not exceed 255)
Function Code: 03 represents reading register,06 represents presetting register.
Register Address: the starting address the register need to be operated
Register amount: the amount need to operate
Checksum: it is calculated by the host. (We recommend that users need to use the CRC calculation software.)

2 Command Format:

2.1 Read angle of X-axis Command: 01 03 00 01 00 01 D5 CA

Address Code (1byte)	Function Code (1byte)	The first high address register	The first low address register	High register number	Low register number	Checksum (2byte)
0x01	0x03	0x00	0x01	0x00	0x01	0xD5CA

Command response:

Address Code (1byte)	Function Code (1byte)	Number of bytes (1byte)	High number (1byte)	Low number (1byte)	Wrong CRC checksum (2byte)
0x01	0x03	0x02	xx	xx	xxxx

Note: The data field is a hexadecimal number (PLC or configuration software reads the data directly with a 16-bit register is decimal). After converting to decimal, the real data = (data field -10000)/100. If the data field is 3D52, it is converted to decimal 15698, real data = (15698-10000)/100 = 56.98 degrees; the data field is 1230, converted into decimal 4656, real data = (4656-20000)/100 = -53.44 degree.

2.2 Read angle of Y-axis Command: 01 03 00 02 00 01 25 CA

Address Code (1byte)	Function Code (1byte)	The first high address register	The first low address register	High register number	Low register number	Checksum (2byte)
0x01	0x03	0x00	0x02	0x00	0x01	xxxx

Command response:

Address Code (1byte)	Function Code (1byte)	Number of bytes (1byte)	Data field high (1byte)	Data field low (1byte)	Checksum (2byte)
0x01	0x03	0x02	xx	xx	xxxx

2.3 Read angle of both X-axis and Y-axis Command: 01 03 00 01 00 02 95 CB

Address Code (1byte)	Function Code (1byte)	The first high address register	The first low address register	High register number	Low register number (1byte)	Checksum (2byte)
0x01	0x03	0x00	0x01	0x00	0x02	xxxx

Command response:

Address Code (1byte)	Function Code (1byte)	Number of bytes (1byte)	X axis Angle (2byte)	Y axis Angle (2byte)	Checksum (2byte)
0x01	0x03	0x04	xx xx	xx xx	xxxx

2.4 Set relative/absolute zero Command:01 06 00 0A 00 00 A9 C8

Address Code (1byte)	Function Code (1byte)	The high address register (1byte)	The low address register (1byte)	Data field (2byte)	Checksum (2byte)
0x01	0x06	0x00	0x0A	0000: absolute zero 0001: relative zero	0xA9 C8 0x68 08

Command response:

Address Code (1byte)	Function Code (1byte)	The first high address register (1byte)	The first low address register (1byte)	Data field (2byte)	Checksum (2byte)
0x01	0x06	0x00	0x0A	0000: absolute zero 0001: relative zero	0xA9 C8

Note: absolute zero: Based on the factory-calibrated zero point.
relative zero: Reference to the zero after the current installation.

2.5 Set communication rate Command: 01 06 00 0B 00 02 79 C9

Address Code (1byte)	Function Code (1byte)	The high address register (1byte)	The low address register (1byte)	Data field (2byte)	Checksum (2byte)
0x01	0x06	0x00	0x0B	0x0002	0x79 C9

Command response:

Address Code (1byte)	Function Code (1byte)	The high address register (1byte)	The low address register (1byte)	Data field (2byte)	Checksum (2byte)
0x01	0x06	0x00	0x0B	0x0002	0x79 C9

Note: 0000 represents 2400; 0001 represents 4800; 0002 represents 9600; 0003represents 19200. The default is 0002:9600.

2.6 Set module address Command: 01 06 00 0D 00 01 D9 C9

Address Code (1byte)	Function Code (1byte)	The high address register (1byte)	The low address register (1byte)	Data field (2byte)	Checksum (2byte)
0x01	0x06	0x00	0x0D	XXXX	XXXX

Command response:

Address Code (1byte)	Function Code (1byte)	The high address register (1byte)	The low address register (1byte)	Data field (2byte)	Checksum (2byte)
XXXX	0x06	0x00	0x0D	XXXX	XXXX

Note: XXXX means the address range to be modified is 0000~00FF

2.7 Save settings Command: 01 06 00 0F00 00 B9 C9

Address Code (1byte)	Function Code	The high address register	The low	The high number	(2byte)	
0x01	0x06	0x00	0x0F	0x00	0x0000	0xB9 C9

Command response:

Address Code (1byte)	Function Code (1byte)	The high address register (1byte)	The low address register (1byte)	Data field (2byte)	Checksum (2byte)
0x01	0x06	0x00	0x0F	0x0000	0xB9C9

Note: If Save setting command is not executed, all setting will be invalid after power off.

Executive standard

- Enterprise Quality System Standard: ISO9001:2015 Standard (Certificate No. 23919Q10455R0S)
- CE certification (certificate number: M.2019.103.UY1151)
- RoHS (certificate number: G190930099)

BWN467

Cost-effective Dual-Axis Digital Output with Modbus Inclinometer

Wuxi Bewis Sensing Technology LLC

Address: Building 30, No. 58 Xiuxi Road, Binhu District, Wuxi City, Jiangsu Province, China

Tel/Whatsapp: +86 189 2129 2620

Email: sales@bwsensing.com

Website: www.bwsensing.com