# BWM418 Series
## Current Output Single Axis Inclinometer

# Technical Manual

## Introduction

BWM418 is a cost-effective single-axis inclinometer developed and produced by Bewis Sensing, which adopts MEMS technology and current output. It has a measurement range of ±180°, the highest accuracy of 0.01°, and an operating temperature of -40°C to +85°C. The product uses a high-precision MEMS accelerometer and a high-resolution differential digital-to-analog converter, with built-in automatic compensation and filtering algorithms, which eliminates errors caused by environmental changes to the greatest extent. Convert the change of the static gravity field into the change of the inclination angle, and directly output the horizontal inclination value through the digital method. This product has high long-term stability, low temperature drift, simple use, and strong ability to resist external interference. It is a recommended choice to be used for surveying and mapping, industrial automation and other industries.

## Main Feature

- Single axis inclination measurement
- Resolution：0.001°
- Power supply：12-36V
- Dimension：L90*W40.5*H26（mm）

- Highest accuracy：0.01°
- Range：±180°
- Output：4-20mA/0-20mA/0-24mA optional
- IP67 Protection level

## Application

- Industrial automatic leveling
- Medical instruments
- Photovoltaic automatic tracking
- Tower tilt monitoring

- Structural deformation monitoring
- Surveying and Mapping Instruments
- Equipment automation
- Lifting equipment inclination control

## Product Feature

### ⚡ Electrical Index

| Parameter | Condition | Minimum | Typical | Maximum |
|---|---|---|---|---|
| Power voltage(V) | | 12 | | 36 |
| Working Current (mA) | No load | 20 | 30 | 40 |
| Output load (Ω) | Max | | | 500 |
| Operating Temperature (℃) | | -40 | 25 | 85 |
| Storage Temperature (℃) | | -55 | 25 | 100 |

### 🛠 Performance Index

| | | | |
|---|---|---|---|
| Measurement Range (°) | Condition | | ±180 |
| Measurement axis | | | X |
| Accuracy (°) | Room temperature | | 0.01 |
| Resolution (°) | Completely still | | 0.001 |
| Zero bias (°/℃) | -40~85℃ | | ±0.005 |
| Cross axis error (°) | -40~85℃ | | 0.01 |
| Output frequency (Hz) | 100 | | |
| Full-scale output current range (V) | 4-20 ( 0-20optional ) ( 0-24 optional ) | | |
| Mean time between failures MTBF | ≥90000h | | |
| Electromagnetic compatibility | According to GBT17626 | | |
| Insulation resistance | ≥100 MΩ | | |
| Impact resistance | 2000g，0.5ms，3 times/axis | | |

**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.**

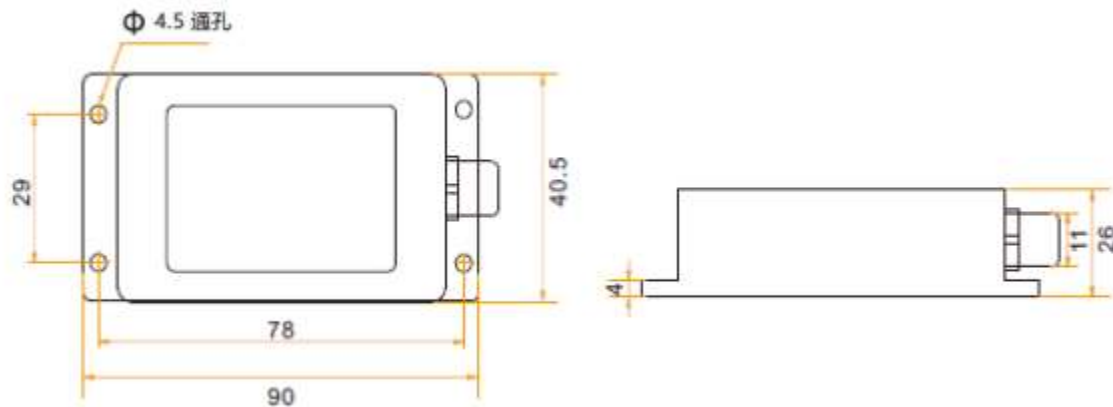## ⚙ Mechanical Index

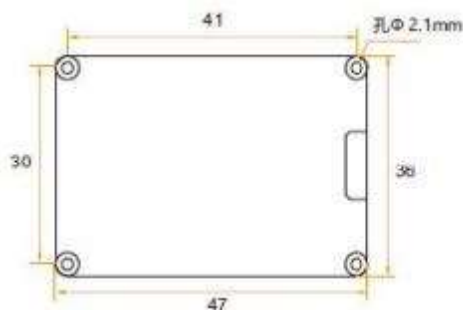| | |
|---|---|
| Connector | Metal Joint（Cable 1.5m) |
| Protection level | IP67 |
| Shell material | Magnesium aluminum alloy oxidation |
| Installation | Three M4 screws |

## 📐 Package product size

Product size：L90*W40.5*H26（mm)



## 📐 Bara board product size

Product size: L47*W36*H15 (mm) The length and width may have an error of ±1mm, please refer to the actual product

## Installation

The correct installation method can avoid measurement errors. When installing the sensor, please do the following:

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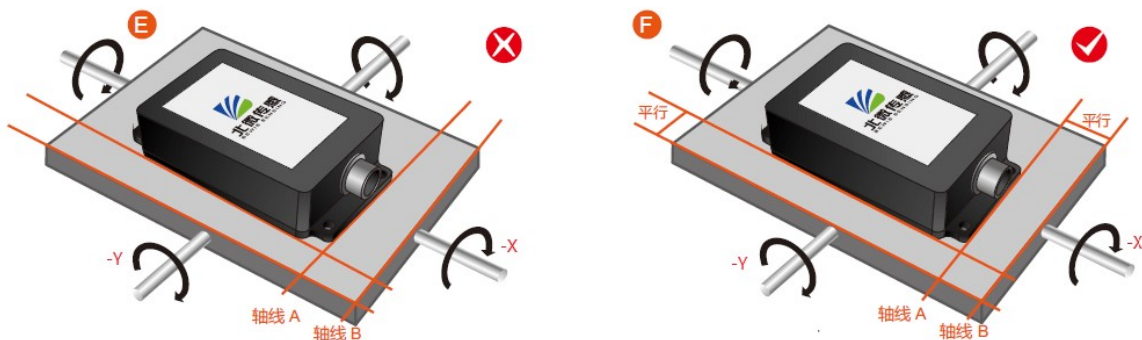
Finally, the mounting surface of the sensor and the surface to be measured must be tightly fixed, smooth in contact, and stable in rotation, and measurement errors due to acceleration and vibration must be avoided.
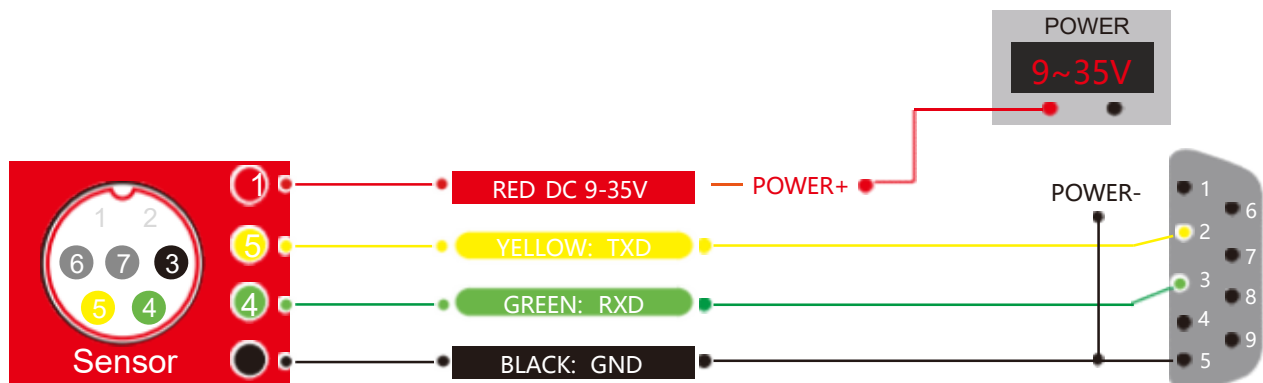
## Electrical Interface

### Electrical interfaces

| Cable color & Function | RED | BLACK | GREEN | YELLOW | WHITE | GRAY |
|---|---|---|---|---|---|---|
| | 1 | 3 | 4 | 5 | 6 | 10 |
| | VCC DC 12-36V | GND | RXD | TXD | I XOUT | Output Ground |
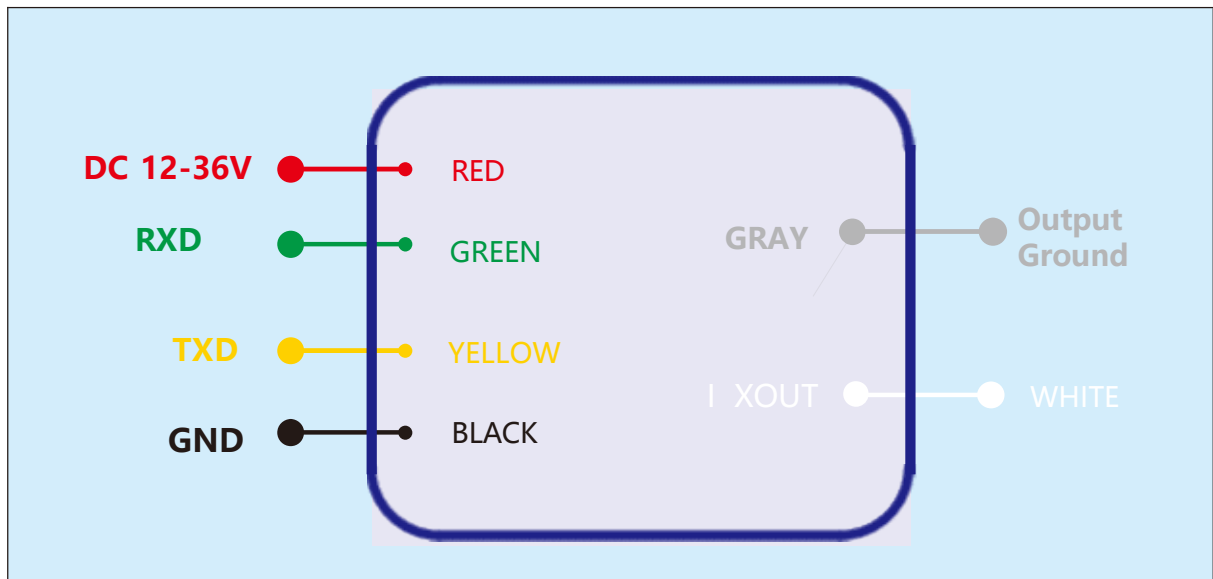


### RS232 Electrical interfaces

| Cable color & Function | RED | BLUE | BLACK | GREEN | YELLOW |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 |
| | VCC DC 9-35V | NC | GND | RXD | TXD |

## Debugging Software

You can download the serial debugging assistant directly on the official website (technical service -> download area), or you can use the more convenient and intuitive host computer software.

BWM418 supporting serial port debugging software can connect the tilt sensor on the computer to display the angle. The software debugging interface is shown in the figure below. Using the tilt angle to debug the host computer, you can conveniently display the current X direction tilt angle, and you can also modify and set other parameters.

Steps:
① Correctly connect the serial port hardware of the inclinometer and connect the power supply.
② Select the computer serial port and baud rate and click to connect to the serial port.
③ Click start, the current tilt angle of the inclinometer in the X direction will be displayed on the screen.
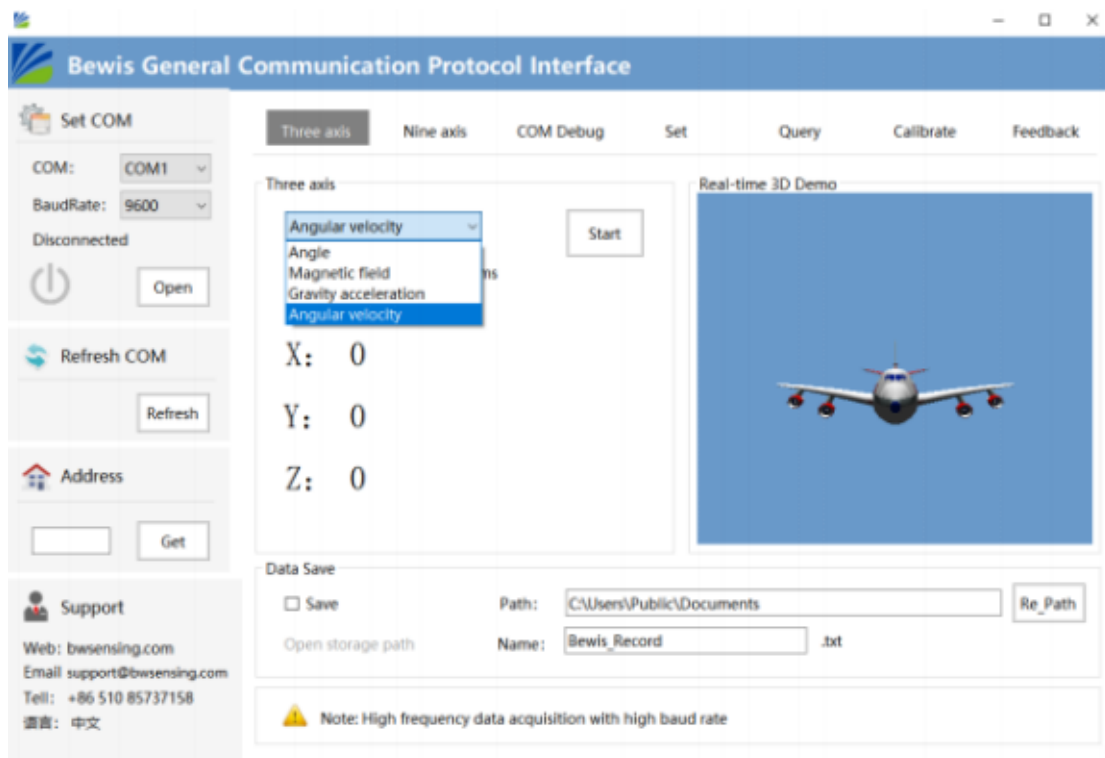
## Order information

| Model | Communication code | Package situation |
|---|---|---|
| BWM418-180-420 | 4-20mA Current/RS232 | IP67 Package/Metal joint |
| BWM418-180-020 | 0-20mA Current/RS232 | IP67 Package/Metal joint |
| BWM418-180-024 | 0-24mA Current/RS232 | IP67 Package/Metal joint |

## Executive standard

- National Standard (Draft) for Static Calibration of Biaxial Inclination Sensors
- GB/T 191 SJ 20873-2003 General specification for inclinometer and level

# BWM418 Series
## Current Output Single Axis Inclinometer

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