



BWT901BLECL5.0 Data Sheet & User Manual



Contents

1. Product Introduction	1
1.1. Product Overview	1
1.2. Features	1
2. Parameter indicators	2
2.1. Accelerometer parameters	2
2.2. Gyroscope parameters	2
2.3. Magnetometer parameters	3
2.4. Pitch and roll angle parameters	3
2.5. Heading angle parameters	3
3. Module parameters	4
3.1. Basic parameters	4
3.2. Electrical parameters	5
4. Product size	6
5. Interface Definition	6
5.1. Interface Description	6
5.2. Software Download	7
5.3. Bluetooth adapter connected to computer	7
5.4. Bluetooth wireless connection to PC	8
5.5. Bluetooth wireless connection to APP	9
6. Product Packaging	10
6.1. Sample packaging	10

1. Product Introduction

1.1. Product Overview

- The module integrates high-precision gyroscopes, accelerometers, and geomagnetic field sensors, and uses a high-performance microprocessor and advanced dynamics solver and Kalman dynamic filtering algorithms to quickly calculate the module's current real-time motion posture.
- The use of advanced digital filtering technology can effectively reduce measurement noise and improve measurement accuracy.
- The module integrates an attitude solver, which, combined with the dynamic Kalman filter algorithm, can accurately output the current attitude of the module in a dynamic environment. The attitude measurement accuracy is 0.2 degrees, and the stability is extremely high. The performance is even better than some professional inclinometers!
- The module has its own voltage stabilization circuit, the operating voltage is 3.3V~5V, the pin level is compatible with 3.3V/5V embedded systems, and the connection is convenient.
- The high-performance Cortex-M4 core processor runs at a main frequency of up to 168MHZ, balancing low power consumption and high performance.
- Bluetooth BLE5.0 wireless transmission, stable transmission, distance up to 50 meters.

1.2. Features

- The module integrates high-precision gyroscopes, accelerometers, and geomagnetic field sensors, and uses a high-performance microprocessor and advanced dynamics solver and Kalman dynamic filtering algorithms to quickly calculate the module's current real-time motion posture.
- The use of advanced digital filtering technology can effectively reduce measurement noise and improve measurement accuracy.
- The module integrates an attitude solver, which, combined with the dynamic Kalman filter algorithm, can accurately output the current attitude of the module in a dynamic environment. The attitude measurement accuracy is 0.2°, the stability is extremely high, and the performance is even better than some professional inclinometers.

BWT901BLECL5.0 | Data Sheet & User Manual V251216 | www.wit-motion.com

- The Z-axis heading angle incorporates geomagnetic sensor filtering and fusion, resolving the cumulative error caused by gyroscope integral drift in the 6-axis algorithm. This ensures long-term stable heading angle output.
Note: Due to magnetic field detection, calibration is required before use. During use, the device must be kept at least 20 cm away from magnetic interference areas, electronic devices, magnets, speakers, and other hard magnetic objects.
- Working current: $\approx 15\text{mA}$, broadcast current: $\approx 150\mu\text{A}$, standby current: $10\mu\text{A} \sim 50\mu\text{A}$.
- Data interface: baud rate 115200.
- Data output frequency: $0.2\text{Hz} \sim 200\text{Hz}$, $50\text{Hz} \sim 200\text{Hz}$ data package transmission, default 10HZ.
- Bluetooth 5.0: Supports Android/IOS operating systems (specific actual use is subject to the final device)

2. Parameter indicators

2.1. Accelerometer parameters

parameter	condition	Typical values
Range		$\pm 16\text{g}$
Resolution	$\pm 16\text{g}$	$0.0005(\text{g}/\text{LSB})$
RMS noise	Bandwidth = 100 Hz	$0.75 \sim 1\text{mg-rms}$
Static zero drift	Horizontal placement	$\pm 20 \sim 40\text{mg}$
Temperature Drift	$-40^{\circ}\text{C} \sim +85^{\circ}\text{C}$	$\pm 0.15\text{mg}/^{\circ}\text{C}$
bandwidth		$5 \sim 256\text{Hz}$

2.2. Gyroscope parameters

parameter	condition	Typical values
Range		$\pm 2000^{\circ}/\text{s}$

Resolution	$\pm 2000^{\circ}/s$	$0.061(^{\circ}/s)/(LSB)$
RMS noise	Bandwidth = 100 Hz	$0.028 \sim 0.07(^{\circ}/s)\text{-rms}$
Static zero drift	Horizontal placement	$\pm 0.5 \sim 1^{\circ}/s$
Temperature Drift	$-40^{\circ}C \sim +85^{\circ}C$	$\pm 0.005 \sim 0.015 (^{\circ}/s)/^{\circ}C$
bandwidth		5~256Hz

2.3. Magnetometer parameters

parameter	condition	Typical values
Range		$\pm 2\text{Gauss}$
Resolution	$\pm 2\text{Gauss}$	$0.0667\text{mGauss}/LSB$

2.4. Pitch and roll angle parameters

parameter	condition	Typical values
Range		X: $\pm 180^{\circ}$
		Y: $\pm 90^{\circ}$
Inclination accuracy		0.2°
Resolution	Horizontal placement	0.0055°
Temperature Drift	$-40^{\circ}C \sim +85^{\circ}C$	$\pm 0.5 \sim 1^{\circ}$

2.5. Heading angle parameters

parameter	condition	Typical values
Range		Z: $\pm 180^{\circ}$
Heading accuracy	9-axis algorithm,	1° (without magnetic

	magnetic field calibration, dynamic/static	field interference) [1]
	6-axis algorithm, static	0.5° (dynamic integral cumulative error) 【2】
Resolution	Horizontal placement	0.0055°

Note:

【1】 Please calibrate the magnetic field in the test environment before use to ensure that the sensor is familiar with the magnetic field in the environment. Please stay away from magnetic interference during calibration. **【2】** In some vibration environments, there will be cumulative errors. The specific error cannot be estimated. Please refer to the actual test.

3. Module parameters

3.1. Basic parameters

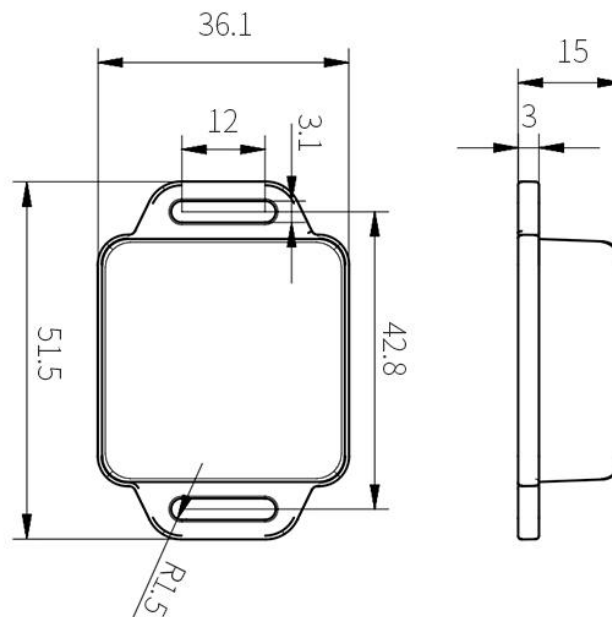
parameter	condition	Minimum	default	Maximum
Communication interface	UART	115200bps	115200bps	115200bps
Output content		3-axis acceleration, 3-axis angular velocity, 3-axis magnetic field, 3-axis angle, quaternion, port status		
Output rate		0.2Hz	10Hz	200Hz
Startup time				1000ms
Number of cascades	Computer Bluetooth			4
Bluetooth transmission distance	open environment			50m

Operating temperature		-20℃		60℃
Storage temperature		-40 ℃		85 ℃
impact resistant				20000g

3.2. Electrical parameters

parameter	condition	Minimum	default	Maximum
Charging voltage			5V	
Battery voltage			3.7V	
Working current	10HZ		15mA	
Broadcast current			150uA	
Standby current			50uA	
Battery capacity			200mAH	
Working hours		6 hours		8 hours
Charging time		2 hours		3 hours

4. Product size



5. Interface Definition

5.1. Interface Description



Interface Name	Interface Function
TYPE-C	Charging and serial port output 【1】

Note:



【1】 Supports TYPE-C connection to PC to view data. The PC needs to install the CH340 driver.

5.2. Software Download

1. CH340 driver download link:

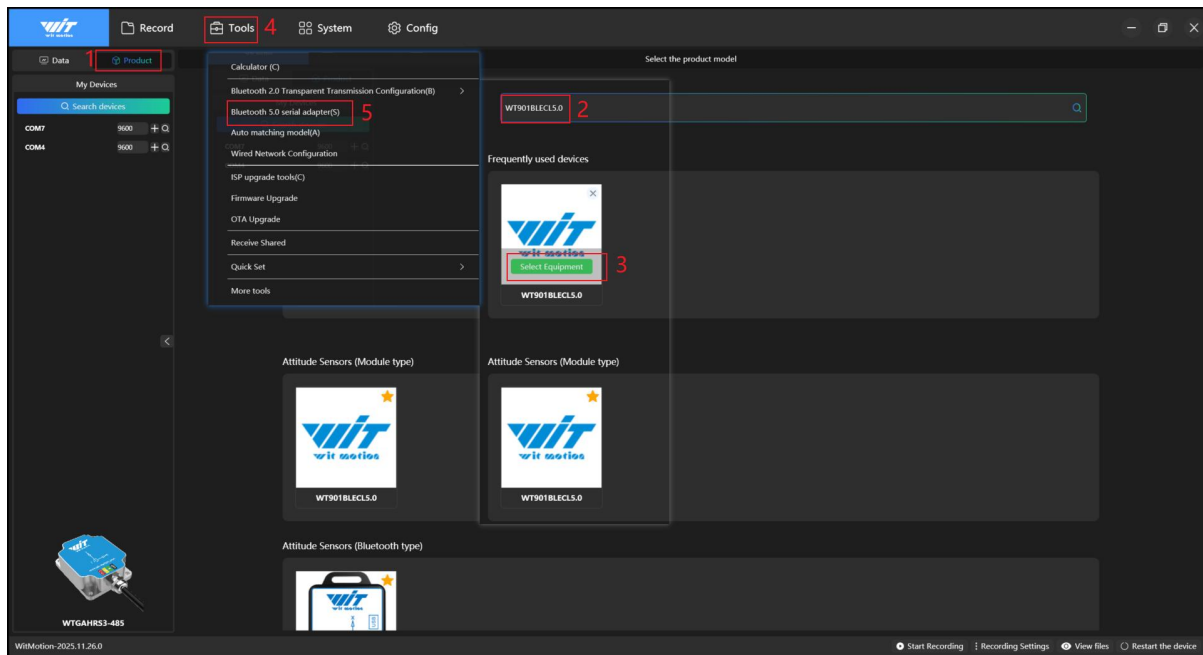
https://drive.google.com/file/d/1JidopB42R9EsCzMAYC3Ya9eJ8JbHapRF/view?usp=drive_link

2. Witmotion software download link:

https://drive.google.com/file/d/10xysnkuyUwi3AK_t3965SLr5Yt6YKE-u/view?usp=drive_link

5.3. Bluetooth adapter connected to computer

1. Turn on the sensor
2. Connect the adapter to the computer.
3. Open Witmotion software
 - ① Click "**Product**"
 - ② Search model **WT901BLECL5.0**
 - ③ Click "**Search for device**"
 - ④ Click "**Tools**"
 - ⑤ Select "**Bluetooth 5.0 serial adapter(S)**"



5.4. Bluetooth wireless connection to PC

1. Turn on your computer's Bluetooth

2. Turn on the sensor

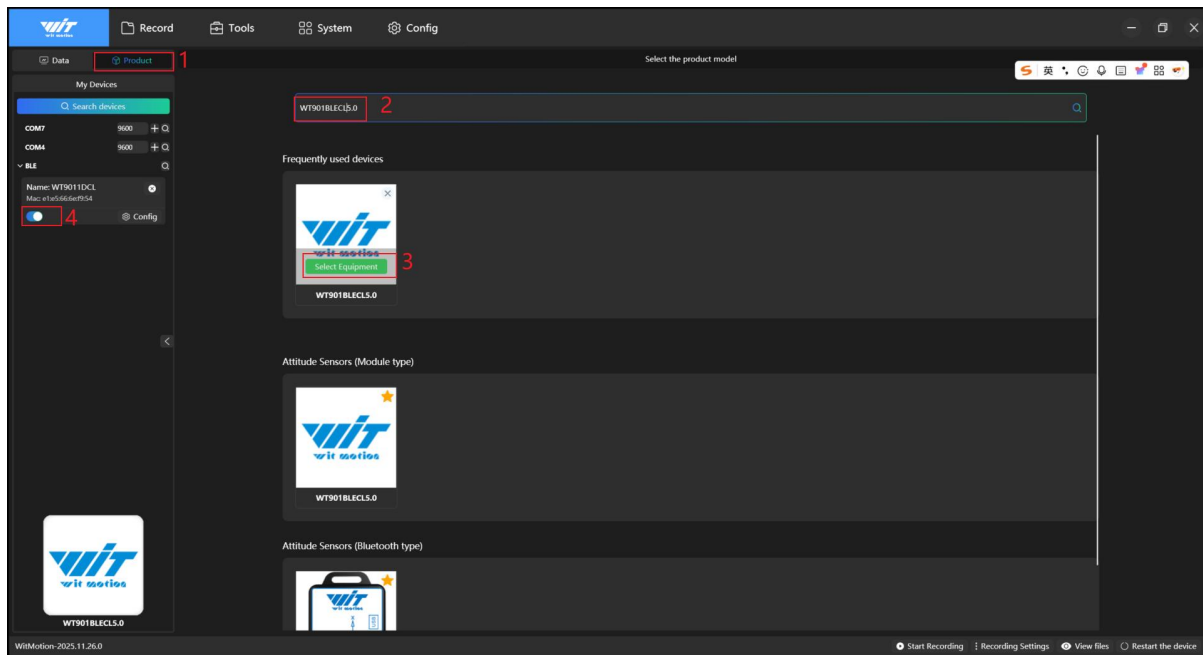
3. Open the Witmotion PC software.

① Click "Product"

② Search model **WT901BLECL5.0**

③ Click "Search for device"

④ Check the identified Bluetooth device. If the data on the host computer interface is updated, it means the connection is successful.



5.5. Bluetooth wireless connection to APP

1. APP Download

①Android APP download link:

https://drive.google.com/drive/folders/1rXb82bFbgQjIRaIKGEgMyQTMrnjxssgR?usp=drive_link

②iOS app download steps: Please search "WitMotion" in the App store directly.

Turn on your phone's Bluetooth

2. Turn on your phone's Bluetooth

3. Open [the APP](#)

①②③Select device model **WT901BLECL5.0**.

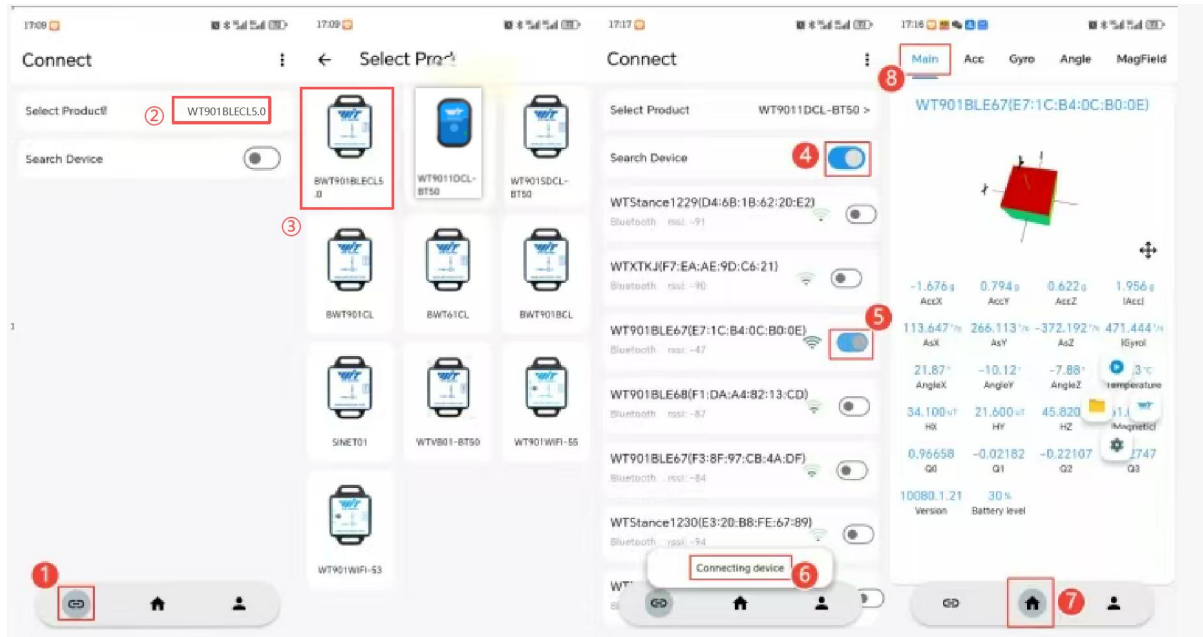
④Start the surrounding search.

⑤Turn on Bluetooth connection.

⑥The device is successfully connected.

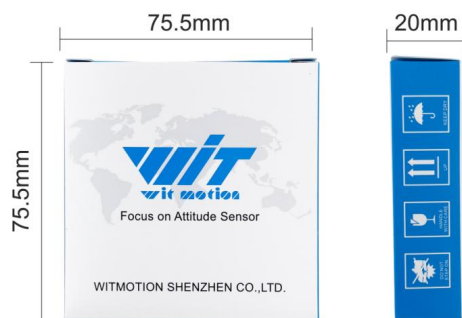
⑦Open the main interface.

⑧Open the dashboard interface and you can see the data updated, indicating that the sensor is connected successfully.



6. Product Packaging

6.1. Sample packaging



FCC Warning:

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.

Caution: Any changes or modifications to this device not explicitly approved by manufacturer could void your authority to operate this 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.

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 0cm between the radiator and your body.