WITMOTION WT901B

WITMOTION WT901B 10-Axis Accelerometer Sensor User Manual

Model: WT901B | Brand: WITMOTION

1. Introduction

The WITMOTION WT901B is a high-performance 10-axis Inertial Measurement Unit (IMU) sensor designed for precise attitude measurement. It integrates an accelerometer, gyroscope, angle sensor, magnetometer, barometer, and tilt sensor, utilizing advanced Kalman filtering for stable and accurate data output. This manual provides essential information for setting up, operating, and maintaining your WT901B sensor.

Image 1: The compact WITMOTION WT901B 10-Axis IMU Sensor, highlighting its small form factor and various sensing capabilities including 3-axis acceleration, 3-axis gyro, 3-axis angle, 3-axis magnetic field, quaternion, barometric pressure, altitude, port status, and time.

2. Product Features

- **High Performance:** Military-grade 10-axis sensor providing Pitch, Roll, Yaw (X, Y, Z axis), angular velocity, angle, magnetic field, atmospheric pressure, and height data. Selectable measurement range and output rate (0.2 - 200 Hz).

- **Robust Design:** Features a Cortex-M0 core processor, highly integrated MEMS, and Kalman algorithm for 0.05-degree measurement accuracy (X, Y axes). Small size with diverse interface options for easy integration.
- **Advanced Algorithms:** Built-in R&D dynamic fusion algorithm and Kalman filtering ensure stable data output, excellent bias stability, and low noise for increased measurement accuracy.
- **Compact Size:** Easy to install in various applications.
- **6-axis/9-axis Free Switching:** Allows flexibility in data output based on application needs.
- **Range Automatic Switching:** Automatically adjusts measurement range from 2g to 16g.
- **UART Connection:** Supports TTL/IIC communication protocols.

3. Specifications

Parameter	Value
Model	WT901B
Brand	WITMOTION
Voltage	3.3V~5V
Current	<25mA
Interface	Serial TTL/IIC (support high speed 400K)
Output	Acceleration, Gyro, Magnetic, Angle, Quaternion, Barometric Pressure, Altitude
Range	Acceleration: ±2/4/8/16g (adaptive), Gyro: ±2000°/s, Magnetic: ±2Gauss, Angle: X, Z: ±180°, Y: ±90°, Baro: 300~1100hPa
Angle Accuracy	X, Y axis: 0.2°, Z axis: 1° (after calibrated, no magnetic field interference)
Return Rate	0.2~200Hz (default: 10Hz)
Baud Rate	4800~230400bps (default: 9600bps)
Acceleration Resolution	±2g: 0.061mg/LSB (16384LSB/g), ±4g: 0.12mg/LSB (8192LSB/g), ±8g: 0.25mg/LSB (4096LSB/g), ±16g: 0.5mg/LSB (2048LSB/g)
Size	15.24*15.24*2mm / 0.6" x 0.6" x 0.08"
Operating Temperature	-40 °C to +85 °C
Mounting	Direction: Horizontal / Vertical
Net Weight	1g

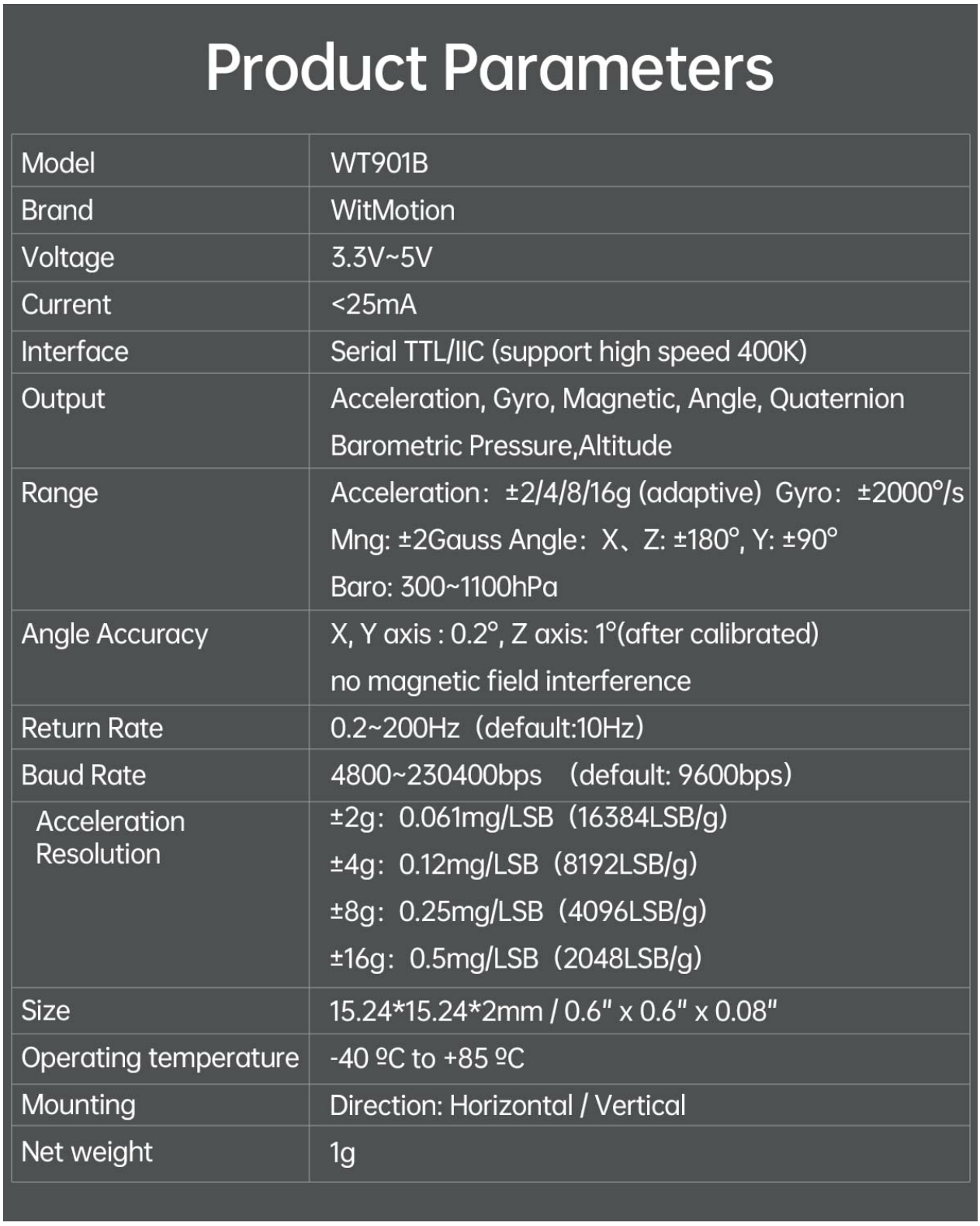

Image 2: Detailed product parameters for the WT901B sensor, including electrical, performance, and physical specifications.

4. What's in the Box

Upon opening your package, you should find the following items:

- 1 x WitMotion WT901B TTL Accelerometer Sensor
- 2 x Six Pin Male Connector (1 x 6)

- 1 x Welcome Guide

Note: A USB-UART Converter is not included and may be required for certain setups.

Image 3: The WT901B sensor shown with its included connectors and welcome guide.

5. Setup

5.1. Hardware Connection

The WT901B sensor supports both Serial TTL and IIC interfaces. Connect the sensor to your microcontroller (e.g., Arduino) or computer via a suitable USB-UART converter (not included) using the provided six-pin male connectors. Ensure correct pin assignments for VCC, GND, TX, RX (for TTL), or SDA, SCL (for IIC).

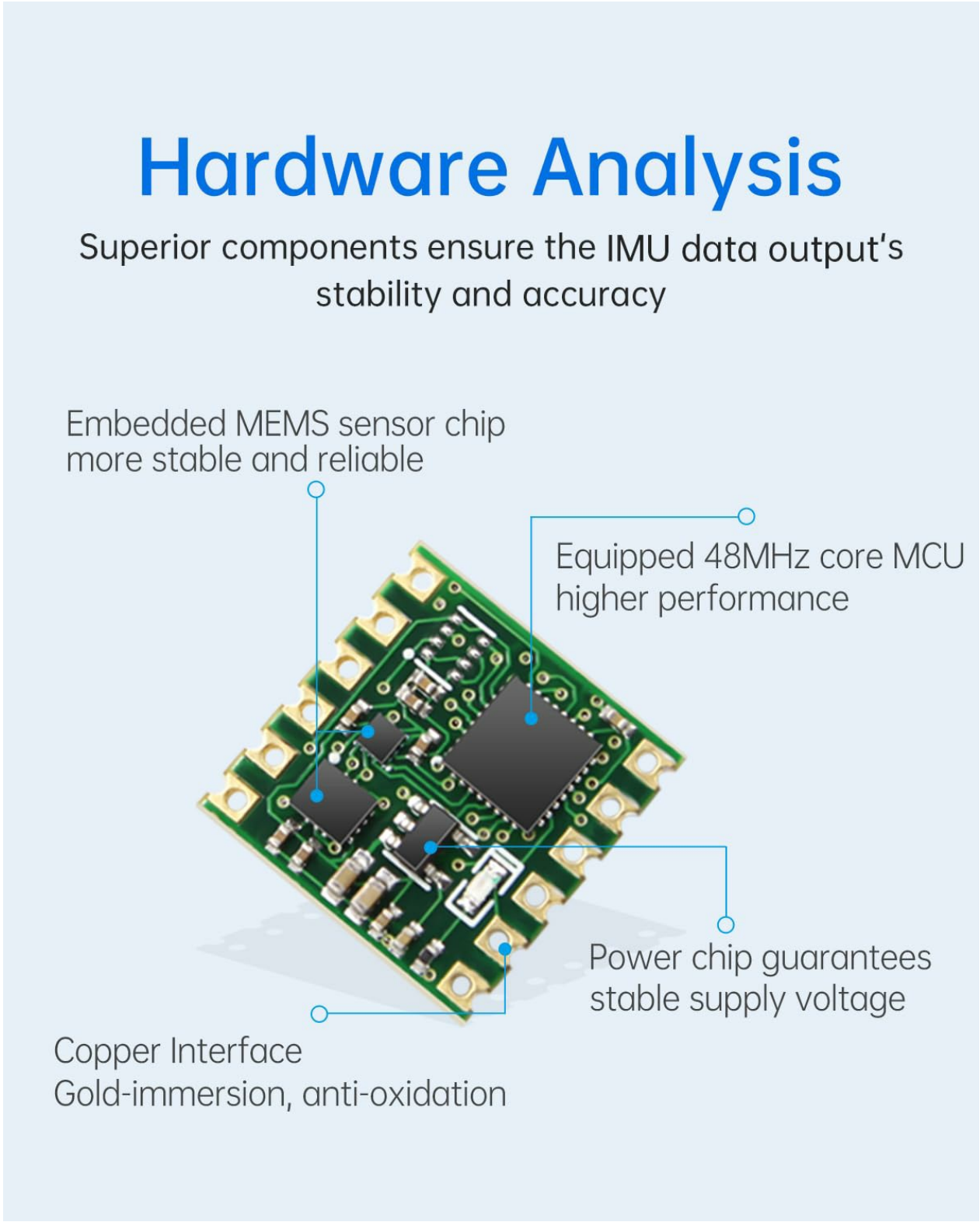

Image 4: An illustration of the WT901B's internal components and connection points, highlighting the copper interface, embedded MEMS sensor chip, 48MHz core MCU, and power chip for stable voltage supply.

5.2. Software Installation

To utilize the sensor, you will need to install the WITMOTION PC software and relevant drivers. You can find the tutorial link on the guide card inside the package or search for 'wit-motion.com' to download the full tutorial and software. The software provides tools for data visualization, configuration, and calibration.

5.3. Magnetic Field Calibration

Magnetic field calibration is crucial for accurate heading data. Perform calibration in an environment free from magnetic interference (e.g., metal objects, speakers).

1. Connect the sensor to your computer and open the WITMOTION PC software.
2. Navigate to the 'Configuration' section.
3. Select 'Magnetic Field' and then 'Ellipse Fitting Calibrate'.
4. Click 'Start Calibrate'.
5. Rotate the sensor slowly and smoothly through all three axes (X, Y, Z) to cover a full sphere of orientations. Ensure each axis points to the East direction during its rotation cycle.
6. Once the calibration data forms a complete ellipse on the software's graph, click 'Finish Calibrate'.

Video 1: Demonstrates the magnetic field calibration process using the WITMOTION PC software, including the physical rotation of the sensor and the visual feedback on the software interface.

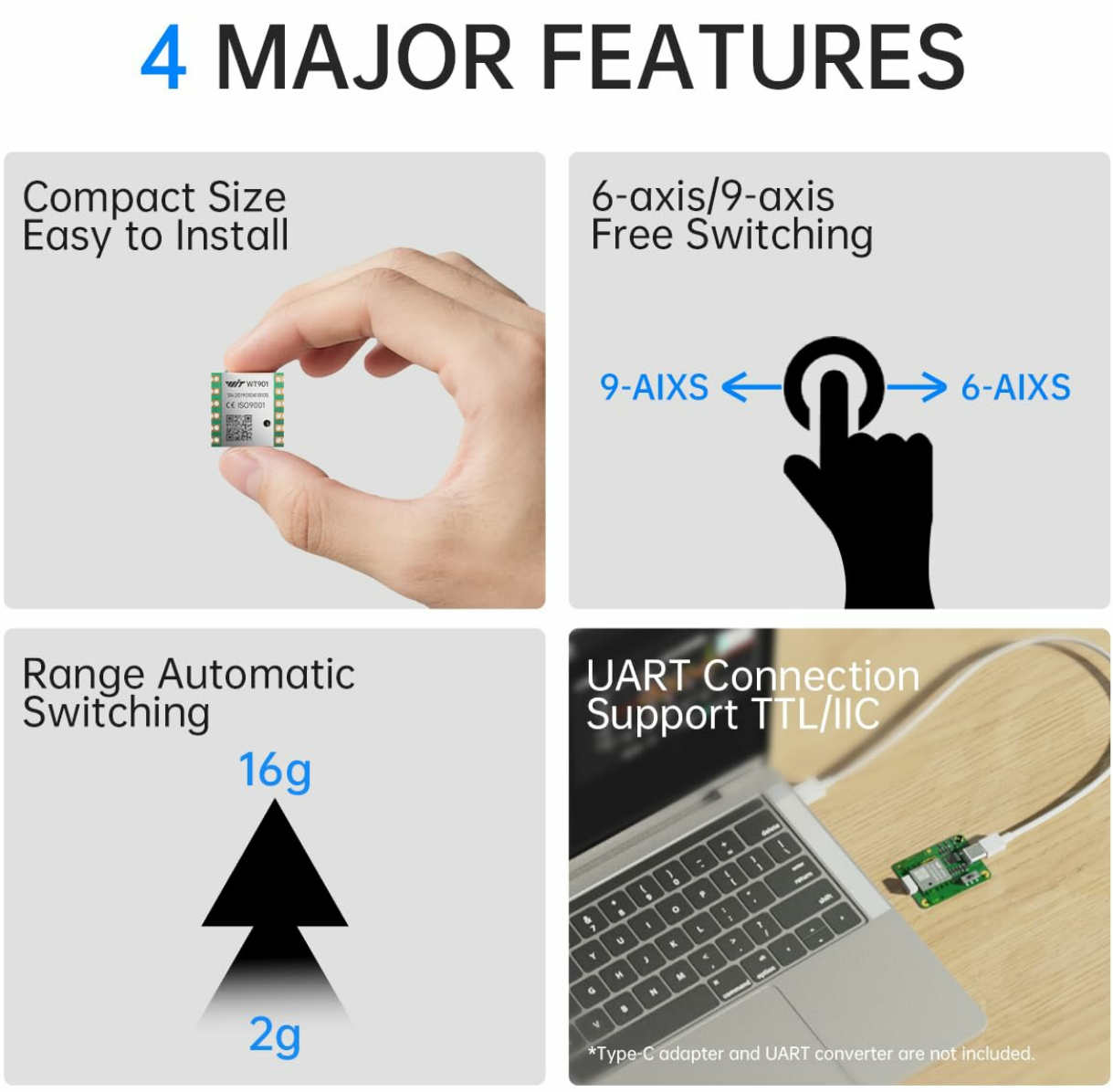

Image 5: Highlights four major features of the WT901B: compact size, 6-axis/9-axis free switching, range automatic switching (2g to 16g), and UART connection support (TTL/IIC).

6. Operating Instructions

6.1. PC Software Usage

The WITMOTION PC software provides a comprehensive interface for monitoring, configuring, and analyzing sensor data. It includes features such as:

- **Real-time Data Display:** View Pitch, Roll, Yaw, acceleration, angular velocity, magnetic field, and other parameters in real-time.
- **3D Pose Visualization:** Observe the sensor's orientation in a 3D model.
- **Data Recording:** Record sensor data in various formats (bin, play, csv, txt) for later analysis.
- **Configuration Menu:** Adjust sensor parameters such as output rate, measurement range, and communication settings.
- **Calibration Tools:** Perform various calibrations, including magnetic field calibration.

Image 6: The WITMOTION PC software interface displaying real-time data updates and analysis for the attitude sensor system, including a dashboard, 3D view, configuration, curve display, and data record options.

Image 7: Examples of the WITMOTION mobile application interface, showing a dashboard with a level indicator and real-time data graphs, and a 3D visualization of the sensor's orientation.

6.2. Secondary Development

WITMOTION provides complete development materials and an SDK to facilitate secondary development with platforms like Arduino. This includes manuals, datasheets, protocols, and sample code.

Image 8: An illustration showing a laptop displaying various development resources provided by WITMOTION, including manuals, SDKs, tutorials, datasheets, and protocols for platforms like Arduino and STM32.

7. Maintenance

To ensure the longevity and optimal performance of your WT901B sensor, observe the following:

- Keep the sensor in a dry environment and avoid exposure to moisture or extreme temperatures outside its operating range (-40 °C to +85 °C).
- Protect the sensor from physical shock or impact.
- When performing magnetic field calibration, ensure the sensor is far away from any magnetic interference sources.
- Clean the sensor gently with a dry, soft cloth if necessary. Avoid using liquids or harsh chemicals.

8. Troubleshooting

If you encounter issues with your WT901B sensor, consider the following:

- **No Data Output:** Verify all electrical connections are secure and correct. Ensure the correct COM port and baud rate are selected in the software.
- **Inaccurate Readings:** Perform a magnetic field calibration as described in Section 5.3. Ensure the sensor is not near strong magnetic fields or metal objects during operation. Check for proper mounting orientation.
- **Software Connection Issues:** Reinstall drivers and the WITMOTION PC software. Try a different USB port or USB-UART converter.
- **Unstable Data:** Ensure the sensor is mounted securely and not subject to excessive vibration. Verify the Kalman filter settings in the software.

For further assistance, refer to the support information in Section 10.

9. Areas of Applications

The WT901B sensor is suitable for a wide range of applications requiring precise motion and orientation sensing:

- Machinery monitoring
- Smart farming equipment
- Robotics and automation
- Tower monitoring
- Virtual Reality (VR) systems
- Industrial control and measurement

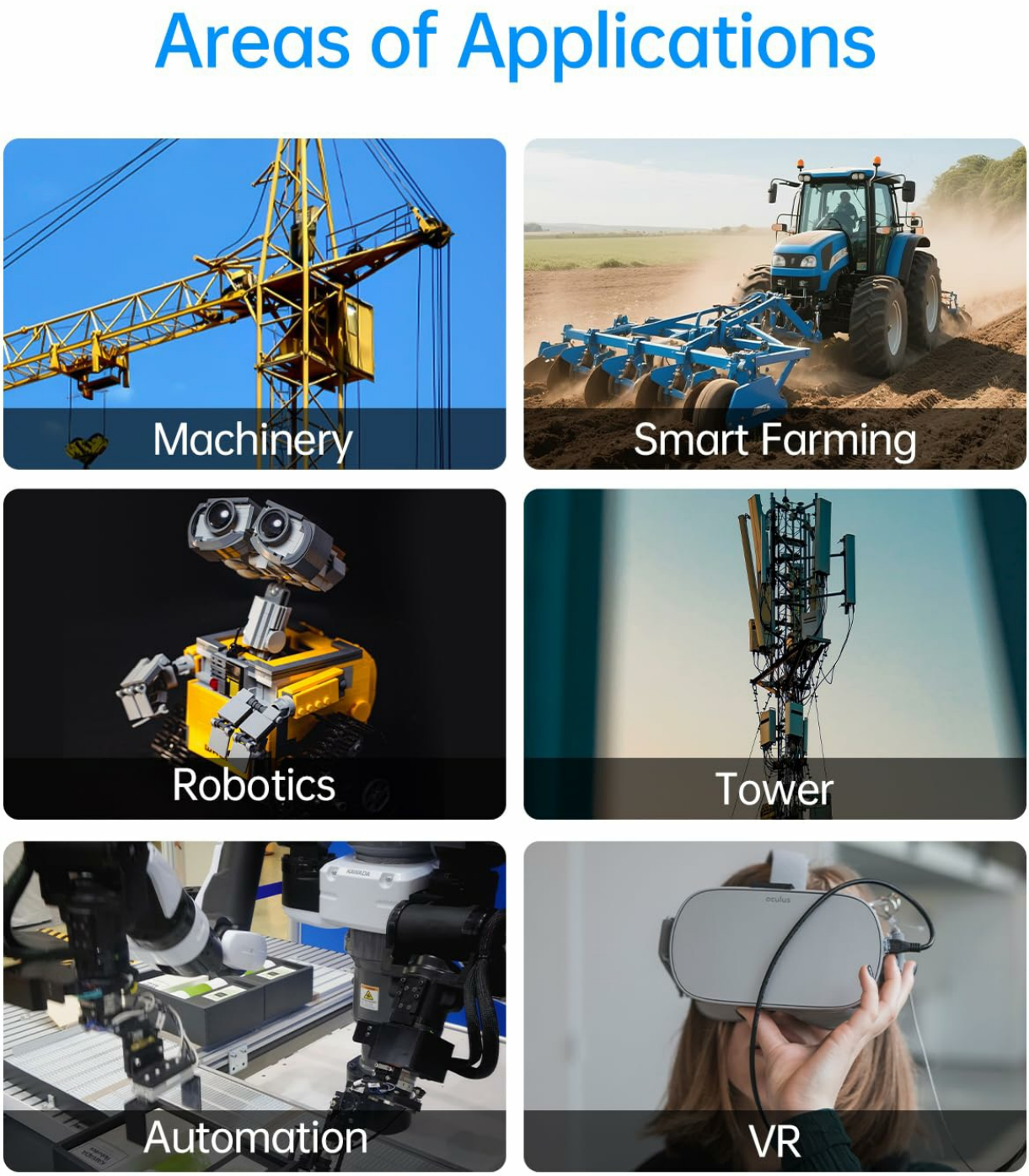

Image 9: Visual representation of various application areas for the WT901B sensor, including machinery, smart farming, robotics, tower monitoring, automation, and VR.

10. Warranty and Support

WITMOTION provides comprehensive support for its products:

- **Warranty:** 12-month warranty from the date of purchase.
- **Customer Service:** Lifetime friendly customer service from the WitMotion team.

- **Support Resources:**
    a. The tutorial link is printed on the guide card inside the package.
    b. Search 'wit-motion.com' to download the full tutorial, software, and development resources.
    c. Contact support directly via email: support@wit-motion.com for personalized assistance.