WITMOTION HWT9053-485

HWT9053-485 High Precision IMU Sensor User Manual

Model: HWT9053-485 | Brand: WITMOTION

1. PRODUCT OVERVIEW

The HWT9053-485 is a high-precision, IP67 waterproof, and anti-vibration IMU (Inertial Measurement Unit) sensor from WitMotion. It integrates an AHRS (Attitude and Heading Reference System) MEMS inclinometer, providing 2-axis tilt angle (without roll), 3-axis acceleration, and angular velocity data. Designed for robust performance, it features advanced compensation chips and a 32-bit processor to ensure accurate and stable data output even in challenging environments.

Figure 1: WitMotion HWT9053-485 IMU Sensor

2. KEY FEATURES

- **High Performance:** Operates on 5-36V. Provides 3-axis XYZ (Pitch, Roll, Yaw) data with high accuracy (XY ± 0.001°, Z ± 1°). Includes acceleration, gyroscope, angle, magnetic field, and quaternion outputs. Features low Z-axis angle drift and automatic data correction.

- **Robust Design:** Equipped with a 32-bit processor, SCA3300 temperature compensation MEMS module, and military-grade RM3100 magnetometer compensation chip for reliable performance in harsh conditions.

- **Military-Grade Inclinometer:** Achieves angle measurement accuracy of 0.05 degrees (X, Y axis) with high signal-to-noise immunity.

- **Advanced Algorithms:** Utilizes integrated R&D dynamic fusion algorithms and Kalman filtering for stable data output, excellent bias stability, low noise, and enhanced measurement precision.

- **Wide Baud Rate Support:** Supports baud rates from 2400 to 921600.

- **Adjustable Output Frequency:** Configurable output frequency from 0.1 Hz to 200 Hz (default 10 Hz).

- **IP67 Waterproof:** Ruggedly built with an anti-rust, protective IP67 waterproof aluminum casing, making it suitable for severe environments.

Figure 2: High-Precision Angle Sensing Capabilities

3. SPECIFICATIONS

Attribute	Value
Item Model Number	HWT9053-485
Brand	WITMOTION
Material	Polycarbonate
Item Weight	55 Grams

Attribute	Value
Maximum Supply Voltage	36 Volts (DC)
Measurement Accuracy	High
Measurement Range	[0.05°, 0.1°, 1°], ['-3g', '3g']
Mounting Type	Surface Mount
Output Type	Digital
Operating Temperature	-40 to +85 degrees Celsius
Dimensions (Volume)	55 x 36.8 x 24 mm
Cable Length	1 meter

4. PACKAGE CONTENTS

Upon opening the package, please verify that all the following items are included:

- 1 x WitMotion HWT905 RS232 Inclinometer
- 1 x 3-in-1 USB-UART Converter
- 1 x Instruction Card

5. SETUP GUIDE

Follow these steps to set up your HWT9053-485 IMU sensor:

1. **Physical Connection:** Connect the HWT9053-485 sensor to your system using the provided USB-UART converter. Ensure secure connections for stable data transmission.
2. **Power Supply:** Provide a stable power supply within the specified voltage range of 9-36V DC to the sensor.
3. **Driver Installation:** If connecting to a PC, install the necessary drivers for the USB-UART converter. These are typically available on the WitMotion official website or included on the instruction card.
4. **Software Installation:** Download and install the free PC software provided by WitMotion. This software is essential for configuring the sensor, viewing real-time data, and performing calibrations.
5. **Initial Calibration:** Before first use, it is highly recommended to perform a magnetic and acceleration calibration using the provided PC software to ensure optimal accuracy. Refer to the software's calibration section for detailed instructions.

9-Axis High-Precision Angle Sensor

Calibration with high-precision non-magnetic turntable and featuring Witmotion high-precision algorithm for calibration to achieve ultra-high precision of 0.001°

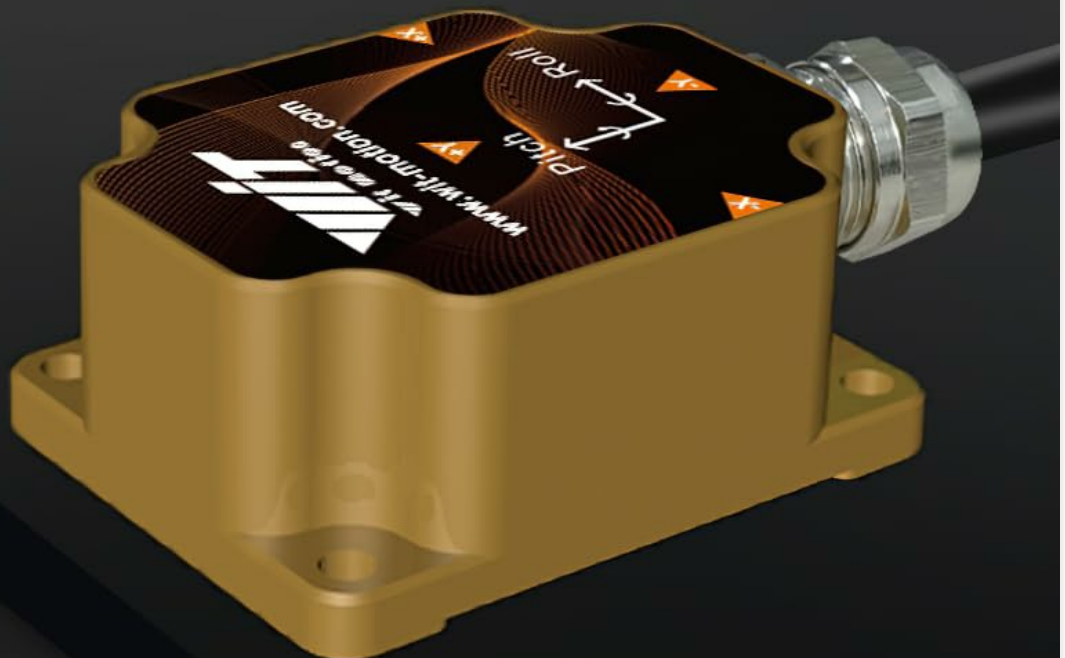3-asix Acc   3-axis Gyro   3-axis Angle   3-axis Mag

Figure 3: WitMotion PC Software Interface for Data Monitoring

Figure 4: Software Interface for Data and Calibration

6. OPERATING INSTRUCTIONS

Once the sensor is set up and connected to the PC software, you can begin operating it:

- **Real-time Data Monitoring:** Use the PC software to view real-time data streams including acceleration, angular velocity, tilt angles (Pitch, Roll, Yaw), and magnetic field readings.

- **Data Logging:** The software typically allows for logging data to a file for later analysis. Configure logging parameters such as sample rate and file format as needed.

- **Configuration:** Adjust sensor parameters such as output frequency, baud rate, and communication protocol (RS232) through the software's configuration settings.

- **Integration:** For integration into custom applications, refer to the communication protocol documentation (Modbus RTU protocol for RS485 version, though this is RS232) and SDKs provided by WitMotion.

7. MAINTENANCE

Proper maintenance ensures the longevity and accuracy of your HWT9053-485 sensor:

- **Cleaning:** Keep the sensor's exterior clean. Use a soft, dry cloth to wipe off dust or debris. Avoid using harsh chemicals or abrasive materials.
- **Storage:** When not in use, store the sensor in a dry, cool environment, away from direct sunlight and extreme temperatures.
- **Cable Inspection:** Regularly inspect the cable for any signs of wear, cuts, or damage. Replace damaged cables immediately to prevent electrical issues or data loss.
- **Recalibration:** For applications requiring high precision, periodic recalibration of the sensor (especially magnetic and acceleration) is recommended, particularly after significant environmental changes or prolonged use.

8. TROUBLESHOOTING

If you encounter issues with your HWT9053-485 sensor, consider the following common troubleshooting steps:

- **No Data Output:**

  - Check all cable connections to ensure they are secure.
  - Verify the power supply is connected and providing the correct voltage.
  - Ensure the correct COM port is selected in the PC software and that the baud rate matches the sensor's setting.
  - Reinstall USB-UART converter drivers if necessary.

- **Inaccurate Readings:**

  - Perform a full magnetic and acceleration calibration using the PC software.
  - Ensure the sensor is mounted securely and is not subject to excessive vibration or magnetic interference from nearby equipment.
  - Check the operating temperature; extreme temperatures outside the specified range can affect accuracy.

- **Software Not Recognizing Sensor:**

  - Close and restart the PC software.
  - Try connecting the sensor to a different USB port on your computer.
  - Ensure no other applications are using the same COM port.

9. QUALITY ASSURANCE

WitMotion is committed to delivering high-quality sensors. Our products undergo rigorous testing and calibration processes to ensure precision and reliability:

- **Repeated Testing:** Products are inspected and tested repeatedly before shipment.
- **High-Precision Calibration:** Non-magnetic calibration is performed using million-class turntables.
- **Professional Quality Control:** Includes aging tests and high-temperature tests.

Figure 5: WitMotion Testing Equipment (High/Low Temperature Test Box, Vibration Test Bench, High-Precision Electric Turntable)

10. WARRANTY AND SUPPORT

Your WitMotion HWT9053-485 sensor comes with a **12-month warranty** and friendly lifetime customer service from the WitMotion team. For comprehensive support and resources:

- The tutorial link is printed on the guide card included in the package.

- Visit the official WitMotion website (wit-motion.com) to download the full tutorial and other resources.

- For direct assistance, contact WitMotion support at support@wit-motion.com.

IMPORTANT NOTICE

OEM design and output data can be customized. Custom orders for TTL protocol sensors are also available. Please contact WitMotion for more details on customization options.

Related Documents - HWT9053-485

[WITMOTION SINDT(485) IP67 Inclinometer User Manual](#)
Comprehensive user manual for the WITMOTION SINDT(485) IP67 Inclinometer, an AHRS IMU sensor. Covers introduction, warnings, usage instructions, software details, and MCU connection for industrial applications.

USER MANUAL WT61 Inclinometer Sensor	[WitMotion WT61 User Manual: Inclinometer Sensor](#) User manual for the WitMotion WT61 Inclinometer Sensor, detailing its features, applications, and connection instructions for PC and MCU.
USER MANUAL HWT906 IP67 Inclinometer	[WITMOTION HWT906 IP67 Inclinometer User Manual](#) User manual for the WITMOTION HWT906 IP67 Inclinometer, an AHRS IMU sensor that measures 3-axis angle, angular velocity, acceleration, and magnetic field. Includes introduction, warning statements, usage instructions, software introduction, and MCU connection details.
USER MANUAL SINDT(232) IP67 Inclinometer	[WITMOTION SINDT(232) IP67 Inclinometer User Manual](#) User manual for the WITMOTION SINDT(232) IP67 Inclinometer, an AHRS IMU sensor for industrial applications. Covers introduction, warnings, usage, software, and MCU connection.
USER MANUAL HWT901B(485) Robust Inclinometer	[HWT901B(485) Robust Inclinometer User Manual - WITMOTION](#) Comprehensive user manual for the WITMOTION HWT901B(485) Robust Inclinometer, an advanced AHRS IMU sensor. Learn about its features, applications in AGV trucks, robotics, and automotive systems, installation, software usage, and technical specifications.
Witmotion Shenzhen Co., Ltd Datasheet AHRS IMU Sensor | WT901	[WT901 AHRS IMU Sensor Datasheet | WitMotion](#) Detailed datasheet for the WitMotion WT901 AHRS IMU sensor, covering specifications, parameters, features, applications, and pin definitions for acceleration, angular velocity, angle, and magnetic field detection.

Documents - WITMOTION – HWT9053-485

[Witmotion Sensor Software Tutorials and Product Links](#)

Access software tutorials and product links for Witmotion's range of sensors, including BLE sensors, high-precision inclinometers, and analog-output tilt switches, covering various models and applications.

lang:i-klingon score:41 filesize: 51.11 K page_count: 1 document date: 2023-05-22
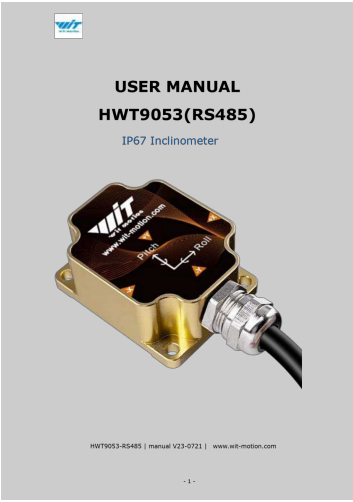
[HWT9053(RS485) IP67 Inclinometer User Manual](#)

User manual for the WIT Motion HWT9053(RS485) IP67 Inclinometer. This document provides an introduction to the sensor's features, applications, and connection instructions.

lang:en score:31 filesize: 340.19 K page_count: 8 document date: 2023-07-21