support@wit-motion.com

AHRS IMU Sensor | WT901

The Robust Acceleration, Angular velocity, Angle & Magnetic filed Detector

---

The WT901 is a IMU sensor device, detecting acceleration, angular velocity, angle as well as magnetic filed. The robust housing and the small outline makes it perfectly suitable for industrial applications such as condition monitoring and predictive maintenance. Configuring the device enables the customer to address a broad variety of application by interpreting the sensor data by smart algorithms and Kalman filtering.

BUILT-IN SENSORS

Accelerometer

Gyroscope

Magnetometer

support@wit-motion.com

Tutorial Link

Google Drive

Link to instructions DEMO:
WITMOTION Youtube Channel
WT901 Playlist

If you have technical problems or cannot find the information that you need in the provided documents, please contact our support team. Our engineering team is committed to providing the required support necessary to ensure that you are successful with the operation of our AHRS sensors.

Contact

Technical Support Contact Info

Application

- AGV Truck
- Platform Stability
- Auto Safety System
- 3D Virtual Reality
- Industrial Control
- Robot
- Car Navigation
- UAV
- Truck-mounted Satellite Antenna Equipment

Contents

1 Overview

WT901's scientific name is AHRS IMU sensor. A sensor measures 3-axis angle, angular velocity, acceleration, magnetic field. Its strength lies in the algorithm which can calculate three-axis angle accurately.

WT901 is employed where the highest measurement accuracy is required. WT901 offers several advantages over competing sensor:

• Heated for best data availability: new WITMOTION patented zero-bias automatic detection calibration algorithm outperforms traditional accelerometer sensor

• High precision Roll Pitch Yaw (X Y Z axis) Acceleration + Angular Velocity + Angle + Magnetic Field output

• Low cost of ownership: remote diagnostics and lifetime technical support by WITMOTION service team

•Developed tutorial: providing manual, datasheet, Demo video, free software for Windows computer, APP for Android smartphones , and sample code for MCU integration including 51 serial, STM32, Arduino, Matlab, Raspberry Pi,communication protocol for project

• WITMOTION sensors have been praised by thousands of engineers as a recommended attitude measurement solution

2 Features

- The default baud rate of this device is 9600 and could be changed.
- The interface of this product only leads to a serial port
- The module consists of a high precision gyroscope, accelerometer and geomagnetic field sensor. The product can solve the current real-time motion posture of the module quickly by using the high-performance microprocessor, advanced dynamic solutions and Kalman filter algorithm.
- The advanced digital filtering technology of this product can effectively reduce the measurement noise and improve the measurement accuracy.
- Maximum 200Hz data output rate. Output content can be arbitrarily selected, the output speed 0.2HZ~ 200HZ adjustable.

3 Specification

3.1 Parameter

Parameter	Specification
➢ Working Voltage	3.3V-5V
➢ Current	<25mA
➢ Size	15.24mm x 15.24mm X 2.54mm
➢ Data	Angle: X Y Z, 3-axis Acceleration: X Y Z, 3-axis Angular Velocity: X Y Z, 3-axis Magnetic Field : X Y Z, 3-axis Time, Quaternion
➢ Output frequency	0.2Hz--200Hz
➢ Interface	Serial TTL level
➢ Baud rate	4800,9600(default),19200,38400,57600, 115200,230400

Measurement Range & Accuracy		
Sensor	Measurement Range	Accuracy/ Remark
➢ Accelerometer	X, Y, Z, 3-axis ±16g	Accuracy: 0.01g Resolution: 16bit Stability: 0.005g
➢ Gyroscope	X, Y, Z, 3-axis -±2000°/s	Resolution: 16bit Stability: 0.05°/s
➢ Magnetometer	X, Y, Z, 3-axis ±4900μT	0.15μT/LSB typ. (16-bit)
➢ Angle/ Inclinometer	X, Y, Z, 3-axis X, Z-axis: ±180° Y ±90° (Y-axis 90° is singular point)	Accuracy:X, Y-axis: 0.05° Z-axis: 1°(after magnetic calibration)

Accelerometer Parameters

Parameter	Condition	Typical Value
Range		±16g
Resolution		0.0005(g/LSB)
RMS noise	Bandwidth = 100Hz	0.75~1mg-rms
Static zero drift	Placed horizontally	±20~40mg
Temperature drift	- -40°C ~ +85°C	±0.15mg/℃
Bandwidth		5~256Hz

Gyro Parameters

Parameter	Condition	Typical Value
Range		±2000°/s
Resolution	±2000°/s	0.061(°/s)/(LSB)
RMS noise	Bandwidth = 100Hz	0.028~0.07(°/s)-rms
Static zero drift	Placed horizontally	±0.5~1°/s
Temperature drift	- -40°C ~ +85°C	±0.005~0.015 (°/s)/℃
Bandwidth		5~256Hz

Magnetometer parameters

Parameter	Condition	Typical Value
Range		±2Gauss
Resolution	±2Gauss	8.333nT/LSB

Pitch and roll angle parameters

Parameter	Condition	Typical Value
Range		XY:±180°; Y:±90°
Inclination accuracy		0.2°
Resolution	Placed horizontally	0.0055°
Temperature drift	-40°C ~ +85°C	±0.5~1°

Heading Angle Parameter

Parameter	Condition	Typical Value
Range		Z:±180°
Heading accuracy	9-axis algorithm, magnetic field calibration, dynamic/static	1° (without interference from magnetic field)
	6-axis algorithm, static	0.5° (Dynamic integral cumulative error exists)
Resolution	Placed horizontally	0.0055°

【1】 Before use, please perform magnetic field calibration in the test environment to ensure that the sensor is familiar with the magnetic field in the environment. When calibrating, please keep away from magnetic interference.

【2】 In vibration environments, there will be cumulative errors, and the specific errors cannot be estimated. The actual test shall prevail.

Module Parameters

Basic Parameters

Parameter	Condition	Minimum value	Default	Maximum value
Interface	UART	4800bps	115200bps	230400bps
	Hardware I2C			400K
	Analog I2C			400K
Output content		3-axis (acceleration, angular velocity, magnetic field, angle) quaternion		
Output rate		0.2Hz	10Hz	200Hz
Start Time				1000ms
Operating temperature		-40℃		85℃
Storage temperature		-40℃		100℃
Shock proof				20000g

Electrical parameters

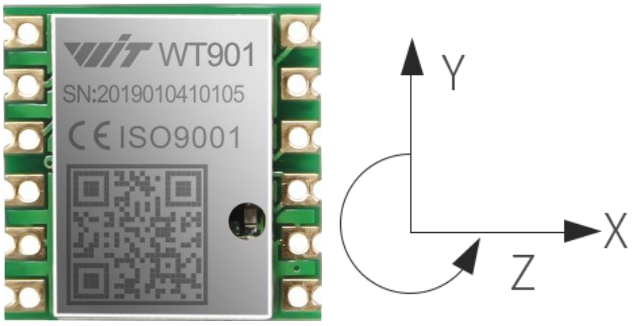
Parameter	Condition	Min	Default	Max
Supply voltage		3.3V	5V	5.5V
Working current	Work (5V)		11.5mA	
	Sleep (5V)		10.05uA	

3.2 Size

Parameter	Specification	Tolerance	Comment
Length	15	±0.1	Unit: millimeter.
Width	15	±0.1	
Height	2	±0.1	
Weight	1	±0.1	Unit: gram

3.3 Axial Direction

The coordinate system used for attitude angle settlement is the northeast sky coordinate system. Place the module in the positive direction, as shown in the figure below, direction right is the X-axis, the direction forward is the Y-axis, and direction upward is the Z-axis. Euler angle represents the rotation order of the coordinate system when the attitude is defined as Z-Y-X, that is, first turn around the Z-axis, then turn around the Y-axis, and then turn around the X-axis.



4 Pin Definition

PIN	Function
➢ VCC	3.3-5V
➢ RX	Serial data input, TTL interface
➢ TX	Serial data output, TTL interface
➢ GND	Ground
➢ DO	Analog input, Digital input and output, Set angle reference
➢ D1	Analog input, Digital input and output, PWM
➢ D2	Analog input, Digital input and output, Hardware reset , X+angle alarm output
➢ D3	Analog input, Digital input and output, Angle alarm output, X-angle alarm output
➢ SDA	I2C signal line, Y-angle alarm output
➢ SCL	I2C clock line, Y+angle alarm output

5 Communication Protocol

Level: TTL level
Baud rate:4800, 9600 (default), 19200 38400, 57600, 115200, 230400, stop bit and parity

Link to WT901 Protocol.