

YEI 3-Space Sensor™ Product Family

Miniature High-Performance Attitude & Heading Reference Systems / Inertial Measurement Units

Overview

The YEI 3-Space Sensor™ product line is a family of miniature, high-precision, high-reliability, Attitude and Heading Reference Systems (AHRS) / Inertial Measurement Units (IMU). Each YEI 3-Space Sensor uses triaxial gyroscope, accelerometer, and compass sensors in conjunction with advanced processing and on-board quaternion-based Kalman filtering algorithms to determine orientation relative to an absolute reference in real-time. The product family offers a breadth of communication, performance, and packaging options ranging from the ultra-miniature TSS embedded to fully integrated battery-powered wireless and data-logging versions.

Orientation can be returned in absolute terms or relative to a designated reference orientation. The proprietary multi-reference vector mode increases accuracy and greatly reduces and compensates for sensor error. The YEI 3-Space Sensor system also utilizes a dynamic sensor confidence algorithm that ensures optimal accuracy and precision across a wide range of operating conditions.

The YEI 3-Space Sensor system features are accessible via a well-documented open communication protocol that allows access to all available sensor data and configuration parameters using a variety of communication interfaces. Versatile commands allow access to raw sensor data, normalized sensor data, and filtered absolute and relative orientation outputs in multiple formats including: quaternion, Euler angles (pitch/roll/yaw), rotation matrix, axis angle, two vector(forward/up).

Applications

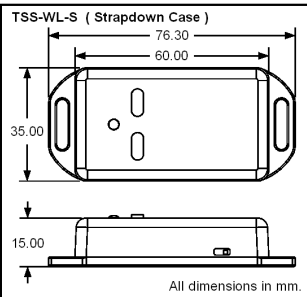
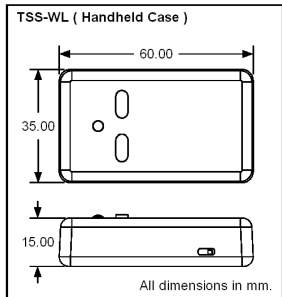
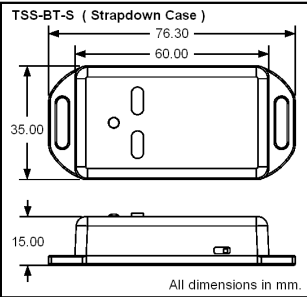
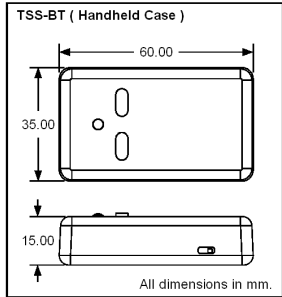
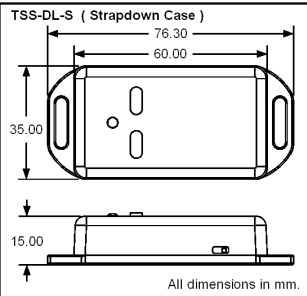
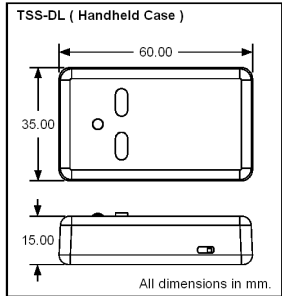
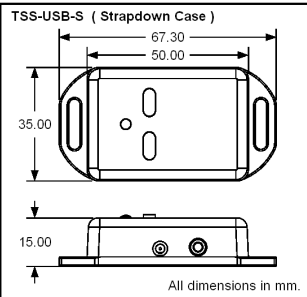
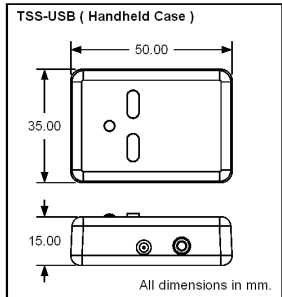
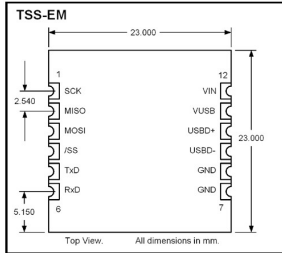
- Robotics
- Motion capture
- Positioning and stabilization
- Personnel / pedestrian navigation and tracking
- Unmanned air/land/water vehicle navigation
- Education and performing arts
- Healthcare monitoring
- Gaming and motion control
- Accessibility interfaces
- Virtual reality and immersive simulation

Product Family

3-Space Embedded (TSS-EM)	
	<ul style="list-style-type: none"> • USB2.0, SPI, logic-level serial • Smallest & lightest AHRS available • 23x23x2.2 mm, only 1.3 grams • Easily integrated • RGB status LED • Development kit available
3-Space USB / RS232 (TSS-USB)	
	<ul style="list-style-type: none"> • USB2.0, RS232 serial • 50x35x15 mm, 17 grams • USB communications via virtual COM port • RGB status LED, two buttons • Hand-held or strap-down case style
3-Space Data-logging (TSS-DL)	
	<ul style="list-style-type: none"> • USB2.0, MicroSD card, RTC, Rechargeable LiPO Battery • 60x35x15 mm, 28 grams • USB communications: virtual COM port, USB Mass Storage Device • RGB status LED, two buttons • Hand-held or strap-down case style
3-Space Bluetooth (TSS-BT)	
	<ul style="list-style-type: none"> • USB2.0, Bluetooth v2.0+EDR Class 1, Rechargeable LiPO Battery • 60x35x15 mm, 28 grams • Communications: USB virtual COM port, Bluetooth v2.0 Wireless • RGB status LED, two buttons • Hand-held or strap-down case style
3-Space Wireless 2.4GHz (TSS-WL)	
	<ul style="list-style-type: none"> • USB2.0, Wireless 2.4GHz DSSS, Rechargeable LiPO Battery • 60x35x15 mm, 28 grams • Communications: USB virtual COM port, 2.4Ghz Wireless • RGB status LED, two buttons • Hand-held or strap-down case style
3-Space Wireless Dongle (TSS-DNG)	
	<ul style="list-style-type: none"> • USB2.0 wireless 2.4GHz adapter • 65x22.7x15 mm • Up to 15 wireless sensor units per dongle • High-performance wireless features

High-reliability MEMS technology combined with advanced processing and quaternion-based Kalman filtering algorithms maintain accurate orientation outputs across a wide range of performance conditions.

Dimensions



Specifications

General	
Part numbers	TSS-EM (3-Space Embedded) TSS-USB (3-Space USB/RS232) TSS-USB-S (3-Space USB/RS232 Strap-down) TSS-DL (3-Space Data-logging) TSS-DL-S (3-Space Data-logging Strap-down) TSS-BT (3-Space Bluetooth) TSS-BT-S (3-Space Bluetooth Strap-down) TSS-WL (3-Space Wireless) TSS-WL-S (3-Space Wireless Strap-down) TSS-DNG (Communication Dongle)
Filter update rate	up to 200Hz with full AHRS functionality up to 1000Hz in IMU mode
Orientation output	absolute & relative quaternion, Euler angles, axis angle, rotation matrix, two vector
Other output	raw sensor data, normalized sensor data, temperature
Shock survivability	5000g
Temperature range	-40C ~ 85C (-40F ~ 185F)
Sensor	
Orientation range	360° about all axes
Orientation accuracy	±2° for dynamic conditions & all orientations
Orientation resolution	<0.08°
Orientation repeatability	0.085° for all orientations
Accelerometer scale	±2g / ±4g / ±8g selectable
Accelerometer resolution	14 bit
Accelerometer noise density	99µg/√Hz
Accelerometer sensitivity	0.00024g/digit for ±2g range 0.00048g/digit for ±4g range 0.00096g/digit for ±8g range
Accelerometer temperature sensitivity	±0.008%/°C
Gyro scale	±250/±500/±2000 °/sec selectable
Gyro resolution	16 bit
Gyro noise density	0.03°/sec/√Hz
Gyro bias stability @ 25°C	11°/hr average for all axes
Gyro sensitivity	0.00875°/sec/digit for ±250°/sec 0.01750°/sec/digit for ±500°/sec 0.070°/sec/digit for ±2000°/sec
Gyro non-linearity	0.2% full-scale
Gyro temperature sensitivity	±0.016%/°C
Compass scale	±1.3 Ga default. Up to ±8.1 Ga available
Compass resolution	12 bit
Compass sensitivity	5 mGa/digit
Compass non-linearity	0.1% full-scale

Specifications are subject to change. Version: 1.0.3