

# MT9 Inertial 3D Motion Tracker

The MT9 is a miniature inertial measurement unit providing serial digital output of 3D acceleration, 3D rate of turn (rate gyro) and 3D earth-magnetic field data. Proprietary sensor fusion software provides accurate 3D orientation data in real-time, which is attitude and heading stabilized and thus free of orientation drift. The MT9 excellently matches the needs of those who want to track motion and orientation of the human body, as well as unmanned vehicles and mobile robots.

## Features

- 3D orientation without drift
- 3D acceleration, rate of turn and earth-magnetic field data available
- high update rate, max. 512 Hz
- all solid state miniature MEMS inertial sensors inside
- digital serial input/output
- temperature compensation in software
- compact design
- Software Development Kit available for easy integration in OEM applications

## Fields of use

- Biomechanics
- Animation
- Virtual Reality/Augmented Reality
- Robotics
- Aerospace
- Autonomous vehicles
- Marine industry
- Bore industry

In the MT9 software, the signals from the rate-of-turn sensors are integrated and used to track rapidly changing orientations. The accelerometers and the earth-magnetic field sensors provide an absolute orientation reference and are used to completely eliminate the drift from the integration of rate-of-turn data.

With the MT9 Software Development Kit, the MT9 can easily be integrated in any system or (OEM) application in biomedical and industrial applications. The MT9 is available in a stand-alone, as well as an Xbus version. On the Xbus, Xsens' digital data bus, multiple MT9s can easily be used simultaneously, enabling ambulatory and cost-effective motion capturing of the human body.



# Specifications MT9-B

## Orientation software

Platform:	Windows 2000/XP (SDK for Linux)
Output:	3D orientation Quaternions/Matrix/Euler angles 3D acceleration 3D rate of turn 3D earth-magnetic field (normalized) Temperature
Developer's tools:	SDK available for Windows and Linux

## Orientation software performance

Dynamic Range:	all angles in 3D
Angular Resolution:	0.05° <sup>(1)</sup>
Static Accuracy:	<1° <sup>(2)</sup>
Dynamic Accuracy:	3° RMS <sup>(3)</sup>
Sample Frequency:	user selectable, 25 – 512 Hz

## Sensor performance

Unit		rate of turn [deg/s]	acceleration [m/s <sup>2</sup> ]	magnetic field [mGauss]	temperature [°C]
Dimensions		3	3	3	-
Full Scale	(units)	+/- 900	+/- 20	+/- 750	-55...+125
Linearity	(% of FS)	0.1	0.2	1	<1
Bias stability	Compensated (units 1σ) <sup>(4)</sup>	5	0.02	0.5	-
	Uncompensated (units per °C) <sup>(5)</sup>	1	0.02	-	-
Scale factor stability	Compensated (% 1σ) <sup>(4)</sup>	-	0.05	0.5	-
	Uncompensated (% per °C) <sup>(5)</sup>	0.15	0.03	0.5	-
Noise	(units RMS)	0.7	0.01	4.5	0.0625 <sup>(6)</sup>
Alignment error <sup>(7)</sup>	(deg)	0.1	0.1	0.1	-
Bandwidth	(Hz)	50	30	10	-

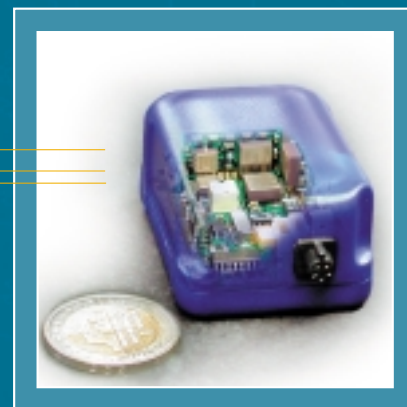
## Physical Specifications

Interface:	Serial (RS-232 max 460kB bps)
Operating Voltage:	5.5 V (adapter available)
Supply Current:	40 mA
Ambient Temperature	
Operating Range:	0°C - 55°C
Outline Dimensions:	39 x 54 x 28 mm (W x L x H)
Weight:	35 g

## Absolute maximum ratings <sup>(8)</sup>

Shock (any axis):	5000 m/s <sup>2</sup> (500 g) powered 10000 m/s <sup>2</sup> (1000 g) unpowered
Supply Voltage:	-0.3 V ... 12 V
Operating/Storage Temperature:	-5 °C ... 60°C

NOTE: Drops onto hard surfaces can cause shocks of greater than 5000 m/s<sup>2</sup> and exceed the absolute maximum rating of the device. Vibrations can damage the device; refer to technical documentation for details. Care should be taken when handling to avoid damage.



<sup>1</sup> 1σ standard deviation of zero-mean angular random walk

<sup>2</sup> in homogeneous magnetic environment

<sup>3</sup> may depend on type of motion

<sup>4</sup> temperature compensated, deviation over operating temperature range (1σ)

<sup>5</sup> not compensated for temperature, temperature dependence dominating error source

<sup>6</sup> minimal resolution of digital readout, absolute accuracy is ±0.5 °C

<sup>7</sup> after compensation of non-orthogonality in software

<sup>8</sup> stresses above Absolute Maximum Ratings may cause permanent damage to the device; for vibration survival refer to technical documentation

