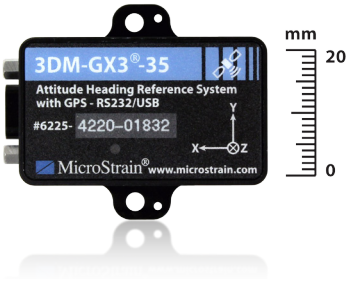
3DM-GX3® -35

Data Sheet

Miniature Attitude Heading Reference System with GPS



Introduction

The **3DM-GX3®** -35 high-performance, miniature Attitude Heading Reference System (AHRS) with GPS, combines MEMS sensor technology and a highly sensitive embedded GPS receiver. It incorporates a triaxial accelerometer, triaxial gyro, triaxial magnetometer, temperature sensors, and an on-board processor running a sophisticated fusion algorithm to provide orientation, inertial, and GPS measurements. Data from the GPS receiver is time synchronized with the inertial sensors and all inertial and GPS data are available as user-defined packets (either by polling or continuous stream). The 3DM-GX3® -35 provides a perfect platform for users to develop their own navigation solutions.

Features & Benefits

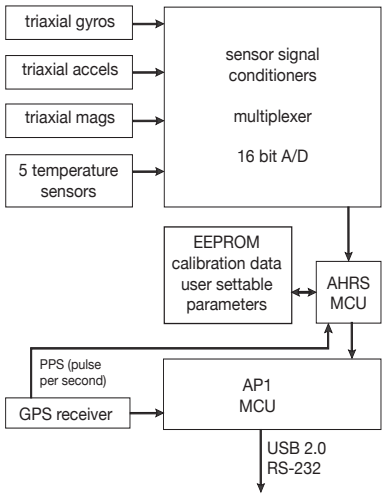
- smallest and lightest AHRS with GPS available on the market
- fully temperature compensated over operational range
- calibrated for sensor misalignment, gyro g-sensitivity, and gyro scale factor non-linearity to third order
- improved performance under vibration, as inertial sensors are sampled at 30 kHz and digitally filtered and scaled into physical units; coning and sculling integrals are computed at 1 kHz
- RS-232 and USB 2.0 communication interfaces
- MIP protocol provides fully customizable data output: inertial data up to 1000 Hz and GPS data up to 4 Hz with individual data quantity control
- AHRS output includes Euler angles, rotation matrix, deltaTheta, deltaVelocity, quaternion, acceleration, angular rate and magnetic field
- NMEA GPS protocol records and UBX GPS protocol records available in advanced mode
- provides time synchronized inertial and GPS data enabling users to develop navigation solutions
- versions available from 1.7 *g* to 50 *g* and 50°/s to 1200°/s
- rugged aluminum enclosure with precision alignment holes
- ROHS compliant

Applications

- host based inertial aided GPS navigation
- location tracking of vehicles or personnel
- unmanned vehicle navigation
- platform stabilization, artificial horizon
- antenna, satellite and camera pointing
- biomechanics, biomedical animation
- robotics
- automotive, marine, military
- heavy equipment, container handling
- virtual reality, computer science
- reconnaissance, surveillance and target acquisition system

Product Overview

The 3DM-GX3® -35 offers a range of fully calibrated inertial measurements including acceleration, angular rate, magnetic field, deltaTheta and deltaVelocity vectors, Euler angles (pitch, roll, and heading), rotation matrix and quaternion. Its GPS data quantities include LLH position, NED velocity, ECEF position and velocity, DOP data, UTC time, GPS time, clock info, GPS fix, and SVI. All quantities are fully temperature compensated and are mathematically aligned to an orthogonal coordinate system. The angular rate quantities are further corrected for *g*-sensitivity and scale factor non-linearity to third order. The 3DM-GX3® -35 architecture has been carefully designed to substantially eliminate common sources of error such as hysteresis induced by temperature changes and sensitivity to supply voltage variations. Gyro drift is eliminated in AHRS mode by referencing magnetic North and Earth's gravity and compensating for gyro bias. On-board coning and sculling compensation allows for use of lower data output rates while maintaining performance of a fast internal sampling rate. For those users, integrators or OEMs who develop their own orientation and navigation applications, the 3DM-GX3® -35 is shipped with a complete Data Communications Protocol guide that provides access to the powerful MicroStrain Inertial Packet Protocol (MIP). Applications of your own design can readily be developed in any coding language and on any computing platform including microprocessors. The 3DM-GX3® -35 is initially sold as a starter kit consisting of an AHRS+GPS module, RS-232 or USB communication and power cable, software CD, user manual and quick start guide.



AHRS Specifications

Attitude and Heading	
Attitude heading range	360° about all 3 axes
Accelerometer range	±1.7 *g*, ±16 *g*, ±50 *g* (±16 *g*, and ±50 *g* may require export license)
Gyroscope range	±300°/sec standard
Static accuracy	±0.5° pitch, roll, heading typical for static test conditions
Dynamic accuracy	±2.0° pitch, roll, heading for dynamic (cyclic) test conditions and for arbitrary angles
Long term drift	eliminated by complementary filter architecture
Repeatability	0.2°
Resolution	<0.1°
Data output rate	AHRS: 1 Hz to 1,000 Hz, GPS: 1 Hz to 4 Hz
Filtering	sensors sampled at 30 kHz, digitally filtered (user adjustable) and scaled into physical units; coning and sculling integrals computed at 1 kHz
Output modes	3DM-GX3 MIP records: acceleration, angular rate, magnetic field, deltaTheta, deltaVelocity, Euler angles, orientation matrix, quaternion, LLH position, NED velocity, ECEF position and velocity, DOP data, UTC time, GPS time, clock info., GPS fix, and SVI; NMEA GPS protocol records and UBX GPS protocol records available in advanced mode

General	
A/D resolution	16 bits SAR oversampled to 17 bits
Interface options	USB 2.0 or RS232
Baud rate	9,600 bps to 921,600 bps (115,200 bps default)
Power supply voltage	+3.2V to +16V (see technical note: http://files.microstrain.com/TN-I0023_Inertia-Link_3DM-GX2_3DM-GX3_Pin-Outs.pdf)
Power consumption	at full performance with GPS lock: 200 mA typ (250 mA max) when powered by Vpri (3.2V-5.5V) 850 mW typ (1.0W max) when powered by Vaux (5.2V-16V)
Connector	micro-DB9
Operating temperature	-40 °C to +65 °C
Dimensions	44 mm x 24 mm x 14 mm - excluding mounting tabs, width across tabs 37 mm
Weight	23 grams
ROHS	compliant
Shock limit	500 *g*
Software utility	CD in starter kit (XP/Vista/Win7 compatible)
Software development kit (SDK)	complete data communications protocol and sample code

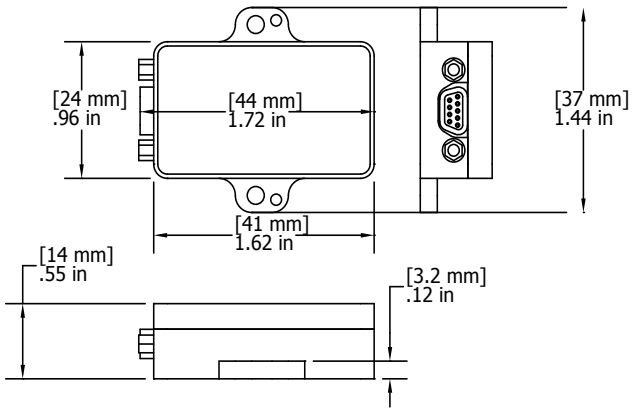
Options	
Accelerometer range	±1.7 *g*, ±16 *g*, ±50 *g*
Gyroscope range	±50°/sec, ±600°/sec, ±1200°/sec

IMU Specifications

	Accels	Gyros	Mags
Measurement range	±5 *g*	±300°/sec	±2.5 Gauss
Non-linearity	±0.1 % fs	±0.03 % fs	±0.4 % fs
In-run bias stability	±0.04 m*g*	18°/hr	—
Initial bias error	±0.002 *g*	±0.25°/sec	±0.003 Gauss
Scale factor stability	±0.05 %	±0.05 %	±0.1 %
Noise density	80 µ*g*/√Hz	0.03°/sec/√Hz	100 µGauss/√Hz
Alignment error	±0.05°	±0.05°	±0.05°
User adjustable bandwidth	225 Hz max	440 Hz max	230 Hz max
Sampling rate	30 kHz	30 kHz	7.5 kHz max

GPS Specifications

GPS Receiver	
GPS receiver type	50 Channels, L1 frequency, GPS C/A Code SBAS: WAAS, EGNOS, MSAS, GAGAN
GPS solution update rate	Up to 4Hz
Time-to-First-Fix	Cold Start (Autonomous): 36 sec Warm Start (Autonomous): 36 sec Hot Start: < 1 sec
GPS tacking and navigation sensitivity	-159 dBm
GPS reacquisition sensitivity	-159 dBm
GPS cold start (autonomous) sensitivity	-141 dBm
GPS velocity accuracy	0.1 m/sec
GPS heading accuracy	0.5°
GPS horizontal position accuracy	< 2.5 m Autonomous < 2.0 m SBAS (CEP, stationary 24 hours, SEP 3.5 m)
GPS timepulse signal accuracy	30 nsec RMS < 60 nsec 99%
GPS acceleration limit	≤ 4 *g*
GPS altitude limit	no limit
GPS velocity limit	500 m/sec (972 knots)
GPS antenna connector	MMCX type



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Patents Pending