measurement SPECIALTIES™

65210ES

User-Configurable, Sealed Inertial Measurement System with Digital Signal Processing

Technical Data*

***Significant Military Equipment (SME)**
This Measurement Specialties product is subject to the licensing jurisdiction of the U.S. Department of State in accordance with the International Traffic in Arms Regulations (**ITAR**) (22 C.F.R. 120 - 130).
http://www.pmddtc.state.gov/regulations_laws/itar_official.html

Features and Benefits

User Programmable Settings
The output range and low-pass filter of each 65210ES accelerometer and rate gyro axis can be set via a built-in RS-485 interface, as can the IRIG-106 encoded PCM output configuration (channels output, sub-commutation, word size, NRZ-L/RNRZ-L/Bi-Phase-L/RBi-Phase-L encoding). The carrier frequency for optional built-in multi-channel S band transmitters can also be set. Programmability reduces costs as the 65210ES can be stocked and configured to meet different application requirements as needed.

Compensated Serial and Telemetry Outputs
Calibrated, ranged, and filtered data can be streamed out at up to 3 Mbit/sec via RS-485 or IRIG-106 encoded PCM.

High Accuracy and Linearity over Wide Temperature Range
Accelerometer accuracy is improved by minimizing variations due to temperature and aging effects. Each axial sensor has been tested over the -40 to +85°C temperature range.

Built-in Calibration
Calibration data for each sensor is maintained in the instrument.

Communication Integrity
A CRC16 cyclic redundancy check is available to validate communications. Telemetry also supports a frame counter to ease detection of missing frames.

Self-Test
Self-test and fixed level outputs simplify installation and system check out by verification of channel integrity and ground station setup.

Sealed, Small Cylindrical Package
Sealed package has a 2.80 inch diameter and 3”-12 UN thread for mounting; can be nitrogen pressurized via built-in valve.

Built-In High Capacity, Fast-Charging Battery
Complete recharge in less than two hours provides up to 20 hours of operation with transmitter off. Built-in monitoring is provided for battery current and voltage.

Suitable for Harsh Environments
The 65210ES is robust and can be used in harsh environments. The unit will survive 100 g shock while powered.

Simplify Configuration and Inertial Measurements

Measurement Specialties 65210ES is a user-configurable 6 DoF (six degree of freedom) Inertial Measurement System containing three accelerometers, three rate gyros, two temperature sensors, signal processor, IRIG encoder, optional FM transmitter, and high-capacity Li-Ion battery in a small, easy-to-install package.

All channels are measured simultaneously with each sampled at 16 bits, filtered, ranged, and calibration compensated at up to 42,500 samples/sec/channel by the built-in digital signal processor. The output range, filter frequency and calibration of each channel, as well as the PCM configuration, can be set by the user.

A frame counter and CRC16 cyclic redundancy check can be included in each telemetry frame to allow dropped frames and data corruption to be detected.

An optional aerodynamic adapter covers top exposed screws and provides tie down holes for captivating connector mates.

Specifications for 65210ES - *improved specifications available upon request*

$T_A = T_{MIN}$ to T_{MAX}; Acceleration = 0 g unless otherwise noted; within one year of calibration.

Parameter	Min	Typical	Max	Units	Conditions/Notes
Accelerometers					
Range, Option A040		±55		g	User configurable
Sensitivity Drift (25°C to T_{MIN} or T_{MAX})		±0.5		%	% of sensitivity at 25°C
Zero Bias Drift (25°C to T_{MIN} or T_{MAX})		±0.06		g	Repeatable, can be compensated
Nonlinearity		0.2		% FSR	Max deviation from best fit straight line
Upper Cutoff Frequency	360	400	440	Hz	2-pole bessel in sensor; additional prog DSP pole
Noise Density		1.4	3	mg/√Hz	10 Hz to 400 Hz
Alignment		±1		degrees	Typical orthogonality < 0.5°
Transverse Sensitivity		±0.25		%	Inherent sensor error, excluding misalignment
Rate Gyros, Option G1k2					
Range			±1200	°/sec	User configurable
Sensitivity Drift (25°C to T_{MIN} or T_{MAX})		±2.5		% FSR	
Zero Rate Drift (25°C to T_{MIN} or T_{MAX})	±2		±6.0	°/sec	
Nonlinearity		0.1		% FSR	
Upper Cutoff Frequency (90°)		100		Hz	Additional programmable DSP pole
Noise Density at 25°C		0.05		°/sec/√Hz	To 100 Hz
Rate Gyros, Option G20k					
Range			±20,000	°/sec	User configurable
Sensitivity Drift (25°C to T_{MIN} or T_{MAX})		±2		% FSR	
Zero Rate Drift (25°C to T_{MIN} or T_{MAX})		±5		°/sec	
Nonlinearity		0.1		% FSR	
Upper Cutoff Frequency (90°)		100		Hz	Additional programmable DSP pole
Noise Density at 25°C		0.25		°/sec/√Hz	To 100 Hz
Battery (V_S)					
Operating Time with 0.5 W Transmitter		4		hrs	At 25°C
Operating Time with Transmitter Off		20		hrs	At 25°C
Charge Time at 20°C		2		hrs	Uncharged to full capacity. Must charge 0-45°C
IRIG-106 PCM Output Rate	0.0144	1.5	3.0	Mbit/sec	Based on NRZ
Optional FM Transmitter (S Band)					Frequency settable in 0.5 MHz steps, IRIG-106 compliant
Transmit Power		0.5	1.5	W	Power specified with order, see Option Tnnn
Temperature Range (T_A)	-40		+85	°C	
Li-Ion Battery Temperature Range	-10		+60	°C	Self-heating may allow lower temp operation
Transmitter Temperature Range	-20		+70	°C	
Mass		823		grams	Without mounting adapter
Shock Survival	-100		100	g	Limited by transmitter

Ordering Information

65210ES - A040 - G1K2 - T01S - M2

Instrument

Accelerometers
- A000 : None
- A010 : ±10 g 1000 Hz
- A040 : ±40 g 400 Hz
- A050 : ±50 g 2000 Hz
- A051 : ±50 g 400 Hz
- A100 : ±100 g 2500 Hz

Rate Gyros
- G000 : None
- G1k0 : ±1000°/s gyros
- G1k2 : ±1200°/s gyros
- GS00 : ±20000°/s* gyros

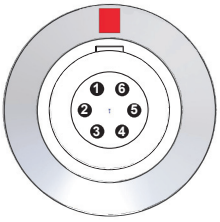
*on roll axis only, ±1200°/s on other two axes

Transmitter
- T000 : None
- T00S : 0.5 W, 272 kb/s, 2.2-2.3 GHz, S band
- T01S : 0.5 W, 1.5 Mb/s, 2.2-2.3 GHz, S band
- T03S : 0.5 W, 3.0 Mb/s, 2.2-2.3 GHz, S band
- TA1S : 1.0 W, 1.5 Mb/s, 2.2-2.3 GHz, S band
- TA1B : 1.0 W, 1.5 Mb/s, 2.2-2.4 GHz, S band
- T11S : 1.5 W, 1.5 Mb/s, 2.2-2.3 GHz, S band
- T13S : 1.5 W, 3.0 Mb/s, 2.2-2.3 GHz, S band
- T20S : 2.0 W, 272 kb/s, 2.2-2.3 GHz, S band
- T20U : 2.0 W, 272 kb/s, 2.3-2.4 GHz, U band

Adapter
- M0 : None
- M1 : Parabolic Mounting
- M2 : (DSU33) Radome Ring

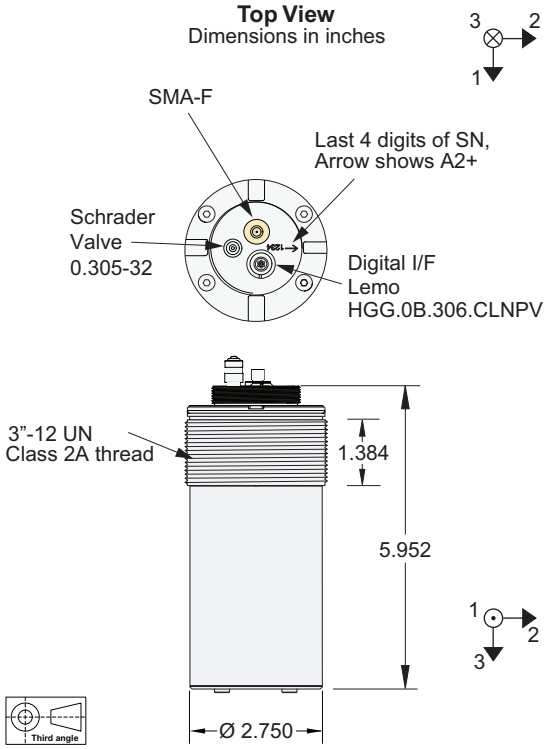
Mounting Options and Connector for 65210ES

STANDARD CONNECTOR

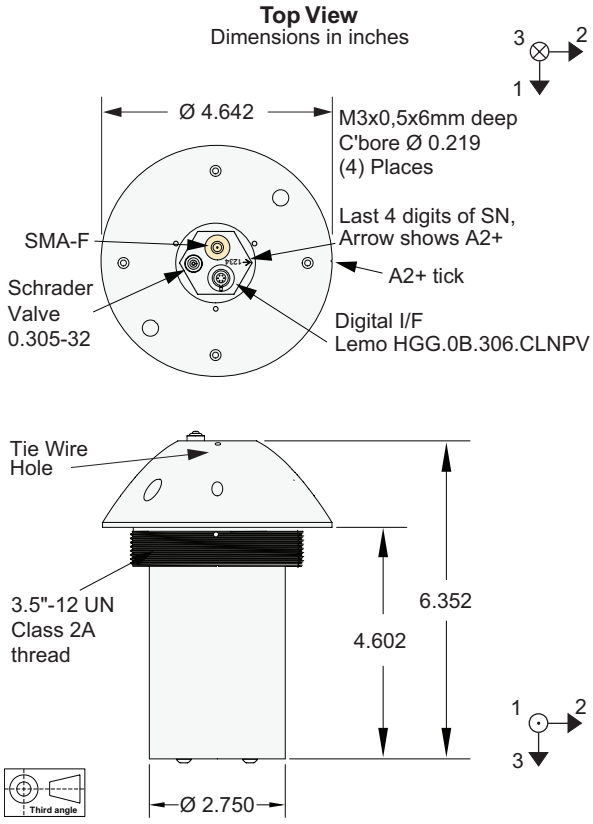


Pin	Signal
1	Aux
2	RS485-
3	RS485+
4	Power Enable L
5	Ground
6	+V Power
SMA-F	RF Out

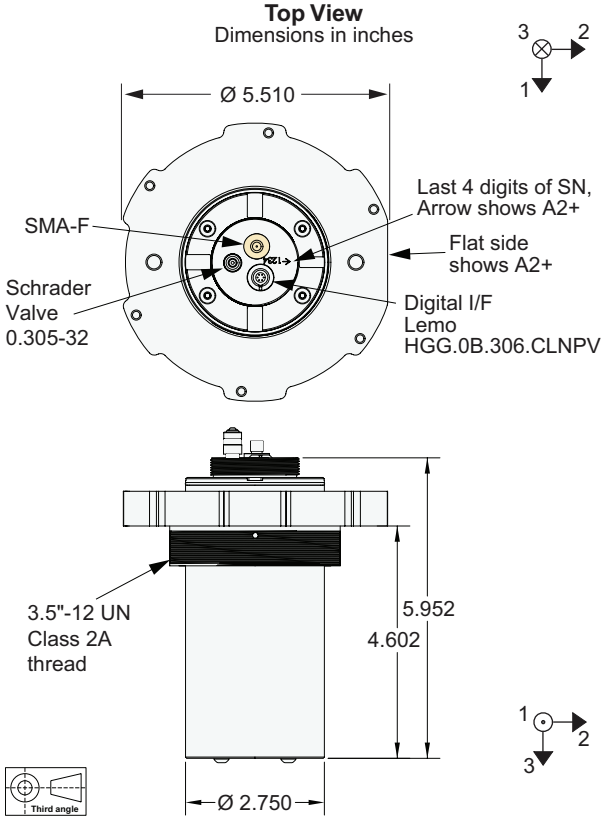
M0: NO MOUNTING



M1: PARABOLIC MOUNTING



M2: RADOME RING (DSU33)



Sensor Locations for 65210ES

ACCELEROMETER AND GYRO POSITIONS (INCHES) WITHOUT ADAPTER

Axis

Accelerometer- Option A040	1: Lateral	2: Vertical	3: Longitudinal
A1 Lateral	-0.112	+0.518	+1.434
A2 Vertical	+0.315	+0.518	+1.008
A3 Longitudinal	-0.112	+0.944	+1.008

Accelerometer Position ±0.025 typical

Accelerometer- Option A050/A100	1: Lateral	2: Vertical	3: Longitudinal
A1 Lateral	+0.301	+0.518	+1.008
A2 Vertical	-0.112	+0.930	+1.008
A3 Longitudinal	-0.112	+0.518	+1.4200

Accelerometer Position ±0.050 typical

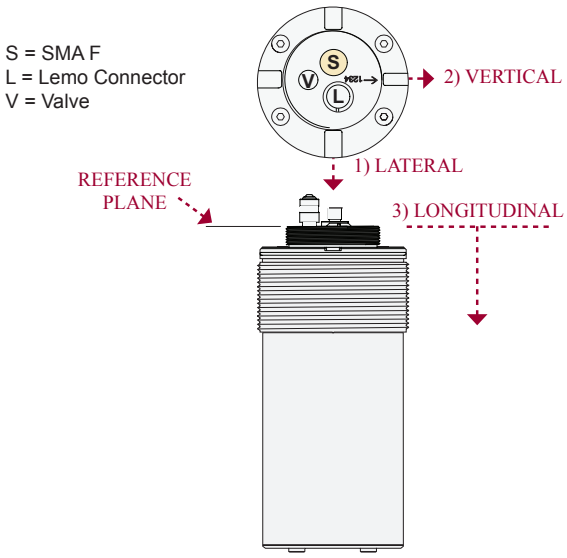
Gyro- Option G1k0/G1k2	1: Lateral	2: Vertical	3: Longitudinal
G1 Lateral	+0.370	-0.518	+1.008
G2 Vertical	-0.112	-0.999	+1.008
G3 Longitudinal	-0.112	-0.518	+1.489

Gyro Position ±0.050 typical

OPTIONAL:

Accelerometer- Low g	1: Lateral	2: Vertical	3: Longitudinal
A1 Lateral	-0.920	+0.635	+3.170
A2 Vertical	-0.920	+0.635	+3.170
A3 Longitudinal	-0.920	+0.635	+3.170

Accelerometer Position ±0.050 typical



ACCELEROMETER AND GYRO POSITIONS (INCHES) WITH ADAPTER (Parabolic or Radome Ring DSU33)

Axis

Accelerometer- Option A040	1: Lateral	2: Vertical	3: Longitudinal
A1 Lateral	-0.112	+0.518	+0.084
A2 Vertical	+0.315	+0.518	-0.342
A3 Longitudinal	-0.112	+0.944	-0.342

Accelerometer Position ±0.025 typical

Accelerometer- Option A050/A100	1: Lateral	2: Vertical	3: Longitudinal
A1 Lateral	+0.301	+0.518	-0.342
A2 Vertical	-0.112	+0.930	-0.342
A3 Longitudinal	-0.112	+0.518	+0.070

Accelerometer Position ±0.050 typical

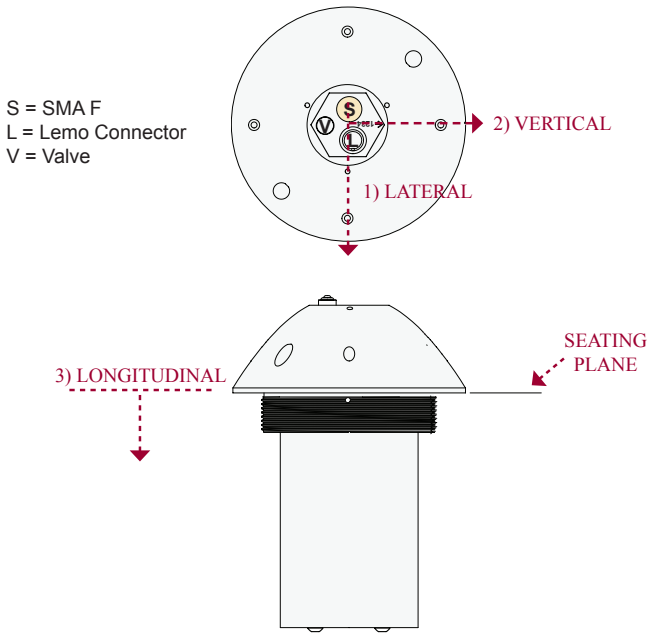
Gyro- Option G1k0/G1k2	1: Lateral	2: Vertical	3: Longitudinal
G1 Lateral	+0.370	-0.518	-0.342
G2 Vertical	-0.112	-0.999	-0.342
G3 Longitudinal	-0.112	-0.518	+0.139

Gyro Position ±0.050 typical

OPTIONAL:

Accelerometer- Low g	1: Lateral	2: Vertical	3: Longitudinal
A1 Lateral	-0.920	+0.635	+1.820
A2 Vertical	-0.920	+0.635	+1.820
A3 Longitudinal	-0.920	+0.635	+1.820

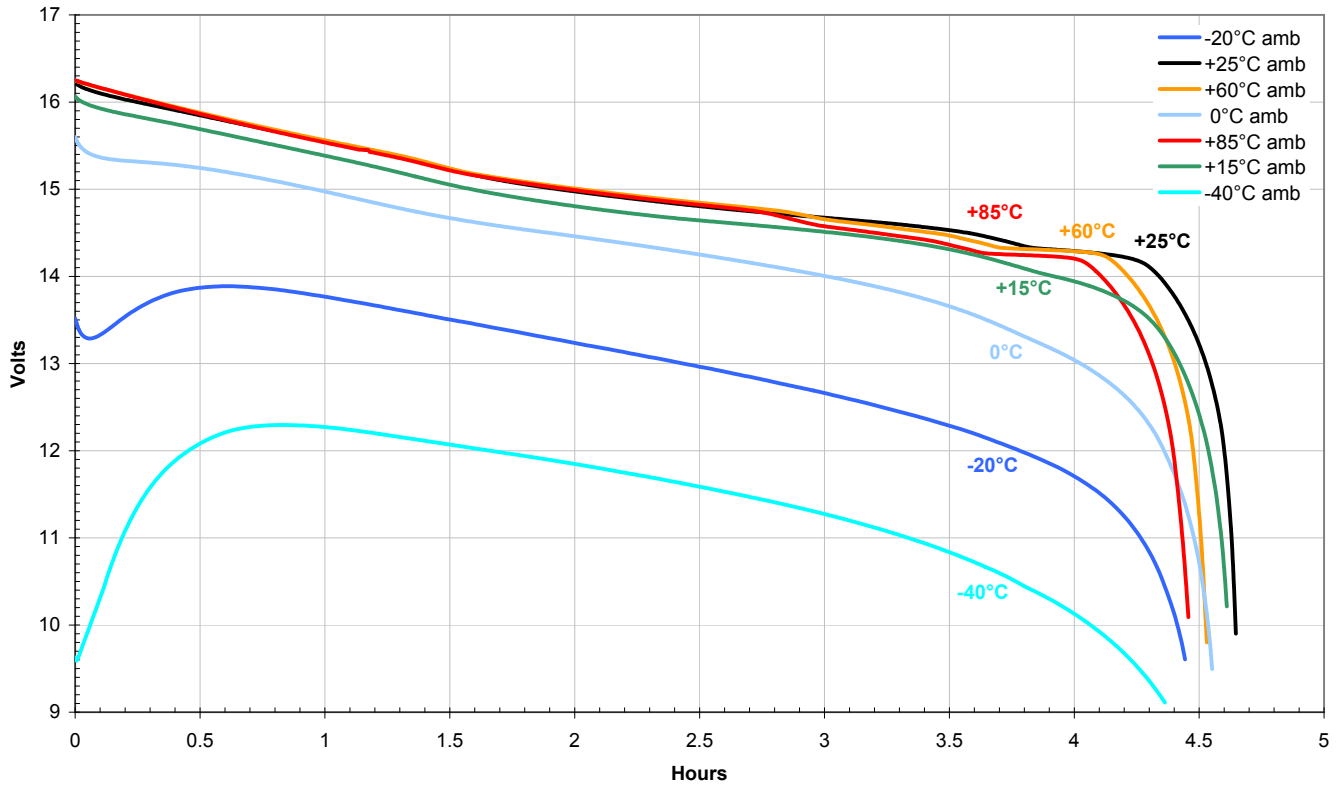
Accelerometer Position ±0.050 typical



Axis 3 (longitudinal) position adjustments (per installation):
Will be increased by up to 0.083" when the main instrument assembly is screwed into 12 TPI adapter, as up to one turn back-off may be required (average increase will be 0.042").

Typical Battery Time for 65210ES

65210ES Battery Operational Time vs Ambient Temperature
(All data points during operational instrument, T01S transmitter ON, avg current ~410mA)



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