



65210ES

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

*Significant Military Equipment (SME)

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The Measurement Specialties 65210ES is a user-configurable 6 DoF (six degree of freedom) Inertial Measurement System containing three internal accelerometers, three internal 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 CRC cyclic redundancy check can be included in each telemetry frame to allow dropped frames and data corruption to be detected.

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

Simplify Configuration and Inertial Measurements

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-communication, 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 3Mbit/sec via RS-485 or IRIG-106 encoded PCM.

Built-in Calibration

Calibration data for each internal sensor is maintained in the instrument.



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.

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

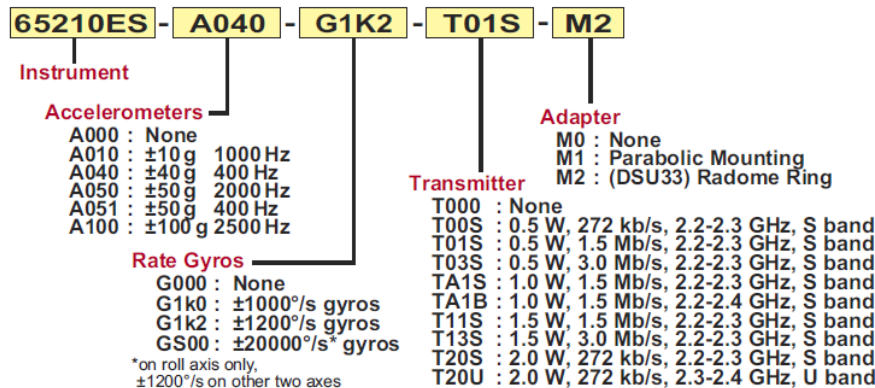
The 65210ES is robust and can be used in harsh environments. The unit will survive 100 g shock while powered.

SPECIFICATIONS FOR 65210E - 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)					
Transmit Power		0.5	1.5	W	Frequency settable in 0.5 MHz steps, IRIG-106 compliant Power specified with order, see Option Tnnn
Temperature Range (T_A)					
Li-Ion Battery Temperature Range	-40		+85	°C	
Transmitter Temperature Range	-10		+60	°C	Self-heating may allow lower temp operation
	-20		+70	°C	
Mass		823		grams	Without mounting adapter
Shock Survival	-100		100	g	Limited by transmitter

ORDERING INFORMATION



DIMENSIONS

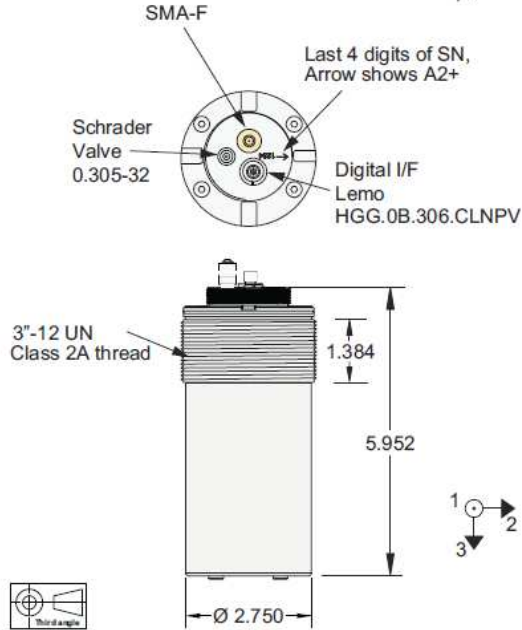
STANDARD CONNECTOR



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

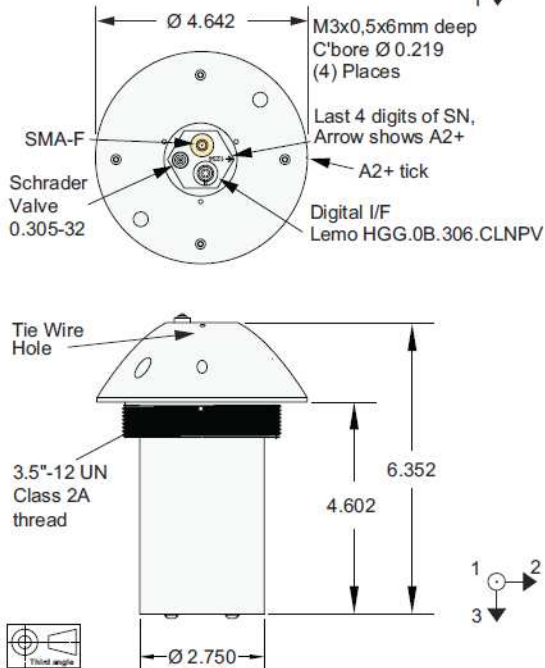
M0: NO MOUNTING

Top View
Dimensions in inches



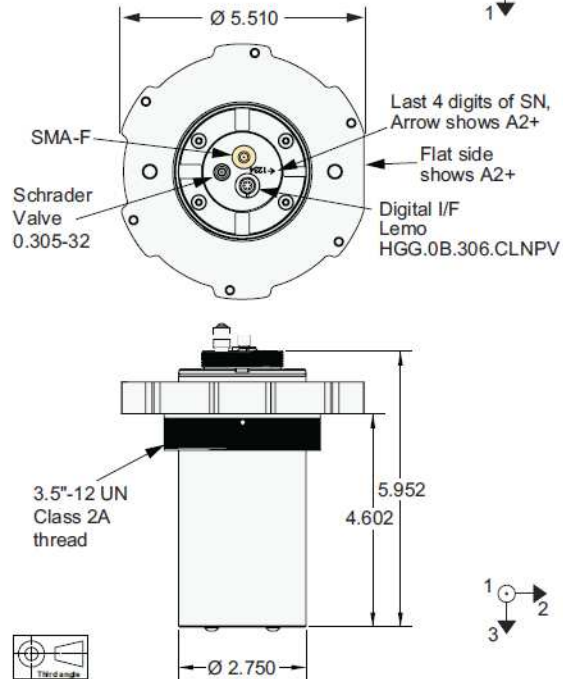
M1: PARABOLIC MOUNTING

Top View
Dimensions in inches



M2: RADOME RING (DSU33)

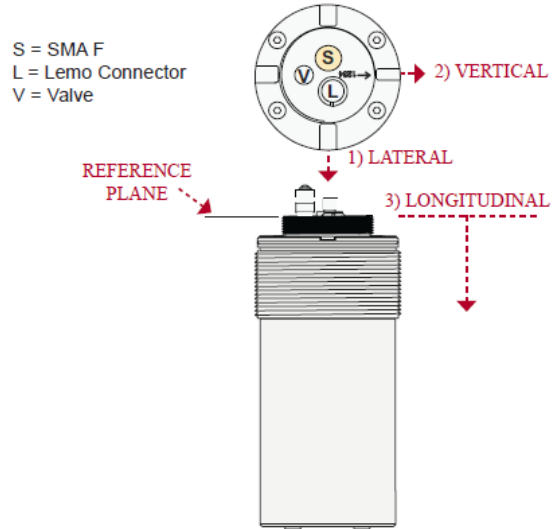
Top View
Dimensions in inches



SENSOR LOCATIONS FOR 65210ES

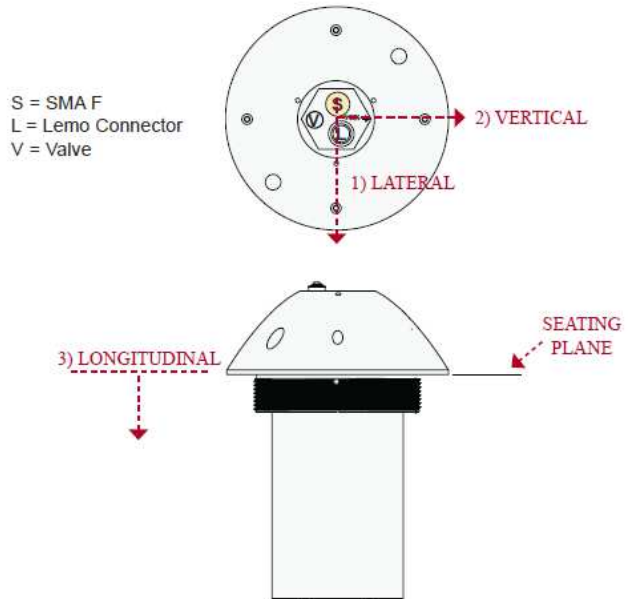
ACCELEROMETER AND GYRO POSITIONS (INCHES) WITHOUT ADAPTER

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)

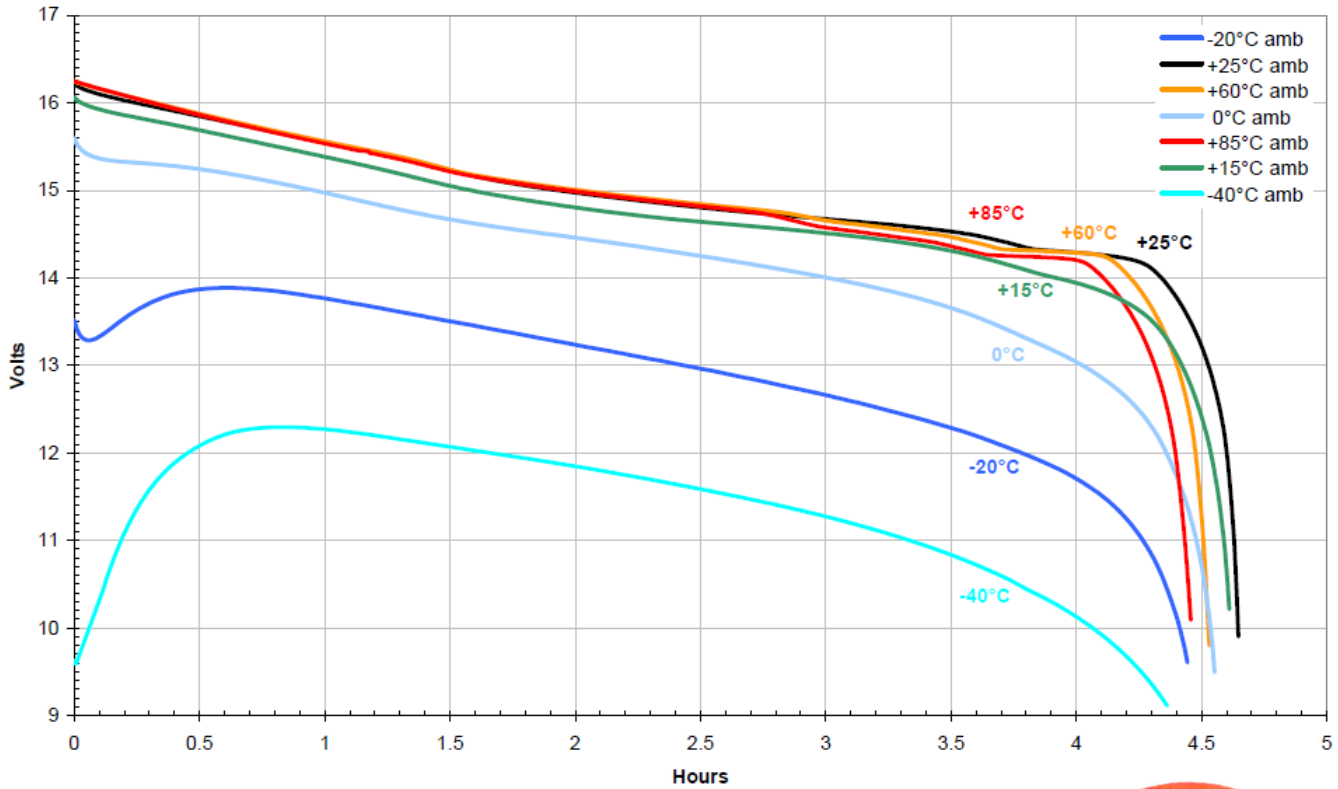
Axis			
Accelerometer-Option A040	1: Lateral	2: Vertical	3: Longitudinal
A1 Lateral	-0.112	+0.518	+0.084
A2 Vertical	+0.315	+0.518	-0.342
A3 Longitudinal	-0.112	+0.944	-0.342
Accelerometer Position ±0.025 typical			
Accelerometer-Option A050/A100	1: Lateral	2: Vertical	3: Longitudinal
A1 Lateral	+0.301	+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)



NORTH AMERICA

Measurement Specialties, Inc.,
a TE Connectivity Company
Phone +1-800-522-6752
Email: customercare.akrn@te.com

EUROPE

MEAS France SAS
a TE Connectivity Company
Phone: +49-800-440-5100
Email: customercare.tlse@te.com

ASIA

Measurement Specialties (China), Ltd.,
a TE Connectivity Company
Phone: +86-400-820-6015
Email: customercare.shzn@te.com

TE.com/sensorsolutions

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