



## 65210E INERTIAL MEASUREMENT SYSTEM

### SPECIFICATIONS

- 6-DOF Inertial Measurement System (IMS)
- Onboard DAQ with External Inputs
- User Selectable Signal Conditioning Modules
- AES Encryption Options

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### FEATURES AND BENEFITS

#### Data Acquisition via External Inputs

Data from external sensors and signals can be input to the 65210E via plug-in Signal Conditioning Modules. Modules are available for many standard transducer types and additional modules can be quickly developed to meet specific customer requirements.

#### User Programmable Settings

When configured as a 6 DoF, the output range and low-pass filter of each 65210E accelerometer and rate gyro axis can be set via a built-in RS-485 interface, as can the IRIG-106 encoded PCM output configuration. The carrier frequency for the optional built-in multi-channel S band transmitters can also be set by the user.

#### IRIG-106 Compatible

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

The TE Connectivity 65210E can be supplied as a user-configurable 6-DoF (six degree of freedom) Inertial Measurement System containing three internal accelerometer axes, three internal rate gyro axes, two temperature sensors, battery voltage and current monitor, signal processor, IRIG encoder, optional FM transmitter, and high-capacity Li-Ion battery in a small, easy-to-install package.

Additionally, external signal inputs can be accommodated with a variety of available Signal Conditioning Modules (SCMs).

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.

### **High Accuracy and Linearity over Wide Temperature Range**

Accelerometer and gyro accuracy is improved by minimizing variations due to temperature and aging effects. Each sensor has been tested over the -40 to +85°C temperature range.

### **Communication Integrity**

A cyclic redundancy check (CRC) 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.

### **Small Cylindrical Package**

Package has a 2.75 inch diameter and 7.77 inch overall length. Optional spline mount parabolic mounting adapter available. The unit will fit in a standard MK-80 fuse well.

### **Built-In High Capacity, Fast-Charging Battery**

Complete recharge in less than two hours provides up to three hours of operation with transmitter powered.

### **Suitable for Harsh Environments**

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

### **Encryption Options**

The Encryption Option allows the 65210E to encrypt the IRIG-106 encoded PCM data stream measurement values prior to transmission. The encryption method is AES and can be configured to use either 128-bit or 256-bit encryption. Telemetry frames must be configured with either 16 or 32 bytes of channel data that can be encrypted, corresponding to the two encryption key sizes. Encryption is not applied to the SYNC, FCTR, SN, PAD or CRC bytes in the frame. Encryption requires minimum ICU V2.36 to be supported.

## 65210E INERTIAL MEASUREMENT SYSTEM

### PERFORMANCE SPECIFICATIONS

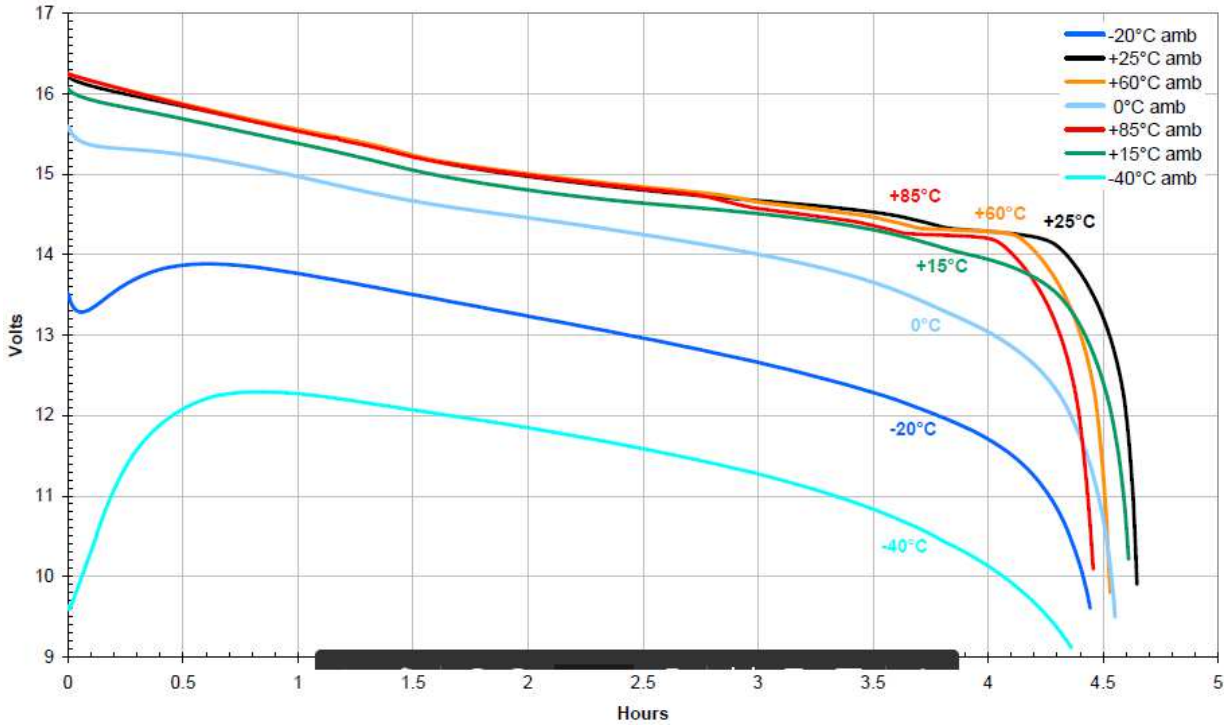
All values are typical at +24°C, battery powered, unless otherwise stated. TE Connectivity reserves the right to update and change these specifications without notice.

#### PARAMETERS

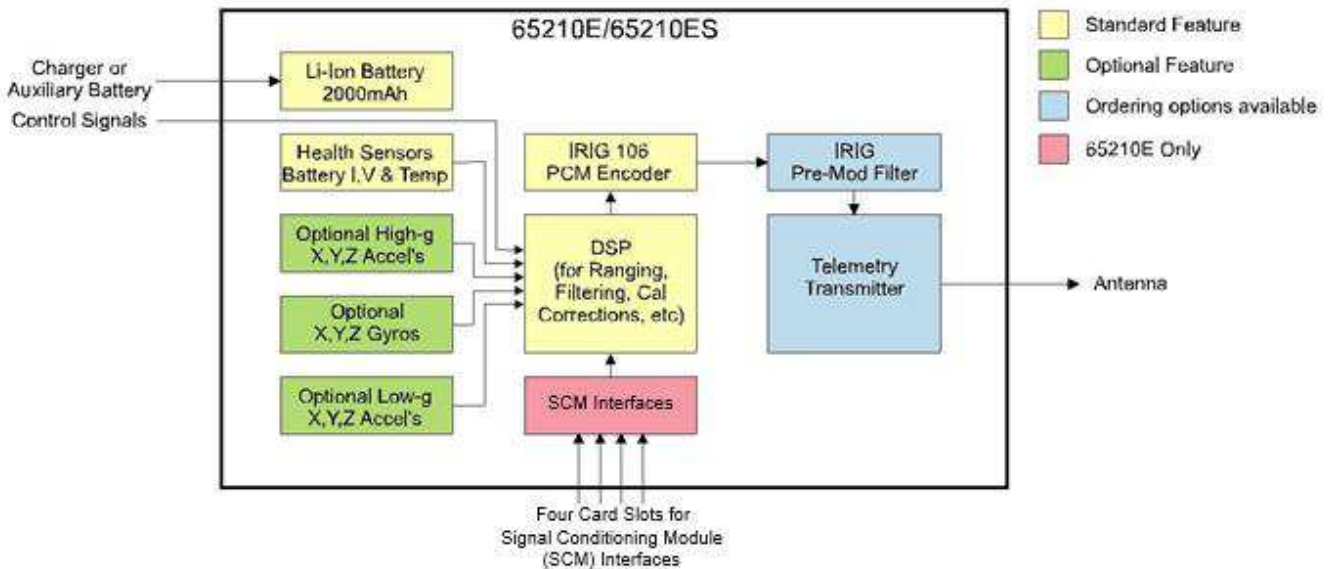
ACCELEROMETER	A010	A040	A050	A100	NOTES
Range	±10g	±40g	±50g	±100g	User configurable
Thermal Zero Bias Drift	±0.25g	±1.0g	±1.1g	±2.0g	-40 to +85°C
Thermal Sensitivity Drift	±5.0%	±5.0%	±5.0%	±5.0%	-40 to +85°C
Non-Linearity	±0.1%	±0.1%	±0.1%	±0.1%	BFSL
Accelerometer Bandwidth	0-1000Hz	0-440Hz	0-2000Hz	0-2500Hz	-3dB point
Programmable Filter Setting (-3dB)	1-10kHz	1-10kHz	1-10kHz	1-10kHz	User programmable
Noise Density	0.13mg/√Hz	0.03mg/√Hz	0.03mg/√Hz	0.03mg/√Hz	Bandpass
Alignment	±1°	±1°	±1°	±1°	Typ. orthogonality <0.5°
Transverse Sensitivity	±1.0%	±1.0%	±1.0%	±1.0%	Excluding misalignment
ANGULAR RATE GYROS	G1K0	G1K2	GS00		
Range	1000°/sec	1200°/sec	20,000°/sec		User configurable
Thermal Zero Rate Drift	±3.0°/sec	±3.0°/sec	±3.0°/sec		-20 to +70°C
Thermal Sensitivity Drift	±2.5%	±2.5%	±2.5%		-20 to +70°C
Non-Linearity	±0.1%	±0.1%	±0.1%		BFSL
Upper Cutoff Frequency	100Hz	100Hz	100Hz		-3dB point
Noise Density	0.20°/sec/√Hz	0.20°/sec/√Hz	0.40°/sec/√Hz		1-100Hz
Cross-Axis Sensitivity	±1.0%	±1.0%	±1.0%		Excluding misalignment
TEMPERATURE SENSOR (internal)					
Accuracy	±2.0°C				
Resolution	±0.25°C				
BATTERY (Vs)					
Battery Life with 0.5W Transmitter	4hrs @ 25°C				
Battery Life with Transmitter Off	15hrs @ 25°C				
Charge time @ 20°C	2hrs, uncharged to full capacity				Must charge 0-45°C
IRIG-106 ENCODER					
PCM Output Rate	1.5Mbit/sec				Based on NRZ
OPTIONAL FM TRANSMITTER (S Band)					
Transmit Power	0.5 to 2.0W options, see ordering info				
Carrier Frequency	2.2 to 2.4GHz options, see ordering info				
ENVIRONMENTAL					
Operating Temperature (°C)	-20 to +70°C				
Storage Temperature (°C)	-40 to +85°C				
Shock	±100g				
PHYSICAL					
Housing Material	Aluminum, Electroless Nickel Plated				
Weight	1520 grams, with parabolic adaptor and four SCM cards				

TYPICAL BATTERY TIME FOR 65210E

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

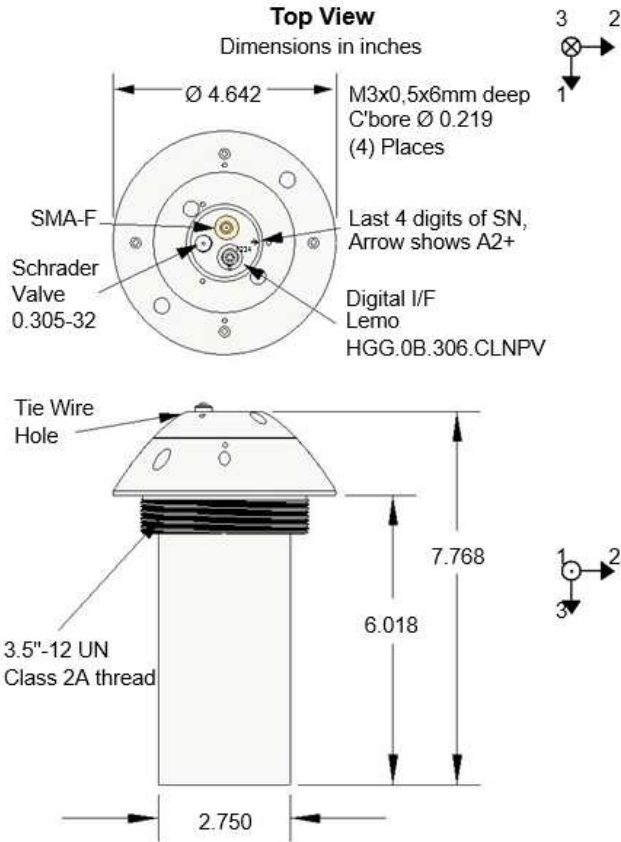


BLOCK DIAGRAM

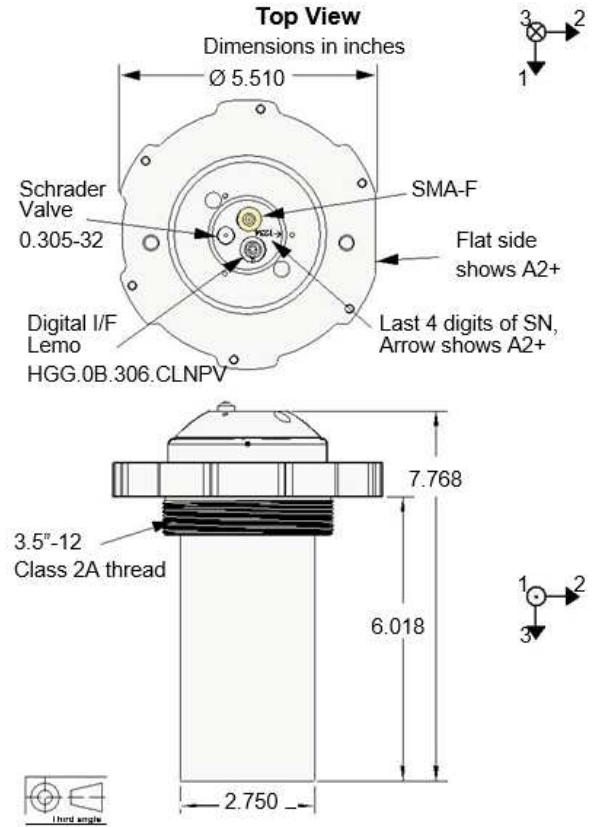


DIMENSIONS

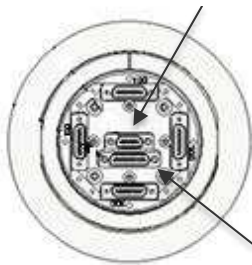
**M1: PARABOLIC MOUNTING**



**M2: RADOME RING (DSU-33)**



I/O for Module 400  
15 pin receptacle, MIL-C-83513



I/O for Module 100, 200, 300  
25 pin receptacle, MIL-C-83513

**STANDARD CONNECTOR**



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

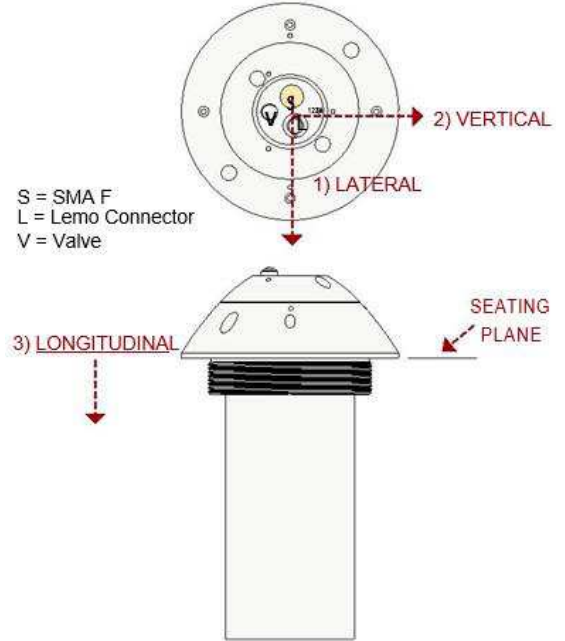
SENSOR CENTER OF GRAVITY LOCATIONS FOR 65210E

**ACCELEROMETER AND GYRO CENTER OF GRAVITY POSITIONS WITH ADAPTER  
(Parabolic or Radome Ring DSU-33)**

Accelerometer	Axes (inches)		
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 inches			

Accelerometer	Axes (inches)		
Option A010, 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 inches			

Rate Gyro	Axes (inches)		
Option G1K0, G1K2	1-Lateral	2-Vertical	3-Longitudinal
A1 Lateral	+0.370	-0.518	-0.342
A2 Vertical	-0.112	-0.999	-0.342
A3 Longitudinal	-0.112	-0.518	+0.139
Gyro Position ±0.050 inches			



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").



SIGNAL CONDITIONING MODULES (SCM) FOR USE WITH 65210E

**Measure External Signals and Sensors with Signal Conditioning Modules (SCM)**

External dynamic sensors and signals can be integrated to the TE Connectivity 65210E by installing up to four Signal Conditioning Modules (SCMs) in the slots provided.

A variety of Signal Conditioning Modules are available for specific requirements. TE Connectivity can tailor SCMs for use with the 65210E to meet your needs. Please feel free to contact us to discuss your specific requirements.



**SIGNAL CONDITIONING MODULES (SCM)**

SCM Model No.	SCM Description	# of Channels	Factory Programmability			
			Excitation	Gain	Filter	AC/DC
85201A	Full bridge high impedance strain gauge inputs; ranges $\pm 25\text{mV}$ , $\pm 50\text{mV}$ , $\pm 100\text{mV}$ , $\pm 200\text{mV}$ ; 5-pole Butterworth low-pass programmable filter.	2	5V @ 25mA	Yes	Yes	Yes
85202A	ICP (IEPE) accelerometer module with battery voltage excitation; AC coupled; 5-pole Butterworth low-pass filter settable to 10kHz;	3	16V @ 4.7mA	No	Yes	AC only
85203B	General purpose 0-5V analog input.	4	9V @ 25mA	No	Yes	Yes
85204A	Full bridge low impedance ( $120\Omega$ or $350\Omega$ ) strain gauge inputs. Custom ranges, std is $\pm 2.5$ nom.; 5-pole Butterworth low-pass programmable filter.	3	5V @ 150mA	Yes	Yes	Yes
85205A	General purpose 0-5V analog input.	3	5V @ 25mA	No	Yes	Yes
85206A	General purpose 0-5V analog input with 4X oversampling for high-speed applications.	1	5V @ 1mA	No	Yes	DC only
85207A	-500 to +500V DC/AC input module, includes DC-coupled channel with 5-pole Butterworth low-pass programmable filter.	1	None	No	No	Ch 1 AC Ch 2 DC
85208A	FZU-48 2X simulated load; simulates loads typically seen from both forward and aft fuzewell (i.e. double load); use with 85207A .	1	None	No	No	No
85209A	10k thermistor input module; provides series resistor and pullup to form divider; 28Hz nom. low-pass filter	4	4.87V @ 25 $\mu$ A	No	No	No
85210A	External Input Module Type AH, GPS	4	N/A	N/A	N/A	N/A
85212A	External Input Module Type AI, 0-5V and 9V excitation	3	9V @ 25mA	No	Yes	No
85213A	External Input Module Type AJ, Digital Input Module with RS-422 & RS-485 Inputs	4	N/A	N/A	N/A	N/A

## ACCESSORIES

### 65250A Adaptor and 65250AK2 Programming Kit

A bidirectional momentary toggle switch and LED allow a 65250A adaptor to be used to activate the 65210 series IMS without additional hardware. Toggling the switch towards the LED will turn a 65210 IMS system on or off with the LED flashing when the power state change has completed. Toggling the switch away from the LED pulls the Aux line low.

The 65250AK2 programming kit includes a 6ft RS232 to adaptor cable and a 3ft adaptor to IMS cable providing all wiring required to communicate.



### 65251E Activation Plug

The 65251E Activation Plug can be used to enable or disable operation of the 65210 series IMS units. Connecting an activation plug to a 65210 IMS which is off causes the power up to be initiated. Connecting to a powered system will cause the system to power down when the plug is removed. A bicolored LED indicates the operational status. The 65251E Activation Plug provides power on/off control without any additional equipment.



### 65260A S-Band Monopole Antenna

The TE Connectivity 65260A antenna is reliable and rugged, designed to be used with the 65210 series IMS units. Operating over the 2200 to 2300 MHz S-band frequency range, the 65260A maintains a VSWR of less than 1.5:1, providing excellent efficiency.

The 65260A's true SMA-M interface allows direct attachment to 65210 Series Inertial Measurement Systems (IMS) without interference or damage to the SMA female connector. Holes are provided for tie down wires to ensure positive captivation.



### 65280A Battery Charger and 65284E Battery Replacement.

The 65280A Battery Charger plugs into any 110 VAC outlet and displays recharging status through an LED indicator. Designed to plug into the 65250A adaptor. For an International compatible power cord, order the model 65281A Battery Charger.

For a replacement battery, TE Connectivity offers the model 65284E Battery Replacement accessory.



### Additional Accessories

35290A	USB to RS232 Adaptor
65250E-T004	6-pin Lemo to DB9 cable, 4 ft.
65286E024	Lemo programming cable, 24 in.
65286E018	Lemo programming cable, 18 in.
65286E018R	Lemo programming cable, 18 in., right angle
65286R018SMA	RF cable extension, 18 in.
65286R004SMA	RF cable extension, 4 in.
65261A	15-pin connector, 10 ft. leads
65262A	25-pin connector, 10 ft. leads
65252A	M-F cable, 9 pin, 6 ft.
65269A	Alignment Pin Kit



## ORDERING INFORMATION

65210E	A040	G1K2	T01S	M2	Sabcd
<b>Accelerometers</b>					
A000 = None					
A010 = ±10g					
A040 = ±40g					
A050 = ±50g					
A100 = ±100g					
<b>Angular Rate Gyros</b>					
G000 = None					
G1K0 = ±1000°/sec					
G1K2 = ±1200°/sec					
GS00 = ±20,000°/s (roll axis only, ±1200°/s on other axes)					
<b>Transmitter</b>					
T000 = None					
T00S = 0.5W, 272kb/s, 2.2-2.3GHz, S band					
T01S = 0.5W, 1.5Mb/s, 2.2-2.3GHz, S band					
T03S = 0.5W, 3.0Mb/s, 2.2-2.3GHz, S band					
TA1S = 1.0W, 1.5Mb/s, 2.2-2.3GHz, S band					
TA1B = 1.0W, 1.5Mb/s, 2.2-2.4GHz, S band					
T11S = 1.5W, 1.5Mb/s, 2.2-2.3GHz, S band					
T13S = 1.5W, 3.0Mb/s, 2.2-2.3GHz, S band					
T20S = 2.0W, 272kb/s, 2.2-2.3GHz, S band					
T20U = 2.0W, 272kb/s, 2.3-2.4GHz, S band					
<b>Adapter</b>					
M1 = Parabolic Mounting					
M2 = Radome Ring (DSU33)					
<b>Installed Modules in Slots (a=100, b=200, c=300, d=400)</b>					
0 = None					
1 = 85201A 2-ch strain, 5V excitation					
2 = 85202A 3-ch IEPE XL, 16V excitation					
3 = 85203A 3-ch 0-5V input, 9V excitation					
4 = 85204A 3-ch strain, com 5V excitation					
5 = 85205A 3-ch 0-5V input, 5V excitation					
6 = 85206A 1-ch 4X ovsmp 0-5V input, 5V excitation					
7 = 85207A 1-ch 0-500VAC input (FZU)					
8 = 85208A 1-ch FZU-48 2X simulated load					
9 = 85209A 4-ch 10k thermistor					
Z = 85203B 4-ch 0-5V input, 9V excitation					

Example; 65210E-A040-G1K2-T01S-M2-S0000

Model 65210E, ±40g accel range, ±1200°/sec rate range, 0.5W 1.5Mb/s S-band Transmitter, Radome Ring Mounting Adapter

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