







## M O D E L **9210D**

# LOW FREQUENCY PORTABLE VIBRATION CALIBRATOR

- Verify Alert and Alarm Settings
- Simulate Vibration at Actual Running Speeds
- Rugged, Lightweight, and Battery-Powered Design
- On-Site ISO 8041 HVM Calibrations
- Ensure Accuracy of Critical Structural Tests
- Proximity Probe Adaptor Kit

## **TYPICAL APPLICATIONS**

- Hydro and Nuclear Power
- Human Vibration Measurement
- Seismic, Building Vibration
- Moving Coil Vibration Sensors
- Condition Monitoring System, Process Control, DCS and SCADA
- Portable Vibration Meters and Analyzers

## **REDUCE PERCEIVED RISK**

The 9210D Low Frequency Portable Vibration Calibrator is the world's first and only ISO 17025-accredited, NIST-traceable portable vibration calibrator capable of creating calibration certificates for critical instrumentation used to protect slow speed rotating equipment. Until now, technicians were required to remove moving coil velocity sensors, low frequency accelerometers and proximity probes during an outage and send these instruments to a separate lab for calibration. Battery-powered, rugged and portable, the Model 9210D brings low frequency calibration to the plant floor, allowing users to verify all aspects of their measurement chain, confirm correct operation of critical alarm thresholds, and create a printable, traceable calibration records.

Immediate instrument verification is available via sensitivity display on the brightly lit LCD screen. The test sensor input supplies ICP® power or can be toggled to voltage mode, allowing the unit to calculate sensitivity and create calibration certificates for Eddy current probes and moving coil velocity sensors. ISO 17025-compliant calibration certificates are created via Microsoft® Excel macro for both linearity and frequency response.

An internal high-resolution quartz reference accelerometer provides unparalleled accuracy while the rugged carbon fiber composite armature supports heavy payloads. A durable Pelican<sup>®</sup> Storm Case and long battery life make it ideal for use on the plant floor. Closed-loop control shortens calibration time. The 9210D can be scaled in displacement, velocity or acceleration (metric or English units) with 0.7 Hz to 2 kHz frequency range (42 to 120 000 CPM).

#### SPECIFICATIONS

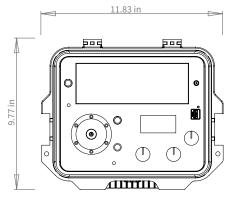
PerformanceFrequency Range (operating, 100 gram payload)0.7 Hz to 2 kHz42 to 120k CPMMax Acceleration (100 Hz, no payload)2 g pk305 mm/s pkMax Velocity (10 Hz, no payload)12 in's pk305 mm/s pkMaximum Payload <sup>11</sup> 800 gritterTest OperationMaximum Payload <sup>111</sup> 800 gritterTest OperationPass/Fail NotificationAnter Each Test PortNotices Coole CoolePass/Fail NotificationAfter Each Test PortStores 500 calibration Function SitterPoints Per Record; Mothumber, AdvantatorStores 500 calibration Function SitterPoints Per Record; Mothumber, Serial SitterStores 500 calibration Function SitterPoints Per Record; Mothumber, Serial SitterStores 500 calibration Function SitterPoints Per Record; Mothumber, Serial SitterStores 500 calibration Function SitterPoints Per Record; Mothumber, Serial SitterStores 500 calibration Function SitterPoints Per Record; Mothumber, Serial SitterStores 500 calibration Function SitterPoints Per Record; Mothumber, Mounting SitterStores 500 calibration Function SitterPoints Per Record; Mothumber, Mounting SitterStores 500 calibration Function SitterPoints Per Record; Mothumber, Mounting SitterStores 500 calibration Function SitterPoints Per Record; Mothumber, Mounting SitterStores 500 calibration Function SitterPoints Per Record; Mothumber, Mounting SitterStores 500 calibration Function SitterPoints Per Record; Mothumber, Mounting SitterStores 500 calibration Function SitterPoints Per Record; Sit	SPECIFICATIONS		
(operating, 100 gram payload)         0.7 P2 t0 2 KH2         P2 t0 120K CPM           Max Acceleration (100 Hz, no payload)         2 g pk         19.6 m/s² pk           Max Velocity (10 Hz, no payload)         12 in/s pk         305 mm/s pk           Max Displacement (1 Hz, no payload)         200 mils pk-pk         5 mm pk-pk           Maximum Payload <sup>[1]</sup> 800 gram         Stores 500 Calibration         Stores 500 Calibration           Pass/Fail Notification         After Each Test Port (CAL HOUTE Mode) Number, Mounting Orientation & Notes; Semi-Automated Test Routine         Stores 500 Calibration           Programmability         Up to 30 Test Points per Records; 30 Data Number, Mounting Orientation & Notes; Semi-Automated Test Routine           Programmability         Up to 30 Test Points per Records; 30 Data Number, Mounting Orientation & Notes; Semi-Automated Test Routine           Acceleration and Velocity (2 Hz to 2 kHz) <sup>[2] [7]</sup> ±3 %           Displacement (1 Hz to 150 Hz) <sup>[3]</sup> ±10 %           Displacement (1 Hz to 150 Hz) <sup>[3]</sup> ±10 %           Maveform Distortion (>54 Hz to 20 Hz)         Typical!< 1%	Performance		
(100 Hz, no payload)         2 g pk         19.6 m/s* pk           Max Velocity (10 Hz, no payload)         12 in/s pk         305 mm/s pk           Max Displacement (1 Hz, no payload)         200 mils pk-pk         5 mm pk-pk           Maximum Payload <sup>11</sup> 800 gr=ms         7 mage pk-pk           Maximum Payload <sup>111</sup> A800 gr=ms         7 mage pk-pk           Maximum Payload <sup>111</sup> Stores 500 Calibration Records; 30 Data Points per Record; Model Number, Serial Number, Mounting Orientation & Notes; Stemi-Automatic Test Routors           Semi-Automate Test Routor (Model Number, Serial Number, Mounting Orientation & Notes; Stemi-Automatic Test Routors         7 mage pk           Acceleration and Velocity         ±10 %         1 spison           (0.7 Hz to 2 kHz) <sup>121</sup> ±10 %         1 spison           Displacement (0.7 Hz to 150 Hz) <sup>121</sup> ±2 GPK         4 mage pk           Mayeform Distortion (>20 Hz to 2 KHz)         Typicall < 1 %		0.7 Hz to 2 kHz	42 to 120k CPM
Max Displacement (1 Hz, no payload)200 mils pk-pk5 mm pk-pkMaximum Payload <sup>[1]</sup> 800 gramsTest OperationAfter Each Test Pont (CALROUTE Mode)Pass/Fail NotificationAfter Each Test Pont (CALROUTE Mode)MemoryStores 500 Calibration Records, 30 Data Proints Per Record: Model Number, Serial Number, Mounting Orientation & Notes; Semi-Automated Test RoutineProgrammabilityUp to 30 Test Points per Record: Model Number, Serial Number, Mounting Orientation & Notes; Semi-Automated Test RoutineAcceleration and Velocity (2 Hz to 2 KHz) <sup>[21] (1]</sup> ±3 %Displacement (3 Hz to 15 Hz) <sup>[31]</sup> ±10 %Displacement (1 Hz to 150 Hz) <sup>[31]</sup> ±10 %Displacement (1 Hz to 150 Hz) <sup>[31]</sup> ±10 %Maveform Distortion (>5 Hz to 20 Hz)Typically < 15 %		2 g pk	19.6 m/s² pk
Maximum Payload <sup>[1]</sup> 800 gramsTest OperationManual (Closed Loop) or Semi-AutomaticPass/Fall NotificationAfter Each Test Pont (CAL ROUTE Mode)MemoryStores 500 Calibration Records; 30 Data Points Per Record; Model Number, Serial Number, Mounting Orientation & Notes; Semi-Automated Test RoutineProgrammabilityUp to 30 Test Points per Routine with Pass/ Fail Upper & Lower Bount Tolerances.Acceleration and Velocity (2 Hz to 2 kHz) <sup>[2] (7]</sup> $\pm 3 \%$ Acceleration and Velocity (0.7 Hz to 2 kHz) <sup>[2] (7]</sup> $\pm 10 \%$ Displacement (3 Hz to 15 Hz) <sup>[3]</sup> $\pm 3 \%$ Displacement (1 Hz to 150 Hz) <sup>[3]</sup> $\pm 10 \%$ Displacement (0.7 Hz to 150 Hz) <sup>[3]</sup> $\pm 2 d B$ Amplitude Linearity (100 gram payload, 100 Hz)Typically < 1 % up to 2 g pk	Max Velocity (10 Hz, no payload)	12 in/s pk	305 mm/s pk
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Pass/Fail Notification         After Each Test Port (CAL ROUTE Mode)           Memory         Stores 500 Calibration Records; 30 Data Points Per Record; Model Number, Serial Number, Mounting Orientation & Notes; Semi-Automated Test Routine           Programmability         Up to 30 Test Points per Routine With Pass/ Fail Upper & Lower Bound Tolerances.           Acceleration and Velocity (0.7 Hz to 2 KHz) [21 (7)         ±3 %           Acceleration and Velocity (0.7 Hz to 2 KHz) [21 (7)         ±10 %           Displacement (3 Hz to 15 Hz) [3]         ±3 %           Displacement (1 Hz to 150 Hz) [3]         ±2 (8)           Amplitude Linearity (100 gram payload, 100 Hz)         1 % up to 2 g pk           Waveform Distortion (>5 Hz to 20 Hz)         Typically < 1 %	Maximum Payload [1]	800 gra	ams
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(10) gram payload, 100 Hz) $< 1 \%$ up to 2 g pkWaveform Distortion (1 Hz to 5 Hz)Typically < 15 %		±2 dB	
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Waveform Distortion (>20 Hz to 2 kHz)Typically < 7 %Acceleration (peak and RMS)gm/s²Velocity (peak and RMS)in/smm/sDisplacement (peak to peak)mils $\mu$ mFrequencyHzCPMTest Sensor SensitivitymVEU [4]PhysicalTest Sensor InVoltageICP® [5]Test Sensor Input Voltage [8]20 mV-10 V AC pk-pkBias Fault Indication (ICP® Sensors)YesExternal Source In (max)1 V AC RMSMonitor Reference Out100 mV/g buffered internal reference outputInternal Battery (sealed solid gel lead acid)12 VDC, 4 amp hoursAC Power (for recharging battery)110–240 VDC, 50–60 HzInput Power Rating from charger18 VDC, 1 AOperating Battery Life <sup>[6]</sup> 32 °F-122 °F100 gram payload (100 Hz 1 g pk)32 °F-122 °FOperating Temperature32 °F-122 °FDimensions (H x W x D)8.5 x 12 x 10 in82 x 30.5 x 28 cmWeight18 lb8.2 kgSensor Mounting Platform Thread Size¼-28		Typically < 15 %	
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Physical         Test Sensor In       Voltage       ICP® [5]         Test Sensor Input Voltage [8]       20 mV–10 V AC pk-pk         Bias Fault Indication (ICP® Sensors)       Yes         External Source In (max)       1 V AC RMS         Monitor Reference Out       100 mV/g buffered internal reference output         Internal Battery (sealed solid gel lead acid)       12 VDC, 4 am hours         AC Power (for recharging battery)       110–240 VDC, 50–60 Hz         Input Power Rating from charger       18 VDC, 1 A         Operating Battery Life <sup>[6]</sup> 7 hours         100 gram payload (100 Hz 1 g pk)       14 hours         Operating Temperature       32 °F–122 °F       0 °C–50 °C         Dimensions (H x W x D)       8.5 x 12 x 10 in       22 x 30.5 x 28 cm         Weight       18 lb       8.2 kg         Sensor Mounting Platform Thread Size       ¼-28       ¼-28			
Test Sensor InVoltageICP® [5]Test Sensor Input Voltage [8]20 mV-10 V AC pk-pkBias Fault Indication (ICP® Sensors)YesExternal Source In (max)1 V AC MMSMonitor Reference Out100 mV/g buffered internal reference outputInternal Battery (sealed solid gel lead acid)12 VDC, 4 JmAC Power (for recharging battery)110–240 VDC, 50–60 HzInput Power Rating from charger18 VDC, 1 AOperating Battery Life [6]0 °C–50 °C100 gram payload (100 Hz 1 g pk)14 hours100 gram payload (11 Hz 0.02 g pk)7 hoursOperating Temperature32 °F–122 °F0 °C–50 °CDimensions (H x W x D)8.5 x 12 x 10 in22 x 30.5 x 28 cmWeight18 lb8.2 kgSensor Mounting Platform Thread Size14-28		mv	EU [4]
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Bias Fault Indication (ICP® Sensors)       Yes         External Source In (max)       1 V AC RMS         Monitor Reference Out       100 mV/g buffered internal reference output         Internal Battery (sealed solid gel lead acid)       12 VDC, 4 amp hours         AC Power (for recharging battery)       110–240 VDC, 50–60 Hz         Input Power Rating from charger       18 VDC, 1 A         Operating Battery Life <sup>16]</sup> 0°C–50 °C         100 gram payload (100 Hz 1 g pk)       14 hours         Operating Temperature       32 °F–122 °F       0 °C–50 °C         Dimensions (H x W x D)       8.5 x 12 x 10 in       22 x 30.5 x 28 cm         Weight       18 lb       8.2 kg         Sensor Mounting Platform Thread Size       ¼-28       ¼-28			
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Operating Battery Life <sup>[6]</sup> Operating Battery Life <sup>[6]</sup> 100 gram payload (100 Hz 1 g pk)         14 hours           100 gram payload (1 Hz 0.02 g pk)         7 hours           Operating Temperature         32 °F–122 °F         0 °C–50 °C           Dimensions (H x W x D)         8.5 x 12 x 10 in         22 x 30.5 x 28 cm           Weight         18 lb         8.2 kg           Sensor Mounting Platform Thread Size         ¼-28         ¼-28	AC Power (for recharging battery)	110-240 VDC, 50-60 Hz	
100 gram payload (100 Hz 1 g pk)       14 hours         100 gram payload (1 Hz 0.02 g pk)       7 hours         Operating Temperature       32 °F–122 °F       0 °C–50 °C         Dimensions (H x W x D)       8.5 x 12 x 10 in       22 x 30.5 x 28 cm         Weight       18 lb       8.2 kg         Sensor Mounting Platform Thread Size       14 hours	Input Power Rating from charger	18 VDC, 1 A	
100 gram payload (1 Hz 0.02 g pk)         7 hours           Operating Temperature         32 °F-122 °F         0 °C-50 °C           Dimensions (H x W x D)         8.5 x 12 x 10 in         22 x 30.5 x 28 cm           Weight         18 lb         8.2 kg           Sensor Mounting Platform Thread Size         14-28         14-28	Operating Battery Life [6]		
Operating Temperature         32 °F-122 °F         0 °C-50 °C           Dimensions (H x W x D)         8.5 x 12 x 10 in         22 x 30.5 x 28 cm           Weight         18 lb         8.2 kg           Sensor Mounting Platform Thread Size         14-28         14-28	100 gram payload (100 Hz 1 g pk)	14 hours	
Dimensions (H x W x D)         8.5 x 12 x 10 in         22 x 30.5 x 28 cm           Weight         18 lb         8.2 kg           Sensor Mounting Platform Thread Size         14-28         14-28	100 gram payload (1 Hz 0.02 g pk)	7 hours	
Weight18 lb8.2 kgSensor Mounting Platform Thread Size14-2814-28	Operating Temperature	32 °F–122 °F	0 °C–50 °C
Sensor Mounting Platform Thread Size 14-28 14-28	Dimensions (H x W x D)	8.5 x 12 x 10 in	22 x 30.5 x 28 cm
	Weight	18 lb	8.2 kg
Integral Armature Lock Supplied	Sensor Mounting Platform Thread Size	1⁄4-28	1⁄4-28
	Integral Armature Lock	Supplied	

SPECIFICATIONS (continued)		
Optional Accessories		
9105C	Transfer standard reference accelerometer and ICP <sup>®</sup> sensor signal conditioner, for calibration and system verification of the 9200 Series Calibrators.	
9100-MPPA01	Proximity probe adaptor kit, supports probes with common case threads ranging from M6 to ¾ in. Includes Mitutoyo micrometer (metric) and 9100-PPA02 nickel-plated 4140 steel target.	
9100-PPA01	Proximity probe adaptor kit, supports probes with common case threads ranging from M6 to ¾ in. Includes Mitutoyo micrometer and 9100-PPA02 nickel-plated 4140 steel target.	
Accessory Pouch		
Power Supply and Plug Adaptors, 1/4-28 to 1/4-28 Adaptor, 10-32 to 1/4-28 Adaptor		

and Mounting Pad. Ships with shipping lock (remove before use). USB Flash Drive with Calibration Report Generation Worksheet.



**Hydropower Plant** 



Model 9210D Technical Drawing

[1] Operating range reduced at higher payloads. Reference manual for full details.

[1] Operating range recubed at higher payoads. Reference
 [2] Measured with 30 gram quartz reference accelerometer.
 [3] Measured with laser displacement interferometer.
 [4] EU can be [g], [m/s<sup>2</sup>], [in/s], [mm/s], [mils] or [µm].
 [5] 5 mA constant current excitation to ICP® (IEPE) sensor.
 [6] As shipped from factory in new condition.

- [0] As simple in on racially in new condition.
  [7] Depending upon payload at higher frequencies transverse motion may cause localized increased measurement uncertainty.
  [8] Expected low frequency calibration limitations per sensor under test sensitivity:

  1000 mV/g: 0.9 Hz
  500 mV/g: 2 Hz

  - 100 mV/g: 3 Hz

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