AT-2040 Gen 2

PORTABLE VIBRATION TEST SET

Portable Vibration Calibrator with Signal Simulator

APPLICATIONS

- Troubleshoot cabling and wiring
- Simulate vibration signals for accelerometers and velocity probes
- Simulate machinery-speed signals
- Calibrate:
  - Accelerometers
  - Monitoring systems
  - Proximity probes and drivers
  - Analyzers
  - Avionics equipment

ADVANCED FEATURES

- High-accuracy sensor simulation
- Built-in charge converter
- Automatic low-battery shutdown
- Built-in power supplies
- Automatic mass-load correction
- Networking capabilities
- Fully-automated testing
- Data exports to PDF certificate or CSV
- Advanced computer algorithms for accurate readout

LITHIUM IRON PHOSPHATE BATTERY

- Longer lifespan & longer cycle life of up to 5,000 cycles at 80% depth of discharge, or 10 years.
- Lighter weight
- More environmentally friendly than lead-acid batteries
- Higher constant power ensures full battery power at low charge
- Ten times faster charging than lead-acid batteries
- Can withstand high temperatures without decomposing, and is non-flammable and non-toxic

OVERVIEW

The AT-2040 Gen 2 is a dual-purpose portable vibration test set that combines a precision electrodynamic shaker with a high-accuracy electronic sensor simulator, enabling both physical vibration calibration and full electrical system verification in one compact instrument.

Its closed-loop shaker delivers stable, low-distortion vibration for accelerometers, velocity sensors, and vibration meters, using a laser-calibrated primary reference, precision quartz reference accelerometer, and distortion-compensation algorithms to ensure repeatable accuracy across a wide frequency and amplitude range.

The integrated simulator and function generator produce highly accurate IEPE, charge, 4–20 mA, coil, and proximity-probe signals for analyzer validation, linearity checks, and rapid end-to-end system testing without mounting a sensor or running the shaker. Simulator mode supports amplitude levels far beyond mechanical capability.

A dedicated mechanical bearing-fault pulse mode generates true impact-style waveforms and defect harmonics, allowing verification of envelope detection, alarm thresholds, and early-fault response under real mechanical excitation without seeded defects or rotating machinery.

The AT-2040 provides direct sensor inputs and onboard positive and negative power supplies for IEPE, charge, 4–20 mA, coil, and proximity-probe systems, supporting both industrial and aviation-class instrumentation.

By integrating a precision shaker, advanced simulator, and mechanical fault-pulse generator, the AT-2040 delivers exceptional versatility for calibration labs, field service teams, and sensor-system developers. Calibration of the AT-2040 and its accuracy has been accredited to ISO 17025 by a 3rd party, A2LA.[1]

FUNCTIONALITY

- Create calibration certificates for vibration instruments.
- Test all types of vibration sensors and transducers from a variety of accelerometer and proximity probe manufacturers.
- Test and verify the performance of vibration meters, portable data collectors, and cabling using an accurate and traceable signal generator to simulate a variety of sensors.
- Test impulse or impact signals on transducers or data acquisition systems.
- Create sensor database files on the device.
- Rapidly identify and solve issues in vibration system setup using comprehensive, user-friendly software tools.
- Control AT-2040 from a remote location.

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1 Vibration simulator and bearing fault simulator not part of A2LA scope.

SPECIFICATIONS

AT-2040 Gen 2

Electrodynamic Shaker Performance		
Frequency Range (operating)[1]	5 Hz to 10,000 Hz	300 to 600,000 RPM
Maximum Amplitude (100 Hz, with no payload)	20 g pk 15 in/s pk 50 mils p-p	196 m/s² pk 380 mm/s pk 1270 µm p-p
Maximum Payload[2]	800 grams	
Waveform Type	Sine or Impulse	
PureWave™ Distortion Correction	• Active harmonic cancellation system • Reduces total harmonic distortion (THD) • Corrects up to 30 harmonics	

Maximum Sinusoidal Output (Sinusoidal Excitation)			
Parameter Value	(Imperial)	Value (Metric)	Frequency (Typical)
Maximum Acceleration	20 g pk	196 m/s² pk	≈ 50–1000 Hz
Maximum Velocity	20 in/s pk	508 mm/s pk	≈ 50 Hz
Maximum Displacement	0.20 in pk-pk	5.1 mm pk-pk	≈ 40 Hz
Test Conditions: Measured with bare table and reference accelerometer. Maximum achievable output is limited by frequency, payload mass, and shaker dynamics.			

System Architecture	
Linux Kernel	OS embedded, optimized for real-time I/O
Database	• Internal SQL storage for automatic test profiles • Create sensor database files on device
Sensor Test Method	• Manual sensitivity • Automatic sweep, with sensitivity and deviation relative to reference frequency. Includes phase data.
Sensor Select	Built-in transducer library
Calibration Sheets	• Automatic creation to memory • Export to PDF or CSV • Certificate includes test point with graph
Memory	• 16 GB (internal storage) • MicroSD slot for additional storage
Hardware Architecture	• FPGA-based signal generation and acquisition • 24-bit codec for high-resolution signal processing • Digital signal routing for multiple input/output configurations • GPIO-controlled relay matrix for signal path selection
Signal Processing	• DFT-based amplitude and phase measurement • Real-time harmonic analysis • Configurable high-pass filtering • Automatic gain ranging
Safety Features	• Automatic amplitude limiting based on frequency • Over-displacement protection (200 mils p-p maximum) • Low-frequency amplitude reduction to prevent mechanical damage • Validation of all user-entered test parameters • Automatic shutdown on alarm conditions

Simulation Performance[4]	
Frequency Range	1 to 11,000 Hz
Maximum Simulation Amplitude	150 g pk @ 10 mV/g
Test Type	Manual
Waveform Type	Sine

Simulator Sensor Types Supported	• Velocity
	• Proximity probes
	• 4-20 mA vibration transmitters
	• Accelerometer:
	  • Voltage
	  • Charge
	  • IEPE

Accuracy[5]	
Acceleration (5 Hz to 9 Hz)	±3.2 %
Acceleration (10 Hz to < 5 kHz)	±2.2 %
Acceleration (5 kHz to 10 kHz)	±3.0 %
Velocity (10 Hz to 1,000 Hz)	±2.2 %
Displacement (30 Hz to 150 Hz)	±2.2 %
Amplitude Linearity (100 gram payload, 100 Hz)	< 1 % up to 10 g pk
Waveform Distortion (100 gram payload, 30 Hz to 2 kHz)	< 1 % THD (typical) up to 5 g pk

Input/Output		

Test Sensor Inputs	• Accelerometer:
	  • Voltage
	  • Charge
	  • IEPE
	• 4-20 mA vibration transmitters
		• Velocity
		• MEMS[3]
		• Piezoresistive[3]
		• Capacitive[3]
		• Proximity probes

Bias Measurement	Yes	
Sensitivity Measurement	• Automatic sensitivity calculation in mV/g, pC/g, or mV/unit • Phase angle measurement (relative to reference) • Distortion percentage display • Multi-point frequency sweep capability	
Built-in Excitation Current and Supply Voltages for Transducers	• IEPE current source • –24 V proximity driver source	• +24 V 4-20 mA supply • Variable voltage supply

Readout				
Acceleration	g pk	m/s² pk	g RMS	m/s² RMS
Velocity	mm/s pk	in/s pk	mm/s RMS	in/s RMS
Displacement (peak to peak)	mils p-p	mm p-p	µm p-p	
Frequency	Hz		RPM	

Bearing Fault Simulator	
Fault Types	Outer Race (BPFO), Inner Race (BPFI), Cage Fault (FTF)
Ball-Count Range	1–99 (user adjustable)
Shaft Speed Range	User adjustable (Hz or RPM)
Amplitude Units	g(Peak)
Fault Signal Components	Impact pulses, BPFO/BPFI/FTF frequencies
Harmonics Generated	2×, 3×, 4× fault frequency (amplitude decreases with order)

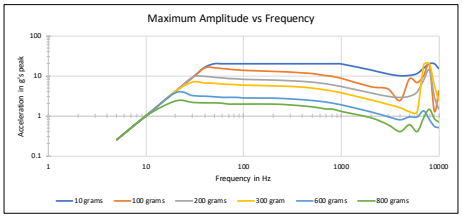
Power		
Internal Battery	12 V DC	6 amp hours
Battery Type	$LiFePO_4$	
Battery Charge Time	1 hour	
Battery Life Expectancy	5,000 cycles at 80% depth-of-discharge, or 10 years	
AC Power Input (for recharging battery)	100–240 V AC, 50–60 Hz, integrated charger with IEC C13 power cord	
Operating Mode Battery Life	• Low output: Up to 18 hours • Typical testing (mixed use): ~4-12 hours • Continuous high-output vibration: ~1 hour	

Physical		
Sensor Connectors	BNC, DIN, terminal strip	
Display	4.3" capacitive TFT LCD (480×272 px), high-brightness, anti-glare surface	
Controls	Capacitive touchscreen with 2 dials	
Dimensions (H × W × D)	10.6 × 9.7 × 6.9 in	27 × 24.6 × 17.4 cm
Weight	13.0 lb, 12 oz.	6.24 kg
Sensor Mounting Platform Thread Size	¼-28	
Operating Temperature	32–122 °F	0–50 °C
Agency Requirements and Certifications[4]	A2LA Accredited NIST Traceable EMC:EN61326-1 LVD:EN61010-1	ISO/IEC17025:2017 RoHS ANSI/NCSL Z540 Traceable

Accessories		
Included Accessories	• Power cable • Micro dot (10-32) • ¼-28 stud • 2-56 UNC adapter • 10-32 UNF stud • 6-32 UNC adapter • 10-32 UNF adapter • Short-handle wrench	• Universal Accelerometer Adapter Disc • Universal Velocity Adapter Disc • USB drive: loaded with templates for sensor CSV import and manual
Optional Accessories[6]	• Proximity Probe Adapter Kit (digital or manual micrometer) • Chadwick-Helmuth® Velocimeter Cable • Triaxial Accelerometer Adapter • Mems Adapter	
Warranty	2 years (includes drift/accuracy)	
Tech Support	Training webinars, email support	

1 100 gram payload.

2 Maximum weight recommendations for sine signal; see figure below (click here to visit our website for a larger chart). Limited at lower frequencies to 0.1 inch (2.54mm) Peak displacement.



3 Sensors require a MEMS-100 MEMS Adapter.

4 Vibration simulator and bearing fault simulator not part of A2LA scope.

5 Accuracy only applies to sine signals; it does not apply to impulse.

6 For comprehensive list, please consult the Product Spec Sheet or contact sales.

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