

ECON

UCON *series*

Vibration Transducer Calibration



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Overview

UCON Vibration Transducer Calibration System is designed for calibrating sensitivity, frequency response characteristic and amplitude linearity of acceleration transducer.

There are three basic operation modes for the calibration system:

- Calibration of vibration transducers by comparative measurements using a stable high-precision back-to-back transducer or laser interferometer.
- Calibration of measuring instruments and systems with self-contained indication by applying defined values of vibration parameters a, v, and d.
- Calibration of calibrators by absolute measurement of vibration parameters a, v, and d.

In these basic operation modes, ECI 9102/9108 system adopts back-to-back method and meets demands made on a High-Tech equipment of precision class.

The system also meets all and any requirements for streamlining of test procedures by:

- Automatic test run and automatic user-specific record printout.
- Possible processing of test results using spreadsheet programs.

Based on ECI 9102/9108 programmable calibrator, ECON supplies an effective and powerful calibration system for vibration transducers quality assurance, working calibration, and reference calibration of back- to- back transducer. The frequency range is to 10,000 Hz (extendable).



Features

Vibration Transducer Calibration System

The vibration calibration system has the following advantages:

Automatic

Friendly GUI with real-time profile display; all the testing process can be set up and auto-complete by the computer, Real-time monitoring, self- diagnosis and smart alarming in progress

High-precision

Control System has high dynamic range and precision, the calibration uncertainty only depends on the exciter and amplifier system. Calibration uncertainty 0.5%;

Combination of control and calibration

ECI 9102/9108 can not only complete the exciter control but also make calculation and graphics for calibration results.

Superb marking function

Single cursor, double cursor, read the meaning of the cursor location of the X1, Y1, X2, Y2; harmonic cursor mark; automatic peak / valley detect and mark the cursor.

Auto report generation

After test, the system can generate detailed illustrations WORD report, including amplitude linearity and frequency response characteristic curve.

Applications

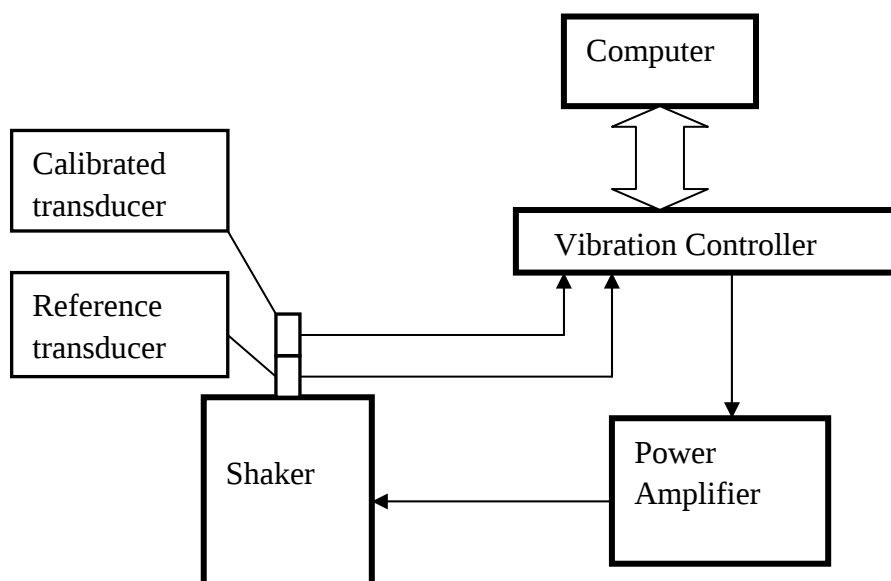
- Quality assurance in transducer production
- Piezoelectric transducers or IEPE transducers calibration
- Quick and accurate calibration of sensitivity, amplitude linearity and frequency response
- Adopts back-to-back method, traceability to national standard, GB/T 20485.21-2007 (ISO 16063-21:2003)
- Measuring uncertainty: 0.5 % under reference conditions, depending on the ability of employed shaker and reference transducer
- Frequency range: 1Hz-10 KHz, depending on the ability of employed shaker and reference transducer
- Departments for supervision of measuring instruments in research and industry as required by ISO 9000
- Reference calibration of back-to-back transducer
- Working calibration of vibration transducers
- Supervision of test equipment as required by ISO 9000 for transducers calibrators charge amplifier measuring system as a mobile system for testing stationary measuring and testing equipment in production lines in accordance with ISO 9000
- Calibration methods: Swept sine, step sine and FFT method
 - Swept sine: customers can define swept sine profile
 - Step sine: test frequency points can be customized or automatically equally distributed (linearity or logarithm)
 - FFT method: customers can define amplitude, sampling frequency, points and frequency range
 - Substitute method: can save/import test data of sensitivity, frequency response characteristic and amplitude linearity of reference transducer to working transducer

Specifications

An Integrated Vibration Transducer Calibration System consists of following parts:

- Standard shaker and its amplifier
- ECI 9102/9108, calibration software and computer
- Reference transducer

Picture shows the following framework:



1. Standard shaker and its amplifier

Modal		MT-2015
Rated Sine Force		150N
Rated random force (rms)		110N
Rated Shock force		300N
Frequency Range		5-5000Hz
Max. Displacement		6 mm(P-P)
Rated Acceleration		20 g
Rated Velocity		1.2 m/s
Effective Mass of Moving Element		0.75Kg
Max. load		2.0 Kg
Shaker Amplifier	Type	MP-1200
	Rated output	1.2 kVA
	System Weight (uncrated)	28 Kg

2. ECI 9102/9108 Programmable Calibrator

In the course of calibration, ECI 9102/9108 programmable calibrator generates standard sine signal required for calibrating, then the signal through the power amplifier drive the exciter. The output signal from standard transducer will be as a closed-loop control signal, the output signal from calibrated transducer will be as a feedback signal to the ECI 9102/9108, then ECI 9102/9108 makes calculation, drawing curves on the data, and then displayed on the computer screen.

Inputs

Analog channels	2~8 synchronized channels, each channel can be set to control or disable the measurement.
Resolution	24-bit ADC
Dynamic range	110 dB
Filtering	An analog filter plus a 160 dB/octave digital filter
Maximum input	$\pm 36V_{PEAK}$ without damage
Amplitude Accuracy	0.08dB
Signal-to-noise measured with	> 100 dB (DC to 1,000 Hz half-full-scale sine wave)

Regulatory Compliance

Compliance	CE Marking
Safety	EN 61326-1:1997, EN 61010-1:2001

Outputs

Analog channels	One Drive Channel
Resolution	24-bit DAC
Dynamic range	110 dB
Filtering	An analog filter plus a 160 dB/octave digital filter
Harmonic distortion	<-100dB
Output impedance	30 K Ω

General

Mechanical	
Dimension (mm)	VT-9002: 362x278x79 (mm)
Weight (Kg)	VT-9002: 2.77 (Kg)
Electrical	
AC Power	88 to 264 Volts, 47 to 63 Hz, auto sensing
Consumption(W)	VT-9002: 40
Environmental	
Temperature	41 to 113 °F, -10 to 50°C
Humidity	20% to 90% RH non-condensing

Swept sine performance

- To provide standard swept sine signal.
- Dynamic range is greater than 95dB.
- Typical closed-loop time is 5ms.
- Waveform distortion is less than 0.3 percent.
- Signal to noise ratio is greater than 100dB.
- The frequency resolution is 0.01%.

3. Reference transducer

- Type: EA-SC-232
- Charge Output
- Sensitivity: 1pC/ms^2
- Frequency Range: $0.5\sim 10000\text{Hz}$ ($\pm 5\%$)
- Harmonic Frequency: 32KHz
- Transverse Sensitivity: $<3\%$
- Working Temperature: $-50\sim 250^\circ\text{C}$
- Weight: 25gram
- Dimension: $13\times 25\times 20\text{ mm}$

Calibration items

1. Sensitivity and the stability test

You should connect standard transducers with calibrated transducer in back-to-back way, installing exciter in the center of the table. Vibration controller generates frequency of 160Hz (or 80Hz) and acceleration vibration signals of (100m/s^2 or 10m/s^2). In this state, sensitivity of preparatory calibrated transducer will be work out. Then, stability indexes will be work out according to the reference sensitivity.

2. Amplitude-frequency response calibration

1) Continuous scanning

With ECI 9102/9108, vibration transducers and a standard compose a closed-loop control system, then setting preparatory calibrated transducer into exciter, ECI 9102/9108 generated swept sine signal (for example, from 20Hz to 8KHz), the output curves of standard transducer and preparatory calibrated transducer will be got by vibration controller respectively. By comparing, we get the frequency response of be-calibrated transducer.

2) Point by point comparison

You should connect standard transducer with be-calibrated transducer in back-to-back way, installing exciter in the center of the table. In the selected frequency range (according to the frequency range of be-calibrated transducer), according to the uniform scale select at least 10 points. Through setting ECI 9102/9108, the sine incentives as well as response of each frequency are confirmed automatically. It automatically records the whole process of testing, by comparing the two transducer outputs in the same frequency point; you will get frequency response of be-calibrated transducer in different frequencies.

3) FFT method

You should connect standard transducers with calibrated transducer in back-to-back way, installing exciter in the center of the table. Vibration controller generates a specified white noise, the output curves of standard transducer and preparatory calibrated transducer will be got by vibration controller respectively. By comparing, we get the frequency response of be-calibrated transducer.

2. Amplitude linearity test

According to the dynamic range of be-calibrated transducer, choosing 7-14 points inner its acceleration (Including the largest and the smallest acceleration), check the accelerometer's sensitivity with resonance method or impact method.

Control Parameters

Sensitivity

☒ Measure

Reference Frequency:

160

Hz

Reference Level:

100

m/s²

Amplitude Linearity

☒ Measure

Insert

Delete

	Acceleration(m/s ²)
1	10
2	20
3	30
4	40
5	50
6	60
7	70

Frequency Response

☒ Measure

☒ Sweep Sine

Graph...

☐ Step Sine

Insert

Delete

	Freq.(Hz)	Acceleration(m/s ²)
1	20	100
2	25	100
3	31.5	100
4	40	100
5	50	100
6	63	100
7	80	100
8	100	100
9	125	100

☐ FFT

Setting...

Sine Dwell Duration:

30

s

Drive Limit:

10

V

Advanced...

☒ Substitution

Import STD/ATD Data

☐ Sensitivity

Browse

☐ Amplitude Linearity

Browse

☐ Frequency Response

Browse

OK

Cancel

Help

Ordering Information**ECI 9102****ECI 9108****Hardware**

- ECI 9102/9108 2 analog input channels (with built-in ICP sensor power and built-in charge amplifier)
 1 analog output (drive) channel
 Integrated manual abort button
 Steel/aluminum case with shock guards
 CE Compliant
- ECI 9108 8 analog input channels (with built-in ICP sensor power and built-in charge amplifier)
 1 analog output (drive) channel
 Integrated manual abort button
 Steel/aluminum case with shock guards
 CE Compliant

Software

9211	Sensitivity Calibration
9211-01	Automatic Calibration Report (requires 9211)
9212	Point by Point Frequency Response Calibration with Range of 1~5KHz
9212-01	Calibration Frequency Range Extension ~10KHz (requires 9212)
9212-02	Calibration Frequency Range Extension ~20KHz (requires 9212)
9212-03	Enhanced Swept Sine Calibration (requires 9212)
9212-04	Enhanced Random Calibration (requires 9212)
9213	Amplitude Linearity Calibration
9214	Transverse Sensitivity
9215	Enhanced Substitution Calibration (requires 9211)

About ECON Technologies

ECON Technologies is a leading developer and of vibration test products, industrial measurement instruments in China. We have a pioneering and innovative R&D team and manufacturing facility located in Hangzhou, China.

We provide solutions to Quality & Reliability Assurance, Vibration/Shock Test, Data Acquisition and Logging, NVH, Structural Modal test, Rotating Machine Diagnostics, Acoustics Analysis, as well as Industrial Monitoring and Control.

We have customers from automotive, aerospace/aviation, vessel, electronics, computers, and research institutes as well as universities. Up to now, more than 2,000 products are installed and in operation worldwide.

At ECON, we are aware of the challenges that face the test and measurement applications from field to lab in the 21st century, and we have well prepared to face these challenges with you.



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Ref: 2011.04.25