Overview

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, UCON 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 programmes.

Based on UCON vibration controller, 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

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
UCON VT-9002 vibration controller 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
- 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
- UCON VT-9002 vibration controller, calibration software and computer
- Reference transducer

Picture shows the following framework:
Vibration Transducer Calibration System

1. Standard shaker and its amplifier

<table>
<thead>
<tr>
<th>Modal</th>
<th>TC-50</th>
<th>TC-100</th>
<th>TC-200</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated Sine Force</td>
<td>50N</td>
<td>98N</td>
<td>50N</td>
</tr>
<tr>
<td>Rated random force (rms)</td>
<td>35N</td>
<td>89N</td>
<td>50N</td>
</tr>
<tr>
<td>Frequency Range</td>
<td>5-5000Hz</td>
<td>5-12,000Hz</td>
<td>5-20,000Hz</td>
</tr>
<tr>
<td>Max. Displacement</td>
<td>15mm(P-P)</td>
<td>18mm(P-P)</td>
<td>18mm(P-P)</td>
</tr>
<tr>
<td>Rated Acceleration</td>
<td>17g</td>
<td>40g</td>
<td>30g</td>
</tr>
<tr>
<td>Effective Mass of Moving Element</td>
<td>0.30Kg</td>
<td>0.25Kg</td>
<td>0.16Kg</td>
</tr>
<tr>
<td>Max. load</td>
<td>1.0Kg</td>
<td>2.0Kg</td>
<td>2.0Kg</td>
</tr>
<tr>
<td>Weight (uncrated)</td>
<td>20Kg</td>
<td>20Kg</td>
<td>20Kg</td>
</tr>
<tr>
<td>Shaker Amplifier</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>SA-50</td>
<td>SA-100</td>
<td>SA-200</td>
</tr>
<tr>
<td>Rated output</td>
<td>0.25kvA</td>
<td>0.45kvA</td>
<td>0.25kvA</td>
</tr>
<tr>
<td>Weight (uncrated)</td>
<td>15Kg</td>
<td>15Kg</td>
<td>15Kg</td>
</tr>
</tbody>
</table>

2. UCON VT-9002 Vibration controller

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

**Inputs**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Analog channels</td>
<td>2~8 synchronized channels, each channel can be set to control or disable the measurement.</td>
</tr>
<tr>
<td>Resolution</td>
<td>24-bit ADC</td>
</tr>
<tr>
<td>Dynamic range</td>
<td>110 dB</td>
</tr>
<tr>
<td>Filtering</td>
<td>An analog filter plus a 160 dB/octave digital filter</td>
</tr>
<tr>
<td>Maximum input</td>
<td>± 36V&lt;sub&gt;PEAK&lt;/sub&gt; without damage</td>
</tr>
<tr>
<td>Amplitude Accuracy</td>
<td>0.08dB</td>
</tr>
<tr>
<td>Signal-to-noise measured with</td>
<td>&gt; 100 dB (DC to 1,000 Hz half-full-scale sine wave)</td>
</tr>
</tbody>
</table>

**Outputs**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog channels</td>
<td>One Drive Channel</td>
</tr>
<tr>
<td>Resolution</td>
<td>24-bit DAC</td>
</tr>
<tr>
<td>Dynamic range</td>
<td>110 dB</td>
</tr>
<tr>
<td>Filtering</td>
<td>An analog filter plus a 160 dB/octave digital filter</td>
</tr>
<tr>
<td>Harmonic distortion</td>
<td>&lt; -100dB</td>
</tr>
<tr>
<td>Output impedance</td>
<td>30 KΩ</td>
</tr>
</tbody>
</table>

**General**

<p>| | |</p>
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Mechanical Dimension (mm)</td>
<td>VT-9002: 362x278x79 (mm)</td>
</tr>
<tr>
<td>Weight (Kg)</td>
<td>VT-9002: 2.77 (Kg)</td>
</tr>
<tr>
<td>Electrical</td>
<td></td>
</tr>
<tr>
<td>AC Power</td>
<td>88 to 264 Volts, 47 to 63 Hz, auto sensing</td>
</tr>
<tr>
<td>Consumption(W)</td>
<td>VT-9002: 40</td>
</tr>
</tbody>
</table>

**Regulatory Compliance**

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<thead>
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<tbody>
<tr>
<td>Compliance</td>
<td>CE Marking</td>
</tr>
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</table>

**Environmental**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Temperature</td>
<td>41 to 113 ºF, -10 to 50 ºC</td>
</tr>
<tr>
<td>Humidity</td>
<td>20% to 90% RH non-condensing</td>
</tr>
</tbody>
</table>

**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/ms²
- Frequency Range: 0.5~10000Hz (±5%)
- Harmonic Frequency: 32KHz
- Transverse Sensitivity: <3%
- Working Temperature: -50~250℃
- Weight: 25gram
- Dimension: 13x25x20 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/s² or 10m/s²). 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 UCON vibration controller, vibration transducers and a standard compose a closed-loop control system, then setting preparatory calibrated transducer into exciter, UCON vibration controller 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 the UCON vibration controller, 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.
Ordering Information

Hardware
VT-9002 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 Marking

Software
VT-9205-1 Sensitivity Calibration Software (required)
VT-9205-2 Amplitude Linearity Calibration Software (required)
VT-9205-3 Frequency Response Calibration Software (Bundle)
VT-9205-31 Swept Sine Calibration Software
VT-9205-32 Step Sine Calibration Software
VT-9205-33 Random (Simple FFT) Calibration Software
VT-9205-34 Substitution FFT Calibration Software
VT-9205-4 Frequency Limitation Password DC~5 kHz
VT-9205-5 Frequency Limitation Password 5k ~10 kHz
VT-9205-6 Frequency Limitation Password 10k ~20 kHz (requires VT-9205-33)
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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