Vibration Testing

Calibration of Shakers & Vibration Transducers

Shaker calibration with Minirator MR-PRO

The Minirator MR-PRO generates low frequency 1 - 10 Hz sine wave-files in 1 Hz steps. These test signals are typically required for low frequency vibration or seismic applications such as driving a vibration source. This application note describes how to utilize the MR-PRO for calibration of vibration applications.

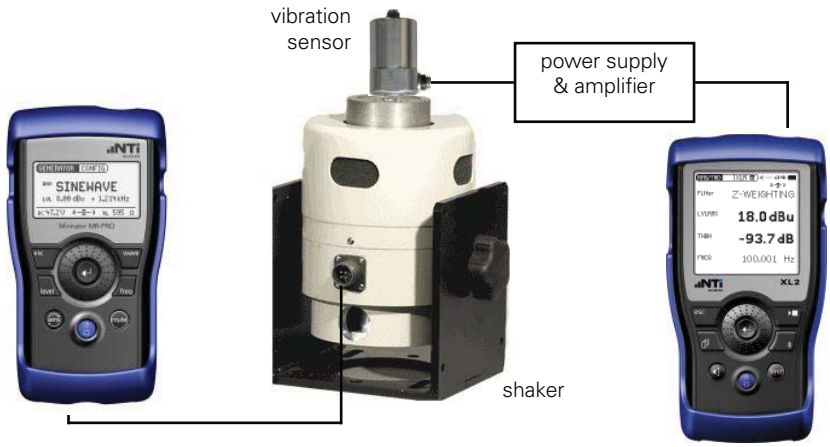
The Minirator generates low distortion test signals from 1 to 10 Hz. These signals are tailored for driving vibration shakers and for the calibration of vibration transducers. Shakers and vibrations transducers are typically used in automotive, aviation and machinery industry.

1. Calibration of vibration transducers

Vibrations sensors typically operate in the frequency range from 1 Hz to 20 kHz. In order to calibrate a vibration accelerometer its sensitivity needs accurately be determined in mV/g or pC/g. Additionally the amplitude-frequency response shall be recorded and the resulting flatness tolerance verified with the manufacturer specifications.

The portable signal generator MR-PRO is the ideal test signal source providing accurate sinusoidal signals from 1 Hz – 20 kHz for the calibration of vibration transducers.

Test configuration:



Calibration of vibration transducer with MR-PRO & XL2

The Minirator drives the shaker and a wideband voltmeter reads the output signal of the vibration transducer (alternatively the NTi Audio XL2 measures the vibration frequency and signal level).

How to measure the transducer sensitivity?

Adjust the MR-PRO output frequency to 159.2 Hz (=1000 rad/s, the typical calibration frequency).

- Set the MR-PRO output level according the technical specifications of the shaker and the vibration transducer, the resulting shaker vibration is for example 10 g = 10x 9.81 m2/sec.
- Measure the vibration transducer output signal with the XL2 (select the RMS/THD+N function).
- The sensitivity of vibration accelerometer is calculated as sensitivity = measured voltage / 10g = x V/g
- Verify the specified operation range of the shaker and vibration sensor and measure the frequency response in this range. The Minirator MR-PRO generates the following test signals:

  - for frequencies > 10 Hz to SINE signal

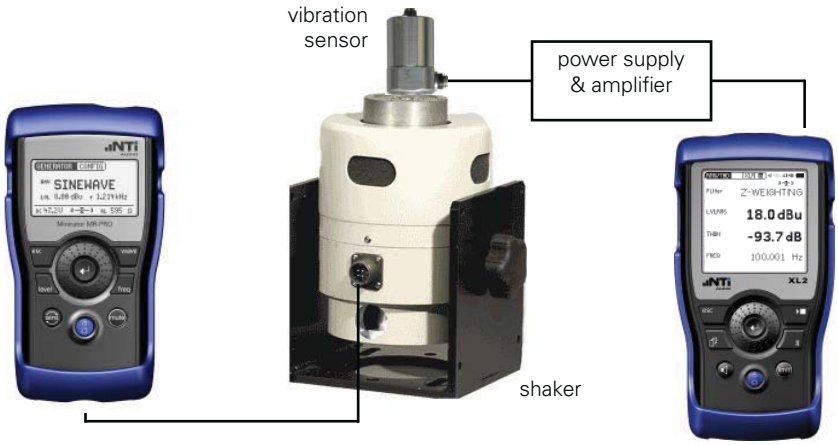
  - for frequencies < 10 Hz to WAVE

    (load 1-10 Hz wav files into the internal MR-PRO memory)

2. Testing of vibration shakers

The operation verification of shakers is vice versa to the above described calibration guideline of vibrations transducers. A calibrated transducer is utilized and mounted on the shaker. In this manner the sensitivity and operation of the shaker can be verified.

Test configuration:



Calibration of shakers with MR-PRO & XL2

How to calibrate the shaker?

- Adjust the MR-PRO output frequency to 159.2 Hz (=1000 rad/s, the typical calibration frequency).
- Set the MR-PRO output level according the technical specifications of the shaker and the vibration transducer, the resulting shaker vibration is for example 10 g = 10x 9.81 m2/sec.
- Measure the output signal of the reference vibration transducer with the XL2 (select the RMS/THD+N function).
- The sensitivity of the reference vibration accelerometer is listed in the product specifications. The vibration frequency is shown in the XL2 display. The actual vibration level is calculated as
- vibration level = measured voltage/(10x sensitivity) = x m/s^2
- Verify the specified operation range of the shaker and vibration sensor and measure the frequency response in this range. The Minirator MR-PRO generates the following test signals:

  - for frequencies > 10 Hz to SINE signal

  - for frequencies < 10 Hz to WAVE

    (load 1-10 Hz wav files into the internal MR-PRO memory)

The wave file set with sinusoidal subsonic frequencies 1 – 10 Hz is available for download at NTi Audio website.

This application note has been developed in cooperation with the NTi Audio partner in Czech, Mr. Bedrich Votypka, Spectris. Many thanks!

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