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## Calibration, Vibration Transducer, 501.XX



### Main Characteristics

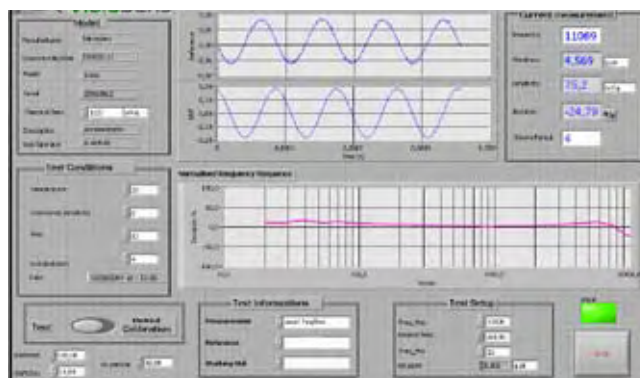
- Vibration transducer calibration from 10 Hz to 10 kHz
- Calibration of most vibration transducer :
  - piezoelectric charge accelerometer
  - accelerometer with constant current excitation
  - velocimeter
- Back to back method with compensation for :
  - electrical gain
  - reference accelerometer frequency response
- Traceable to PTB

### Introduction

The VibraSens PC based automated accelerometer calibration system provides traceable calibration of most vibration transducer. It consists of a high frequency shaker, a PC and a 12 bit two channels 5 MS/s data acquisition card. Its operational software is based on National Instrument Labview.

### Description

This system provides a significant improvement in vibration calibration. High speed data acquisition associated with Labview allow compensation of parameters that were not possible with analog system.



### Back to back calibration with substitution.

Our system includes Back to back calibration with substitution. This technique greatly improved the accuracy of the measurement using 2 reference accelerometers with known and traceable sensitivity on the entire frequency range. The computer then corrects for electronic

gain at each frequency. It virtually eliminates uncertainties due to temperature variation and signal conditioner gain on the entire frequency range.

**Filtering technique**

Digital system uses more powerful signal processing to reduce the signal noise ratio. The reference and Unit under test accelerometer are both stimulated with a sinusoidal signal. Unfortunately, the system is poised with noise and harmonic distortion. The power amplifier and the transverse mechanical resonance of the shaker are the main distortion sources. Our calibration is performed in the frequency domain where we apply a cross correlation technique between the input and output signal. This almost removes all signal not correlated with the input signal of the shaker.

**Mass loading**

Mass loading on back to back calibration system can be a high source of uncertainty. At 10kHz with a 200 grammes sensor, the deviation of the curve are well below 0.5%. We have therefore decided to not compensate our system for this effect.

**Data Storage and output**

The system automatically generates a report of the test. The user can then print or saved it in Acrobat PDF format.

**Specifications**

**Principle**

**Back to back calibration by substitution**

Conform to ISO 5347-3

**Electrical Input type**

Charge for piezoelectric transducers (single ended or differential)

Voltage with constant current supply (ICP type)

Current input with constant voltage supply

Voltage for velocity transducer (velocity coil)

Voltage for piezoresistive or capacitive accelerometer

**range, acceleration transducer**

Charge : ..... 0.02-5000 pC/g

Voltage : ..... 1-10 000 mV/g

Current : ..... 0.01 to 100 uA/g

**range, velocity transducer**

Voltage : ..... 0.5-100 mV/mm/s

**Frequency range**

Accelerometers ..... 10Hz to 10kHz

Velocimeters : ..... 10Hz to 2.5kHz

**Max transducer weight**

10Hz to 5kHz ..... 500 g

10Hz to 10kHz ..... 60 g

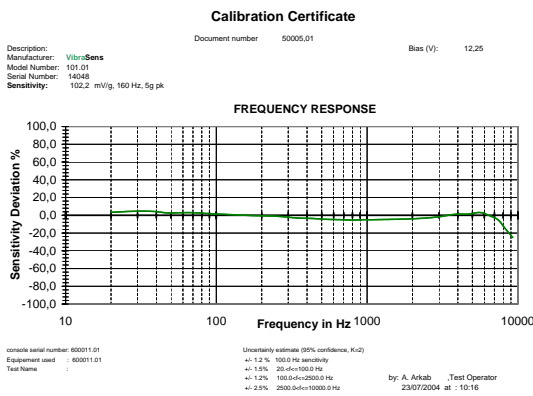
**Accuracy**

**Absolute errors are as follows :**

10Hz-4kHz ..... 1.2%

4-7kHz ..... 1.8%

7-10kHz ..... 2.6%



**Ordering information**

To order, specify part number and vibration parameters :

**501.01**, Calibration, Vibration Transducer, single point, (vibration parameter to be defined)

**501.11**, Calibration, Vibration Transducer, sinusoidal sweep, 10Hz to 10kHz, (vibration parameter to be defined)

**Ordering example :**

501.01, Calibration, Vibration Transducer, frequency=160Hz, 5g

501.01, Calibration, Vibration Transducer, frequency=80Hz, 50mm/s

501.11, Calibration, Vibration Transducer, frequency=10Hz to 5kHz, 5g

501.11, Calibration, Vibration Transducer, frequency=10Hz to 1kHz, 5ips