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**Design, Test, and Evaluation Division
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IEST-RP-DTE011.1

**Mechanical Shock and Vibration
Transducer Selection**

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1 SCOPE AND LIMITATION

The purpose of this Recommended Practice is to provide guidelines for selecting transducers to measure shock and vibration in laboratory and field testing environments. Some special applications are not covered because of their unique nature and the rapid advancements taking place in their disciplines. These include a variety of biodynamic and biomechanical tests. Even in those applications not specifically addressed, however, these recommendations may be helpful.

There are basically two classes of motion transducers: fixed-reference and mass-spring (relative motion). Non-contact transducers, such as laser interferometric displacement and laser Doppler velocity transducers, are fixed-reference designs. Although they offer some unique properties, these instruments are used to measure shock and vibration only in applications where a fixed reference is available, and where their cost, size, and physical space and geometry requirements are acceptable. Similarly, video and photographic displacement measurement techniques are sometimes useful for motion analysis of large, complex structures or mechanisms, but they are used mostly for verification. These fixed-reference techniques, which have different constraints, are discussed elsewhere.^{1,2,3} This Recommended Practice will concentrate on the more common mass-spring type transducers, with the sensing element(s) represented by the spring.

The following recommendations apply to dynamic measurements on objects over 10 grams, with frequencies ranging from DC (0 Hz) to over 100 kHz. Only measurements of linear (translational) motion are considered; measurement of angular or rotational motion is addressed as an application at the end of the document.

Recent developments^{4,5,6} in smart sensor technology have the potential to revolutionize the measurement industry, and play an important role in transducer selection. However, part of the IEEE standard directly related to transducer selection had not been finalized as of publication of this Recommended Practice. We therefore limit our discussion in this document to the basic concept of mixed-mode, point-to-point smart sensor where it is relevant. A complete look at multi-drop smart sensor technology will be included in future revisions.

2 REFERENCES

It is recommended that the user reference manufacturers' specification and application data in the selection and use of equipment. Please see Appendix A: Bibliography for informative resources.

3 TERMS AND DEFINITIONS

accelerometer

A transducer whose instantaneous output is proportional to the instantaneous acceleration input.

acoustic sensitivity

The rated output produced by a non-acoustic transducer in the presence of a specified acoustic field.

back-to-back comparison method

A method of performing a sensitivity/frequency response calibration of an accelerometer by mounting the unit under test to the "back" of a reference standard and comparing the outputs of the two devices.