

# National Bureau of Standards

## Certificate

### Standard Reference Material 1856

#### Acoustic Emission Transducer

Serial No. \_\_\_\_\_

This Standard Reference Material (SRM) is a displacement-measuring transducer. SRM 1856 is intended to be used to determine the size and character of surface vibrations in the frequency range of 0.1 to 1 MHz. It may also be used as a standard against which other transducers may be calibrated.

The certified data for this SRM are given in Table 1

At each frequency,  $f_n = 9765.624 n$  (Hz), where  $n = 1, 2, 3, \dots, 204$ , we have calculated the magnitude,  $y_n$ , and the phase,  $\theta_n$ , of the response of the transducer under test relative to that of the NBS capacitive standard transducer. The values of  $y_n$  are expressed in decibels relative to  $1V/\mu\text{m}$ . Graphs are provided, which are piecewise linear functions constructed through the data points. Table 1 gives values for  $y_n$  and  $\theta_n$  as functions of frequency. The values of  $y_n$  from 0.1 MHz to 1.0 MHz are certified to be within the uncertainty limits given below. Other values of  $y_n$  and all values of  $\theta_n$  are not certified and are given for information only.

Within the frequency range of 0.1 MHz to 1.0 MHz, the fractional uncertainties of the values of  $y_n$  are estimated to be  $\pm 1.5$  dB. The values of  $\theta_n$  are indeterminate within multiples of  $2\pi$ .

The transducer shown in Figure 1, consists of a truncated cone of lead-zirconate-titanate, polarized axially, and bonded at its large end to a large brass backing block. In use, the small end of the cone is placed on the surface the displacement of which is to be measured. Electrodes at the ends of the cone make contact with the mounting surface (ground) and the brass block (hot electrode).

An amplifier is included as part of SRM 1856. This amplifier is built so that its box forms a partial electrical shield for the transducer's hot electrode. The input lead to the amplifier makes electrical contact with the brass block through gold contacts. The amplifier has an output impedance of 50 ohms and should be connected to a 50 ohm resistive load.

The transducer was calibrated using the NBS steel block facility. The calibration provides the voltage output of the transducer per unit of displacement of the mounting surface as a function of frequency. The surface displacement is that which would occur in the absence of the transducer. The calibration procedure is described in reference 1.

The technical work leading to the development of SRM 1856 was performed in the Ultrasonic Standards Group of the NBS Mechanical Production Metrology Division by T.M. Proctor, Jr., S.E. Fick, and F.R. Breckenridge.

The overall direction of the technical efforts was performed by D.G. Eitzen.

The support for the production and certification of this SRM was coordinated through the Office of Standard Reference Materials by L.J. Kieffer and R.L. McKenzie.

Gaithersburg, MD 20899  
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Stanley D. Rasberry, Chief  
Office of Standard Reference Materials

1. Acoustic Emission Transducer Calibration by Means of the Seismic Surface Pulse, Breckenridge, F.R., J Acoust. Emission 1, No. 2, 1982.

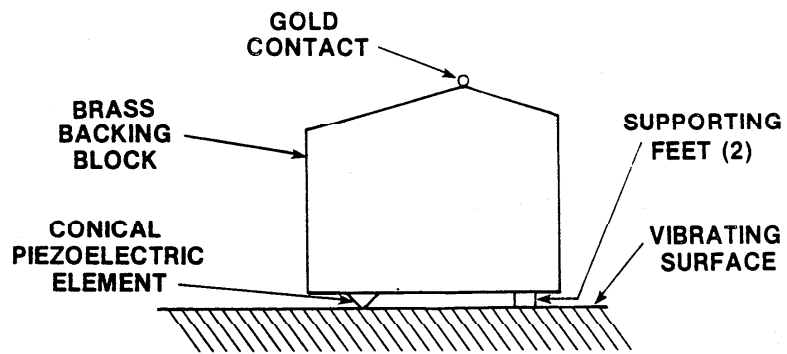


Figure 1. Schematic diagram of the NBS conical transducer.