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**Electrical test methods for piezoelectric ceramic vibrators**

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## Forward

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Standard of Japan Electronics and information Technology Industries Association

## Electrical test methods for piezoelectric ceramic vibrators

### Introduction

This standard was established 1993. Because of amendment of numerical value and unification of numerical formula, we revised this standard.

There is no international specification corresponding to this standard.

### Introduction at establishment

Since 1973, in the piezoelectric ceramic technical committee, we made standardization of the test methods for piezoelectric ceramic vibrators and established the industrial association standard about an electrical test method for the bellows.

**EMAS-6001:** The radial vibration of a disk vibrator (established July 1977)

**EMAS-6002:** The axial vibration of a column vibrator (established October 1979)

**EMAS-6003:** The thickness extensional vibration of a disk vibrator (established October 1979)

**EMAS-6004:** The length extensional vibration of a rectangular plate shape vibrator  
(established June 1982)

**EMAS-6005:** The thickness shear vibration of a rectangular plate shape vibrator  
(established August 1983)

**EMAS-6006:** Poisson's ratio (established March 1985)

**EMAS-6007:** Measurement and calculation of material constant (established March 1986)

Making these standards, some inconvenience had pointed out in the content of early version standards, and there was an opinion to point out an incommensurability of the separated volumes. In May 1990, we set up "Measurement method WG" under the technical committee, and started the work of the integration including the review of the above standards.

In Measurement method WG, we had established new standard number **EMAS-6100** to avoid confusion with the above standards. We divided roughly the constitution into **Chapter 1** (measurement method of vibrator) and **Chapter 2** (the measurement and the calculation of material constant). In **Chapter 1**, we described about common test method of piezoelectric ceramic vibrator. In **Chapter 2**, we described about test method and calculation method of several piezoelectric ceramic vibrators.

In **EMAS-6001~6007**, we determined the contents of measurement method, how to approximately measure,  $f_a$ ,  $f_r$ ,  $f_n$ , and  $f_m$  in case of not being able to measure directly  $f_s$  and  $f_p$ .

Recently, we can directly measure  $f_s$  and  $f_p$  with the latest measuring instruments such as impedance analyzers. In **EMAS-6100**, these measurement methods were summarized basically in accordance with these instruments.

In addition, there was an opinion to expect the supervision of an academic people because Measuring method WG consisted of the persons in piezoelectric device makers. After we finished deliberation in Measuring method WG, we requested to supervise of Professor Kiyoshi Nakamura of Tohoku University engineering department, and this standard is ready for the establishment here.