INTERNATIONAL STANDARD

ISO 21819-2

First edition
2018-08

Fine ceramics (advanced ceramics, advanced technical ceramics) — Characteristic of piezoelectric properties under high-load conditions —

Part 2:
Electrical transient response method under high vibration levels

Céramiques techniques (céramiques avancées, céramiques techniques avancées) — Caractéristique des propriétés piézoélectriques en conditions de charge élevée —

Partie 2: Méthode de la réponse transitoire électrique sous des niveaux vibratoires élevés

Reference number
ISO 21819-2:2018(E)

COPYRIGHT PROTECTED DOCUMENT

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Fax: +41 22 749 09 47
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Page

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 206, *Fine ceramics*.

A list of all parts in the ISO 21819 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Fine ceramics (advanced ceramics, advanced technical ceramics) — Characteristic of piezoelectric properties under high-load conditions —

Part 2:
Electrical transient response method under high vibration levels

1 Scope

This document specifies a method of measuring piezoelectric properties of piezoelectric fine ceramics and other piezoelectric devices. It applies to electrical transient response methods for evaluating the piezoelectric properties of piezoelectric fine ceramics resonators under high vibration levels.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 20507, *Fine ceramics (advanced ceramics, advanced technical ceramics) — Vocabulary*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 20507 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
electrical transient response method
method in which a voltage close to the resonance frequency is applied to a piezoelectric fine ceramic resonator, and a large amplitude state is realized by driving only for a brief time until vibration is excited, before characteristics of piezoelectric properties under an arbitrary vibration level are evaluated by using the attenuation waveform of vibration velocity and the current under short circuit of the electrical terminal

Note 1 to entry: Superior ability to exclude the effects of external electrical fields and temperature allows measurement and evaluation of characteristics in a vibrational stress load environment excluding these factors.

3.2
burst
driving for only a brief duration to excite vibration

4 Symbols

A	Force factor (N/V)
d_{31}	Equivalent piezoelectric constant (C/N)
f_{ri}	Resonance frequency of current (Hz)
f_{rv}	Resonance frequency of vibration velocity (Hz)
f_{rv1}	Instantaneous frequency of vibration velocity (Hz)
i	Current (A)
I_1	Instantaneous amplitude of current (A)
I_0	Amplitude of current (A)
M	Mass of test piece determined in 7.2 (kg)
Q_m*	Equivalent mechanical quality factor
s_{11}^E*	Equivalent elastic compliance(m^2/N)
t	Time (s)
T_m*	Amplitude of equivalent maximum stress on central region of test piece (Pa)
v	Vibration velocity (m/s)
V_0	Amplitude of vibration velocity (m/s)
V_1	Instantaneous amplitude of vibration velocity (m/s)
X	Width of test piece (m)
Y	Length of test piece (m)
β_i	Decay constant of current (S^{-1})
β_v	Decay constant of vibration velocity (S^{-1})
β_{v1}	Instantaneous decay constant of vibration velocity (S^{-1})
ϕ_i	Initial phase of current
Φ_v	Initial phase of vibration velocity
ρ	Density determined in 7.2 (kg/m^3)

5 Principle

A voltage e near the resonance frequency of a piezoelectric fine ceramic resonator is applied to driving voltage then reduced to 0, placing the electrical terminals in a shorted state (e = 0, see Figure 1).