

# INTERNATIONAL STANDARD



Measurement techniques of piezoelectric, dielectric and electrostatic  
oscillators –  
Part 2: Phase jitter measurement method

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**MEASUREMENT TECHNIQUES OF PIEZOELECTRIC,  
DIELECTRIC AND ELECTROSTATIC OSCILLATORS –****Part 2: Phase jitter measurement method**

## FOREWORD

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International Standard IEC 62884-2 has been prepared by IEC technical committee 49: Piezoelectric, dielectric and electrostatic devices and associated materials for frequency control, selection and detection.

The text of this International Standard is based on the following documents:

CDV	Report on voting
49/1212/CDV	49/1243/RVC

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the IEC 62884 series, published under the general title *Measurement techniques of piezoelectric, dielectric and electrostatic oscillators*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific document. At this date, the document will be

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## INTRODUCTION

A crystal oscillator as a highly efficient and highly precise source of a frequency oscillation is widely used for fields such as the electronic equipment, communication equipment, measurement equipment and a clock. Also recently, digitalization of these equipments is advancing rapidly. In this situation, the frequency of crystal oscillator requires high precision and high stability and reduction of noise with oscillating phenomenon. A phase jitter is one of the noise characteristic in oscillation characteristic and precise measurement which is needed when shipping a component to a customer.

For advance application in electronic information and communication technology, (e.g. advanced satellite communications, control circuits for electric vehicle (EV)), necessity arises for the measurement method for common guidelines of phase jitter. In these days, measurement method of phase jitter also becomes more important from the electromagnetic influence (EMI) point of view.

This document has been restructured from IEC 60679-1:2007 (third edition) and IEC 60679-6:2011 (first edition). The test methods for oscillators have been separated from IEC 60679-6:2011 into IEC 62884 (all parts). This document covers the phase jitter measurement.

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# MEASUREMENT TECHNIQUES OF PIEZOELECTRIC, DIELECTRIC AND ELECTROSTATIC OSCILLATORS –

## Part 2: Phase jitter measurement method

### 1 Scope

This part of IEC 62884 specifies the methods for the measurement and evaluation of the phase jitter measurement of piezoelectric, dielectric and electrostatic oscillators, including dielectric resonator oscillators (DROs) and oscillators using a thin-film bulk acoustic resonator (FBAR) (hereinafter referred to as an "Oscillator") and gives guidance for phase jitter that allows the accurate measurement of RMS jitter.

In the measurement method, phase noise measurement equipment or a phase noise measurement system is used.

NOTE Dielectric resonator oscillators (DROs) and oscillators using FBAR are under consideration.

### 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.

IEC 60027 (all parts), *Letter symbols to be used in electrical technology*

IEC 60050-561, *International Electrotechnical Vocabulary – Part 561: Piezoelectric, dielectric and electrostatic devices and associated materials for frequency control, selection and detection*

IEC 60679-1:2017, *Piezoelectric, dielectric and electrostatic oscillators of assessed quality – Part 1: Generic specification*

IEC 60469, *Transitions, pulses and related waveforms – Terms, definitions and algorithms*

IEC 60617, *Graphical symbols for diagrams (available at <http://std.iec.ch/iec60617>)*

IEC 62884-1:2017, *Measurement techniques of piezoelectric, dielectric and electrostatic oscillators – Part 1: Basic methods for the measurement*

ISO 80000-1, *Quantities and units – Part 1: General*

### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60027 (all parts), IEC 60050-561, IEC 60469, IEC 60617, IEC 60679-1 and ISO 80000-1 apply.

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

- IEC Electropedia: available at <http://www.electropedia.org/>

- ISO Online browsing platform: available at <http://www.iso.org/obp>

## 4 Test and measurement procedures

### 4.1 General

The test and measurement procedures are given in Clause 4 of IEC 62884-1:2017 and shall be applied as indicated in 4.2 to Clause 8.

### 4.2 Test methods of phase jitter

#### 4.2.1 General

As the measurement method, the phase noise measurement equipment (system) or the specially designed phase jitter measurement equipment shall be used.

Three basic methods are described:

- a) measurement in the time domain by use of a digital real-time or sampling oscilloscope;
- b) measurement in the data domain (BER test set);
- c) measurement in the frequency domain using
  - 1) a phase noise test set, or
  - 2) a jitter and wander test set.

Method c) 1) using a phase noise test set is the recommended measurement method because it allows sufficient accuracy for arbitrary oscillator output frequencies.

- In the measurement of phase jitter and wander of oscillator circuits, attention should be paid to relative measurement reproducibility.
- A user and a manufacturer should deepen understanding through discussion about relative measurement reproducibility.
- Measurement equipment (including software program) should be made clear between a manufacturer and a user through a contract.
- When phase jitter and wander is calculated from phase noise, the range of frequency deviation should be made clear between a user and a manufacturer through a contract.

#### 4.2.2 Measurement in the time domain

Digital real-time or sampling oscilloscopes with wide bandwidth, fast sampling rates, and large data memories are commercially available (see Figure 1), in some cases with special jitter evaluation software.