
**Piezoelektrični, dielektrični in elektrostatični oscilatorji ocenjene kakovosti - 2. del:
Smernice za uporabo oscilatorjev (IEC 60679-2:2026)**

Piezoelectric, dielectric and electrostatic oscillators of assessed quality - Part 2:
Guidelines for the use of oscillators (IEC 60679-2:2026)

Piezoelektrische, dielektrische und elektrostatische Oszillatoren mit bewerteter Qualität -
Teil 2: Leitfaden für die Verwendung von Quarzkristalloszillatoren (IEC 60679-2:2026)

Oscillateurs piézoélectriques, diélectriques et électrostatiques sous assurance de la
qualité - Partie 2: Lignes directrices pour l'utilisation des oscillateurs (IEC 60679-2:2026)

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31.140	Piezoelektrične naprave	Piezoelectric devices
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EN IEC 60679-2

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English Version

**Piezoelectric, dielectric and electrostatic oscillators of assessed
quality - Part 2: Guidelines for the use of oscillators
(IEC 60679-2:2026)**

Oscillateurs piézoélectriques, diélectriques et
électrostatiques sous assurance de la qualité - Partie 2:
lignes directrices pour l'utilisation des oscillateurs
(IEC 60679-2:2026)

Piezoelektrische, dielektrische und elektrostatische
Oszillatoren mit bewerteter Qualität - Teil 2: Leitfaden für
die Verwendung von Quarzkristalloszillatoren
(IEC 60679-2:2026)

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European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

EN IEC 60679-2:2026 (E)**European foreword**

The text of document 49/1540/FDIS, future edition 2 of IEC 60679-2, prepared by TC 49 "Piezoelectric, dielectric and electrostatic devices and associated materials for frequency control, selection and detection" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 60679-2:2026.

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IEC 62884-1:2017	NOTE	Approved as EN 62884-1:2017 (not modified)
IEC 62884-2	NOTE	Approved as EN 62884-2
IEC 62884-3	NOTE	Approved as EN IEC 62884-3
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IEC 60068-2-6	NOTE	Approved as EN 60068-2-6
IEC 60068-2-7	NOTE	Approved as EN 60068-2-7
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IEC 60068-2-21	NOTE	Approved as EN IEC 60068-2-21
IEC 60068-2-17	NOTE	Approved as EN IEC 60068-2-17
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IEC 61340 (series)	NOTE	Approved as EN IEC 61340-6-1:2018/A1 (series)
IEC 60068 (series)	NOTE	Approved as EN 60068 (series)

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Annex ZA (normative)

Normative references to international publications with their corresponding European publications

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NOTE 1 Where an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60679-1	-	Piezoelectric, dielectric and electrostatic oscillators of assessed quality - Part 1 : Generic specification	EN 60679-1	-

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IEC 60679-2

Edition 2.0 2026-08

INTERNATIONAL STANDARD

**Piezoelectric, dielectric and electrostatic oscillators of assessed quality -
Part 2: Guidelines for the use of oscillators**

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**Piezoelectric, dielectric and electrostatic oscillators of assessed quality -
Part 2: Guidelines for the use of oscillators**

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IEC 60679-2 has been prepared by IEC technical committee 49: Piezoelectric, dielectric and electrostatic devices and associated materials for frequency control, selection and detection. It is an International Standard.

This second edition cancels and replaces the first edition published in 1981. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) some new contents that reflect the latest manufacturing technologies;
- b) added contents about the operating principle of crystal oscillators;
- c) added contents about usage precautions for crystal oscillators.

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

Draft	Report on voting
49/1540/FDIS	49/1544/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

A list of all parts of the IEC 60679 series, published under the general title *Piezoelectric, dielectric and electrostatic oscillators of assessed quality* 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 webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

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INTRODUCTION

Crystal controlled oscillators are commonly used to provide the stable frequencies required for telecommunications, navigations and data processing systems. Depending upon the frequency of operation, ambient conditions and specific oscillator design, crystal oscillators are capable of providing frequency stability varying from 1×10^{-4} to 1×10^{-10} .

This document offers a guideline that describes the general properties, performance characteristics and usage precautions for crystal oscillators.

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1 Scope

This part of IEC 60679 describes the general properties, performance characteristics and usage precautions for quartz crystal oscillators. This document mainly describes crystal oscillators, but some descriptions also apply to oscillators other than crystal units (e.g. MEMS resonators).

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60679-1 apply.

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

- IEC Electropedia: available at <https://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

4 Working principle of crystal oscillators

The operating principle of crystal oscillators is easier to understand when compared with that of a pendulum. To maintain the swing of a pendulum, the position and time point of maximum amplitude of the pendulum should be detected, and the operation of pushing the pendulum back should be repeated so that the time point and position are maintained. The pendulum corresponds to a crystal unit which comprises an amplifier with a feedback circuit that provides the detection and push-back force (see Figure 1).

A typical feedback amplifier (Colpitts circuit) is shown in Figure 2, where the signals at both terminals of the crystal unit are divided at capacitors C_A , C_B , one connected to the input side and the other to the output side. It can be considered that the "detection" in the case of the pendulum is on the input side of the feedback amplifier and the "push-back force" is given on the output side. Here, R_A and R_B are bleeder resistance to provide a fixed bias to the base terminal of the oscillation transistor, R_E is negative feedback resistance connected to the emitter and R_C is load resistance connected to the collector.

Next, in the state of oscillation, as shown in Figure 3, the oscillator circuit side which is viewed from the crystal unit terminals, can be represented by a series circuit of equivalent input capacitance C_i and equivalent input resistance R_i . In this case, the crystal unit side is equivalently an inductive effective inductance L_e and an effective resistance R_e and the crystal oscillation conditions are as follows:

Frequency condition:

$$\omega L_e - \frac{1}{\omega C_i} = 0 \quad (1)$$

where

ωL_e is the inductive effective inductance, and

ωC_i is the equivalent input capacitance.

Amplitude condition:

$$R_e \leq |R_i| \quad (2)$$

where

R_e is the effective resistance;

R_i is the equivalent input resistance.

The frequency condition determines the oscillation frequency. For the amplitude condition, equivalent input resistance on the circuit side shall be negative value in the vicinity of the oscillation frequency and at the small signal on the start-up, then this is called negative resistance. This negative resistance can be obtained with active circuits such as transistors and operational amplifiers. $|R_i|$ shall be designed to be larger than R_e in order to ensure oscillation at the start-up of the oscillator, meaning that $R_e = |R_i|$ in the steady-state following the end of the start-up and the oscillation becomes the steady-state amplitude.

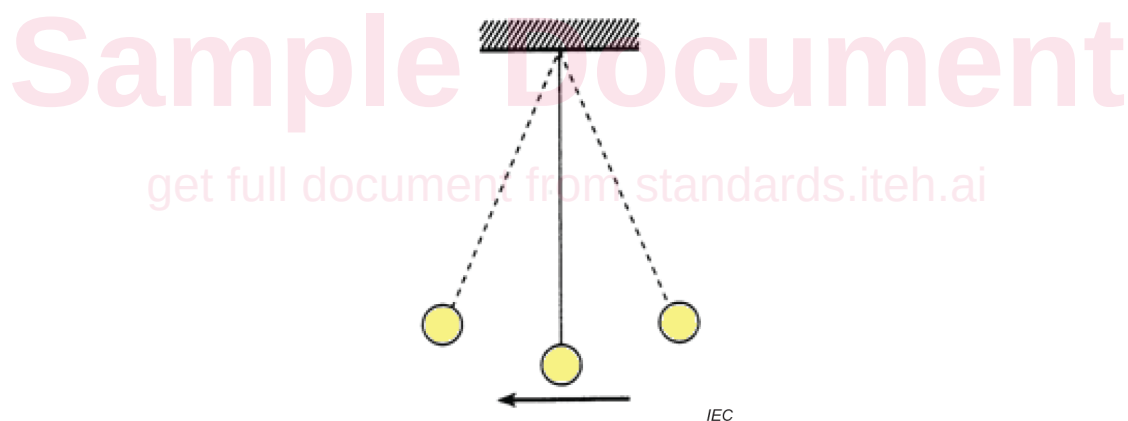


Figure 1 – Swinging pendulum motion

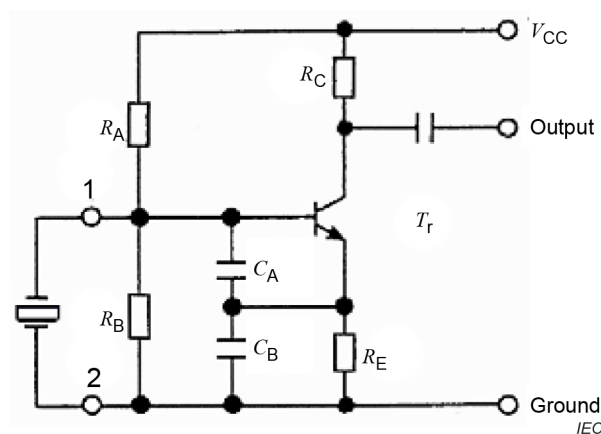


Figure 2 – Colpitts oscillator circuit