



BSI Standards Publication

Quartz crystal units of assessed quality

Part 1: Generic specification (IEC 60122-1:2002)

National foreword

This British Standard is the UK implementation of EN 60122-1:2002+A1:2018. It is identical to IEC 60122-1:2002, incorporating amendment 1:2017. It supersedes BS EN 60122-1:2002, which is withdrawn.

The start and finish of text introduced or altered by amendment is indicated in the text by tags. Tags indicating changes to IEC text carry the number of the IEC amendment. For example, text altered by IEC amendment A1 is indicated by A1 A1.

The UK participation in its preparation was entrusted to Technical Committee EPL/49, Piezoelectric devices for frequency control and selection.

A list of organizations represented on this committee can be obtained on request to its secretary.

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Amendments/corrigenda issued since publication

Date	Text affected
31 May 2018	Implementation of IEC amendment 1:2017 with CENELEC endorsement A1:2018

English Version

Quartz crystal units of assessed quality – Part 1: Generic specification (IEC 60122-1:2002)

Résonateurs à quartz sous assurance de la qualité –
Partie 1: Spécification générique (CEI 60122-1:2002)

Schwingquarze mit bewerteter Qualität – Teil 1:
Fachgrundspezifikation (IEC 60122-1:2002)

This European Standard was approved by CENELEC on 2002-10-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

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CENELEC members are the national electrotechnical committees of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and United Kingdom.



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

European Foreword

The text of document 49/551/FDIS, future edition 3 of IEC 60122-1, prepared by IEC TC 49, Piezoelectric and dielectric devices for frequency control and selection, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 60122-1 on 2002-10-01.

This European Standard supersedes EN 168000:1993 + A2:1998.

The following dates were fixed:

- | | | |
|--|-------|------------|
| — latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement | (dop) | 2003-07-01 |
| — latest date by which the national standards conflicting with the EN have to be withdrawn | (dow) | 2005-10-01 |

Annexes designated "normative" are part of the body of the standard.

In this standard, [annex ZA](#) is normative.

[Annex ZA](#) has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 60122-1:2002 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

- | | | |
|--------------------------------|------|--|
| IEC 60068-2-58 | NOTE | Harmonized as EN 60068-2-58:1999 (not modified). |
| IEC 60068-2-64 | NOTE | Harmonized as EN 60068-2-64:1994 (not modified). |

European foreword to amendment A1

The text of document 49/1254/FDIS, future edition 1 of IEC 60122-1:2002/A1, prepared by IEC/TC 49 "Piezoelectric and dielectric devices for frequency control and selection" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 60122-1:2002/A1:2018.

The following dates are fixed:

- | | | |
|--|-------|------------|
| • latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement | (dop) | 2018-10-12 |
| • latest date by which the national standards conflicting with the document have to be withdrawn | (dow) | 2021-01-12 |

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC shall not be held responsible for identifying any or all such patent rights.

Endorsement notice

The text of the International Standard IEC 60122-1:2002/A1:2017 was approved by CENELEC as a European Standard without any modification.

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

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.

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.

Publication	Year	Title	EN/HD	Year
IEC 60027	series	Letter symbols to be used in electrical technology — 60027 Part 1: General		series
IEC 60050-561	1991	International Electrotechnical Vocabulary (IEV) — Chapter 561: Piezoelectric devices for frequency control and selection	—	—
IEC 60068-1	1988	Environmental testing — Part 1: General and guid- ance	—	—
IEC 60068-2-1	1990	Environmental testing — Part 2: Tests — Tests A: Cold	—	—
IEC 60068-2-2	1974	Environmental testing — Part 2: Tests — Tests B: Dry heat	—	—
IEC 60068-2-3	1969	Basic environmental testing procedures — Part 2: Tests — Test Ca: Damp heat, steady state	—	—
IEC 60068-2-6	1995	Environmental testing — Part 2: Tests — Test Fc: Vibration (sinusoidal)	—	—
IEC 60068-2-7	1983	Basic environmental testing procedures — Part 2-7: EN 60068-2-7 Tests — Test Ga and guidance: Acceleration, steady state		1993
IEC 60068-2-13	1983	Basic environmental testing procedures — Part 2-13: Tests — Test M: Low air pressure	EN 60068-2-13	1999
IEC 60068-2-14	1984	Environmental testing — Part 2: Tests — Test N: Change of temperature	—	—
IEC 60068-2-17	1994	Basic environmental testing procedures — Part 2-17: Tests — Test Q: Sealing	EN 60068-2-17	1994
IEC 60068-2-20	1979	Environmental testing — Part 2: Tests — Test T: Soldering	—	—

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60068-2-21	1999	Environmental testing — Part 2-21: Tests — Test U: Robustness of terminations and integral mounting devices	—	—
IEC 60068-2-27	1987	Basic environmental testing procedures — Part 2: Tests — Test Ea and guidance: Shock	—	—
IEC 60068-2-29	1987	Environmental testing — Part 2: Tests — Test Eb and guidance: Bump	—	—
IEC 60068-2-30	1980	Basic environmental testing procedures. Part 2: Tests. Test Db and guidance: Damp heat, cyclic (12 + 12-hour cycle)	—	—
IEC 60068-2-32	1975	Basic environmental testing procedures — Part 2: Tests — Test Ed: Free fall	—	—
IEC 60068-2-45	1980	Basic environmental testing procedures — Part 2-45: Tests — Test XA and guidance: Immersion in cleaning solvents	EN 60068-2-45	1992
IEC 60122-3	2001	Quartz crystal units of assessed quality — Part 3: Standard outlines and lead connections	—	—
IEC 60444-1	1986	Measurement of quartz crystal unit parameters by zero phase technique in a pi-network — Part 1: Basic method for the measurement of resonance frequency and resonance resistance of quartz crystal units by zero phase technique in a pi-network	EN 60444-1	1997
IEC 60444-2	1980	Measurement of quartz crystal unit parameters by zero phase technique in a pi-network — Part 2: Phase offset method for measurement of motional capacitance of quartz crystal units	EN 60444-2	1997
IEC/TR 60444-4	1988	Measurement of quartz crystal unit parameters by zero phase technique in a pi-network — Part 4: Method for the measurement of the load resonance frequency fL, load resonance resistance RL and the calculation of other derived values of quartz crystal units, up to 30 MHz	EN 60444-4	1997
IEC 60444-5	1995	Measurement of quartz crystal unit parameters — Part 5: Methods for the determination of equivalent electrical parameters using automatic network analyzer techniques and error correction	EN 60444-5	1997
IEC 60444-6	1995	Measurement of quartz crystal unit parameters — Part 6: Measurement of drive level dependence (DLD)	—	—
IEC 60617	series	Graphical symbols for diagrams — Part 1: General information, general index, Cross-reference tables	EN 60617	series
IEC 61178-2	1993	Quartz crystal units — A specification in the IEC Quality Assessment System for electronic Components (IECQ) — Part 2: Sectional specification — Capability approval	—	—

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 61178-3	1993	Quartz crystal units — A specification in the IEC Quality Assessment System for electronic Components (IECQ) — Part 3: Sectional specification — Qualification approval	—	—
IEC 61760-1	2006	Surface mounting technology — Part 1: Standard method for the specification of surface mounting components (SMDs)	EN 61760-1	2006
IEC QC 001001	2000	IEC Quality Assessment System for Electronic Components (IECQ) — Basic rules	—	—
IEC QC 001002-2	1998	IEC Quality Assessment System for Electronic Components (IECQ) — Rules of Procedure — Part 2: Documentation	—	—
IEC QC 001002-3	1998	IEC Quality Assessment System for Electronic Components (IECQ) — Rules of Procedure — Part 3: Approval procedures	—	—
IEC QC 001005	2000	Register of firms, products and services approved under the IECQ system, including ISO 9000	—	—
ISO 1000	1992	SI units and recommendations for the use of their multiples and of certain other units	—	—

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FOREWORD

- 1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, the IEC publishes International Standards. Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. The IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of the IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested National Committees.
- 3) The documents produced have the form of recommendations for international use and are published in the form of standards, technical specifications, technical reports or guides and they are accepted by the National Committees in that sense.
- 4) In order to promote international unification, IEC National Committees undertake to apply IEC International Standards transparently to the maximum extent possible in their national and regional standards. Any divergence between the IEC Standard and the corresponding national or regional standard shall be clearly indicated in the latter.
- 5) The IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with one of its standards.
- 6) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. The IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 60122-1 has been prepared by IEC technical committee 49: Piezoelectric and dielectric devices for frequency control and selection.

This third edition of IEC 60122-1 cancels and replaces IEC 61178-1 published in 1993 and IEC 60302 published in 1969 and constitutes their technical revision.

International Standard IEC 60122-1 is the first part of a new edition of the IEC standard series for quartz crystal units of assessed quality.

The text of this standard is based on the following documents:

FDIS	Report on voting
49/551/FDIS	49/558/RVD

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

This publication has been drafted in accordance with the ISO/IEC Directives, Part 3.

IEC 60122 consists of the following parts under the general title: Quartz crystal units of assessed quality:

- Part 1: Generic specification (IEC 60122-1);
- Part 2: Guide to the use of quartz crystal units for frequency control and selection (IEC 60122-2 at present);

- Part 3: Standard outlines and lead connections (IEC 60122-3);
- Part 4: Sectional specification — Capability Approval (IEC 61178-2 at present);
- Part 4-1: Blank detail specification — Capability Approval (IEC 61178-2-1 at present);
- Part 5: Sectional specification — Qualification Approval (IEC 61178-3 at present);
- Part 5-1: Blank detail specification — Qualification Approval (IEC 61178-3-1 at present).

The QC number which appears on the front cover of this publication is the specification number in the IEC Quality Assessment System for Electronic Components (IECQ).

The committee has decided that the contents of this publication will remain unchanged until 2007. At this date, the publication will be

- reconfirmed;
- withdrawn;
- replaced by a revised edition, or
- amended.

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Quartz crystal units of assessed quality —

Part 1: Generic specification

1 General

1.1 Scope

This part of IEC 60122 specifies the methods of test and general requirements for quartz crystal units of assessed quality using either capability approval or qualification approval procedures.

1.2 Normative references

The following referenced documents are indispensable for the application 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):1991, *International Electrotechnical Vocabulary (IEV) — Chapter 561: Piezoelectric devices for frequency control and selection*

[IEC 60068-1:1988](#), *Environmental testing — Part 1: General and guidance*

[IEC 60068-2-1:1990](#), *Environmental testing — Part 2: Tests — Tests A: Cold*

[IEC 60068-2-2:1974](#), *Environmental testing — Part 2: Tests — Tests B: Dry heat*

[IEC 60068-2-3:1969](#), *Environmental testing — Part 2: Tests — Test Ca: Damp heat, steady state*

[IEC 60068-2-6:1995](#), *Environmental testing — Part 2: Tests — Test Fc: Vibration (sinusoidal)*

[IEC 60068-2-7:1983](#), *Environmental testing — Part 2: Tests — Test Ga: Acceleration, steady state*

[IEC 60068-2-13:1983](#), *Environmental testing — Part 2: Tests — Test M: Low air pressure*

[IEC 60068-2-14:1984](#), *Environmental testing — Part 2: Tests — Test N: Change of temperature*

IEC 60068-2-17:1994, *Basic environmental testing procedures — Part 2: Tests — Test Q: Sealing*

[IEC 60068-2-20:1979](#), *Environmental testing — Part 2: Tests — Test T: Soldering*

[IEC 60068-2-21:1999](#), *Environmental testing — Part 2-21: Tests — Test U: Robustness of terminations and integral mounting devices*

[IEC 60068-2-27:1987](#), *Environmental testing — Part 2: Tests — Test Ea and guidance: Shock*

[IEC 60068-2-29:1987](#), *Environmental testing — Part 2: Tests — Test Eb and guidance: Bump*

[IEC 60068-2-30:1980](#), *Environmental testing — Part 2: Tests — Test Db and guidance: Damp heat, cyclic (12 + 12-hour cycle)*

[IEC 60068-2-32:1975](#), *Environmental testing — Part 2: Tests — Test Ed: Free fall (Procedure 1)*

[IEC 60068-2-45:1980](#), *Environmental testing — Part 2: Tests — Test XA and guidance: Immersion in cleaning solvents*

[IEC 60122-3:2001](#), *Quartz crystal units of assessed quality — Part 3: Standard outlines and lead connections*

[IEC 60444-1:1986](#), *Measurement of quartz crystal unit parameters by zero phase technique in a π -network — Part 1: Basic method for the measurement of resonance frequency and resonance resistance of quartz crystal units by zero phase techniques in a π -network*

[IEC 60444-2:1980](#), *Measurement of quartz crystal unit parameters by zero phase technique in a π -network — Part 2: Phase offset method for the measurement of motional capacitance of quartz crystal units*

[IEC 60444-4:1988](#), *Measurement of quartz crystal unit parameters by zero phase technique in a π -network — Part 4: Method for the measurement of the load resonance frequency f_L , load resonance resistance R_L and the calculation of other derived values of quartz crystal units, up to 30 MHz*

[IEC 60444-5:1995](#), *Measurement of quartz crystal unit parameters — Part 5: Methods for the determination of equivalent electrical parameters using automatic network analyzer techniques and error corrections*

[IEC 60444-6:1995](#), *Measurement of quartz crystal unit parameters — Part 6: Measurement of drive level dependence (DLD)*

IEC 60617 (all parts), *Graphical symbols for diagrams*

IEC 61178-2:1993, *Quartz crystal units — A specification in the IEC Quality Assessment System for Electronic Components (IECQ) — Part 2: Sectional specification — Capability approval*

IEC 61178-3:1993, *Quartz crystal units — A specification in the IEC Quality Assessment System for Electronic Components (IECQ) — Part 3: Sectional specification — Qualification approval*

[\[A1\] IEC 61760-1:2006](#), *Surface mounting technology — Part 1: Standard method for the specification of surface mounting components (SMDs)* [\[A1\]](#)

IEC QC 001001:2000, *IEC Quality Assessment System for Electronic Components (IECQ) — Basic Rules*

IEC QC 001002-2:1998, *IEC Quality Assessment System for Electronic Components (IECQ) — Rules of Procedure — Part 2: Documentation*

IEC QC 001002-3:1998, *IEC Quality Assessment System for Electronic Components (IECQ) — Rules of Procedure — Part 3: Approval Procedures*

IEC QC 001005:2000, *Register of firms, products and services approved under the IECQ System, including ISO 9000*

[ISO 1000:1992](#), *SI units and recommendations for the use of their multiples and of certain other units*

1.3 Order of precedence

Where any discrepancies occur for any reason, documents shall rank in the following order of precedence:

- the detail specification;
- the sectional specification;
- the generic specification;
- any other international documents (for example of the IEC) to which reference is made.

The same order of precedence shall apply to equivalent national documents.

2 Terminology and general requirements

2.1 General

Units, graphical symbols, letter symbols and terminology shall, wherever possible, be taken from the following standards: IEC 60027, IEC 60050(561), IEC 60617 and [ISO 1000](#).

2.2 Terms, definitions and classification of phenomena

The following paragraphs contain additional terminology applicable to quartz crystal units and describe certain phenomena in this context.

2.2.1

crystal element (crystal blank)

piezoelectric material cut to a given geometrical shape, size and orientation with respect to the crystallographic axes of the crystal

2.2.2

electrode

an electrically conductive plate or film in contact with, or in proximity to, a face of a crystal element by means of which an electric field is applied to the element

2.2.3

crystal resonator

a mounted crystal element that vibrates when an alternating electric field exists between the electrodes

2.2.4

mounting

the means by which the crystal resonator is supported (within its enclosure)

2.2.5

enclosure

the enclosure protecting the crystal resonator(s) and mounting

2.2.6

enclosure type

a crystal enclosure of specific outline dimensions and material with a defined method of sealing

2.2.7

crystal unit

a crystal resonator mounted in an enclosure

2.2.8

socket

a component into which the crystal unit is inserted to hold the crystal unit and to provide electrical connection

2.2.9

mode of vibration

the pattern of motion in a vibrating body of the individual particles resulting from stresses applied to the body, the frequency of oscillation and the boundary conditions existing. The common modes of vibration are:

- flexural;
- extensional;
- face shear;
- thickness shear.