

Piezoelectric filters of assessed quality —

Part 1: Generic specification

The European Standard EN 60368-1:2000, with the incorporation of amendment A1:2004 has the status of a British Standard

ICS 31.140; 31.160

National foreword

This British Standard is the official English language version of EN 60368-1:2000, including corrigendum February 2001 and amendment A1:2004. It is identical with IEC 60368-1:2000, including amendment 1:2004. It supersedes BS EN 167000:1993 which is withdrawn.

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Summary of pages

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ICS 31.140; 31.160

English version

Piezoelectric filters of assessed quality — Part 1: Generic specification

(includes amendment A1:2004)

(IEC 60368-1:2000)

Filtres piézoélectriques sous assurance de la
qualité —

Partie 1: Spécification générique
(inclut l'amendement A1:2004)
(CIE 60368-1:2000)

Piezelektrische Filter mit bewerteter
Qualität —

Teil 1: Fachgrundspezifikation
(enthält Änderung A1:2004)
(IEC 60368-1:2000)

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

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Foreword

The text of document 49/448/FDIS, future edition 1 of IEC 60368-1, 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 60368-1 on 2000-04-01. This European Standard supersedes EN 167000:1993 and its amendment A1:1997.

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) 2001-01-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2003-04-01

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 60368-1:2000 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following note has to be added for the standard indicated:

IEC 60617 NOTE: Harmonized in the series EN 60617 (not modified).

Foreword to amendment A1

The text of document 49/682/FDIS, future amendment 1 to IEC 60368-1:2000, 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 amendment A1 to EN 60368-1:2000 on 2004-09-01.

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- latest date by which the amendment has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2005-06-01
- latest date by which the national standards conflicting with the amendment have to be withdrawn (dow) 2007-09-01

Endorsement notice

The text of amendment 1:2004 to the International Standard IEC 60368-1:2000 was approved by CENELEC as an amendment to the European Standard without any modification.

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PIEZOELECTRIC FILTERS OF ASSESSED QUALITY –

Part 1: Generic specification

1 General

1.1 Scope

This part of IEC 60368 specifies the methods of test and general requirements for piezoelectric filters of assessed quality using either capability approval or qualification approval procedures.

1.2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 60368. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of IEC 60368 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

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

IEC 60050(561):1991, *International Electrotechnical Vocabulary (IEV) – Chapter 561: Piezo-electric 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 and guidance: Acceleration, steady state*

IEC 60068-2-10:1988, *Environmental testing – Part 2: Tests – Test J and guidance: Mould growth*

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, *Environmental testing – 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 60068-2-52:1996, *Environmental testing – Part 2: Tests – Test Kb: Salt mist, cyclic (sodium chloride solution)*

IEC 60068-2-58:1999, *Environmental testing – Part 2-58: Tests – Test Td: Test methods for solderability, resistance to dissolution of metallization and to soldering heat of surface mounting devices (SMD)*

IEC 60068-2-64:1993, *Environmental testing – Part 2: Test methods – Test Fh: Vibration, broad-band random (digital control) and guidance*

IEC 60368-4, *Piezoelectric filters of assessed quality – Part 4: Sectional specification – Capability Approval* ¹⁾

IEC 60642:1979, *Piezoelectric ceramic resonators and resonator units for frequency control and selection – Chapter I: Standard values and conditions – Chapter II: Measuring and test conditions*

IEC 61000-4-2:1995, *Electromagnetic compatibility (EMC) – Part 4: Testing and measurement techniques – Section 2: Electrostatic discharge immunity test. Basic EMC Publication*
Amendment 1 (1998) ²⁾

IEC 61178-1:1993, *Quartz crystal units – A specification in the IEC Quality Assessment System for Electronic Components (IECQ) – Part 1: Generic specification*

IEC QC 001001:1998, *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*

ISO 1000:1992, *SI units and recommendations for use of their multiples and of certain other units*

¹⁾ To be published.

²⁾ There is a consolidated edition 1.1 (1999) that includes IEC 61000-4-2 (1995) and its amendment 1 (1998).

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 document (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 60642
- IEC 61178-1
- ISO 1000

2.2 Definitions

For the purpose of this part of IEC 60368, the following definitions apply.

2.2.1

piezoelectric filter

an electrical filter in which one or more piezoelectric resonators made from quartz crystals or other piezoelectric materials are incorporated

2.2.2

band-pass filter

a filter having a single pass-band between two specified stop-bands
[IEV 561-03-33]

2.2.3

band-stop filter

a filter having a single stop-band between two specified pass-bands
[IEV 561-03-34]

2.2.4

high-pass filter

a filter having a single pass-band above a cut-off frequency and a stop-band for lower frequencies
[IEV 561-03-32]

2.2.5

low-pass filter

a filter having a single pass-band below a cut-off frequency and a stop-band for higher frequencies
[IEV 561-03-31]

2.2.6
comb filter
a two terminal pair filter in which there are five or more bands of which two or more are pass-bands and two or more are stop-bands
[IEV 561-03-35]

2.2.7
monolithic filter
a filter with at least one monolithic multiple pole resonator
[IEV 561-03-36 modified]

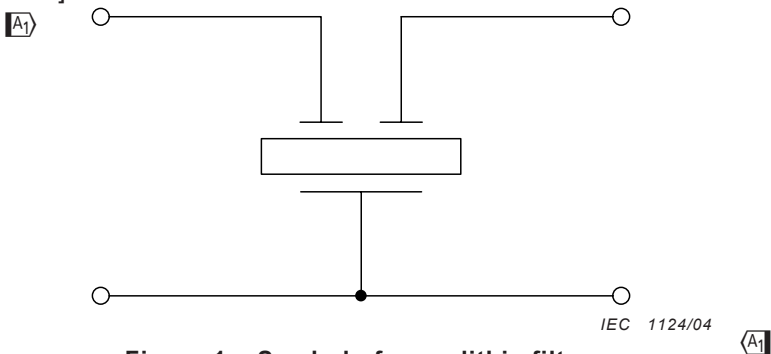


Figure 1 – Symbol of monolithic filter

2.2.8
tandem monolithic filter
a filter made by electrically connecting at least two monolithic multiple pole resonators

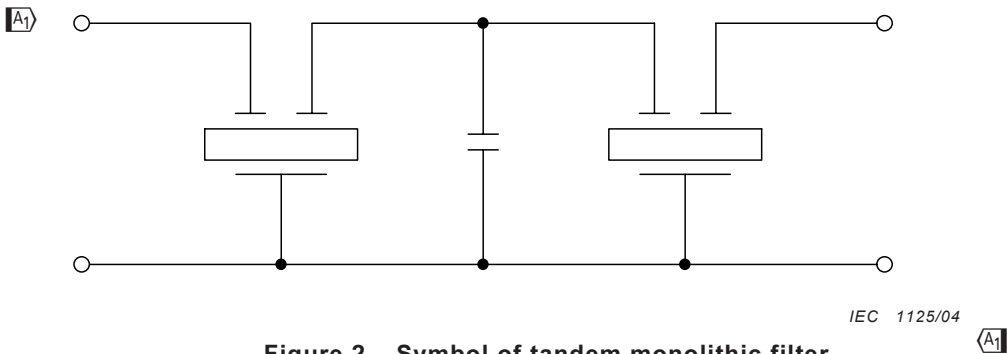


Figure 2 – Symbol of tandem monolithic filter

2.2.9
monolithic multiple pole resonator
a piezoelectric resonator with at least two mechanically coupled vibrating regions on a single crystal element

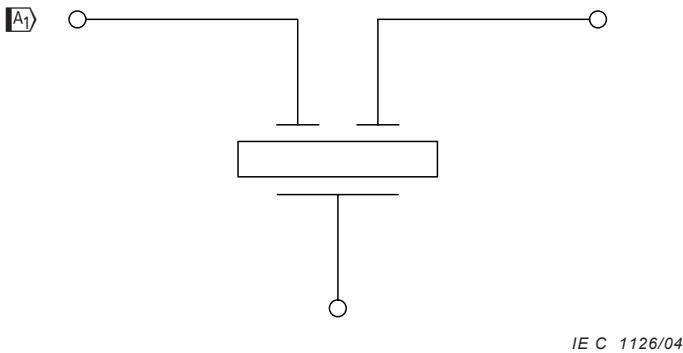


Figure 3 – Symbol of monolithic multiple pole resonator

2.2.10
input level
the power, voltage or current value presented to the input terminal pair of a piezoelectric filter
[IEV 561-03-02]

2.2.11

output level

the power, voltage or current value delivered to the load circuit of a piezoelectric filter
[IEV 561-03-03]

2.2.12

rated level

the power, voltage or current value at which the characteristics of a piezoelectric filter are specified
[IEV 561-03-04]

2.2.13

maximum level

the power, voltage or current value above which unacceptable distortion of the signal or irreversible changes may occur in a piezoelectric filter
[IEV 561-03-05]

2.2.14

available power

the maximum power which may be obtained from a given source by suitable adjustment of the load impedance
[IEV 561-03-06]

2.2.15

input impedance

the impedance presented by a piezoelectric filter to the signal source when terminated in the specified load impedance
[IEV 561-03-07]

2.2.16

output impedance

the impedance presented by a piezoelectric filter to the load when its input is connected to the specified source impedance
[IEV 561-03-08]

2.2.17

terminating impedance

the impedance presented to a piezoelectric filter by its load or by its source
[IEV 561-03-09]

2.2.18

cut-off frequency

a frequency of the pass-band at which the relative attenuation of a piezoelectric filter reaches a specified value
[IEV 561-03-10]

2.2.19

mid-band frequency (of a band-pass or band-stop filter)

the geometric mean of the cut-off frequencies limiting a single pass-band or single stop-band

NOTE In practice, the arithmetic mean is often used as a good approximation to the geometric mean for piezoelectric filters with relatively narrow pass-bands or stop-bands.

[IEV 561-03-11]

2.2.20**nominal frequency** (of a piezoelectric filter)

the frequency used to identify the piezoelectric filter

[IEV 561-03-12]

2.2.21**pass-band**

a band of frequencies in which the relative attenuation of a piezoelectric filter is equal to or less than a specified value

[IEV 561-03-13]

2.2.22**pass bandwidth**

the separation of frequencies between which the attenuation of a piezoelectric filter shall be equal to or less than a specified value

[IEV 561-03-14]

2.2.23**stop band**

a band of frequencies in which the relative attenuation of a piezoelectric filter is equal to or greater than specified values

[IEV 561-03-15]

2.2.24**stop bandwidth**

the separation of frequencies between which the relative attenuation of a piezoelectric filter shall be equal to or greater than a specified value

[IEV 561-03-16]

2.2.25**transition band**

a band of frequencies between a cut-off frequency and the nearest point of the adjacent stop-band

[IEV 561-03-17]

2.2.26**envelope delay time**

the time of propagation of a certain characteristic of a signal envelope between two points, for a certain frequency

[IEV 561-03-18]

2.2.27**phase delay time**

the time of propagation of a sinusoidal oscillation of a certain frequency between two points

[IEV 561-03-19]

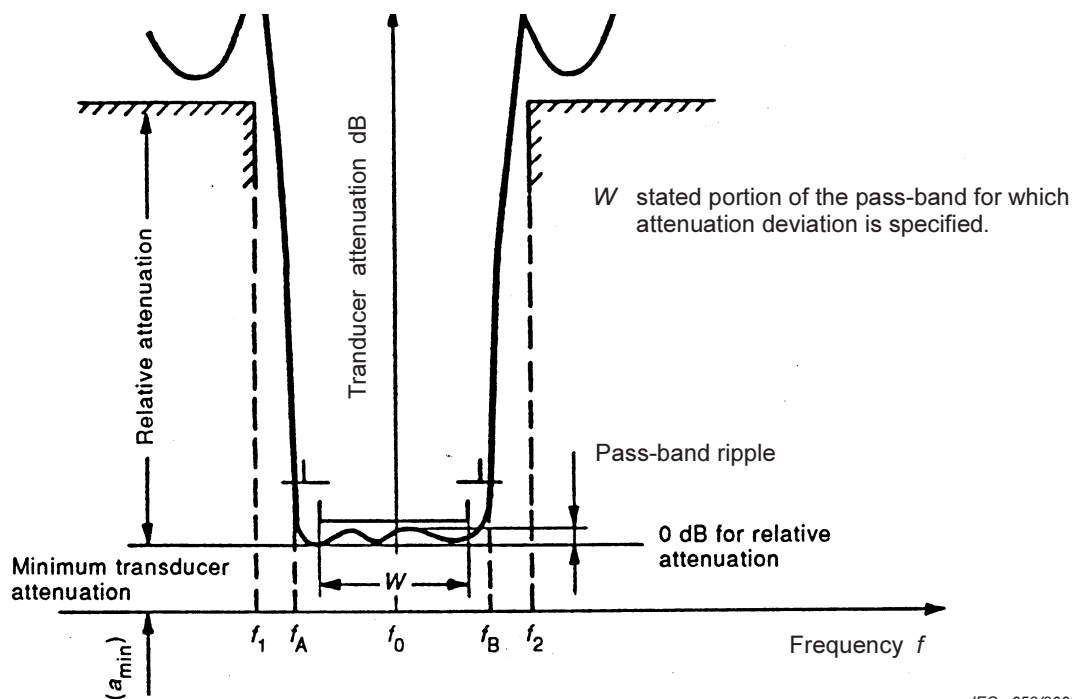
**2.2.28****group delay**

the time equal to the first derivative of the phase shift, in radians, with respect to the angular frequency

2.2.29**transducer attenuation** (of a filter)

the ratio, generally expressed in decibels, of the available power of a given source to the power that the filter connected to this source delivers to a load impedance under specified conditions

[IEV 561-03-20]



$$f_0 = \sqrt{f_A \times f_B}$$

or

$$f_0 = \frac{f_A + f_B}{2}$$

where

f_A , f_B are the cut-off frequencies of the pass-band;
 f_0 is the mid-band frequency.

Figure 4 – Transducer attenuation characteristics of a filter

2.2.30

insertion attenuation (of a filter)

the ratio, generally expressed in decibels, of the power delivered to the load impedance before insertion of the filter to the power delivered to the load impedance after insertion of the filter

[IEV 561-03-21]

2.2.31

insertion phase shift

change in phase caused by the insertion of a filter into a transmission system

2.2.32

transducer phase

the phase difference between the output of a given filter with a specified load impedance and the source connected to its input

[IEV 561-03-22] **A1**