

# INTERNATIONAL STANDARD

# IEC 60368-1

2000

AMENDMENT 1  
2004-08

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Amendment 1

**Piezoelectric filters of assessed quality –**

**Part 1:  
Generic specification**

*iteh Standards*  
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[IEC 60368-1:2000/AMD1:2004](https://standards.iteh.ai/catalog/standards/iec/b55c11a2-d117-45e9-8a12-fc16a9dbc925/iec-60368-1-2000-amd1-2004)

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## FOREWORD

This amendment has been prepared by IEC technical committee 49: Piezoelectric and dielectric devices for frequency control and selection.

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

FDIS	Report on voting
49/682/FDIS	49/688/RVD

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

The committee has decided that the contents of this amendment and the base publication will remain unchanged until the maintenance result date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

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- withdrawn,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

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*Delete the following two items in the list of parts:*

Part 5: Sectional specification – Qualification approval (IEC 60368-5, under consideration)

Part 5-1: Blank detail specification – Qualification approval (IEC 60368-5-1, under consideration)

Replace Figures 1, 2 and 3 by the following Figures 1, 2 and 3:

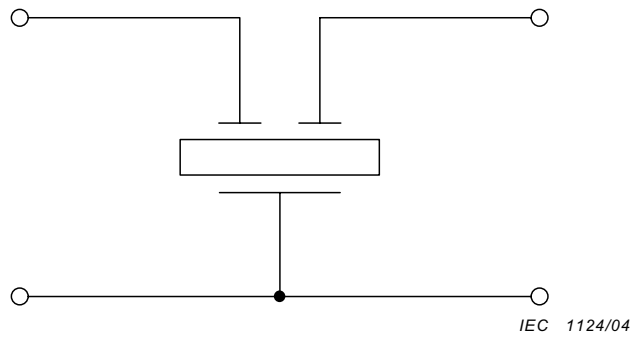


Figure 1 – Symbol of monolithic filter

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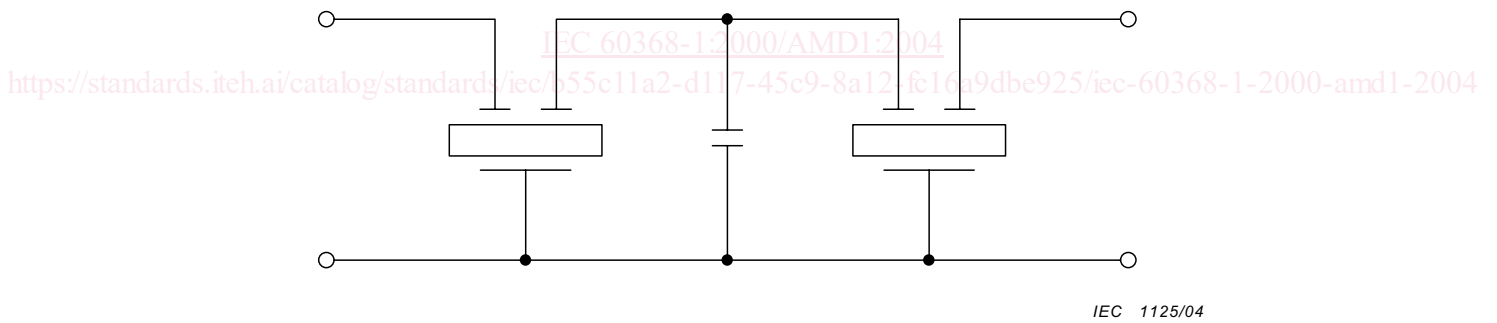
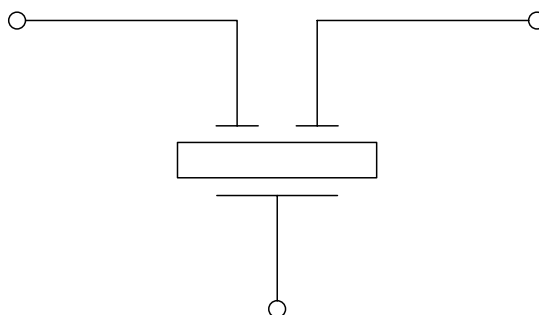


Figure 2 – Symbol of tandem monolithic filter



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**Figure 3 – Symbol of monolithic multiple pole resonator**

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Add, after definition 2.2.27, the following new definition:

**2.2.28**

**group delay**

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

Renumber existing definitions 2.2.28 to 2.2.40 as 2.2.29 to 2.2.41.

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[IEC 60368-1:2000/AMD1:2004](https://standards.iteh.ai/catalog/standards/iec/b55c11a2-d117-45e9-8a12-fc16a9dbc925/iec-60368-1-2000-amd1-2004)

<https://standards.iteh.ai/catalog/standards/iec/b55c11a2-d117-45e9-8a12-fc16a9dbc925/iec-60368-1-2000-amd1-2004>

Add, after definition 2.2.40 (old), the following new definitions and renumber the existing definitions 2.2.41 to 2.2.45 as 2.2.44 to 2.2.48:

**2.2.41 intermodulation product(s)**

undesired signals resulting from the combination of independent input signals within the filter. For two signals of frequencies  $f_1$  and  $f_2$ , the intermodulation product(s) have frequencies of the form

$$(Mf_1 \pm Nf_2) \text{ or } (Mf_2 \pm Nf_1)$$

where  $M, N = 1, 2, 3, \dots$

Intermodulation product(s) of signals  $f_1, f_2$  outside the pass-band are called out-of-band intermodulation, intermodulation product(s) of signals  $f_1, f_2$  inside the pass-band are called in-band intermodulation.

**2.2.42 intermodulation ratio**

the difference, expressed in decibels, between the signal output of reference in the pass-band and the level of the intermodulation product(s)

### 2.2.43 intercept point

the (virtual) output level (in dBm), where the signal output of reference in the pass-band and the intermodulation product(s) would become the same, on the assumption that the level of the input signals increase

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### 3.6.3 Qualification approval

*Replace the text as follows:*

Qualification approval is appropriate for components manufactured to a standard design and established production process and conforming to a published detail specification.

The programme of tests defined in the detail specification for the appropriate assessment and severity level applies directly to the piezoelectric filter to be qualified, as prescribed in 3.8.

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### 4.5.5 Envelope delay time

*Replace the title and text of this subclause by the following:*

### 4.5.5 Group delay

The filter shall be connected to the test circuit as shown in Figure 8 and with the specified terminating impedance as given in the detail specification except that the measuring equipment shall set the group delay mode to the measure the group delay directly.

The group delay may be determined by calculation by measuring the phase shift, using the procedure given in 4.5.3, at two different frequencies expressed as:

$$\omega \pm \Delta\omega/2$$

where  $\omega = 2\pi f$

The group delay can then be calculated from the following formula:

$$t_g = \Delta\Phi/\Delta\omega$$

where

$t_g$  is group delay;

$\Delta\Phi$  is the difference between the two phase shift measurements;

$\Delta\omega$  is the frequency difference in radians per second.

The group delay shall be within the limits as stated in the detail specification.

**4.5.6 Envelope delay time as a function of temperature**

Replace the title and text of this subclause by the following:

**4.5.6 Group delay as a function of temperature**

To determine the group delay as a function of temperature, the procedure described in 4.5.5 shall be used, except that the measurements shall be taken over the specified temperature range and the rated level of drive as specified in the detail specification.

The group delay shall be within the limits as stated in the detail specification.

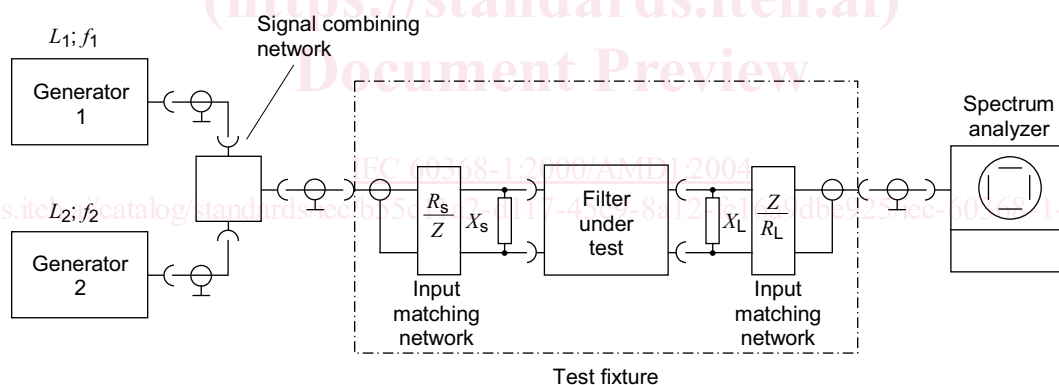
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**4.5.9 Intermodulation distortion**

Replace the title and text of this subclause by the following:

**4.5.9 Intermodulation**

The filter shall be connected to the test circuit as shown in Figure 10, with the terminating impedance and at the level of drive as specified in the specification.



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**Figure 10 – Test circuit for the intermodulation measurement**

The two signal generators shall be capable of covering the frequency range and providing sufficient power level to provide the correct power at the filter after passing through the matching network. They shall also provide an output with extremely high single-noise ratio and lower higher harmonic content.

The spectrum analyzer shall have a reference attenuation of greater than  $P + 10$  dB at  $f_1$  and  $f_2$  when tuned to the relevant intermodulation product(s):

where

$P$  is the specified level of intermodulation ratio;

$f_0$  is the nominal frequency of the filter under test;

$f_1$  is the frequency of signal generator 1 ( $f_1 = f_0 + \Delta f$  or  $f_1 = f_0 - \Delta f$ );

$f_2$  is the frequency of signal generator 2 ( $f_2 = f_0 + 2\Delta f$  or  $f_2 = f_0 - 2\Delta f$ ).