IEC 60368-1

Edition 4.0 2004-08

INTERNATIONAL STANDARD

NORME INTERNATIONALE

AMENDMENT 1
AMENDEMENT 1

Piezoelectric filters of assessed quality – Part 1: Generic specification

Filtres piézoélectriques sous assurance de la qualité – Partie 1: Spécification générique

IEC 60368-1:2000/A1:2004

IEC Central Office
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00
info@iec.ch
www.iec.ch

About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigenda or an amendment might have been published.

Useful links:

IEC publications search - www.iec.ch/searchpub

The advanced search enables you to find IEC publications by a variety of criteria (reference number, text, technical committee,…).
It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished

Stay up to date on all new IEC publications. Just Published details all new publications released. Available on-line and also once a month by email.

Electropedia - www.electropedia.org

The world's leading online dictionary of electronic and electrical terms containing more than 30 000 terms and definitions in English and French, with equivalent terms in additional languages. Also known as the International Electrotechnical Vocabulary (IEV) on-line.

Customer Service Centre - webstore.iec.ch/csc

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: csc@iec.ch.

A propos de la CEI

La Commission Electrotechnique Internationale (CEI) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

A propos des publications CEI

Le contenu technique des publications de la CEI est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

Liens utiles:

Recherche de publications CEI - www.iec.ch/searchpub

La recherche avancée vous permet de trouver des publications CEI en utilisant différents critères (numéro de référence, texte, comité d'études,…).
Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

Just Published CEI - webstore.iec.ch/justpublished

Restez informé sur les nouvelles publications de la CEI. Just Published détaille les nouvelles publications parues. Disponible en ligne et aussi une fois par mois par email.

Electropedia - www.electropedia.org

Le premier dictionnaire en ligne au monde de termes électroniques et électriques. Il contient plus de 30 000 termes et définitions en anglais et en français, ainsi que les termes équivalents dans les langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (VEI) en ligne.

Service Clients - webstore.iec.ch/csc

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: csc@iec.ch.

IEC 60368-1

Edition 4.0 2004-08

INTERNATIONAL STANDARD

NORME INTERNATIONALE

AMENDMENT 1
AMENDEMENT 1

Piezoelectric filters of assessed quality – Part 1: Generic specification

Filtres piézoélectriques sous assurance de la qualité – Partie 1: Spécification générique

INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSION ELECTROTECHNIQUE INTERNATIONALE

PRICE CODE
CODE PRIX H

ICS 31.140

ISBN 978-2-83220-706-2

FOREWORD

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

This bilingual version (2013-05) corresponds to the monolingual English version, published in 2004-08.

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 French version of this amendment has not been voted upon.

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.

Page 9

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)

Page 17

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

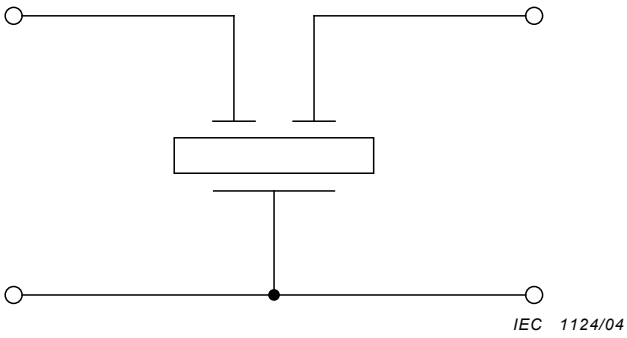

Figure 1 – Symbol of monolithic filter

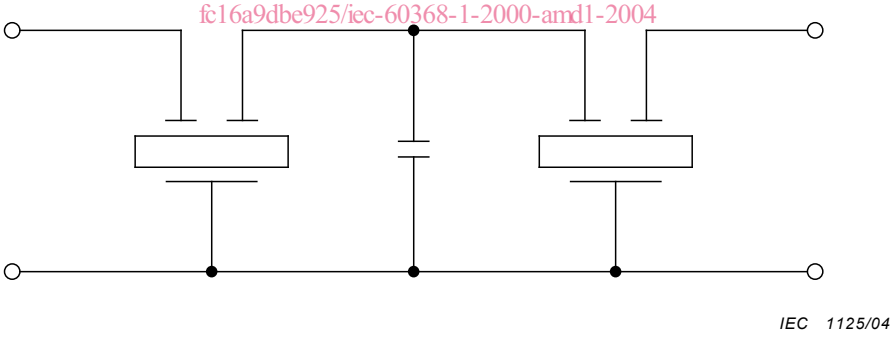

Figure 2 – Symbol of tandem monolithic filter

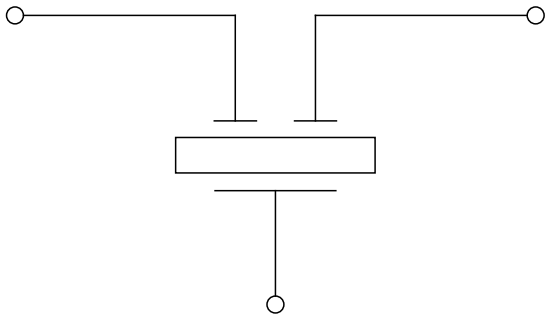

Figure 3 – Symbol of monolithic multiple pole resonator

Page 21

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.

Page 29

Add, after definition 2.2.40 (old), the following new definitions and renumber the existing definitions 2.2.41 to 2.2.45 as 2.2.45 to 2.2.49:

2.2.42 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

$$(M f_1 \pm N f_2) \text{ or } (M f_2 \pm N f_1)$$

where M, N = 1, 2, 3, ...

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.

2.2.43 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)

2.2.44 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

Page 37

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.

Page 49

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.

Page 53

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.

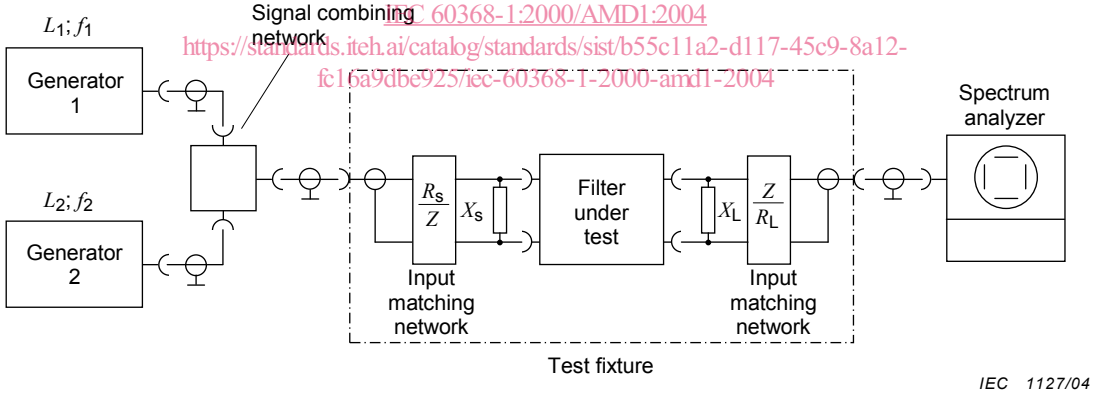

Figure 10 – Test circuit for the intermodulation measurement

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 $f_2 = f_0 - 2\Delta f$).

The marks of "+" or "–" are taken as the combination of the same mark. The value of Δf is specified in the detail specification.

However, precautions shall be taken to ensure that the spectrum analyzer provides sufficient guard against intrinsic intermodulation product(s) of the same order as those being measured.

Two identical unmodulated signals of levels L_1 and L_2 with frequencies f_1 and f_2, as specified in the detail specifications, shall be set on the two signal generators and simultaneously applied to the filter under test.

The spectrum analyzer shall be adjusted to display the two-tone test signal and the inter-modulation product(s) to be measured (Figure 11).

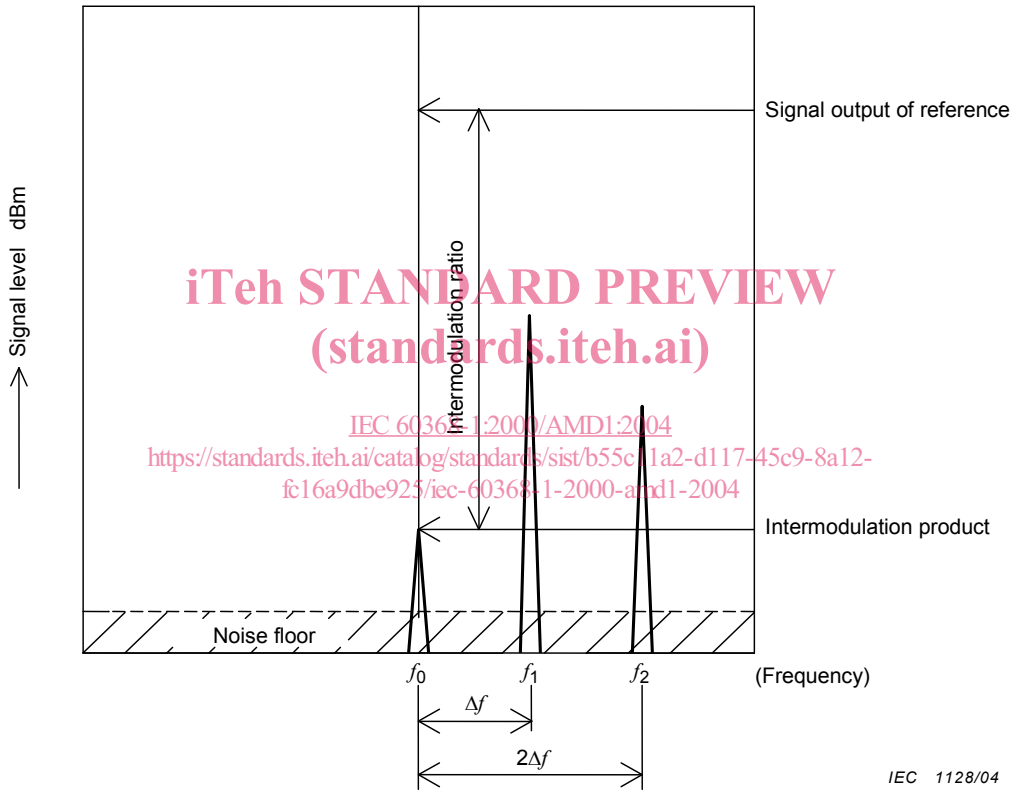

Figure 11 – Measurement of out-of-band intermodulation

The intermodulation ratio is the difference in decibels between the signal output of reference (the signal of f_0 which appears in an output, when the signal of f_0 of the same level as L_1 and L_2 is input into a filter) and the intermodulation product(s).

The third order intercept point (IP3) is got according to the following method.

As shown in Figure 12, the straight line of an inclination 1 is drawn from the intersection of the specified input level and the signal output of reference. Then, the straight line of an inclination 3 is drawn from the intersection of the specified input level and intermodulation product. The intersection of these two straight lines is the third order intercept point (IP3). The input level of this point is called input intercept point and is used for the specification of piezoelectric filter.

NOTE It is important to check that the equipment is producing acceptable low levels of intermodulation product(s) by repeating the test with the filter removed.

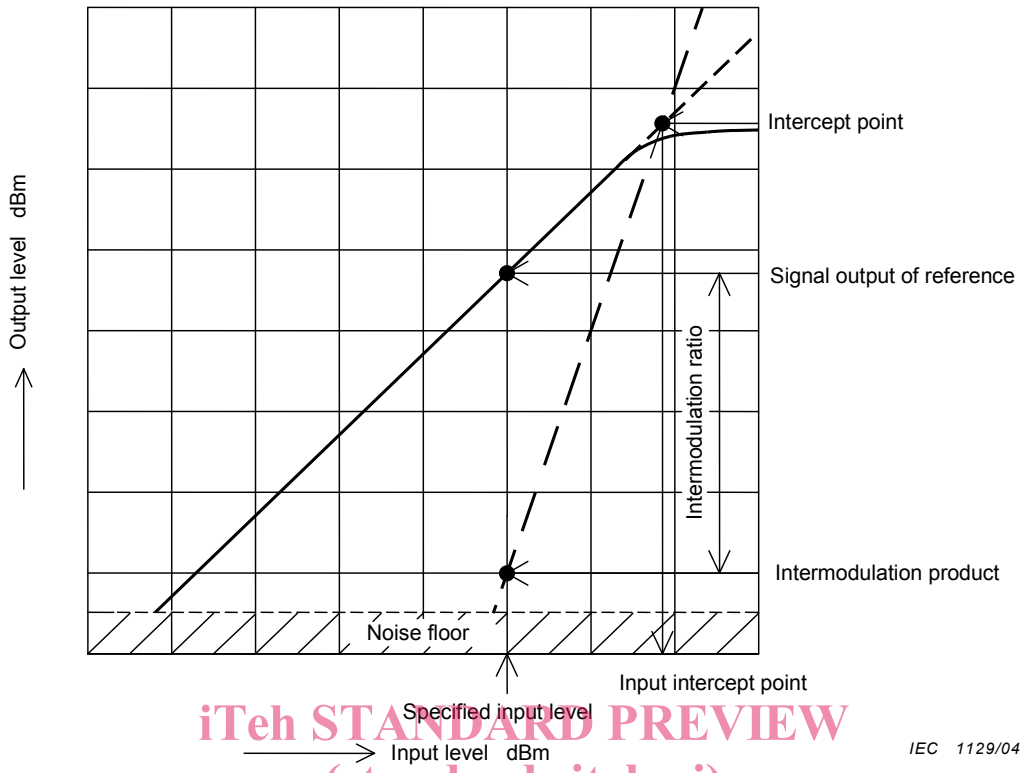

Figure 12 – Input/output signal level of intermodulation (general)