

Filters using waveguide type dielectric resonators —

Part 1: Generic specification

The European Standard EN 61337-1:2004 has the status of a
British Standard

ICS 31.140

National foreword

This British Standard is the official English language version of EN 61337-1:2004. It is identical with IEC 61337-1:2004. It supersedes BS EN 171000:2001 which will be withdrawn on 2007-10-01.

The UK participation in its preparation was entrusted to Technical Committee EPL/49, Piezo-electric devices for frequency control and selection, which has the responsibility to:

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- monitor related international and European developments and promulgate them in the UK.

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Summary of pages

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English version

Filters using waveguide type dielectric resonators
Part 1: Generic specification
(IEC 61337-1:2004)

Filtres utilisant des résonateurs
diélectriques à modes guidés
Partie 1: Informations générales
(CEI 61337-1:2004)

Filter mit dielektrischen Resonatoren
vom Wellenleitertyp
Teil 1: Fachgrundspezifikation
(IEC 61337-1:2004)

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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.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

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CENELEC

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

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

Foreword

The text of document 49/685/FDIS, future edition 1 of IEC 61337-1, 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 61337-1 on 2004-10-01.

This European Standard supersedes EN 171000:2001.

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) | 2005-08-01 |
| – latest date by which the national standards conflicting with the EN have to be withdrawn | (dow) | 2007-10-01 |

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 61337-1:2004 was approved by CENELEC as a European Standard without any modification.

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FILTERS USING WAVEGUIDE TYPE DIELECTRIC RESONATORS –

Part 1: Generic specification

1 General

1.1 Scope

This part of IEC 61337 applies to filters using waveguide type dielectric resonators of assessed quality using either capability approval or qualification approval procedures. It also lists the test and measurement procedures which may be selected for use in detail specifications for such filters.

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: 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 – Test A: Cold*

IEC 60068-2-2:1974, *Environmental testing – Part 2: Tests – Test B: Dry Heat*

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 60068-2-20:1979, *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 60068-2-58:1999, *Environmental testing – Part 2-58: Tests – Tests Td: Test methods for solderability, resistance to dissolution of metalization and to soldering heat of surface mounting devices (SMD)*

IEC 60068-2-78:2001, *Environmental testing – Part 2-78: Tests – Test Cab: Damp heat, steady state*

IEC 60617 (all parts) [DB]¹, *Graphical symbols for diagrams*

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

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

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

QC 001005:2000, *Register of Firms, Products and Services approved under the IECQ System, including ISO 9000*

ISO 1000:1992, *SI units and recommendation 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 authority:

- detail specification;
- sectional specification;
- 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 whenever possible, be taken from IEC 60617, IEC 60027, IEC 60050(561) and ISO 1000.

Any other units, symbols and terminology peculiar to one of the components covered by the Generic Specification, shall be taken from the relevant IEC or ISO documents listed under 1.2.

2.2 Terms and definitions

For the purposes of this part of IEC 61337, the following terms and definitions apply.

Further detailed information may be provided in IEC 61994-1 for some of the following terms.

¹ "DB" refers to the IEC on-line database.

2.2.1
dielectric filter
 filter in which one or more dielectric resonators are incorporated

2.2.2
dielectric mono-block filter
 filter consisting of a metallized rectangular ceramic block with cylindrical holes, which functions as a TEM (Transverse-ElectroMagnetic) mode filter with two or more stages

2.2.3
stripline filter
 filter consisting of stripline resonators, which functions as a TEM mode filter with two or more stages

2.2.4
microstripline filter
 filter consisting of microstripline resonators, which functions as a TEM mode filter with two or more stages

2.2.5
coplanar filter
 filter consisting of coplanar line resonators, which functions as a TEM mode filter with two or more stages

2.2.6
coupling factor
k
 coupling factor of a band-pass filter is the degree of coupling between two resonators.

NOTE The coupling between dielectric resonators is mainly done either magnetically or electrically. According to each case, the equivalent circuit of coupling is expressed by inductive or capacitive coupling, respectively, see Figure 1.

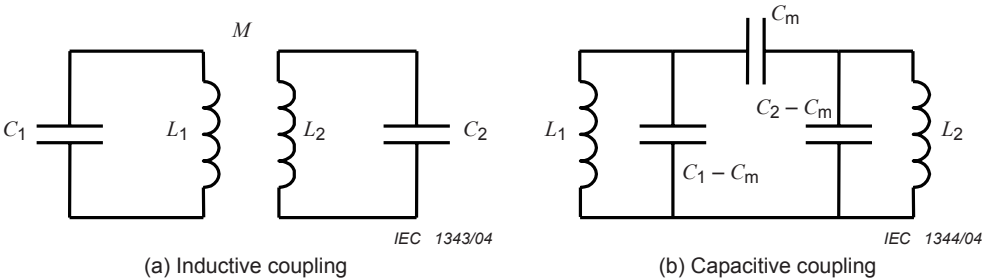


Figure 1 – Equivalent circuit

The coupling factor by inductive or capacitive coupling is defined by the following respective equations:

$$k = \frac{M}{\sqrt{L_1 \times L_2}} \qquad k = \frac{C_m}{\sqrt{C_1 \times C_2}}$$

where
*L*₁, *C*₁ and *L*₂, *C*₂ are the resonance circuit elements;
M is the mutual inductance;
*C*_{*m*} is the coupling capacitance;
k is the coupling factor.

In the case of a symmetrical circuit of coupling, the coupling factor can be obtained from two resonance frequencies calculated or measured for the coupled resonators:

$$k = \frac{|f_o^2 - f_e^2|}{f_o^2 + f_e^2}$$

where

f_e is the resonance frequency in the case of even mode excitation (open-circuited symmetric plane);

f_o is the resonance frequency in the case of odd mode excitation (short-circuited symmetric plane).

The coupling factor of a band-stop filter is the degree of coupling between the resonator and the transmission line. The coupling factor k is defined as the ratio of the external power loss (P_e) of the resonator system to the internal power loss (P_u) of the resonator and can be expressed by a function of quality factor as follows:

$$k = \frac{P_e}{P_u} = \frac{Q_u}{Q_e} = \frac{Q_u}{Q_L} - 1$$

where

Q_u is the unloaded quality factor of resonator;

Q_e is the external quality factor of resonator;

Q_L is the loaded quality factor of resonator.

2.2.7

mid-band frequency

arithmetic mean of the cut-off frequencies (see Figures 2 and 3)

2.2.8

cut-off frequency

frequency of the pass band at which the relative attenuation reaches a specified value (see Figures 2 and 3)

2.2.9

trap frequency

frequency of the trap at which the attenuation reaches a large peak value (see Figure 2)

2.2.10

pass-band

band of frequencies in which the relative attenuation is equal to or less than a specified value (see Figures 2 and 3)

2.2.11

pass bandwidth

separation of the frequencies between which the attenuation is equal to or less than a specified value (see Figure 2)

2.2.12

stop band

band of frequencies in which the relative attenuation is equal to or greater than a specified value (see Figures 2 and 3)