BRITISH STANDARD

BS EN
61337-2:2004

Filters using waveguide type dielectric resonators —

Part 2: Guide for use

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ICS 31.140

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English version

Filters using waveguide type dielectric resonators
Part 2: Guidance for use
(IEC 61337-2:2004)

Filtres utilisant des résonateurs diélectriques à modes guidés
Partie 2: Guide d'utilisation
(CEI 61337-2:2004)

Filter mit dielektrischen Resonatoren vom Wellenleitertyp
Teil 2: Leitfaden zur Anwendung
(IEC 61337-2:2004)

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European Committee for Electrotechnical Standardization
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Foreword

The text of document 49/665/FDIS, future edition 1 of IEC 61337-2, 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 61337-2 on 2004-09-01.

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– latest date by which the national standards conflicting with the EN have to be withdrawn	(dow)	2007-09-01

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Endorsement notice

The text of the International Standard IEC 61337-2:2004 was approved by CENELEC as a European Standard without any modification.

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FILTERS USING WAVEGUIDE TYPE DIELECTRIC RESONATORS –

Part 2: Guidance for use

1 Scope

The scope of this part of IEC 61337 is limited to filters using waveguide type dielectric resonators that are used for microwave applications such as portable phones, cellular base stations and radio links.

It is not the aim of this standard either to explain the theory or to attempt to cover all the eventualities that may arise in practical circumstances. This standard draws attention to some of the more fundamental questions which should be considered by the user before he places an order for dielectric filters for a new application. Such a procedure will be the user's insurance against unsatisfactory performance.

Standard specifications, such as those given in IEC 61337, and national specifications or detail specifications issued by manufacturers, will define the available combinations of mid-band frequency, pass band, insertion attenuation, pass-band ripple, return attenuation, spurious response, operating power, and so on. These specifications are compiled to include a wide range of dielectric filters with standardized performances. It cannot be over-emphasized that the user should, wherever possible, select his dielectric filters from these specifications, when available, even if it involves making small modifications to his circuit to enable standard filters to be used.

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 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 60068-2-6:1975, *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*

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IEC 60068-2-27:1987, *Environmental testing – Part 2: Tests. Test Ea and guidance: Shock*

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 – Test Td – Test methods for solderability, resistance to dissolution of metallization 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 61337-1-1, *Filters using waveguide type dielectric resonators – Part 1-1: General information, standard values and test conditions – General information and standard values*

IEC 61337-1-2, *Filters using waveguide type dielectric resonators – Part 1-2: General information, standard values and test conditions – Test conditions*

3 Application guide for filters using waveguide type dielectric resonators

3.1 Classification of filters using waveguide type dielectric resonators

Filters using waveguide type dielectric resonators are classified into six types: $TE_{01\delta}$ mode dielectric filter, TM mode dielectric filter, TEM mode coaxial dielectric filter, stripline and microstripline dielectric filter, and multilayered chip-type filter.

These dielectric filters are classified according to their operating power and the unloaded Q of their resonance mode. Figure 1 shows the relationship between the unloaded Q and the maximum power durability for these filters in practical applications.

High-power durability of up to 100 W is the advantage of dielectric filters. The maximum operating power, however, should be limited by the construction of filters and by the Q value of the dielectric resonator used for the filters, because higher operating power causes a temperature rise that results in inferior electric characteristics such as a shift of mid-band frequency and an increase in insertion attenuation.

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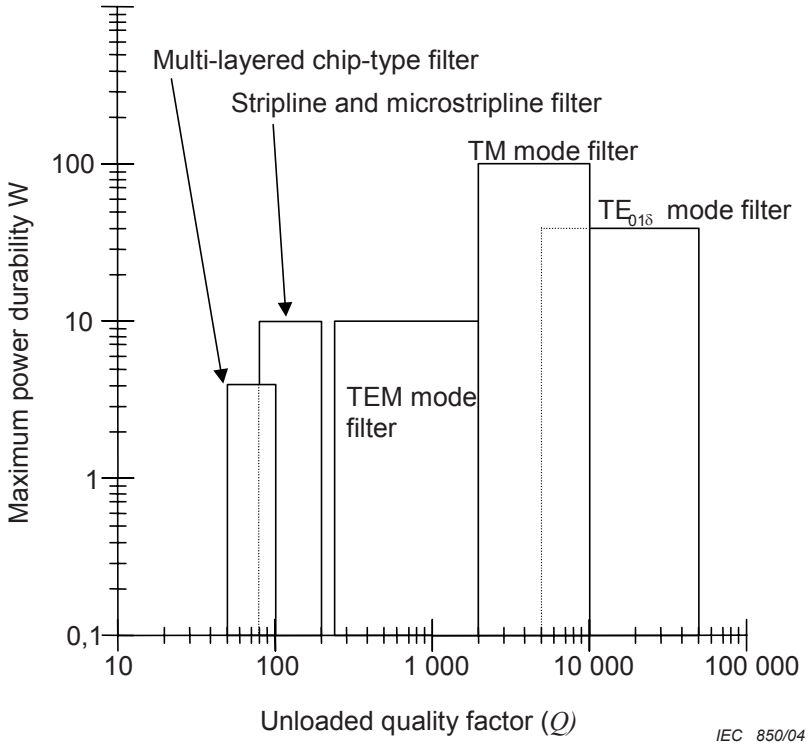


Figure 1 – Typical unloaded Q and maximum operating power of dielectric filters

3.2 Practical remarks for filters using waveguide type dielectric filters

3.2.1 $TE_{01\delta}$ mode dielectric filter

a) Features of the $TE_{01\delta}$ mode dielectric filter

The $TE_{01\delta}$ mode resonator obtains very high unloaded Q, as most of the resonance energy is stored in the dielectric element, and the copper loss due to the resistivity of the shielding conductor is minimized.

Figure 2 shows an example of the practically equivalent unloaded Q for the $TE_{01\delta}$ mode dielectric filter compared with the TE_{101} mode metal cavity. High unloaded Q from 5 000 to 10 000 is obtained by using high Q dielectric resonator materials with characteristics such as an ε' of 30 and a $Q \times$ f value of 150 000 GHz, or an ε' of 25 and a Q × f value of 300 000 GHz.

Using these $TE_{01\delta}$ mode dielectric resonators, miniaturized dielectric filters with low insertion attenuation and high temperature stability are realized at the frequency range from 1 GHz to 20 GHz. The relative bandwidth of the $TE_{01\delta}$ mode dielectric band-pass filter is usually less than 1 % of the mid-band frequency.

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