SIST

SLOVENSKI STANDARD
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Generic specification: Filters using waveguide type dielectric resonators

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Fachgrundspezifikation: Filter mit dielektrischen Resonatoren vom Wellenleitertyp

Spécification générique: Filtres utilisant des résonateurs diélectriques à modes guidés

Ta slovenski standard je istoveten z: EN 171000:2001

ICS:

31.140	Piezoelektriļ ne in dielektriļ ne naprave	Piezoelectric and dielectric devices
31.160	Elektriļ ni filtri	Electric filters

SIST EN 171000:2002 **en**

EUROPEAN STANDARD

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ICS 31.140; 31.160

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English version

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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

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Foreword

This European Standard was prepared by the CENELEC Technical Committee TC 49, Piezoelectric devices for frequency control and selection.

The text of the draft was submitted to the Unique Acceptance Procedure and was approved by CENELEC as EN 171000 on 2000-08-01.

This European Standard supersedes EN 61337-1-1:1997.

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)	2002-02-01
- latest date by which the national standards conflicting with the EN have to be withdrawn	(dow)	2003-08-01

CONTENTS

1 General

1.1 Scope

This Generic Specification 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

This European Standard incorporates by dated and undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

CECC 00 109	1974	Rule of procedure 9: Certified Test Records
CECC 00 111-3	1994	Rule of procedure 11 - Part 3: Regulations for CECC specifications for components for general and professional (civil and military) usage
CECC 00 114-2	1994	Rule of procedure 14 - Part 2: Qualification approval of electronic components
CECC 00 114-3	1993	Rule of procedure 14 - Part 3: Capability approval of an electronic component manufacturing activity
EN 100114-1	1996	Rule of Procedure – Quality Assessment Procedures - Part 1: CECC requirements for the approval of an organization
EN 60068-1	1994	Environmental testing - Part 1: General and guidance (IEC 60068-1:1988 + corr. Oct 1988 + A1:1992)
EN 60068-2-1	1993	Part 2: Tests - Test A: Cold (IEC 60068-2-1:1990)
EN 60068-2-2	1993	Test B: Dry heat (IEC 60068-2-2:1974 + IEC 60068-2-2A:1976)
EN 60068-2-6	1995	Test F_c: Vibration (sinusoidal) (IEC 60068-2-6:1995 + corr. March 1995).
EN 60068-2-7	1993	Test Ga and guidance: Acceleration, steady state (IEC 60068-2-7:1983 + A1:1986)
EN 60068-2-21	1983	Test U: Robustness of terminations and integral mounting devices (IEC 60068-2-21:1983 + corr. Nov 1991 + A1:1985)
+ A2	1997	(IEC 60068-2-21:1983/A2:1991)
+ A3	1997	(IEC 60068-2-21:1983/A3:1992)
EN 60068-2-27	1993	Test Ea and guidance: Shock (IEC 60068-2-27:1987)
EN 60068-2-29	1993	Test Eb and guidance: Bump (IEC 60068-2-29:1987 + corr.)
EN 60617	Series	Graphical symbols for diagrams (IEC 60617 series)
HD 323.2.3 S2	1987	Test Ca: Damp heat, steady state (IEC 60068-2-3: 1969 + A1:1984)
HD 323.2.13 S1	1987	Test M: Low air pressure (IEC 60068-2-13:1983)
HD 323.2.14 S2	1987	Test N: Change of temperature (IEC 60068-2-14:1984 + A1:1986)
HD 323.2.20 S3	1988	Test T: Soldering (IEC 60068-2-20:1979 + A2:1987)

HD 323.2.30 S3	1988	Test Db and guidance: Damp heat, cyclic (12 + 12 hour cycle) (IEC 60068-2-30:1980 + A1:1985)
HD 323.2.58 S1	1991	Test Td: Solderability, resistance to dissolution of metalization and to soldering heat of Surface Mounting Devices (SMD) (IEC 60068-2-58:1989)
IEC 60027-1	1992	Letter symbols to be used in electrical terminology - Part1: General
IEC 60050	Series	International Electrotechnical Vocabulary (IEV)
ISO 1000	1973	SI units and recommendation for the use of their multiples and of certain other units

1.3 Units, symbols and terminology

Units, graphical symbols, letter symbols and terminology shall whenever possible, be taken from the following documents:

EN 60617	Graphical symbols for diagrams (IEC 60617)
IEC 60027	Letter symbols to be used in electrical technology
IEC 60050	International Electrotechnical Vocabulary
ISO 1000	SI units and recommendations for the use of their multiples and of certain other units

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, Normative references.

The following paragraphs contain additional terminology applicable to filters using waveguide type dielectric resonators.

1.3.1
dielectric filter
filter in which one or more dielectric resonators are incorporated

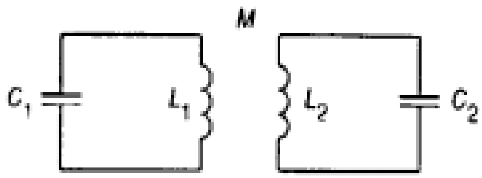
1.3.2
dielectric mono-block filter
filter consisting of a metallized rectangular ceramic block with cylindrical holes, which functions as a TEM (Transverse-electromagnetic) mode filter with two or more stages

1.3.3
stripline filter
filter consisting of stripline resonators, which functions as a TEM mode filter with two or more stages

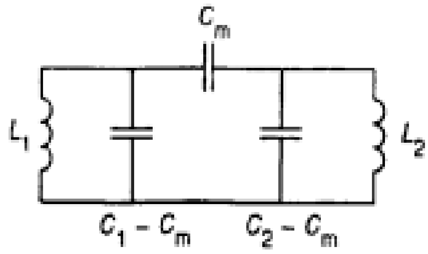
1.3.4
microstripline filter
filter consisting of microstripline resonators, which functions as a TEM mode filter with two or more stages

1.3.5
coplanar filter
filter consisting of coplanar line resonators, which functions as a TEM mode filter with two or more stages

1.3.6
coupling factor k
coupling factor of a band-pass filter is the degree of coupling between two resonators. 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 capactive coupling, respectively



Inductive coupling



Capacitive coupling

The coupling factor by inductive or capactive coupling is defined by the following equation, respectively:

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

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.

1.3.7
mid-band frequency
arithmetic mean of the cut-off frequencies (see Figures 1 and 2)

1.3.8
cut-off frequency
frequency of the pass band at which the relative attenuation reaches a specified value (see Figures 1 and 2)

1.3.9
trap frequency
frequency of the trap at which the attenuation reaches a large peak value (see Figure 1)

1.3.10
pass-band
band of frequencies in which the relative attenuation is equal to or less than a specified value (see Figures 1 and 2)

1.3.11
pass bandwidth
separation of the frequencies between which the attenuation is equal to or less than a specified value (see Figure 1)

1.3.12
stop band
band of frequencies in which the relative attenuation is equal to or greater than a specified value (see Figures 1 and 2)

1.3.13
stop bandwidth
separation of frequencies between which the attenuation is equal to or greater than a specified value (see Figures 1 and 2)

1.3.14
fractional bandwidth

1) Ratio of the pass bandwidth to the mid-band frequency in case of band-pass filter
2) Ratio of the stop bandwidth to the mid-band frequency in case of band-stop filter

1.3.15
insertion attenuation
logarithmic ratio of the power delivered directly to the load impedance before insertion of the filter to the power delivered to the load impedance after the insertion of the filter

The value is defined by:

$$10 \log_{10} \frac{P_o}{P_t} \text{ (dB)}$$

Where

P_o is the power delivered to the load impedance before insertion of the filter
P_t is the power delivered to the load impedance after insertion of the filter.

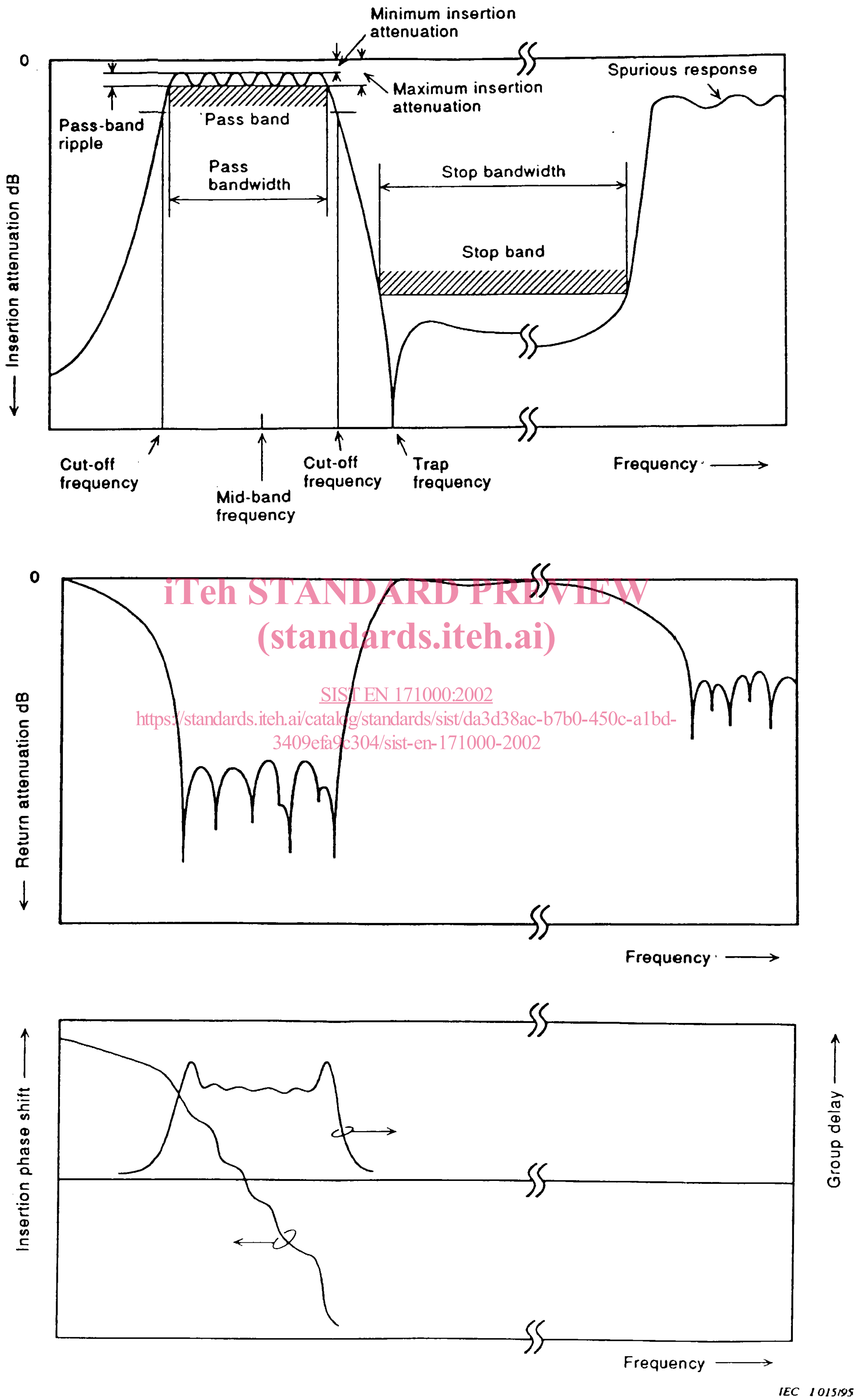


Figure 1 – Typical frequency characteristics of a band-pass filter

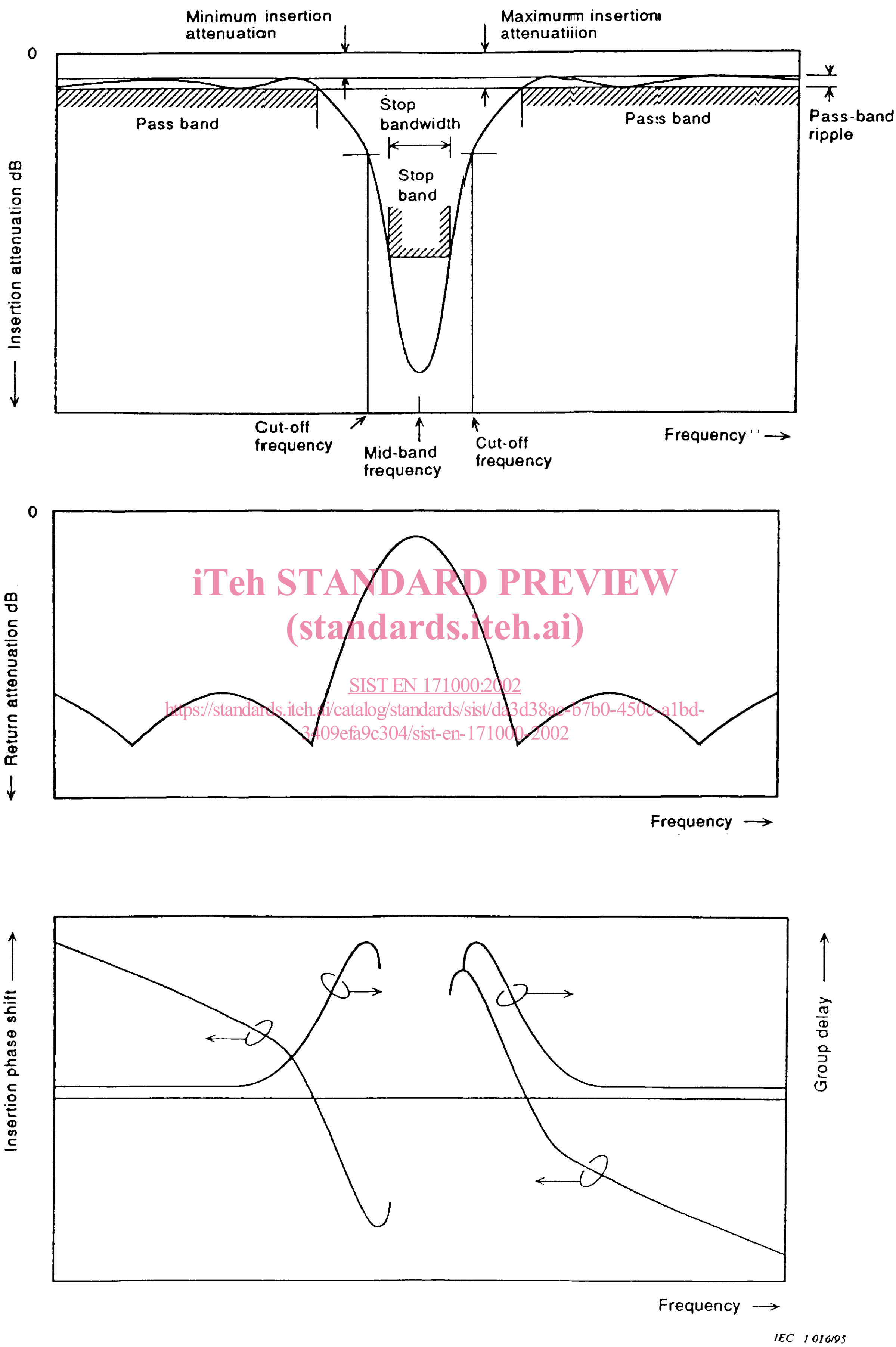


Figure 2 – Typical frequency characteristics of a band-stop filter