

**Harmonized system of quality assessment
for electronic components**

Generic specification:

**Surface acoustic wave (SAW)
filters**

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British Standard

ICS 31.160

Committees responsible for this British Standard

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- Federation of the Electronics Industry
- Institute of Electrical Engineers
- Institute of Physics
- Ministry of Defence
- National Supervising Inspectorate (BSI PC)

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National foreword

This British Standard has been prepared by Technical Committee EPL/49, and is the English language version of EN 166000 : 1995, *Generic specification: Surface acoustic wave (SAW) filters*, published by the Electronic Components Committee (CECC) of the European Committee for Electrotechnical Standardization (CENELEC).

EN 166000 has been prepared by CECC Working Group 17, Piezoelectric devices for frequency control and selection, and the United Kingdom participation in the drafting was provided by Technical Committee EPL/49, Piezoelectric devices for frequency control and selection.

Cross-references

Publication referred to	Corresponding British Standard
EN 100114-1 : 1993 (CECC 00 114/I : 1992)	BS EN 100114 <i>Rules of Procedure 14. Quality assessment procedures</i> BS EN 100114-1 : 1994 <i>Approval of manufacturers and other organizations</i>
EN 100015-1 : 1992 (CECC 0015/I : 1991)	BS EN 100015 <i>Harmonized system of quality assessment for electronic components. Basic specification. Protection of electrostatic sensitive devices</i> BS EN 100015-1 : 1992 <i>General requirements</i>
EN 60068-1 : 1994 (IEC 68-1 : 1988)	BS EN 60068 <i>Environmental testing</i> BS EN 60068-1 : 1995 <i>General and guidance</i>
EN 60068-2-1 : 1993 (IEC 68-2-1 : 1990)	BS EN 60068-2 <i>Test methods</i> BS EN 60068-2-1 : 1993 <i>Test A. Cold</i>
EN 60068-2-2 : 1993 (IEC 68-2-2 : 1974)	BS EN 60068-2-2 : 1993 <i>Test B. Dry heat</i>
EN 60068-2-6 : 1995 (IEC 68-2-6 : 1995)	BS EN 60068-2-6 : 1996 <i>Test Fc. Vibration (sinusoidal)</i>
EN 60068-2-7 : 1993 (IEC 68-2-7 : 1983)	BS EN 60068-2-7 : 1993 <i>Test Ga and guidance Acceleration, steady state</i>
EN 60068-2-27 : 1993 (IEC 68-2-27 : 1987)	BS EN 60068-2-27 : 1993 <i>Environmental testing procedures. Tests. Test Ea and guidance. Shock</i>
EN 60068-2-29 : 1993 (IEC 68-2-29 : 1987)	BS EN 60068-2-29 : 1993 <i>Environmental testing procedures. Tests. Test Eb and guidance. Bump</i>
EN 60068-2-32 : 1993 (IEC 68-2-32 : 1975)	BS EN 60068-2-32 : 1993 <i>Test Ed. Free fall</i>
EN 60068-2-45 : 1992 (IEC 68-2-45 : 1980)	BS EN 60068-2-45 : 1993 <i>Environmental testing. Tests. Test Xa and guidance. Immersion in cleaning solvents</i>
CECC 00 016 : 1990	BS CECC 00016 : 1991 <i>Harmonized system of quality assessment for electronic components. Basic specification: basic requirements for the use of statistical process control (SPC) in the CECC System</i>
CECC 00 114/II : 1994	BS CECC 00114 <i>Rules of Procedure 14. Quality assessment procedures</i> Part 2 : 1995 <i>Qualification approval of electronic components</i>
CECC 00 114/III : 1993	Part 3 : 1993 <i>Capability approval of an electronic component manufacturing activity</i>
CECC 00 109 : 1974	BS CECC 00109 : 1991 <i>Rule of Procedure 9. Certified test records</i>
CECC 00 111/I : 1994	BS CECC 00111 <i>Rule of Procedure 11. Specifications</i> Part 1 : 1994 <i>General regulations for CECC specifications</i>

CECC 00 200 : 1995	BS CECC 00200 : 1995 <i>Register of approvals</i>
CECC 00 802 : 1994	BS CECC 00802 : 1994 <i>Harmonized system of quality assessment for electronic components. Guidance document CECC Standard method for the specification of surface mounting components (SMDs) of assessed quality</i>
IEC 68-1 : 1988	BS 2011 <i>Environmental testing</i> Part 1.1 : 1989 <i>General and guidance</i> Part 2.1 <i>Tests</i>
HD 323.2.3 S2 : 1987 (IEC 68-2-3 : 1969)	Part 2.1Ca : 1977 <i>Test Ca. Damp heat, steady state</i>
HD 323.2.10 S3 : 1988 (IEC 68-2-10 : 1988)	Part 2.1J : 1989 <i>Test J and guidance. Mould growth</i>
HD 323.2.13 S1 : 1987 (IEC 68-2-13 : 1983)	Part 2.1M : 1984 <i>Test M. Low air pressure</i>
HD 323.2.14 S2 : 1987 (IEC 68-2-14 : 1984)	Part 2.1N : 1985 <i>Test N. Change of temperature</i>
IEC 68-2-17 : 1978	Part 2.1Q : 1981 <i>Test Q. Sealing</i>
HD 323.2.20 S3 : 1992 (IEC 68-2-20 : 1979)	Part 2.1T : 1981 <i>Test T. Soldering</i>
HD 323.2.21 S3 : 1988 (IEC 68-2-21 : 1983)	Part 2.1U : 1984 <i>Test U. Robustness of terminations and integral mounting devices</i>
HD 323.2.30 S3 : 1988 (IEC 68-2-30 : 1980)	Part 2.1Db : 1981 <i>Test Db and guidance. Damp heat, cyclic (12 + 12 hour cycle)</i>
HD 323.2.36 : 1984 (IEC 68-2-36 : 1972)	Part 2.1 Fdb : 1973 <i>Test Fdb. Random vibration — wide band reproducibility medium</i>
IEC 68-2-52 : 1984	Part 2.1KB : 1987 <i>Test Kb. Salt mist, cyclic (sodium chloride solution)</i>
IEC 617	BS 3939 <i>Graphical symbols for electric power, telecommunications and electronics diagrams</i> BS 6458 <i>Fire hazard testing for electrotechnical products</i> Part 2 <i>Test methods</i>
IEC 695-2-2 : 1991	Section 2.2 : 1993 <i>Needle-flame test</i>
ISO 1000 : 1992	BS 5555 : 1993 <i>Specification for SI units and recommendations for the use of their multiples and of certain other units</i>

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Descriptors: Quality, electronic components, surface acoustic wave (SAW) filters

English version

Generic specification Surface acoustic wave (SAW) filters

Spécification générique:
Filtres à ondes acoustiques de surface (OAS)

Fachgrundspezifikation:
Oberflächenwellen (OFW-) Filter

This European Standard was approved by CENELEC on 1995-06-24. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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

This European Standard was prepared by Working Group CLC/TC CECC/WG 17.

The text of the draft based on document CECC(Secretariat)3278 was submitted to the formal vote; together with the voting report, circulated as document CECC(Secretariat)3656, it was approved as EN 166000 on 1995-06-24.

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) 1996-07-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 1997-07-01

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SECTION 1 - SCOPE

This document specifies the methods of test and general requirements for surface acoustic wave filters of assessed quality using either capability approval or qualification approval procedures.

SECTION 2 - GENERAL

2.1 Order of precedence

Where any discrepancies occur for any reason, documents shall rank in the following order of precedence:

- the detail specification
- the sectional specification
- the generic specification;
- the CENELEC internal regulations:
- 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.

2.2 Related documents

ISO 1000	(1973)	SI units and recommendations for use of their multiples and of certain other units
IEC 27-1	(1971)	Letter symbols to be used in electrical technology : Part I : General
IEC 27-2	(1972)	Letter symbols to be used in electrical technology: Part 2 : Telecommunications and electronics
IEC 50	-	International Electrotechnical Vocabulary
IEC 50 (561)	(1991)	Chapter 561: Piezoelectric devices for frequency control and selection
IEC 68		Basic environmental testing procedures
IEC 68-1	(1988)	Part I: General and guidance
IEC 68-2	(1990)	Part 2: Tests

IEC 68-2-1	(1990)	Test A: Cold
IEC 68-2-2	(1974) (1976)	Test B : Dry heat Supplement A
IEC 68-2-3	(1969) (1984)	Test Ca : Damp heat, steady state Amendment No.1
IEC 68-2-6	(1982) (1983) (1985)	Test Fc and guidance : Vibration(sinusoidal) Amendment No.1 Amendment No.2
IEC 68-2-7	(1983) (1986)	Test Ga and guidance: Acceleration, steady state Amendment No.1
IEC 68-2-10	(1988)	Test J and guidance: Mould growth
IEC 68-2-13	(1983)	Test M Low air pressure
IEC 68-2-14	(1984) (1986)	Test N Change of temperature e Amendment No.1
IEC 68-2-17	(1978) (1991)	Test Q : Sealing Amendment No.4
IEC 68-2-20	(1979) (1986) (1987)	Test T : Soldering Amendment No.1 Amendment No.2
IEC 68-2-21	(1983) (1991)	Test U : Robustness of terminations and integral mounting devices Amendment No.2
IEC 68-2-27	(1987)	Test Ea and guidance: Shock
IEC 68-2-29	(1987)	Test Eb: Bump
IEC 68-2-30	(1980) (1990)	Test Db and guidance: Damp heat cyclic Amendment No.2
IEC 68-2-32	(1975) (1990)	Test Ed: Free fall Amendment No.2
IEC 68-2-36	(1973) (1983)	Test Fdb : Random vibration wide band- reproducibility medium Amendment No.1
IEC 68-2-45	(1980)	Test XA and guidance: Immersion in cleaning solvents

IEC 68-2-52	(1984)	Test Kb: Salt mist, cyclic (sodium chloride solution)
IEC 410	(1973)	Sampling plans and procedures for inspection by attributes
IEC 617	----	Graphical symbols for diagrams
IEC 695-2-2		Fire hazard testing
	(1991)	Part 2: Test methods
		Section 2: Needle -flame test
IEC 862-1	(1989)	Surface acoustic wave (SAW) filters
		Part 1: General information, standard values and test conditions
IEC 862-2	(1991)	Surface acoustic wave (SAW) filters
		Part- 2: Guide to the use of surface acoustic wave filters
IEC 862-3	(1986)	Surface acoustic wave (SAW) filters
		Part 3: Standard outlines
CECC 00 015/1	(1991)	Basic Specification: Protection of electrostatic sensitive devices: Part 1: General requirements.
CECC 00 016	(1990)	Basic requirements for the use of Statistical Process Control(SPC) in the CECC System.
CECC 00 114/I	(1990)	Quality assessment procedures Part I: Approval of manufacturers and other organizations
CECC 00 114/II	(1991)	Quality assessment procedures Part II: Qualification approval of electronic components
CECC 00 114/III	(1989)	Quality assessment procedures Part III: Capability approval of an electronic component manufacturing activity
CECC 00 109	(1974)	Certified test records
CECC 00 111	(1991)	Specifications
CECC 00 200	(1994)	Register of firms, products and services approved under the CECC System
CECC 00 802	(1990)	CECC Standard method for specification of surface mounting components (SMDs) of assessed quality

2.3 Units, symbols and terminology

2.3.1 General

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

ISO 1000	SI units and recommendations for the use of multiples and of certain other units
IEC 27	Letter symbols to be used in electrical technology
IEC 50	International Electrotechnical Vocabulary
IEC 50(561)	International Electrotechnical Vocabulary Chapter 561: Piezoelectric devices for frequency control and selection
IEC 862-1	Surface acoustic wave (SAW) -filters Part 1: General information, standard values and test conditions.
IEC 617	Graphical symbols for diagrams

The following paragraphs contain additional terminology applicable to surface acoustic wave (SAW) filters and the latest IEV definitions.

2.3.2 Surface acoustic wave (SAW) (561-06-01)

An acoustic wave, propagating along a surface of an elastic substrate, whose amplitude decays exponentially with substrate depth.

2.3.3 Surface acoustic wave filter (SAW filter) (561-06-2)

A filter characterized by a surface acoustic wave which is usually generated by an interdigital transducer and propagates along a substrate surface to a receiving transducer.

2.3.4 Power flow vector (561-06-03)

A vector, analogous to a Poynting vector, characterizing energy propagation caused by a surface acoustic wave.

2.3.5 Propagation vector (561-06-04)

A vector characterizing the phase progression of a wave.

2.3.6 Power flow angle (561-06-05)

The angle between the direction of power flow vector and the direction of propagation vector.

2.3.7 SAW beam steering (561-06-06)

SAW propagation phenomenon in anisotropic materials described by an angle of power flow, which is not zero.

2.3.8 SAW diffraction (561-06-07)

A phenomenon (analogous to diffraction of light from a source of finite aperture) which causes SAW beam spreading and wave front distortion.

2.3.9 SAW coupling coefficient (k_s) (561-06-08)

SAW electromechanical coupling coefficient is defined as follows:

$$k_s^2 = 2 \left| \frac{\Delta v}{v} \right|$$

where $\Delta v/v$ is the relative velocity change produced by short-circuiting the surface potential from the open-circuit condition.

2.3.10 Interdigital transducer (IDT) (561-06-09)

A SAW transducer made of a comb-like conductive structure deposited on a piezoelectric substrate transforming electrical energy into acoustic energy or vice versa.

2.3.11 Unidirectional interdigital transducer (UDT) (561-06-10)

A transducer capable of radiating and receiving surface acoustic waves in or from a single direction.

2.3.12 Multiphase transducer (561-06-11)

An interdigital transducer having more than two inputs which are driven in different phases. Usually used as unidirectional transducer.

2.3.13 Finger (561-06-12)

An element of the IDT electrode.

2.3.14 Dummy finger (561-06-13)

A passive finger which may be included in order to suppress wavefront distortion.

2.3.15 Split finger (561-06-14)

A finger formed of more than one element, so as to produce antireflection properties in a surface acoustic wave filter.