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Piezoelektrični senzorji - 1. del: Rodovna specifikacija

Piezoelectric Sensors - Part 1: Generic Specifications

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SECRETARIAT:

Japan

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OF INTEREST TO THE FOLLOWING COMMITTEES:

SC 47E

PROPOSED HORIZONTAL STANDARD:



Other TC/SCs are requested to indicate their interest, if any, in this CDV to the secretary.

FUNCTIONS CONCERNED:

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TITLE:

Piezoelectric Sensors – Part 1: Generic Specifications

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CONTENTS

1			
2	FOREWORD.....		4
3	1 Scope		6
4	2 Normative references		6
5	3 Terms and definitions		7
6	3.1 General.....		7
7	3.2 Piezoelectric sensor.....		7
8	3.3 Types of chemical sensors		7
9	3.4 Types of physical sensors		8
10	4 Symbol of sensor elements.....		8
11	4.1 General.....		8
12	4.2 Symbol for sensor elements of BAW resonator type		8
13	4.3 Symbol for sensor elements of SAW resonator type		9
14	4.4 Symbol for sensor elements of SAW delay-line type.....		10
15	4.5 Symbol for sensor elements of non-acoustic type.....		10
16	4.6 Symbols.....		11
17	5 Specifications		11
18	5.1 General.....		11
19	5.1.1 Sensor elements of resonator and delay-line types		11
20	5.1.2 Sensor elements of non-acoustic type		12
21	5.2 Frequency ranges		12
22	5.3 Level of drive or Input power.....		12
23	5.4 Unwanted response		12
24	5.5 Analysis of measurements		12
25	5.6 Enclosure		12
26	5.7 Performance confirmation		12
27	5.8 Long-term and short-term stabilities		13
28	6 Measurement and detection methods		13
29	7 Delivery conditions		13
30	7.1 Marking.....		13
31	7.2 Wrapping		13
32	7.3 Packaging.....		13
33	8 Quality and reliability		13
34	8.1 Reuse		13
35	8.2 Validity of release		13
36	8.3 Test procedures.....		13
37	8.4 Screening requirements		13
38	8.5 Unchecked parameters		14
39	9 Test and measurement procedures.....		14
40	9.1 General.....		14
41	9.1.1 Shipping test		14
42	9.1.2 Mechanical and environmental test.....		14
43	9.2 Test and measurement conditions.....		14
44	9.2.1 Standard conditions for testing		14
45	9.2.2 Equilibrium state.....		15
46	9.2.3 Power supply.....		15
47	9.2.4 Alternative test system		15
48	9.2.5 Visual inspection		15

49	9.3	Test conditions for shipment	15
50	9.3.1	Temperature dependence of frequency, phase, insertion loss/gain, 51 motional resistance, and electric charge / voltage	15
52	9.3.2	Unwanted response	15
53	9.3.3	Shunt capacitance	15
54	9.3.4	Insulation resistance	16
55	Annex A (normative)	Measurement methods	17
56	A.1	General	17
57	A.2	Measurement methods using reflection and transmission characteristics	17
58	A.3	Measurement methods using oscillation circuits	18
59	A.4	Measurement method of non-acoustic type sensor elements and cells	19
60	A.5	Other measurement methods	19
61	Annex B (normative)	Detection methods	20
62	B.1	General	20
63	B.2	Detection methods	20
64	B.2.1	Frequency difference measurement	20
65	B.2.2	Insertion loss/gain measurement	21
66	B.2.3	Phase difference measurement	21
67	B.2.4	Other detection methods	22
68	Bibliography		23
69			
70	Figure 1	– Conceptual diagrams for sensor elements of BAW resonator type	9
71	Figure 2	– Symbol for sensor elements of BAW resonator type	9
72	Figure 3	– Conceptual diagram of sensor elements of SAW resonator type	9
73	Figure 4	– Symbol for sensor elements of SAW resonator type	9
74	Figure 5	– Conceptual diagram for sensor elements of SAW delay-line type	10
75	Figure 6	– Symbol for sensor elements of SAW delay-line type	10
76	Figure 7	– Conceptual diagrams for sensor elements of non-acoustic type	10
77	Figure 8	– Symbol for sensor elements of non-acoustic type	10
78	Figure A.1	– Measurement method using reflection characteristics of BAW resonator 79 type sensor elements and cells	17
80	Figure A.2	– Measurement method using reflection characteristics of SAW resonator 81 type sensor elements and cells	17
82	Figure A.3	Measurement method using transmission characteristics of SAW delay-line 83 type sensor elements and cells	18
84	Figure A.4	– Measurement method using oscillation circuit consisting of BAW resonator 85 type sensor elements and cells	18
86	Figure A.5	– Measurement method using oscillation circuit consisting of SAW 87 resonator type sensor elements and cells	18
88	Figure A.6	– Measurement method using oscillation circuit consisting of SAW delay- 89 line type sensor elements and cells	19
90	Figure A.7	– Measurement method using amplifier consisting of non-acoustic type 91 sensor elements and cells	19
92	Figure B.1	– Measurement of frequency difference using two oscillation circuits	20
93	Figure B.2	– Measurement of frequency difference using an oscillation circuit and 94 frequency synthesizer	21
95	Figure B.3	– Measurement of insertion loss/gain difference using two oscillation 96 circuits	21
97	Figure B.4	– Measurement of phase difference using signal generator and phase 98 detector	22

INTERNATIONAL ELECTROTECHNICAL COMMISSION

PIEZOELECTRIC SENSORS –

Part 1: Generic specifications

FOREWORD

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International Standard IEC 63041-1 has been prepared by working group WG13: Sensor devices and systems of IEC technical committee TC 49: Piezoelectric, dielectric and electrostatic devices and associated materials for frequency control, selection and detection.

The text of this standard is based on the following documents:

FDIS	Report on voting
XX/XX/FDIS	XX/XX/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this publication will remain unchanged until the stability 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

- 153 • reconfirmed,
154 • withdrawn,
155 • replaced by a revised edition, or
156 • amended.

157

158 The National Committees are requested to note that for this publication the stability date
159 is 2021.

160 THIS TEXT IS INCLUDED FOR THE INFORMATION OF THE NATIONAL COMMITTEES AND WILL BE DELETED
161 AT THE PUBLICATION STAGE.

162

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[SIST EN IEC 63041-1:2018](https://standards.iteh.ai/catalog/standards/sist/b6bdf071-fb41-402b-9b25-a7e929b409a4/sist-en-iec-63041-1-2018)

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PIEZOELECTRIC SENSORS –

Part 1: Generic specifications

1 Scope

This International Standard applies to piezoelectric sensors of resonator, delay-line and non-acoustic types, which are used in physical and engineering sciences, chemistry and biochemistry, medical and environmental sciences, etc.

The purpose of this standard is to specify the terms and definitions for the piezoelectric sensors, and to make sure from a technological perspective that users understand the state-of-art piezoelectric sensors and how to use them correctly.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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

IEC 60068(all parts), Environmental testing

IEC 60122-1: Quartz crystal units of assessed quality - Part 1: Generic specification

IEC 60444-1: Measurement of quartz crystal unit parameters by zero phase technique in a pi-network - Part 1: Basic method for the measurement of resonance frequency and resonance resistance of quartz crystal units by zero phase technique in a pi-network

IEC 60444-5: Measurement of quartz crystal unit parameters – Part 5: Methods for measurement of quartz crystal elements for the determination of equivalent electrical parameters using automatic network analyzer techniques and error correction

IEC 60444-9: Measurement of quartz crystal unit parameters - Part 9: Measurement of spurious resonances of piezoelectric crystal units

IEC 60617: Graphical symbols for diagrams

IEC 60689: Measurements and test methods for tuning-fork quartz crystal units in the range 10 to 200 kHz and standard values

IEC 60758:2008, Synthetic quartz crystal-Specifications and guidelines for use

IEC 60862-1: Surface acoustic wave (SAW) filters of assessed quality - Part 1: Generic specification

IEC 61019-1: Surface acoustic wave (SAW) resonators – Part 1: Generic specification

IEC 62276: 2012, Single crystal wafers for surface acoustic wave (SAW) element applications - Specifications and measuring methods

ISO 1000: 1992, SI units and recommendations for the use of their multiples and of certain other units

ISO 2859-1:1999, Sampling procedures for inspection by attributes - Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection

ISO 80000 (all parts), Quantities and units

3 Terms and definitions

3.1 General

Piezoelectric sensors covered herein are those used for the detection and measurement of physical quantities, chemical substances or biological molecules. For the purpose of this document, the following terms and definitions apply. Units, letter symbols and terminology shall, wherever possible, be taken from the following standards: IEC 60027, IEC 60050(561), IEC 60617, and ISO 1000.

3.2 Piezoelectric sensor

3.2.1

piezoelectric sensor element

electronic component which is able to detect physical quantities as a change in its frequency, phase, delay, electrical charge, resistance, Q-value, bandwidth, etc.

Note 1 to entry: For chemical and biochemical sensor applications, the piezoelectric sensor element includes a sensitive or receptive layer (target recognition material).

3.2.2

resonator type sensor element

piezoelectric sensor component using acoustic resonances.

3.2.3

delay line type sensor element

piezoelectric sensor component using an SAW delay-line of transversal type.

3.2.4

non-acoustic type sensor element

piezoelectric sensor component using the electrical charge induced by a quasi-static force, torque or the like.

Note 1 to entry: Here, the term, "non-acoustic", represents "quasi-static piezoelectric". Accordingly, the (piezoelectric) non-acoustic type sensor element means a sensor element using the quasi-static piezoelectric effect.

3.2.5

piezoelectric sensor cell

sensor element equipped with necessary mechanical accessories and attachments to correctly detect the parameters to be measured.

3.2.6

piezoelectric sensor module

sensor element or cell equipped with electronic accessories for interfacing to external data acquisitions.

3.2.7

piezoelectric sensor

generic term that includes a sensor element, cell and module.

3.2.8

QCM (quartz crystal microbalance)

one of the families of chemical and biochemical sensors using crystal resonators.

Note 1 to entry: A thickness shear mode (TSM) sensor is identical with a QCM.

3.3 Types of chemical sensors

3.3.1

piezoelectric chemical sensor element

piezoelectric sensor component including a sensitive layer (target recognition material), which is necessary for the practical measurement of simple non-biological molecules in quantity, and which works and detects chemical substances mainly in the gas phase.

Note 1 to entry: A gas sensor element is one of the chemical sensor elements.

3.3.2**piezoelectric biochemical sensor element**

piezoelectric sensor component including a receptive layer (target recognition material), which is necessary for the practical measurement of complex biological molecules in quantity, and which works mainly in aqueous media and detects biomolecules therein.

3.4 Types of physical sensors**3.4.1****piezoelectric force sensor element**

piezoelectric sensor component whose resonance frequency, delay or electrical charge/voltage is used for force measurement.

3.4.2**piezoelectric pressure sensor element**

piezoelectric sensor component whose resonance frequency, delay or electrical charge/voltage is used for pressure measurement.

3.4.3**piezoelectric torque sensor element**

piezoelectric sensor component whose resonance frequency, delay or electrical charge/voltage is used for torque measurement.

3.4.4**piezoelectric viscosity sensor element**

piezoelectric sensor component whose resonance frequency, delay or insertion loss/gain is used for viscosity measurement.

3.4.5**piezoelectric temperature sensor element**

piezoelectric sensor component whose resonance frequency or delay is used for temperature measurement.

3.4.6**piezoelectric film-thickness sensor element**

piezoelectric sensor component whose resonance frequency is used for film-thickness measurement.

4 Symbol of sensor elements**4.1 General**

Figures 1 to 6 show the conceptual diagrams and defined symbols for sensor elements of BAW (bulk acoustic wave) resonator, SAW resonator and SAW delay-line types. The symbols are essentially the same with those shown in IEC 60122-1, IEC 61019-1 and IEC 60862-1.

Figures 7 and 8 show the conceptual diagram and defined symbol for sensor elements of non-acoustic type.

NOTE 1 The diagonal line in Figures 2, 4, 6 and 8 shows an emblem expressing changes in objects to be measured.

NOTE 2 Letter symbols (see 4.6) showing the types of sensors are put in the circle at the upper right corner in Figures 2, 4, 6 and 8.

4.2 Symbol for sensor elements of BAW resonator type

Figure 1 shows the conceptual diagrams for sensor elements of BAW resonator type from which a mounting portion is omitted. Figure 2 shows the symbol for sensor elements of BAW resonator type.