



IEC/TC OR SC: IEC/TC 49	SECRETARIAT: JAPAN	DATE: 2019-10-18
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Please ensure this form is annexed to the Report to the Standardization Management Board if it has been prepared during a meeting or sent to the Central Office promptly after its contents have been agreed by the committee.

A. STATE TITLE AND SCOPE OF TC

Are there any new or emerging trends in technology that will impact the scope and work activities of the TC? Please describe briefly.

Do you need to update your scope to reflect new and emerging technologies? If yes, will these changes impact another TC's scope or work activities?

If yes, describe how these will impact another TC(s) and list the TC(s) it would impact

Title: PIEZOELECTRIC, DIELECTRIC AND ELECTROSTATIC DEVICES AND ASSOCIATED MATERIALS FOR FREQUENCY CONTROL, SELECTION AND DETECTION

IEC TC 49 was established in November 1960 at the IEC General Meeting held in New-Delhi. Prior to the origin of TC 49, work on quartz crystal units was managed by subcommittee 40-3, electronic components. When TC 49 was founded, its title was "Piezoelectric crystals and associated devices". Afterwards, with the expansion of the related technologies and products such as surface acoustic wave (SAW) devices and dielectric devices, it became "Piezoelectric and dielectric devices for frequency control and selection". From 2009, the title has been revised to a current title, to cover not only piezoelectric and dielectric but also electrostatic devices and expand their functions into frequency detection.

Scope:

To prepare international standards for piezoelectric, dielectric and electrostatic devices for frequency control, selection and detection, such as resonators, filters, oscillators, sensors and their related products (excluding those piezoelectric transducers dealt with by TC29 and TC87 and active devices dealt with by SC47E and SC47F) and for the associated materials.

B. MANAGEMENT STRUCTURE OF THE TC

Describe the management structure of the TC (use of an organizational chart is acceptable) (should be integrated by CO automatically) and, if relevant (for example an unusual structure is used), provide the rationale as to why this structure is used.

Note: Check if the information on the IEC website is complete.

When was the last time the TC reviewed its management structure? Describe any changes made. When does the TC intend to review its current management structure? In the future, will the TC change the current structure, for example due to new and emerging technologies, product withdrawal, change in regulations etc. Please describe.

Make sure the overview includes:

- any joint working groups with other committees,
- any special groups like advisory groups, editing groups, etc.

TC 49 has 7 working groups as listed below:

WG 1: Piezoelectric crystal and ceramic devices

WG 5: Materials for frequency control and selection

WG 7: Piezoelectric, dielectric and electrostatic oscillators

WG 9: Enclosures and related technologies

WG 10: Surface and bulk acoustic wave (SAW and BAW) and dielectric devices

WG 11: Coordination of measuring methods and, development and maintenance of glossary

WG 13: Sensor devices and systems

TC 49 reviewed its management structure at its plenary meeting held in Berlin, 2015-06. It was decided to disband WG 6 (Measuring methods) as the preparation of measurement methods is now the responsibility of each working group, and to remain only coordination function of measuring methods for all devices in new WG11.

TC 49 re-organized WG 11 with a new title and task. The new WG 11 is tasked for coordination of measuring methods for all devices discussed in TC 49 in addition to its former role to develop and maintain the glossary of TC 49.

TC 49 started to develop the international standard of piezoelectric sensors at New Working Group of WG13 and two standards have been published in 2018.

C. BUSINESS ENVIRONMENT

Provide the rationale for the market relevance of the future standards being produced in the TC.

If readily available, provide an indication of global or regional sales of products or services related to the TC/SC work and state the source of the data.

Specify if standards will be significantly effective for assessing regulatory compliance.

Piezoelectric, dielectric and electrostatic devices for frequency control, selection and detection, such as resonators, filters, oscillators, and sensors are key devices for various electrical industries. With the progress and spread of broadband & mobile communications, demand for higher frequency control and selection devices has grown rapidly year-by-year. Especially, mobile phones are now popularized in worldwide and among their key electrical components are frequency control and selection devices such as temperature compensated crystal oscillators (TCXO), quartz resonators and SAW filters/duplexers. Also, in broadband high-end communication systems, many kinds of frequency control and selection devices such as voltage controlled crystal oscillators (VCXO), oven controlled crystal oscillators (OCXO), dielectric devices and SAW devices are utilized as necessary components to provide high performance of many characteristics such as low noise, high stability, low loss, small size and so on.

The demand for frequency control, selection and detection devices with high-performance and high-reliability for aerospace, space and defence increases steadily.

There is an increasing demand for safety, connectivity and entertainment in vehicles that boosts the auto electronics market and devices developments in electronic control and sensing. These technological developments are also for the advancement of self-driving technology.

Sensors are increasing in importance and represent a rapidly developing use of piezoelectric technology. Moreover, in order to provide more convenient life to humankind, improved human-interfaces are desired leading to wireless radio applications and sensing systems becoming much more important in such applications as automobiles, robot, home automation, etc. Thus, modern civilization realizes many benefits from piezoelectric, dielectric and electrostatic devices for frequency control, selection and detection.

The internet of Things (IoT) is highly dependent on frequency control and selection used in

all aspects of wireless and networking.

D. MARKET DEMAND

Provide a list of likely customers of the standards (suppliers, specifiers, testing bodies, regulators, installers, other TC/SC's etc.). Do not specify company names, only categories of customers.

The frequency control business today is led by international companies' that are global and diverse. The most important manufacturing companies own multiple factories outside of their home countries and often utilize independent electronics assembly (EMS) companies. Therefore, customer / producer relationships are also global, resulting in an increased need for international standards to improve technical compatibility to support quality management and achieve economic benefit. At present, IEC TC 49 standards are the leading standards for frequency control and selection devices world-wide and are very significant for various electronics markets covering fixed communications such as wireless and optical fibre communications, mobile communications, IoT, PCs, electrical games, automotive, consumer electronics, medical care and so on.

E. TRENDS IN TECHNOLOGY AND IN THE MARKET

If any, indicate the current or expected trends in the technology or in the market covered by the products of your TC/SC.

The market is driven by trends in various electronics fields as above. The frequency control, selection and sensing device industry continue to develop by addressing fundamental electronics industry trends of miniaturization, increased functionality, lower costs, higher performances/quality, and accelerating technical evolution.

There are many market segments of frequency control and selection devices. Major segments can be said to be telecommunication infrastructure, such as wireless and optical fibre communications access systems, and consumer electronics such as mobile phone terminals, CATV, PCs, Audio-Visual, electrical games, and automotive. The quantity of mobile phone terminals is overwhelmingly large, and this market is one of the most important segments for frequency control components. The current demand of other markets is not as large as mobile phones, but the function of frequency control, selection and detection is extremely important to the functionality of end products in these markets and, therefore, they represent important growth opportunities to expand the use of frequency control, selection and detecting components. Recently, MEMS timing devices have found application in consumer products and for communication equipment. It is also expected to be applied to automotive products. Among these growing segments, automotive is of special note. The usage of frequency control and selection devices for the automobile is rapidly increasing, because automobile is pursuing safety and comfort-oriented car electronics and so many frequency control and selection devices are utilized in such car electronics equipment.

For further miniaturization, trends are observed towards small, thin and light surface mount packaging technology (SMT) of frequency control and selection components themselves, and integration of RF circuits as modules involving the frequency control and selection components inside. Digital technologies have impacted the use of piezoelectric devices in certain filter applications associated with mobile communications. For a single smartphone, 10-40 pieces of SAW/BAW filters/duplexers are installed and utilized. Those SAW/BAW devices are strongly requested to be tiny and thin, and wafer level-chip size package (WL-CSP) technologies have been developed. In addition, WL-CSP type SAW/BAW devices are installed with RF semiconductors, such as switches and amplifiers, inside the RF front-end modules for smartphones. Also, oscillators and/or resonators are key devices as RF frequency sources for smartphones, and they are continuously requested to be reduced in size. It is said that the next generation of the mobile communication would be 5G and the allocated frequency band would shift up to millimetre wave, but 5G communication contains multiple functions of not only mobile communication but also communications and sensors for IoT, robots and self-driving. Thus, the demands for various components of frequency control, selection and detection will greatly expand with spreading 5G communication systems.

The transportation market continues to expand its use of timing, filtering, and sensing components towards realization of advanced driving assistance systems (ADAS). Greater interest in advanced resonator technology is created by trends towards higher operating frequencies. Thus, the priorities of work will be set to best meet market needs.

One of recent technical innovation in frequency control is SAW/BAW devices applied to sensors. Foremost among these products are SAW/BAW chemical sensors such as the quartz crystal microbalance (QCM). The QCM and other sensor devices entered into the practical stage and are used for sensing various chemical, gas, and environmental phenomena by detecting their frequency change more precisely than other competing technology sensors. TC 49 has established a new WG13 to address this family of sensor products.

Another topic of innovation is, aerospace, space and defence as technology driving market for frequency control, selection and detection. There are (besides others) ultra-low phase noise and jitter, low sensitivity to vibration and other environmental conditions, tough holdover requirements in case of loss of GNSS (Global Navigation Satellite System) reference signals.

F. SYSTEM APPROACH ASPECTS (REFERENCE – AC/33/2013)

Does your TC/SC have a need for a systems approach?

If so:

- Will the Systems work be in a single TC or in multiple TCs?
- Will a Systems Evaluation Group (SEG), Systems Committee (SyC), or Systems Resource Group be required?
- Is your TC/SC work of relevance to ISO?
- Is or are there fora or consortia working in parallel to IEC? Is there a chance to integrate this work in your TC/SC?

This should not only be restricted to the customer/supplier relationships with other TC/SCs indicating types of co-operation (e.g. liaisons, joint working groups) but be of a more generic nature.

If there is no need for a systems approach as outlined in AC/33/2013, is it intended a TC would not be requested to report on general systems approach considerations such as customer/supplier relationships, liaisons, joint WGs, etc. as referenced in the system approach matrix illustrated in slide 14 of the presentation attached to AC/37/2006?

There is no identified need for a systems approach for TC 49 with reference to IEC document AC/33/2013. However, as a product technical committee, TC 49 reports the general systems approach considerations on customer/supplier relations as below:

System Committees (TC 49 as a supplier)	TC 9	Electrical equipment and systems for railways
	TC 18	Electrical installations of ships and of mobile and fixed offshore units
	TC 62	Electrical equipment in medical practice
	TC 65	Industrial-process measurement, control and automation
	TC 69	Electric road vehicles and electric industrial trucks
	TC 80	Maritime navigation and radio communication equipment and systems
	TC 100	Audio, video and multimedia systems and equipment
	TC 103	Transmitting equipment for radio communication
	TC 124	Wearable electronic devices and technologies
Other Committees	SC 46F	RF and microwave passive components
	SC 47F	Micro-electromechanical systems
	SC 47E	Discrete semiconductor devices

	TC 91	Electronics assembly technology	
	TC 101	Electrostatics	
	TC 111	Environmental standardization for electrical and electronic products and systems	
	TC 113	Nanotechnology standardization for electrical and electronic products and systems	

G. CONFORMITY ASSESSMENT

With reference to clause 33 of Part 2 of the ISO/IEC directives, are all your publications in line with the requirements related to conformity assessment aspects? Will the TC/SC publications be used for IEC Conformity Assessment Systems (IECEE, IECEx, IECQ, IECRE)?

Will any of your standards include test specifications, reproducible test requirements, and test methods? Are there likely to be special conformity assessment requirements generated by any standards projects? If yes, list which projects.

TC 49 has developed several international standards for use in the IEC Quality Assessment System for Electronic Components (IECQ) in the 1980's to 2000 which can be seen in some parts of IEC 60122, IEC 60368, IEC 60679, IEC 60862, IEC 61019, IEC 61178, IEC 61253, IEC 61261, IEC 62884, IEC 63041 series, etc. These publications will be aligned to clause 33 of Part 2 of the ISO/IEC directives in accordance with the "neutrality principle" when these publications should be revised.

H. HORIZONTAL ISSUES

Indicate here how the TC/SC deals with horizontal issues such as energy efficiency, environmental aspects, safety, security...

Provide information on the interaction with SMB Advisory Committees, if applicable.

Since devices standardized by TC49 have a multiplicity of uses, horizontal issues are taken into standardization.

I. 3-5 YEAR PROJECTED STRATEGIC OBJECTIVES, ACTIONS, TARGET DATES

STRATEGIC OBJECTIVES 3-5 YEARS	ACTIONS TO SUPPORT THE STRATEGIC OBJECTIVES	TARGET DATE(S) TO COMPLETE THE ACTIONS
Nomination of more experts	Promote technical exchange through academic and industrial field.	2021
Standardization of measurement method of power durability of SAW devices	CDV was issued in May 2019.	2020
Configuration change of IEC TS 61994 Series (Glossary)	First discussion will be done at Shanghai meeting held in Oct. 2019	2021
Standardization of piezoelectric sensors.	1st CD for physical sensor was issued in Jun. 2019.	2021
Expand MEMS participation in TC49 activity	Discussion will be done at Shanghai meeting held in Oct. 2019.	2020

Note: The progress on the actions should be reported in the RSMB.