STRATEGIC BUSINESS PLAN (SBP)

IEC/TC OR SC:	SECRETARIAT:	DATE:
TC 40	**The Netherlands**	**2017-12-XX**

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

TC 40 “Capacitors and resistors for electronic equipment is responsible for the preparation and maintenance of international standards for:

a. Capacitors, resistors, thermistors and varistors for use in electronic equipment.

b. Capacitors, resistors and inductors and complete electromagnetic interference (EMI) suppression filter units for EMI suppression.

c. Passive integrated circuits or networks containing resistors, capacitors, inductors or their combinations.

d. Packaging of electronic components for automatic handling, which is an activity undertaken on behalf of all relevant component technical committees.

e. Electric double layer capacitors for use in electric and electronic equipment.

B. MANAGEMENT STRUCTURE OF THE TC

Working Groups

WG 36 : Packaging of components for automatic handling

WG 39 : General items and harmonization

WG 40 : Capacitors, Inductors and Filters

WG 41 : Resistors

AG 42 : TC 40 Website

WG 43 : Non-Linear Resistors

C. BUSINESS ENVIRONMENT

Capacitors, resistors and inductors are so called passive components, which together with active components (semiconductors), printed wiring boards, connectors and some other components like filters, switches and fuses are basic building blocks in electronic products.

There are more than 4000 Billion discrete resistors, capacitors and inductors used annually in these products. The value of this business worldwide was more than 25 Billion Euros year 2015, and the market is fully global.

The increasing use of electronics in all fields of industry supports a continuous growth in the demand of these passive components. Today’s electronic circuits have typically 6 to 25 passive components against each active component (semiconductor), and the active and passive component markets develop “hand in hand”.

During the last 20 years five major technological trends have influenced the development of all components and continue to do so: miniaturization, automatic assembly of the components, electronics assembly technology (earlier surface mounting, now growingly embedding of the components), digitalization of the electronics and request for zero defects. These trends have meant a huge challenge in the development of passive components, which consequently has resulted in a continuous need of standards for new component families and updates of existing specifications, appropriate test methods and requirements. Similar activities have influenced all

styles of packaging of all various components for automatic handling, active as well as passive.

At the same time the prices of passive components have declined, in some areas dramatically. This development has forced to large consolidation in the component industry lowering the number of producing companies in the world, and moving the manufacturing industry to low cost countries, especially to China. At the same time also the electronics manufacturing, i.e. the customer industry for components, especially in consumer products, has moved from Europe, Japan and North-America largely to Asia-Pacific region. New companies have entered the component manufacturing in this region. In year 2000 still ca. 55% of capacitors were produced in Europe, Japan and North-America, when this share in 2015 was lower than 20%. Rest of the production is in Asia-Pacific region, mainly in China, but India growing as well.

D. MARKET DEMAND

The “audience” of the standards developed by TC 40 are the manufacturers of components, the users of the components [set makers = OEMs (Original Equipment Manufacturers), ODMs (Original Design Manufacturers) and EMSs (Electronics Manufacturing Services)], producers of machines for automatic handling and assembly, test houses and certifying bodies (specifically with regard to safety matters).

Although component manufacturing industry is well represented in TC 40, the OEM-, ODM-, EMS-, and machine producing industries i.e. component users are encouraged to participate more in TC 40 standardization work along with the component makers.

The growth of electronics production is fastest in the Asia-Pacific region. Active participation (P-membership) by countries from this region is developing well.

There is a continuous need for new standards in the TC 40 area and at the same time the maintenance of existing standards causes considerable amount of work. The trend to adopt IEC standards as National standards has increased also outside of Europe, and IEC standards have gained credibility over other competing standards. This puts increasing pressure to the contents and timelines of the standards in the future. There will be a growing amount of requests to adopt national requirements in the IEC standards so that unified documents, accepted by everybody, can be written.

E. TRENDS IN TECHNOLOGY AND IN THE MARKET

The trends given in C. continue to affect the work of TC 40 also in the future. Due to large increase in hand-held and mobile electronics, and in signal frequencies, the miniaturization of components is an ongoing trend. The smallest discrete capacitors today are 0,25 mm x 0,125 mm x 0,125 mm in volume. The handling of this kind of components needs special packaging and automatic machinery. To further increase the packaging density, more and more components will be embedded in the substrates like printed wiring boards rather than assembled on their surfaces. Very thin (in the range of 150 µm) and small components used in embedding have created totally new requirements for testing and automatic handling. The function of several passive components can also be integrated together in a single passive integrated circuit component. Here the manufacturing technology can be a planar technology on silicon, ceramic or glass, or LTCC (Low Temperature Co-fired Ceramics) technology.

The TC 40 scope covers very wide area of technologies from components to complete filters and also wide range of physical sizes of components, the largest having a volume of cubic decimeters. The increasing use of delicate electronics in all areas of industry has put lot of pressure to protect the electronics of electromagnetic interferences. The need for mains voltage EMI suppression filters also in the industrial area is pushing the voltage ratings up, and creates new requirements for safety components. In general the cost and size pressures have changed the practices in the electronics design during last years. This means that the established limitations for voltage, current, dissipation and temperature for components are increasingly challenged, and the

comprehension of the physical background to these parameters has widely disappeared. This has to be taken into account in the maintenance of existing standards.

The following developments will require appropriate standardization:

- Passive integrated circuits and embedded passives
- New dielectric materials in the area of capacitors (e.g. Nb capacitors), new electrolytic materials (e.g. new conductive polymers), higher permeability of ferrites for inductors.
- New capacitor technologies, e.g. thin film capacitors
- Very thin capacitors and resistors for embedded electronics
- Increasing voltages in EMI filter area
- Very high frequency test methods for capacitors
- Electric double layer capacitors, both symmetric and asymmetric technologies, hybrid capacitors combining a capacitor and a battery, and their testing for various applications
- Packaging of thin and ultra small components for automatic assembly
- Lower resistance values with increased precision requirements, made in affordable technologies
- Combination of different resistors on single substrates

There is an increasing emphasis on environmental issues and restriction on materials used. Maintenance Teams should take this into account during their deliberations. The severe pressure to remove from using known, well performing flame retardant materials may influence the ability of safety capacitors to meet self extinguishing classification tests, and new rules may be needed. The ban of lead has required major changes in the components assembly, partly threatening the applicability of certain components for larger application areas, an issue which will continue to impose changes in the industries.

Market continues to be very volatile. After a good year 2008 the global recession meant clear drop in business for year 2009. 2010 was a year of fast recovery leading to shortage of capacitors and resistors and to increasing prices and better profitability of component producing companies. During the second half of 2011 the market again dropped considerably and this soft market situation has continued through the year 2012. During 2014 and 2015 the quantities of passive components showed a significant growth again, but the average selling price continues to decrease causing the total market value to grow slower or drop in some areas. The new area of Electric Double Layer Capacitors (EDLCs), so called Super or Ultra capacitors, has started to find mass market applications, and growth here is expected to be fast (double digit average annual growth rate, reaching 1 Billion Euros by 2016-2017). New technologies have entered this area causing some confusion among customers in component selection.

The electronics industry is continuing to grow on long term, and there are no known reasons, why the use of passive components would not continue growing, also. The companies will continue moving production to low cost areas, but this development will slow down. The fast development in the area of electric and hybrid vehicles and renewable energy production (e.g. wind and solar power) will create new applications, requirements and market also for passive components, and this development should be followed carefully. The demarcation line between TC 40 and TC 33: Capacitors for power electronics will be challenged because of this new development, and discussions between the committees are needed.

The move of the production of electronic equipment from the OEMs to subcontracting (EMS) continues, as well as geographical relocation especially to China. This means a great challenge to find and reach new “audience” for standards, and participants to standardization work.

TC 40's main focus is on standards for components as end products, not on manufacturing technologies and materials used. In standards for packaging of components for automatic handling, attention will be paid to minimize the use of packaging materials as well as to adopting recyclable materials. New energy saving equipment / solutions may generate needs for new types of capacitors or filters and their standards.

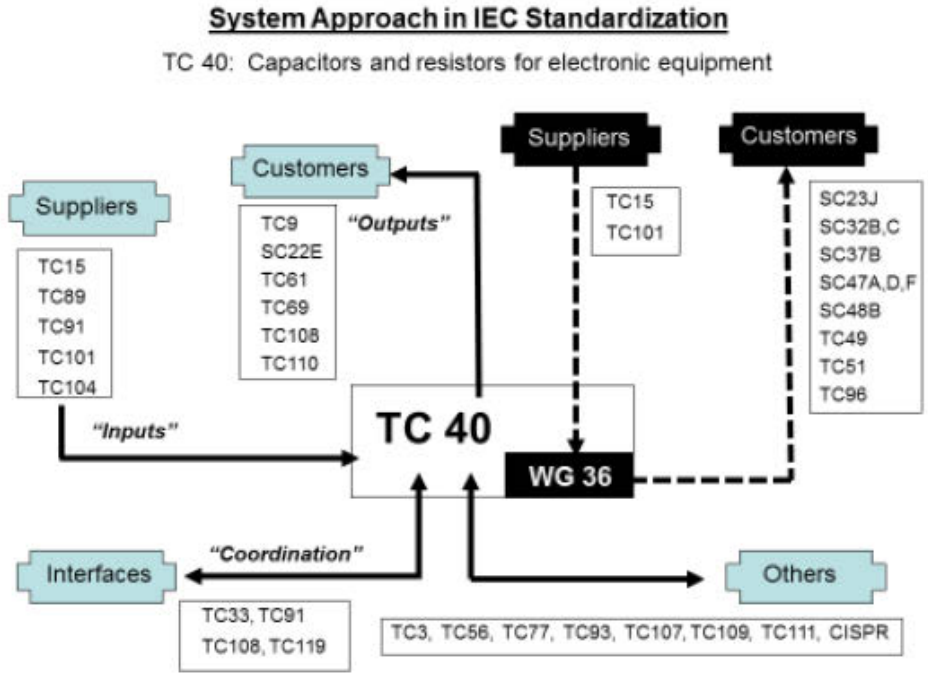
The trend to ban hazardous substances has had, and may have indirect influence to component standards (e.g. changes in solder materials have forced to change the soldering standards), an issue to be dealt with in the regular maintenance cycles.

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

TC 40 will actively continue to promote the establishment of liaisons to other committees. Internal IEC liaisons have been established with the following TCs / SCs:

TC 9: Electrical equipment and systems for railways
SC 37B: Components for low-voltage surge protection
SC 47A: Integrated circuits
TC 69: Electric road vehicles and electric industrial trucks
TC 91: Electronics assembly technology
TC 101: Electrostatics
TC 104: Environmental conditions, classification and methods of test
TC 108: Safety of electronic equipment within the field of audio/video, information technology and communication technology

The System Approach of TC 40 is visualized in the overview below in which "suppliers to", "customers of", "interfaces to" and "other links to" TC 40 and its Working Group 36 are shown.



Legend of TCs and SCs mentioned in the System Approach overview

TC 3 : Information structures, documentation and graphical symbols
TC 9 : Electrical equipment and systems for railways
TC 15 : Solid electrical insulating materials

TC 33 : Power capacitors and their applications
TC 49 : Piezoelectric and dielectric devices for frequency control and selection
TC 51 : Magnetic components and ferrite materials
TC 56 : Dependability
TC 61 : Safety of household and similar electrical appliances
TC 69 : Electric road vehicles and electric industrial trucks
TC 77 : Electromagnetic compatibility
TC 89 : Fire hazard testing
TC 91 : Electronics assembly technology
TC 93 : Design automation
TC 96 : Transformers, reactors, power supply units and similar products for low voltage up to 1100 V
TC 101: Electrostatics
TC 104: Environmental conditions, classification and methods of test
TC 107: Process management for avionics
TC 108: Safety of electronic equipment within the field of audio/video, information technology and communication technology
TC 109: Insulation co-ordination for low-voltage equipment
TC 110: Flat panel display devices
TC 111: Environmental standardization for electrical and electronic products and systems
TC 119: Printed electronics
SC 22E : Stabilized power supplies
SC 23J : Switches for appliances
SC 32B : Low-voltage fuses
SC 32C : Miniature fuses
SC 37B : Specific components for surge arresters and surge protective devices
SC 47A : Integrated circuits
SC 47D : Mechanical standardization for semiconductor devices
SC 47F : Micro-electromechanical systems
SC 48B : Connectors

G. Conformity Assessment

TC 40 prepares standards and specifications for use within the IECQ or other conformity assessment systems.

H. 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
General objectives		
Establishment and utilization of TC40 Website	1. Set up AG42, decide on content and a visible place at the IEC Website 2. Go online with a preliminary version	Completed. Completed. TC 40 website is operational.
Focus on project management	1. Make available enhanced project management tools 2. Introduce quarterly reporting of performance including target setting	Completed. Completed.

To cover non-linear resistor technology	Set up of a WG	Completed. WG43 has formally been established.
Evolve to new assembly technologies	Embedded passive in PCB in cooperation with TC 91	-
WG36		
Enhanced measuring methods - packaging of components for automatic handling	Measuring static electricity of packaging material / JWG13	2018
Packaging of very thin and small components	Develop a standard in the IEC 60286 series	2021
WG39		
Guidance on the structure of TC 40 component standards	1. Guidance for Generic Spec. 2. Guidance for Sectional Spec. 3. Guidance for Blank Detail Spec.	2018 2018 2018
WG40		
EDLC standardization framework (taxonomy)	1. Taxonomy and terminology for symmetric and asymmetric EDLC 2. Generic specification for asymmetric EDLC	Determination of the strategy for symmetric and asymmetric EDLC standardization is foreseen in 2018 2020
Enhanced test methods for components	1. Reference test specification for ripple current 2. Corona effects in capacitors 3. Pulse testing – influence of coupling network	2020 2021 2021
WG41		
Adapt current specification to SMD technologies	Thermal management for surface mount resistors.	2020
Evolve to new assembly technologies	High temperature mounting and operation on Power module.	2020
Note: The progress on the actions should be reported in the RSMB.		