SMB/5519/R

STRATEGIC BUSINESS PLAN (SBP)

IEC/TC or SC	Secretariat	Date
TC 48	USA	2014-11

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Title of TC

"Electrical connectors and mechanical structures for electrical and electronic equipment"

BACKGROUND

This draft of the TC 48 strategic business plan intends to overview the period until 2020 and to predict the future activities of TC 48 under consideration of the development of world-wide economy and society.

The development of a second edition was agreed in TC 48 meeting in Delft 2013.

A Background

A.1 Date of establishment of the Technical Committee and a brief historical background

IEC TC 48 (formerly a sub-committee of the original TC 40 established in 1954 as the parent committee for electronic components) was established in 1961 with the title "Electromechanical components for electronic equipment". In 1992 the title of TC 48 was amended to "Electromechanical components and mechanical structures for electronic equipment" to reflect the needs of industry in this area. At the beginning of 2013 the latest title change was approved by the SMB to "Electrical connectors and mechanical structures for electrical and electronic equipment" to reflect the fact that nowadays only electrical connectors are standardized by TC 48 among the electromechanical components.

A.2 Meeting history and key issues

Date	Location	Key issues
2003	Milan, Italy	• New TC 48 Chairman: Gerd Weking • Use of IPR in standards • Usage of PAS documents
2004	Beijing, PR China	• TC 48 Strategic policy statements (SPS) • Usage of PAS Procedure • New TC 48 secretary: Jeff Toran
2005	Cape Town, South Africa (w/ GM)	• TC 48 SPS • Adaption of SMB Standardization Strategy 2005 – 2007 concerning system & component committees
2006	Berlin, Germany (w/ GM)	• TC 48 draft Good Working Practice (GWP) • SC 48D considered an extension of its scope.
2007	Prague, Czech	• TC 48 draft Strategic Business Plan (SBP) including system approach aspects

	Republic	• Update of IEV 581 revision • TC 48s First version of Good Working Practice document
2008	São Paolo, Brazil (w/ GM)	• TC 48 Strategic Business Plan was considered by the SMB as a good example to be used by all TCs as guidance (see AC 42, 2008). • The November issue of the IEC E-Tech bulleting has a four-page article about the SBP of TC 48.
2009	Stockholm / Kista; Sweden	• IEC CO allocated TC 48 to the North American Branch Office of IEC, Technical Officer is Tim Rotti. • The meetings of TC 48, SC 48B and SC 48D are held within one day for the first time. • Update of TC 48s SBP with respect to financial crisis' effects
2010	Seattle, USA, (w/ GM)	• New chairman of SC 48D: N. Sugiura • Based on items provided in the Strategic Business Plan and on new trends of technology, the Chairman proposed forming a new advisory group (AG1) for TC 48 “Trends and planning”. This working group would not be a group that prepares standards, but whose focus is on future work • TC 48 requests its secretaries of the Sub-committees to maintain an appropriate project plan to be reviewed at any working group meeting to discuss appropriate actions, for late projects.
2011	Beijing, PR China	• AG1 become a permanent group within TC 48. • Significant step forward concerning network between IEC TC 48 and the hosting Chinese national committee • SC 48B: "Category 6 & 7" project team disbanded
2012	Maintal, Germany	• TC 48/AG1 proposal for revising the scope & title for the TC and SC 48B • TC 48 started exploration how to adopt the new ISO 14405 dimensioning and tolerancing rules in its new and revised standards.
2013	Delft, The Netherlands	• Agreement of new Title of TC 48 • TC 48 approved a new title for SC 48B: Electrical connector • Update of GWP document regarding GPS

Table A.1 Meeting history and key issues

A.3 Current title, scope, and sub-committees

The current title, “Electrical connectors and mechanical structures for electrical and electronic equipment” was defined in 2013 and was an adjustment of the previous one in order to make more clear the scope of standardization.

Products which are within the scope of standardization:

- The focus is on electrical connectors usable to establish signal, data or power connection between two or more electrically conductive parts
- Included are non-conducting connectors such as inductive or capacitive coupling which may enclose suitable converters to conductors respectively
- Included are mechanical parts surrounding those connectors including enclosures as standardized according IEC 60297 and IEC 60917

Properties of the products which are subject of standardization are:

- Dimensions mandatory for proper mating of plug and socket[1] components. This covers electrical contact, safety means against electric shock and mechanical locking mechanism.
- Type test requirements and procedures with respect to the intended use.
- Requirements and dimensions of termination technologies.

TC 48 standards refer to major safety IEC standards, such as:

- IEC 60664-series, “Insulation coordination”
- IEC 60364-4-41, “Low-voltage electrical installations - Part 4-41: Protection for safety - Protection against electric shock”
- IEC 61140, “Protection against electric shock - Common aspects for installation and equipment”

Based on those, the basic TC 48 standard IEC 61984 has been developed. This interpretes the above mentioned standards for the use of connectors and provides a framework for appropriate testing.

The standardization projects are handled by two subcommittees.

SC 48B, “Electrical Connectors” whose scope is as follows:

“To prepare standards for electrical connectors and connecting devices. Standards for electrical connector test methods and for solderless connection technologies are also prepared.[2,3]

SC 48D, “Mechanical structures for electronic equipment” whose scope is as follows:

“To prepare IEC standards for mechanical structures for electronic equipment on the two main fields; the first one is related to indoor mechanical structures for electronic equipment. The second is for outdoor mechanical structures. Both activities deal with their dimensioning and environmental criteria, including requirements and tests for climatic, mechanical, electromagnetic performance and safety aspects, as well as their thermal management.”

B Business Environment

B.1 General

B.1.1 Electrical connectors

Electrical connectors are intended to enable modular system designs and fast interchangeability of components and assembly groups of electrical or electronic equipment. This means, standardization is a key issue for this kind of products. Otherwise interchangeability would not be possible.

Connectors are electro-mechanical components, made out of more or less three different parts:

- Contacts
- Insulation body (to accommodate the contacts)
- optional: a hood or housing which encloses the previous

Contacts are made out of conductive metal by cold forming or turning.

[1] The terms „plug“ and „socket“ are used at this place only to address readers who are not familiar with the respective specific TC48 terms. Within TC48 “fixed connector” and “free connector” are used instead.
[2] RF and fibre optic connectors will not be dealt with by the sub-committee; hybrid connectors which additionally employ RF and/or fibre optic contacts, will be handled in cooperation with TC 46 and/or TC 86.
[3] IEC 61984: Connectors - Safety requirements and tests is covered by this sub-committee. Safety requirements for areas already dealt with by other committees will not be developed by this sub- committee

Insulating bodies are made mostly from thermo-plastic, thermo-set or elastomeric materials by the appropriate forming technologies for each plastic compound.

Thus, the raw materials for connectors today are copper, silver and gold for the contacts, petroleum based products for plastic parts and aluminum or steel for mounting parts and accessories.

Optional enclosures are imaginable in a wide variety of types and materials. Aluminum, steel and plastics are widely used. Manufacturing is done by cold forming or die casting of metal as well as injection molding of plastic.

Most of the mentioned manufacturing technologies and required engineering know how are available by highly developed industry countries. Although the level of automation already is very high, further process improvement together with increase of precision and miniaturization at least will keep these countries in an advantageous position.

Almost all of the connector users are industrial customers which means it is a B2B business. Technical function, quality, delivery performance and price override brands or product image.

With respect to product safety and liability the connector manufactures are widely out of responsibility, since these issues are in the scope of the customers, the system manufacturers. Connectors only need to be compliant with few basic safety requirements, the major effects on safety are due to assembly and system integration.

Intellectual property is widely not an issue within the SC 48B standards. Compared to e. g. ICT standards with several essential patents per standard document the situation within SC 48B is just the opposite. The majority of the standards does not include essential patents.

B.1.2 Mechanical structures

These products are intended for the mechanical packaging of electronic equipment, comprising printed boards, backplanes and connectors, as well as their wiring interconnection.

Interface dimensions, tests and test performances concerning mechanical stuructures are key issues for standardization and the preconditions for interchangeability of products.

B.1.3 Other organizations working on standards within the TC 48 scope:

- SFF Committee: Connector Specs as SFP, QFSP, QLFSP
- Universal Serial Bus USB: Connector specs as USB 3.1 Specification released on July 26, 2013
- PICMG: µTCA
- PC/104

A significant part of those products have been afterwards standardized by SC 48B.

B.2 Market demand

B.2.1 Connectors

The long term market growth (CAGR) of connectors was 5.6% since 1980[4]. This is significantly higher than the overall world economy growth during the same time period is estimated between 2.8[5] and 3.8%[6] (CAGR).

[4] Bishop „Connector Industry Forecast 2013“
[5] Wikipedia historical GWP figures
[6] International Monetary Fund: World Economic Outlook Database

However, the connector market is related to global economy, e. g. there was a decline of some 7% in connection with the dotcom bubble bust as well a 22% decline together with the 2009 crisis, but these losses have been compensated the years after respectively.

A CAGR of some 8 … 9%4 is predicted for the mid-term future. Thus, standardization work for connectors will continue on a high level, even if there are industry-driven tendencies for proprietary connectivity products.

Looking at the End-Use equipment the three sectors Automotive, Telecom/Datacom and Industry (Automation, Machinery, Building Engineering, Energy Technologies, Heavy Equipment, etc.) make some 60% of the total demand. The most promising growth will come from Automotive, Telecom/Datacom and Transportation. This situation unlikely will change over the next couple of years.

Geographically the market of connectors and mechanical structures is a global market having three dominant segments, North America, Europe and Asia-Pacific. This is still demanding international standards on components with quality conformance assessment. World-wide operating multinational companies desire world-wide procurement from multiple sources. There is a permanent request for cost reduction. From these influences as well as from a steady growth of the main user markets the requirement for standardized and interchangeable products will remain high.

Users of TC 48 standards include international and national standards organizations, electronic equipment designers & manufacturers and testing laboratories. In almost all TC 48 participating countries, at least within the highly developed industry countries, the standards are adopted nationally and used “as published” or with “defined differences” in equivalent national standards.

B.2.2 Mechanical Structures

The estimated worldwide market of above mentioned enclosures (bare enclosures without integration, IEC SC 48D related) = 6 billion Euro. Another 6 billion Euro is estimated for non standard enclosures, but potentially a market for standard products. Value added system integration, such as backplanes, power supplies, thermal management and cabling estimated 12 billion Euro (value of integration sold with standard related enclosures). Therefore, total worldwide revenue with standard related enclosures, including integration = 18 billion Euro. Geographic segmentation of IEC SC 48D related enclosures and integration: 30% Americas, 30% Asia/Pacific and 40% Europe and Mid East

B.3 Trends in technology

B.3.1 New & nano-enabled materials

- Firstly, nanotechnology has become industry applicable during the last decade. The first nano-enabled products are already on the market. The relevance of for TC 48 is with respect to new surface properties, which offer the potential to change, maybe dramatically, the technical limits of the products within the scope of standardization. This is with respect to contact resistance or environmental influence.
- Secondly, there is still the question about end of oil. Although the quantity of oil which is required to manufacture plastics is rather small compared with the overall oil demand, the price increase due to decrease of classic sources and necessity of new higher cost exploration technologies will make pressure to use alternative sources for insulating materials. This may affect TC 48-scope products in terms of material properties such as CTI and others.

B.3.2 Strong progress of generative manufacturing technologies

Commonly known also as 3D printers these technologies offer completely new business models. Individual metal as well as plastic parts can be produced leaving behind limits for geometrical conditions tied to classical

mass production such as die casting or injection molding. TC 48 consequences are expected mainly in the field of surface and mechanical properties of such new generated objects and therefore related type test specifications.

B.3.3 Digital factory, cyber physical systems, integrated industry

Since traditional systems are incapable of meeting flexible customer requirements, manufacturing processes and equipment must be modularized and assembled to become individual with respect to the actual demand. This entails the integration of various technologies into a “smart” factory: automation technology, sensors, RFID and information technology. In this field the huge address space of internet protocol version 6 and the continuously decreasing cost for related embedded electronics will raise dramatically the granularity of directly network-connected devices in the manufacturing process, such sensors, actors, electric tools, product parts, etc. = “Cyber Physical Systems”. For TC 48 the consequences are already visible in the area of connectors which combine the connection of power and signals within one conductor as it is done for PoE or PLC. The need for connectors with breaking capacity according to IEC 61984 will increase.

In general, this development will demand suitable, somehow intelligent and maybe contactless “connectors” which have to be standardized in order to accelerate the success of this industrial revolution.

B.3.4 High availability of electronic document description languages in combination with well developed component data dictionary

The future standard will be no longer a pdf document but will be a database content with licensing concepts similar to music download etc. The first step is to revise existing standards to become conform to a suitable terminology standard. The proposal is to use IEC 61360. In a second step a way has to be elaborated how to publish these standards in e. g. XML format and make them usable.

B.3.5 Highly integrated and cost-effective electronic circuits

The products within the scope of TC 48 may include more and more functions based in integrated electronics. As a consequence the respective functions of and requirements to those components need to be standardized. E. g., standardization related to in-situ temperature monitoring of a high current connector shall be in line with the derating curve concept according to IEC 60512-5-2 drafted by SC 48B.

B.4 Market trends

B.4.1 Users require simplification of standard application

The structure of SC 48B standards was set many years ago, several blank detail specifications have been drafted. Many of the current standards show a high granularity of definitions, in particular type test specifications. On the other hand, the increasing number of standards is causing more and more confusion which standard product may be suitable for which application.

As a consequence, a high level application class definition with respect to the intended use seems to be a solution to make users life more easy. Sets of type test procedures may “summarize” typical application requirements, such as “seaside out-door”, “high elevation outdoor”, “cabinet”, “industry in-door”, “tropical”, “maritime”, etc.

At the same time there is an increasing demand for customer-individual specifications. To solve this, type test procedures need to become even more modular.

B.4.2 Increasing data rates and ongoing miniaturization

Electrical connectors need to follow this demand. 100GBit/s via twisted Cu-pairs is already in sight. In particular standardization of relevant test methods will become an important issue. Test set-ups need to be reproducible and practicable at the same time. Maybe data transfer properties of connectors (without cable) need to be

standardized. Standards describing very high speed Cu-solutions need to be published quickly in order to remain competitive against FO technology.

B.5 Ecological environment

There is increasing sensitivity of CO_2 footprint, lifetime energy efficiency, water usage and waste generation. The market already requires quantitative declarations respectively. This concerns raw materials use, manufacturing process and the logistics as well.

C System approach aspects

In order to be up-to-date about customers trends, TC 48, SC 48B and SC 48D have relations to other TCs/SCs as listed in the table below.

Between		Purpose
TC 48	TC1 - Terminology	Maintenance of IEV 581 ELECTROPEDIA
TC 48	TC91 - Electronics assembly technology	Avoid overlapping, preserve TC 48s interests
TC 48	ISO/IEC JTC1/SC25	Customer committee
SC 48B	TC9 - equipment and systems for railways	Customer committee
SC 48B	SC23G -Appliance couplers	Avoid overlapping
SC 48B	SC23H - Plugs, Socket-outlets and Couplers for industrial and similar applications, and for Electric Vehicles	Avoid overlapping
SC 48B	TC46 - Cables, wires, waveguides, R.F. connectors, R.F. and microwave passive components and accessories	General information exchange
SC 48B	SC46C - Wires and symmetric cables	Partner committee for SC25/JTC1 customers
SC 48B	SC46F - R.F. and microwave passive components	General information exchange
SC 48B	SC 65C Industrial networks	Customer committee
SC 48B	TC 82 Solar photovoltaic energy systems	Customer committee, avoid overlapping
SC 48B	TC 94 All-or-nothing electrical relays	To be disbanded
SC 48B	TC 100 Audio, video and multimedia systems and equipment	Customer committee, avoid overlapping, preserve TC 48s interests
SC 48B	TC 104 Environmental conditions, classification and methods of test	“Supplier” committee

D Objectives and strategies

The main and overall objective of TC48 is produce standards of high quality at a speed meeting the market requirements.

D.1 Objectives – Connectors and Mechanical Structures

- TC 48 is the sole organization of drafting standards in its technology field.
- TC 48 standards are up-to-date and reflect new/changing technologies and user requirements both in the marketplace and customer IEC and ISO Technical committees.

D.2 Strategies

D.2.1 Connectors

The SC 48B strategy has the following elements

- Increase the awareness of SC 48B and its publications, in particular to other TCs. Pull NPs of system/customer TCs towards SC 48B as far as SC 48B scope is affected.
- Identify SC 48B standards to review and prepare list of clauses to add/update/withdraw.
- Regularly inform and address members and customers of “competition” about speed, capability, expertise and flexibility of SC 48B.
- Make use of modern IT to draft and use(!) standards.
- Regularly review liaisons.

D.2.2 Mechanical Structures

Observe changing market demands and initiate updates of existing standards and/or establish new standards.

Drive research for better usage of resources in means of environmental requirements.

E Action plan

E.1 General & Connectors

- Completion of TC 48 generic presentation – TC 48/AG1, fall 2014
- Elaboration of a communication plan, in particular to other TCs and consortia – TC 48/AG1, spring 2015
- Identification of the most relevant parts of IEC 61360 with respect to SC 48B standards – TC 48/AG1, spring 2015
- Drafting a generic IEC 61360-compatible type test specification for connectors – SC 48B/WG3, fall 2015
- Discuss within AG how to handle the CO_2 issue.
- Prepare technical report about appropriate sets of connector type test requirements with resepect to specific applications – SC 48B/WG3, fall 2015

- Investigate the consequences of new materials & technologies – TC 48/AG1, fall 2016
    - nano-enabled materials & surfaces.
    - bioplastics.
    - 3D-printed plastic components.
- Evaluate the consequences to future SC 48B deliverables with respect to the evolution of integrated industry & digital factory together with the respective system committees.

E.2 Mechanical Structures

- Prepare new and update existing standards to new requirements on thermal management, signal integrity and shielding due to the rapid increase of equipment power dissipation and signalling speed in the industry.
- Discuss with the IEC Central Office to have some guidance or information documents available for download on the website to encourage new engineers to visit the IEC SC 48D micro-site as a source for information and hence encourage the use of IEC standards.
- Discuss the Strategies above to develop action items for the coming year. Publish detailed action items as part of SC 48D and WG meeting minutes as appropriate.
- Prepare new standards for communication networks, based on IEC 60297 and IEC 60917.

F Useful links to IEC web site

TC 48 dashboard gives access to membership, TC Officers, scope, liaisons, WG/MT/PT structure, publications issued and work and maintenance programmes, if any.

Name or signature of the secretary

Mr. Jeffrey R. Toran