STRATEGIC BUSINESS PLAN (SBP)

IEC/TC or SC	Secretariat	Date
32	FRANCE	2013-12-02

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.

TC32 - Field of activity

TC32 covers all features of Fuses: Product requirements (characteristics, product information, normal service, mounting and transport conditions, constructional and performance requirements…) and the associated test requirements:

TC32 considers the horizontal topics that impact Fuses and also contributes to the improvement of the associated horizontal standards, in particular Energy efficiency.

TC32 also issues publications dealing with the correct association of Fuse gear, switchgear, and control gear (short-circuit, selectivity…)

A Background

Scope of TC 32:

To prepare international standards regarding specifications for all types of fuses, with the object of determining:

1. The characteristics which are essential in specifying the conditions for installation and operation of the fuses.
2. The requirements to be met by the fuses and the tests designed to ascertain their compliance with such requirements as well as the procedures to be followed for these tests.
3. Markings.

To prepare for these fuses international standards for values of :

1. Characteristics : rated voltages, currents and breaking capacities;
2. Dimensions in connection with the fixing and interchangeability of high-voltage and low-voltage fuses.

The Main Committee has two Maintenance teams:

MT2: Guidance concerning the permissible temperature rise for parts of electrical equipment, in particular for terminals.
MT3: Review of the IEV(International Electrotechnical Vocabulary

and three Subcommittees:

SC 32A: High voltage fuses;
SC 32B: Low voltage fuses;
SC 32C: Miniature fuses;

These Subcommittees have no common work for the time being and no common market.

SC 32A

Standardization of specific requirements for high-voltage fuses designed for use on alternating current systems of 50 Hz and 60 Hz.

Membership: SC32A has currently June 2013, before plenary meeting) 19 P-members and 20 O-members who provide a significant worldwide representation. Such involvement demonstrates the very common use of High Voltage Fuses around the world, as well as the large number of market players.
Publications: the SC32A has published 5 International Standards, one of them being withdrawn (IEC 60282-3), and two Technical Reports, and has currently three Maintenance Teams one of which with work going on the revision of IEC 60282-1, and one Working Group which just finished its job (IEC /TR 62655).
Experts: ten P members (AU, CA, DE, ES, FR, GB, JP, NL, PL , SI, US) are participating to these MTs, with representatives coming from users, manufacturers, universities and laboratories.

Liaison with other IEC TCs and SCs
SC32A has very little common points with other SCs of TC32.
SC32A has liaisons with SC17A and SC17C, as high voltage fuses are most often used within switchgear and control gear.

SC32B

To prepare international standards for the following types of fuses intended to be used at nominal voltages not exceeding 1 000 V a.c. or 1 500 V d.c. and also, in so far as they are applicable, for circuits of higher nominal voltages:

- fuses for the protection of all circuits in electrical installations (e.g. industrial or domestic) against overload and/or short-circuit currents

- fuses for the protection of all kinds of apparatus or components (e.g. motors, electro-domestic appliances, semiconductor devices) or systems (distribution network, PV panels and installations, wind mills, convertors) against overload and/or short-circuit currents with a rated breaking capacity of at least 6 000 A a.c. or 2000 A d.c.

Publications issued since the last SBP (2009):

- IEC 60269-1	Ed. 4.1	2009-07
- IEC 60269-2	Ed. 5.0	2013-07
- IEC 60269-3	Ed. 4.1	2013-01
- IEC 60269-4	Ed. 5.1	2012-05
- IEC/TR 60269-5	Ed. 1,0	2010-09
- IEC 60269-6	Ed. 1.0	2010-09

SC 32C

IEC SC 32C began as a working party of TC 23 in 1955 to prepare draft standards for miniature fuses. In 1963 it was decided that fuses should be considered by one committee. TC 32 Fuses, and SC32C Miniature fuses, were established. The first meeting of SC 32C was held in Aix-les-Bains, France in 1964.
SC32C is responsible for the standardization of miniature fuses and thermal-links, which are mainly used for the protection of circuits in electric appliances and electronic equipments. The standardization projects are handled by two maintenance teams and working groups at present.
MT9 is responsible for standardization activities related to thermal-links. Thermal-links, are defined as non-resettable devices functioning only once without refunctioning, are widely applied for the thermal protection of equipment in which, under fault conditions, one or more parts may reach hazardous temperatures.
MT10 is responsible for standardization activities related to miniature fuses. Miniature fuses protect electric appliances, electronic equipment and component parts from overcurrents and short circuits. This is achieved automatically by the melting of a fuse-element through which a fault current flows.

WG 12, *Miniature fuse links for special applications*, was created in 2009. The task of this

project is to establish uniform test methods for miniature fuse-links for special applications, so as to allow verification of the values (for example melting time and breaking capacity values) specified by the manufacturer.

B Environment

TC32

Fuses continue to be in demand worldwide for a growing range of applications

B.1 Business environment

SC32A
HV fuses are considered to be safe, easy to use, and inexpensive protective devices that can in most cases, limit very efficiently I^2t values and let-through current, then damage and costs induced by a fault. This explains the continuous use of high-voltage fuses.

Types defined as “full range” can in many cases be used as sole protection without additional protective devices (i.e. circuit-breakers)

However, they are always used in association with other devices (connections, switchgear or loads) and one should pay great attention to proper co-ordination, fault current applications and surrounding operating conditions so that their performances and breaking capacities are not impaired. Such surrounding is often in the scope of SC17A and SC17C and the liaisons which are established ensure that both parties are aware of their respective works.

The HV fuses manufacturing is shared among many companies, some of them with a rather limited turn-over with only local market access. Furthermore, many national or regional standards exist which differ often by specifying different dimensions or defining melting characteristics. Current IEC standards acknowledge this situation, proposing several sets of dimensions taken from these national standards.

SC 32B
Low-voltage fuses have been developed decades ago in different countries all over the world. This has led to a number of different fuse-systems in use today around the world.

When very high short-circuit currents can arise, fuses are safe, easy to use, inexpensive protective devices that safely limit potentially destructive fault energy and fault currents. They also very effectively limit the dangerous effects of arc-flash. This explains the continuous growth of the use of all types of fuses.

The rapid development of electronic products increased the demand for protection devices. This has led to the design of fast low-voltage fuse-links. Because of their very fast operation and limitation of fault energy they are the best protection for semiconductor and other electronic devices (such as PV modules and installation systems).

The worldwide market (estimated for the year 2012) has a size of 1 000 Mio. €, served by more than 50 manufacturers. The market splits in approximately equal parts for Europe, the Americas and the Asia/Pacific region

SC 32C
Miniature fuses are important circuit protection components widely used in all kinds of electric appliances and electronic equipment. Miniature fuses may be installed in clips, open blocks, or enclosed fuse-holders. In addition they may be surface mounted or provided with external leads for direct soldering.

Just like many products, the miniature fuse industry business model has been dramatically transformed in the past years. Since the advent of the globalization of the economy, a great number

of miniature fuse customers have already moved to developing countries. As component suppliers, fuse manufacturers followed to set up new factories close to the end product customer's factory.

It is served by more than 80 companies throughout the world. The opportunity and value for standardization has increased significantly.

The safety approvals or certifications are required for miniature fuses.

B.2 Market demand

Markets are influenced by the aspects included in B5

SC 32A
The major users of IEC SC32A standards are mainly fuse manufacturers, electrical OEM's (switchgear and transformer manufacturers), testing laboratories, and electrical utilities or large industry. They are all represented in SC32A, with a majority of manufacturers and laboratories, giving good agreement between publications and market requirements.
Work has just been completed on the application of fuses and the coordination with other devices.

SC 32B
Because of the long history of low-voltage fuses only the general requirements have been standardized in IEC 60269-1. The fuse-system types used in different countries are standardized in the subsequent parts of IEC 60269.
Many developing countries follow the existing IEC standardization and choose systems from IEC 60269 for their own national standards.
In IEC SC32B National Committees are represented by experts from fuse manufacturers and test institutes. Users are influencing the standards through their National Committees by proposals, comments and votes. Other interested parties are involved through liaisons.
Following the market demand for guidance on the application of low-voltage fuses, SC32B has published :

- One application guide IEC/TR 60269-5
- A standard dedicated for the protection of solar photovoltaic energy systems IEC 60269-6

SC 32C
This globalization has created a greater demand for harmonized national standards on components and has supported the trend towards international standards.

The customers for SC 32C standards include international and national standards organizations, suppliers for miniature fuses, electric appliances and electronic equipment designers & manufacturers, testing laboratories and other groups.

The current IEC miniature fuse-link standards are widely used in Europe, China, Japan and other parts of the world, except in North America where UL (UL 248-14), which is a tri-nationally harmonized Standard covering the US, Canada and Mexico, is more common. The IEC thermal link standard is completely harmonized with the North America standard. Most SC 32C standards are under continuing development.

B.3 Trends in technology

SC 32A
The technology for the development, production and testing of high-voltage fuses is well known. Limited new principles of design or operation that may influence standardization are expected in the near future (vacuum fuses…). This will be considered when they are more distributed on the market.

The standards issued by SC32A give a reliable and proven basis for the design and testing of high-voltage fuses, to be up-dated when new applications or new types of fuses are created.

SC 32B
Major technical trends in the industry served by SC32B are results of the increasing cost of energy. These trends include improvements in energy efficiency and reliability.

New fields of application include d.c. distribution network, renewable energies, energy storage and electrically powered vehicles.

Highly important is coordination between fuses and other devices

Technology trends continue to demand more product functionality and less power consumption in a smaller size.

The standards of the IEC60269 series give a reliable and proven basis for the design and test of low-voltage fuses. Nevertheless new applications for fuses and new types of fuses are created so that the standards have to be improved accordingly.

SC 32C
The major technical trend towards miniaturization of electronic equipment has caused users to require fuse links of small dimensions, and of appropriate design for application to printed circuit boards or other substrate systems, possibly mounted by automatic means. These fuse-links should be designed to incorporate a degree of non-interchangeability. This need to provide smaller and smaller surface mounted devices in a shorter and shorter development cycle dominates this industry.

B.4 Market trends

SC 32A

It is not foreseen to get large mergers among the manufacturers in the coming years, nor is it expected that any significant breakthrough in the devices or applications will happen, as both technology and market seem stable.

India joined the SC32A recently, meaning they have both economic interest and technical knowledge on this topic. China has been a P-member already for many years. Both these countries represent a large growth opportunity for the IEC fuses business. To date, their attendance in the work of the SC is limited.

Some applications now make an extensive usage of fuses, while they were almost nonexistent some years ago; wind farms are an example of such fast-growing applications.

SC 32B

There is a need for new fuses able to protect renewable energy production installations and electrically powered vehicles.
New DC applications, including DC network, should also be considered in order to develop new fuse standards for DC application and/or to adapt existing ones
In the future fuses should be influenced by: Smart grid, Energy storage

SC 32C

Customer demands for higher current rating fuse-links, higher breaking capacity products and even higher rated voltage products for IEC 60127 Parts 2 and 3 means that the existing temperature limits need review.

B.5 Ecological environment

SC 32A

High-voltage fuses have only a very small impact on the ecological environment, due to :
- small quantity of raw material content, none of them being potentially harmful,
- lack of material emissions (except operation of expulsion fuses),
- very small energy consumption during its manufacturing process
- operational losses are requested to be reduced by some users, mainly utilities, and that is a challenge for
the technology;
- recycling process which does not require specific treatments.

The identified fire risk associated to the operation of expulsion fuses is normally dealt with through the installation rules applied by the users, and is not requested to date to be considered by the standard.

Environmental aspect is therefore not a key issue in standards for such products.

Recycling is implemented by some countries for fuses, but it is linked to waste management and no special requirement nor caution applies to HV fuses. Recycling of fuses has been proved technically feasible and economically viable in Germany and in Great Britain.

SC 32B

Laws in different countries focus on restrictions on the usage of hazardous materials, substances and processes. Another target is the reduction of material content of the product itself (e.g. RoHS – WEEE).
In order to reduce the quantity of disposed materials impacting the environment, the recycling of electrical and electronic parts is necessary. Replaced fuse-links can be brought into a recycling process. Recycling systems for fuse-links have been installed in several countries.

SC 32C

SC 32C products do not impact the environment due to their sub-miniature size and basic materials. One area of concern is the miniature fuse-links that use lead alloy solders. Using these solders has been prohibited by European Commission, China, etc. The manufacturers have already substituted Pb-free solders where lead solders were previously used.

C System approach aspects

TC32

Fuses are used in conjunction with a wide range of other equipment. Liaison with manufacturers and users of this equipment is therefore essential.

SC 32A
High voltage fuses, as protective components, have to be properly graded within an electrical network in such a manner that satisfactory selectivity is achieved between the various protection levels; these aspects known as "protection plan" are well documented and, while historical discrepancies remain between protecting relays and melting curves of fuses, no convergence of these two approaches is foreseen. A possible definition of standardized current-time melting curves would help but has not been agreed yet.

Committees for which SC 32A is a supplier of standards:

SC 17A High voltage switchgear and control gear (several standards use HV fuses as part of the global switching function);

TC 14 Power transformers (has introduced a "self protected oil-immersed transformer" for which current limiting HV fuses are generally used).

SC32B
SC32B will continue to promote the establishment of liaisons to other committees;

A. SC32B has a liaison with

TC9	Electric railway equipment
SC17B	Low-voltage switchgear and control gear
TC22	Power electronics
SC22G	Semiconductor power converters for adjustable speed electric drive systems
SC22H	Uninterruptable power systems (UPS)
TC23	Electrical Accessories
SC23E	Circuit-breakers and similar equipment for household use
SC32C	Miniature fuses
TC64	Electrical installations and protection against electric shock
TC82	Photovoltaic energy systems

B. SC32B has proposed a liaison to

TC111	Environmental standardization for electrical and electronic products and systems
ISO TC 22/SC3	Road vehicles – Electric and Electronic Equipment
SC32K	Electrical Energy efficiency products

SC 32C

SC 32C will actively continue to promote the establishment of liaisons to other committees as follows:

SC 3C	Graphical symbols for use on equipment
SC 17B	Low-voltage switchgear and control gear
TC 72	Automatic electrical controls
SC 32B	Low-voltage fuses
ISO/TC 22/SC 3/WG5	Fuses and circuit-breakers

D Objectives and strategies (3 to 5 years)

TC 32

Fuses are to respond appropriately to evolving requirements for present and future applications.

SC 32A
Several objectives are identified for the work of SC32A:
- looking for more participation from the "user side" in the technical work, but end users are less and less motivated in keeping skills on such topics
- expanding the use of the "Collaboration Tools" in order to facilitate the involvement of parties with limited financial resources
- maintain existing documents, and be aware of possible influences of new materials made available

SC 32B
The objective of the SC is devoted to new technical applications of low-voltage fuses in alternative energies, including:
- photovoltaic and wind-energy
- electrically powered vehicles
- DC applications

SC 32C
Future work will remain stable to meet the increasing demands of the multinational electronic equipment industry.

1. Keep SC 32C standards up to date to reflect new/changing technologies and user requirements in the marketplace.

2. Current IEC fuse-link standards harmonize reasonably with the North American standards.

3. Achieve mutual recognition of test results for obtaining certification or approval at national level.

E Action plan

TC32

To ensure that appropriate fuse protection is available to all electrical installations and equipment.

SC 32A

Most of the future work will be devoted to maintenance and improvement of the existing standards. It is expected that SC32A will have a sustained activity, even though the workload is expected to be rather low. Secretariat will ensure that the Collaboration Tools are available for all active groups and experts and are actually used in the technical work.

Some topics are often discussed:
- definition of standardized current-time melting curves for current-limiting fuses
- harmonization of the dimensions of the replacement fuse-links

No further actions are planned for the time being, beyond what is already implemented, due to the maintenance cycles of relevant standards and the limited pressure expressed through these discussions, to date.

SC 32B

Future work includes fuses for new applications in:
- electrically powered vehicles,
- DC applications,

and development for:
- the reduction of power losses,
- higher current ratings,
- adjust the scope between SC32B and SC32C (2013)
- adjust the work between TC32 and SC32B (2013)
- align the photovoltaic standard between TC64, TC82 and SC32B (2014)

Identify areas of possible cooperation with other standardizing committees in IEC and ISO for covering the system protection aspect of low-voltage fuses.

SC 32C

1. Finish the IEC 60127 and IEC 60691 standards updated.

2. Prepare the higher current rating fuse-link standards for customer's demand.

F Useful links to IEC web site

TC 32 dashboard giving access to Membership, TC/SC Officers, Scope, Liaisons, WG/MT/PT structure, Publications issued and Work and Maintenance Programs and similar information for SCs**,** if any.

• Official TC home page - TC/SC Officers, Scope, Liaisons, WG/MT/PT structure
• Own TC 3 home page – News, Meeting documents, Standing documents, etc
• Membership
• Publications issued
• Work Programme
• Maintenance programme

TC 32 secretary
Jean Claude Luquain