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| IEC/TC OR SC: TC 121 | SECRETARIAT: France | DATE: 2016-12-21 |
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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

A.1 TC 121 Switchgear and controlgear and their assemblies for low voltage

Scope:

“To prepare international standards for low-voltage switchgear and controlgear equipment for industrial, commercial and similar use rated below or equal to 1 kV a.c. and 1,5 kV d.c, electromechanical as well as semiconductor (solid state) equipment. The scope includes open and enclosed separate items of equipment as well as assemblies which are the combinations of items of equipment into complete functional units.”

Currently there are no new or emerging trends in technology that will impact the scope and work activities of the TC. Therefore no update of TC 121 scope is deemed necessary. Nevertheless, new market requirements are continuously surveyed and considered when relevant for SC publications maintenance.

A.2 SC 121A Low-voltage switchgear and controlgear

Scope:

“To prepare international standards for low-voltage switchgear and controlgear equipment for industrial, commercial and similar use rated below or equal to 1 kV a.c. and 1,5 kV d.c.

The scope includes open and enclosed separate items of equipment as well as combinations of items of equipment into complete functional units, electromechanical as well as semiconductor (solid state) equipment.

Group Safety Function: IEC 60999-2 “Connecting devices, either as separate entities or as integral parts of an end product for connecting external electrical supply conductors, for use with conductor cross-sections above 35 mm² up to and including 300 mm².”

Currently there are no new or emerging trends in technology that will impact the scope and work activities of the SC. Therefore no update of SC 121A scope is deemed necessary. Nevertheless, new market requirements are continuously surveyed and considered when relevant for SC publications maintenance.

A.3 SC 121B Low-voltage switchgear and controlgear assemblies

Scope:

“To prepare international standards covering assemblies which are combinations of one or more pieces of low-voltage switchgear and controlgear equipment, not exceeding 1 kV a.c. or 1,5 kV d.c. together with associated control and/or power equipment, measuring, signalling, protective, regulating equipment, etc”

Currently there are no new or emerging trends in technology that will fundamentally impact the scope and work activities of the SC. Therefore, no update of the scope is necessary, however, the evolution of assemblies (e.g. assemblies for photovoltaic application, internal arc fault limitation and performance, wider use of static switching with and increased need for forced cooling) are being appropriately considered within existing or new standards.

B. MANAGEMENT STRUCTURE OF THE TC

B.1 TC 121

TC 121 was set up in December 2013 (see 121/1/AC). It includes all activities of the former SC 17B and SC 17D.

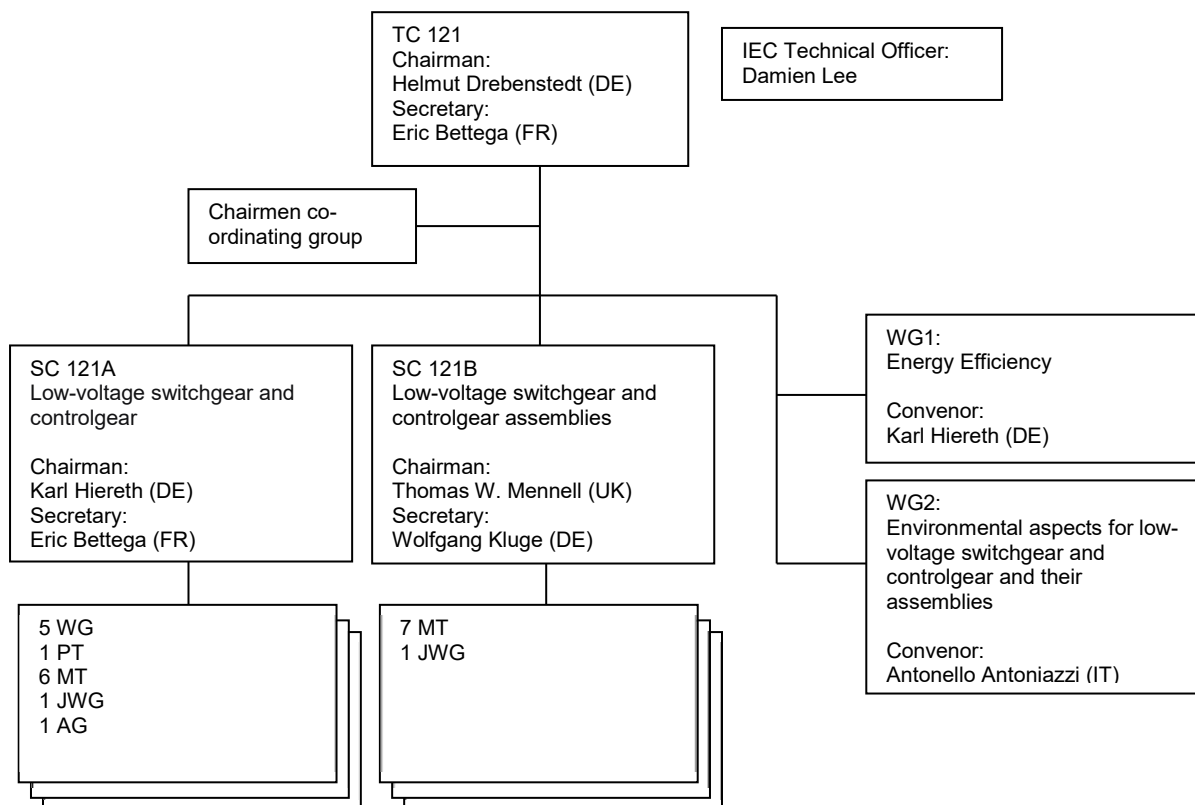
Currently, there are two sub-committees listed below which prepare international standards for their

respective products domains:

- SC121A: Low-voltage switchgear and controlgear
- SC121B: Low-voltage switchgear and controlgear assemblies

TC 121 coordinates the work between its subcommittees and its work between other technical bodies within and outside IEC. To this end, it will establish ad hoc groups, working groups etc., as appropriate. A Chairmen Co-ordinating Group, including all officers of TC 121 and its SCs, as well as TC 121 WGs convenors, and MT or PT leaders, prepares the decisions which have to be agreed at TC level.

The current structure of TC 121 is the following:



Since first plenary meeting (Pretoria, ZA, 2014-10-03), new TC 121/WG2 “Environmental aspects for low-voltage switchgear and controlgear and their assemblies” has been created (see 121/17/RVN).

(Unchanged) TC 121 structure has been formally reviewed and agreed by NC delegates during 2016 plenary meeting (Frankfurt-am-Main, DE, 2016-10-14). Currently there are no changes planned in TC 121 structure.

B.2 SC 121A

SC 121A covers all features of low-voltage switchgear and controlgear devices:

- Product requirements (characteristics, product information, normal service conditions, mounting and transport conditions, constructional and performance requirements) and the associated test requirements;
- Physical and logical interfaces to the control systems (Controller-device interfaces and device profiles);
- Product data and properties for information exchange (e-commerce).

SC 121A considers the horizontal topics and system aspects that impact low-voltage switchgear and controlgear and also contributes to the improvement of the associated horizontal standards, for example the following topics:

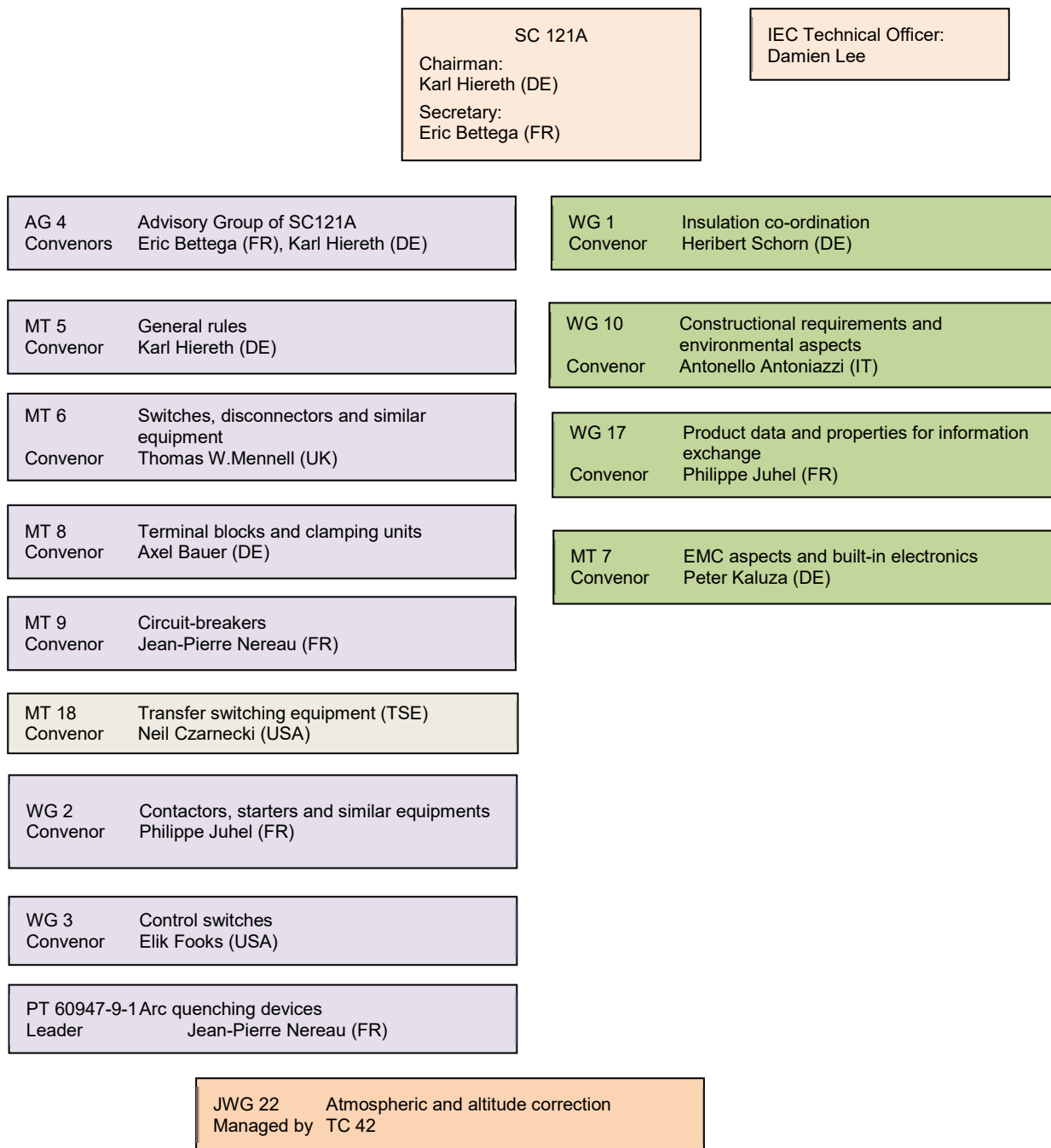
- Energy efficiency;
- Environmental aspects;
- Functional safety;
- Electromagnetic compatibility (EMC);
- Smart grid aspects;
- Security

SC 121A also issues publications dealing with the correct association of low-voltage switchgear and

controlgear (short-circuit, selectivity...).

SC 121A publication IEC 60999-2:2003 has Group Safety Function for “Connecting devices - Electrical copper conductors - Safety requirements for screw-type and screwless-type clamping units - Part 2: Particular requirements for clamping units for conductors above 35 mm² up to 300 mm² (included)”

The current structure of SC 121A is the following:



The structure was reviewed at SC 121A plenary meeting in Pretoria (ZA) on 2014-10-02.

Changes since Pretoria meeting:

- creation of PT 60947-9-1;
- disbanding of PT 62626, PT 62683 and JWG 1.

The structure has been formally reviewed during 2016 plenary meeting (Frankfurt-am-Main, DE, 2016-10-13) and the following proposed updates agreed by NC delegates:

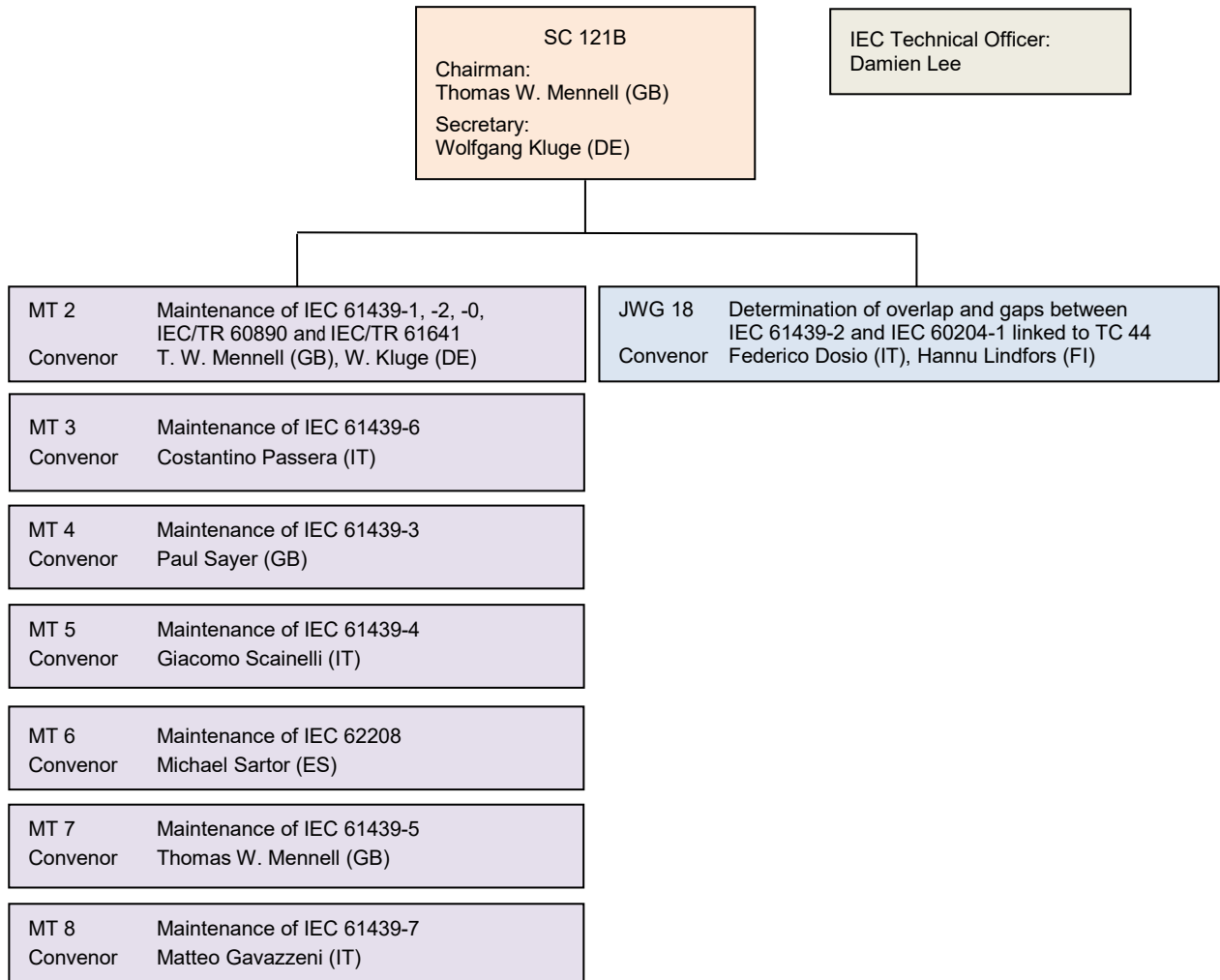
- creation of WG17 and MT18;
- disbanding of JWG 14.

SC 121A has issued 66 publications within which the main series is IEC 60947.

B.3 SC 121B

SC 121B covers the product requirements (characteristics, product information, normal service conditions, mounting and transport conditions, constructional and performance requirements...) and the associated verification requirements for stationary and movable low-voltage switchgear and controlgear assemblies. These assemblies incorporate low-voltage switchgear and controlgear, generally complying with standards prepared by SC 121A or SC 23E, and associated equipment.

The current structure of SC 121B is the following:



The structure was reviewed at SC 121B plenary meeting in Pretoria (ZA) on 2014-10-01.

Changes since Pretoria meeting:

- New MT 8 replacing WG 8;
- New JWG 18 replacing WG 9;
- Disbanding of JWG 1.

The structure has been formally reviewed and agreed by NC delegates during 2016 plenary meeting (Frankfurt-am-Main, DE, 2016-10-14). Currently there are no changes planned.

SC 121B has issued 11 publications within which the main series is IEC 61439.

C. BUSINESS ENVIRONMENT

C.1 TC 121

The expanding worldwide market for industrial applications, machinery and big infrastructural projects requires switchgear and controlgear and their assemblies which are designed, verified and produced in compliance to internationally harmonized, readily accessible and easy to understand standards.

The importance of these products is increasing due to a growing degree of automation and control in factories, power plants, buildings, construction sites, offices etc.

Due to the wide range of applications and depending on the particular type of product possible handling by unskilled operators cannot be excluded and has to be taken into account. Therefore, increasing demands including those for safety necessitate the development of new standards and the adaptation of existing standards.

Requirements for utmost product safety and reliability lead to high levels of performance verification during development and manufacturing, all based on the provisions of the relevant product standards.

C.2 SC 121A

Manufacture of switchgear and controlgear is mostly undertaken by global players, although some regional manufacturers take significant market share.

The products are manufactured by serial or mass production. Therefore performance verification is generally based on testing (type and routine tests).

SC 121A product standards are used for assessing regulatory compliance in countries such as Russia (EAC), China (CCC), EU, etc...

C.3 SC 121B

Assemblies are generally manufactured or assembled on a one-off basis; incorporating various combinations of devices and components, to suit the needs of the particular customer application and safety requirements. Verification of the assembly design solely by test is therefore not always feasible.

In many cases the design and manufacture of an assembly is made by different parties. One manufacturer may provide a basic design and possibly also supply a kit of parts to another manufacturer, who completes the design and produces the final assembly for the particular application. Alternatively, the complete design and manufacturing process can also be executed under the control and responsibility of a single manufacturer.

SC 121B assembly standards are used for assessing regulatory compliance in countries such as Russia (EAC), China (CCC), EU, etc.

D. MARKET DEMAND

D.1 TC 121

The international standards published by TC 121 and its subcommittees are a reference for many parties, for example:

- low-voltage switchgear and controlgear manufacturers;
- assembly manufacturers/panel builders;
- certification bodies and test houses;
- contractors;
- market surveillance authorities;
- insurance companies;
- other users of the products, for example electrical utilities and major industrial organisations.

The IEC standards developed by TC 121 and their subcommittees are used at regional and local levels. They are adopted and/or translated to local languages, e.g.:

- In Europe, harmonized EN standards are accepted through a parallel voting procedure with IEC. These standards fulfil the requirements of the applicable European directives;
- In China, modified IEC standards are adopted in Chinese language as GB standards.

D.2 SC 121A

As most manufacturers of low-voltage switchgear and controlgear devices and components supply their products worldwide, harmonization of these product standards is of utmost importance.

SC 121A hosts harmonization projects, e.g. task forces which are actively working on the harmonization of the IEC and UL standards. UL 60947-1 and UL 60947-4-1 are already issued.

D.3 SC 121B

Major industrial companies acting internationally today often require assemblies for their sites which are assembled and maintained locally, but which are of the same design, according to the IEC 61439 series.

Also, for the majority of applications where local assembly designs are accepted and/or required there is a need for harmonized safety requirements, taking into account the basic safety publications of IEC.

Additionally, the nature and characteristics of the incorporated components and devices have to be taken into account. These are defined in the standards of SC 121A, SC 23E and other IEC committees and reflected as far as necessary in the IEC 61439 series.

IEC standardization for switchgear and controlgear assemblies has reached a high level of application worldwide. SC 121B strives to achieve full coverage of all applications.

E. TRENDS IN TECHNOLOGY AND IN THE MARKET

E.1 TC 121

The development of mechanical switching devices and of assemblies has been relatively stable in recent years. This has made it possible to effectively define and verify the functionality of highly-efficient products. Fundamental changes in these core technologies are not anticipated in the medium-term future.

Renewable energy sources are creating an increasing demand for d.c. applications. This is necessitating the review of the corresponding design and verification rules in some standards.

New techniques in arc-flash detection and arc extinguishing will also be considered for application in industrial, commercial and infrastructures environments.

Current market trends generally require:

- increased product safety and reliability;
- increased "intelligence" within the products (automation functions, communication etc.);
- increased power-handling capability (load currents, fault currents, voltage);
- more information concerning materials and compliance with environmental regulations;
- optimization in the use of natural resources;
- increased international trade;
- continuous cost reduction.

The need to reduce any adverse impact on the natural environment by a product during all phases of its life is recognized. This includes environmental-conscious design of TC 121 products and the contribution of TC 121 products to the efficiency of their associated systems.

E.2 SC 121A

Electronic and semiconductor technologies have created new and hybrid devices, combining mechanical, electronic and semiconductor technologies. These new technologies bring new functionality to the products and an improved ability for communication.

There are divergent tendencies:

- high-volume production of the devices bringing cost reduction, and
- devices suitable for a specific environment,
- both need to be optimized by standards.

The increased demand for reliability clearly creates a need for rigorous standards. It also creates the necessity for:

- more effective quality monitoring;
- more engineering improvements.

International organizations, for example machine manufacturers and their customers, require ready access to devices complying with international standards.

Growing e-commerce and digitalization is increasing the interest in data exchange in electronic format describing products through a defined structure for the information.

The continuous need to increase the energy efficiency pushes the market of electronic intelligence capable of providing more information to the monitoring and control systems.

DERs (Distributed Energy Resources) and their applications are of growing interest. For example, widespread use of battery storage, energy production (e.g. PV), a.c. to d.c. converters, will lead to energy exchange flows which are much more complex than in a traditional "top-down" network. Therefore, in such applications, some essential characteristics of protection (e.g. overload or short-circuit protection) and functionalities (e.g. selectivity), provided by low-voltage switchgear and controlgear, must be managed

differently in order to maintain safety, reliability and availability of electrical energy in all topologies. The focus for SC 121A will in part be determined by the activities of TC 64. As a consequence, SC121 A will consider the new requirements for protective and control devices.

E.3 SC 121B

As a result of an increasing use of electronic equipment in the main and control circuits, assemblies will continue to grow in complexity. This may result in a review of the associated environmental and electromagnetic compatibility aspects in assembly standards.

The growing safety demands in conjunction with growing load currents and powers to be distributed, and the demand for increased packing density inside the assemblies increase the importance of design and verification rules (e.g. temperature rise, short-circuit strength).

The evolution of switchgear and controlgear technologies, the trends towards higher a.c. and d.c. voltages, more compact assemblies, higher degrees of automation, greater dependability and growth of international trade all require more precise standards for low-voltage switchgear and controlgear assemblies.

Environmental aspects are of growing importance for low-voltage switchgear and controlgear assemblies. The environmental aspects of assemblies are to a greater extent determined by the incorporation of devices and components that have already taken environmental aspects into account.

The nature of the primary technologies used for assemblies is such that their constructional elements can in general be recycled. During operation detrimental emissions are considered not to occur.

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

F.1 TC 121

Liaisons are essentially established at SCs level. However, the following liaisons at TC level are currently established:

- TC 23/SC 23K “Electrical Energy Efficiency products”;
- TC 82 “Solar photovoltaic energy systems”.

During last plenary meeting (Frankfurt-am-Main, 2016-10-14), NC delegates agreed:

- To transfer existing liaison between TC 121 and TC 82 to SC 121A and SC 121B (products and assembly level);
- To ask TC 111 for shifting existing liaison with SC 121A to TC 121/WG2.

In addition, TC 121 is represented in ACEE (Advisory Committee on Energy Efficiency).

Currently, there is no Systems Evaluation Group (SEG), Systems Committee (SyC), or Systems Resource Group, and no need to establish any. There are no known consortia working on the same topics in parallel to IEC.

F.2 SC 121A

SC 121A, as a component supplier for many systems, is linked to many other committees. It is crucial to harmonize the requirements coming from all these different applications.

Therefore SC 121A is in favour of a few well-implemented horizontal standards and group safety standards.

Note: Some TCs (or SCs) appear twice in the spreadsheet below, because SC 121A has several types of relationship with these TCs (or SCs). I.e. TC 22/SC 22G is a system committee for SC 121A because contactors are used in Power Drive Systems, and also an interacting/partner committee, because included in the same industrial control systems.

| SC 121A | Committee | Description |
|--|--------------|--|
| Component committees (SC 121A - role of a customer) | TC 32/SC 32B | Low-voltage fuses |
| | TC 32/SC 32C | Miniature fuses |
| | TC 94 | All-or-nothing electrical relays |
| System committees SC 121A - role of | TC 18 | Electrical installations of ships and of mobile and fixed offshore units |
| | TC 22/SC 22G | Adjustable speed electric drive systems incorporating |

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| a supplier) | | semiconductor power converters |
| | TC 22/SC 22H | Uninterruptible power systems (UPS) |
| | TC 44 | Safety of machinery - Electrotechnical aspects |
| | TC 64 | Electrical installations and protection against electric shock |
| | TC 65 | Industrial-process measurement, control and automation |
| | TC 82 | Solar photovoltaic energy systems |
| | TC 121/SC 121B | Low-voltage switchgear and controlgear assemblies |
| Other committees (interacting/ partner committees, committees providing generic guidance or horizontal standards, boundary committees, etc.) | TC 2 | Rotating machinery |
| | TC 3 | Information structures, documentation and graphical symbols |
| | TC 3/SC 3C | Graphical symbols for use on equipment |
| | TC 3/SC 3D | Product properties and classes and their identification |
| | TC 22/SC 22G | Adjustable speed electric drive systems incorporating semiconductor power converters |
| | TC 23/SC 23E | Circuit-breakers and similar equipment for household use |
| | TC 31 | Equipment for explosive atmospheres |
| | TC 32/SC 32B | Low-voltage fuses |
| | TC 34/SC 34A | Lamps |
| | TC 34/SC 34C | Auxiliaries for lamps |
| | TC 44 | Safety of machinery - Electrotechnical aspects |
| | TC 65 | Industrial-process measurement, control and automation |
| | TC 65/SC 65C | Industrial networks |
| | TC 65/SC 65E | Devices and integration in enterprise systems |
| | TC 77 | Electromagnetic compatibility |
| | TC 77/SC 77A | Electromagnetic compatibility – Low-frequency phenomena |
| | TC 85 | Measuring equipment for electrical and electromagnetic quantities |
| | TC 89 | Fire hazard testing |
| | TC 94 | All-or-nothing electrical relays |
| | TC 111 ¹ | Environmental standardization for electrical and electronic products and systems |
| TC 112 | Evaluation and qualification of electrical insulating materials and systems | |
| CISPR/CIS/B | Interference relating to industrial, scientific and medical radio-frequency apparatus, to other (heavy) industrial equipment, to overhead power lines, to high voltage equipment and to electric traction | |
| ¹ Note that during last plenary meeting (Frankfurt-am-Main, 2016-10-13) NC delegates agreed to transfer this liaison to TC121/WG2 | | |

F.3 SC 121B

Effective liaison with system committees is important so as to avoid conflicting requirements and tests for assemblies.

| SC 121B | Committee | Description |
|---|----------------|--|
| Component committees (SC 121B - role of a customer) | CLC TC 121A | Low-voltage switchgear and controlgear |
| | TC 23/SC 23B | Plugs, socket-outlets and switches |
| | TC 23/SC 23E | Circuit-breakers and similar equipment for household use |
| | TC 121/SC 121A | Low-voltage switchgear and controlgear |
| System committees (SC 121B - role of a supplier) | TC 44 | Safety of machinery – Electrotechnical aspects |
| | TC 69 | Electric road vehicles and electric industrial trucks |

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| | TC 82 ^a | Solar photovoltaic energy systems |
| Other committees (interacting/partner committees, committees providing generic guidance or horizontal standards, boundary committees, etc.) | TC 64 | Electrical installations and protection against electric shock |
| | SC 22G ^a | Adjustable speed electric drive systems incorporating semiconductor power converters |
| | CIS/B | Interference relating to industrial, scientific and medical radio-frequency apparatus, to other (heavy) industrial equipment, to overhead power lines, to high voltage equipment and to electric traction |
| ^a Liaison to be confirmed | | |

G. CONFORMITY ASSESSMENT

Product standards under the responsibility of TC 121 and its subcommittees define the necessary test methods and test requirements to ensure a reproducible verification of the design of the products with the requirements of the corresponding standard.

The standards developed in the SCs of TC 121 are in line with requirements related to conformity assessment, and already used by IECCE for conformity assessment (categories EMC, INDA, POW, INST).

Therefore, no special conformity assessment requirements need to be generated.

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

H.1 TC 121

| STRATEGIC OBJECTIVES 3-5 YEARS | ACTIONS TO SUPPORT THE STRATEGIC OBJECTIVES | TARGET DATE(S) TO COMPLETE THE ACTIONS |
|---|---|--|
| To build-up the structure of new TC 121 | identify topics for common work (e.g. environmental aspects, functional safety, EMC...) and establish the necessary working structures, without disturbing the ongoing standardization work that has been transferred from the previous SC 17B and SC 17D | On-going |
| To provide necessary recommendations, requirements and testing procedures for low-voltage switchgear and controlgear and their assemblies in the field of energy efficiency | To develop a new IEC/TR "Switchgear and controlgear and their assemblies for low voltage - General guidelines on Energy Efficiency" | 2019 |
| To: <ul style="list-style-type: none"> - establish environmentally-conscious product design principles; - evaluate ecodesign performance; - communicate potential environmental impacts; for low voltage switchgear and controlgear and their assemblies | To develop a new IEC/TS 63058 "Environmental aspects for Low-Voltage Switchgear and Controlgear and their assemblies" | 2018 |
| To ensure, as far as reasonably possible, publications fulfil essential | Subject applicable documents to a risk assessment in accordance to | On-going activity |

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| safety requirements. | IEC Guide 116. | |
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H.2 SC 121A

| STRATEGIC OBJECTIVES 3-5 YEARS | ACTIONS TO SUPPORT THE STRATEGIC OBJECTIVES | TARGET DATE(S) TO COMPLETE THE ACTIONS |
|---|--|---|
| To provide standards for new products | To have a continuous survey of customer/market needs and related decisions, when relevant (e.g. newly-established PT for arc quenching devices) | On-going |
| To maintain the appropriate safety level | To continuously align our publications with basic safety standards and group safety standards, especially functional safety standards (i.e. IEC 61508) | On-going |
| To provide standards to simplify business: <ul style="list-style-type: none"> - Simplify integration of SC 121A devices into systems (e.g. communication, device profiles); - Simplify e-commerce (e.g. product properties) and digitalization; - To facilitate integration of SC 121A products into customers application | <ul style="list-style-type: none"> - To maintain and publish standards on device profiles: revision of IEC 62026 series; - To publish standards on product classification and properties: conversion of IEC 62683 to Database format (DB, on-going revision); - To investigate the engineering aspects concerning the products. | <p>On-going</p> <p>On-going</p> <p>2017</p> |
| To increase the application of the SC 121A IEC standards worldwide | <ul style="list-style-type: none"> - To continue the harmonization projects with UL; - To involve all regions of the world in the IEC SC121A work program. | On-going |
| To evaluate impact and contribute to smart grid | To participate in joint working groups with system committees | On-going |
| To reduce the harm on environment by: <ul style="list-style-type: none"> - Increasing the energy efficiency; - Accelerating environmental-conscious design; - Integration of products environmental footprint. | <ul style="list-style-type: none"> - To participate in joint working groups with system committees; - To apply as fast as possible the outcome of TC 111 and ACEE; - To facilitate simple practical ways of collecting information exchange throughout the supply chain and demonstrate compliance. | On-going |
| To harmonize EMC requirements throughout SC 121A publications | <ul style="list-style-type: none"> - Overall analysis of EMC requirements in publications; - Experts from MT7 to support each product group when maintenance decided; - Each MT/WG to update – when relevant – their publications. | <p>2016</p> <p>On-going</p> <p>On-going</p> |
| To investigate safety-related cyber-security risks for communication | To identify the minimum set of requirements to be fulfilled at | 2019 |

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| means and develop appropriate strategies | product level | |
| To specify test requirements for terminals for the use of Aluminium conductors | <ul style="list-style-type: none"> - Integration of new requirements in specific product parts (60947-2, 60947-3), and - Publication of new specification for terminal blocks | 2019 2019 |
| To adopt different switching behaviour on high-efficiency motors | Integration of new requirements in specific product parts (60947-3, 60947-4-1) | 2019 |
| To specify tests for integrated electronics | To integrate in 60947-4-1 new requirements concerning "secondary circuits" and breakdown of components | 2019 |

H.3 SC 121B

| STRATEGIC OBJECTIVES 3-5 YEARS | ACTIONS TO SUPPORT THE STRATEGIC OBJECTIVES | TARGET DATE(S) TO COMPLETE THE ACTIONS |
|--|--|--|
| To improve the user-friendliness | The series of assembly standards is not easy to apply for those parties not involved in the development and verification process, in particular persons/bodies specifying assemblies for the end-user. This matter is being addressed by SC 121B. In a first instance a guidance document for specifying assemblies, IEC 61439-0, is incorporated in the IEC 61439 series as a Technical Report. | On-going |
| To improve the design verification methods | For assemblies which are to a large extent customized, design verification solely by test is not always feasible. To increase the application of the standards so as to include all assemblies the design verification methods, other by test, will be further reviewed, taking care to ensure safety and reliability are not impaired. | On-going |
| To reduce the standards development time | The difficulties in establishing the first edition of IEC 61439-1 with the "General rules" for the new series of assembly standards resulted in severe delays to this project and resulted in immediate maintenance work and the subsequent publication of the second edition of IEC 61439-1. In the medium-term future the regular development of the IEC 61439 series is envisaged | On-going |
| Potential works | Future considerations may include: <ul style="list-style-type: none"> - Use of Aluminium conductors; - Incorporation of arc detection and arc quenching devices for assemblies; - Derating for altitude and specific frequencies; - Conversion of IEC/TR 61641 to an IS, and further considerations of personnel safety; - Review and refinement of IEC/TR 60890; | 2021 |

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| | <ul style="list-style-type: none"> - Work with TC 44 to resolve the gaps and overlap between IEC 60204-1 and 61439-2 as far as practical. | |
| The universal acceptance of IEC 61439 series for all types of assemblies | To encourage the widely use of IEC 61439 series by continuously reflecting market evolutions | On-going |