



IEC/TC or SC SC 17A	Secretariat Sweden	Date 2004-12
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**Title of TC**

High-voltage switchgear and controlgear

**A. Background****Scope:**

To prepare International Standards regarding specifications for high-voltage switchgear and controlgear having a rated voltage of 1 kV a.c. or above and/or 1,5 kV d.c. or above.

With the exception of switchgear and controlgear for direct current traction purposes, which is covered by SC 17A for rated voltages above 3 kV. Switchgear and controlgear for direct current traction purposes rated up to 3 kV is dealt with by SC 17B.

High-voltage switchgear is of special importance not only for the operation of transmission and distribution systems but in case of circuit-breakers serves as the ultimate safety device. Particularly the latter aspect reflects into the philosophy of work of the subcommittee.

Due to the nature of switchgear and controlgear the subcommittee is dealing with switchgear and controlgear as apparatus as well as with its interaction with networks and loads and with systems reaction to switching operations.

**Publications:** 16

**P-members:** 25

AU, AT, BE, CA, CN, CZ, DK, EG, FI, FR, DE, IN, IT, JP, KR, NL, NO, PT, RU, ES, SE, CH, TR, GB, US

**Liaisons**

IEC/SC 32A, SC 36C, TC 99

SC 17A works together very closely with SC 17C and cooperates with TC 10, TC 28, TC 36, TC 50, TC 57, TC 75, TC 77 and TC 98.

A) CIGRE/ SC A3;

D) IEEE Switchgear Committee.

**B. Environment****B.1 Business environment**

SC 17A is taking into account the particular requirements of high-voltage switchgear and controlgear as such as well as the reactions to the switching process in networks and of other components serving as generating, transmission and load equipment. Basically, this concerns voltage and current transients due to switching.

The application of switchgear and controlgear, particularly circuit-breakers, as safety device leads to considerations of reliability and availability in service, but also is reflected in the formulation of testing requirements and methods. These requirements are based on the stresses from the networks and loads and the characteristic behaviour of the various types of switchgear and controlgear.

IEC Standardization for high-voltage switchgear and controlgear world-wide has reached a level far higher than that for most other types of equipment, today.

As the development of electric power systems is a key issue for less industrialized and developing countries, and as these countries to a large extent lack experienced personnel, IEC standards on switchgear and controlgear also serve as means for the transfer of knowledge and as guideline for planning.

### **B.2 Market demand**

The evolution of switchgear and controlgear technologies, the trends toward higher degrees of automation, the integration of various additional functions into primary equipment, the changing political environments – saving of energy, deregulation, etc. – and the growth of the international trade require the maintenance of the existing as well as the development of new IEC standards on high voltage switchgear and controlgear.

Global market expansions continue to create high demands for international standards on switchgear and controlgear. Upon this background the harmonization of existing national standards through their integration into IEC is of major importance.

The world market for high-voltage switchgear and controlgear can be considered as an open market. In this field IEC standards are accepted world-wide, and in many countries national standards have been harmonized with IEC. It is the policy of SC 17A to actively promote this harmonization.

Especially in newly industrialized countries IEC Standards and Technical Reports on high-voltage switchgear and controlgear serve as a source of information on the status of this technology and are used as an aid to the planning and the selection of equipment. SC 17A actively supports the view that engineers from these countries should take part in the work of the subcommittee.

Although IEC standards for high-voltage switchgear and controlgear are very well accepted throughout the world, ANSI/IEEE standards are still used in many regions. This creates a competitive situation that is beneficial for neither side. Therefore, active cooperation with ANSI/IEEE is sought to promote a harmonization of both standards.

SC 17A supports the harmonization of standards for different types of equipment which are installed in substations and stressed in the same manner, e.g. by the same currents, environmental conditions, overvoltage, etc.

### **B.3 Trends in technology and trade**

No dramatic changes are foreseen in the principal technology of high-voltage switchgear and controlgear.

New designs may result in changing interactions between switchgear and controlgear, the network and load equipment. This is taken into account in revisions of the existing standards.

Until recently switchgear and controlgear design was solely based on conventional technology. Electronics will, in future, be incorporated for control, diagnosis and monitoring purposes. Controlled switching may replace random switching in many cases. Instead of using individual apparatus in substations, such as switchgear and controlgear, measuring transformers, etc., high-voltage switchgear and controlgear, particularly circuit-breakers, with integrated functions other than switching will be used. These evolutions might necessitate new requirements for rating and testing.

As the electronic components and circuits which will be incorporated into switchgear and controlgear in the course of these developments are more sensitive with respect to electromagnetic compatibility (EMC) than conventional control devices, more emphasis will have to be placed on EMC in view of disturbances from the switching process itself and from the outside world.

Close cooperation will be sought with other IEC Committees to define interfaces and the requirements for the newly integrated components.

Political and economic constraints will reduce the safety margins, necessitate lower equipment and operational costs, and enforce development trends for higher reliability and availability.

A typical example is the growing attention to monitoring and life management of high-voltage switchgear and controlgear.

Trends in the development of transmission and distributions networks are observed closely as they may impose new requirements on the switchgear and controlgear used in these systems. Typical examples could be series compensation installations, filter circuits, new configurations of overhead lines, or higher voltage ratings for transmission systems. Dynamic overloading of electricity distribution and transmission networks will be considered in switchgear documents.

Possible trends in the future are towards short-circuit current limitation with the application of superconducting current limiters and solid state switching technology. Again, there may be reactions from the networks and network components other than those due to the currently used mechanical switching process.

#### **B.4 Ecological environment**

SC 17A is aware that environmental issues are of increasing importance. A typical example is the concern about the contribution of SF<sub>6</sub>-gas to the greenhouse effect. Enquiries that are taking place in other bodies (e.g. CIGRE, IEC TC 10) are being closely monitored.

The nature of the primary technologies of switchgear and controlgear implies that practically all constructional elements can be recycled without limitations. There are no detrimental emissions during the switching process.

Care is taken to avoid the use of toxic materials or materials which may produce toxic by-products.

### **C. Work programme**

#### **Current work**

The current status of programme of work for SC 17A (projects and timescale) can be found in the updated IEC database sheet which is included in the annex of the present report.

In particular the present work is focussed on the following items:

- Revision of IEC 62271-1: Common specifications
- Revision of IEC 62271-100: Alternating-current circuit-breakers
- Based on work carried out by CIGRE SC A3 on behalf of SC 17A, the rating and testing requirements for high-voltage circuit-breakers having a voltage rating below 100 kV are under review
- Requirements for non-conventional (=electronic) components to be installed in high voltage switchgear and controlgear as well as interfaces to substation and network control and protection systems (jointly with SC 17C)
- Revision of IEC 62271-101: Synthetic testing
- Review of IEC and IEEE/ANSI Standards for circuit-breakers rated 72,5 kV and above in view of a harmonization.

#### **C.2 Resources/infrastructure needed**

SC 17A meets every 18 months (on average).

Up to now, no real difficulties were experienced in recruiting WG members – apart from the fact that a more active cooperation is desired from the users' side – and in obtaining invitations for WG and SC meetings.

While, generally speaking, the manufacturers of switchgear and controlgear are adequately represented in SC 17A and the subcommittees it would be desirable to have a more active participation from the users' side.

The administrative support is considered adequate.

Liaisons within IEC, to external standardization bodies, organizations of manufacturers and users,

and scientific corporations are established according to the need from ongoing work.  
In total, the available resources are sufficient for the ongoing work.

#### D. Future work

- The existing publications will be reviewed continuously.
- The future work of SC 17A will be governed by the evolution of switchgear technology and changing operational requirements as described under item B. The cooperation with CIGRE SC A3 plays a major role to provide the necessary background material.
- Taking into account the necessity to maintain the knowledge gained up to now within the subcommittee and especially within the working groups, an application guide for high-voltage circuit-breaker standards will be written. This application guide serves as a transfer of technology to the engineering community.
- Close cooperation is maintained between SC 17A and Sector Board 1.
- SC 17A continues the efforts for harmonization particularly with ANSI/IEEE standards
- Overlapping subjects are being and will be treated jointly by SC 17A/SC 17C. Consequently, these subcommittees conduct joint meetings.

Due to the maturity of high-voltage switchgear and controlgear technology and the durability of these products the maintenance cycles of the respective standards are rather long, i.e. in the order of 10 years.

Detailed maintenance cycles of the individual standards for high-voltage switchgear and controlgear are listed in a separate document.

#### E – Maintenance cycles

Publication No.	New publication No.	Date of Publication	Review Date	Maintenance result date	Responsibility (Maintenance Team)
IEC 60265-1 Ed.3.0	IEC 62271-103	1998-01-15	2006	2010	MT
IEC 60265-2 Ed.1.0	IEC 62271-104	1988-03-15	Review in progress	2008	MT 37
IEC 60265-2 Amd.1 Ed.1.0		1994-07-14			
IEC 60265-2 Amd.2 Ed.1.0		1998-08-19			
IEC 60427 Ed.3.0	IEC 62271-101	2000-04-07	MWIP	2005	MT 28
IEC 60470 Ed.2.0	IEC 62271-106	2000-05-30	2007	2011	MT
IEC 60694 Ed.2.0	IEC 62271-1	1996-05-22	MWIP	2007	34
IEC 60694 Amd.1 Ed.2.0		2000-09-29			
IEC 60694 Amd.2 Ed.2.0		2001-07-11			
IEC 60694 Ed.2.2		2002-01-25			
IEC 61166 Ed.1.0	IEC 62271-300	1993-04-07	MWIP	2005	33
IEC 61233 TR2 Ed.1.0	IEC 62271-110	1994-07-29	MWIP	2007	32
IEC 61633 TR2 Ed.1.0	IEC 62271-302	1995-04-26	2003	2007	MT
IEC 61634 TR2 Ed.1.0	IEC 62271-303	1995-05-30	2003	2007	MT 38
IEC 62063 TR Ed.1.0	IEC 62271-307	1999-08-06	2007	2011	MT
IEC 62271-100 Ed.1.0		2001-05-28	MWIP	2006	36
IEC 62271-100 Amd.1 Ed1.0		2002-05-07			
IEC 62271-102 Ed.1.0		2001-12-19	2005	2009 (1)	MT
IEC 62271-105 Ed.1.0		2002-08-22	2009	2013	MT
IEC 62271-301TR Ed 1.0		2004-10-07	2005	2008	MT
IEC 62271-308 TR Ed.1.0		2002-08-09	2004	2008	MT
IEC 62271-310 TR Ed 1.0		2004-04-05	2005	2007	MT 39
IEC/PAS 62271-109 Ed.1.0		2002-07-05	MWIP	2005	PT62271-109

MWIP – Maintenance work in progress

1) Subject to SMB approval

Name or signature of the secretary

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