

**STRATEGIC BUSINESS PLAN (SBP)**

IEC/TC or SC 73	Secretariat Norway	Date December 2012
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Title of TC  
Short-circuit currents

**A Background**

TC 73 held the first meeting in Solna (Stockholm) 13 - 14 September 1972. The scope and responsibilities of the Committee are to prepare standardised procedures for the calculation of short-circuit currents, and the thermal and mechanical effects.

The Standards shall be, as far as possible, in form to facilitate their use by non-specialist engineers.

The Committee deals with industrial installations and public supply systems.

At the meeting in Solna two working groups were assigned to assist the secretariat:

- WG 1: Calculation of currents
- WG 2: Heating and mechanical effects

These working groups are now assigned as maintenance teams for the documents related to:

- calculation of currents
- heating and mechanical effects.

At the TC 73 meeting in Kista (Stockholm) in 1993 the decision was made to establish WG 3: Collection of information of reduction factors. The objective was to collect data for reduction factors of cables in overhead transmission lines. The result was intended for the revision of IEC 60909-3 "Currents during two separate simultaneous single-phase line-to-earth short circuits and partial short-circuit currents flowing through earth". A questionnaire was circulated to National Committees, but insufficient information was received. At the TC 73 meeting in Trondheim in 1997 WG 3 was disbanded. Later information has been obtained from the manufacturers.

Among the p-members TC 73 have active representatives from Australia, Austria, France, Germany, Japan, Norway, Sweden, Switzerland and United Kingdom. Most countries have one representative while Austria has 3 and Germany has 9 representatives.

**B Business Environment****B.1 General**

The ability withstand the maximum short-circuit currents including their thermal en mechanical effect concern all electrical apparatus and equipment. Thus short-circuit calculations are of fundamental importance for the electrical manufacturing industry, industrial power plants and power utilities to ensure safe design of components and systems to prevent damage of equipment, interruptions of public electric supply systems and ensure safety to involved personnel and third parties. The objective of the existing standards is to cover today's equipment and systems.

**B.2 Market demand**

In the western world the expansion of the electrical supply system has for some time been limited to a slow increase level, but introduction of environment friendly renewable generation i.e wind turbines, small hydro power stations etc. and the increased need for power transmission. In a dynamic

competitive electric power market, a new comprehensive expansion of transmission capacity is expected in many countries. A substantial increase is also expected in the third world. The future demand for adequate standards depends on the growth and technology development, manufacturers, industry with power plants and utilities on national, regional and local grid levels that are the main customers of the world wide TC 73 standards.

### B.3 Trends in technology

Traditionally the main sources for short-circuit currents has been large conventional synchronous and asynchronous machines. The development of power electronics has led to the use of inverter governed generators and motors driven by wind turbines representing a new technology that needs to be included in the standards for a proper calculation their contribution to the short circuit currents. The technology development of new types of HVDC transmission systems are expected to be increasingly used and standardised calculation of short-circuit current in such systems must accordingly be addressed.

### B.4 Market trends

The need for standards for short-circuits calculation and calculation of thermal and mechanical effects has so far traditionally been little effected by the technology development and trends. Use of more complex wind generation systems and combined AC and DC transmission systems call for new and improved standards.

### B.5 Ecological environment

Not applicable to the field of TC 73.

## C System approach aspects

TC 73 standards are providing basic information for electric power component designers and power system designers to ensure both that components and systems may withstand the maximum thermal and mechanical stresses due to short-circuit currents. This information is especially important for the switchgear manufacturers that should provide switchgears that may break the maximum short-circuit currents within acceptable time to isolate short circuits and minimize the consequences for the energy consumers and transmission utilities. In this way TC 73 is largely supplier of standards that are used to generate important requirements for the design of current carrying electric equipment. The impact from the components on the short-circuit currents in electric power supply systems is mainly the impedance of the different involved components like overhead lines, cables, transformers, motors and generators.

TC 73 has an internal liaison with TC 8 “Systems aspects for electrical energy supply” and this liaison will continue. The type “Liaison A” with CIGRE task force (SC B3 WG 3 TF ESCC “Effects of Short-Circuit Currents”) will be terminated since the task force has finished its work and does not exist anymore.

A new IEC committee has been established i.e. IEC TC 115: “High Voltage Direct Current (HVDC) transmission for DC voltages above 100 kV” and for the future work with short circuit currents in HVDC systems, TC 73 has decided to establish an internal liaison with TC 115.

The TC 73 relationship with other IEC Committees is summarized in the table below.

Component Committees (TC 73 as a supplier of standards)	TC 17	Switchgear and controlgear
	TC 14	Power transformers
	TC 2	Rotating machinery
	TC 20	Electric cables
	TC 7	Overhead electrical conductors
	TC 32	Fuses
	TC 33	Power capacitors and their applications
System Committees (TC 73 as a customer of standards)		
Other Committees (horizontal)	TC 1	Terminology

committees that produce standards used by TC 73)	TC 8	Systems aspects for electrical energy supply
	TC 25	Quantities and units
	TC 115	High Voltage Direct Current (HVDC) transmission for DC voltages above 100 kV
Other Committees (committees that produce standards similar to TC 73)	TC 18	Electrical installations of ships and of mobile and fixed offshore units

## D Objectives and strategies (3 to 5 years)

The main objective for TC 73 will be the maintenance of its publications taking into account new technology development and trends. The work with the implementation of short-circuit contribution from dispersed wind generators and wind farms is continuing but more information, that the manufacturers tend to claim sensible, is still necessary before this revision may be completed. The need for short-circuit calculations in more complex HVDC systems will be thoroughly evaluated and started when the time is due, basic scope is defined and necessary experts are available. The contribution from capacitor banks to the peak short-circuit current is also a topic of interest for TC 73. The relevancy of including this effect in the standards is however to be examined thoroughly before this work should be started within TC 73.

Concerning the thermal and mechanic effects of short circuit currents, the maintenance of the existing publications will continue. However some of the remaining topics to be standardised need comprehensive research and measuring controls before these items may be put on the agenda for standardisation. The development in this field will be continuously observed.

The topic of rise of pressure due to short-circuit currents in areas with limited space is a well know problem, however without standardised methods for calculation. The possibility to develop a standardised method is going to be examined by setting up a scope and seeking sufficient expertise from the National Committees.

The standards for DC auxiliary systems are characterized by their complexity and the limitation that they only may be used by experts. The revision of these will be performed when it is requested by their users.

## E Action plan

Most important activities are:

### A. Short-circuit calculations:

1. Continue the work with inclusion of the short-circuit current contribution from wind power farms and dispersed wind power generators in IEC 60909-0. The main focus is on the contribution from doubly fed asynchronous wind generators and full size convertor wind generators. The objective is to publish the revised standard in the autumn of 2014.
2. Evaluation of the need for short-circuits calculations in more complex HVDC systems. When the time is due for such calculations the scope will be established and experts invited. It is estimated that the standardisation work may start in 2015.
3. Examining the effects of the contribution from capacitor banks to the peak short-circuit currents and thermal and mechanical effects. If deemed of importance, the work of standardisation should be initiated and the start up is estimated to 2016.

### B. Thermal and mechanical effects:

1. Finish the revision of the IEC/TR 60865-2 dealing with calculation examples for thermal and mechanical effects of short-circuit currents. The objective is to publish the revised technical report in May 2013.
2. To observe the development of calculation methods for the mechanic stresses in substations:
  - a. stresses on flexible conductors caused by automatic reclosing
  - b. equivalent static loads for portals

Estimated time for the start up of this standardisation activity is not before 2017.

3. Standardised methods for calculation of the rise of pressure due to short-circuit currents in areas with limited space. The scope for this activity may be established in 2013 and the work may start in 2014.

C. Standards for DC auxiliary systems

The revision of these will be performed when it is requested by their users.

#### **F Useful links to IEC web site**

[The IEC TC 73 dashboard](#) is giving access to Membership, TC Officers, Scope, Liaisons, MT structure, Publications issued along with their Stability Dates and Work Programme.

Name or signature of the secretary

Lars Rolfseng