**Discussion paper on Substation - Switchgear Coordination**

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## 1. Status

The technical work in the Substations and Switchgear Committee often is rising questions of who would be responsible or who could do the work the best.

Standardization itself needs clear defined borders of responsibility to avoid conflicts in standards and with this confusion of the users of standards.

In the practical world this question is coming with each project and needs to be solved. Most cases are clear, but some times clarification is needed.

Also on the borderline between Substations and Switchgear committee questions come up.

This discussion paper will give some ideas about how IEC SC 17A and SC 17C has solved this coordination problem.

## 2. IEC

The title and scope of IEC SC 17 A says:
***High-voltage switchgear and controlgear***
*To prepare international standards regarding specifications for high-voltage switchgear and controlgear rated above 1 kV a.c. or above 1,5 kV d.c.*

while the title and scope of SC 17 C says:
***High-voltage switchgear and controlgear assemblies***
*To prepare international standards covering prefabricated assemblies which are combination of one or more parts of switchgear and controlgear exceeding 1 kV a.c., together with associated control and power equipment, measuring, signalling, protective, regulating equipment etc. Gas-insulated transmission lines are in the scope of SC 17C.*

The main difference is on the little word "assemblies". A small word with a big meaning.

To explain it is better to turn into the question: What are not assemblies?

Not assemblies are devices which follow one function or a combination of functions in one device. For example: A circuit breaker is one function using one interruption chamber, one driving mechanism and has two terminal A and B. The same could be said for a disconnector switch and a ground switch.

In case the device has two functions as the combined disconnector circuit breaker where the disconnecting function is made by using larger gaps. In practice to use a 170 kV device in a 110 kV application. In such cases Fig. 1 applies.

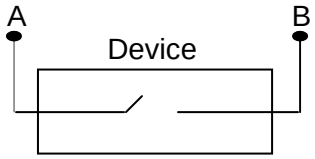


Fig. 1: Device function or combined function

## 3. Assemblies

What are now assemblies?

In IEC working group WG 17 developed definitions for assemblies, which has been published as:

> 'IEC 62271-205 Ed.1: High-voltage switchgear and controlgear – Part 205: Compact switchgear assemblies for rated voltages above 52 kV'.

This IEC work is based on results of working group WG B3.20 CIGRE Study Committee B3 Substations which investigated the question of different switchgear technologies. The result has been published in November 2008 as a study committee report under the titel:

> 'Evaluation of Different Switchgear Technologies (AIS, MTS, GIS) for Rated Voltages of 52 kV and above'

The following examples are part of the IEC 62271-205 in annex A, and illustrate some possible compact switchgear assemblies. Since there are many possible solutions the types shown below are for indicative purposes only. Compact switchgear assemblies may consist of air-insulated devices, gas-insulated devices or combination of both.

Type 1: Assembly of independently operated switching devices and/or devices which are connected by short connecting parts on a common base frame (similar to a conventional substation design).

Type 2: Assembly of independently operated switching devices and/or devices sharing parts of the neighbouring switching device or device.

Type 3: Assembly of independently operated switching devices and/or devices being integrated in another switching device.

List of abbreviations for figure A.1, A.2, A.3 and A.4

| | |
|---|---|
| DS | Disconnector |
| DS1a | Part a of disconnector 1 |
| DS1b | Part b of disconnector 1 |
| CB | Circuit-breaker |
| ES | Earthing switch |
| CT | Current transformer |
| VT | Voltage transformer |
| SA | Surge arrester |

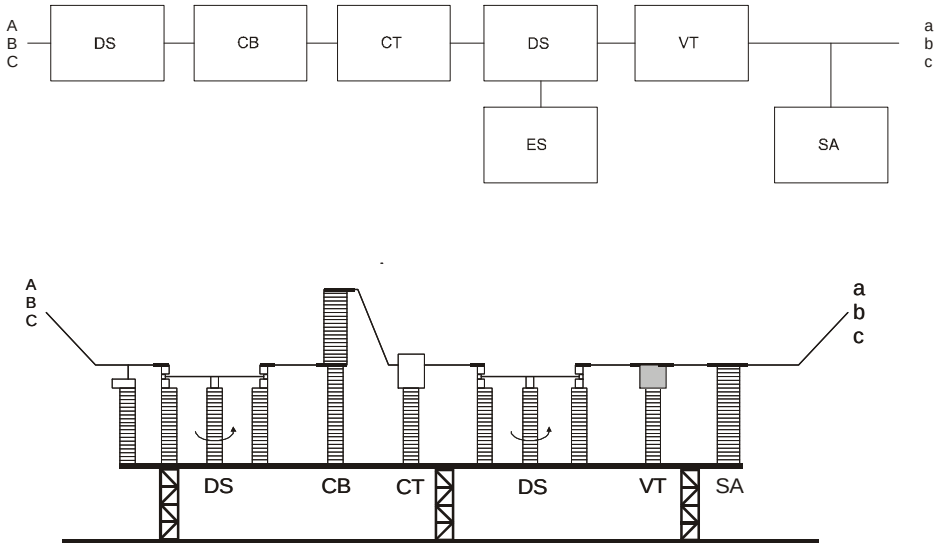


**Figure A.1 - Example for type 1**

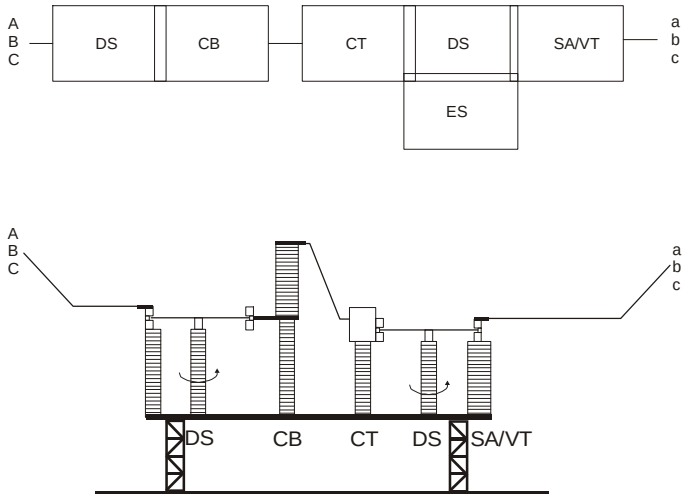


**Figure A.2 - Example for type 2**

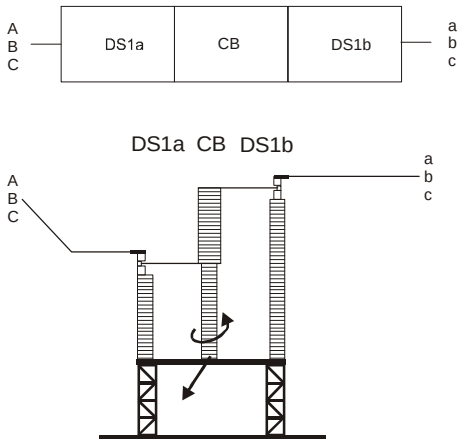


**Figure A.3 - Example for type 3**

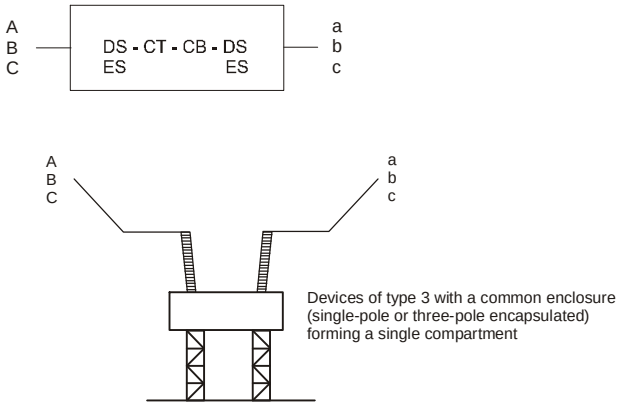


**Figure A.4 - Example for type 3**

## 4. The Principle

The principle behind this logic is that the details of any device shall be in the hands of these experts: circuit breaker, disconnectors, ground switch. Any detailed requirement linked to these devices are covered by their standards.

When it comes to assemblies the required knowledge is different, not so much the single detail of a device, e. g. interruption chamber is in focus, and it is more the well adjusted coordination of any single device to function correctly as a system. The focus is on interactions e. g. like thermal heating up from one device to another or mechanical impact in vibrations or shocks between devices.

The IEC does not have a Substations Committee as we have. When these simple principles are applied to substations we would see the focus clearly.

Substations Committee

To be responsible for functions assembled from single devices in a substation and their technical, ecological, safety and cost interactions.

Switchgear Committee

To be responsible for devices with single or combined functions in one device in technical, ecological, safety and cost aspects.

Wider View

In a wider view it the Substations Committee has the overlooking function of all devices used in substations and their interactions. This includes switchgear, transformers, cables and other devices. The clear line always is the single or combined function of devices and the impact of assemblies of such functions.

## 5. Conclusion

The future of standards is going to a more system-orientated approach. Market will ask standardising more complex solution. Simplified standards are needed to keep the clearlyness of understanding and the simple application of standards. A basic goal for standardisation: Keep it as simple as possible.

We shall take the opportunity to improve!

In a first step officers of the related committees shall get together and try to simplify the standards organisation. In IEC we needed several years to get this solution between two committees. It's not an easy task, but it is valuable to think about it.