Discussion Paper on Substation - Switchgear Coordination based on IEC

by Hermann Koch

Chairman Substations Committee

Status

- Border lines of technical work in the Substations and Switchgear Committee are sometimes under question.
- Standardization itself needs clear defined borders of responsibility to avoid conflicts and confusion.
- The border line between Substations and Switchgear committee responsibilities need clear definition.
- IEC has defined limits of responsibilities in SC 17A and SC 17C.

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.

IEC

- The main difference is on the little word "**assemblies**".
- To explain “assemblies” it is good to ask:
  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.

IEC

- The device has one function or a combination of functions.
  The device has two terminals A and B.

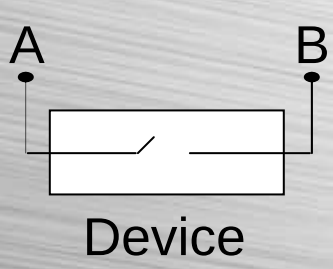

Fig. 1: Device
one function or a combination of functions

Assemblies

IEC defines assemblies in:

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

Based on results of CIGRE Substations WG B3-20 published in November 2008 as: 'Evaluation of Different Switchgear Technologies (AIS, MTS, GIS) for Rated Voltages of 52 kV and above'

Assemblies

- Three types of assemblies:
- 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.

Assemblies

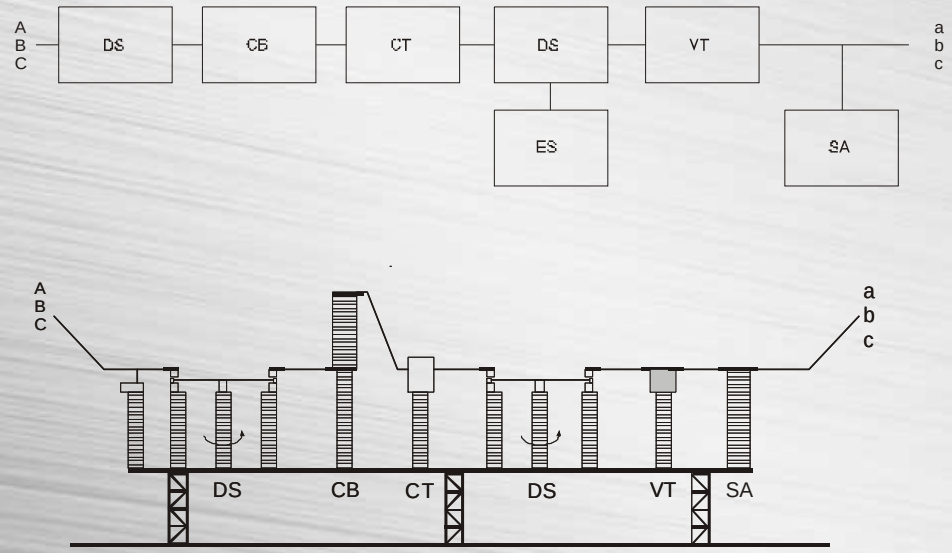

Figure A.1 - Example for type 1

Assemblies

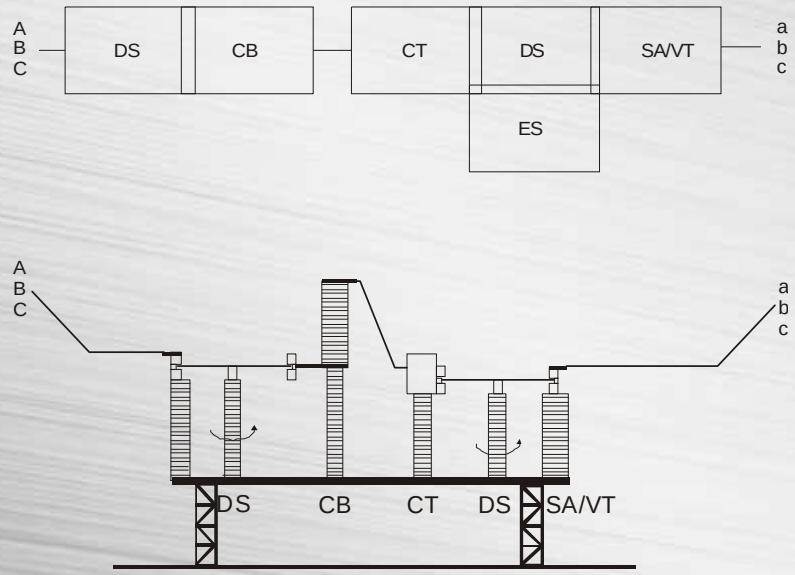

Figure A.2 - Example for type 2

Assemblies

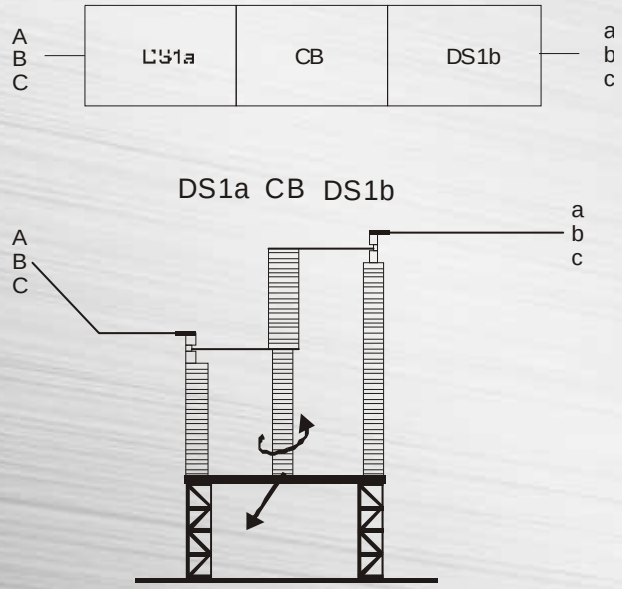

Figure A.3 - Example for type 3

Assemblies

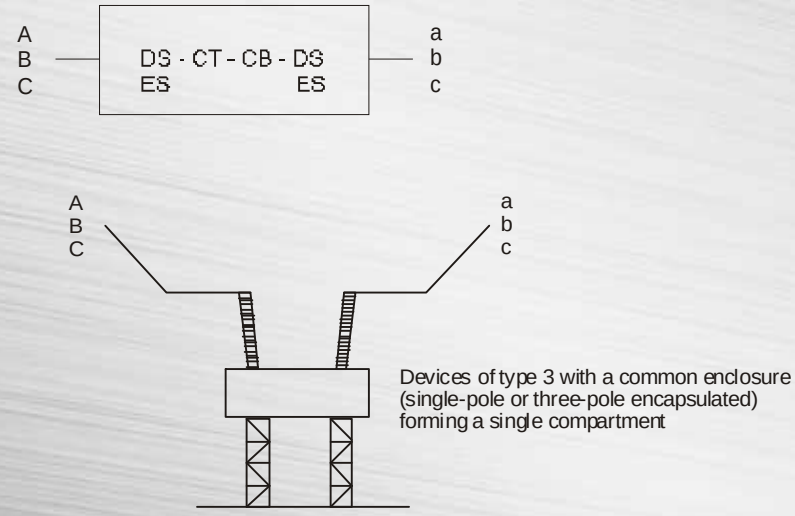

Figure A.4 - Example for type 3

The Principle

- Principle behind the logic:
- Device experts (e. g. CB, DC, ES) make the details.
- Assembly experts of substation make the interaction of devices.

The Principle

Possible border lines of responsibilities:

- Substations Committee
  To be responsible for functions assembled from single devices in substations and their interactions.

- Switchgear Committee
  To be responsible for devices with single or combined functions in one device.

- 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 devices (e.g. CB, transformers, cables) and communication technology (SCADA).

Conclusion

- Standards are getting more complex with system orientation.
- Standards of single devices and interaction of devices need different experts.
- Clear border lines of responsibility is important for standards to avoid confusion.
- IEC concept has proven well over the last years. Could be a basis for Substations-Switchgear discussions.
- 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.