

Annex E HVDC Converter Transformers and Smoothing Reactors Subcommittee

**March 26, 2018, 3.15 pm
Pittsburgh, Pennsylvania, USA**

**Chair: Michael Sharp
Vice Chair: Les Recksiedler
Secretary: Ulf Radbrandt**

E.1 Introduction / Attendance

Introductions were made and the attendance list circulated.

There were 9 members and 13 guests present. No new requests for membership were received.

The total membership of the SC is 17. We needed at least a total of 9 members to be present in order to have a quorum. This was achieved.

The agenda for this meeting was approved.

E.2 Approval of the minutes of the April 3, 2017 meeting in New Orleans

The minutes from the Louisville meeting were approved.

E.3 Brief report on the meeting of the Administrative SC by Mike Sharp

Pictures and video recordings will not be allowed during meetings, except by officers and only if that is prior announced.

E.3.1 Reminder that IEEE C57.129 will expire in 2018 and IEEE 1277 will expire in 2020.

The standard for converter transformers, IEEE C57.129, will expire in 2018. That standard is now replaced by the published dual logo standard for converter transformers.

The standard for smoothing reactors, IEEE 1277, will expire in 2020.

E.4 Working Group Reports

E.4.1 WG IEC/IEEE 60076-57-129 – Transformers for HVDC applications

Chair: Ulf Radbrandt (IEEE) and Mats Berglund (IEC), Co-Chairs

Ulf Radbrandt made a presentation regarding the status of the work with the dual logo document. There has been a very good cooperation with the IEC WG. There were seven working meetings, of about 2 working days each, where three of those meetings were in connection with IEEE Transformers Committee meetings. The dual logo document was published in November 2017.

An IEEE standard has a maximum life time of ten years while an IEC standard has a stability date which might be longer. When we see that we must start the revision process for this dual logo standard then we must contact IEC with that request.

E.4.2 WG IEEE P1277 - Dry-Type and Oil-Immersed Smoothing Reactors and Dry-Type Converter Reactors

Chair: Klaus Pointner (klaus.pointner@ieee.org)
Vice-Chair: -
Secretary: Ulf Radbrandt (temporary)

E.4.2.1 Introductions and Call for Patents

This WG meeting was conducted as part of the HVDC SC meeting.

The chair, Klaus Pointner, asked the members if they are aware of any essential patent claims that could affect the work by the WG but nobody expressed any knowledge of such claims.

The WG has different membership than the SC but the same roster. Klaus Pointner will retrieve the WG participation from the roster after the meeting.

There were 9 members and 13 guests present. No new requests for membership were received.

The total membership of the WG is 17. We needed at least a total of 9 members to be present in order to have a quorum. This was achieved.

The agenda for this meeting was approved.

The minutes from the Louisville meeting were approved.

E.4.2.2 Review of the Draft 3 of the standard.

Draft 2 was created before Christmas last year based on comments after the Louisville meeting. Draft 3 was created prior to this meeting based on new comments. Most comments have been received from Pierre Riffon. Comments have also been received from Mike Sharp, Klaus Papp and Alexander Gaun.

Pierre Riffon has proposed that we should add an optional chopped impulse test for converter reactors. A discussion regarding that followed. One reason for this is that HVDC links often are very important for the user and that motivates more stringent testing compared to similar ac equipment. Another reason for this test is that it is already an optional test for smoothing reactors in this standard. Comments offered against this test are that these reactors normally are very well protected e.g. by location and by close surge arresters, they are normally not directly connected to gas-insulated switchgears and not oil-insulated. Another reason provided as to why not to add it as an optional test is that if the test exists as optional in a standard then many end users would select the test even if it is not technically motivated. A voting took place after a motion by Pierre Riffon, which was seconded by Waldemar Ziomek. The voting result was evenly distributed. The decision was postponed to later. We should check Cigré statistics on failures on converter reactors. Waldemar Ziomek volunteered to do that.

Pierre Riffon has also commented that outdoor temperature rise tests should be avoided since wind, rain and solar radiation might influence the test significantly. Klaus Pointner commented that smoothing reactors often are so big so it is practically very difficult to test them indoor and that the losses would increase the surrounding temperature which would affect the test and that ventilation of the room would do that also. It was agreed to write that the test should usually be performed indoors but that outdoor test also can be accepted. A note should be added to explain that if an outdoor test is to be performed then consideration to wind, rain and solar radiation should be taken into account.

An extended polarity reversal test was added in the dual logo standard for converter transformers. That test should be added also for oil-insulated smoothing reactors.

Chris Ploetner has volunteered to update the sound parts of this standard at the fall meeting in Louisville. He contacted the chair of the WG prior to the meeting and informed that he cannot make it to the spring meeting in Pittsburgh. He will provide his input safely prior the next meeting

Pierre Riffon and Ulf Radbrandt volunteered to do investigations regarding the background of the short circuit requirements on smoothing reactors. We should also consider a threshold level, e.g. 10 times the rated current, for recommendation if evaluation of short circuit currents would be necessary. Normally the peak short circuit current is very low compared to the rated operating current compared to that relation for ac reactors.

RIV test might be applicable for ac side and not only for dc side converter reactors. It might also be valid for indoor reactors. Ulf Radbrandt will investigate this.

Klaus Pointner will send out a survey regarding the Annexes. Should we keep, modify or delete them?

- Annex A “Application of HVDC smoothing reactors” is only applicable for line commutated converters and the title should be updated accordingly.
- Annex E “In-service overloading of HVDC smoothing reactors” should be updated with reference to the converter transformer standard.
- Annex F “Smoothing reactors used in voltage source converters (VSC) HVDC schemes” should be updated with converter reactors that are subjected to both ac and dc current, i.e. for multi-level converters. This should be coordinated with the work in the WG for IEEE C57.16 “Dry-type series reactors” which will cover converter reactors without direct current, i.e. for 2- and 3-level converters. The WG for IEEE C57.16 is now introducing a description of the different types of converter topologies. This WG should consider to include that also.

Klaus Pointner would like to have new comments on Draft 3. The intention is to have a final draft ready to the Spring 2019 meeting.

E.4.2.4 New Business

- There was no new business

E.4.2.5. Adjournment

The WG meeting was adjourned and the SC chair, Mike Sharp, took over with the SC meeting.

E.5 Old Business

- There was no old business

E.6 New Business

- There was no new business

E.7 Adjournment

The meeting was adjourned at 4:20 pm.