

Minutes of the Meetings held on  
September 18<sup>th</sup> and 19<sup>th</sup> 2013 in San Antonio - TX, US

Joint IEC/IEEE revision of IEEE C37.013: IEEE Standard for AC High-Voltage  
Generator Circuit Breakers Rated on a Symmetrical Current Basis

IEC TC 17 / SC 17A / WG 52

IEEE P62271-37-013

The Working Group met on September 18<sup>th</sup> and 19<sup>th</sup> 2013 in San Antonio - TX, US.

The chair started the meeting with the introduction of all participants.

The following people attended the meetings: see Annex A

Main points:

The agenda proposed for the two-day meeting was approved by the WG members.

The minutes of the meeting held in Galveston were approved.

Bill Long informed the WG members that according to IEEE it is possible to have colourful figures in the Standard provided that they can be read by people who cannot distinguish different colours. All the figures in the document will be checked and where needed modified accordingly.

Jim Van de Ligt presented the flowchart which summarizes the procedure to select the class of a generator circuit-breaker concerning the generator-source short-circuit current interrupting capability. The WG agreed to have a simplified version of the flowchart. The revised flowchart shall give to the reader an overview of the selection process referring to the specific part of the text for each major step.

The comments received from Chih Chow have been reviewed by the WG.

Editorial errors in the document have been corrected.

IEC 60068-2-17 has been added to Bibliography.

It was agreed that the documents listed in Bibliography do not need to be referred to in the text of the document.

It has been added reference to 4.11 in 4.107 as marked red below:

*Rated time quantities are based on*

...

*rated pressures of compressed gas supply for operation, for insulation and/or interruption, as applicable (see 4.10 and 4.11);*

It has been clarified in 6.102.6 that the setting of the pressure of the fluid for interruption at its minimum functional value does not apply to sealed-for-life generator circuit-breakers.

In 6.102.6, indent b) reference to 4.10 has been added.

In 6.102.6, indent c) reference to 4.11 has been deleted.

The pending action items from the IEC ballot have been addressed.

Definitions of making operation, breaking operation, close-open operation (CO) and make-break operation have been added to cl. 3.

As a consequence the word “closing” has been replaced by “making” in the 6th paragraph of 6.102.4.1.

Cl. 4.106 has been modified to address the comment #41 received from the last IEC ballot.

Cl. 4.106 will read as follows:

*The standard operating sequence of a generator circuit-breaker shall be CO – 30 min – CO (without any intentional delay between C and O).*

Cl. 7.4.2 has been modified to address the comment #134 received from the last IEC ballot.

The following sentence has been added: “For this reason, sniffing is not acceptable because it is not cumulative.”

It was agreed to remove the last two paragraphs of 4.4.2 because reference to IEC 62271-1 prevails.

An agreement was reached on Table 9. The final version of this table will be as follows:

**Table 9 – Conditions during temperature rise test**

Part	Ranges of average temperature rise of the IPB at ambient air temperature not exceeding 40 °C	
	Option 1	Option 2
IPB conductor at position 8 on each side	50	65
IPB enclosure at position 9 on each side	30	40

The related tolerances in Table A.1 on temperature rises of IPB conductor and enclosure will be  $\pm 5$  K.

In 4.107.1 Note 5 has been modified to match the definition in Figure 4.

In 4.108 the word “sequences” has been replaced with “cycles”.

Junichi Kashima had a concern about the arcing time to be tested according to 6.105.12. His concern was that the arcing time is normally a test result and not a test requirement. The WG agreed that in the specific case of tests described in 6.105.12 the arcing time is a test requirement. This requirement is the outcome of a comprehensive survey carried out on several existing power stations operating in different countries. The requirement on the arcing time is necessary because in power laboratories is normally impossible to reproduce the fault current waveform obtained in real power stations. No change in the document is required in this respect.

A discussion took place concerning the requirements laid down in 6.102.7.

Two manufacturers shared their experience with vacuum circuit-breakers testing. They were not able to open the circuit-breaker by normal means after the short-time withstand current test. One of the two manufacturers successfully performed short-circuit breaking current tests with different operating mechanisms before the short-time withstand current test. The requirements which are laid down in the current version of 6.102.7 were fulfilled. In order to pass the short-time withstand current test this manufacturer increased the moving mass keeping the same speed. The lesson learned is that comparing the speed of the operating mechanisms might not be sufficient to prove that the circuit-breaker will break the weld. The acceleration should be taken into account as well but with today technology it seems to be difficult to measure acceleration precisely.

The same topic is being discussed in IEC MT36. Apparently this problems might arise only on circuit-breakers equipped with butt contacts. It was agreed not to introduce a short-time withstand current test in 6.102.7 and to re-discuss this item after a decision is made in IEC MT36 on this topic.

It was agreed to add the requirement of performing an opening operation after the making operation described in 6.102.7 in order to show that generator circuit-breaker is able to break the weld. This modification is due to the fact that some circuit-breakers with butt contacts the short-time withstand current capability is not adequately covered by the making test.

Henk te Paske proposed that it should be made clear that 6.102.7 is not applicable to generator circuit-breakers originally single-pole operated which are to be converted into three-pole operated.

On the other hand from 3.5.122 and 3.5.123 it seems that the above mentioned case is covered by 6.102.7.

It was agreed that no change in the document is required for the time being because the same topic should be first discussed in IEC MT36.

Finally a list of topics to be developed in the next revision of the document has been presented and discussed.

These topics include:

- guidance notes for the selection of generator circuit-breakers in case of power station layouts consisting of two generators connected to one two-winding step-up transformer;
- procedure to obtain TRV parameters for testing generator circuit-breakers equipped with capacitors;

- whether to display the degree of asymmetry of the system-source short-circuit breaking current on the nameplate.

Next Steps and Agreed Actions:

1. Check throughout the document whether references to wrong clause numbers exist and inform MP accordingly (ALL)
2. Check if the procedure laid down in cl. 6.2.4 is sufficient for testing internal insulation considering altitudes of testing locations higher than 1000 m.a.s.l. (BL)
3. Revise the flowchart to be included in cl. 8.103.5.3.6 “Guide for the selection of the class of the generator circuit-breaker”. The purpose of this flowchart is to provide the reader with a visual indication of the procedure to select the class (G1 or G2) of the generator circuit-breaker. This flowchart shall be consistent with the text of cl. 8.103.5.3.6. (JVdL)
4. Check the consistency of the flowchart (MP)
5. Replace number with lower-case superscript letters in the footnotes of the tables (MP)
6. Add label “q” to Figure 1 (JH)
7. Add identification of contact separation and arcing time in Figures 32B, C, D and 33B, C (JH)
8. Inform JH about the changes required in Figures 21 to 29 (HtP)
9. Replace t[ms] with time in the horizontal axis and add current in the vertical axis of Figures 21 to 29 and 32A to 33C (JH)
10. Coordinate the work described in action items 6, 7, 8 and 9 above (BL)

Please send your contributions to MP no later than October 7<sup>th</sup>, 2013. Contributions sent later than this date might not be included in the CDV.

Future Meetings and Schedule:

The next step is to submit CDV by October 15<sup>th</sup>, 2013. A meeting or a phone conference might be arranged based upon the quantity and type of comments received from the IEC and IEEE ballots.

**Annex A: List of Attendees**

Member/ Guest	Last name	First name	Affiliation	Attended September 18 <sup>th</sup> , 2013	Attended September 19 <sup>th</sup> , 2013
Member	Carmona	Gilbert	Southern California Edison	√	√
Guest	Cary	Stephen	Eaton	√	
Member	Chen	Steven	Eaton	√	√
Member	Chow	Chih	Pepco	√	√
Guest	Christian	Michael	ABB	√	
Member	Dufournet	Denis	Alstom Grid		√
Member	Falkingham	Leslie	Vacuum Interrupters Limited	√	
Guest	Farr	Larry	Eaton	√	
Guest	Flores	Sergio	Schneider Electric		√
Guest	Day	Jerod	Vacuum Interrupters Inc.	√	
Member	Kashima	Junichi	Hitachi Ltd.	√	√
Guest	Li	Wangpei	Eaton	√	
Convenor	Long	Bill	Eaton	√	√
Member	Matsuki	Masashi	Mitsubishielectric corporation	√	√
Guest	Mayle	Frank	Technibus Inc.	√	
Member	Oemisch	Joachim	Siemens	√	√
Secretary	Palazzo	Mirko	ABB	√	√
Guest	Rosenkrans	Ben	Eaton	√	
Member	Shawn	Patterson	Bureau of Reclamation	√	
Member	Ricciuti	Tony	Eaton	√	
Member	Te Paske	Henk	KEMA	√	√
Member	Van de Ligt	Jim	CANA High Voltage Ltd.	√	√
Guest	Wactor	Michael	Powell Industries	√	
Member	Webb	John	ABB		√
Member	Willieme	Jean-Marc	Alstom Grid	√	√
Member	Zehnder	Lukas	ABB	√	√