

Minutes of the Meetings held on
May 1st, 2nd and 3rd 2013 in Galveston - 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 May 1st, 2nd and 3rd 2013 in Galveston - 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 three-day meeting was approved by the WG members.

The minutes of the meeting held in Tokyo were approved.

The WG reviewed and resolved the comments received from IEEE ballot.

The comments received from IEC ballot had already been resolved during the previous meeting in Tokyo but they were shown again for informing the people who were not attending the meeting in Tokyo and for summarizing the pending tasks.

The comments received from IEC SC 17A as result of the plenary meeting in Delft were reviewed. The relevant excerpt of the minutes of that meeting is shown below. Those comments shall be taken into account for the preparation of the CDV. CDV shall be submitted by October 2013.

During the meeting in Galveston representatives of WG 52 mentioned to the secretary of IEC SC 17A that a typo is present in the minutes of the meeting held in Delft. It refers to the comment #63. Reference to IEC 62271-1 shall be replaced by reference to IEC 62271-100. The wording shall be revised as follows: "#63: The CA comment was accepted. The wording in IEC ~~62271-1~~ 62271-100 will be used."

Furthermore reference to comment #100 shall be cancelled beside comments #66 and #83 to read: “#66, 83 ~~100~~: The present wording will be retained as a temporary measure. At the moment...”.

7.1 IEC 62271-37-013: Generator circuit-breakers

The second CD of WG 52 was circulated under reference 17A/1031/CD and the comments received reference 17A/1040/CC.

The Chairman asked Mr. Larry Farr of the USNC, to assist him with the discussion of the document. Document 17A/Delft/06 was used as a guide for the discussion.

Detailed discussion:

#19: The DE comment was accepted. Classes M1 and M2 are also used for other equipment. The definitions for class M1 and M2 in IEC 62271-100 were changed to remove the number of operations, which means that these definitions are generally acceptable.

Against: Abstain: ES, GB, JP: All others were in favour.

#28 and 31: “Shall” will be replaced by “should” and reference will be made to preferred values. The table heading will be changed to “Preferred supply voltages and their ranges for generator circuit-breakers”. The paragraph beginning with “Other control voltages...” will be removed.

#58: The IPB shall be at its maximum operating temperature stated in Table 9 irrespective of its design. No change required.

#63: The CA comment was accepted. The wording in IEC 62271-1 will be used.

#66, 83 100: The present wording will be retained as a temporary measure. At the moment the sealed for life GCB are based on vacuum technology. The matter of resistance measurement as a condition check is currently under consideration by MT 34 (IEC 62271-1). As soon as MT 34 has found a suitable procedure with acceptance criteria, the GCB standard will be updated.

#96, 101: The procedure should clearly state that the determination of the minimum arcing time can be deleted provided that a clear identification of the test object used previously for the determination minimum arcing time is provided.

#108: The asymmetrical test procedure is under review by MT 36 (IEC 62271-100). For the time being the text in the CD will remain as it is. The document will be revised once the new procedure in IEC 62271-100 has been approved.

#110: The procedure for asymmetrical tests for a time constant of 133 ms for GCBs and for a time constant of 120 ms for circuit-breakers should be aligned. The text of the CD remains the same.

#112, 121, 130, 140: The CA comment is accepted. MT 36 will be asked to review this item as well.

#119: The FR comment is accepted. The number of tests specified under f) will be moved to another subclause related to testing.

#120: A standard should contain the basic requirements, not the testing circuits that shall be used to fulfill the requirements.

132: The text of subclause 6.107 will be replaced by the following:

Switching unloaded transformers, i.e. breaking transformer magnetizing current, is not considered in this standard. The reasons for this are as follows:

- a) due to the non-linearity of the transformer core, it is not possible to correctly model the switching of transformer magnetizing current using linear components in a test laboratory. Tests conducted using an available transformer, such as a test transformer, will only be valid for the transformer tested and cannot be representative for other transformers;
- b) as detailed in IEC 62271-306, the characteristics of this duty are usually less severe than any other inductive current switching duty. It should be noted that such a duty may produce severe overvoltages within the transformer winding(s) depending on the circuit-breaker re-ignition behaviour and transformer winding resonance frequencies.

#141: The CA comment was accepted. The IEC tolerance ($\pm 3\%$) will be used when using procedure B of IEC 60060-1 and the IEEE tolerance ($-0 +3\%$) when using procedure C of IEC 60060-1.

Decision: WG 52 will prepare a CDV with target date October 2013, taking account of the decisions taken at the meeting.

The secretary of IEC SC 17A confirmed that it is possible to use in a clause other than 6.107 the text that IEC SC 17A decided to be implemented in cl. 6.107 provided that the general meaning and intention are maintained.

Concerning hanging paragraphs, they will be fixed once the same are fixed in IEC 62271-1 which our document refers to.

A comment made by HtP concerning the questionable relation between measurement uncertainty and coverage factor stated in cl. 6 gave the impulse to remove that relation from the text. The sentence (*equal to a coverage factor of 2,0*) will be removed.

It was decided to add a flowchart to to be included in cl. 8.103.5.3.6 "Guide for the selection of the class of the generator circuit-breaker" to provide the reader with a visual indication of the procedure to select the class (G1 or G2) of the generator circuit-breaker.

It was noted that in some figures the wording "CO cycle" is shown. It shall be replaced by "CO operation".

JMW made the following proposal to avoid that a "too easy" temperature-rise type test is carried out taking into account all the allowed tolerances on IPB temperature values.

Tolerances for IPB temperature rise have been chosen very large (+ or - 5K) to take into account the difficulty to regulate at the same time the enclosure and the conductor of the IPB.

According to my experience, this should not be changed to allow test to be feasible.

But to take into account the spirit of a standard which is to do test in the most difficult condition, I would propose to have this most difficult condition on a mean value, so to have always a positive tolerance on this mean value (+0K +5K)

So my proposal of change in red:

In 6.5.2.101:

Table 9 – Conditions during temperature rise test

Part	Average temperature rise of the IPB at ambient air temperature not exceeding 40 °C K	
	Option 1	Option 2
IPB conductor	50	65
IPB enclosure	30	40
IPB mean value (arithmetic mean value of the 4 measurement points on IPB)	40	52.5

in Annex A:

6.5	Temperature-rise tests Test tolerances and limits shall be kept only for the last two hours of the testing period.	Ambient air velocity	--	≤ 0,5 m/s	IEC 62271-1
		Test current frequency	Rated frequency	± 2 %	
		Test current	Rated normal current	+ 2 % / 0 %	
		IPB conductor and enclosure temperatures	See Table 9	± 5 K	
		IPB mean value temperatures	See Table 9	+0K, +5K	
		Ambient air temperature <i>T</i>	--	+ 10 °C < <i>T</i> < 40 °C	

The WG reviewed the proposal and the following new proposal for Table 9 is made so that no tolerance needs to be shown in Annex A. No agreement was reached on this proposal.

Table 9 – Conditions during temperature rise test

Part	Ranges of average temperature rise of the IPB at ambient air temperature not exceeding 40 °C K	
	Option 1	Option 2
IPB conductor at position 8 on each side	45 - 55	60 - 70
IPB enclosure at position 9 on each side	25 - 35	35 - 45
Arithmetic mean value of IPB temperature rise at positions 8 and 9 on both sides	37 - 43	50 - 55

In cl. 6.102.3.1 the following text was added to take into account the influence of capacitors on the prospective TRV.

Capacitors can be installed between the step-up transformer and the generator circuit-breaker, or between the generator and the generator circuit-breaker, or at both sides, or capacitors can be part of the generator circuit-breaker assembly. In these cases the tests shall be carried out with the capacitors connected or if these capacitors are not installed during these tests the influence of the capacitors on the prospective TRV shall be taken into account and the modified TRV applied accordingly. Computer simulations may be necessary to establish the TRV affected by these capacitors.

The interrupting capability demonstrated by these tests is valid only if capacitors of the same capacitance value as used during the tests are installed according to the tested configuration.

Cl. 9 was modified so that the generator-source short-circuit breaking current is listed as one of the required characteristics of the generator circuit-breaker. The whole list in indent c) was improved.

The document IEEE P62271-37-013 D10.4 balloted in IEEE was found to be different in various parts from the IEC CD2 document 17A/1031/CD. The WG never agreed on those changes which have implemented from IEC 17A/1031/CD to IEEE P62271-37-013 D10.4. The WG decided to fix those mistakes because the version of the document circulated in IEC (i.e. document 17A/1031/CD) is the latest valid version of the document.

Only the text from D10.4 cl. 4.105.1 is partially retained. In cl. 4.105.2 the text from IEC 17A/1031/CD is slightly changed and U_r is replaced by u_c when reference to the TRV peak values in Tables 3 to 6 is made.

Next Steps and Agreed Actions:

1. Implement a 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, MP)
2. Remove references to power factor of test circuit throughout the document (MP)
3. Add IEC 62271-306 to the normative references (MP)
4. Check and implement text from IEC 62271-100 concerning cl. 6.10 (JMW)
5. Cancel cl. 6.107 and adjust references to excitation switching current throughout the text (LZ)
6. Remove units as well as the dash-dotted line from Figure 12 and make reference to Annex H (MP)
7. Add the dash-dotted line to the legend of figure H.1 (MP)
8. Correct references to wrong clause numbers throughout the document (MP)
9. Check and correct when necessary the use of "functional" and "filling" pressure throughout the document (MP)
10. Re-draw Figures 2, 3, 4 and 5 (JVdL)
11. Re-draw Figures 21 to 29 (JH)
12. Coordinate the re-drawing of Figures 2, 3, 4, 5 and 21 to 29 (BL)

13. Check if the procedure laid down in cl. 6.2.4 is sufficient for testing internal insulation (BL)
14. Check and modify when necessary the use of “pole” and “phase” throughout the document (MP)
15. Replace Figures in Annex F with those received from DD (MP)
16. Prepare a proposal for cl. 8 to explain that in real applications a different interrupting capability than tested cannot be confirmed for the generator circuit-breaker by changing the capacitance value of the wave-slowng capacitors used to mitigate the TRV (MP)
17. Check if colorful Figures are allowed for IEEE Standards (BL)

Future Meetings and Schedule:

An invitation for the next WG meeting is welcome. In case of no invitation a phone conference will be tentatively arranged.

Annex A: List of Attendees

Member/ Guest	Last name	First name	Affiliation	Attended May 1 st , 2013	Attended May 2 nd , 2013	Attended May 3 rd , 2013
Member	Bosma	Anne	ABB		√	
Member	Carmona	Gilbert	Southern California Edison	√		
Guest	Cary	Stephen	Eaton	√		
Member	Chen	Steven	CHENHOUSE N.A.	√	√	
Member	Chow	Chih	Pepco	√	√	√
Member	Dufournet	Denis	Alstom Grid	√	√	
Member	Fadat	Nicolas	Schneider Electric	√	√	√
Member	Falkingham	Leslie	Vacuum Interrupters Limited	√		
Member	Hu	Joanne	RBJ Engineering Corporation	√		
Member	Liu	Li	Eaton	√	√	
Convenor	Long	Bill	Eaton	√	√	√
Member	Oemisch	Joachim	Siemens	√	√	√
Secretary	Palazzo	Mirko	ABB	√	√	√
Member	Ricciuti	Tony	Eaton	√		
Member	Te Paske	Henk	KEMA	√	√	√
Member	Van de Ligt	Jim	CANA High Voltage Ltd.	√		
Member	Willieme	Jean-Marc	Alstom Grid	√	√	√
Member	Zehnder	Lukas	ABB	√	√	√
Guest	Flores	Sergio	Schneider Electric	√		
Guest	Starcevic	Kresimir	KEMA	√		
Guest	Reddy	S. Santosh	Powell Industries	√		
Guest	Brehm	Cody	ATC	√		
Guest	Schuetz	Carl	ATC	√		