

REPORT of
SC17A MT47/IEEE WG C37.60 for the Revision of IEC 62271-111/IEEE C37.60-2003, Automatic Circuit Recloser Standard
(Denver, Colorado, USA; September 29, 2009)

The Working Group for the revision of C37.60-2003 held its ninth meeting on September 29, 2009 in Denver, Colorado, USA between 8:00 AM and 6:00 PM.

The agenda was reviewed followed by introductions. The Chair welcomed Dr. Leslie Falkingham (UK) and Mr. Christian Heinrich (Germany) as members of the IEC MT. Attendance included 23 members of the Dual Logo Maintenance Team and 10 guests. Nine members of the DLMT were absent or excused. Refer to Annex A for attendance list.

The Chair displayed and reviewed the IEEE patent policy and guidelines for the conduct of meetings (inappropriate topics of discussion).

The report for the previous meeting held in Asheville, NC was approved as written.

Note: The PowerPoint presentation used during the meeting will be placed on the WG/MT web site for access by members.

Dual Logo Maintenance Team (DLMT) Timeline

Chairman Stone outlined the timeline for recent and pending goals for the WG/MT activities.

- A second Committee Draft (CD2) was circulated in June to the IEC National Committees for comment. Closing date is October 2, too late to be reviewed at the Denver meeting.
- A second IEEE ballot was completed in parallel on Aug 26, 2009.
- The IEC CDV ballot is due by June 2010
- The IEC FDIS and final IEEE ballot will be in 2011.

Documents available on IEEE web site

All documents from the WG are posted on the IEEE web site. The Chairman updates the list as required. Last update was on September 20, 2009. The Web address, ID and password have been given to all Working Group members.

WG/MT47 Membership

Mr. Chris Lettow, S&C Electric has joined the IEEE Working Group.

Status of Comments prior to Denver meeting

The open comments have been reduced to about 18 topics, the cutout recloser topic accounting for the majority. At the start of the meeting the comment resolution status was as given in the following table (approximate numbers)

Type	Preliminary Resolved	Open
Editorial	94	4
General	7	3
Technical	139	51
Total	240	58

Significant Changes to the WG Draft

The latest Working Group draft was circulated to the WG before the meeting and is available on the WG web site under file: “17A_MT47_Stone29_PC37.60D07a_090920.pdf.”

Attachment B lists the significant changes made to the draft following the preliminary disposition of comments from the 2nd IEEE ballot. Each item was reviewed briefly with little discussion.

The Chairman asked that the comment resolutions marked as “Agree”, “Disagree” or “Principle” in the Compilation of Comments (CoC) dated 09/09/20,

(file 17A_MT47_Stone28_Comments_WG_Copy090920.xls on the Web site),

as well as the draft changes noted in Annex B of this report be accepted by the Working Group/Maintenance Team **by acclamation**. Any WG/MT member who objects to any of the above should provide the Chairman with a note by November 15, 2009.

Note: Comments numbers 40, 89, 90, 105 and 118 have been reclassified to “Open” at the request of a WG member

Review of Comments

The open topics as shown in Attachment C were then discussed in some detail. In some cases there was sufficient disagreement among the members that the issue was left unresolved. The results of the WG discussions are summarized below:

1. Distinction of Equipment: Some members felt that there was no need to make a distinction between the cutout mounted recloser and the “traditional” recloser. Others strongly disagree pointing out the significant differences in construction, operating procedures and rating/test requirements between the two. At the previous meeting, the WG voted that the distinction and ratings/test requirements should be made clear in the standard.

Chairman will review this point and attempt to make the distinction clear and understandable.

2. Separate standard: The WG voted at its previous meeting that the cutout mounted recloser should be added to C37.60. However, there were two comments from the ballot group stating that a separate standard was called for. Throughout the course of the day-long meeting, this theme came up several times. The question remains on the table, because of the two negative IEEE comments received and the opinion of at least one IEC Expert that the dependent manual operation required by the cutout mounted device will be unacceptable in some countries for safety reasons.

3. Load vs. Critical Current tests: Several members were concerned that the critical current tests were uncalled for. Some labs that can perform mainly active load switching tests cannot perform the critical current tests. Most technologies in use today do not have a critical current problem and those that do can be detected with the load switching test. One suggestion was to allow critical current tests as an alternative to load switching.

The WG decided to return to the load switching test requirement and delete the critical current test.

4. Cutout mounted reclosers - Dielectric testing: There was lengthy discussion regarding the special treatment of the cutout device with respect to dielectric tests. It was pointed out that the withstand ratings are derived (in part) from the fuse mounting. One implication is that the dielectric ratings cannot be stated on the cutout device nameplate.

There was no satisfactory resolution to this issue.

5. Cutout mounted recloser - Fault close capability: There was considerable discussion. It was agreed that fault closing was a valid requirement and that the “condition after test” must be defined. Test labs have a concern about how to safely conduct the test. IEC standards for cutout devices do not include fault close requirements. This was felt to be another argument for a separate standard.

6. Cutout mounted recloser - Mechanical Life Test: A cutout mounted recloser has two mechanical parts, the interrupting gap (vacuum interrupter) and the isolation or lockout gap (dropped out position). It was agreed that the mechanical endurance test should include the entire system (including control) as is the case with the traditional recloser. The test will be redefined to require operations to lockout with and O - CO - drop out counting for two operations for a cutout mounted recloser and an O-CO-CO-CO counting as 4 operations for a traditional recloser capable of a 4 shot to lockout sequence. It was also agreed that the 2000 operation requirement for a traditional recloser might not be appropriate for a cutout mounted device.

Chris Lettow (S & C) agreed to propose a number for this rating.

It was also agreed that the “condition after test” applies to the cutout device. The standard needs to be modified to reflect that both the interrupter gap (vacuum) and the isolation gap must be tested for dielectric integrity after the mechanical life test.

7. First-Pole-to-Clear Factor ($k_{pp} = 1.3$ vs. 1.5): Several IEEE ballot comments challenged the justification for this added (optional) test. Antone Bonner presented the results of a study that suggested that the differences between the two values of k_{pp} were small. Discussion pointed out that most systems in the US are, in fact, effectively grounded for which a k_{pp} of 1.3 might be appropriate. However, the general opinion was that several decades of service experience did not show that there was a problem using the k_{pp} factor of 1.5 (ungrounded) as is specified in the circuit breaker standards for distribution voltage class equipment.

The WG agreed that use of $k_{pp}=1.5$ should be retained and that the extra (optional) test for a k_{pp} of 1.3 should be removed from the draft.

8. TRV Application - Tables 5 & 12: A lengthy discussion considered Table 12 and an alternate submitted by WG members that removed the distinction between the cutout mounted and traditional reclosers. The basic issue is the same as noted in issue #1 above.

It was apparent that the WG was divided on this question and no acceptable option was available. The question remains open.

9. Partial Discharge Tests - test limits: In the weeks prior to the meeting, a suggestion was made to remove the design (type) test requirement for partial discharge testing. A poll of the WG members arrived at the recommendation to retain the design (type) test requirement but to supplement it with a requirement that the manufacture state an upper limit for the design when submitting it for certification tests. This upper limit would be reported in the certified test report along with the actual test values of the test sample(s). It was felt that this would provide the users with a more useful benchmark for their evaluation.

A suggestion was also made that the manufacturers might pool a sample of their actual test results for a statistical analysis. To accomplish this, an independent third party would be needed to gather the data, render it anonymous with regard to manufacture, and provide the statistical analysis. Five manufacturers present agreed to participate in this effort. Chairman Stone agreed to see if a suitable third party could be found.

Mietek Glinkowski (ABB) presented the results of some research that concluded that partial discharge testing was not a conclusive predictor of the life of an epoxy encapsulated interrupter. The stress level on the epoxy was more indicative than the partial discharge level.

10. Temperature rise of Auxiliary Equipment: This requirement came out of the adoption of the Common Requirements Standard C37.100.1/ IEC 62271-1. The WG agree that this requirement should not be added to C37.60.

11. Cable and Line charging test circuits: Comments suggested that C37.60 refer to IEEE 1247 and IEC 62271-103 for the test circuit, methods and procedures for these two tests. A review of these two standards shows that they have so many differences that to render the references “technically equivalent” would require so many “additions” and “modifications” that it would be clearer to simply pull the specifications into the standard. This is the approach taken in the last draft. However, it was agreed that certain parameters were missing including specifications for testing single phase reclosers. These omissions will be addressed.

12. Test circuit for Standard Operating duty: Figure 4 does not include a circuit for testing single phase reclosers. This is being addressed by the Chairman.

13. TRV Documentation: A comment was made that the certified test report should include an oscillogram of the inherent TRV attained for the Standard Operating Duty in view of the fact that most labs cannot reach the specified T_2 value. The WG agreed to this change.

14. Interrupting performance requirements: The requirement that the first operation in every sequence be fully offset for maximum asymmetry will be changed to require that at least 25% of the operating sequences be fully offset and the balance be random. This change recognizes that the cutout mounted recloser has a two shot sequence while the traditional recloser has a 4 shot sequence.

15. Ice testing: The rating is as specified in C37.100.1 at 1mm. Designs where all external moving parts are shielded would be exempt from the test.

16. Simulated surge arrester operation test: Discussion about the reason for changes - the test has not changed, only the placement of the measuring current transformer to properly reflect the surge current through the recloser ground connection. Changes in parameters reflect this new location.

Discussion regarding the value of the peak current and rate-of-rise: the di/dt is the most important parameter. Peak current, while it may not reflect the majority of actual lightning surges, is less important.

17. TCC test point @ 80% of rated interrupting current: Comments considered this requirement as unrealistic as a production test. There was not enough time for an adequate discussion of this issue, the Chairman agrees and will draft a proposal for the WG to consider for the next draft. The background of this requirement goes back to early designs that used series trip and had interrupting ratings well below 10 kA. Current shunt trip designs and ratings of 12.5 kA and 16 kA make this requirement both unnecessary and unrealistic.

18. Test tolerances Annex E: Time ran out before this topic could be discussed. However, most of the comments have been addressed outside the meeting and will be noted in the Compilation of Comments and included in the next draft.

The meeting adjourned at 6:00 PM.

David T. Stone
Working Group Chairperson, C37.60 and
Convenor for IEC MT47
Reclosers and Other Distribution Switchgear Subcommittee
October 6, 2009

Annex A: Attendance
IEC MT47/IEEE C37.60 Working Group Meeting Sept. 29, 2009

X = present at meeting

Role	First Name	Last Name	Company	Country	9/29/2009
Co-Chair	Robert	Behl	ABB	USA	X
Chair	David	Stone	DTS Technical Services	USA	X
Member	Chris	Ambrose	Florida Power & Light Company	USA	X
Member	Herman	Bannink	KEMA Netherlands	Netherlands	excused
Member	Jerry	Baskin	Federal Pacific	USA	X
Member	Craig	Befus	BC Hydro	Canada	X
Member	Antone	Bonner	Cooper Power Systems	USA	X
Member	Glenn	Borchardt	S&C Electric	USA	excused
Member	Raymond	Capra	Consultant	USA	X
Member	Frank	DeCesaro	Cooper Power Systems	USA	X
Member	Randall	Dotson	Lakeland Electric, City of Lakeland, FL	USA	X
Member	Michael	Ennis	S&C Electric Company	USA	excused
Member	Leslie	Falkingham	Vacuum Interrupters Limited	UK	X
Member	Lawrence	Farr	Eaton Electrical	USA	X
Member	Marcel	Fortin	Hydro-Quebec Distribution	Canada	excused
Member	Jeffrey	Gieger	Thomas & Betts	USA	excused
Member	Peter	Glaesman	Reuel, Inc.	USA	X
Member	Christian	Heinrich	Siemens	Germany	X
Member	Harold	Hirz	Thomas and Betts	USA	X
Member	Edward	Jankowich	Thomas & Betts	USA	X
Member	Chris	Lettow	S&C Electric Company	USA	X
Member	Steven	Meiners	GE	China	X
Member	Donald	Parker	Alabama Power Company	USA	X
Member	Timothy	Royster	Dominion Virginia Power	USA	excused
Member	R. Kirkland	Smith	Eaton Corporation	USA	X
Member	Francois	Soulard	Hydro-Quebec	Canada	X
Member	James	Swank	Cooper Power Systems	USA	X
Member	Nenad	Uzelac	G&W Electric	USA	X
Member	Walt	Von Miller	Delta Technology Consulting, Inc.	USA	absent
Member	Jan	Zawadzki	Powertech	Canada	X
Member	Anthony	Headley		UK	excused
Member	Zhengli	Kou		China	absent
Guest	Bob	Brown	Hubbell Power Systems	USA	X
Guest	Larry	Davis	Reuel Inc	USA	X
Guest	Edgar	Dullni	ABB	Germany	X
Guest	Mark	Feltis	Schweitzer Engineering Labs	USA	X
Guest	Mietek	Glinkowski	ABB	USA	X
Guest	Robert	Jeanjean	Consultant	France	X
Guest	Michael	LaBianco	G&W Electric Company	USA	X
Guest	Paul	Leufkeus	KEMA Powertest	USA	X
Guest	Donald	Martin	G&W Electric Co.	USA	X
Guest	Tim	Taylor	Thomas & Betts	USA	X

Annex B:
Significant Changes in Current Draft Resulting
from IEEE 2nd Ballot

Clause	Subject	Question or Comment
1.2	Dated References	➤ Three standards changed to dated because of specific references to a figure or because they contain test values/requirements
3.5	Dependent manual operation	➤ Definition added for clarity. It is already defined in C37.100
4 Table 1	Open position gap testing	➤ Table 1 note c added to cover potential situations where cutout mounted device might end up with closed isolation gap but open interrupting gap.
4.4 and Table 3	Temperature rise table	➤ Added all the “points” from C37.100.1 for clarity
4.4 and Table 3	Temperature rise table, line 8	➤ Changed allowable total temp/temp rise for “metal or insulation in contact with oil” from 90/50 to 100/60. This is now harmonized with C37.100.1 and IEC 62271-1
4.101 & 6.106	Tolerance on minimum trip current	➤ Was $\pm 10\%$; changed to greater of $\pm 10\%$ or $\pm 3A$. Reason: at low pick-up currents the excitation current of a CT can approach 2A.
4.104 Table 12	Standard operating duty and half life of contacts	➤ Change note 1 so that it does not apply to cutout mounted reclosers.
4.105	Operating sequence-dead times	➤ Changed maximum dead time capability from 0.33 s to 2.0 s.
6.4.1	Resistance of main circuit	➤ Added tolerance range and flexibility for DC current in test.
6.5.2	Temp rise test setup	➤ Allowed alternate to IEC method. This alternate has been part of std for decades.
6.101.10.2	Cable/line charging tests - restrikes	➤ Clarifies case for multiple restrikes in one operation. Wording needs work
6.111	Ice breaking tests	➤ Equipment with no exposed (unshielded) moving parts exempted

Annex C:

Discussion Issues - C37.60/D7a

Issue #	Comment #'s	Issue Description
1	16, 218	Distinction of equipment - Cutout mounted & "traditional" reclosers
2	17, 18, 19	Separate standard for cutout mounted recloser
3	32, 39, 44, 207, 209, 210	Load vs critical current
4	142, 144, 247	Cutout dielectrics (including non-reclose)
5	179, 182	Cutout fault close capability
6	217,	Cutout mechanical endurance requirements
7	71, 72, 76, 77, 203, 205	1st pole-to-clear factor & effectively grounded systems
8	73, 80, 83, 85	Table 5 TRV application
9	150, 213	Partial Discharge test limits
10	161, 162	Temp rise Aux equip
11	166, 170, 171, 175	Cable & line charging test circuits
12	191, 192, 193, 194	Test Circuit Operating duty
13	195,	TRV documentation - Oscillogram
14	196, 199	Interrupting performance requirements - Asymmetrical closing
15	219, 230, 232, 235, 237, 238	Ice testing
16	240, 241, 243, 266	Simulate surge arrester operation test
17	252,	TCC test points @ 80% of rated interrupting current
18	278, 279, 282	Test tolerances - Annex E