RODE C37.60 Reclosers Working Group
Meeting Minutes
April 2-3, 2024 – Fort Lauderdale – IEEE PES Spring meeting

Chair: Ian Rokser
Secretary: Federico Di Michele

Meeting Minutes

1. Call to Order

The meeting will be called to order.
Meeting started at 1:01 pm on Tuesday April 2, 2024. Four sessions were held on April 2 and 3.
The chair reminded the group this is a dual logo standard.

2. Call for Patents/Copyrights

IEEE Patent and Copyright slides will be shown.
Chair presented the IEEE slides about IEEE's patents and copyright policy.

3. Introduction of Members/Guests

Self-introductions with affiliations.
Members and guests presented their selves according to rules below:

- Members and guests from the IEEE shall announce name, affiliation, and location.
- Experts from the IEC shall announce name, country, and the standards body being represented.
- Those who are both IEEE members and IEC experts should announce themselves as IEC experts.

4. Review of minutes of last meeting

February 28 2024, Virtual meeting.
The chair presented the minutes of the last meeting. The chair informed the group there are 3 in person meetings per year. 2 are at IEEE. 1 is in Europe. There is generally one virtual meeting in between each of these meetings.

There were no comments on any edits to the minutes. The minutes were approved.

5. Current status & project plan

Updating regarding activities status and future steps.
Review of project status within IEEE and IEC.

The chair presented the agenda for the current meeting. One addendum to the agenda was added. This is index item 88.
The chair presented the project status and timeline. The standard is due at 2027 for IEEE and 2028 for IEC. The plan is to get this complete by 2027. The work up to this point was largely deciding scope. Now, the effort will go mostly into the work that needs to be done. The plan is to circulate and informal ballot within the next 4 months. This will be done before the Fall IEEE meeting.

A question was asked if the internal ballot is just members or could it include guests. There was no disagreement to also include guests.

6. Draft development

Indexes refer to "Reclosers_DLMT_Changes_Considered_pre_ballot_R4.xlsx"

a. Review of work list

All topics that will be considered have an index that is logged in the "Changes Considered" document in iMeetCentral. This includes all work and who is assigned to each item. This file was also sent out over email as a PDF.

The chair presented 7 topics titled "Confirm with DLMT". These are index items 19, 40, 42, 85, 32, 60, and 71. The intention of presenting these items is to confirm these items can be confirmed as is. The chair asked if anyone had concerns accepting these as is. There were no comments from the DLMT. These changes are approved.

b. Ad hoc reports

- 5: BIL: 25-shot limit

The ad-hoc presented new verbiage. The chair proposed to keep the verbiage as written by the ad-hoc and carry this into the ballot. Stephan Micic presented this language to the DLMT. A proposal was made to change the Annex from a recommended example to just an example without the word "recommended". The chair eliminated the word "recommended" from the draft in the meeting. A proposal was to make the statement "NOTE: External devices, such as current limiting…" into an informative reference in the main body of the text that is not a note. Also, change the word "could" to "may". The chair made this change in the meeting. A member proposed changing the wording of this sentence to make it grammatically correct. The chair agreed to make this grammatical change offline. The DLMT otherwise accepted the proposed verbiage.

In addition, a proposal was made to change the text in the sentence "voltage level of preliminary impulse, defined as a percentage of the switchgear rated impulse voltage level". It was proposed to delete the text defining the voltage level as a percentage. Ian changed this text in the meeting. The DLMT accepted this changed wording.

- 14: Recloser sequence for TCC

Chris Hastreiter presented slides that were created by the ad-hoc. This issue is a leftover ballot comment from the 2018 version of the standard. The comment is to ensure that a recloser's TCC should be identical for both a O and CO operation. Currently, the standard only requires manufacturers to test TCCs in O, but not for CO operations. The ad hoc discussed whether a TCC should be identical for both a O and a CO operation. If this is relevant, do we implement a test? The ad-hoc decided to bring this discussion to the WG today to understand from users if they care if TCCs match for a O and a CO operation. Chris presented this question to the group. It was noted in the meeting that TCC will definitely be different for O and CO. Chris noted that this difference becomes more important for shorter TCCs. There could be a situation where the unit is ready to trip again before the contacts are closed from the last operation. The ad hoc had several manufacturers in the group, and none of them heard about complaints about this. No users in the group expressed concerns about differences in TCCs between O and CO. One user noted they care most about O. There are not many users in the room. So, the chair proposed a questionnaire gets drafted and circulated to all users in the DLMT. Sergey Rogozhkin volunteered to draft a questionnaire that Chair will circulate to the users in the working group. Chris Hastreiter and Mark Feltis will assist too. One user noted that this will impact coordination with other OCP devices. The chair stated that the ad hoc and the DLMT have not yet heard reasons why users care about CO TCCs. DLMT Chair or Secretary will circulate the questionnaire to the users once ready.

- 16: SSAO

Frank De Cesaro confirmed no progress. He volunteered to lead this ad-hoc.

- 24: 50/60Hz procedure

Harm Bannink presented slides prepared by the ad hoc. Section 7.1.101.4 is discussed. Note 1 makes a reference for "most" vacuum interrupters. The STL guide requires T100 tests at both 50 and 60 Hz. 50 Hz is more severe than 60 Hz because of longer arcing times. So, 50 Hz will cover 60 Hz, but not the other way around. Table 7 in IEC 62271-103 shows what is applicable to the other frequency for tests performed at either 50 or 60 Hz. This was used as a basis for incorporating a similar table into C37.60. Harm presented a similar table for inclusion in C37.60. A member commented that recloser arcing times are not as controllable, although the table only applies for 1 phase tests since arc times are typically longer. Another member mentioned that the difference in arcing time between 50 and 60 Hz is very low, and likely small enough to ignore. The agreement from the group was to accept the table as proposed but change the text to "Yes" for T100 shots performed at 60 Hz and also valid for 50 Hz. This would ignore the minor difference in arcing time from 50 to 60 Hz. The agreement was also to add a note stating that arcing times were considered and decided the differences can be ignored. Harm Bannink volunteered to create this note and extend the proposed table to other tests.

- 35: Simultaneity of poles

David Dart presented slides created by the ad hoc. The proposal is to add some language around pole simultaneity. The proposal also includes design testing requirements if simultaneity is required. One point of discussion was whether this needs to be tested using a T100 shot vs a no load. Several individuals voiced that no load conditions are sufficient for this. The design test requirement proposal was accepted other than changing from T100 to no load to test for simultaneity. Routine testing requirements were also proposed. This new requirement states that the test should be performed if agreed upon between manufacturer and user. The group decided that the language in 8.103 could be clarified better to clarify the intent. The ad hoc will continue to meet to clarify these points.

- 49: Manual operating lever

Mark Feltis presented updated verbiage for the manual lever or "yellow handle". New verbiage was presented that requires the manufacturer to describe what exactly the manual operating lever does, including what it does to the state of the contacts and other operations of the recloser. This new information is all a "shall". A member proposed this should be generalized and changed from manual operating lever to manual operating mechanism. The chair stated the proposed language meets the intent, which is to describe the user interface, which is the lever. Different terms were proposed including handle, lever, and provision. Another proposal was the term "bypass", which is likely a dated term that is still used today, but less often. It was noted that C37.63 also states operating lever. It was also noted that reclosers exist that don't have a lever but have other devices that meet the intent. A member stated the term "handle" was already used in C37.60 for the same application. The chair changed the word "lever" to "handle" in the draft. It was further noted that this is not intended to impose a new requirement on devices but put the burden on manufacturers to clearly state what their device does. It was also noted that all manufacturers in the ad-hoc were in favor of this new requirement. The DLMT agreed to reword the last two sentences of the new text to clarify the differences between main and auxiliary contacts. The chair changed this wording in the meeting. The intent of the revised wording is to capture the main contacts of the recloser, and any other contacts associated with the manual handle. DLMT could agree on this intent, but not the specific words. The chair will continue to refine this wording and continue the discussion on wording over email and other correspondence. An expert stated that in IEC, "should", "shall", and "may" cannot be used in a note. The chair will change the note to eliminate these words.

- 54-55: Extension of type test results (Now index item 87)

These two items were combined and changed to item 87. Karla Trost presented the work from this ad-hoc. 54 was previously for the controls, and 55 was previously for the recloser. They were combined in the January meeting due to both following similar paths. This new proposal is for clause 9. The new requirement is a "shall" with some guidance. The intent of the guidance is what needs to be retested on the recloser, control, or package if a design change to a recloser or control is made to one, but not the other. Karla presented a table

created by the ad-hoc showing recommended tests or calculations depending on what part of the recloser or control are changed.
A question was asked if a table is normative or informative. Karla stated they are typically normative, but the title includes “may”. The style guide will need to be consulted and the table might need to be an annex.
Karla asked if the general direction the ad-hoc took (created a table with recommendations) was the right approach. There were no disagreements with general direction.
Some actions that need to be done by the ad hoc:

- Clean up some of the specific verbiage.
- Decide if the table normative or informative. If informative, it must be moved to an annex.
- Need to consider 7.101 and how this is related.
- Create an example of tests to be performed and put them in an annex.

The chair stated that these changes will be made and circulated around before ballot. A question was asked about whether field repairs are considered. Karla stated this was not considered. It was only focused on new equipment.

- 62: Line & cable charging updates

There was an ad-hoc on this. The chair does not believe the ad-hoc has met. There was discussion in Milan. The members of the ad-hoc confirmed they have not met. Marcos Botelho volunteered to lead this group.

- 64: Post-test criteria

This is an ad hoc that originated in the last in person meeting in Milan. The ad-hoc has not met yet. David Beseda volunteered to lead this ad hoc and schedule some discussions. Stefan Micic asked to be added to this ad hoc.

- 66: Removal of references to IEEE C37.301 for partial discharge

Kennedy Darko presented slides in the meeting. C37.301 has been withdrawn. C37.60 needs a different standard to reference. Kennedy found IEC 60270-2000 is under revision and will be released in October 2024. This is a near copy of C37.301. There are still some relevant annexes in C37.301. The recommendation is to:

- Remove references to C37.301
- Change them to IEC 60270
- Pull relevant annexes from C37.301 and include them in C37.60.
- Change 7.106.4 to include a number for a ramp rate and decrease for voltage instead of stating “gradual”.
- Improve some of the wording

A member mentioned an issue with Annex J and wanted to make sure there wasn’t a copyright issue bringing this info into C37.60.

Different test sets have different ways of ramping voltage. The ramp rate can affect the test. Marcos Botelho volunteered to come up with a proposal for ramp rate. Kennedy Darko volunteered to lead an ad-hoc group to update some of the wording. Stefan Micic, Mohit Chhabra, Marcos Botelho, and Harm Bannink will assist Kennedy.

The DLMT agreed that this general approach is good. There's still some specific wordsmithing that needs to be done.

- 70: Updated verbiage for kpp = 1.5 and kpp = 1.3

An ad-hoc was formed in Milan to write the verbiage. The ad-hoc hasn't met yet. Pedro Castillo volunteered to lead this group.

- 82: DC test voltages vs. VLF

An ad hoc was formed, but no work has been performed yet by the group. Based on the previous discussion in the last virtual meeting, the decision was to not eliminate DC test. This was based on input from users. The reason this discussion came up was understanding what impact 72 kV will have on table 3. Should the DC column get extended to 72 kV or should it get eliminated? Based on user feedback, this cannot get eliminated. A proposal was made to add another column to table 3 for VLF. The VLF test would get extended to 72 kV, but don't extend DC beyond 38 kV. A member also proposed harmonizing with C37.74. Harm Bannink volunteered for this assignment. Ganesh Balasubramanian will assist with this.

- 83: Updating of TRV tables

No work done on this yet. Ganesh Balasubramanian volunteered to join this team.

c. Individual assignment reports

- 10: Table 11 updates.

Harm Bannink presented some slides. X/R is a very difficult thing to achieve in the lab. The X/R values in table 10 seem to be very low (about 10% of what it is in other standards). There is some verbiage in 7.103.2 that states the values are low due to limitations of labs. With the low X/R, we're never seeing TRVs that are intended. Table 11 will not be updated at this time. This item is closed.

Action: The TRV ad-hoc committee should review the impact of this on TRVs.

- 12: Low current tests – final decision.

Harm Bannink explained that this has been changed a few times over the last few decades. Harm has proposed going back to a previous version. Chair stated there were "must satisfy" comments when that change was made. So, there are concerns with just going back to previous text. Harm presented slides in the meeting with a revised proposal:

- Remove T5 and T10 as required. T5 and T10 are only applicable if there is critical current. This would revert back to the 2007 standard.
- Also introduce load switching as an option. (See IEEE C37.09 4.9.1).
- Remove Item a) under 4.9.1.

There were no disagreements to this proposal from the DLMT. Chair will include this in the draft.

- 39: Updates to 6.4.1 for line-powered devices.

Karla Trost presented slides created by the ad hoc. The proposal is to split 6.4.1 into several different subcategories. The language for this proposal was worked on in the ad-hoc group and the previous virtual WG meeting. A question was asked about how to incorporate an auxiliary battery device plugged into the unit for basic testing or troubleshooting tasks. This needs to be explored. 6.4.1.4 – The group agreed to delete a portion of the last sentence and end the sentence at the word "status". Another proposal was to change "auxiliary power supply" to something clearer such as "user supplied power" or "external power source". It was also suggested to change "line powered recloser" to "self-powered recloser". The ad hoc will meet once more to resolve these points. Also David Dart volunteered to add a note to index 84 for voltage powered devices.

- 44: Updating of withdrawn IEEE C37.06 references.

No work has been done. Kirk Smith will complete this work after the meeting.

- 45: References to IEEE C37.41:2016.

Chair will follow up with Caryn Riley to see what work has been completed.

- 67: C1/C0 ratio tolerance.

Harm Bannink presented slides created by the ad-hoc. There is no tolerance mentioned for C1/C0 in Table 10. STL guide has a tolerance of +/- 20%. In C37.62, there is +10% tolerance for line charging and -10% tolerance for cable charging. 10% vs 20% doesn't make much of a difference on recovery voltage. The proposal is to implement a tolerance of +/- 10% for both cable charging and line charging. A member agreed with the tolerance, but stated we'll have to be careful that it doesn't violate the current tolerance already in the standard. The DLMT didn't think this is an issue. Harm Bannink will check with calculations if this is an issue. If this checks out, this proposed tolerance will get included in the draft.

- 69: Vacuum in SF6 post-test requirement.

This proposal came from Harm Bannink. He presented some revised verbiage for section 7.112.2. It pertains to vacuum interrupters in SF6 equipment. It's possible the VI could get broken, filled with SF6, and still pass hi pot. The proposal is an additional test to confirm the integrity of the vacuum bottle. This additional requirement was already in the standard, but just a few changes. DLMT agreed to keep Harm's verbiage. The chair will

implement the proposed verbiage. Sergey Rogozhkin volunteered to further improve this section but keep the changes Harm created.

- 75: Referencing IEEE C37.68-2023.

This is a proposal to add normative references to IEEE C37.68. This was a topic of discussion at the last meeting in Milan. IEC gives guidance on when to refer to other standards. The decision was not to include a reference to C37.68. Instead, there are 3 informative references added to C37.60 that states "In some jurisdictions and when specified by the user, conformance to clause 6 of IEEE C37.68 may be required". The intention of doing this is that C37.68 will take hold in the market and users will specify it. A member stated agreement for including these informative references. She further clarified that IEEE requires calling out a specific year if referencing a specific clause in another standard.

- 84: Adaptation of SSAO test for ungrounded reclosers.

David Dart presented slides created by the ad hoc. There is currently a requirement for a test for grounded devices, but not for ungrounded devices. David presented a new schematic that will work for both grounded and ungrounded devices. This also considers cutout mounted devices. The proposal is only for 1 phase devices, but it could be easily adapted in the future to 3 phase devices if these become available. A member mentioned that we need to specify the distance from the recloser to the rod gap. 15 cm was recommended as a proposal. It was noted that this distance is inherent in the design of the device if it's mounted in a fuse cutout, but there are other mounting methods that exist. Another member mentioned that the schematic proposed was not realistic because likely no users are running a ground lead from an arrester in the way it is shown here. Others expressed concerns about where and how the ground was applied in the proposed schematic. A proposal was made to include a note that the figure applies to devices that have an integrated control. The chair proposed that this change gets included in the draft. No concerns were made. David Dart has to make a few changes based on the discussion.

- 86: References to IEC 60255-26:2023.

A document was presented that was prepared by Sergey Rogozhkin. There are 6 references to IEC60255-26, which is now outdated. Sergey's document presents each time this standard is referenced. One proposal is to remove the year since there are no references to specific clauses. It was called out as a risk because the other standard can still change. Another risk was stated because specific items were called out in IEC60255-26 within the table in 7.111.1 but not the specific clause. For this reason, a proposal was made that we keep the dated reference. There were no disagreements to this proposal. So, the dated reference will be included moving forward.

- 88: Verification of short-circuit breaking current

This item was added to the agenda in the 4/2/24 IEEE meeting. This is section 7.103.3. The proposal was to implement a Kpp prime value for the second pole to clear. The chair suggested to bring this discussion offline. Harm Bannink and David Dart agreed to work on this offline.

- 68: Thermal runaway

This is section 7.113 in the standard. The current verbiage requires the temperature to stabilize, but no limits. Ian proposed adding a sentence: "The manufacturer shall define the limits of observable temperature rise". David Beseda stated the intent is that we don't want the temperature to stabilize due to breakdown of the device. Another way to address this is to add a requirement to ensure the device can still handle is carrying current. Chair proposed new wording in the meeting with assistance from David Beseda. The intent of this new wording was to ensure the temperature rise stabilizes while still carrying current. A member proposed that there should be some limit to the ultimate temperature. It may not be a specified number in the standard but specified by the manufacturer. The intent of this is to ensure the insulation system wasn't damaged. Ian proposed that we include a clause that the manufacturer should specify the temperature limit of the insulation rather than referring to the temperature limit table in the standard. If the table is referenced, then the thermal runaway test is just another continuous current test and not meeting the intend of the thermal runaway test. Another proposal is that we reference the table stating that the insulation class limits apply, but the other temperature limits do not. The two options discussed are:

1. Let the manufacturer define the limit of temperature rise.
2. Reference the temperature rise table, but specify that only the limits of insulation apply.

Chair presented revised verbiage in the meeting that incorporates option 1 above. The group could not agree on the language. Chair proposed an ad hoc should be formed to discuss. The following individuals volunteered for this ad hoc: Sergey Rogozhkin, Hall Sigmon, Dave Beseda, Kennedy Darko, Chris Ekpoudom, Victor Savulyak, Ganesh Balasubramanian. Victor volunteered to lead.

d. Confirmation of changes made to draft since Jan '24 meeting

The chair presented the open ad hocs and who is the leader of each. The notes from this meeting will go to the secretary. He will create tasks in imeetcentral for all the open items. The chair mentioned that the change in the upper voltage limit needs to get cleared by the IEC subcommittee, SC17A. The action is to submit a questionnaire that will get circulated to SC17A. The national committees will vote on whether to proceed with the scope change.

An internal ballot is planned for mid-August 2024. Sooner is desirable but will conflict with many vacations.

7. Next steps/ meeting(s):

Face-to-face meeting – IEEE PES Fall (October 2024). This meeting is in Oklahoma City, OK. Virtual meeting to be scheduled around July 2024. The plan is to schedule this for mid-May prior to vacation season starting. The intention of this meeting is to follow up on open items from this meeting. There is also intention to have one more virtual meeting after this but before the Fall IEEE in person meeting.

8. Adjournment

The chair asked if any anyone has additional comments. No comments were made. The meeting was adjourned at 11:48 am on Wednesday April 3.

LIST OF ATTENDEES

Status	Last name	First name	Affiliation	Attended April 2nd-3rd 2024 - Spring meeting
Convenor	Rokser	Ian	Eaton - IEC USA	X
Secretary	Di Michele	Federico	CESI - IEC Italy	A
IEC Member	Bannink	Harm	G&W - IEC Netherlands	X
IEC Member	Botelho	Marcos	Siemens - IEC Germany	X
IEC Member	Dart	David	Noja Power - IEC Australia	X
IEC Member	Falkingham	Leslie	Representing VIL and S&C - IEC United Kingdom	
IEC Member	Kerr	Blair	G&W - IEC USA	X
IEC Member	Ptushko	Sergey	IEC Russia	
IEC Member	Kou	Zhengli	IEC China	
IEC Member	Manavar	Suresh	IEC United Kingdom	
IEC Member	Micic	Stefan	G&W - IEC USA	X
IEC Member	Rogozhkin	Sergey	Tavrida - IEC Russia	X
Member	Bush	Kelsey	ABB	X
Member	Hirz	Harry	VESCO	X
Member	Darko	Kennedy	G&W	X
Member	Feltis	Mark	Schweitzer Eng	X
Member	Kapitula	John	ABB	X
Member	Li	Eric (Qian)	Powertech Labs	X
Member	Neujahr	Jonathan	Eaton	X
Member	Olivares	Roberto	Siemens	X
Member	Riley	Caryn	NEETRAC	X
Member	Slattery	Christopher	First Energy	
Member	Trost	Karla	G&W	X
Member	Zhou	Xin	Eaton	
Member	Balasubramanian	Ganesh K	Eaton	X
Member	Beseda	David	S&C	X
Member	Ekpoudom	Chris	Southern States	X
Member	Stemmerich	Joe	Trayer Engineering Corporation	X

Member	Herring	Ricky	Siemens	
Member	Castillo	Pedro	ABB	X
Member	Marshall	Cody	Schweitzer Engineering Laboratories	X
Member	Sigmon	Hall	Siemens	X
Member	Hastreiter	Chris	Eaton	X
Member	Chhabra	Mohit	S&C Electric	X
Member	Kirkpatrick	Brendan	SCE	
Member	Dhawan	Anil	Allegis Groups	A
Member	McKinney	Kenneth	UL solutions	X
Member	Busilan	Dan	Dominion Energy	X
Member	Found	Paul	BC Hydro	A
Member	Agliata	Peter	S&C Electric	X
Member	DeCesaro	Frank	DeCesaro Consulting Solutions	X
Guest	Kirienko	Vladimir	Tavrida Electric	X
Guest	Hatfield	Ben	Trayer Engineering Corporation	X
Guest	Shocket	Abe	ABB	X
Guest	Yin	Connie	G&W Canada	X
Guest	Smith	Kirk	Retired	X
Guest	Lovins	Colby	Federal Pacific	X
Guest	Lee	Yong Woo	KERI	X
Guest	Almeida	Edwin	Southern California Edison	X
Guest	Fernandes	Andrew	Trayer Engineering Corporation	X
Guest	Martz	Jaden	S&C	X
Guest	Bhrugen	Amin	S&C	X
Guest	Antantis	Michelle	Duquesne Light Company	X
Guest	Soulard	Francois	Hydro-Quebec	X
Guest	Buel	Tanner	S&C	X
Guest	Avila	Jesus	ABB	X
Guest	Sax	Benjamin	Nashville Electric Service	X
Guest	Hinshaw	Robert	Hubbell	X
Guest	Bronsveld	Arjan	Hitachi Energy Sweden	X
Guest	Kim	Yun Seong	KERI	X
Guest	Grdina	Todd	Siemens	X
Guest	Kandel	Jackie	Powell Industries	X
Guest	Lee	Michael	PG&E	X
Guest	Paul	Barnhart	UL solutions	X
Guest	Borck	Chris	Eaton	X
Guest	Miranda Garcia	Sergio	ABB	X
Guest	Pruitt	Al	Durham	X
Guest	Cochran	Alex	G&W	X
Guest	Savulyak	Victor	KEMA Labs	X