

IEEE/PES TRANSFORMERS COMMITTEE

Performance Characteristics Subcommittee

**IEEE Standard Requirements, Terminology, and Test Code for
Shunt Reactors Rated Over 500 kVA C57.21**

**Jacksonville, FL
Hyatt Regency Jacksonville Riverfront Hotel
Tuesday October 16, 2018**

The working group met in the Grand Ballroom 2 & 3 (2) of the Hyatt Regency Jacksonville Riverfront Hotel on Tuesday October 16, 2018, at 9:30 AM.

The meeting was called to order at 9:30 AM by the Chairman Sanjib Som.

There were a total of 52 participants: 12 Members and 40 Guests out of which 7 Guests requested membership.

- The meeting was opened with the Chairman remarks and the circulation of attendance rosters.
- 12 of the current 16 WG Members were present and quorum to carry out business was met.

Meeting notes:

■ **Meeting Agenda**

- Meeting agenda, which was circulated among members and guests on October 2, 2018 by email, was presented to the audience.
- There were no objections or comments and the agenda was approved unanimously.

■ **Minutes from previous meeting**

- The minutes from the S18 meeting in Pittsburgh, which were circulated on October 2, 2018 by email, were presented to the audience.
- There were no objections or comments and the S18 meeting minutes were approved.

■ **Unfinished Business:**

Document status:

- Par and standard expire on December 31 2018 and the standard will become inactive. A PAR extension for 2 years was submitted by the Chairman in September 2018.

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- Draft 4 of the standard was circulated among the members for approval and comments.
- 13 responses to Draft 4 were received from the 15 current voting members. 9 responses received with approval with no comments there by achieving over 2/3 among members voting. The Chairman will take the Draft 4 to the PC Subcommittee. Returned comments relate to pending technical, editorial and document formatting changes. With the approved Draft 4 by the membership, next step requires approval by PCS.
- Yes with comments: Comments from Klaus Pointner:

AW: C57.21 draft 4 -20180930 [\[Gmail\]/C57_21 x](#)

Klaus Pointner <klaus.pointner@ieee.org>
an Sanjib

03.10.2018, 15:42 (vor 10 Tagen)

Englisch > Deutsch [Nachricht übersetzen](#)

[Deaktivieren](#)

Dear Sanjib,

Unfortunately I have to vote

Not approved with comments as follows:

Additionally to those comments already sent, please find below my input:

-

Technical:

General:

It appears that the updates/comments as per attached input have been taken over partly only and very inconsistent - please check and update (e.g. 10.3.9.1, 10.3.9.1.1, 10.3.9.1.2 or 10.3.8.1, 10.5.9ff). At the moment this leads to contradicting/conflicting information !

6.2.1 - I believe the standard shall be C57.12.90 (Test Code) not C57.12.80 (Terminology) ?

Editorial/technical:

Please change all "oil-immersed" to "liquid-immersed" --> currently it is mixed

Table 6: Note 5, 13, 15 may be deleted as they explain changes from 1990 to 2008 edition and thus a not valid for the update anymore

I trust that the editorial issues will be handled (formatting etc.)

best regards

Klaus

- No with comments: Comments from Luc Dorpmanns:

I have checked with our test bay and we have a few remarks to the draft. I copied the guys in and also Christoph as he wrote the chapter about the noise measurements:

- Item 9.2.4: note: tail time of switching impulse: change 1000 to 500 microseconds as in IEC (this is technically already a challenge)
- Item [10.3.4](#): LI sequence: change to 1x RFW, 1x FW, 2x CFW, 2x FW (as in C57.12.90 and IEC).
- Item 10.6.3: insufficient test power: the remark in line 20-21 is contradicting the part before. And also the behaviour is highly non-linear so extrapolation is for some designs not feasible.
- Item 10.6.5: Sound pressure measurement: As mentioned before we have a preference for sound intensity method and this could be included in the standard. If a

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test transformer is used inside the same test bay this method should be used to rule out the noise of the test transformer.

- Item [10.6.6](#): lines 30-34: Maybe it is clearer to include the PI-index here and give a guidance on that too?
 - Item [10.6.6](#): lines 41-43: this only works if the noise of the test transformer is about the same as of the reactor (or lower): in case the noise of the test transformer is much more than the reactor this correction will not make sense. Some remark our limit should be added.
- Yes with a question: Comment from Hemchandr Shertukde, to be addressed during balloting process:

Shertukde, Hemchandr shertukde@hartford.edu **via** hartford0.onmicrosoft.com

to Dharam, Klaus, Sanjib, a.delrio@ieee.org, ebetanco@ieee.org, arup.chakraborty@deltastar.com, I.do

Yes, I had provided some query which does not seem to satisfy me.

Best
Hem

- Comment by Enrique Betancourt (voted yes) but noted that some sections of text in the standard is repeated information and changes will be required to address the issue. The Chair indicated that those changes will be done during the next revision of the standard.
- No with comments from Christoph Ploetner (see below)

*****Comments from Luc on Draft 4 (blue) and comments on same by Christoph*****

I have checked with our test bay and we have a few remarks to the draft. I copied the guys in and also Christoph as he wrote the chapter about the noise measurements:

- Item 9.2.4. note: tail time of switching impulse: change 1000 to 500 microseconds as in IEC (this is technically already a challenge)
- Item 10.3.4.: LI sequence: change to 1x RFW, 1x FW, 2x CFW, 2x FW (as in C57.12.90 and IEC).
- Item 10.6.3: insufficient test power: the remark in line 20-21 is contradicting the part before. And also the behaviour is highly non-linear so extrapolation is for some designs not feasible.

I agree, the sentence

“Tests at lower voltage levels are not qualified for extrapolation.”
can be misunderstood and I suggest to delete the sentence it without replacement as it is not really needed.

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Hereafter a re-phrased wording for lines 18-25 that puts a little more emphasize on manufacturer's obligation in case of reduced testing...

When the available test power is insufficient for testing at 1.05 pu nominal system / rated voltage, then the manufacturer shall notify the user of reduced voltage testing during the proposal stage and the reduced voltage test level agreed upon at the time of contract. It is the manufacturer's obligation to demonstrate to the user's satisfaction that reduced-voltage testing produces sufficiently accurate results when extrapolated to the required test voltage. The minimum permissible test voltage is set to 0.9 pu nominal system / rated voltage. ~~If a sufficient accurate extrapolation cannot be demonstrated to the user, a field test may be performed, subject of agreement between manufacturer and user at the time of contract.~~

I stroked out the last sentence as I do not really see it as an option for a reliable measurement (It came from the old version). Up to the group to decide in Jacksonville on it! Please consider to exchange these new wording with lines 18-25 in Draft4.

We all know that reduced testing is not desirable and I have no problem to entirely remove this possibility. Historically it was justified to have this possibility because test power was widely an issue. Nowadays this has definitely changed worldwide and removing this possibility would affect probably only a few cases. And even such cases are not necessary to have because there is sufficient competition available for all reactor ratings such that there is no commercial issue by having for instance too few vendors capable doing full testing. However, it would be a huge step and I think it must be well agreed amongst the WG members at first and secondly also confirmed by the subcommittee. Maybe we do this better during next revision.

In terms of non-linearity, I do not suggest to start a discussion on technical limits for the extrapolation at this stage of revision. Let us consider and discuss during next revision – it will take too much time.

- [Item 10.6.5: Sound pressure measurement: As mentioned before we have a preference for sound intensity method and this could be included in the standard. If a test transformer is used inside the same test bay this method should be used to rule out the noise of the test transformer.](#)

C57.12.90:2015 defines two quantities for sound level reporting: Sound pressure and Sound power. It fully independently further defines two methods for sound measurements – the sound pressure method and the sound intensity method. The returned results from both methods are applicable for sound pressure and sound power reporting. The selection of the measurement method is on

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manufacturer's side, if not specified by the user. Therefore: The proposed wording entirely follows C57.12.90:2015 and no changes shall be made to the proposed wording. FYI: I intend to modify IEC 60076-10 likewise during next revision. IEEE C57.12.90:2015 approach is physically better.

- Item 10.6.6.: lines 30-34: Maybe it is clearer to include the PI-index here and give a guidance on that too?

Same as before. No need to modify as limits for the intensity method using the PI-index are well described in C57.12.90:2015

- Item 10.6.6.: lines 41-43: this only works if the noise of the test transformer is about the same as of the reactor (or lower): in case the noise of the test transformer is much more than the reactor this correction will not make sense. Some remark our limit should be added.

Yes this is correct. There are limits for the application of this method and the limits are given in the provided reference clause of C57.12.90:2015. Such are more stringent than suggested here. If we would allow the same sound level for the background noise and for the reactor noise, than we would overrule C57.20.90. If the WG wants to do this for this specific case in order to enable a wider applicability – technically it is justified – then we should add following sentences after line 44 of clause 10.6.6:

The application of this method is technically justified for a sound level difference between average background sound pressure level and total sound pressure level of 3 dB or more, although in clause 13.5.5.2 of IEEE Std. C57.12.90:2015 a minimum difference of 5 dB is stated. For the extended range of application it yields: For a 3 dB sound level difference, the correction to be added to the total sound pressure level is -3 dB and for a 4 dB difference it is -2.2 dB.

*****LUC's comments and comments on same by Christoph*****

- The CRG is now set in place by the Chairman.
- Changes to the WG Officers were introduced:
 - Vice Chair: Arturo Del Rio (a.delrio@ieee.org)
 - Secretary: Kris Zibert (kris.zibert@amce.com)

No new businesses were presented at the meeting.

A motion to adjourn the meeting was proposed by Mat Weisensee, seconded by Enrique Betancourt. Meeting was adjourned at 10:05 am.

Next meeting: Spring 2019, Anaheim, CA, March 24-28, 2019.

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Respectfully submitted,

Chairman: Sanjib Som (ssom@patransformer.com)

Vice Chair: Arturo Del Rio (a.delrio@ieee.org)

Secretary: Kris Zibert