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IEEE Guide for the Application of Capacitance Current Switching for AC High-Voltage Circuit Breakers Above 1000 V

Amendment 1

IEEE Power and Energy Society

Developed by the
Switchgear Committee

IEEE Std C37.012a™-2020
(Amendment to IEEE Std C37.012-2014)

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Approved 4 June 2020

IEEE SA Standards Board

Abstract: Covered in this amendment are changes in d*i*/d*t* limitations for non-oil circuit breakers. A section has been added describing possible delayed current zeros when doing a rapid close—open of a line circuit breaker (CO) when shunt reactors are connected to a line or cable. Some minor errors have been corrected and references have been updated.

Keywords: capacitive current switching, circuit breaker capacitive inrush/outrush limitations, IEEE C37.012a, switching reactor compensated lines

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PDF: ISBN 978-1-5044-6762-9 STD24217
Print: ISBN 978-1-5044-6763-6 STDPD24217

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Introduction

This introduction is not part of IEEE Std C37.012a-2020, IEEE Guide for the Application of Capacitance Current Switching for AC High-Voltage Circuit Breakers Above 1000 V.

Recent work has demonstrated that for vacuum, SF_6 and other gas switchgear, the inrush current frequency on capacitor energization or restrike is much less important than the current magnitude and often does not need to be limited. Also, the inrush current magnitude alone may not need to be limited. The limiting parameter is the ICI (Inrush Current Integral) during the pre-arc time of a making operation, before galvanic contact of the contacts is achieved. As a result, the formerly used $i \times f$ product (or $\mathrm{d}i/\mathrm{d}t$) as a limitation for switchgear is less of a concern. Therefore, IEEE Std C37.012 has been amended to provide guidance in applications where the formerly used $i \times f$ limitation is exceeded. At this time, it is deemed appropriate to retain the inrush current magnitude limits with less emphasis on the importance of the natural frequency of the inrush current until such time as the impact of the ICI is better understood and reducible to an easily computed form suitable for an application guide.

Also, a few other corrections have been addressed (i.e., Ferranti rise numbers, added clauses on reactor compensated lines and cables, delayed current zero possibility, and the discharge capability of capacitor units with no internal fuses, etc.). References have been updated, and IEEE Std C37.100.2 was added to the normative references.

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NOTE—The editing instructions contained in this **amendment** define how to merge the material contained therein into the existing base standard and its amendments to form the comprehensive standard.

The editing instructions are shown in ***bold italic***. Four editing instructions are used: change, delete, insert, and replace. ***Change*** is used to make corrections in existing text or tables. The editing instruction specifies the location of the change and describes what is being changed by using ~~strikethrough~~ (to remove old material) and underscore (to add new material). ***Delete*** removes existing material. ***Insert*** adds new material without disturbing the existing material. Insertions may require renumbering. If so, renumbering instructions are given in the editing instruction. ***Replace*** is used to make large changes in text, subclauses, tables, figures, or equations by removing the existing material and replacing it with new material. Editing instructions, change markings, and this NOTE will not be carried over into future editions because the changes will be incorporated into the base standard.

2. Normative references

Change the following references in Clause 2:

IEEE Std C37.04™, IEEE Standard ~~Rating Structure for AC High-Voltage Circuit Breakers~~ for Ratings and Requirements for AC High-Voltage Circuit Breakers with Rated Maximum Voltage Above 1000 V.[2,3]

IEEE Std C37.09~~a~~™~~-2005~~, IEEE Standard Test Procedures for AC High-Voltage Circuit Breakers ~~Rated on a Symmetrical Current Basis — Amendment 1: Capacitance Current Switching~~ with Rated Maximum Voltage Above 1000 V.

IEEE Std C37.010™, IEEE Application Guide for AC High-Voltage Circuit Breakers > 1000 Vac Rated on a Symmetrical Current Basis.

Delete the following references in Clause 2:

IEEE Std C37.04a™-2003, IEEE Standard Rating Structure for AC High-Voltage Circuit Breakers Rated on a Symmetrical Current Basis Amendment 1: Capacitance Current Switching.