

C37.09a™

IEEE Standard Test Procedure for AC High-Voltage Circuit Breakers Rated on a Symmetrical Current Basis— Amendment 1: Capacitance Current Switching

IEEE Power Engineering Society

Sponsored by the
Switchgear Committee



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Abstract: A revision to the capacitance current switching standards is included in this amendment.

Keywords: amendment, capacitance current switching, fast transient recovery voltage, indoor, initial, mechanical endurance, operating duty, outdoor, power frequency, short-circuit current, short-line fault, single-phase testing, test data reporting, three-phase testing, unit test, voltage distribution synthetic test

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Introduction

This introduction is not part of IEEE Std C37.09a-2005, IEEE Standard Test Procedure for AC High-Voltage Circuit Breakers Rated on a Symmetrical Current Basis—Amendment 1: Capacitance Current Switching.

The capacitance current switching standards have been completely revised. A joint IEEE/IEC task force developed a revised approach to capacitance current switching standardization. IEC has published this task force's work as part of IEC's new circuit breaker standard, designated IEC 62271-100. IEC 62271-100 replaces the old IEC 56.

In the interest of harmonization of high-voltage circuit breaker standards, a joint meeting of the IEC 17A, the IEEE/PES Switchgear Committee, and the IEEE/PES Substations Committee was held in Vienna VA, in May 1995. One of the outcomes of that meeting was a decision to form a joint IEEE/IEC task force to revise the standards for capacitance current switching. The task force was given the IEC designation "IEC SC17A WG21 TF10." It was agreed that the work of this task force (TF10) would serve as the basis for capacitance current switching standards in IEC and IEEE. The task force had two 2-day meetings, one in Clamart, France in September 1995 and one in Berlin Germany in December 1995.

The task force was comprised of the following:

R. W. Alexander (<i>IEEE</i>)	H. Kempen (<i>IEC</i>)	P. Riffon (<i>IEC</i>)
D. Dufournet (<i>IEEE and IEC</i>)	R. O' Leary (<i>IEEE</i>)	M. Seeger (<i>IEC</i>)
R. Jeanjean (<i>IEEE and IEC</i>)		N. Trapp (<i>IEC</i>)

The work of the above task force has been incorporated into the new IEC circuit breaker standard IEC 62271-100 (formerly IEC 56) published in May 2001. The IEEE version is comprised of IEEE Std C37.04a™, IEEE Std C37.09a, and a revised set of tables in ANSI C37.06. Slight modifications to the IEC version have been made to reflect North American practice. Additionally, slight modifications to the text have been made for the North American reader, such as "Earth" is replaced by "Ground." Most of the text is the same and certain usage may be unfamiliar, but is understandable to the discriminating reader.

In keeping with IEC Circuit Breaker Standard philosophy, the capacitance current switching ratings have been "unbundled." A "basic" circuit breaker has either an overhead line switching rating (outdoor circuit breaker), or a cable switching rating (indoor circuit breaker) Capacitor bank ratings, both single bank and back to back, or additional OH or cable ratings must be specified separately.

Three classes of circuit breaker regarding restriking performance are specified. "Class C0" has a probability of restrike up to one restrike per operation, and its capacitance current switching performance can be compared to the former "general purpose circuit breaker" defined in IEEE Std C37.04™-1979. "Class C1" has a restriking performance similar to the old "definite purpose circuit breaker" defined in IEEE Std C37.04-1979 and is called "low probability of restrike." Class C2 is intended to have a very low probability of restriking, about 1/10 or less than that of a class C1 circuit breaker. A probability of restrike classification is applicable to each capacitance current switching rating.

For circuit breakers rated 362 kV and above, a single phase test voltage factor of 1.4 (recovery voltage of 2.8 p.u.) is required for the overhead line switching test duties. (This is an option in IEC 62271-100.) The purpose of this requirement is to acknowledge the long transmission lines and low coefficient of grounding, common in North America. This is an increase from the 1.2 single phase test voltage factor (2.4 p.u. recovery voltage) requirement in IEEE Std C37.04-1979. For circuit breakers rated 72.5 kV and below the same 1.4 single phase test voltage factor is required for all capacitance current switching duties. This is to allow for the many ungrounded systems that exist at 72.5 kV and below. IEC 62271-100 requires this only at

52 kV and below. This is a slight decrease in the requirement for a 1.5 single phase test voltage factor (3.0 p.u. recovery voltage) for capacitance current testing in IEEE Std C37.09-1999.

IEEE Std C37.012™ “IEEE Application Guide for Capacitance Current Switching for AC High-Voltage Circuit Breakers Rated on a Symmetrical Current Basis” is being revised to align with this new approach and to alert the user concerning these changes.

Notice to users

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Errata, if any, for this and all other standards can be accessed at the following URL: <http://standards.ieee.org/reading/ieee/updates/errata/index.html>. Users are encouraged to check this URL for errata periodically.

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IEEE Standard Test Procedure for AC High-Voltage Circuit Breakers Rated on a Symmetrical Current Basis— Amendment 1: Capacitance Current Switching

NOTE—The editing instructions contained in this amendment define how to merge the material contained herein 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 small corrections in existing text or tables. The editing instruction specifies the location of the change and describes what is being changed by using ~~strike through~~ (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 existing text, subclauses, tables, or figures by removing existing material and replacing it with new material. Editorial notes will not be carried over into future editions because the changes will be incorporated into the base standard.

3. Definitions

Replace the text in Clause 3 with the following:

For the purposes of this standard, the following terms and definitions apply. These definitions are not intended to embrace all possible meanings of the terms. They are intended solely to establish the meanings of terms used in power switchgear. IEEE Std C37.100™ and IEEE Std C37.04a™[B4]¹ should be referenced for terms not defined in this clause.

3.1 Close-open time: Interval of time between the instant when the contacts touch in the first pole during a closing operation and the instant when the arcing contacts have separated in all poles during the subsequent opening operation.

NOTE—Unless otherwise stated, it is assumed that the opening release incorporated in the circuit-breaker is energized at the instant when the 52a contacts close in the trip circuit during the closing operation. This represents the minimum close-open time.²

¹The numbers in brackets correspond to those of the bibliography in Annex D.

²Notes in text, tables, and figures are given for information only and do not contain requirements needed to implement the standard.