



IEEE Standard for Rating Structure for AC High-Voltage Circuit Breakers

Corrigendum 1

IEEE Power & Energy Society

Sponsored by the
Switchgear Committee

IEEE
3 Park Avenue
New York, NY 10016-5997, USA

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IEEE Std C37.04™-1999/Cor 1-2009
(Corrigendum to
IEEE Std C37.04-1999)

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Approved 17 June 2009

IEEE-SA Standards Board

Abstract: This corrigendum corrects technical and other non-editorial errors made during the preparation of IEEE Std C37.04-1999 latest version, third printing 29 November 2005, which covers the rating structure for high-voltage circuit breakers rated over 1000 VAC. This corrigendum includes the corrections made in the errata, as the errata will be removed once this corrigendum is approved.

As of the printing of this corrigendum, IEEE Std. C37.04-1999 includes the following:

- IEEE Std C37.04™-1999 latest version, third printing 29 November 2005;
- IEEE Std C37.04a™-2003, Amendment 1: Capacitance Current Switching
- IEEE Std C37.04b™, Amendment 2: Amendment to Change the Description of Transient Recovery Voltage for Harmonization with IEC 62271-100; and
- this corrigendum, IEEE C37.04-1999/Cor 1-2009, which makes technical corrections to the original IEEE Std C37.04-1999 and includes the corrections published in errata.

Keywords: circuit breaker

The Institute of Electrical and Electronics Engineers, Inc.
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Introduction

This introduction is not part of IEEE Std C37.04-1999/Cor_1-2009, IEEE Standard for Rating Structure for AC High-Voltage Circuit Breakers—Corrigendum 1.

This corrigendum corrects technical and editorial errors printed in the text of the latest published version of IEEE Std C37.04-1999. IEEE Std C37.04a-2003, Amendment 1 “Capacitance Current Switching” to this IEEE Std C37.04-1999 was published on 25 July 2003 as IEEE Std C37.04a-2003. Also, IEEE Std C37.04b-2008, Amendment 2 “To Change the Description of Transient Recovery Voltage for Harmonization with IEC 62271-100” was published on 3 April 2009.

Due to errors and changes in the original Introduction to IEEE C37.04-1999, the entire revised Introduction is given in this corrigendum.

In 1964, consolidated standards for circuit breakers rated on a symmetrical current basis were published to take the place of standards established on the total current basis of rating. The 1999 revision was undertaken to update the standard to reflect today’s circuit breaker technology and application on modern power systems. The revision also continues harmonization with IEC circuit breaker standards, a process that first began in 1951.

IEEE-Std C37.04-1999 makes significant changes in the rating structure for circuit breakers, such as the change of the voltage range factor, K, and the standard duty cycle. With these changes, information needed to properly apply circuit breakers rated in accordance with the 1979 or 1964 editions of IEEE Std C37.04 is eliminated from this new edition. Accordingly, users must refer to the prior editions of the relevant standards (including IEEE Std C37.04, ANSI C37.06, IEEE Std C37.09™, etc.) in order to properly select and apply circuit breakers rated in accordance with the older standards.

NOTE— These older standards are part of the IEEE archives. Contact the IEEE Standards Association for ordering information.

The changes in this standard are explained in the following clause-by-clause summary:

- 1) Scope— The scope was expanded to clarify the type of circuit breakers specifically covered by this standard.
- 2) References— A complete updated listing of references is supplied.
- 3) Definitions— No substantial changes.
- 4) Service conditions— The usual and unusual service conditions are given. Information given on how to deal with unusual service conditions has been moved to IEEE Std C37.010™-1999.
- 5) Ratings— The rated voltage range factor, K, defined in earlier versions of IEEE Std C37.04 is commonly recognized as being equal to 1.0 for modern interrupting technologies; consequently, the rating structure has been simplified, because the use of a K factor on 1.0 has effectively eliminated K from the rating structure. The rated permissible tripping delay, Y, has been incorporated in the rated closing, latching, and short-time current carrying capability (5.8.2.3).
 - 5.1 Rated maximum voltage— No major changes.
 - 5.2 Rated power frequency— No major changes.
 - 5.3 Rated continuous current— Changes were made to Table 1 (Limits of temperature and temperature rise for various parts and materials of circuit breakers). This table has been brought into better harmony with IEC.
 - 5.4 Rated dielectric withstand capability— Changes clarify basic dielectric requirements.

- 5.5 Rated standard operating duty (standard duty cycle)— Changed and expanded to include circuit breakers for rapid reclosing and to coordinate with IEC.
- 5.6 Rated interrupting time— The definition was clarified and updated for modern circuit breaker performance.
- 5.7 Contact parting time— This definition was modified to alert users of high-voltage circuit breakers that it may be necessary to add external delay to account for fault deionization times on power systems.
- 5.8 Rated short-circuit current and related required capabilities
 - 5.8.1 Rated short-circuit current— No major changes.
 - 5.8.2 Related required capabilities— The required asymmetrical interrupting capability for three-phase faults (5.8.2.2) defines the percent dc component based on the standard time constant of 45 ms (corresponding to an X/R of 17 for 60 Hz or 14 for 50 Hz). This replaces the “S-factor” concept used in earlier versions of IEEE Std. C37.04. The rated closing, latching, and short-time current carrying capability (5.8.2.3) incorporates the permissible tripping delay and short-time current into values that coordinate with IEC. The required reclosing capability is referenced to IEEE Std C37.010™-1999.
- 5.9 Rated transient recovery voltage (TRV)— This subclause of the standard was expanded to provide a detailed explanation of how TRV values are calculated. The first-pole-to-clear factor and transient amplitude factors have been harmonized with IEC in preparation for future harmonization of waveshapes for testing. The shortline fault surge impedance and amplitude constant were harmonized to a single value. The initial TRV was incorporated from IEEE Std C37.04i™-1991.
- 5.10 Rated operating endurance capabilities— This subclause replaced “Required load current switching capability and life.”
- 5.11 Rated capacitance current switching— This subclause was replaced by IEEE Std C37.04a-2003, Amendment 1: Capacitance Current Switching. The revised approach to capacitance current switching specified in IEEE Std C37.04a-2003 was developed by a joint IEEE-IEC task force.
- 5.12 Out-of-phase switching current capability— No major changes.
- 5.13 Shunt reactor current switching capability— References are made to IEEE Std C37.015™-1993.
- 5.14 Line closing switching surge factor— Text has been revised to reflect that this is not a rating that is verified by testing.
- 5.15 Rated control voltage— IEC definitions are incorporated.
- 5.16 Rated operating pressure for insulation and/or interruption (P_{re})— IEC definitions are incorporated.
- 5.17 Rated operating pressure for mechanical operation (P_{m})— IEC definitions are incorporated.
- 6) Construction
 - 6.1 Outdoor apparatus bushings— References have been updated.
 - 6.2 Creepage distance— References ANSI C37.06-1997 requirements.
 - 6.3 Mechanical loading—This subclause has been updated to reflect individual mechanical loads per IEC.
 - 6.4 Pressurized components— Requirements for non-ceramic pressurized vessels have been added.