

IEEE Recommended Practice for Instruction Manual Content of AC High- Voltage Circuit Breakers above 1000 V

IEEE Power and Energy Society

Sponsored by the
Switchgear Committee

IEEE Recommended Practice for Instruction Manual Content of AC High- Voltage Circuit Breakers above 1000 V

Sponsor

Switchgear Committee
of the
IEEE Power and Energy Society

Approved 5 December 2018

IEEE-SA Standards Board

Abstract: This recommended practice is intended to identify, organize, and summarize information about ac high-voltage circuit breakers provided by the manufacturer that knowledgeable users will find useful for the receipt, installation, commissioning, operation and maintenance, and decommissioning of ac high-voltage circuit breakers above 1000 V. Recommended categories and an arrangement for the presentation of information in circuit breaker instruction manuals is covered in this recommended practice.

Keywords: circuit breaker, disposal, installation, IEEE C37.12.1™, instruction manual, maintenance, operation

The Institute of Electrical and Electronics Engineers, Inc.
3 Park Avenue, New York, NY 10016-5997, USA

Copyright © 2019 by The Institute of Electrical and Electronics Engineers, Inc.
All rights reserved. Published 16 April 2019. Printed in the United States of America.

IEEE is a registered trademark in the U.S. Patent & Trademark Office, owned by The Institute of Electrical and Electronics Engineers, Incorporated.

PDF: ISBN 978-1-5044-5443-8 STD23489
Print: ISBN 978-1-5044-5444-5 STDPD23489

IEEE prohibits discrimination, harassment, and bullying.

For more information, visit <http://www.ieee.org/web/aboutus/whatis/policies/p9-26.html>.

No part of this publication may be reproduced in any form, in an electronic retrieval system or otherwise, without the prior written permission of the publisher.

Important Notices and Disclaimers Concerning IEEE Standards Documents

IEEE documents are made available for use subject to important notices and legal disclaimers. These notices and disclaimers, or a reference to this page, appear in all standards and may be found under the heading “Important Notices and Disclaimers Concerning IEEE Standards Documents.” They can also be obtained on request from IEEE or viewed at <http://standards.ieee.org/ipr/disclaimers.html>.

Notice and Disclaimer of Liability Concerning the Use of IEEE Standards Documents

IEEE Standards documents (standards, recommended practices, and guides), both full-use and trial-use, are developed within IEEE Societies and the Standards Coordinating Committees of the IEEE Standards Association (“IEEE-SA”) Standards Board. IEEE (“the Institute”) develops its standards through a consensus development process, approved by the American National Standards Institute (“ANSI”), which brings together volunteers representing varied viewpoints and interests to achieve the final product. IEEE Standards are documents developed through scientific, academic, and industry-based technical working groups. Volunteers in IEEE working groups are not necessarily members of the Institute and participate without compensation from IEEE. While IEEE administers the process and establishes rules to promote fairness in the consensus development process, IEEE does not independently evaluate, test, or verify the accuracy of any of the information or the soundness of any judgments contained in its standards.

IEEE Standards do not guarantee or ensure safety, security, health, or environmental protection, or ensure against interference with or from other devices or networks. Implementers and users of IEEE Standards documents are responsible for determining and complying with all appropriate safety, security, environmental, health, and interference protection practices and all applicable laws and regulations.

IEEE does not warrant or represent the accuracy or content of the material contained in its standards, and expressly disclaims all warranties (express, implied and statutory) not included in this or any other document relating to the standard, including, but not limited to, the warranties of: merchantability; fitness for a particular purpose; non-infringement; and quality, accuracy, effectiveness, currency, or completeness of material. In addition, IEEE disclaims any and all conditions relating to: results; and workmanlike effort. IEEE standards documents are supplied “AS IS” and “WITH ALL FAULTS.”

Use of an IEEE standard is wholly voluntary. The existence of an IEEE standard does not imply that there are no other ways to produce, test, measure, purchase, market, or provide other goods and services related to the scope of the IEEE standard. Furthermore, the viewpoint expressed at the time a standard is approved and issued is subject to change from time to time about through developments in the state of the art and comments received from users of the standard.

In publishing and making its standards available, IEEE is not suggesting or rendering professional or other services for, or on behalf of, any person or entity nor is IEEE undertaking to perform any duty owed by any other person or entity to another. Any person utilizing any IEEE Standards document, should rely upon his or her own independent judgment in the exercise of reasonable care in any given circumstances or, as appropriate, seek the advice of a competent professional in determining the appropriateness of a given IEEE standard.

IN NO EVENT SHALL IEEE BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO: PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE PUBLICATION, USE OF, OR RELIANCE UPON ANY STANDARD, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE AND REGARDLESS OF WHETHER SUCH DAMAGE WAS FORESEEABLE.

Translations

The IEEE consensus development process involves the review of documents in English only. In the event that an IEEE standard is translated, only the English version published by IEEE should be considered the approved IEEE standard.

Official statements

A statement, written or oral, that is not processed in accordance with the IEEE-SA Standards Board Operations Manual shall not be considered or inferred to be the official position of IEEE or any of its committees and shall not be considered to be, or be relied upon as, a formal position of IEEE. At lectures, symposia, seminars, and educational courses, an individual presenting information on IEEE standards shall make it clear that his or her views should be considered the personal views of that individual rather than the formal position of IEEE.

Comments on standards

Comments for revision of IEEE Standards documents are welcome from any interested party, regardless of membership affiliation with IEEE. However, IEEE does not provide consulting information or advice pertaining to IEEE Standards documents. Suggestions for changes in documents should be in the form of a proposed change of text, together with appropriate supporting comments. Since IEEE standards represent a consensus of concerned interests, it is important that any responses to comments and questions also receive the concurrence of a balance of interests. For this reason, IEEE and the members of its societies and Standards Coordinating Committees are not able to provide an instant response to comments or questions except in those cases where the matter has previously been addressed. For the same reason, IEEE does not respond to interpretation requests. Any person who would like to participate in revisions to an IEEE standard is welcome to join the relevant IEEE working group.

Comments on standards should be submitted to the following address:

Secretary, IEEE-SA Standards Board
445 Hoes Lane
Piscataway, NJ 08854 U.S.A.

Laws and regulations

Users of IEEE Standards documents should consult all applicable laws and regulations. Compliance with the provisions of any IEEE Standards document does not imply compliance to any applicable regulatory requirements. Implementers of the standard are responsible for observing or referring to the applicable regulatory requirements. IEEE does not, by the publication of its standards, intend to urge action that is not in compliance with applicable laws, and these documents may not be construed as doing so.

Copyrights

IEEE draft and approved standards are copyrighted by IEEE under U.S. and international copyright laws. They are made available by IEEE and are adopted for a wide variety of both public and private uses. These include both use, by reference, in laws and regulations, and use in private self-regulation, standardization, and the promotion of engineering practices and methods. By making these documents available for use and adoption by public authorities and private users, IEEE does not waive any rights in copyright to the documents.

Photocopies

Subject to payment of the appropriate fee, IEEE will grant users a limited, non-exclusive license to photocopy portions of any individual standard for company or organizational internal use or individual, non-commercial use only. To arrange for payment of licensing fees, please contact Copyright Clearance Center, Customer Service, 222 Rosewood Drive, Danvers, MA 01923 USA; +1 978 750 8400. Permission to photocopy portions of any individual standard for educational classroom use can also be obtained through the Copyright Clearance Center.

Updating of IEEE Standards documents

Users of IEEE Standards documents should be aware that these documents may be superseded at any time by the issuance of new editions or may be amended from time to time through the issuance of amendments, corrigenda, or errata. A current IEEE document at any point in time consists of the current edition of the document together with any amendments, corrigenda, or errata then in effect.

Every IEEE standard is subjected to review at least every ten years. When a document is more than ten years old and has not undergone a revision process, it is reasonable to conclude that its contents, although still of some value, do not wholly reflect the present state of the art. Users are cautioned to check to determine that they have the latest edition of any IEEE standard.

In order to determine whether a given document is the current edition and whether it has been amended through the issuance of amendments, corrigenda, or errata, visit IEEE Xplore at <http://ieeexplore.ieee.org/> or contact IEEE at the address listed previously. For more information about the IEEE-SA or IEEE's standards development process, visit the IEEE-SA Website at <http://standards.ieee.org>.

Errata

Errata, if any, for all IEEE standards can be accessed on the IEEE-SA Website at the following URL: <http://standards.ieee.org/findstds/errata/index.html>. Users are encouraged to check this URL for errata periodically.

Patents

Attention is called to the possibility that implementation of this standard may require use of subject matter covered by patent rights. By publication of this standard, no position is taken by the IEEE with respect to the existence or validity of any patent rights in connection therewith. If a patent holder or patent applicant has filed a statement of assurance via an Accepted Letter of Assurance, then the statement is listed on the IEEE-SA Website at <http://standards.ieee.org/about/sasb/patcom/patents.html>. Letters of Assurance may indicate whether the Submitter is willing or unwilling to grant licenses under patent rights without compensation or under reasonable rates, with reasonable terms and conditions that are demonstrably free of any unfair discrimination to applicants desiring to obtain such licenses.

Essential Patent Claims may exist for which a Letter of Assurance has not been received. The IEEE is not responsible for identifying Essential Patent Claims for which a license may be required, for conducting inquiries into the legal validity or scope of Patent Claims, or determining whether any licensing terms or conditions provided in connection with submission of a Letter of Assurance, if any, or in any licensing agreements are reasonable or non-discriminatory. Users of this standard are expressly advised that determination of the validity of any patent rights, and the risk of infringement of such rights, is entirely their own responsibility. Further information may be obtained from the IEEE Standards Association.

Participants

At the time this IEEE recommended practice was completed, the PC37.12.1 Working Group had the following membership:

Kenneth S. Edwards, *Chair*
John C. Webb, *Vice Chair*

W.J. (Bill) Bergman
Patrick Di Lillo
Robert Foster
Raymond Frazier
Roy Hutchins

Jennifer Hunter
Todd Irwin
Thomas Keels
Scott Lanning
Neil McCord

Andrew Peterson
Anthony Ricciuti
Devki Sharma
Dean Sigmon
Michael Skidmore

The following members of the individual balloting committee voted on this recommended practice. Balloters may have voted for approval, disapproval, or abstention.

Steven Alexanderson
W.J. (Bill) Bergman
Steven Bezner
Jean-Marc Biasse
Stan Billings
Wallace Binder
Anne Bosma
Ted Burse
Eldridge Byron
Thomas Callsen
Paul Cardinal
Chih Chow
Michael Culhane
Denis Dufournet
Edgar Dullni
Douglas J. Edwards
Tanner Esco
Keith Flowers
David Giegel
Douglas Giraud
Mietek Glinkowski
Edwin Goodwin

Randall Groves
Werner Hoelzl
Todd Irwin
Richard Jackson
Joseph Jasinski
Laszlo Kadar
Yuri Khersonsky
James Kinney
Boris Kogan
Jim Kulchisky
Hua Liu
Albert Livshitz
R. Long
David Mitchell
Charles Morse
Thomas W. McAhy
Thomas Weitzel
Jeffrey Nelson
Michael Newman
T.W. Olsen
Lorraine Padden
Andrew Peterson
Christopher Petrola

Anthony Peterson
Julien Poirier
Anthony Ricciuti
Thomas Rozek
Sundi Ryandi
Roderick Sauls
Bartien Sayogo
Daniel Schiffbauer
Carl Schuetz
Devki Sharma
Xu She
Suresh Shrivastava
Dean Sigmon
Michael Skidmore
Jeremy Smith
Jerry Smith
Marcelo Valdes
James Van De Ligt
John Vergis
John Wang
Terry Woodyard
Larry Yonce

When the IEEE-SA Standards Board approved this recommended practice on 5 December 2018, it had the following membership:

Jean-Phillipe Faure, *Chair*
Gary Hoffman, *Vice Chair*
John D. Kulick, *Past Chair*
Konstantinos Karachalios, *Secretary*

Ted Burse
Guido Hiertz
Christel Hunter
Joseph Koepfinger*
Thomas Koshy
Hung Ling
Dong Liu

Xiaohui Liu
Kevin Lu
Daleep Mohla
Andrew Myles
Paul Nikolich
Ron Petersen
Annette Reilly

Robby Robson
Dorothy Stanley
Mehmet Ulema
Phil Wennblom
Philip Winston
Howard Wolfman
Jingyi Zhou

*Member Emeritus

Introduction

This introduction is not part of IEEE Std C37.12.1-2018, IEEE Recommended Practice for Instruction Manual Content of AC High-Voltage Circuit Breakers above 1000 V.

This revision of the IEEE Guide for High-Voltage (> 1000 V) Circuit Breaker Instruction Manual Content will make this document the IEEE Recommended Practice for Instruction Manual Content of AC High-Voltage Circuit Breakers above 1000 V. IEEE Std C37.12.1-2018 provides recommendations to manufacturers on the data and information to include with their circuit breaker instruction manuals. Circuit breaker instruction manuals are considered to include all component instructions, drawings and illustrations, data sheets, documentation, and other written information provided by the circuit breaker manufacturer.

The specific material recommended for inclusion in instruction manuals is that data and information commonly employed by users for the installation, operation, and maintenance of circuit breakers.

A separate [Clause 5](#) contains additional information for specific high-voltage circuit breakers such as some nameplate information, some test measurements, some setting or calibration data, and other topics required for the installation, operation, and maintenance of a circuit breaker. This summary information is not intended to replace a thorough review of more detailed information contained in the manufacturer's instruction manual.

[Clause 5](#) does not apply to draw-out circuit breakers such as those used in switchgear assemblies. A generic instruction manual may be more appropriate for such circuit breakers and the instruction manual for these circuit breakers may apply to many other circuit breakers produced over a wide range of time. This recommended practice does not apply to circuit breakers used in gas-insulated switchgear.

A manufacturer's instruction manual is the definitive reference for information on the receiving, installation, operation, maintenance, and disposal of circuit breakers. This recommended practice is not intended to provide or replace the circuit breaker data normally found on the nameplate, the test reports, or the various other forms of data provided to owners of circuit breakers by the circuit breaker manufacturer. The recommended practice is intended to provide a recommended minimum content for a circuit breaker instruction manual.

Contents

1. Overview.....	10
1.1 Scope.....	10
1.2 Purpose.....	10
1.3 Limitations.....	10
2. Normative references.....	11
3. Definitions.....	11
4. Recommended instruction manual contents.....	11
4.1 General.....	12
4.2 General description of the circuit breaker.....	12
4.3 Safety and precautions.....	12
4.4 Receiving, handling, and storage instructions.....	12
4.5 Circuit breaker installation and assembly instructions.....	12
4.6 Circuit breaker field testing instructions.....	13
4.7 Circuit breaker operating instructions.....	13
4.8 Description of circuit breaker auxiliary systems (pneumatic or hydraulic systems, SF ₆ systems, etc.).....	13
4.9 Description of circuit breaker mechanism.....	13
4.10 Description of circuit breaker interrupter.....	13
4.11 Circuit breaker production tests.....	13
4.12 Expected circuit breaker inspection and maintenance activities.....	13
4.13 Failure reporting.....	15
4.14 End-of-life procedures.....	15
4.15 Drawings.....	15
4.16 Recommended renewable parts data.....	16
5. Information and characteristics of circuit breakers.....	16
5.1 General.....	16
5.2 Applicable nameplate data.....	16
5.3 Specific data.....	17
5.4 Applicable timing data.....	17
5.5 Verify condition of interrupting medium.....	18
5.6 Mechanism limit switch or pressure switch settings.....	19
5.7 External insulator data.....	19
6. Form of instruction manual and updating.....	19
Annex A (informative) Bibliography.....	20

IEEE Recommended Practice for Instruction Manual Content of AC High-Voltage Circuit Breakers above 1000 V

1. Overview

1.1 Scope

This recommended practice is intended to identify, organize and summarize information about high-voltage circuit breakers provided by the manufacturer that knowledgeable users will find useful for the receipt, installation, commissioning, operation and maintenance, and decommissioning of ac high-voltage circuit breakers above 1000 V. This recommended practice recommends categories and an arrangement for the presentation of information in circuit breaker instruction manuals.

1.2 Purpose

The purpose of the document is to provide recommendations for authors and those who specify instruction manuals for ac high-voltage circuit breakers. Structuring instruction manual content according to a common (standard) format shown herein will allow knowledgeable users a means to effectively and quickly, find the information they need:

- To receive, install, and commission new high-voltage circuit breakers.
- To operate, inspect, maintain, and repair high-voltage circuit breakers throughout their service life.
- To decommission the high-voltage circuit breakers at the end of their service life.

1.3 Limitations

This recommended practice addresses various forms of documentation that pertain to high-voltage circuit breakers. IEEE Std C37.04^{TM1} requires essential markings on a circuit breaker whereas this recommended practice is directed at the various forms of documentation that pertain to a circuit breaker.

Users are advised that this recommended practice is NOT an instruction manual.

This recommended practice suggests items for inclusion in an instruction manual that is to be prepared by the circuit breaker manufacturer. A manufacturer may include additional information that is not identified in this recommended practice. Users are to follow manufacturer's instructions in the care of circuit breakers.

¹Information on references can be found in [Clause 2](#).