IEEE STANDARDS ASSOCIATION

IEEE Standard Requirements for Tap Changers

IEEE Power & Energy Society

Sponsored by the
Transformers Committee

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

4 May 2012

IEEE Std C57.131™-2012
(Revision of
IEEE Std C57.131-1995)

IEEE Std C57.131™-2012
(Revision of
IEEE Std C57.131-1995)

IEEE Standard Requirements for Tap Changers

Sponsor

Transformers Committee
of the
IEEE Power & Energy Society

Approved 29 March 2012

IEEE-SA Standards Board

Abstract: This standard covers electrical and mechanical performance and test requirements for tap changers installed in voltage regulating power and distribution transformers of all voltage and kVA ratings. It covers load tap changers (LTCs), also known as on-load tap changers (OLTCs), which can change taps while the transformer is energized and carrying load; and it covers de-energized tap changers (DETCs), also known as off-circuit tap changers, which may be operated only while the transformer is not energized. For load tap changers, this standard covers both resistor and reactor types. It also covers certain aspects of the attendant tap changer motor-drive mechanism. It does not cover the tap changer control system (manual or automatic).

Keywords: de-energized tap changers, IEEE C57.131, load tap changers, off-circuit tap changers, on-load tap changers, reactance type, reactor type, regulating transformers, resistance type, resistor type, step voltage, tap changers, taps, through current, voltage regulators

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

PDF: ISBN 978-0-7381-7272-9 STD97247
Print: ISBN 978-0-7381-7378-8 STDPD97247

Notice and Disclaimer of Liability Concerning the Use of IEEE Documents: IEEE Standards documents are developed within the IEEE Societies and the Standards Coordinating Committees of the IEEE Standards Association (IEEE-SA) Standards Board. IEEE develops its standards through a consensus development process, approved by the American National Standards Institute, which brings together volunteers representing varied viewpoints and interests to achieve the final product. Volunteers are not necessarily members of the Institute and serve without compensation. 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.

Use of an IEEE Standard is wholly voluntary. IEEE disclaims liability for any personal injury, property or other damage, of any nature whatsoever, whether special, indirect, consequential, or compensatory, directly or indirectly resulting from the publication, use of, or reliance upon any IEEE Standard document.

IEEE does not warrant or represent the accuracy or content of the material contained in its standards, and expressly disclaims any express or implied warranty, including any implied warranty of merchantability or fitness for a specific purpose, or that the use of the material contained in its standards is free from patent infringement. IEEE Standards documents are supplied "**AS IS**."

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 brought about through developments in the state of the art and comments received from users of the standard. 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 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.

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 the official position of IEEE or any of its committees and shall not be considered to be, nor be relied upon as, a formal position of IEEE. At lectures, symposia, seminars, or 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 to ensure 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. Any person who would like to participate in evaluating comments or revisions to an IEEE standard is welcome to join the relevant IEEE working group at http://standards.ieee.org/develop/wg/.

Comments on standards should be submitted to the following address:

Secretary, IEEE-SA Standards Board
445 Hoes Lane
Piscataway, NJ 08854
USA

Photocopies: Authorization to photocopy portions of any individual standard for internal or personal use is granted by The Institute of Electrical and Electronics Engineers, Inc., provided that the appropriate fee is paid to Copyright Clearance Center. To arrange for payment of licensing fee, 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.

Notice to users

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

This document is copyrighted by the IEEE. It is made available 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 this document available for use and adoption by public authorities and private users, the IEEE does not waive any rights in copyright to this document.

Updating of IEEE 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. An official 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. 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 the IEEE-SA Website at http://standards.ieee.org/index.html or contact the IEEE at the address listed previously. For more information about the IEEE Standards Association or the IEEE standards development process, visit IEEE-SA Website at http://standards.ieee.org/index.html.

Errata

Errata, if any, for this and all other standards can be accessed 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 Patents 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 draft standard was submitted to the IEEE-SA Standards Board for approval, the Tap Changer Performance Working Group had the following membership:

William Henning, *Chair*

Paul Ahrens
Carlo Arpino
Allen Bartek
Jeff Benach
Juan Castellanos
Donald Chu
Craig Colopy
Frank Damico
Dieter Dohnal
Donald Fallon
Pierre Feghali
Marcos Ferreira
James Gardner
David Goodwin
Bill Griesacker
Wayne Hanson
James Harlow
Gary Hoffman
Phillip Hopkinson
Rowland James, Jr.
Virendra Jhonsa
Axel Kraemer
Bernhard Kurth
Thomas Lundquist
John Matthews
Susan McNelly
Shirish Mehta
Van Nhi Nguyen
Bipin Patel
Paulette Powel
Ewald Schweiger
H. Jin Sim
Thomas Spitzer
Bengt-Olof Stenestam
Craig Stiegemeier
Thomas Traub
Edgar Trummer
Kiran Vedante
Robert Vei[illegible]
Roger Ve[illegible]olin
Barry [illegible]Vard
Pe[illegible]Zh[illegible]

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

Carlo Arpino
Allen Bartek
Jon Brasher
Juan Castellanos
Craig Colopy
Dieter Dohnal
Jorge Gonzalez de la Vega
James Harlow
David Harris
William Henning
Gary Hoffman
Rowland James, Jr.
Axel Kraem[illegible]
Bernhard Kurth
Van Nhi Nguyen
Daniel Sauer
Bengt-Olof Stenestam
Craig Stiegemeier
Kiran Vedante
Peter Zhao

When the IEEE-SA Standards Board approved this recommended practice on 29 March 2012, it had the following membership:

Richard H. Hulett, *Chair*
John Kulick, *Vice Chair*
Robert M. Grow, *Past President*
Judith Gorman, *Secretary*

Satish Aggarwal	Alexander Gelman	Ted Olsen
Masayuki Ariyoshi	Paul Houzé	Gary Robinson
Peter Balma	Jim Hughes	Jon Walter Rosdahl
William Bartley	Joseph L. Koepfinger*	Sam Sciacca
Ted Burse	David J. Law	Mike Seavey
Clint Chaplin	Thomas Lee	Yatin Trivedi
Wael Diab	Hung Ling	Phil Winston
Jean-Philippe Faure	Oleg Logvinov	Don Wright

*Member Emeritus

Also included are the following nonvoting IEEE-SA Standards Board liaisons:

Richard DeBlasio, *DOE Representative*
Michael Janezic, *NIST Representative*

Don Messina
IEEE Standards Program Manager, Document Development

Erin Spiewak
IEEE Standards Program Manager, Technical Program Development

Introduction

This introduction is not part of IEEE Std C57.131-2012, IEEE Standard Requirements for Tap Changers.

The introduction to IEEE Std C57.131-1995 is reproduced below, and it still applies today:

> In the interest of furthering international standardization for load tap changers, portions of this standard have been reproduced by permission of the International Electrotechnical Commission (IEC), which retains the copyright.
>
> This document is a new standard that has been developed by the Load Tap Changer Performance Requirements Working Group of the Transformers Committee. Its main intent is to provide standard performance and test requirements for both resistance and reactance type load tap changers. In many respects this standard parallels the IEC-214 (1989), Standard for On-Load Tap Changers, which covers resistance-type load tap changers in great detail, but reactance type load tap changers in lesser detail. This IEEE standard complements the IEC standard insofar as it provides additional performance and test requirements for reactance-type load tap changers, while essentially adopting, although sometimes with modification, the IEC requirements for resistance type load tap changers.

Since IEEE Std C57.131-1995 was published, IEC-214 (1989) has been revised and now has the designation, 60214-1. Many of the changes in the IEC document were also made in this revision of IEEE Std C57.131.

In addition to changes inspired by changes in IEC 60214-1, various working group members have proposed needed modifications to IEEE Std C57.131. The resulting changes fall into these areas:

- There were changes and additions to definitions and terminology.
- The scope was modified to include de-energized (off-circuit) tap changers.
- Typographical errors in figures and tables were corrected.
- Changes were made to some of the test requirements.

Contents

IEEE Standard Requirements for Tap Changers

1. Overview

1.1 Scope

This standard covers electrical and mechanical performance and test requirements for load tap changers and de-energized tap changers, installed in power transformers and voltage regulating transformers and immersed in transformer mineral oil, but may also be used for other insulating fluids insofar as conditions are applicable.

1.2 Application

This standard applies mainly to tap changers immersed in transformer oil but may also be used for gas-insulated tap changers and tap changers with other insulating liquids, when the conditions indicated in this standard are applicable. It applies to tap changers mounted inside the main transformer tank and immersed in the insulating liquid of the transformer. It also applies to tap changers mounted in a container outside the main transformer tank.