IEEE Standard for Separable Insulated Connector Systems for Power Distribution Systems Above 600 V

IEEE Power Engineering Society

Sponsored by the
Insulated Conductors Committee

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

1 March 2007

IEEE Std 386™-2006
(Revision of IEEE Std 386-1995)

IEEE Std 386™-2006
(Revision of
IEEE Std 386-1995)

IEEE Standard for Separable Insulated Connector Systems for Power Distribution Systems Above 600 V

Sponsor

Insulated Conductors Committee
of the
IEEE Power Engineering Society

Approved 15 September 2006

IEEE-SA Standards Board

Abstract: Definitions, service conditions, ratings, interchangeable construction features, and tests are established for loadbreak and deadbreak separable insulated connector systems rated above 600 V and, 600 A or less, for use on power distribution systems.
Keywords: deadbreak connector, elbow connector, loadbreak connector, power distribution systems, separable conductor, separable insulated connector systems

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

SECOND PRINTING 12 November 2009: Corrections to Table 1, Figure 5, and Figure 18 are included in this version.

Print: ISBN 0-7381-5219-6 SH95570
PDF: ISBN 0-7381-5220-X SS95570

IEEE Standards documents are developed within the IEEE Societies and the Standards Coordinating Committees of the IEEE Standards Association (IEEE-SA) Standards Board. The 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 the IEEE administers the process and establishes rules to promote fairness in the consensus development process, the IEEE does not independently evaluate, test, or verify the accuracy of any of the information contained in its standards.

Use of an IEEE Standard is wholly voluntary. The 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 this, or any other IEEE Standard document.

The IEEE does not warrant or represent the accuracy or content of the material contained herein, 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 herein 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 five years for revision or reaffirmation. When a document is more than five years old and has not been reaffirmed, 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 this document available, the IEEE is not suggesting or rendering professional or other services for, or on behalf of, any person or entity. Nor is the IEEE undertaking to perform any duty owed by any other person or entity to another. Any person utilizing this, and any other IEEE Standards document, should rely upon the advice of a competent professional in determining the exercise of reasonable care in any given circumstances.

Interpretations: Occasionally questions may arise regarding the meaning of portions of standards as they relate to specific applications. When the need for interpretations is brought to the attention of IEEE, the Institute will initiate action to prepare appropriate responses. Since IEEE Standards represent a consensus of concerned interests, it is important to ensure that any interpretation has also received 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 interpretation requests except in those cases where the matter has previously received formal consideration. 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, explanation, or interpretation of the IEEE.

Comments for revision of IEEE Standards are welcome from any interested party, regardless of membership affiliation with IEEE. Suggestions for changes in documents should be in the form of a proposed change of text, together with appropriate supporting comments. Comments on standards and requests for interpretations should be addressed to:

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

Introduction

This introduction is not part of IEEE Std 386-2006, IEEE Standard for Separable Insulated Connector Systems for Power Distribution Systems Above 600 V.

This standard was developed in response to a need created by the rapid expansion of underground distribution systems. A key element that allowed this expansion to become a reality is the separable insulated connector. This device provides for simple and inexpensive connection and switching to transformers and other equipment used in underground distribution.

When separable insulated connectors became available, the Institute of Electrical and Electronics Engineers (IEEE) and the National Electrical Manufacturers Association (NEMA) worked cooperatively to develop a document that defined the interfaces, ratings, and test conditions for the device. The success of that cooperative effort is apparent from both the vast number of these devices now in interchangeable use in the field and their enviable safety record.

This cooperative effort continues due to the ongoing upgrading and changing nature of these underground systems and products. The recent cooperative effort has been provided by the ANSI C119.2 Subcommittee and the IEEE Working Group on Separable Connectors under the auspices of the Insulated Conductors Committee of the IEEE Power Engineering Society.

This revision reflects the following major additions:

- Definitions of new and previously omitted connector components
- Overload current ratings for deadbreak connectors
- Optional color coding for 200 A loadbreak connectors
- Clarification of interchangeability requirements
- Bushing well stud torque withstand requirement
- Thermal cycle withstand test for non-elastomeric components
- Stacking dimensions for 200 A deadbreak and 600 A deadbreak connectors
- Test table reviewed to indicate sequence of tests
- Operating procedures for switching test expanded
- Trial-use guide for testing separable connector lubricants
- Operating interface ac withstand test for 200 A loadbreak connectors

For information on the application of separable connectors, refer to IEEE Std 1215™-2001 [B9].[a]

[a] The numbers in brackets correspond to those of the bibliography in Annex C.

Notice to users

Errata

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.

Interpretations

Current interpretations can be accessed at the following URL: http://standards.ieee.org/reading/ieee/interp/index.html.

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 with respect to the existence or validity of any patent rights in connection therewith. The IEEE shall not be responsible for identifying patents or patent applications for which a license may be required to implement an IEEE standard or for conducting inquiries into the legal validity or scope of those patents that are brought to its attention.

Participants

At the time this standard was completed, the NEMA Primary Connector Committee, 8CC-IV, had the following membership:

Frank M. Stepniak, *Chair*
Vince A. Baclawski, *Secretariat*

Roy Jazowski
John Makal
Tiebin Zhao
Carl Wentzel

At the time this standard was completed, the joint IEEE Power Engineering Society, Insulated Conductors Committee, B16W—Revision of IEEE Std 386 Working Group and ANSI C119.2 Subcommittee on Separable Insulated Connectors had the following membership:

Frank M. Stepniak, *Chair*
Harry Hayes, *Vice Chair*
Vince A. Baclawski, *Secretariat*

Darren Barnett
Ed Bradley
Dave Dixon
Thomas Champion
Jack Cherry
Russ Dantzler
Robert Gear
Stan Heyer
Trung Hiu
Stan Howell
Roy Jazowski
Gael Kennedy
Albert Kong
Glenn Luzzi
John Makal
Greg Mastoras
Rachel Mosier
Denis Pratt
Ewell (Tim) Robeson
Roger Schoneman
Bruce Shattuck
John Spence
Wes Spencer
Greg Stano
Tim Wall
Dennis Wedam
Carl Wentzel
Sanford Yoder
Tiebin Zhao

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

Marcos Andrade
Kenneth Bow
Harvey Bowles
Vern Buchholz
William Byrd
Thomas Callsen
Mary Capelli-Schellpfeffer
Michael Clodfeder
R. Daubert
Larry Davis
Frank Denbrock
John Densley
Mark Drabkin
John DuPont
Dana Dufield
Guru Dutt Dhingra
Stephen Early
Marcia Eblen
Gary Engmann
Michael Faulkenberry
Jorge Fernandez-Daher
Marcel Fortin
Robert Fulcomer
Robert Gear
David Gilmer
Ron Greenthaler
Randall Groves
Richie Harp
Jeffrey Hartenberger
Steven Hensley
Dennis Horwitz
David Jackson
Edward Jankowich
Robert Keefe
Gael R. Kennedy
Yuri Khersonsky
Hermann Koch
Edwin Kramer
Gregory Luri
Glenn Luzzi
John Makal
James Medek
Steven Meiners
John Merando
G. Michel
Shantanu Nandi
Gary L. Nissen
Neal Parker
Michael Pehosh
Dave Singleton
Michael Smalley
James Smith
Gregory Stano
Brian Steinbrecher
Frank M. Stepniak
John Teixeira
William Thue
Carl Wall
Daniel Ward
Lee Welch
Carl Wentzel
James Wilson
Jan Zawadzki
Tiebin Zhao
Donald W. Zipse

When the IEEE-SA Standards Board approved this standard on 15 September 2006, it had the following membership:

Steve M. Mills, *Chair*
Richard H. Hulett, *Vice Chair*
Don Wright, *Past Chair*
Judith Gorman, *Secretary*

Mark D. Bowman
Dennis B. Brophy
William R. Goldbach
Arnold M. Greenspan
Robert M. Grow
Joanna N. Guenin
Julian Forster*
Mark S. Halpin
Kenneth S. Hanus
William B. Hopf
Joseph L. Koepfinger*
David J. Law
Daleep C. Mohla
T. W. Olsen
Glenn Parsons
Ronald C. Petersen
Tom A. Prevost
Greg Ratta
Robby Robson
Anne-Marie Sahazizian
Virginia Sulzberger
Malcolm V. Thaden
Richard L. Townsend
Walter Weigel
Howard L. Wolfman

*Member Emeritus

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

Satish K. Aggarwal, *NRC Representative*
Richard DeBlasio, *DOE Representative*
Alan H. Cookson, *NIST Representative*

Catherine Berger
IEEE Standards Editor

William Ash
IEEE Standards Program Manager, Technical Program Development

Contents

IEEE Standard for Separable Insulated Connector Systems for Power Distribution Systems Above 600 V

1. Scope

This standard establishes definitions, service conditions, ratings, interchangeable construction features, and tests for loadbreak and deadbreak separable insulated connector systems rated above 600 V, 600 A or less, for use on power distribution systems.

2. Normative references

The following referenced documents are indispensable for the application of this document. For undated references, the latest edition of the referenced document (including any amendments or corrigenda) applies.

ANSI C119.4, Electrical Connectors-Connectors for Use between Aluminum-to-Aluminum or Aluminum-to-Copper Bare Overhead Connectors.[1]

ANSI/ASQC Z1.4, Sampling Procedures and Tables for Inspection by Attributes.

ASTM F467, Standard Specification for Nonferrous Nuts for General Use.[2]

IEEE Std 4™, IEEE Standard Techniques for High-Voltage Testing.[3, 4]

IEEE Std 592™, IEEE Standard for Exposed Semiconducting Shields on High-Voltage Cable Joints and Separable Insulated Connectors.

[1] ANSI publications are available from the Sales Department, American National Standards Institute, 25 West 43rd Street, 4th Floor, New York, NY 10036, USA (http://www.ansi.org/).
[2] ASTM publications are available from the American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959, USA (http://www.astm.org/).
[3] IEEE publications are available from the Institute of Electrical and Electronics Engineers, 445 Hoes Lane, Piscataway, NJ 08855-1331, USA (http://standards.ieee.org/).
[4] The IEEE standards or products referred to in this clause are trademarks of the Institute of Electrical and Electronics Engineers, Inc.