



ANSI C119.4-2016

*American National Standard for Electric Connectors—
Connectors for Use between Aluminum-to-Aluminum and
Aluminum-to-Copper Conductors Designed for Normal Operation at or
Below 93°C and Copper-to-Copper Conductors Designed for
Normal Operation at or Below 100°C*

Secretariat:

National Electrical Manufacturers Association

Approved: July 7, 2016

American National Standards Institute, Inc.

NOTICE AND DISCLAIMER

The information in this publication was considered technically sound by the consensus of persons engaged in the development and approval of the document at the time it was developed. Consensus does not necessarily mean that there is unanimous agreement among every person participating in the development of this document.

ANSI standards and guideline publications, of which the document contained herein is one, are developed through a voluntary consensus standards development process. This process brings together volunteers and/or seeks out the views of persons who have an interest in the topic covered by this publication. While NEMA administers the process to promote fairness in the development of consensus, it does not write the document and it does not independently test, evaluate, or verify the accuracy or completeness of any information or the soundness of any judgments contained in its standards and guideline publications.

NEMA disclaims liability for any personal injury, property, or other damages of any nature whatsoever, whether special, indirect, consequential, or compensatory, directly or indirectly resulting from the publication, use of, application, or reliance on this document. NEMA disclaims and makes no guaranty or warranty, expressed or implied, as to the accuracy or completeness of any information published herein, and disclaims and makes no warranty that the information in this document will fulfill any of your particular purposes or needs. NEMA does not undertake to guarantee the performance of any individual manufacturer or seller's products or services by virtue of this standard or guide.

In publishing and making this document available, NEMA is not undertaking to render professional or other services for or on behalf of any person or entity, nor is NEMA undertaking to perform any duty owed by any person or entity to someone else. Anyone using this document should rely on his or her own independent judgment or, as appropriate, seek the advice of a competent professional in determining the exercise of reasonable care in any given circumstances. Information and other standards on the topic covered by this publication may be available from other sources, which the user may wish to consult for additional views or information not covered by this publication.

NEMA has no power, nor does it undertake to police or enforce compliance with the contents of this document. NEMA does not certify, test, or inspect products, designs, or installations for safety or health purposes. Any certification or other statement of compliance with any health- or safety-related information in this document shall not be attributable to NEMA and is solely the responsibility of the certifier or maker of the statement.

AMERICAN NATIONAL STANDARD

Approval of an American National Standard requires verification by The American National Standards Institute, Inc. (ANSI) that the requirements for due process, consensus, and other criteria for approval have been met by the standards developer. An American National Standard implies a consensus of those substantially concerned with its scope and provisions. Consensus is established when, in the judgment of the ANSI Board of Standards Review, substantial agreement has been reached by directly, and materially affected interests. Substantial agreement means much more than a simple majority, but not necessarily unanimity. Consensus requires that all views and objections be considered, and that a concerted effort be made toward their resolution.

The existence of an American National Standard does not in any respect preclude anyone, whether s/he has approved the standard or not, from manufacturing, marketing, purchasing, or using products, processes, or procedures not conforming to the standards. It is intended as a guide to aid the manufacturer, the consumer, and the general public.

The American National Standards Institute, Inc., does not develop standards and will in no circumstances give an interpretation of any American National Standard. Moreover, no person shall have the right or authority to issue an interpretation of an American National Standard in the name of the American National Standards Institute, Inc. Requests for interpretations should be addressed to the secretariat or sponsor whose name appears on this title page.

CAUTION NOTICE: This American National Standard may be revised or withdrawn at any time. The procedures of the American National Standards Institute, Inc., require that action be taken periodically to reaffirm, revise, or withdraw this standard. Purchasers of American National Standards may receive current information on all standards by calling or writing the American National Standards Institute, Inc.

Published by

National Electrical Manufacturers Association
1300 North 17th Street, Suite 900
Rosslyn, Virginia 22209

© 2016 National Electrical Manufacturers Association

All rights, including translation into other languages, reserved under the Universal Copyright Convention, the Berne Convention for the Protection of Literary and Artistic Works, and the International and Pan American copyright conventions.

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

Printed in the United States of America

< This page intentionally left blank. >

CONTENTS

Foreword	v
1 Scope and Purpose	1
1.1 Scope	1
1.2 Purpose	1
2 Referenced Standards.....	1
3 Definitions.....	1
4 Performance Requirements	2
4.1 General.....	2
4.1.1 Sample Non-Conformance	2
4.1.2 Substantive Change to a Product	2
4.2 Mechanical Tests	3
4.2.1 Tensile Strength and Rated Conductor Strength	3
4.2.2 Tap Connector.....	4
4.2.3 Tee Connector.....	4
4.2.4 Wye Connector.....	4
4.2.5 Bolt Tightening	4
4.3 Electrical Tests	4
4.3.1 Current Cycle Resistance Stability	4
4.3.2 Current Cycle Temperature Stability.....	5
4.3.3 Copper System Thermal Stability	5
4.4 Reusability	5
5 Sampling.....	5
6 Test Methods	6
6.1 General.....	6
6.1.1 Test Conductors	6
6.1.2 Conductor Preparation for Mechanical Tests	6
6.1.3 Conductor Preparation for Electrical Tests	6
6.2 Mechanical.....	6
6.2.1 Pullout Strength.....	6
6.2.2 Tensile Strength	6
6.2.3 Bolt Tightening Test.....	7
6.2.4 Run Conductor Damage Test	7
6.3 Electrical.....	7
6.3.1 Current Cycle Test.....	7
6.3.2 Static Heating Stability Test	9
7 Test Report.....	9
8 Connector Marking	9
9 Installation Instructions.....	10
10 Tables & Figures.....	11

Annexes

Annex A Current Cycle Data Sheet	12
Annex B Applicable Standards.....	13
Annex C Performance Requirements for the ANSI C119.0 Annex B Optional Fault Current Test Class "F" Connectors.....	15
Annex D Performance Requirements for the ANSI C119.0 Annex C Optional Corrosion Test Addition to Current Cycle Test (CCT) Class "S" Connectors	16
Annex E Shunt Class Connector Devices.....	17

Tables

Table 1 Test Duration.....	11
----------------------------	----

Worksheet

Current Cycle Data Sheet.....	12
-------------------------------	----

Foreword (Neither this foreword nor any of the informative annexes is a part of American National Standard C119.4-2016)

The standard covers electrical and mechanical requirements for connectors used in tests to establish performance characteristics of connectors used to join aluminum-to-aluminum, aluminum-to-copper, or copper-to-copper bare and insulated conductors.

It is the responsibility of the user to determine the proper connector for any particular application. The user may request the manufacturer to perform any additional desired testing beyond that required by the C119.4 standard performance tests.

Extensive editorial changes have been made in the C119.4-2016 version of the standard. The editorial changes to the standard are as follows:

1. Testing methods and equipment requirements were removed since all testing methods and equipment are now addressed in the new ANSI C119.0-2015, Testing Methods and Equipment Common to the ANSI C119 Family of Standards document.
2. The remaining performance standards and requirements unique to the C119.4 standard have been reorganized under a new numbering format.

This revision includes the addition of one optional set of performances requirements: Shunt Class Connector Devices (Annex E). These performance requirements are not a part of the required C119.4 standard performance requirements. The subcommittee has provided these optional performance requirements as a reference in response to users who have requested guidance for testing of shunt devices. The user may request that the manufacturer perform any additional tests that are not a part of the required C119.4 standard performance requirements.

This standard was initially developed under the direction of the Transmission and Distribution Committee of the Edison Electric Institute (EEI). Tentative performance-type specifications for electrical characteristics were issued in joint report form in 1958 by a steering committee of EEI and an advisory committee of manufacturers on the aluminum conductor research project (EEI Pub. No. 59-70 *Tentative Specifications for Connectors for Aluminum Conductors*).

Experience gained from extensive trial use further confirmed the performance criteria and test conditions of the tentative specifications and led to the development of Standard TDJ 162 in October 1962 by a joint committee of EEI and the National Electrical Manufacturers Association (NEMA). TDJ 162 was subsequently superseded by this document.

The C119.4 Subcommittee of the Accredited Standards Committee on Connectors for Electric Utility Applications, C119, in its constant review of the publication, continues to seek out the views of responsible users that will contribute to the development of better standards. Suggestions for improvement of this standard are welcome.

Send to:

The National Electrical Manufacturers Association
1300 North 17th Street, Suite 900
Rosslyn, Virginia 22209.

This standard was processed and approved for submittal to ANSI by the Accredited Standards Committee on Connectors for Electrical Utility Applications, C119. Committee approval of this standard does not necessarily imply that all committee members voted for its approval. At the time it approved this standard, the C119 Main Committee had the following members:

Harry Hayes, Chairperson
Mike Zaffina, Vice Chairperson
Paul Orr, Secretary

Organizations Represented

Electric Utility Industry	Zachary Anderson Michael Dyer Harry Hayes C. Cory Morgan Wilson Peppard Angelo Rodriguez Curt Schultz Gerald Wasielewski William Winge Larry Witteck Michael Zaffina
EPRI	Gary Sibilant
National Electric Energy Testing Research & Applications Center	Joe Goldenburg
National Electrical Manufacturers Association	Scott Casler Matt Cawood Peter Chan David Coulombe Seydou Diop Jeff Door Matt Gaertner David Hughes Kevin Jenkins Barry Johnson Eyass Khansa Ron Kmiecik Colin McCullough Alejandro Pineda Wayne Quesnel Gary Schrader David Shibilila Ben Sparks Dan Stanton Justin Tuchscherer
CFE LAPEM	Giovanni Velazquez
Kinectrics Inc.	Dmitry Ladin Craig Pon
Powertech Labs Inc.	Chris Morton

Tennessee Valley Authority	Joseph Graziano Ryan Stargel
Underwriters Laboratories Inc.	Kenneth McKinney
Other	Enes Basic Waymon Goch Tip Goodwin Luke Hill Jonathon Olzewski Kevin Puccini Joe Renowden Walter Romanko Ryan Stough Carl Tamm Robert Westbrook Andrew Zwit

The C119.4 Subcommittee on Connectors for use Between Aluminum-to-Aluminum and Aluminum-to-Copper Conductors Designed for Normal Operation at or Below 93°C and Copper-to-Copper Conductors Designed for Normal Operation at or Below 100°C, which developed the revisions of this standard, had the following members at the time of its approval:

William Winge, Chairperson

David Shibilila, Vice Chairperson

Paul Orr, Secretary

- Zachery Anderson
- Enes Basic
- Todd Beauchamp
- Scott Casler
- Matt Cawood
- Peter Chan
- Constantino Dangelo
- Seydou Diop
- Jeff Door
- Michael Dyer
- Matt Gaertner
- Waymon Goch
- Joe Goldenburg
- Tip Goodwin
- Joseph Graziano
- Douglas Harms
- Harry Hayes
- Luke Hill
- Trung Hiu
- David Hughes
- Kevin Jenkins
- Barry Johnson
- Eyass Khansa
- Ron Kmiecik
- Clint Mason
- Colin McCullough
- Kenneth McKinney

Richard Morin
Chris Morton
Alex Pantouris
Wilson Peppard
Zsolt Peter
Alejandro Pineda
Craig Pon
Kevin Puccini
Wayne Quesnel
Joe Renowden
Angelo Rodriguez
Jesus Rodriguez
Walker Romanko
Gary Schrader
Curt Schultz
David Shibilila
Gary Sibilant
Ben Sparks
Paul Springer
Dan Stanton
Ryan Stough
Stanley Szyszko
Carl Tamm
Neil Vandermeulen
Giovanni Velazquez
Richard Waidelich
Gerald Wasielewski
Allen Wilcox
William Winge
Larry Witteck
Michael Zaffina
James Zahnen
Andrew Zwit

1 Scope and Purpose

1.1 Scope

This standard covers connectors used for making electrical connections between aluminum-to-aluminum or aluminum-to-copper or copper-to-copper conductors used on distribution and transmission lines for electric utilities.

This standard establishes the electrical and mechanical test requirements for electrical connectors. Additional optional tests are shown in the annexes. This standard is not intended to recommend operating conditions or temperatures.