ANSI C119.5-2024

American National Standard for Electric Connectors— Insulation Piercing Connector Systems, Rated 2000 Volts or Less (Low-Voltage Aerial Bundled Cables and Insulated and Non-Insulated Line Wires)

Secretariat:

National Electrical Manufacturers Association

Approved November 4, 2024

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.

NEMA 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 and establishes rules 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, express 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.

© 2025 National Electrical Manufacturers Association

AMERICAN NATIONAL STANDARD

Approval of an American National Standard requires verification by ANSI that the requirements for due process, consensus, and other criteria for approval have been met by the Standards developer.

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 use of American National Standards is completely voluntary; their existence does not in any respect preclude anyone, whether he has approved the Standards or not, from manufacturing, marketing, purchasing, or using products, processes, or procedures not conforming to the Standards.

The American National Standards Institute 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. Requests for interpretations should be addressed to the secretariat or sponsor whose name appears on the title page of this Standard.

Caution Notice: This American National Standard may be revised or withdrawn at any time. The procedures of the American National Standards Institute 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.

Published by:

National Electrical Manufacturers Association
1812 North Moore Street, Suite 2200, Arlington, VA 22209

© 2025 National Electrical Manufacturers Association
All rights reserved 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 the prior written permission of the publisher.

Printed in the United States of America.

Contents

Foreword iv
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
4.2 Mechanical Tests 3
4.3 Electrical Tests 3
5 Sampling 5
5.1 General 5
5.2 Mechanical Tests 5
5.3 Electrical Tests 6
6 Test Methods 6
6.1 General 6
6.2 Mechanical Tests 7
6.3 Electrical Tests 8
7 Test Report 13
8 Marking 13
8.1 Connector Marking 13
8.2 Assembly Instructions 13

Annexes

Annex A Standards That Are Applicable to C119.5 by Inference but Not Directly Referenced in the Standard (Informative) 25
Annex B Heat Cycle Data Sheet (Informative) 26
Annex C Loop Construction (Informative) 27
Annex D Thermocouple Location 28

Tables

Table 1 One (1) Minute Load Test Values 14
Table 2 Tightening Torque 15
Table 3 Minimum Number of Samples 15
Table 4 Length of Exposed Conductor 15
Table 5 Oven-Conditioning Temperatures 16
Table 6 Insulation Puncture and Flashover Test Voltage, Test A and B 16
Table 7 Conductor Lengths for Current Cycle Tests, AWG Sizes 16
Table 8 Conductor Lengths for Current Cycle Tests, Square Millimeter Sizes 16
Table 9 Suggested Initial Test Current to Raise AWG Control Conductor Temperature 100°C Above Ambient 17
Table 10 Suggested Initial Test Current to Raise Square Millimeter Control Conductor Temperature 100°C Above Ambient 17
Table 11 Current Cycle Periods for AWG Control Conductors 17
Table 12 Current Cycle Periods for Square Millimeter Control Conductors 18
Table 13 Resistance and Temperature Measurement Intervals 18

© 2025 National Electrical Manufacturers Association

Figures

Figure 1 One (1) Minute Load Test Configuration 19
Figure 2 Setup for Installation of Connector Mounting at Low Temperature Closing Circuit Indicator (Continuity) 20
Figure 3 An Example of a Vertical Test Configuration 21
Figure 4 Dielectric Withstand Test for Watertight Connectors 22
Figure 5 Water Penetration Test for Watertight Connectors 23
Figure 6 Connector Markings 24

Worksheet

ANSI C119.5 Worksheet 26

© 2025 National Electrical Manufacturers Association

Foreword (This foreword is not part of American National Standard C119.5.)

This standard describes current cycle, mechanical, and environmental tests used to establish performance characteristics of insulation piercing connectors used to join insulated and non-insulated overhead conductors.

The qualification tests may be made before supplying, on a commercial basis, connectors covered by this standard, in order to demonstrate satisfactory performance characteristics to meet the intended application. Qualification tests, once successfully completed, need not be repeated, unless changes are made in the materials, design, or manufacturing process that might change the connector's performance characteristics.

The Subcommittee on Insulation Piercing Connectors 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 will be welcome. They should be sent to the National Electrical Manufacturers Association, 1812 North Moore Street, Suite 2200, Arlington, 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 ANSI ASC C119 Committee had the following members:

Mike Dyer, Chair
Joe Goldenberg, Vice Chair
Paul Orr, Secretary

C119 Members

Matt Cawood	ABB Electrification
Seydou Diop	Classic Connectors Inc.
Michael Dyer	Salt River Project
Matt Gaertner	MacLean Power Systems LLC
Frédéric Gervais	Hydro-Quebec
Joe Goldenburg	NEETRAC
Jun Golo	Idaho Power Company
Genti Gorja	Kinectrics Inc.
Trung Hiu	USDA Rural Development Utilities Programs
Alan Kasanow	Southern California Edison
Pat Kelly	Eversource Energy
Martha Lachmayr	SDGE
Colin McCullough	3M
Gabriel Okafor	Hubbell Power Systems
Jonathon Olszewski	Preformed Line Products
Robert Osborne	UL Solutions
Angelo Rodriguez	Florida Power & Light Company
Gary Schrader	BURNDY LLC, A Hubbell Company
Gary Sibilant	EPRI
Dan Stanton	DMC Power
Ryan Stargel	Tennessee Valley Authority
Curtis Stidham	TE Connectivity
Carl Tamm	Classic Connectors Inc.
Giovanni Velazquez	CFE LAPEM
Matthew Welborn	AFL
Robert Westbrook	Polaris Electrical Connectors
Christopher Wong	CTC Global
Andrew Zwit	ILSCO LLC

© 2025 National Electrical Manufacturers Association

The C119.5 Subcommittee on Insulation Piercing Connector Systems, Rated 600 Volts or Less (Low-Voltage Aerial Bundled Cables and Insulated and Non-Insulated Line Wires), which developed this standard, had the following members:

NEMA Subcommittee Secretary, Paul Orr
Chair, Gary Schrader, BURNDY LLC, A Hubbell Company
Vice Chair, Matt Jolani, ASK / Sicame

Matt Cawood	ABB Electrification
Seydou Diop	Classic Connectors Inc.
Jeff Door	H-J Family of Companies
Michael Dyer	Salt River Project
Jun Golo	Idaho Power Company
Trung Hiu	USDA Rural Development Utilities Programs
Matt Jolani	ASK / Sicame
Alan Kasanow	Southern California Edison
Colin McCullough	3M
Gabriel Okafor	Hubbell Power Systems
Jonathon Olszewski	Preformed Line Products
Robert Osborne	UL Solutions
Pat Pearl	Sicame Australia
Angelo Rodriguez	Florida Power & Light Company
Gary Schrader	BURNDY LLC, A Hubbell Company
Carl Tamm	Classic Connectors Inc.
Robert Westbrook	Polaris Electrical Connectors
Andrew Zwit	ILSCO LLC

© 2025 National Electrical Manufacturers Association

< This page intentionally left blank. >

© 2025 National Electrical Manufacturers Association

1 Scope and Purpose

1.1 Scope

This standard covers insulation piercing connectors used for making electrical connections between insulated, insulated-to-bare, and bare-to-bare conductors rated 1500 V / 2000 V (Sealed/Non-Sealed) or less and 90°C (low-voltage aerial bundled cables and bare and insulated line wires) on overhead distribution lines for electric utilities. Underground insulation piercing connector systems rated at 600 V are covered by ANSI C119.1.

Since cable and insulation types exist in very different types and configurations, insulation piercing connectors cannot be designed for the full range of cable and insulation possibilities (cable cross-section and material, insulation material and thickness). The manufacturer is to indicate the cable and insulation types the connector is designed for, and conformity to this standard shall be established by testing with these cable and insulation types.

This standard establishes the electrical, mechanical, and environmental test requirements for electrical insulation piercing connectors. This standard is not intended to recommend operating conditions or temperatures.

1.2 Purpose

The purpose of this standard is to give reasonable assurance to the user that connectors meeting the requirements of this standard will perform in a satisfactory manner, provided they have been properly selected for the intended application and are installed in accordance with the manufacturer's recommendations. The service operating conditions and the selection of the connector class is the responsibility of the user.

2 Referenced Standards

This standard is intended to be used in conjunction with the following standards. When the referenced standard is superseded by a new revision, the latest referenced revision shall apply. Standards that are referenced by inference are shown in Annex A.

ASTM E4	*Standard Practices for Force Calibration and Verification of Testing Machines*
IEEE 837-2014	*Standard for Qualifying Permanent Connections Used in Substation Grounding*
ANSI C119.0	*Testing Methods and Equipment Common to the ANSI C119 Family of Standards*

3 Definitions

bolted connector: A tap connector that makes an electrical connection utilizing bolting (or a bolt and nut combination) to apply contact pressure to the conductor.

Class W: A connector designated "Class W" has met the requirements of the Dielectric Withstand/Leakage Current and Water Penetration Tests.

connector: A device joining two or more conductors to provide a continuous electrical path.

control cable: A conductor of the same type and size as the conductor in the current cycle loop that serves as a reference for setting test current and monitoring temperature.

equalizer: A device installed in the test loop to ensure a point of equipotential in a stranded conductor.

© 2025 National Electrical Manufacturers Association