



ANSI/NEMA WC 67-2015

*American National Standard for Uninsulated Conductors—
Used in Electrical and Electronic Applications*

Secretariat:

National Electrical Manufacturers Association

Approved: February 13, 2015

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

© 2015 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

FOREWORD

This standard publication was developed by the NEMA High Performance Wire and Cable Section as an alternative non-government standard to MIL-DTL-29606. This publication assures that all included conductors, both metric and English (inch/pound) sizes will meet the current requirements associated with high-reliability aerospace electrical and electronic equipment. This standard was adapted from, and harmonizes the following specifications: MIL-DTL-29606, ISO 2635, PREN 2083, and BSI 231. In addition, it also utilizes many of the ASTM conductor standards for reference purposes.

Compliance with provisions of this standards publication is strictly voluntary and any certification of compliance is left to the discretion of the buyer and seller.

In the preparation of this standard publication, input of users and other interested parties has been considered. Inquiries, comments, and proposed or recommended revisions should be submitted to the concerned NEMA product subdivision by contacting the:

Senior Technical Director, Operations
National Electrical Manufacturers Association
1300 N. 17th Street
Rosslyn, Virginia 22209

This standards publication was developed by the NEMA High Performance Wire and Cable Section. Section approval of the standard does not necessarily imply that all section members voted for its approval or participated in its development. At the time it was approved, the section was composed of the following members:

AFC Cable Systems	New Bedford, MA
AmerCable	El Dorado, AR
Belden Inc.	St. Louis, MO
Berk-Tek a Nexans Company	Elm City, NC
Cable USA LLC.	Naples, FL
Coleman Cable Inc.	Waukegan, IL
General Cable	Highland Heights, KY
Harbour Industries LLC.	Shelburne, VT
IWG High Performance Conductors	Inman, SC
Kaneka North America	Pasadena, TX
Leviton Manufacturing Co., Inc.	Gardena, CA
Quirk Wire Company, Inc.	West Brookfield, MA
Radix Wire Company	Euclid, OH
RSCC Aerospace and Defense	East Granby, CT
Southwire Company	Carrollton, GA
The Monroe Cable Company, Inc.	Middletown, NY
The Okonite Company	Ramsey, NJ
TE Connectivity	Menlo Park, CA

CONTENTS

FOREWORD..... ii

Section 1 GENERAL..... 1

1.1 Scope 1

1.2 Referenced Standards 1

Section 2 DEFINITIONS 3

Section 3 PART NUMBERING SYSTEMS..... 5

Section 4 REQUIREMENTS 6

4.1 General 6

4.2 Conductor Material and Coating 6

4.2.1 Bare (Uncoated) Copper (BC) 6

4.2.2 Tin Coated Copper (TCC) 6

4.2.3 Silver Coated Copper 6

4.2.3.1 Silver Coated Copper (SCC) 6

4.2.3.2 Silver Coated Copper (SCC1)..... 6

4.2.4 Nickel Coated Copper (NCC) 6

4.2.5 Heavy Nickel Coated Copper (NHC)..... 6

4.2.6 Silver Coated Copper Alloy 6

4.2.6.1 Silver Coated Copper Alloy (SCA)..... 7

4.2.6.2 Silver Coated Copper Alloy (SCA1)..... 7

4.2.7 Nickel Coated Copper Alloy (NCA)..... 7

4.2.8 Tin Coated Copper Alloy (TCA)..... 7

4.2.9 Heavy Nickel Coated Copper Alloy (NHA) 7

4.2.10 Silver Coated Ultra-High Strength Copper Alloy (SCU) 7

4.2.11 Nickel Coated Ultra-High Strength Copper Alloy (NCU) 7

4.2.12 Aluminum Strands (ALU)..... 7

4.2.13 Type K Thermocouple Extension Conductor (KPH, KPS, KNH, and KNS) 7

4.2.14 Nickel-Coated Copper-Clad Steel (NCCCS) 8

4.2.15 Silver-Coated Copper-Clad Steel (SCCCS) 8

4.3 Conductor Construction 8

4.3.1 Single End..... 8

4.3.2 Concentric Stranding 8

4.3.3 Rope-Lay Stranding..... 8

4.3.4 Bunch Stranding 8

4.3.5 Allowable Splices..... 8

4.3.5.1 Whole Conductor Splices..... 9

4.4 Conductor Properties 9

4.4.1 Diameter..... 9

4.4.2 Elongation 9

4.4.3 Tensile or Break Strength 9

4.4.4 Conductor DC Resistance 9

4.4.5 Continuity of Coating..... 9

4.4.6 Coating Thickness..... 9

4.4.6.1 Coating thickness of Types SCC1 and SCA1..... 9

4.4.7 Weight 9

4.4.8 Solderability of Tin and Silver Coated Conductors 10

4.4.9 Workmanship 10

Section 5 QUALITY ASSURANCE 11

5.1 Responsibility for Inspection 11

5.2 Quality Conformance Inspection of Finished Product..... 11

5.2.1	Inspection Lot and Unit of Product.....	11
5.2.2	Sampling for Performance Inspection.....	11
5.2.3	Quality Conformance Inspection.....	11
Section 6	TEST METHODS	12
6.1	Visual	12
6.2	Conductor Diameter	12
6.3	Conductor Elongation, Tensile, and Break Strength.....	12
6.3.1	Test Equipment	12
6.3.2	Test Samples.....	12
6.3.3	Test Procedure	13
6.3.3.1	Spool-Type Grips.....	13
6.3.3.2	Jaw-Type Grips	13
6.3.3.3	Soft or Annealed Copper and Copper-Clad Steel	13
6.3.3.4	High Strength Copper Allow and Ultra-High Strength Copper Allow	13
6.3.3.5	Aluminum Conductors	13
6.3.4	Calculations	13
6.3.4.1	Elongation.....	13
6.3.4.2	Tensile Strength	14
6.4	Conductor DC Resistance	14
6.4.1	Test Equipment	14
6.4.2	Test Specimen.....	14
6.4.3	Measurement.....	14
6.4.4	Temperature Correction	15
6.5	Continuity of Coating.....	15
6.5.1	Single End	15
6.5.2	Stranded Conductors.....	15
6.6	Coating Thickness.....	16
6.7	Weight.....	16
6.8	Solderability.....	16
Section 7	VERIFICATION	17
Section 8	PACKAGING	18
8.1	Packaging Requirements.....	18
8.2	Labeling.....	18
Section 9	NOTES.....	19
9.1	Ordering Data.....	19
Section 10	DETAILS OF CONDUCTORS.....	20

Section 1 GENERAL

1.1 SCOPE

This standard covers the following uninsulated conductors:

- a) Single end (solid) and stranded;
- b) coated and uncoated copper;
- c) coated copper alloy;
- d) coated copper-clad steel;
- e) aluminum conductors; and,
- f) thermocouple extension conductors.

These conductors are used primarily in insulated wires for aerospace, electrical, electronic, and other high performance applications.

Both metric and English (inch/pound) conductors are included in this standard. Where alternative units are shown in parenthesis, English (inch/pound) units shall be normative.