

**NEMA Standards Publication WC 56-1986 (R2018)**

*3.0 kHz Insulation Continuity Proof Testing of Wire and Cable*

*Published by:*

**National Electrical Manufacturers Association**

1300 North 17<sup>th</sup> Street, Suite 900  
Rosslyn, Virginia 22209

[www.nema.org](http://www.nema.org)

© 2018 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.

## **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.

The National Electrical Manufacturers Association (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, 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.

## Foreword

This standards publication has been prepared to delineate the basic requirements for spark testing apparatus utilizing a 3 kHz nominal frequency. It is intended as a substitute or an alternative to conventional spark testing at an industrial frequency.

The use of an elevated frequency will allow a reduction in the electrode length while exposing the wire or cable to a suitable number of wave crests.

Performance criteria have been included which will stipulate minimum sensitivities for the equipment. Underwriters Laboratories has recognized 3 kHz spark test for testing of wire or cable. The NEMA High-Performance Wire and Cable Section prepared this test procedure.

Comments or proposed revisions are welcomed and should be submitted to:

Senior Technical Director, Operations  
National Electrical Manufacturers Association  
1300 North 17th Street, Suite 900  
Rosslyn, VA 22209

At the time of the reaffirmation of this standard in 2012, the NEMA High-Performance Wire and Cable Section comprised the following member companies:

AFC Cable Systems, Inc. a part of Atkore International	New Bedford, MA
Apical Division, Kaneka Texas Corporation	Pasadena, TX
Belden	St. Louis, MO
Cable USA LLC	Naples, FL
Champlain Cable Corporation	Colchester, VT
Coleman Cable, Inc.	Waukegan, IL
Freeport-McMoRan Copper and Gold	Phoenix, AZ
General Cable	Highland Heights, KY
Harbour Industries LLC	Shelburne, VT
IWG High Performance Conductors	Inman, SC
Leoni Wire, Inc.	Chicopee, MA
Marmon Innovation and Technology Group	Seymour, CT
Prestolite Wire and Cable	Southfield, MI
Quirk Wire Company, Inc.	West Brookfield, MA
Radix Wire Company	Euclid, OH
RSCC Wire and Cable Group	East Granby, CT
Rubadue Wire Co., Inc.	Greeley, CO
Southwire Company	Carrollton, GA
TE Connectivity Ltd., a Tyco Electronics Corporation	Menlo Park, CA
The Monroe Cable Company, Inc.	Middletown, NY
The Okonite Company	Ramsey, NJ

## CONTENTS

<b>Foreword</b>		<b>i</b>
<b>Section 1</b>	<b>Test Equipment</b>	<b>1</b>
1.1	Electrode	1
	1.1.1 Electrode Length	1
	1.1.2 Use of Electrode	1
1.2	Voltage Shape	1
1.3	Voltage Frequency	1
1.4	Voltmeter	1
1.5	Regulation	1
1.6	Failure Detection Circuit	2
1.7	Safety of Equipment and Safe Use of Equipment	4
<b>Section 2</b>	<b>Test Procedure</b>	<b>5</b>
2.1	Set-Up	5
	2.1.1 Voltage	5
	2.1.1.1 Maximum Voltage	5
	2.1.2 Frequency	5
	2.1.3 Line Speed	5
	2.1.3.1 Maximum	5
	2.1.3.2 Minimum	5
2.2	Fault Identification	6
2.3	Calibration and Crest Factor	6
2.4	Ventilation of Work Area	6

## **Scope**

This standard covers a general procedure for continuous voltage proof testing of wire and cable. It is intended to apply primarily to the final inspection of wire or cable for the purpose of finding and eliminating defects prior to shipment or before use. The method can also be used to eliminate defects at an early stage of manufacturing, i.e., for wire or cable to be used in multiconductor cables or jacketed constructions.

Because of possible damage in handling, damage caused by repeated testing, and variations in test parameters, the comparison between producer's and consumer's test results is not significant.