ANSI/NEMA WC 53

Standard Test Methods for Extruded Dielectric Power, Control, Instrumentation, and Portable Cables for Test





Approved as an American National Standard ANSI Approval Date: April, 7, 2016

ANSI/NEMA WC 53 ICEA T-27-581-2016

Standard Test Methods for Extruded Dielectric Power, Control, Instrumentation, and Portable Cables for Test

Prepared by:

Insulated Cable Engineers Association, Inc. P.O. Box 1568
Carrollton, Georgia 30112

Published by:

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

www.nema.org

© 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.

This is a preview. Click here to purchase the full publication.

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) and the Insulated Cable Engineers Association (ICEA) 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 persons who have an interest in the topic covered by this publication. While NEMA and ICEA administer the process and establish rules to promote fairness in the development of consensus, they do not independently test, evaluate, or verify the accuracy or completeness of any information or the soundness of any judgements contained in its standards and guideline publications.

NEMA and ICEA disclaim liability for 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 and ICEA disclaim and make 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 and ICEA do 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 and ICEA are not undertaking to render professional or other services for or on behalf of any person or entity, nor are NEMA and ICEA 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 and ICEA have no power, nor do they undertake to police or enforce compliance with the contents of this document. NEMA and ICEA do 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 ICEA and is solely the responsibility of the certifier or maker of the statement.

© 2016 National Electrical Manufacturers Association

CONTENTS

	Foreword	
Section 1	General	1
1.1	Scope	1
1.2	References	
	1.2.1 Normative References	
Section 2	Electrical Methods	
2.1	Conductor dc Resistance	
2.1	2.1.1 Method When Sample Nominal Resistance is 1 Ohm or More	
	2.1.2 Method When Sample Nominal Resistance is Less Than 1 Ohm	
	I I	
		4
0.0	2.1.4 Converting Measured Conductor Resistance to Resistance at 25°C	
2.2	Voltage Tests on Completed Cables	
	2.2.1 General	
	2.2.2 ac Voltage Test	
	2.2.3 dc Voltage Test	
	2.2.4 Spark Testing	
2.3	Insulation Resistance	
	2.3.1 Single Conductor Cables	8
	2.3.2 Multiple Conductor Cables	
	2.3.3 Method to Determine the 1°F Coefficient Factor for an Insulation	8
	2.3.4 Converting Insulation Resistance to Insulation Resistance Constant	9
2.4	Dissipation Factor (Df), Capacitance (C), and Dielectric Constant	
2.5	Suitability of Insulation Compounds for Use On Dc Circuits in Wet Locations	
2.6	Accelerated Water Absorption Test, Electrical Method at 60 hz (Em-60)	
2.7	Dielectric Constant and Voltage Withstand for Nonconducting Stress Control Layers	12
2.8	Specific Surface Resistivity	
2.9	U-Bend Discharge Resistance	
2.10	Track Resistance	
2.11	Volume Resistivity	
	2.11.1 Conductor Stress Control	
	2.11.2 Insulation Shield	
0.40	2.11.3 Four-electrode Method	
2.12	Semiconducting Jacket Radial Resistivity Test	
	2.12.1 Sample Preparation	
	2.12.2 Test Equipment Setup	
	2.12.3 Calculation	
2.13	Dry Electrical Test for Class III Insulations (Shielded Medium Voltage Only)	
	2.13.1 Test Samples	
	2.13.2 Test Procedure	
	2.13.3 Electrical Measurements	
2.14	Discharge Resistance Test for discharge resistant Insulation	. 18
	2.14.1 Test Specimens	
	2.14.2 Test Environment	
	2.14.3 Test Electrodes	
2.15	Wet Insulation Resistance Stability (600–2000 Volts)	
Section 3	Dimensional Methods	
3.1	Conductor Cross-Sectional Area by Diameter Measurements	21
3.2	Thickness of Components Over a Conductor	
٥.٢	3.2.1 Optical Measuring Device Method for Any Component	۱ ک . 19
	3.2.2 Micrometer Method for Unbonded Components	
	3.2.3 Extruded Insulation or Insulation Shield or Jacket	
	3.2.4 Tape	
	3.2.5 Sheath	. 22

© 2016 National Electrical Manufacturers Association

	3.2.6 Bedding and Servings	22
3.3	Diameter over Cable Components	
	3.3.1 Micrometer Method for Conductors	
	3.3.2 Method for Any Component Except Conductors	22
	3.3.3 Tape Method for Any Component Having a Diameter 0.750 in. (19.1 mm)	
	or Greater	22
3.4	Protrusion and Convolution Measurement	22
Section 4	Physical Methods	
4.1	Adhesion (Stripping Force)	
4.2	Cold Bend	
4.3	Heat Deformation (Distortion)	
	4.3.1 Insulation Deformation	
	4.3.2 Deformation of Jackets, Insulating and Conducting	
4.4	Flexibility Test for Interlocked Armor	
4.5	Tear Resistance	
4.6	Gravimetric Water Absorption	
4.7	Direction and Length of Lay	
4.8	Jacket Irregularity Inspection	
4.9	Hot Creep Test	
4.10	Vertical Tray Flame Test	
4.10	4.10.1 70,000 BTU	
	4.10.2 210,000 BTU	
4.11	Physical And Aging Tests for Insulation, Jackets, and Nonmetallic Conducting Materials.	
4.11	4.11.1 Sampling	
	4.11.2 Number of Test Specimens	
	4.11.3 Size and Preparation of Specimens	
	4.11.4 Calculation for Area of Test Specimens	
	4.11.5 Physical Test Procedures	
	4.11.6 Retests	
	4.11.7 Tensile Strength Test	
	4.11.8 Tensile Stress Test	
	4.11.10 Set Tost	
	4.11.10 Set Test	
	4.11.11 Aging Tests	
4.10	4.11.12 Physical Tests for Nonmetallic Conducting Materials Intended for Extrusion	აა
4.12	Absorption Coefficient	
4.13	Heat Shock	
4.14	Environmental Cracking	
	4.14.1 Test Specimens	
4.45	4.14.2 Test Procedures	
4.15	Method For Flexibility Test for Continuous Corrugated Armor	
4.16	Shrinkback Test	
	4.16.1 Sample Preparation	
	4.16.2 Test Procedure	
4.17	Wafer Boil Test for Conductor And Insulation Shields	
4.18	Extruded Insulation Shield Removeability (Field Strippability) Test	35
/ 1Q	Tightness of Polyothylana, Jacket to Shooth Tost	25