

UL 486C

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Splicing Wire Connectors

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Underwriters Laboratories Inc. (UL)
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UL Standard for Safety for Splicing Wire Connectors, UL 486C

Fifth Edition, Dated September 7, 2004

Revisions: This Standard contains revisions through and including August 25, 2006.

Summary of Topics

These revisions include the following changes in requirements:

- *Revision to remove country-specific differences for Canada and Mexico for intermixing (direct-contact) of conductors of different materials;*
- *Addition of an explanatory note that insulating tubing with a VW1 rating is not equivalent to V2 rating and that the test is performed differently;*
- *Addition of requirements to address "families" of connectors;*
- *Reorganization and relocation of marking location guide, Table 24, to new Annex F; and*
- *Miscellaneous corrections and clarifications.*

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Text that has been changed in any manner is marked with a vertical line in the margin. Changes in requirements are marked with a vertical line in the margin and are followed by an effective date note indicating the date of publication or the date on which the changed requirement becomes effective.

The following table lists the future effective dates with the corresponding item.

Future Effective Date	References
October 10, 2006	Paragraphs 6.3.7, 6.3.8, 6.3.9, 10.6, 10.21, 10.22 and Table 19 and Annex F

The new and revised requirements are substantially in accordance with UL's Proposal(s) on this subject dated March 17, 2006.

The revisions dated August 25, 2006 include a reprinted title page (page1) for this Standard.

As indicated on the title page (page 1), this UL Standard for Safety is an American National Standard. Attention is directed to the note on the title page of this Standard outlining the procedures to be followed to retain the approved text of this ANSI/UL Standard.

As indicated on the title page (page1), this UL Standard for Safety has been adopted by the Department of Defense.

The master for this Standard at UL's Northbrook Office is the official document insofar as it relates to a UL service and the compliance of a product with respect to the requirements for that product and service, or if there are questions regarding the accuracy of this Standard.

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The requirements in this Standard are now in effect, except for those paragraphs, sections, tables, figures, and/or other elements of the Standard having future effective dates as indicated in the preface. The prior text for requirements that have been revised and that have a future effective date are located after the Standard, and are preceded by a "SUPERSEDED REQUIREMENTS" notice.

New product submittals made prior to a specified future effective date will be judged under all of the requirements in this Standard including those requirements with a specified future effective date, unless the applicant specifically requests that the product be judged under the current requirements. However, if the applicant elects this option, it should be noted that compliance with all the requirements in this Standard will be required as a condition of continued Listing and Follow-Up Services after the effective date, and understanding of this should be signified in writing.

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Association of Standardization and Certification
NMX-J-548-ANCE-06
Second Edition



Canadian Standards Association
C22.2 No. 188-04
Second Edition



Underwriters Laboratories Inc.
UL 486C
Fifth Edition

Splicing Wire Connectors

September 7, 2004

(Title Page Reprinted: August 25, 2006)



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Revisions of this Standard will be made by issuing revised or additional pages bearing their date of issue. A UL Standard is current only if it incorporates the most recently adopted revisions, all of which are itemized on the transmittal notice that accompanies the latest set of revised requirements.

The most recent designation of ANSI/UL 486C as an American National Standard (ANSI) occurred on August 25, 2006.

This ANSI/UL Standard for Safety, which consists of the Fifth edition with revisions through August 25, 2006 is under continuous maintenance, whereby each revision is ANSI approved upon publication. Comments or proposals for revisions on any part of the Standard may be submitted to UL at any time. Proposals should be submitted via a Proposal Request in UL's On-Line Collaborative Standards Development System (CSDS) at <http://csds.ul.com>.

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Preface

This is the common ANCE, CSA, and UL standard for splicing wire connectors. It is the second edition of NMX-J-548-ANCE, the second edition of CSA C22.2 No. 188, and the fifth edition of UL 486C. This edition of CSA C22.2 No. 188 supersedes the previous edition published in 1983. This edition of UL 486C supersedes the previous edition published in 2002.

This common standard was prepared by the Association of Standardization and Certification (ANCE), the Canadian Standards Association (CSA), and Underwriters Laboratories Inc. (UL). The efforts and support of the Technical Harmonization Committee for Connectors, of the Council on the Harmonization of Electrotechnical Standards of the Nations of the Americas (CANENA), are gratefully acknowledged.

This standard was reviewed by the CSA Subcommittee on C22.2 No. 188, under the jurisdiction of the CSA Technical Committee on Wiring Products and the CSA Strategic Steering Committee on Requirements for Electrical Safety, and has been formally approved by the CSA Technical Committee.

This standard will be submitted to the Standards Council of Canada (SCC) for approval as a National Standard of Canada.

This standard has been approved by the American National Standards Institute (ANSI) as an American National Standard.

A UL standard is current only if it incorporates the most recently adopted revisions, all of which are itemized on the transmittal notice that accompanies the latest set of revised requirements.

The U.S. Department of Defense (DoD) has adopted UL 486C on January 28, 1992. The publication of revisions or a new edition of this Standard will not invalidate the DoD adoption.

Where reference is made to a specific number of samples to be tested, the specified number is to be considered a minimum quantity.

Note: Although the intended primary application of this standard is stated in its scope, it is important to note that it remains the responsibility of the users of the standard to judge its suitability for their particular purpose.

Level of harmonization

This standard uses the IEC format but is not based on, nor is it to be considered equivalent to, an IEC standard. This standard is published as an equivalent standard for ANCE, CSA, and UL.

An equivalent standard is a standard that is substantially the same in technical content, except as follows: Technical national differences are allowed for codes and governmental regulations as well as those recognized as being in accordance with NAFTA Article 905, for example, because of fundamental climatic, geographical, technological, or infrastructural factors, scientific justification, or the level of protection that the country considers appropriate. Presentation is word for word except for editorial changes.

Reasons for differences from IEC

The Technical Harmonization Committee identified several IEC standards that address electrical wire connectors included in the scope of this standard. The IEC standards for electrical wire connectors are recognized as being generally system-specific, containing the requirements for the relevant wire connectors and cables in many discrete IEC standards.

The THC determined the safe use of electrical wire connectors is dependent on the design and performance of the wire connectors in relation to the North American electrical codes with which they are intended to be installed. The THC agreed such future investigation would be facilitated by the harmonization of the North American electrical codes for wire connectors with IEC installation practices.

Interpretations

The interpretation by the standards development organization of an identical or equivalent standard is based on the literal text to determine compliance with the standard in accordance with the procedural rules of the standards development organization. If more than one interpretation of the literal text has been identified, a revision is to be proposed as soon as possible to each of the standards development organizations to more accurately reflect the intent.

ANCE effective date

The effective date for ANCE will be announced through the Diario Oficial de la Federación (Official Gazette) and is indicated on the cover page.

CSA effective date

The effective date for CSA International will be announced through CSA Informs or a CSA certification notice.

UL effective date

As of August 25, 2006 all products Listed or Recognized by UL must comply with the requirements in this standard except for clauses, figures, and tables in the following list, which are effective October 10, 2006.

Clauses 6.3.7, 6.3.8, 6.3.9, 10.6, 10.21, and 10.22, Table 19, and Annex F

Between August 25, 2006 and October 10, 2006, new product submittals to UL may be evaluated under all requirements in this standard or, if requested in writing, evaluated under presently effective requirements only. The presently effective requirements are contained in the Fourth edition of UL 486C.

A UL effective date is one established by Underwriters Laboratories Inc. and is not part of the ANSI approved standard.

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Foreword (ANCE)

The present Mexican Standard was developed by the Low Voltage Wires and Cables Subcommittee from the Comité de Normalización de la Asociación de Normalización y Certificación, A.C., CONANCE, with the collaboration of wire and cable manufacturers and users.

ANCE is an Organization for Standardization (ONN) registered by the DGN (Dirección General de Normas) in the electrical sector and household appliances. ANCE develops Mexican Standards (NMX) and collaborates in the development of the Mexican Official Standards (NOM); these are voluntary and normative standards, respectively.

Conformity assessment in accordance with ANCE Mexican Standards is the responsibility of ANCE's Product Certification Division.

ANCE's Product Certification Division is accredited by the EMA (Entidad Mexicana de Acreditación) to certify a variety of products. Certification is carried out following the relevant procedures established and developed by the Technical Committee on Certification in connection with the test reports produced in test labs accredited by the EMA.

The conformity assessment activities developed by ANCE cover quality systems, test labs, and product verification.

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Foreword (CSA)

The Canadian Standards Association (CSA) develops standards under the name Canadian Standards Association, and provides certification and testing under the name CSA International. CSA International provides certification services for manufacturers who, under license from CSA, wish to use the appropriate registered CSA Marks on certain products of their manufacture to indicate conformity with CSA Standards.

CSA Certification for a number of products is provided in the interest of maintaining agreed-upon standards of quality, performance, interchangeability and/or safety, as appropriate. Where applicable, certification may form the basis for acceptance by inspection authorities responsible for enforcement of regulations. Where feasible, programs will be developed for additional products for which certification is desired by producers, consumers, or other interests. In performing its functions in accordance with its objectives, CSA does not assume or undertake to discharge any responsibility of the manufacturer or any other party. The opinions and findings of the Association represent its professional judgement given with due consideration to the necessary limitations of practical operation and state of the art at the time the Standard is processed.

Products in substantial accord with this Standard but which exhibit a minor difference or a new feature may be deemed to meet the Standard providing the feature or difference is found acceptable utilizing appropriate CSA International Operating Procedures. Products that comply with this Standard shall not be certified if they are found to have additional features which are inconsistent with the intent of this Standard. Products shall not be certifiable if they are discovered to contravene applicable laws or regulations.

Testing techniques, test procedures, and instrumentation frequently must be prescribed by CSA International in addition to the technical requirements contained in Standards of CSA. In addition to markings specified in the Standard, CSA International may require special cautions, markings, and instructions that are not specified by the Standard.

Some tests required by CSA Standards may be inherently hazardous. The Association neither assumes nor accepts any responsibility for any injury or damage that may occur during or as the result of tests, wherever performed, whether performed in whole or in part by the manufacturer or the Association, and whether or not any equipment, facility, or personnel for or in connection with the test is furnished by the manufacturer or the Association.

Manufacturers should note that, in the event of the failure of CSA International to resolve an issue arising from the interpretation of requirements, there is an appeal procedure: the complainant should submit the matter, in writing, to the Secretary of the Canadian Standards Association.

If this Standard is to be used in obtaining CSA Certification please remember, when making application for certification, to request all current Amendments, Bulletins, Notices, and Technical Information Letters that may be applicable and for which there may be a nominal charge. For such information or for further information concerning CSA Certification, please address your inquiry to Applications and Customer Service, CSA International, 178 Rexdale Boulevard, Toronto, Ontario, Canada M9W 1R3.

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Foreword (UL)

A. This Standard contains basic requirements for products covered by Underwriters Laboratories Inc. (UL) under its Follow-Up Service for this category within the limitations given below and in the Scope section of this Standard. These requirements are based upon sound engineering principles, research, records of tests and field experience, and an appreciation of the problems of manufacture, installation, and use derived from consultation with and information obtained from manufacturers, users, inspection authorities, and others having specialized experience. They are subject to revision as further experience and investigation may show is necessary or desirable.

B. The observance of the requirements of this Standard by a manufacturer is one of the conditions of the continued coverage of the manufacturer's product.

C. A product which complies with the text of this Standard will not necessarily be judged to comply with the Standard if, when examined and tested, it is found to have other features which impair the level of safety contemplated by these requirements.

D. A product employing materials or having forms of construction which conflict with specific requirements of the Standard cannot be judged to comply with the Standard. A product employing materials or having forms of construction not addressed by this Standard may be examined and tested according to the intent of the requirements and, if found to meet the intent of this Standard, may be judged to comply with the Standard.

E. UL, in performing its functions in accordance with its objectives, does not assume or undertake to discharge any responsibility of the manufacturer or any other party. The opinions and findings of UL represent its professional judgment given with due consideration to the necessary limitations of practical operation and state of the art at the time the Standard is processed. UL shall not be responsible to anyone for the use of or reliance upon this Standard by anyone. UL shall not incur any obligation or liability for damages, including consequential damages, arising out of or in connection with the use, interpretation of, or reliance upon this Standard.

F. Many tests required by the Standards of UL are inherently hazardous and adequate safeguards for personnel and property shall be employed in conducting such tests.

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Splicing Wire Connectors

1 Scope

1.1 This Standard applies to hand- or tool-applied splicing wire and cable connectors intended for use with all alloys of copper or aluminum conductors, or both, in accordance with the *Canadian Electrical Code Part I*, C22.1, in Canada, the *National Electrical Code*, NFPA-70, in the United States of America, or the *Standard for Electrical Installations*, NOM-001-SEDE, in Mexico, as follows:

- a) connectors intended to hold two or more conductor(s);
- b) connectors intended for use in appliances and equipment that comply with the requirements for such appliances and equipment;
- c) connectors intended for use with 6 AWG (13.3 mm²) or smaller conductors; and
- d) uninsulated connectors that are used in circuits rated 8 000 V and less.

Note: Examples of splicing wire connectors include twist-on connectors, insulation-piercing or displacement connectors, spring-action connectors, tool-applied crimp, mechanical set-screw connectors, etc.

1.2 This Standard is intended for splicing wire connectors suitable for use with conductors in the size ranges as follows:

a) Aluminum:

- 1) 12 AWG (3.3 mm²) and 10 AWG (5.3 mm²) solid; and
- 2) 12 AWG (3.3 mm²) to 6 AWG (13.3 mm²) stranded, Class B concentric, compressed, and unidirectional lay compact.

In México, the use of aluminum conductors is permitted only with thermoset insulation and for sizes of 6 AWG (13.3 mm²) and higher.

b) Copper:

- 1) 30 AWG (0.05 mm²) to 10 AWG (5.3 mm²) solid; and
- 2) 30 AWG (0.05 mm²) to 6 AWG (13.3 mm²) stranded, Class B concentric and compressed, and Class C concentric.

c) Compact-stranded copper conductors:

In Canada and Mexico, for 8 AWG (8.4 mm²) and 6 AWG (13.3 mm²).

In the United States this is not applicable.

d) Rigid (solid and stranded) metric wire falling within the ranges of the above AWG sizes.

Note: For example, a connector rated for 6 AWG (13.3 mm²) – 14 AWG (2.1 mm²) may be additionally rated for 10 – 2.5 mm².

e) Other class and strand configurations as indicated by marking.

1.3 These requirements cover splicing wire connectors intended for:

- a) copper-to-copper;
- b) aluminum-to-aluminum;
- c) copper-to-aluminum conductor combinations intended for intermixing of conductors and dry locations only; or
- d) all of the above.

1.4 This Standard is intended for splicing wire connectors suitable for currents not exceeding the ampacity of insulated conductors rated 75 °C or 90 °C, in accordance with the rating of the connector.

1.5 This Standard does not apply to:

- a) splicing wire connectors intended for direct burial;
- b) insulated splicing wire connectors intended for use at voltage levels in excess of 600 V [1 000 V in a sign or luminaire];
- c) terminal wire connectors;
- d) wire binding screw terminals;
- e) built-in terminal connectors on devices rated less than 30 A and intended for outlet box mounting or having provision for stress relief;
- f) built-in terminal connectors on devices having integral cable clamps;
- g) flat quick connect terminals; and
- h) soldering lugs.

2 Reference publications

2.1 Normative references

For undated references to standards, such reference shall be considered to refer to the latest edition and all revisions to that edition up to the time when this standard was approved. For dated references to standards, such reference shall be considered to refer to the dated edition and all revisions published to that edition up to the time the standard was approved.

2.1.1 ANCE Standards

NMX-J-192-ANCE

Electrical Products – Wires and Cables – Flame Test on Electrical Wires – Test Method

NMX-J-218-ANCE

Wires and Cables – Aluminum 1350 Drawing Stock for Electrical Purposes – Specifications

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NMX-J-417-ANCE

Wires and Cables – Convection Laboratory Ovens for Evaluation of Electrical Insulation – Specifications and Test Methods

NMX-J-508-ANCE

Electrical Fittings – Safety Requirements – Specifications and Test Methods

2.1.2 CSA Standards

C22.1-02

Canadian Electrical Code, Part 1 (CEC)

CAN/CSA-C22.2 No. 0.17-00

Evaluation of Properties of Polymeric Materials

2.1.3 UL Standards

UL 746C

Polymeric Materials – Use in Electrical Equipment Evaluations

2.1.4 NFPA* Standards

ANSI/NFPA 70-2002

National Electrical Code (NEC)

* National Fire Protection Association

2.1.5 NOM Standards – Mexican Secretary of Energy

NOM-001-SEDE

Standard for Electrical Installations

2.2 Informative references

2.2.1 See Annex A for a listing of supplemental standards.

3 Units of measure

3.1 The values given in SI (metric) units shall be normative, except for AWG conductor sizes. Any other values given are for information purposes only.

4 Definitions

For the purpose of this Standard, the following terms and definitions apply.

4.1 Circular Mil (Cmil) – the area of a circle with a diameter of 0.001 in.

4.2 Control Conductor – an unbroken conductor that is included in the current-cycling test loop.

4.3 Crimping Die – that part of a crimping tool which forms the crimp(s) and usually incorporates the crimp anvil(s), the crimp indenter(s), and the positioner.

Note: Crimping dies may have a separate or integral section for compressing the insulation grip, if provided.

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4.4 Equalizer – a busbar that provides for equipotential and uniform current flow in a stranded conductor without adversely affecting the temperature of the connector(s).

4.5 Packaging Container – the container in which the unit containers are packaged.

4.6 Splicing Wire Connector – establishes a connection between two or more conductors by means of mechanical pressure and is not intended to be permanently mounted.

4.7 Stability Factor S – the measure of temperature stability of a connector during the current-cycling test.

4.8 Temperature Rating – the maximum temperature of an insulated connector assigned by the manufacturer.

4.9 Temperature Rise – denotes the difference of the temperature of the connector, measured under load, and the ambient temperature.

4.10 Unit Container – the smallest container in which connectors are packaged.

4.11 Voltage Rating – the maximum voltage of an insulated connector.

5 Symbols and abbreviations

5.1 ° – Degree

5.2 A – Amps, Amperes

5.3 Al – Aluminum

5.4 AWG – American Wire Gage/gauge

5.5 C – Celsius

5.6 Cu – Copper

5.7 d – Days

5.8 f – Flexible

5.9 h – Hour

5.10 HgNO₃ – Mercurous nitrate

5.11 Hz – Hertz, cycles per second

5.12 in – Inches

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5.13 m – Meter

5.14 mil – Thousandth of an inch

5.15 min – Minutes

5.16 ml – Milliliter

5.17 mm – Millimeter

5.18 mm² – Square millimeter

5.19 N – Newton – Kilogram meter/sec²

5.20 NH₄ – Ammonia

5.21 r – Rigid solid and rigid stranded

5.22 rpm – Revolutions per minute

5.23 SAE – Society of Automotive Engineers

5.24 sol – Solid

5.25 str – Stranded

5.26 V – Volts

6 Construction requirements

6.1 General

6.1.1 The design and construction of a connector intended for use with stranded conductors shall be such that all strands of the conductor shall be contained within the connector.

6.1.2 A connector that is suitable for compact-stranded conductors shall also accept all strands of a Class B concentric-stranded conductor of the same size.

6.1.3 The clamping or twist-on movement of a connector shall adapt it for use with conductors of different sizes, when such use is intended, without permanent removal or addition of parts. Examples of clamping means are:

- a) direct-bearing screws with or without use of a pressure plate;
- b) deformation of the connector barrel (crimping) using a special tool;
- c) element for insulation piercing or insulation displacement;
- d) spring-action clamp;
- e) helical coiled spring; and
- f) formed insulation cavity (no spring).

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6.1.4 Any rearrangement or adjustment of a connector that is necessary to adapt it to various sizes of conductors shall be obvious unless the connector is marked as described in 10.11.

6.1.5 There shall be no sharp edges or corners on the outer surface of a connector that result in damage to insulation that the connector contacts.

6.2 Intermixing

6.2.1 Intermixing (direct conductor contact) between conductors of different materials shall be permitted if the connector meets the performance requirements of this standard and is marked in accordance with 10.5d).

6.2.2 Deleted

6.2.3 Deleted

6.3 Materials

6.3.1 The main current-carrying part of a connector shall be of aluminum, an aluminum alloy, copper, a copper alloy, or other material investigated and found to meet the performance requirements of this Standard.

6.3.2 Except as specified in 6.3.3, a connector body of a copper, copper alloy, aluminum, or aluminum alloy and intended for aluminum conductor shall be coated with an electrically conductive coating, such as tin, that will inhibit oxidation and corrosion.

6.3.3 With reference to 6.3.2, the following need not be coated:

- a) a connector shipped prefilled with an oxide-inhibiting compound; and
- b) a connector of aluminum or aluminum alloy that is intended for aluminum conductor only.

Note: Other coatings may be used if investigated for the purpose and found suitable.

6.3.4 Iron or steel, if protected against corrosion, may be used for screws, plates, yokes, springs, or other parts that are employed as a means of clamping the conductor, if such parts are not the primary current-carrying members.

6.3.5 Insulation employed as a part of the connector shall be suitable for its rated temperature in accordance with Table 1.

6.3.6 Insulation employed as a part of the connector shall be suitable for the tested voltage rating of the connector in accordance with Table 2.

6.3.7 The insulating material shall have a minimum flammability classification of V-2 or VTM-2 as determined by tests described in Annex B. The material thickness for determining the flammability shall be measured at points supporting live parts or within 3 mm (0.118 in) of live parts, whichever is less.

Note: Insulating tubing that has a VW1 rating is not considered equivalent. Tubing may be tested using bar samples to achieve a V-2 minimum rating or the glow wire test (see 6.3.8) may be performed.

6.3.8 With reference to 6.3.7, a material other than V-2 or VTM-2 may be used when the insulation of the wire connector complies with the requirements for the glow-wire test as specified in UL 746C, or CAN/CSA-C22.2 No. 0.17, or NMX-J-508-ANCE, with a glow wire at a temperature of 750 °C.

6.3.9 The insulation color of a twist-on or set-screw connector rated for aluminum conductor shall be purple or brown. The insulation color of a twist-on or set-screw connector rated for copper wire only shall be any color other than purple or brown.

7 Test requirements

7.1 General

7.1.1 A connector shall meet the test requirements when separate sets of specimens are subjected to the tests in Table 3 and Table 4, as applicable, for the design of the connector.

7.1.2 For a tool-applied crimp-on connector, when the conductors are secured by a single securing means, tests shall be conducted with the conductors pre-twisted according to the instructions provided by the manufacturer and according to 10.12d) and 10.17. The conductors shall not be required to be pre-twisted when the design of the connector does not lend itself to direct contact, such as a butt-end splice.

7.1.3 With reference to 7.1.2, at the manufacturer's option, tests of connectors intended for original equipment manufacturer (OEM) use shall be allowed to be conducted with the conductors not pre-twisted. However, instructions for pre-twisting the conductors shall be provided for field-wiring applications. Instructions for pre-twisting shall be optional for OEM wiring applications. If the connector can be crimped without providing direct contact between the conductors, then tests shall be conducted with the connector crimped so they are not in direct contact. Connectors tested with the conductors not pre-twisted shall be marked as specified in 10.18.

7.1.4 For the current-cycling, static-heating sequence, and mechanical sequence tests, when more than a single conductor is secured by a single securing means, tests on duplicate specimens shall be conducted to represent the most severe conductor position conditions that could result when conductors are assembled into the connector.

7.1.5 A connector of copper or copper alloy need not be subjected to the current-cycling test using copper conductors, unless the connector is dependent upon insulation piercing, insulation displacement, or spring action.

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7.1.6 A twist-on connector provided with a metal insert need not be subjected to the current-cycling test using copper conductors. A twist-on connector not provided with a metal spring shall be subjected to the current-cycling test.

7.1.7 With reference to 7.1.5 and 7.1.6, a pre-filled twist-on connector, with or without a spring insert, shall also be subjected to the current-cycling test using copper conductors.

Note: Pre-filling usually consists of a gel, epoxy, anti-oxidant, or similar compound.

7.1.8 The initial static-heating test need not be conducted in the static-heating sequence using copper conductor.

7.1.9 Conductor-sizes 30 – 20 AWG (0.05 – 0.52 mm²) need not be subjected to the secureness test in the static-heating sequence or mechanical sequence.

7.1.10 Specimen sets shall be subjected to the test sequences using the conductor material specified in Table 5 for the one or more conductor material combinations for which the connector is intended. The dielectric withstand, stress corrosion, secureness of insulation, flexing, and low temperature installation tests shall be permitted to be conducted using either copper or aluminum conductor. When a connector is rated for copper-to-copper, aluminum-to-aluminum, and copper-to-aluminum (intermixed), the mechanical sequence with copper-to-aluminum conductors may be omitted.

7.1.11 Testing using AWG conductors shall be considered representative of Class 1 and 2 metric conductors (rigid solid and rigid stranded) within the cross-sectional area envelope of the rated AWG range. A connector rated for Class 5 and 6 metric conductors (flexible stranded) shall be subjected to all test sequences using flexible metric conductors.

7.1.12 Tests conducted on a connector with compact-stranded conductors shall be considered representative of concentric and compressed stranded conductors of the same size.

7.2 Current cycling

7.2.1 The specimen sets shall complete 500 continuous cycles of current-on and current-off operations, while carrying the current corresponding to the conductor size as specified in Table 6. Other than as noted in 9.2.3, each cycle of operation shall consist of 1 h on and 1 h off.

Note: A current source may be maintained at or above the required value by regulation or frequent adjustment.

7.2.2 The current-cycling test shall be completed without any connector exceeding a 125 °C temperature rise above the ambient temperature for any recorded cycle.

7.2.3 The stability factor "S_i" (see 7.2.4) shall not exceed ± 10 for connector temperature measurements taken at approximately 25, 50, 75, 100, 125, 175, 225, 275, 350, 425, and 500 cycles.

7.2.4 The stability factor "S_i" for each of the 11 temperature measurements shall be determined by applying the following equations:

$$S_i = d_i / D$$

$$D = [(d_1 + d_2 + \dots + d_{11}) / 11]$$

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D is the average temperature deviation;

i is a number from 1 to 11 and signifies one of the 11 individual temperature measurements;
and

d_i is a temperature deviation for an individual temperature measurement.

Note: The value for d_i is determined by subtracting the control-conductor temperature from the connector temperature. The value for d_i is a positive number when the connector temperature is more than that of the control conductor and a negative number when the connector temperature is less than that of the control conductor. The average of the 11 temperature deviations is then determined. See Annex C for example.

7.3 Static-heating sequence

7.3.1 The specimen sets shall carry continuously the value of 60 Hz test current specified in Table 6 for the conductor size being tested until stable temperatures are reached without exceeding a 50 °C temperature rise above ambient temperature.

Note: A current source may be maintained at or above the required value by regulation or frequent adjustment.

7.3.2 The joint between a connector and the conductor shall be intact after being subjected for 30 min to the secureness test described in 9.3.2.

7.3.3 The joint between a connector and the conductor shall be intact after being subjected for 1 min to the pullout test described in 9.3.4.

7.3.4 As a result of the tests, there shall be no breakage of the conductor or any strand of a stranded conductor, stripping of threads, shearing of parts, or other damage to the connector. Breaking of the conductor or any strand of a stranded conductor shall be determined by examination of the complete connector assembly while still intact after the secureness or pullout tests. Breakage has occurred if the conductor or a strand of a stranded conductor becomes visibly unattached. Strand breakage of 5 percent is allowed for all classes of conductors other than B and C.

7.4 Mechanical sequence

7.4.1 The joint between a connector and the conductor shall be intact after being subjected for 30 min to the test described in 9.4.1.

7.4.2 The joint between a connector and the conductor shall be intact after being subjected for 1 min to the test described in 9.4.2.

7.4.3 As a result of the tests, there shall be no breakage of the conductor or any strand of a stranded conductor, stripping of threads, shearing of parts, or other damage to the connector. Breaking of the conductor or any strand of a stranded conductor shall be determined by examination of the complete connector assembly while still intact after the secureness or pullout tests. Breakage has occurred if the conductor or a strand of a stranded conductor becomes visibly unattached. Strand breakage of 5 percent is allowed for flexible and fine stranded conductors.