

STANDARD INFORMATION

Standard Number: UL 486A-486B / CSA C22.2 No. 65

Standard Name: Wire Connectors

Standard Edition and Issue Date: 2nd / 5th Edition Dated January 11, 2013

Date of Revision: December 13, 2013 (Gen Ins 1) and January 20, 2016 (Gen Ins 2)

Date of Previous Revision of Standard: January 11, 2013

EFFECTIVE DATE OF NEW/REVISED REQUIREMENTS

Effective Date: **December 31, 2019**

IMPACT, OVERVIEW, AND ACTION REQUIRED

Impact Statement: A review of all Listing Reports is necessary to determine which products comply with new/revised requirements and which products will require re-evaluation. **NOTE:** Effective immediately, this revised standard will be exclusively used for evaluation of new products unless the Applicant requests in writing that current requirements be used along with their understanding that their listings will be withdrawn on Effective Date noted above, unless the product is found to comply with new/revised requirements.

Overview of Changes:

- Additional requirements for uninsulated wire
- Revision of requirements for low temperature installation test
- Revision of requirements for compact stranded conductors

Specific details of new/revised requirements are found in table below.

If the applicable requirements noted in the table are not described in your report(s), these requirements will need to be confirmed as met and added to your report(s) such as markings, instructions, test results, etc. (as required).

Client Action Required:

Information – To assist our Engineer with review of your Listing Reports, please submit technical information in response to the new/revised paragraphs noted in the attached or explain why these new/revised requirements do not apply to your product (s).

Current Listings Not Active? – Please immediately identify any current Listing Reports or products that are no longer active and should be removed from our records. We will do this at no charge as long as Intertek is notified in writing prior to the review of your reports.



STANDARD INFORMATION

CLAUSE	VERDICT	COMMENT
<i>Additions to existing requirements are underlined and deletions are shown lined out below.</i>		
The following changes reflect the December 13, 2013 Revision		
9	Info	Test Methods
9.1	Info	General
9.1.3	Info	Control conductor temperature measurement
9.1.3.2		<p>A thermocouple on a control conductor used in the current-cycling test shall be located at the midpoint of the conductor and under the conductor insulation. The thermocouple shall be secured by soldering, by use of an adhesive, or by other equivalent means. The conductor insulation shall be replaced over the thermocouple location. The surface of the conductor metal shall not be penetrated. Drilling and peening shall not be used. <u>When uninsulated wire is used, the thermocouple is not placed under any conductor insulation.</u></p>
9.1.3.3		<p>For temperature measurements on a copper control conductor, the following technique shall be employed:</p> <p>a) A small flap shall be cut into the conductor insulation and rolled back to expose the conductor. <u>When using uninsulated wire, this step shall be skipped.</u></p> <p>b) The thermocouple bead shall be positioned in the valley between conductor strands or on the surface of a solid conductor.</p> <p>c) The flap of insulation shall be repositioned and secured by a tightly wrapped, double layer of black thermoplastic tape extending not more than 12.7 mm (1/2 in) on each side of the flap, or by another similar means of holding the test conductor insulation in place. <u>When using uninsulated wire, no insulation flap shall be used. A double layer of black thermoplastic tape shall be wrapped directly over the thermocouple bead.</u></p>
9.1.3.4		<p>For temperature measurements on an aluminum control conductor, if a thermally conductive adhesive which maintains direct contact with the strand of the control conductor is used, the technique specified in 9.1.3.3 shall be used. When a thermally conductive adhesive is not used, the following technique shall be used:</p> <p>a) A 25.4 mm (1 in) minimum length of insulation over the full circumference of the conductor shall be removed. <u>When using uninsulated wire, this step shall be omitted.</u></p> <p>b) For a solid conductor, the thermocouple shall be secured to the surface of the conductor.</p> <p>c) One conductor strand shall be pried out of the stranding just enough to insert the end of a soft copper ribbon measuring 6.4 mm (1/4 in) wide x 0.13 mm (0.005</p>



in) thick to a length that overlaps approximately 3.2 mm (1/8 in) as illustrated in Figure 1. The conductor strand shall then be lightly tapped back down on the copper ribbon.

d) The copper ribbon shall be wrapped partially around the conductor strands back to the one strand that has been pried out.

e) The thermocouple shall be located on the copper ribbon in the valley formed by the pried-out strand and the adjacent strand and shall be soldered in place. The copper ribbon shall be wrapped completely around the bundle of strands and shall be cut off so that a 3.2 mm (1/8 in) overlap results. The ribbon shall be secured in place by reheating the solder behind the ribbon where the thermocouple is located.

f) The section of insulation removed as described in a) shall be attached with the slit side directly opposite the thermocouple junction. Thin-walled heat shrinkable 125°C tubing or a tightly wrapped, double layer of black thermoplastic tape extending not more than 12.7 mm (1/2 in) on each end of the section of insulation shall be used to hold it in place. When using uninsulated wire, no insulation flap shall be used. A double layer of black thermoplastic tape wrapped directly over the copper ribbon or heat shrink tubing shall be used.

9.1.5 Info **Test and control conductors**

9.1.5.1 All test specimen conductors and control conductors shall comply with the requirements in Table 14, Table 15, and Table 16, see 9.1.5.1A. All test specimen conductors and control conductors shall be new (previously unused) or, with the concurrence of those concerned, shall be previously used conductors that have not attained a temperature of over 120°C ~~in previous testing~~. For previously used conductors, used conductor ends shall be cut off and the resulting new ends of the conductor re-stripped in accordance with 9.1.6.

New clause added;

9.1.5.1A With reference to 9.1.5.1, a connector may be tested with uninsulated conductors when the connector assembly does not rely on the conductor insulation, i.e. insulation piercing connector. When using uninsulated conductors, Table 16 shall not be applied.

9.1.8 Info **Preparation of specimens**

New clause added;

9.1.8.9 When preparing assemblies using uninsulated conductors, a tie wrap or similar means shall be used in close proximity to the wire opening to prevent splaying or spreading of the uninsulated conductor. This restriction shall be applied to the conductor end prior to any torquing or crimping and shall remain in place during the remainder of the test.

Note: The use of a tie wrap or similar means is intended to maintain the relative positioning of the individual conductor strands with similar constraints that might occur if insulated conductors had been used, where the conductor insulation acts in the same capacity.



9.10	Info	Low temperature installation
9.10.1		In Canada, the connectors, short lengths of insulated wires, and the applicable hand or ratchet tools shall be placed in a cold chamber for 1 h to allow all of the parts to reach a uniform temperature of $0 \pm 1^\circ\text{C}$ minus $10 \pm 1^\circ\text{C}$. The installation of the connectors on the wires shall be performed in the cold chamber and the specimens shall be removed from the cold chamber and immediately examined for any evidence of damage.

Conductor insulation ^a

Table 16

		AWG or kcmil (mm²)	Type of insulation
Aluminum	Solid and stranded	12 (3.31) and larger	THHN or T90 THW or TW75 RW90 (1000V) or USE RW90 (600V) or XHHW <u>PE or XLPE thermoset insulation</u>
Copper	Solid and stranded	30 – 24 (0.05 – 0.20)	Thermoplastic at least 0.254 (0.010 in) thick ^a
		22 – 16 (0.32 – 1.31)	Thermoplastic at least 0.762 mm (0.030 in) thick ^a
		14 (2.08) and larger	T90 or THHN THW or TW75 RW90 (1000V) or USE RW90 (600V) or XHHW
Copper-clad aluminum	Solid and stranded	12 (3.31) and larger	T90 or THHN THW RW90 (1000V) or USE RW90 (600V) or XHHW

^a Table 16 is not applicable when testing with uninsulated wire.

The following changes reflect the January 20, 2016 Revision

6	Info	Construction Requirements
6.1	Info	General
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.
9	Info	Test Methods
9.1	Info	General
9.1.5	Info	Test and control conductors
9.1.5.3		Connectors additionally rated for 2 AWG (33.6 mm ²) and larger compact-stranded copper conductors shall be tested with compact-stranded Class B copper conductors. See also 6.1.2 and 10.39.
CUSTOMERS PLEASE NOTE: This Table and column "Verdict" can be used in determining how your current or future production is or will be in compliance with new/revised requirements.		