



Copper Clad Aluminum Terminations

Q. Section 110.14 in the 2020 NEC was revised to clarify that copper and copper-clad aluminum are not considered dissimilar metals in a terminal or splicing connector where physical contact occurs. What type of connectors are Certified (Listed) for terminating copper-clad aluminum conductors?

A. Even though they are constructed differently, copper conductors and copper-clad aluminum conductors are not considered dissimilar metals for conductor terminations because copper is used for the outside cladding of both of them. Copper conductors are solid copper and copper-clad aluminum conductors have an aluminum core covered by copper. The surface of each type of conductor is copper, which is important for terminations. However, copper-clad aluminum conductors have an aluminum core, so they have the same ampacity as an aluminum conductor. It is incorrect to assume that wire connectors suitable for copper only (“CU”) can be used to terminate copper-clad aluminum conductors. Wire connectors used to connect copper-clad aluminum conductors to copper conductors must be rated for copper and aluminum (“CU-AL” or “AL-CU”) connections or rated for copper to aluminum, intermixed (terminated in the same twist-on connector), and in direct physical contact.

For information on terminating copper-clad aluminum conductors in distribution and control equipment, see the guide information for Electrical Equipment for Use in Ordinary Locations (AALZ) on UL Product iQ™ (UL.com/piq).

The guide information for AALZ under the heading **Distribution and Control Equipment** states:

Some terminals are suitable for use only with copper wire. Where aluminum or copper-clad aluminum wire can or shall be used (some crimp terminals may be certified only for aluminum wire), there is marking to indicate this. Such marking is required to be independent of any marking on terminal connectors, such as on a wiring diagram or other visible location. The marking may be in an abbreviated form, such as “AL-CU.”

Copper-clad aluminum conductors — Copper-clad aluminum conductors are subject to the ampacity requirements applicable to aluminum conductors.

Copper pigtail leads — Copper pigtail leads may be used with aluminum or copper-clad aluminum supply wires in dry locations if:

1. The splicing devices are certified for use in joining copper to aluminum,
2. There is sufficient wiring space, and
3. The means provided for connecting the wiring system are acceptable for the wire size used.

Wire connectors — Combinations of dissimilar conductors

in terminal or splicing connectors are acceptable only in dry locations and when the connectors are identified as suitable for such intermixing.

For more information on making connections to copper-clad aluminum conductors, see the guide information for Wire Connectors and Soldering Lugs (ZMVV) on UL Product iQ. The ZMVV guide information addresses connector markings that identify the combinations of conductor material for connectors. See the table below from ZMVV that displays the conductor material markings and the suitable conductor material combinations.

Conductor material — Wire connectors or the unit containers are marked with the type of conductor material(s) as follows:

Marking (or equivalent)	For Use With
CU	<ul style="list-style-type: none"> • Copper wire only
AL	<ul style="list-style-type: none"> • Aluminum wire only
AL-CU or CU-AL	<ul style="list-style-type: none"> • Copper to copper • Aluminum to aluminum • Copper to aluminum but not intermixed or in direct physical contact • Copper-clad aluminum to copper-clad aluminum • Copper to copper-clad aluminum • Aluminum to copper-clad aluminum but not intermixed or in direct physical contact
AL-CU (intermixed - dry locations)	<ul style="list-style-type: none"> • Copper to copper • Aluminum to aluminum • Copper to aluminum intermixed and in direct physical contact • Copper-clad aluminum to copper-clad aluminum • Copper to copper-clad aluminum • Aluminum to copper-clad aluminum and in direct physical contact

Except as otherwise noted on or in the shipping carton, aluminum conductors are not intended to be used in direct physical contact with copper and copper-clad aluminum conductors in the same connector. A wire connector for securing an aluminum wire in combination with a copper or copper-clad aluminum conductor, where physical contact occurs between the wires of different metals, is limited to dry locations only and is marked “AL-CU (intermixed - dry locations).”

The guide information for both AALZ and ZMVV categories can be viewed on UL Product iQ at www.UL.com/piq, and enter AALZ or ZMVV in the search field. Product iQ is free to users; however, registration is required. ⚠