

Compression connector crimping methods

To retain UL or CSA rating, Installation tools and methods must be matched to the connectors used

Of all the methods used to make electrical connections, compression of the connector onto the cable with some type of compression tool is considered by most installers to be the most permanent of the common connection methods. To maintain Underwriters Laboratories Listing (UL) or Canadian Standards Association Certification (CSA) for a completed compression connection, it is necessary to use the installation tools and installation methods which have been qualified for the connectors by those organizations during the listing/certification processes.

Cable preparation

It is imperative that the cable strands and the compression connector be clean and free of dirt and/or corrosion. This is particularly important when making connections on cables which have been installed for a period of time.

Connectors which are Underwriters Laboratories Listed or Canadian Standards Association Certified may contain installation instructions in the connector carton which may include information such as usable cable types, insulation strip lengths, and crimping tools for specific connectors. Proper preparation of the cable can make the difference between a permanent connection and a connection which may require a service call at some point in the future.

The cable material will dictate the type of connector which can be used in the compression connection. Copper cable can be installed in a copper compression connector which has a "CU" rating or in an aluminum compression connector which has a "AL9CU" rating. Aluminum cable on the other hand can ONLY be installed in an aluminum compression connector which has a rating of "AL" or "AL7CU". ALUMINUM CABLE CAN NEVER BE INSTALLED IN A COPPER COMPRESSION CONNECTOR.

Once the cable preparation has been accomplished and the proper type and size of compression connector has been selected, the connector manufacturer's recommendations for choice of compression tooling and compression methods should be followed to maintain the UL and/or CSA rating for the completed connection. Connector manufacturers will often be in a position to specify several equivalent UL/CSA crimping recommendations for a specific connector installation. For connectors from No. 22 AWG through No. 10 AWG the compression tools most often have mechanical operation. For No. 8 AWG through 4/0 AWG the compression tools could use either mechanical or hydraulic means to apply the crimping force. Historically at 250 kcmil and above in wire size, the crimping force was almost always applied by a hydraulic crimping tool. With the advent of the TDM500 that has changed to 500 kcmil due to the extra available leverage generated by the extendable handles. Mechanical tools for small wire sizes are generally single leverage types, while those for the medium sized cables apply the crimping force via a compound leverage system. Mechanical crimping tools make either a surrounding type of crimp (Fig. 4A) or a nest and indenter crimp shape (Fig. 4B). The hydraulic crimping

tools used for the medium and the large cable sizes can have quite a variety of crimping die systems and hydraulic pressure sources.

Die-type crimpers

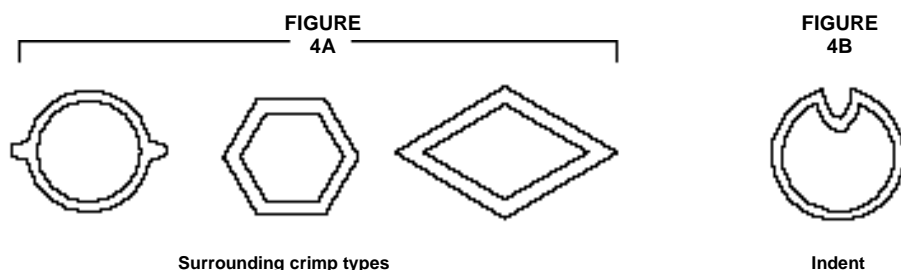
The die-type tools require that a separate set of inserts be placed into the crimping tool head for each different size and type (AL or CU) of connector that is to be crimped. These crimping die inserts are shaped to compress their specific connector size the correct amount when the full force of the hydraulic system of the tool is applied to them. Die type crimping tools generally produce crimps that surround the barrel of the connector with either a rounded oval or a hexagonally shaped outer surface.

Many of the copper and the aluminum connectors used in the electrical contracting industry have a color code applied to them which matches up with a crimping die reference of the same color. This color code is meant to allow the installer to be able to find the correct die more quickly from as many as several dozen die sets that may be required to crimp all of the connectors within the installation range of the specific hydraulic crimping tool.

Certain styles of connectors used in the electric utility industry are designed to minimize the number of crimping die sets that each line crew must carry. These special connectors are designed to have a constant outside diameter on the crimp barrel portion of the connector with various inside diameter to match conductor size. For example, a popular grouping of electric utility connectors has a constant outside diameter of 0.640 inches for a series of cable sizes from No. 10 AWG through 1/0 AWG and all of the individual connectors are crimped with the same die insert. Electric utilities also use a series of compression taps with a cross section shape similar to the letter "H" which are grouped to install most cable size combinations between No. 6 AWG and 500 kcmil with only three crimping die sizes.

Dieless crimpers

The other class of hydraulic crimping tools are the dieless tools. Dieless actually means that there is no die insert change needed when one needs to crimp a different connector size within the range of the tool. The dieless hydraulic tools can be further classified by the three general crimp shapes that are made. One group of dieless tools makes crimps which are of the nest and indenter style with the next being a stationary portion of the tool and the indenter moving with the hydraulic ram. A second grouping of dieless tools makes use of multiple indentors which indent the connector from multiple sides without the use of a nest. The third group of dieless tools provides a crimp which surrounds the connector barrel and has an appearance more like that of a die type tool than either of the two indenter style dieless tools can provide. All of the dieless tool types are capable of crimping cylindrical connector barrels as recommended by their respective manufacturers.



PENN-UNION CORP.

229 Waterford Street • Edinboro, PA 16412-2398
Phone (814) 734-1631 • FAX (814) 734-4946

Some dieless tool brands of each type are also recommended by their manufacturers to be able to provide cable range-taking capabilities (a single connector size could be used for more than one cable size) under very specific conditions of connector brand; catalog number; cable sizes; and installation procedure for which these tool manufacturers have tested and obtained UL and/or CSA listing.

The necessity to maintain UL Listing and/or CSA Certification for a connector installation can limit the available combinations of connectors and crimp tools which can be used in a specific situation. Dieless compression tool systems offer decided advantages in installation flexibility and time saving, particularly if both cylindrical and H-frame connectors can be installed with a single dieless tool.