

How to choose correct size of terminals & Crimp it with cable

As the Cable jointing / wiring / connections requirements vary depending on the type of accessories, let us consider the main types of accessories such as Terminal Ends/Lugs, In-line connector for straight thro' joint.

Terminal Ends/Lugs :-

The Terminals ends are capable of receiving the cable conductor and have fixing arrangement by means of a bolt, fixing or screwing in a part of switchgear, transformer, motor, etc. Terminal lugs are electrical connectors for crimping to large gauge cable and bolting to power or grounding sources. With numerous lines of lugs for automotive, military, telecom, and OEM, chose the style and size you need! We have complete applications engineering and in-house tooling capabilities to make your product quickly and economically.

TYPES OF TERMINAL ENDS/LUGS & THEIR APPLICATION :

Tubular Terminal End /Lugs :- Tubular terminals/lugs are made from Copper Tubes and Aluminium Tubes/ rods. This the most commonly used variety, whether for soldering or compressing, only a limitation if it may be allowed to term so is the smaller palm widths for smaller size of cables, do not permit the availing of required stud holes, depending on the requirements, material can be ETP copper or EC Aluminium.

Ring Tongue Terminal End :- Ring Tongue terminals are made from Sheet metals copper, brass etc as per the requirements. This is the second option to Tubular Terminal Ends/lug. The shapes and materials vary for different techniques of jointing such as soldering, crimping and welding. Herein, the terminals being blanked for soldering and crimping varieties and cast for welding varieties. The required palm width for the stud-holes could be availed even for smaller size of cables. For soldering and crimping varieties these will be made out of copper sheets whereas those for welding will be made from Aluminium casting.

Reducer type Terminal Ends :- These type of terminal ends find their use in tunnel type terminal blocks for e.g. fuse gears, cut-outs, meters, etc. and may be connected by soldering or crimping method, which in general will be made out of Brass for soldering and copper for crimping.

Pin type Terminal End (Round, Flat, Rect.) :- These type of terminations will be required generally for control cables, flexible cables, cords and also for smaller sizes of cables/wires. These are also used for terminating in terminal blocks, terminal stations etc. of the control panel's wiring. These are generally available for crimping type connections, which are made out of copper, brass etc as per requirements.

Fork type Terminal End

(Ring Tongue, Rect. Type, Fork Hook, Fork Lock) :-

All these type of terminals are made from sheet metals. These are also useful in termination of control cables, flexible cables, cords, contactors, meters of control panel cubicles depending on the varying degree of requirements. These are also generally available for crimping and made out of copper/brass as per requirements.

Electrical Cable connectors- Butt Splices /In Line Connectors:

Cable Butt Splices allows for termination of two high voltage cables in-line, butted together. STAR manufactures the widest line of butt splices. All heavy duty gauges and barrel entry configurations. If you need a modification for your application? We have complete applications engineering and in-house tooling capabilities to make your special product quickly and economically. A butt splices for every automotive, military, and electrical application!

In-line Connectors are used to connect together two cables in a straight thro' joint in to one continuous length. Usually the cables will be of a similar type and size but when making extensions or modification to old system it may be necessary to joint dissimilar cables.

CRIMPING TECHNIQUES :

A] Selection of correct Terminal Ends/lugs for connection.



1] The first step in selecting a terminal for a given conductor is to identify the cable size e.g. 1.5mm², 2.5mm², 10mm² etc.

A cable is made up of a number (n) of copper wires bundled together by an outer core. For the purpose of crimping this outer core is stripped, leaving the bare copper strands. These wires have a particular diameter (d). The cross sectional area (CSA) of the cable is calculated by the following formula.

CSA = Area of each wire x No. of wires

Thus if a cable has 7 wires of diameter 2.5mm then

$$CSA = 3.142/4(2.5)^2 \times 7 = 34.3 \text{ mm}^2$$

Thus the cable or conductor size is 35 mm²

2] The second step is to identify the termination point and terminal size requirement.

Example- The size of the bolt to be used in termination like M3, M4, M6, M8 etc depending on the requirement.

Other dimensions of terminals/lugs are also equally important to select to the requirement such as total length, palm width, creep age etc.

This generally varies from application to application.

B] ACTUAL JOINTING/CONNECTING /CRIMPING:

This is actual jointing cable/wires to terminals/lugs by direct crimping. This is also known as cold compression jointing. There is no direct or indirect heat is involved in the process of jointing unlike soldering, welding. The cold compression technique was actually in practice even before the advent of aluminium conductor cables. This technique being simple requiring little or absolutely no skill of jointing compared to the other existing methods. Herein the jointing or terminating of the conductor is attained by forming a permanent connection, by pressure forming or re-shaping the terminal end or connector barrel and the conductor to establish a good electrical and mechanical contact.

After the usual process of cleaning of the stripped conductor by mechanical abrasion, the corrosion inhibiting compound (which is specially developed and recommended for Aluminum and Copper conductors) is applied over the conductor portion as well as the terminal end in barrel. The stripped out portion of conductor is inserted fully inside the terminal end barrel ID and whatever compound comes out is wiped and terminal cleaned (this wiped out compound can be re-used), and the compression with the tool and dies as per the recommendation of the manufacturer of terminal end/ in-line connector is to be carried out.

The corrosion inhibiting compound [available in market] which is a mixture of grease, abrasive particles and certain chemicals, assist in jointing because as the metal flows under pressure the abrasive particles cause small areas of cold welding and also the compound which will not affect the electrical properties of compression joint is also non-corrosion to Aluminum, copper, steel, tin, zinc and any combinations of these and will not deteriorate when exposed to atmosphere at conductor operating temperatures and has very high temperature drop point.

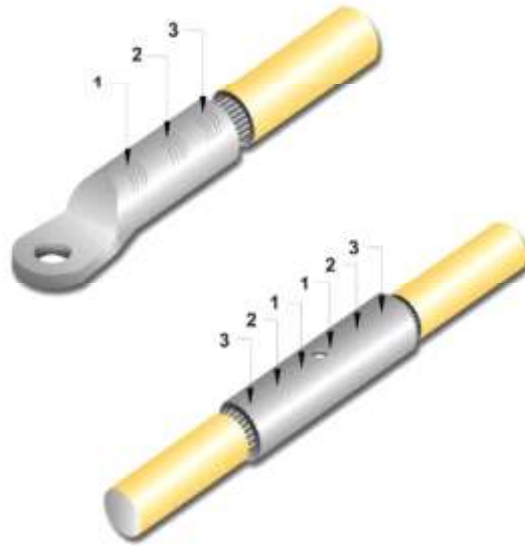
In certain cases when the barrel length exceeds than of the crimping die in the tool it may take more than one crimp to cover the entire length of the lug. When doing so make sure the first crimp is made at the neck portion of the lug and then subsequently towards the end (where cable is entered).

[Please refer to the installation procedure and step of conductor's connection]

Please note, that when a joint is to be crimped always use the specified die for the particular tool. Using the wrong die can lead to improper deformation and lead to low pull-off load. It can also cause excessive flashing at the side of the lug. This can be a major problem, as it may lead to a short circuit, if the crimped lug touches a lug placed beside it on a bus bar.



INSTALLATION PROCEDURE FOR UN-INSULATED LUGS & CONNECTORS - 1.5MM² - 1000MM²



Steps :-

1. Identify the correct Terminal / Connector for the cable in use. This can be done by checking the marking on the connector or from the labels attached to the packages.
2. Necessary cable preparation to be done using suitable stripper to remove the insulation to the distance equal to the insertion depth of the connector plus suitable extra allowances. (3mm to 5mm)
3. Brush the surface of the stranded conductor to remove any oxides if present.
4. Insert the conductor in to the barrel of the connector. Orientation of the palm of the connector should be ensured for the equipment where it is to be connected.
5. Suitable crimping dies / tools should be selected to ensure that the joints made are mechanically strong. Good joint results into good electrical continuity.
6. Ensure proper crimping series (as mentioned above).
7. Clean the surface where the terminal is to be fixed. Necessary nut, bolts, washer as indicated should be used.

RELIABILITY

EXACTITUDE

CONSISTENCY

MAGNITUDE.

