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TECHNICAL DOCUMENT -

We show you how !

IPS
Intelligent Pressing System

ENGINEERING A SAFE ELECTRICAL CONNECTION

Verbindungen mit ***System***
The ***Power*** *of Partnership*

KLAUKE®
A Textron Company

What is an Intelligent Pressing System?

Many Electrical Engineers will not be able to say with certainty that the connection they have just made is 100% safe.

Often cable lugs are purchased at the start of a new job and very rarely does anyone check if these cable lugs are compatible with the crimping tools or dies to be used.
It is often assumed that if you use a cable lug from any supplier with a suitable crimping tool and similarly sized die you will create a connection that is fit for purpose.
This assumption is quite dangerous and can result in a connection failing during service.

The cost to repair a failed connection is often considerably higher than the cost to engineer a safe connection.

To engineer a safe system there are many considerations but it is recommended that installers firstly use cable lugs, crimping tools and dies manufactured by one Company. However most companies have many types of lugs in the their product range such as DIN, Aluminium, Narrow Palm, Flexible and standard lugs to name a few. For all these lugs the installer will need to use the specific die and tool recommended by the manufacturer to ensure the connection is safe.

Who is to blame when the system fails?

The responsibility of adherence to safety standards lies with every manufacturer of cable lugs. For this reason the manufacturer specifies the appropriate cable lug and tool combination to be used with the selected cable.
Some companies offer crimping lugs, possibly bought in from the Far-East and the crimping tools are left to the contractor to source. A solution procured from such a company also requires a degree of caution as not all parts of the system are within their control. Behind a `safe crimping system' you will find a company with an impeccable quality system. This ensures that all raw materials are traceable and tolerances of the individual components are designed to work together to achieve the correct amount of compression every time a connection is made.

`Over or under' compression of a cable lug will give high resistance which leads to overheating and potential burnout of the joint.

Picture 1:
A comparison of good and bad crimps: An incorrect crimp (left: Over compressed, middle: under compressed (leading to increase in resistance), right: correct well formed crimp with die reference visible

Cable lug materials

Cable lugs can be made from a number of materials but due to the excellent electrical properties most are made from tin plated electrolytic copper. Other materials such as Aluminium, Nickel and Stainless Steel are also used and the installer again will need to make sure that the manufactures recommendations for tools and dies are followed.

Types of cable lugs

Cable lugs come in a range of different formats which can be divided as:

- DIN Cable lugs
- Standard lugs
- Sheet metal lugs

Picture 2:
Three types of cable lugs:
DIN compression cable lugs, standard tubular cable lugs and sheet metal terminals (from left to right)

The DIN standard covers all physical aspects of these cable lugs which range from 6 mm^2 to 1,000 mm^2. Barrel lengths are longer (see picture 2) than standard cable lugs and they come with a heavier wall thickness. This system is primarily used in continental Europe and uses a standard die code system.

Standard Cable lugs

Most manufacturers also offer standard tubular cable lugs. These again range from 6 mm^2 to 1,000 mm^2 and are also manufactured with high purity Electrolytic copper. Dimensionally these lugs have a slightly shorter barrel length than the equivalent DIN lugs which makes them more cost effective.

Sheet metal lugs

These lugs are designed only for crimping of stranded, fine and very fine stranded conductors – not for solid conductors. As the name implies these are manufactured from sheet metal and formed into a tube with cross section ranges from 0.5 mm^2 up to 240 mm^2. Amongst others these lugs can be found in electrical control cabinets and vehicles of public transportation. Most manufacturers recommend using an indent die with this type of lug.

Cable lug Markings

Markings on the lug provide the installer with essential information relating to the origin and application of the cable lugs. Typically this will include the Manufacturer, Die code, Metric hole size, and the cross section of the conductor in mm^2
(E.g. See picture 3:
KL = Klauke, 22 = die code, 12 = M12 hole, 150 = cable size)

Picture 3:
Only DIN compression cable lugs show the required number of crimps stipulated by the manufacturer

How often does a cable lug need to be crimped?

Generally the number of crimps needed depends on the size of cable lug and the die width being used. It is possible to replace a smaller crimp with a larger width die if the appropriate tool is used. The first crimp should always start furthest away from the cable. Some lugs such as the DIN range have markings that show the installer how many times the cable lug should be crimped, the die width to be used and the position of the crimp. For other lugs the installer should keep to the manufacturers guide lines.

How do you ensure that the tool stays within calibration?

Tools for crimping cable lugs need to be checked on a regular basis. Depending on which market the installer is operating in will determine how many crimps can be carried out between calibrations. This can be anywhere between 2,000 to 10,000 crimps. To ensure the tool works within the appropriate specification the operator will need to record the number of crimps that the tool has completed. For traditional crimping tools this requires all the users of the tool to manually collate data and put in place a system that ensures the tools are tested when required. In practice most companies test their tools on a periodic basis regardless of how many crimps have been carried out. Klauke however a leading system supplier, manufactures crimping tools that give a visual and audible notification when a calibration is due and also when a crimp does not conform to the required parameters. **The new intelligent pressing system (IPS) provides continuous crimp monitoring and alerts the user immediately if the correct pressure is not achieved**.

These `New Generation' IPS tools allow data to be downloaded to a computer recording both safe and unsafe connections. This allows important information to be kept on file as part of the quality system records which can then be produced at a later date. These tools can also be programmed to either notify the user that a calibration is due or to stop the tool from working when the calibration is due.

Picture 4:
Downloading valuable tool data to a PC

Engineering a safe system is now even more critical than ever.
Due to the increasing cost of copper, cables are now being installed nearer their operating capacity, consequently with lower safety margins. Due to these tight tolerances there is less room for error. This is where the **IPS system** help ensure a safe connection.

Which Crimping Profile for which lug?

For the majority of industrial customers today the hexagonal crimp profile is the preferred solution. This shape die compresses the conductor evenly and the large surface area ensures maximum contact is made while holding the individual wires firmly in place without causing damage. The indent crimp is generally used for sheet metal lugs and fine stranded cables. The indent allows the strands to flow within the lug during compression to optimise electrical and mechanical properties while preventing strands breaking.

Do you need to ensure that the crimp complies with certain specifications?

Every company or industry has specific requirements or specifications that they need to conform to. The requirements are found in European documents or specific industry standards e.g. Rail, Military all with a view to achieving a connection that is safe for the intended application. Most manufacturers will have in-house facilities which allow testing to be carried out to even the most demanding specifications.
Tensile tests are often employed as a preliminary check for compliance (see picture 5)

Picture 5:
Automated tensile test equipment

A certificate is then sent to the customer showing the results achieved against the performance required. Companies like Klauke will then technically `underwrite' that connection providing the recommended tool, die, connector and cable combination is implemented.
A voltage drop tests measures the resistance of the crimped joint to ensure it does not exceed the resistance of an equal length of conductor. Again the resistance achieved is critical in preventing a connection burnout during service.

Conclusion:
There are many factors highlighted in this document which need to be considered when terminating or jointing a power cable connection. Klauke as a leading manufacturer of cable lugs, crimping and cutting tools can advise on engineering a correct solution for your specific application ensuring a long and safe installation. The IPS system is the latest development in ensuring a safe connection is achieved.

For more information please visit
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