

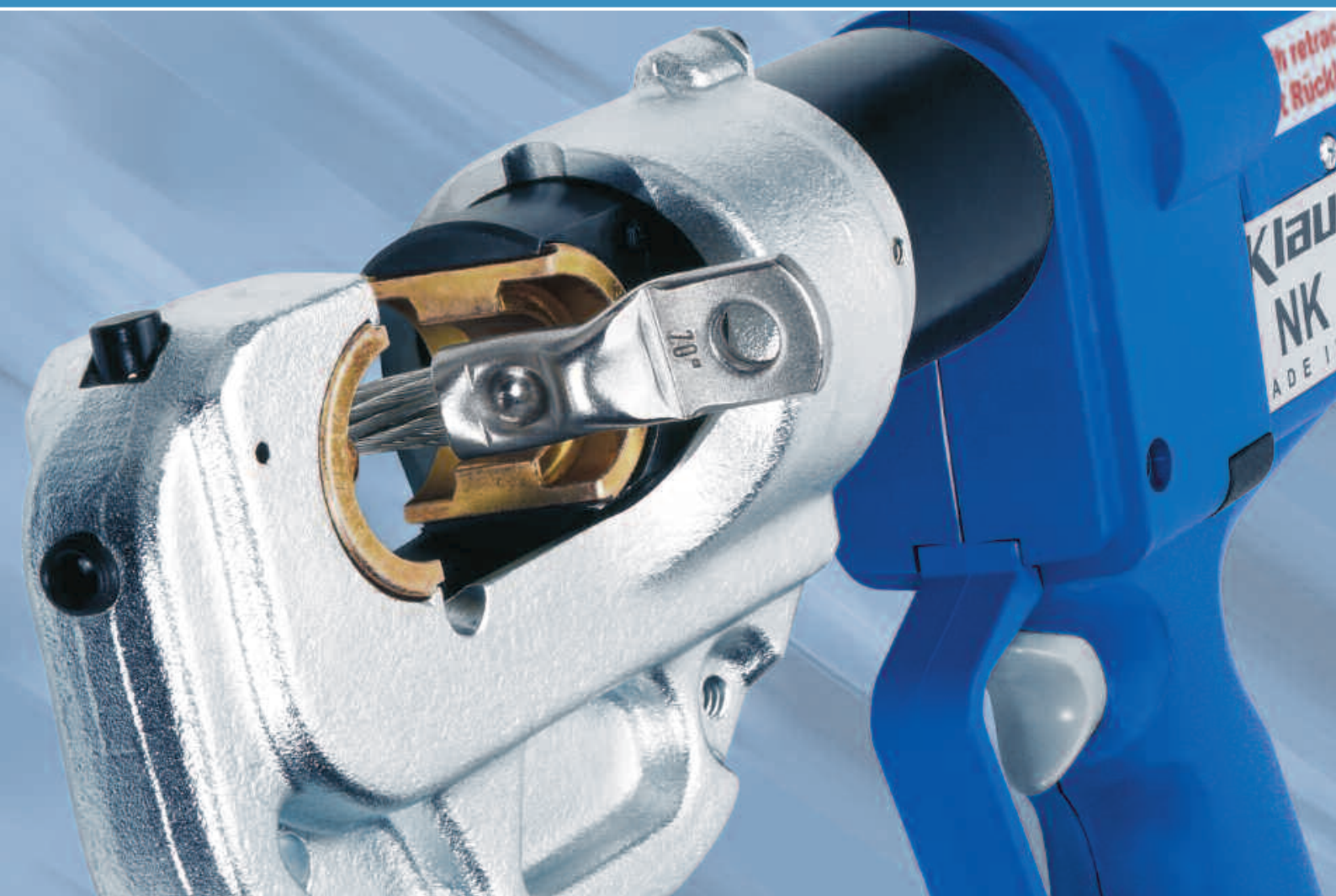
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ELECTROINSTALLATION:

**Tubular cable
lugs for special
applications**

ORGAN DES
ZVEH 

Cable lugs for special applications require a professional crimping procedure. Otherwise you risk loss of power which may result in increased temperatures and – in the worst case – fire.

Tubular cable lugs for special applications

This problem is known to every electrician: When trying to insert a stranded or fine stranded conductor into the cable lug the cable splices and some wires cannot be inserted. To avoid this problem renowned manufacturers offer “cable lugs for special applications”.

With these special cable lugs all types of cables can be used. The design and construction is geared to the characteristics of cable types as classified in the DIN standard 57295. **Picture 1** shows the different types

- Round single / solid conductors (re) per class 1
- Round multi-stranded conductors (rm) per class 2
- Fine stranded conductors per class 5
- Finestranded conductors per class 6

F-cable lugs for fine and very fine stranded conductors

The above mentioned problem of spliced cables per class 5 and 6 acc. to DIN 57295 is being avoided when using “F” type series cable lugs. These lugs are designed for processing larger cross sections in switch cabinet construction, electroplating factories or in rail vehicles. Compared with standard tubular cable lugs the “F type” lugs have a larger tube diameter. The cable lugs have a flared entry which eases cable entry.

The advantages are obvious. “F type” cable lugs ensure an easy and safe insertion of the conductor (**picture 2**), the unravelling of the cable strands is avoided and the complete conductor fits into the cable lug. This is also a safety-related issue: A reduction of the cross section caused by not inserting all the strands is being avoided and the complete cross section of the cable is maintained. Markings on the F-type cable lug barrel provide information of the product, e.g. manufacturer, dimension and design. Marking “KL 12 150 F” and shows

- KL: Manufacturer (Klaue)
- 12: Metric bolt size for connecting bolt: size M12



Source: Klauke

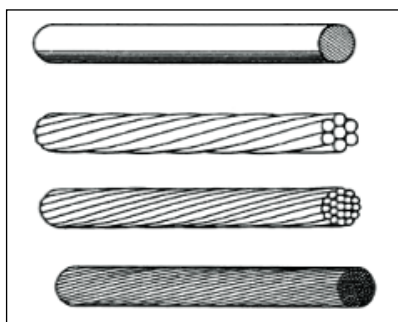
Unprofessional and individually matched cable lugs can create serious safety defects in electrical installations.

- 150: Cross section of conductor in mm²
- F: Tubular cable lugs “F-type” (fine stranded)

For professional crimping of F-type cable lugs (**picture 3, 4**) the indent or quad point crimping method is recommended with the appropriate tools and the correct indent profile. To avoid over or under compression the correct tooling is a prerequisite. An incorrect crimping connection can result in increased joint resistance leading to an increase in temperatures and in the

worst case in fire. Klauke recommends use of their own crimping tools to achieve and guarantee professional crimps according to VDE standards.

In addition to “F-type” cable lugs some manufacturers offer appropriate butt-connectors for extension and repair of conductors. These also feature a flared entry and larger tube dimensions. A central restriction insures uniform insertion of the cable ends, and insure the crimping recommendations for F-type lugs are adhered to.



Source: Klauke

Picture 1: Conductor types acc. to DIN VDE 57295: round solid, round stranded, fine stranded, compacted



Source: Klauke

Picture 2: Cable lugs “F type” for fine stranded conductors for easy insertion with no splicing



Source: Klauke

Picture 3: F-type cable lug shows professional indent crimp



Source: Klauke

Picture 5: Professional crimp on a solid conductor with matched tube dimension



Source: Klauke

Picture 4: A cross sectional view of an indent crimp (with manufacturers recommended tool) shows the even arrangement of conductor in the lug



Source: Klauke

Picture 6: Special cable lugs for switch cabinets (type SG) for safe connection also of conductors with larger cross sections

“F-type” cable lugs and butt connectors conform to the normative requirements of the EN 13600 standard, and are manufactured from electrolytic copper. As corrosion protection they are tin plated. Cross sections range between 10 mm² up to 300 mm². In addition to the normal design “F-type” cable lugs are also available as 45° resp. 90° angled versions as well as inspection holes to check whether the conductor is fully inserted.

As with all other connections these products are subject to test standard IEC 1238 part 1, which guarantees a safe electrical and mechanical connection has been achieved. Cable lugs

manufactured by Klauke are subject to a special annealing process to help relieve material stresses and hardness. This reduces the chance of material fracture and is an additional safety feature.

The quality of cable lugs can often be recognized by visual characteristics. A burr free lug, a flat palm and a cleanly machined end are indicative of a high quality product.

Cable lugs for solid conductors (re)

For processing solid conductors (class 1 acc. to DIN VDE 57295) the use of tubular cable lugs “E” type is recom-

mended which are also manufactured from electrolytic tin plated copper. Their tube diameter is matched to the conductor size to guarantee a professional crimp. (picture 5). Application is in all areas where solid conductors are being mostly used, e.g. manufacture of transformers and engines. A hexagonal resp. indent crimping is being recommended. Again it has to be observed that both cable lugs and crimping tools come from the same manufacturer.

Cable lugs for solid conductors can be recognized by their smaller tube diameter and the marking “E”. For example: KL 10 50 E. Cross sections usually range from 6 mm² up to 50 mm². The range is being completed by butt-, T- and cross connectors having the appropriate internal tube diameters.

Cable lugs for switch cabinets

In many cases working area in switch cabinets is very tight and connecting conductors to high-power switchgears can be a problem. In case of larger cross sections standard cable lugs do not fit the connecting terminal (picture 6).

For such applications many manufacturers have designed special narrow palm cable lugs (SG cable lugs) (picture 7) which fit easily. Important is that this narrow palm is also thicker (picture 8) than standard lugs insuring the same the same amount of electrolytic copper has been used.

Despite a narrower palm no performance is lost. Thus these cable lugs therefore comply with a professional connection for stranded conductors



Source: Klauke

Picture 7: Direct comparison of standard cable lugs (left) and cable lugs with narrow palm for switch cabinets



Source: Klauke

Picture 8: Shows the thicker palm of SG cable lugs for switch cabinets, using the same amount of copper as used in a standard cable lug.



Source: Klauke

Picture 10: A correctly crimped Stainless steel cable lug used for applications where the environment can reach 400° C

Source: Klauke



Picture 9: Professional crimp on stainless steel cable lug for application in ambient temperatures of up to 400° C

according to DIN-VDE class 2 as typically used in switch cabinets. A hexagonal or indent crimp is recommended.

Cross sections range from 35 mm² up to 300 mm². The hole dimensions comply with industry sizes of connecting terminals, e.g. 6, 8, 10, 12 and 16 mm. Versions with inspection hole are also available.

It is dangerous and incorrect to file the palm of a normal cable lug to the size of the connecting terminal. Such manipulation can result in increased temperatures and fire in the worst case.

Stainless steel cable lugs for aggressive environments

Especially for adverse environments and for crimping copper conductors

(picture 9) stainless steel and nickel tubular cable lugs have been designed. Stainless steel cable lugs are particularly acid and corrosion resistant and are typically used in chemical industries, in areas exposed to sea water i.e. the earthing of masts on sailing yachts.

An additional benefit of these lugs is the temperature resistance. Consequently these lugs can be used in ambient temperatures up to 400° C. At higher temperatures of up to 650° C – common in the construction of furnaces – nickel cable lugs represent the best solution. Both stainless steel and nickel cable lugs can be used for all common cable types. Cross section ranges from 0.5 mm² up to 95 mm². Generally an indent crimp is recommended. The same applies for

MORE INFO:

For more literature on these subjects please got to

<http://www.vde-verlag.de/engl.html>

stainless steel and nickel butt connectors with barrier.

Outlook: AL and AL-CU Compression lugs

Another special situation is brought about by the compression of Al and Al-CU cable lugs for use with Aluminium conductors. Due to price and weight benefits a general trend towards these can be seen. To crimp these however a number of things need to be observed which will be covered in a future addition.

Lutz Rimmel, Anwendungstechnik & Application Engineering,
Gustav Klauke GmbH