

**Installation Instruction  
EPP-1690-1/13**

**Outdoor Termination  
with Composite Insulator  
for Polymeric Insulated  
Cables with Wire Shield**

**up to  $U_m$  170 kV**

**Tyco Electronics Raychem GmbH**  
a TE Connectivity Ltd. Company  
TE Energy  
Finsinger Feld 1  
85521 Ottobrunn/Munich, Germany  
Tel: +49-89-6089-0  
Fax: +49-89-6096-345  
energy.te.com

## **Before Starting**

**Check to ensure that the kit you are going to use fits the cable.**

**Refer to the kit label and the title of the installation instruction.**

**Components or working steps may have been improved since you last installed this product.**

**Carefully read and follow the steps in the installation instruction. Read all the text describing the picture before you start to carry out that step.**

## **General Instructions**

**Use a propane (preferred) or butane gas torch.**

**Ensure the torch is always used in a well-ventilated environment.**

**Adjust the torch to obtain a soft blue flame with a yellow tip.**

**Pencil-like blue flames should be avoided.**

**Keep the torch aimed in the shrink direction to preheat the material.**

**Keep the flame moving continuously to avoid scorching the material.**

**Clean and degrease all parts that will come into contact with adhesive.**

**If a solvent is used follow the manufacturer's handling instructions.**

**Tubing should be cut smoothly with a sharp knife leaving no jagged edges.**

**Start shrinking the tubing at the position recommended in the instruction.**

**Ensure that the tubing is shrunk smoothly all around before continuing along the cable.**

**Tubing should be smooth and wrinkle free with inner components clearly defined.**

The Information contained in these installation instructions is for use only by installers trained to make electrical power installations and is intended to describe the correct method of installation for this product. However, TE Connectivity has no control over the field conditions which influence product installation.

It is the user's responsibility to determine the suitability of the installation method in the user's field conditions. TE Connectivity's only obligations are those in TE Connectivity's standard Conditions of Sale for this product and in no case will TE Connectivity be liable for any other incidental, indirect or consequential damages arising from the use or misuse of the products.

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## **General Instructions (continued)**

**Obey relevant security and safety rules during the installation.**

**The cable training and laying needs to be finished and the cable ends have to be properly sealed. The joint pit should be dug in such a way that there is enough free cable to the left and the right of the joint that the parts of the accessory which will later be drawn over it do not interfere with the fitting of the joint.**

**Cable racks are necessary for final positioning and ensure the installation area is free from dust and kept dry.**

**During the cable preparation the working environment has to be kept clean (tent or shelter) and the installers should wear clean working overalls.**

**All tools and devices must be free from oil and grease.**

**Use appropriate stripping tools to allow for smooth and uniformly round insulation diameter and smooth insulation surface.**

**NOTE: Adjust the stripping tool to the thickness of the semicon layer so that only the layer is thoroughly removed.**

**Adjust the cutting depth at the semicon cut to ensure a chamfered transition.**

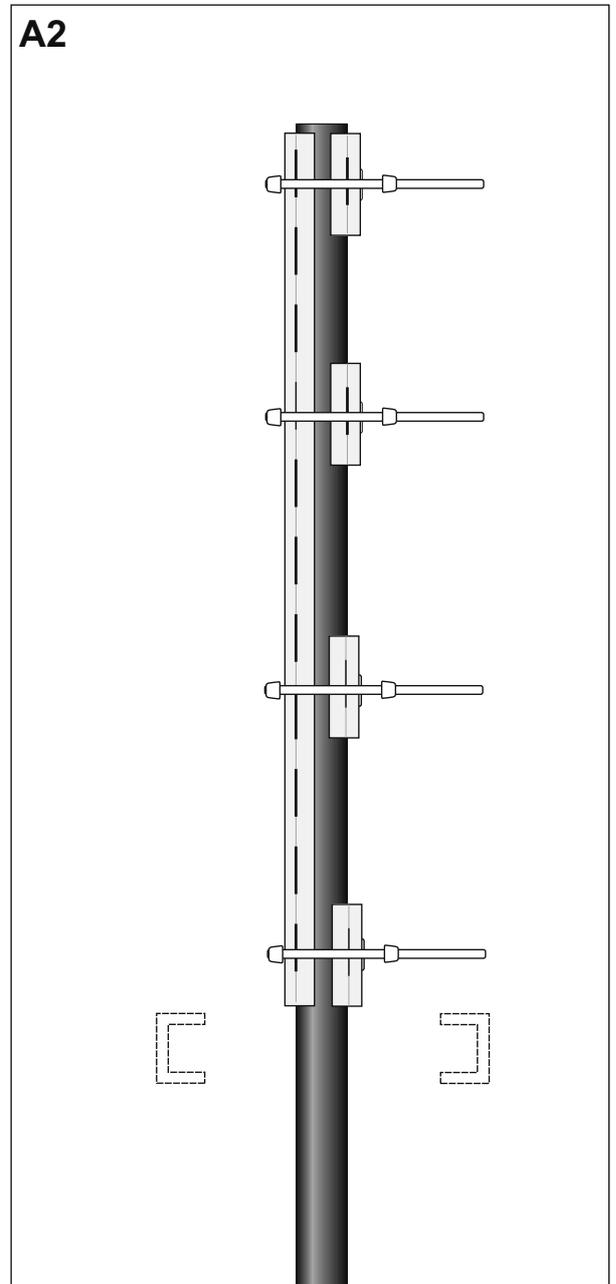
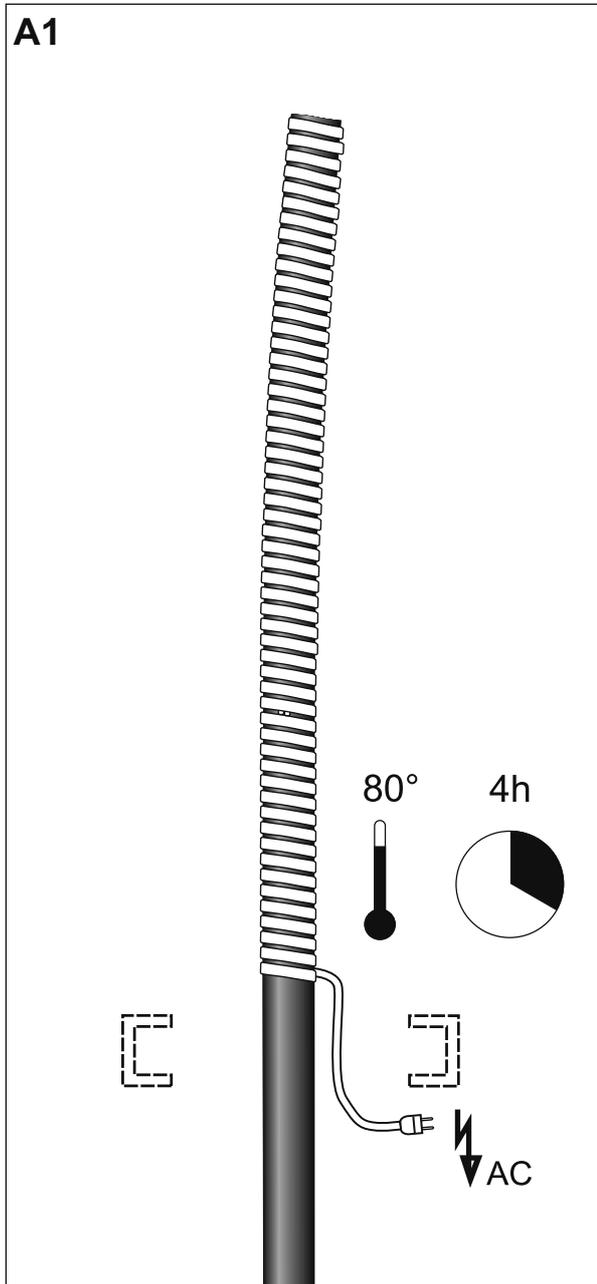
**After the tools have been used polish the stripped surface by hand or a machine grinder using 220 grid (Aluminum Oxide cloth) followed by 400 grid.**

## A. Straightening and Heating of the Cable

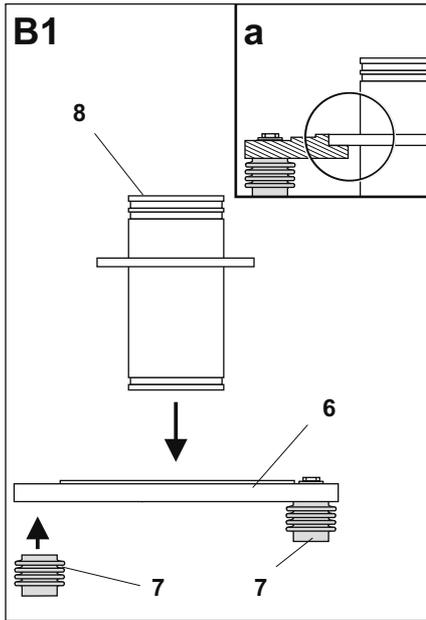
Before starting the cable preparation, train the cable end in the straight installation position and fix it.

In case of graphite coating cover the cable with one layer of crepe paper.

Heat the entire cable by applying a heating device to the outer jacket for a minimum of 4 h at 80°C. Before stripping to the required dimensions the cable needs to be cooled down to ambient temperature using slide rails.



## B. Marking Reference Lines



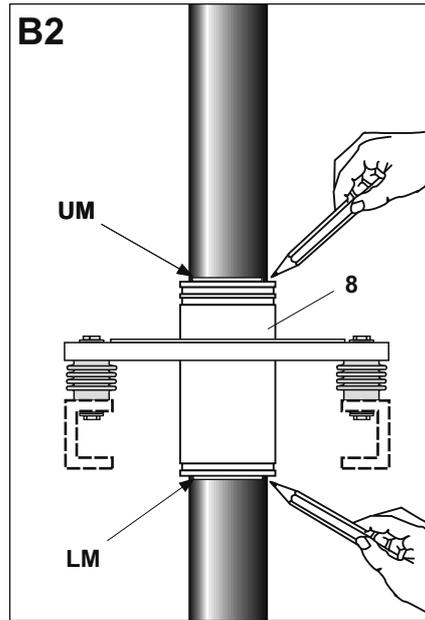
Temporarily fix the support insulators (7) to the base plate (6) with the larger screws.

Position the support insulators and base plate on the support rack.

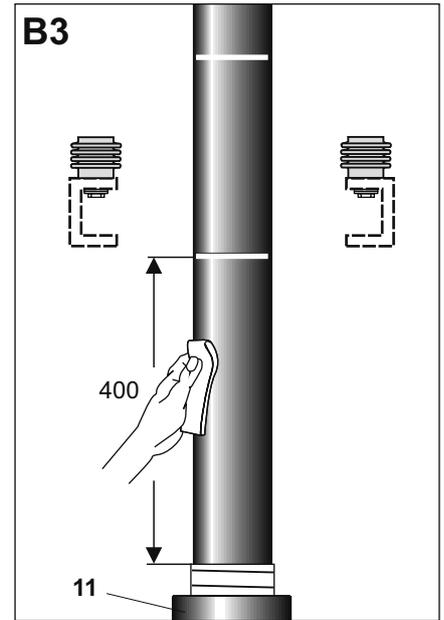
**Note: If necessary, check and adjust the bores on the support rack:** The support insulators have to be installed in a plane. If there is a gap between the support rack and any of the support insulators, use the inserting non-corrosive metal spacers to adjust it.

Firmly fix the support insulators to the support rack.

Place the cable gland (8) into the base plate. Make sure it fits properly (see **detail a**).



**Mark on the cable** the upper mark (UM) next to the uppermost edge and the lower mark (LM) next to the lowermost edge of the cable gland (8) using a marking pen or PVC tape as shown. Make sure that the remaining cable length above UM is greater than L.

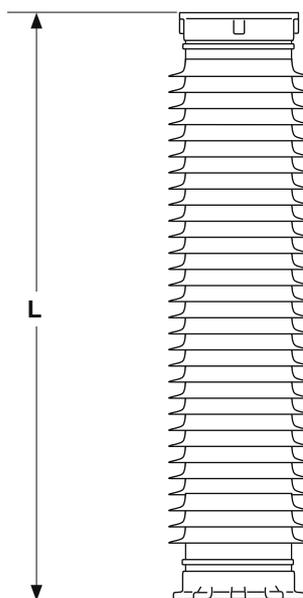


Remove the cable gland and base plate. Leave the support insulators.

Remove the graphite coating or semiconductive layer, if any, up to 400 mm **below the lower mark (LM)**. If the cable has no graphite coating, clean the outer jacket up to 400 mm **below the lower mark (LM)**.

Cover the cable with crepe paper below the cleaned surface for protecting the long tube.

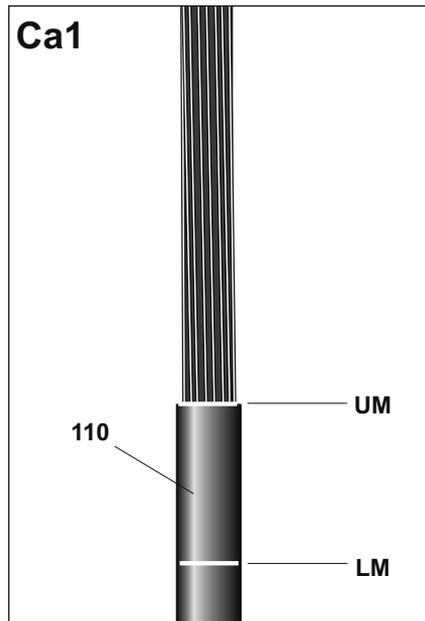
Slide the long tube (11) over the covered cable surface.



**Measure the length L of the insulator (5) as shown.**

## C. Stripping the Cable

### a Cable *without* Metal Foil



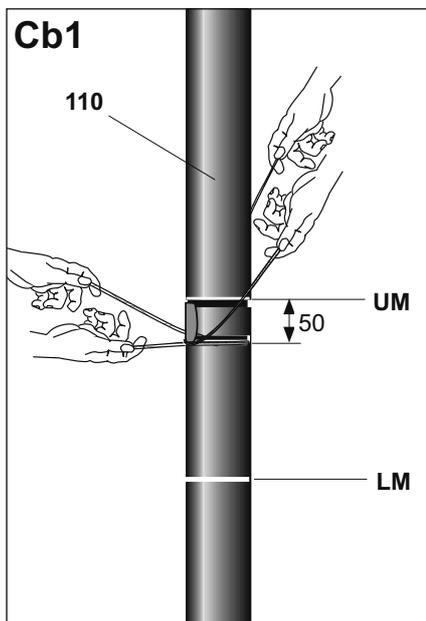
Starting out from the upper mark (UM), remove the outer jacket (110) of the cable as shown.

Continue with chapter D.

### b Cable *with* Metal Foil

Cut through the outer jacket (110) with the supplied yellow string.

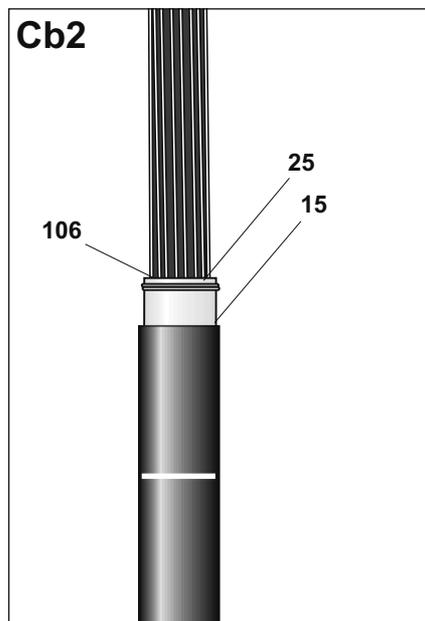
Remove the outer jacket from the AL-foil (106) by slicing segments away with the string as shown.



Fix the AL-foil (106) with a wire binder (25). Clean the AL-foil from traces of the outer jacket (if any).

Apply 2 layers of copper mesh (15) on the AL-foil.

Remove the outer jacket, foil and bedding from the remaining cable end.

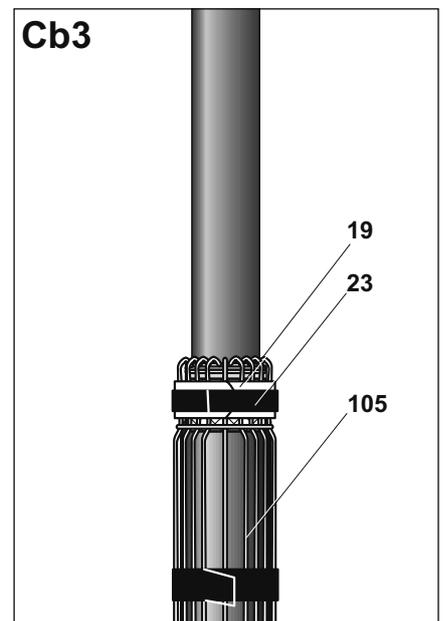


Bend down the shield wires (105).

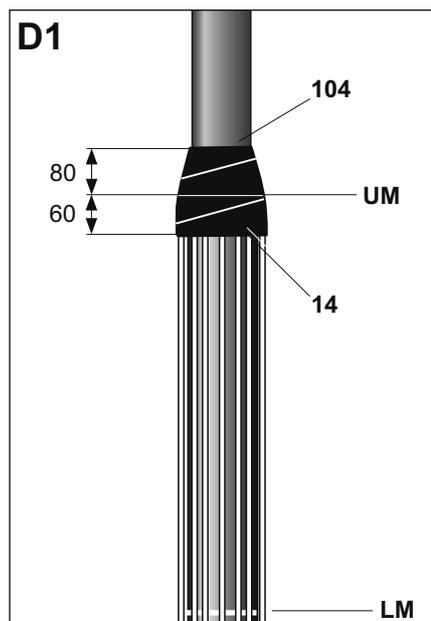
Remove all materials from the semicon layer.

Place one roll spring (19) over the shield wires. Fix the roll spring by twisting.

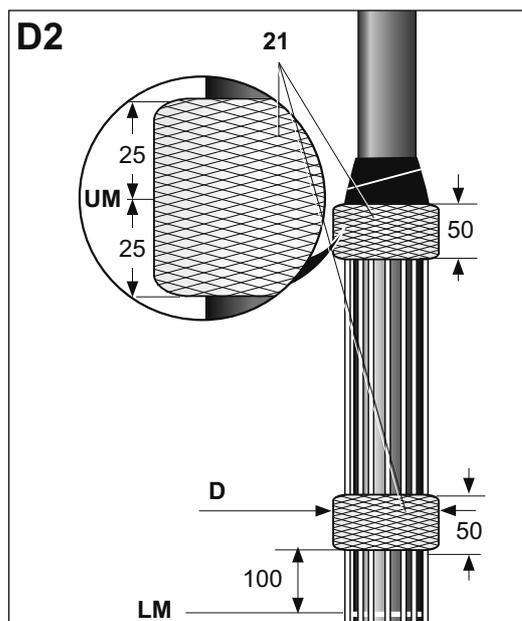
Protect the roll spring with three layers of PVC-tape (23).



## D. Preparations of the Cable Screen/Sheath



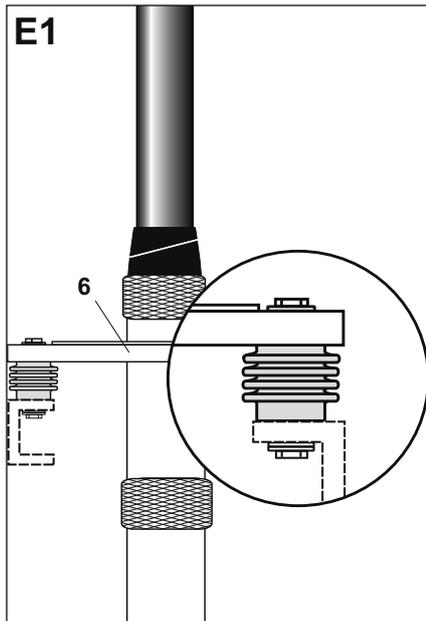
Apply a layer of semi conducting tape (14) with a 50% overlap on the outer semicon layer (104), starting 80 mm above the upper mark. Stretch the tape by 50% during wrapping. Move downwards and stop 60 mm below the upper mark.



Apply a 50 mm wide packing of textile tape (21) on the upper mark as shown. 100 mm above the lower mark, wrap a second 50 mm wide packing of textile tape starting as shown.

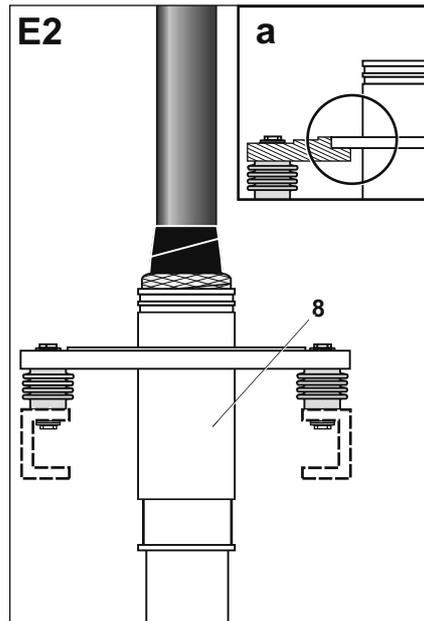
**D** = Inner diameter of the gland

## E. Mounting the Cable Gland



Mount the base plate (6).

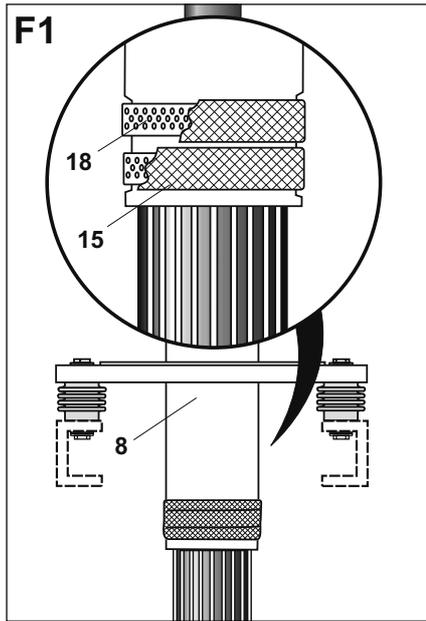
Fasten the screws on the base plate with a maximum torque of 35 Nm.



Mount the cable gland (8).

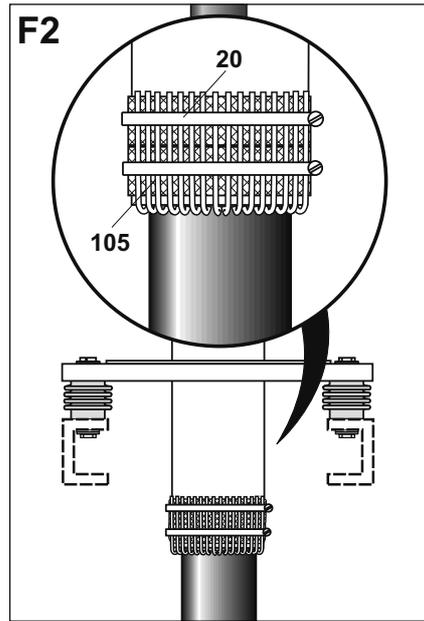
**Make sure the cable gland plate fits properly in the base plate at any spot (see detail a).**

## F. Connecting the Cable Screen



Abrade, degrease and clean the cable gland (8).

Wrap two contact bands (18) around the cable gland and fix them with 2 - 3 layers of copper mesh tape (15).

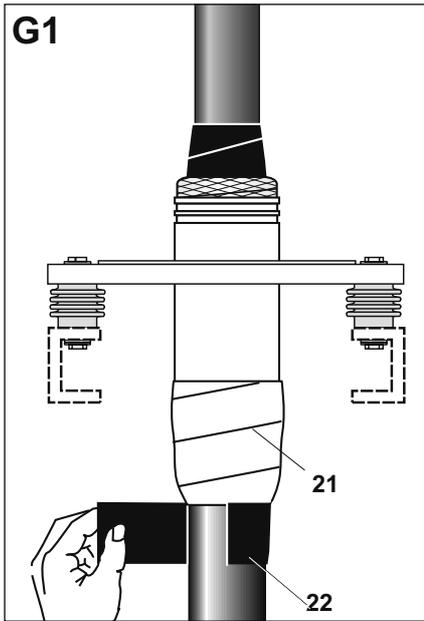


Bend the copper wires (105) back.

Fix the copper wires as shown using two armour clamps (20).

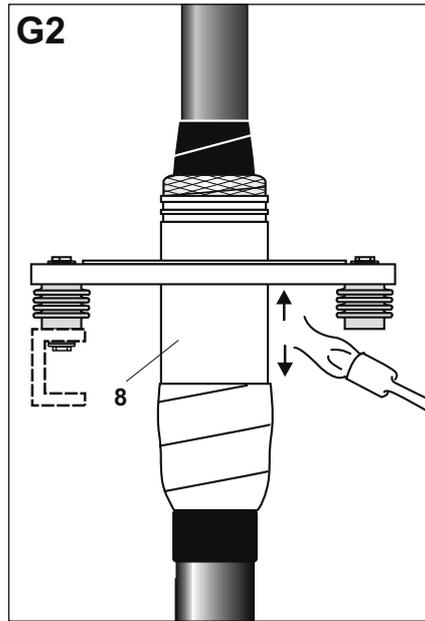
Cut the copper wires above the upper armour clamp.

## G. Sealing the Cable Gland

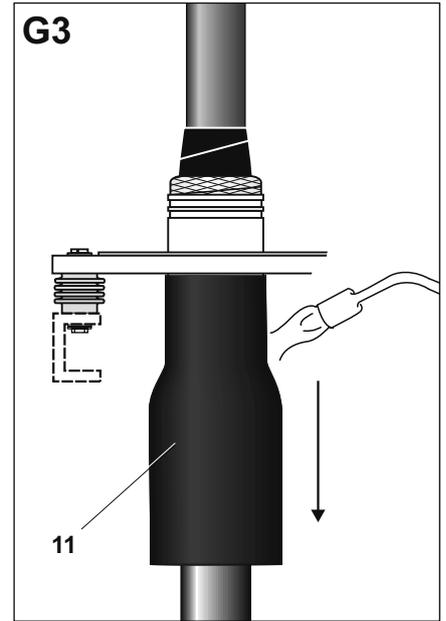


Cover the hose clamps with textile tape (21).

Wrap 1 layer of black mastic tape (22) around the outer jacket cut below the textile tape.

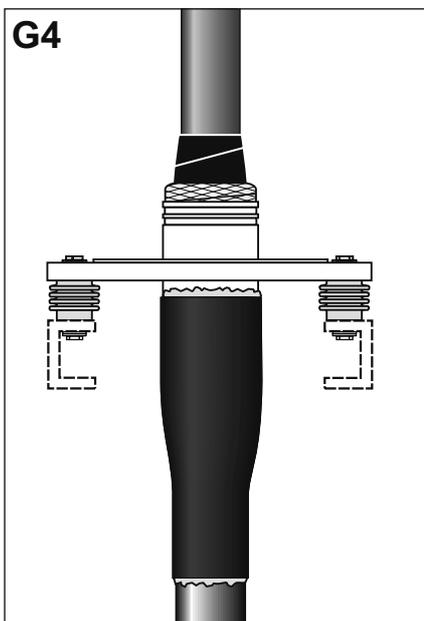


Preheat the gland stud (8).



Position the long tube (11) on the gland stud and shrink it into place. Start shrinking at the top and move downwards.

The tube is fully shrunk when the outer surface is smooth, has a glossy appearance and a flow of sealant is visible at each open end. Intimate surface contact should be made along the whole tube length, conforming to the profile of the components underneath. The tubing should be smooth and wrinkle free.



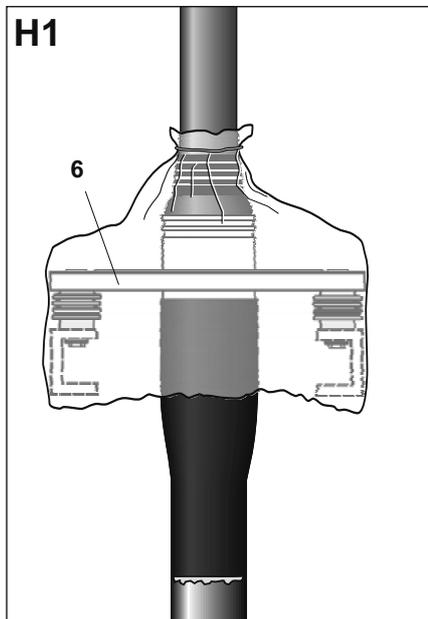
## H. Cutting the Cable to Length



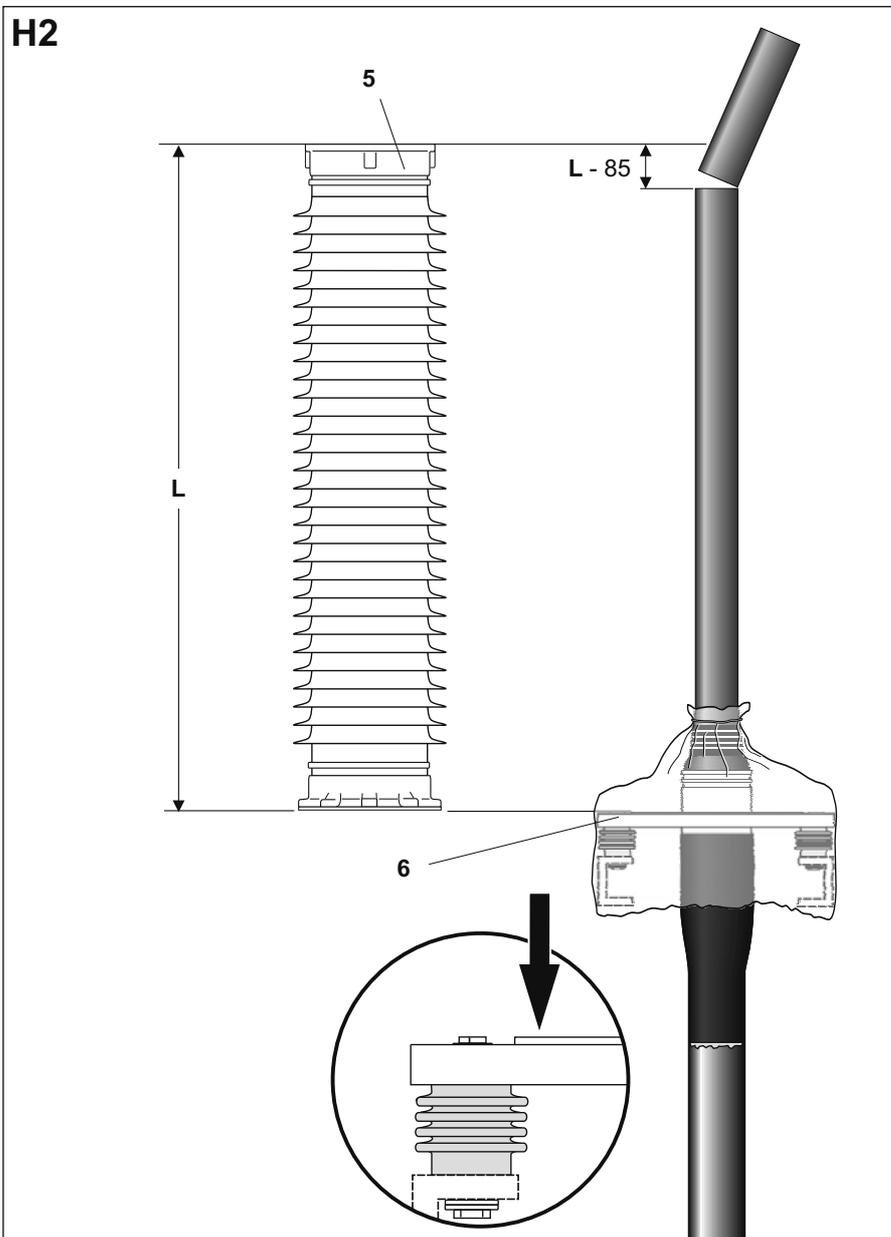
Straighten the cable carefully.

If the cable is bent while you are measuring, you may cut the cable to the wrong length.

**Make sure the cable is straight.**



Protect the base plate (6) with plastic foil.



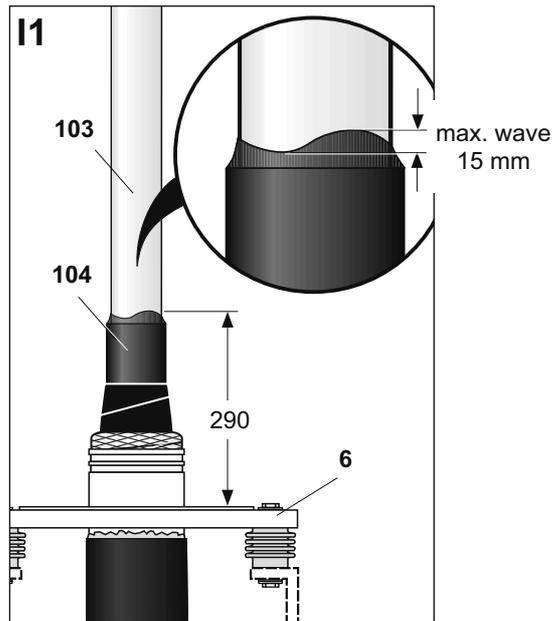
Measure the height **L** of the composite insulator (5).

Starting out from the base plate (6) as shown, measure and mark **L** on the cable.

**Note:** Make sure you measure from the mounting area of the base plate (see detail).

Cut the cable 85 mm below **L**.

# I. Stripping the Semicon Layer



Remove the outer semicon layer (104) to within 290 mm from the base plate (6).

Make sure the cutting depth of the stripping tool is adjusted accurately so it removes the outer semicon layer entirely but does not cut into the insulation (103).

The insulation must be free from all traces of conductive material.

**Note:** Polish the insulation. See „General Instructions“.

**Do not damage the insulation.**

Chamfer the outer semicon layer on the cut between 20 - 30 mm.

Polish the insulation up to 300 mm above the screen cut. Check dimension **D** as in **Table 1**. **D** must be within the given tolerances.

Make sure that the transition from the outer semicon layer to the insulation corresponds in terms of shape and max. height with the wave shown in the detail.

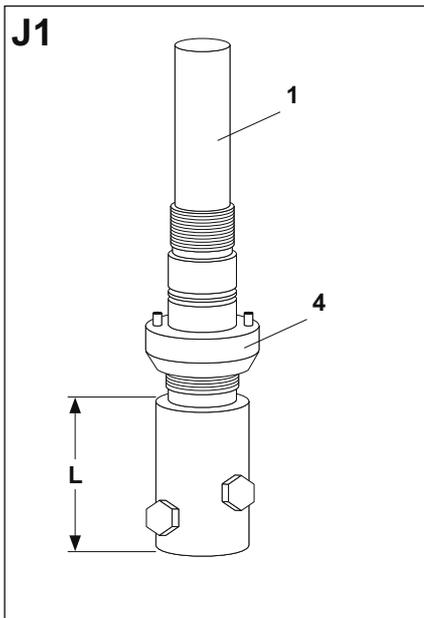
**Table 1**

**Application range of the stress cone sizes**

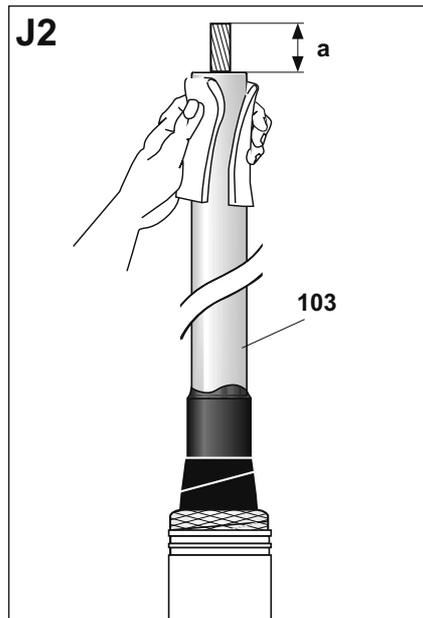
Tyco description	Cable Core D* (mm)
HVCA-XHVT145-SCONE-34/44	34 - 44
HVCA-XHVT145-SCONE-43/52	43 - 52
HVCA-XHVT145-SCONE-50/58	50 - 58
HVCA-XHVT145-SCONE-56/66	56 - 66
HVCA-XHVT145-SCONE-64/74	64 - 75
HVCA-XHVT145-SCONE-72/83	72 - 84
HVCA-XHVT145-SCONE-81/97	81 - 97
HVCA-XHVT145-SCONE-95/108	95 - 108

\*The limit values are valid for the finally prepared cable (after peeling and grinding). For peeling it must be considered that subsequent grinding will reduce the diameter by 0.5 - 1 mm.

## J. Preparing the Conductor



Measure the bottom part **L** of the cable lug as shown.



According to the measured length **L** remove the cable insulation (**103**) as shown in table 2.

Chamfer the insulation and deburr the edges with sandpaper.

Remove all insulation or conductiv materials from the conductor.

Clean the cable insulation thoroughly using the supplied cable cleaner.

**Note:** In case of segmented conductor all insulating layers has to be removed.

Check if the diameter over cable conductor is within the application range of cable lug according to packaging label.

Protect the conductor with PVC tape (**23**).

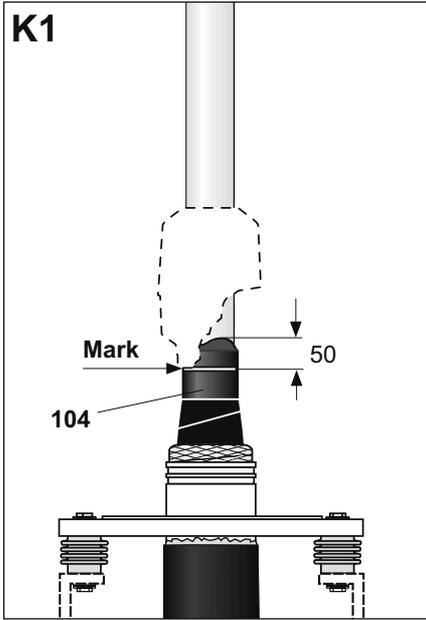
**Table 2**

<b>L (mm)</b>	125	165	160
<b>a (mm)</b>	90	130	135

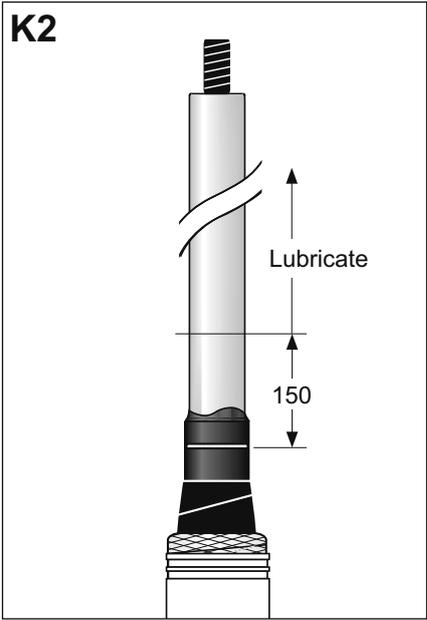
## K. Installing the Stress Cone



Do not interrupt the following installation steps until the termination has been completed.



**Mark** 50 mm on the outer semicon layer (104) measured down from the highest point of the wave.



Thoroughly lubricate the cable insulation up to 150 mm above the mark. Lubricate the inner part of the stress cone by using the supplied PVC stick.

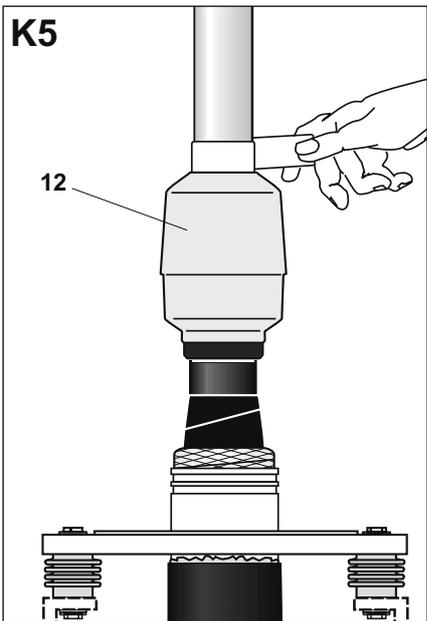
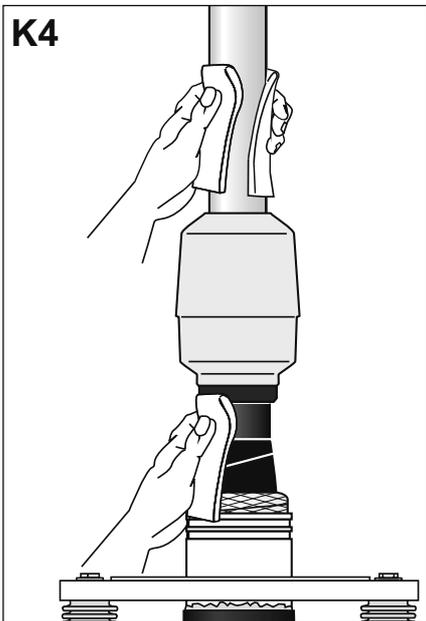
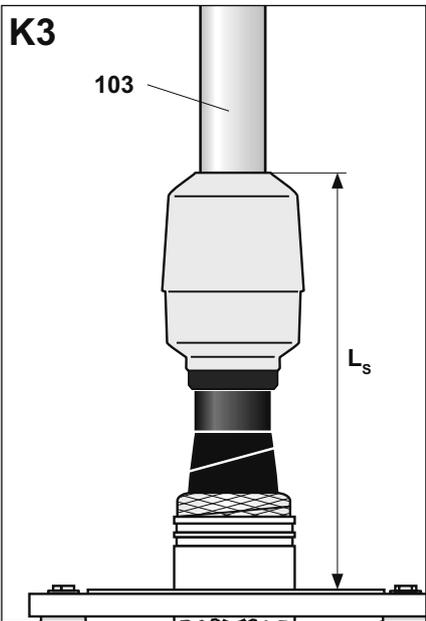
**Note:** Wash and clean your hands before. Push the stress cone with twisting movement onto the cable core until its collar reaches the ungreased cable insulation 150 mm above the mark. Remove the piled up silicone grease at the collar of the stress cone.

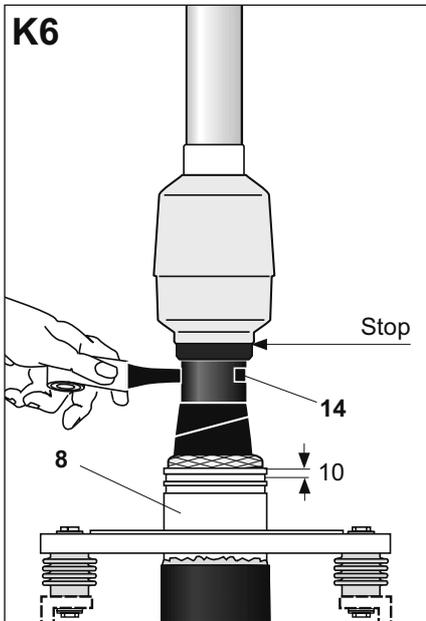
Push the stress cone with a twisting movement until its collar reaches the mark on the outer semicon layer.

Measure the distance  $L_s$ . Note the dimension down to the installation protocol.

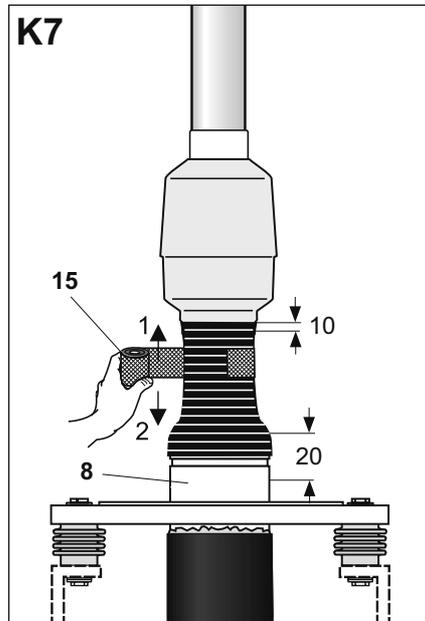
Clean the cable and all parts installed.

Temporarily apply several layers of transparent tape around the cable insulation above the stress cone (12). Wrap the tape tightly in order to keep the stress cone in place.

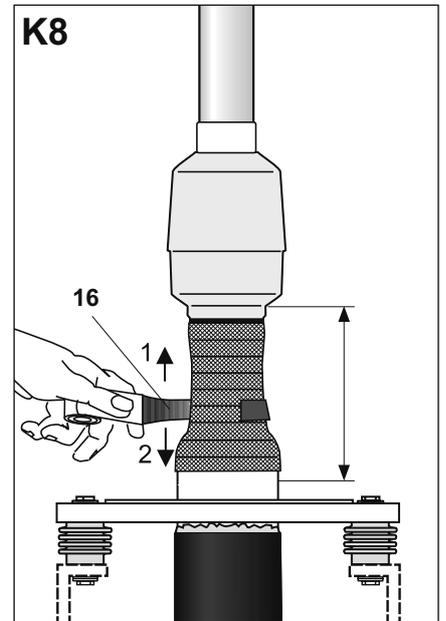




Wrap one layer of semi conducting tape (14) with an overlap of 50 % onto the cable. Stretch the tape by 50 % during wrapping. Start applying the tape in the middle position, then move up stopping on the black part of the stress cone. Move down and apply the tape 10 mm onto the cable gland (8).



Wrap copper mesh (15) onto the semi conducting tape with an overlap of 50 %: start applying the copper mesh in the middle position, then move up 1 stopping 10 mm below the lighter grey part of the stress cone. Move down 2 and apply the copper mesh 20 mm onto the cable gland (8).



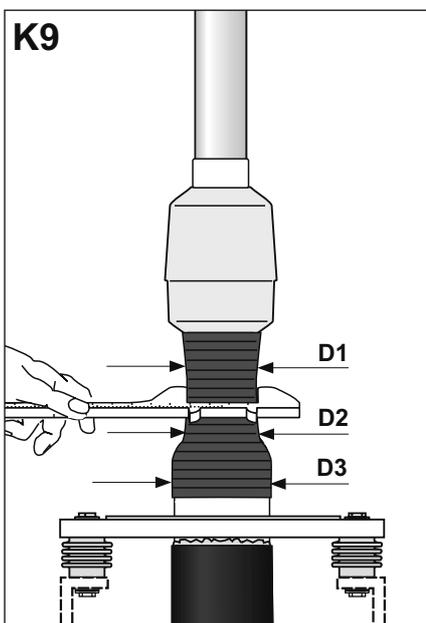
Apply a layer of self-amalgamating tape (16) with an overlap of 50 % onto the cable. Stretch the tape by 50 % of its original width. Start applying the tape in the middle position, then move up 1 and cover the stress cone collar. **Do not apply tape onto the stress cone shoulder.** Move down 2 and apply self-amalgamating tape onto the cable gland as shown. Move up again and stop in the position where you started.

Apply as much self-amalgamating tape (16) as necessary to achieve the calculated diameters D1, D2 and D3. Check the diameters.

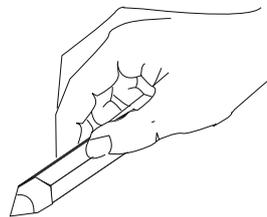
Start and end wrapping on the cable gland. Fix the top end with a string (17) in the position shown.

Cover the stress cone with foil or crepe tape.

Measure the diameters D1, D2 and D3 with a sliding caliper.



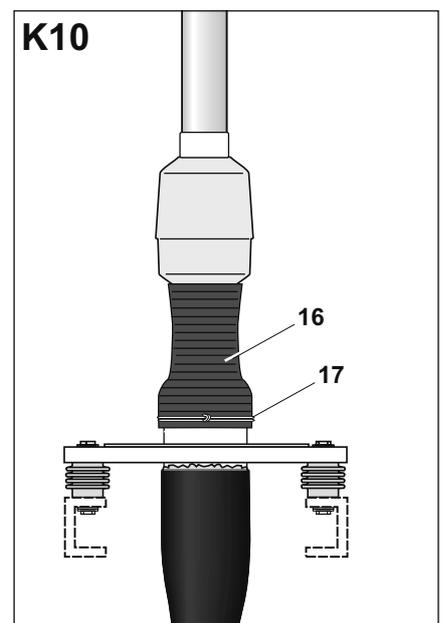
Write the values down. Make the calculation shown in the table.



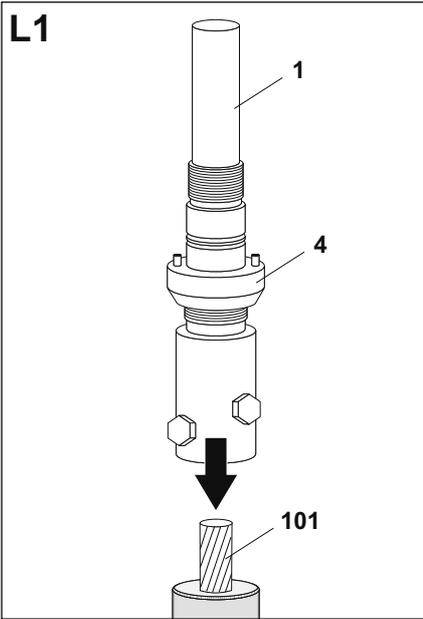
$$D1 = \dots\dots \text{ mm} + 10 \text{ mm} = \dots\dots \text{ mm}$$

$$D2 = \dots\dots \text{ mm} + 10 \text{ mm} = \dots\dots \text{ mm}$$

$$D3 = \dots\dots \text{ mm} + 20 \text{ mm} = \dots\dots \text{ mm}$$



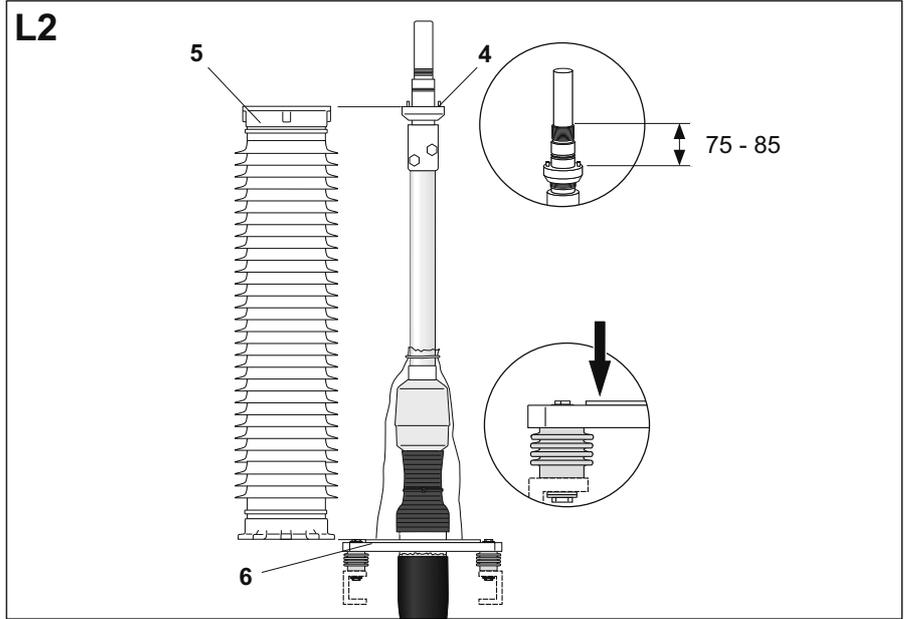
## L. Installing the Cable Lug



Remove the PVC tape from the conductor (**101**).

Temporarily place the lug (**1**) including the support nut (**4**) on the conductor.

**Note: Do not shear off the bolts.**



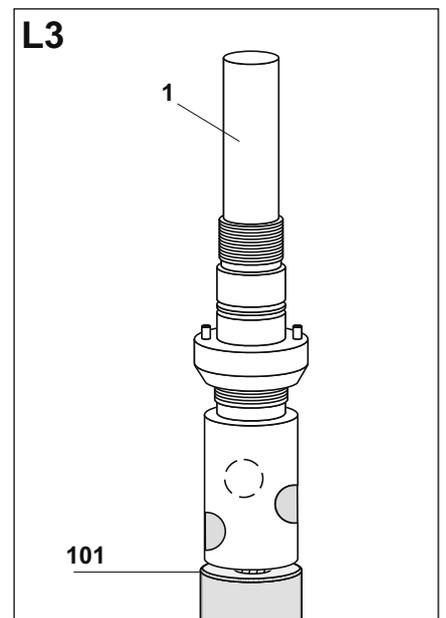
Check the distance between the base plate (**6**) and the top of the support nut (**4**). Adjust the distance exactly to the height of the composite insulator (**5**). If this is not possible, rework the cable.

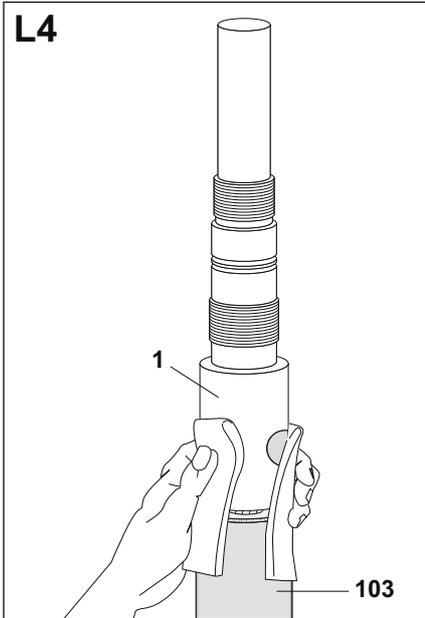
**Note:** Make sure you measure from the highest point of the base plate (see detail). Check all dimensions before you continue with step L3.

**Note:** Make sure the support nut is placed on the lug between 75 mm and 85 mm measured from the top of the thread (see detail).

Tighten the bolts of the lug.

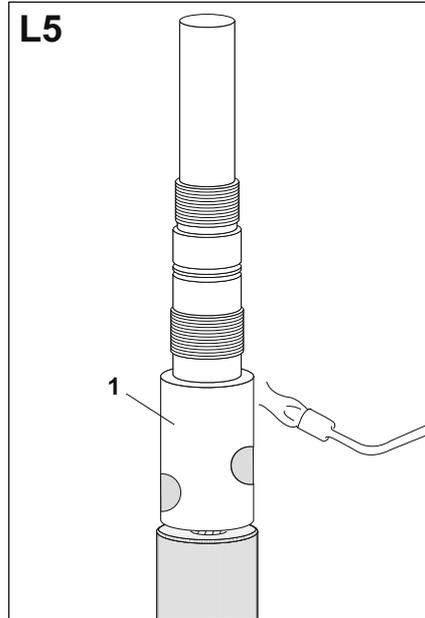
Shear off the bolts starting with the lower one. Use a common box spanner or spanner.



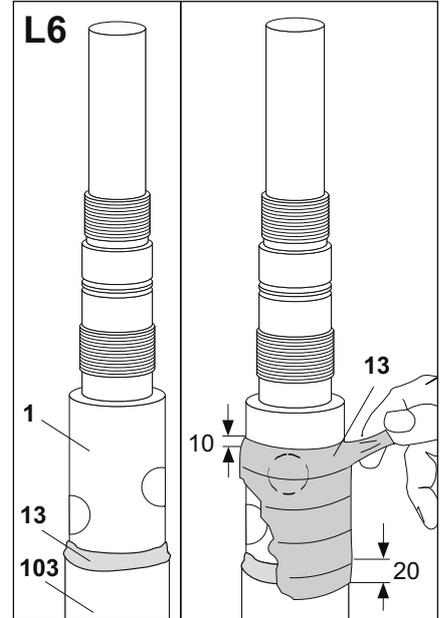


Degrease and clean the lug (1) and the cable insulation (103).

Remove the support nut.



Preheat the lug (1).



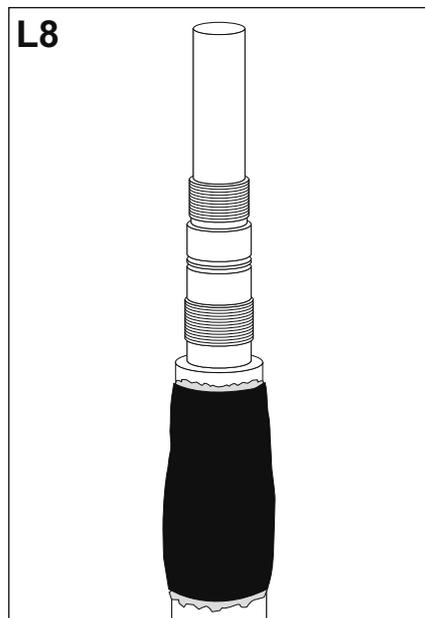
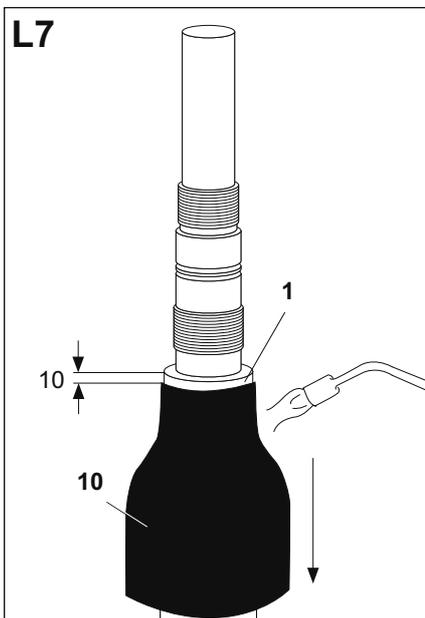
Fill the gap between the lug (1) and the cable insulation (103) with yellow mastic tape (13).

Apply one layer of yellow tape on the cable lug. Start 10 mm above the upper bolt and stop 20 mm below the lug on the insulation (see drawing).

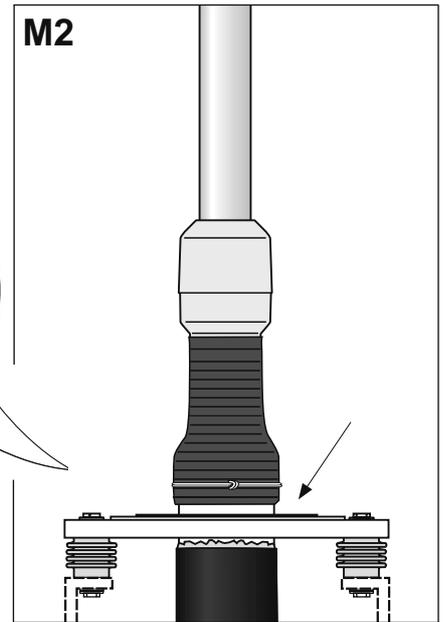
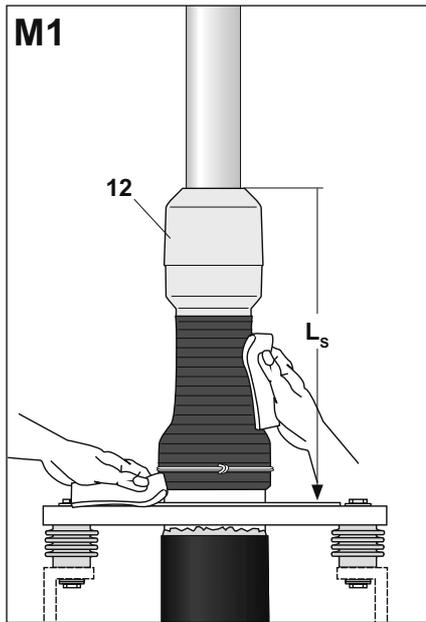
Position the short tube (10) on the lug (1) as shown. Shrink the tube in place starting from the top 10 mm below the edge as shown.

The tube is fully shrunk when the outer surface is smooth, has a glossy appearance and a flow of sealant is visible at each open end.

Let the tube cool down.



## M. Mounting the Insulator



Remove the protection materials from the stress cone (12).

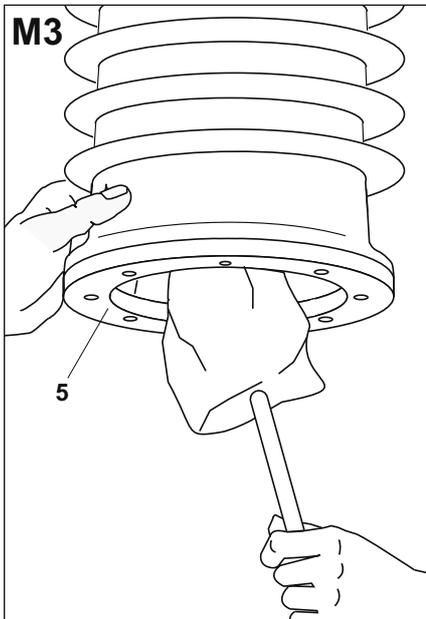
Remove the transparent tape from above the stress cone.

Clean and degrease all parts installed using a cleaning tissue.

Check  $L_s$  and compare with the value taken before. The difference has to be within the tolerance of  $\pm 10$  mm.

**Note:** Don't use other cleaning liquid or solvent to clean the prepared area.

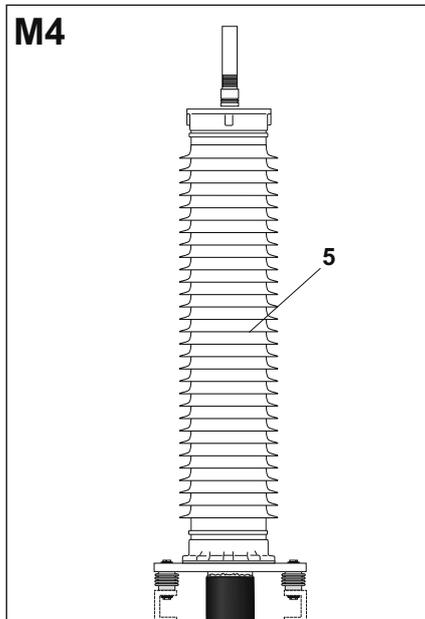
Place the O-ring into the groove of the cable gland (8) as shown.



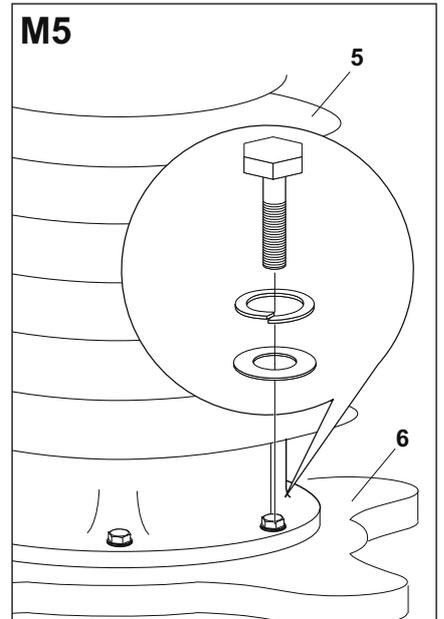
Thoroughly clean the composite insulator (5) inside and outside.

**Note:**

**Make sure that all parts are clean and free from any contamination.**



Carefully slide the composite insulator (5) over the cable assembly, the larger bottom flange first.



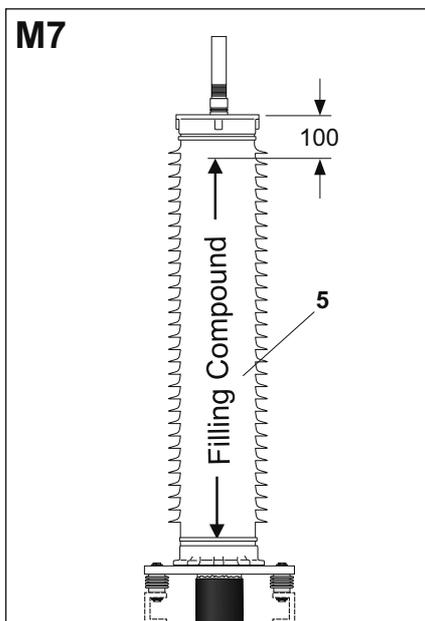
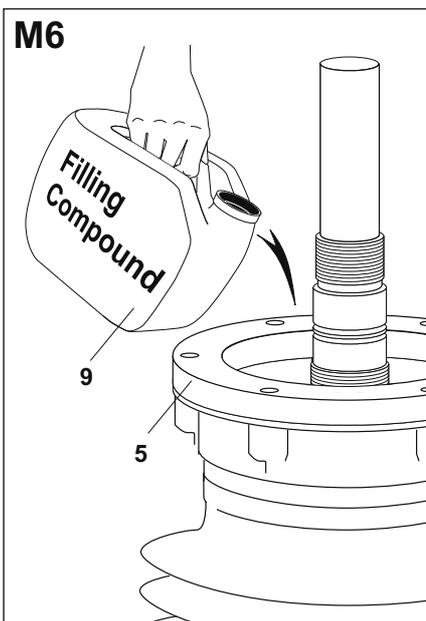
Grease the bolts with grease. Fix the composite insulator (5) to the base plate (6) as shown. Tighten the bolts cross-wise (see detail).

Torque = 50 Nm.

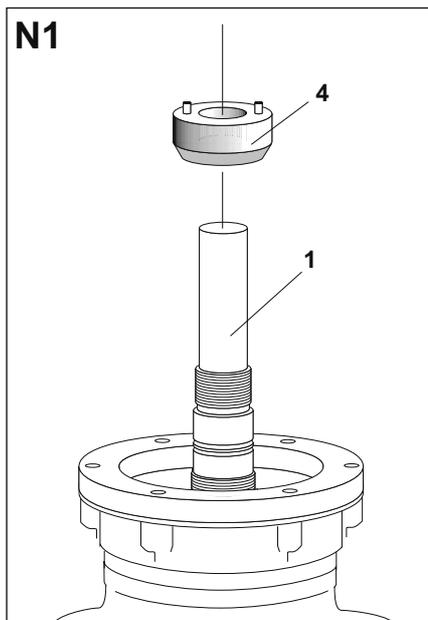
Clean the nozzles of the containers full of filling compound (9) before opening. Carefully fill the filling compound into the composite insulator (5) (see **General Instructions**).

Check the filling level. Make sure the filling compound level is 100 mm below the top of the composite insulator (5).

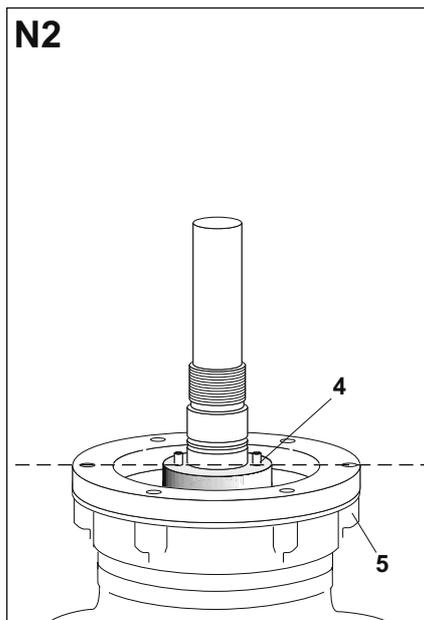
See installation drawing for inclination up to 45°.



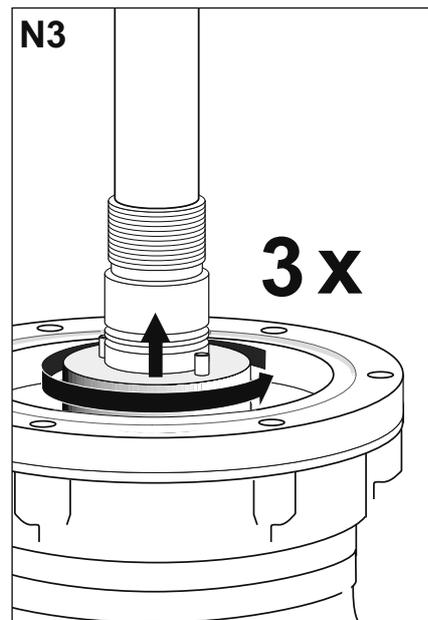
## N. Installing the Top Plate



Grease the support nut (4) with silicone grease. Slide the support nut over the lug (1).



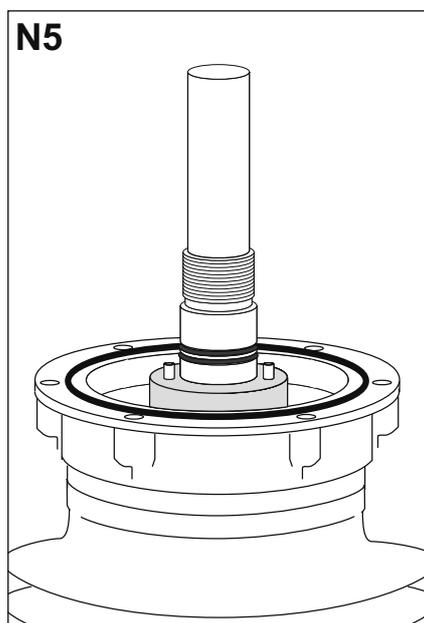
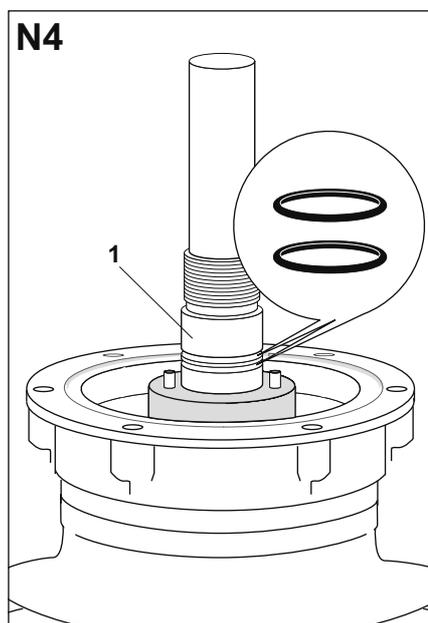
Adjust the support nut (4) temporarily so its surface is **flush with** the top of the composite insulator (5).

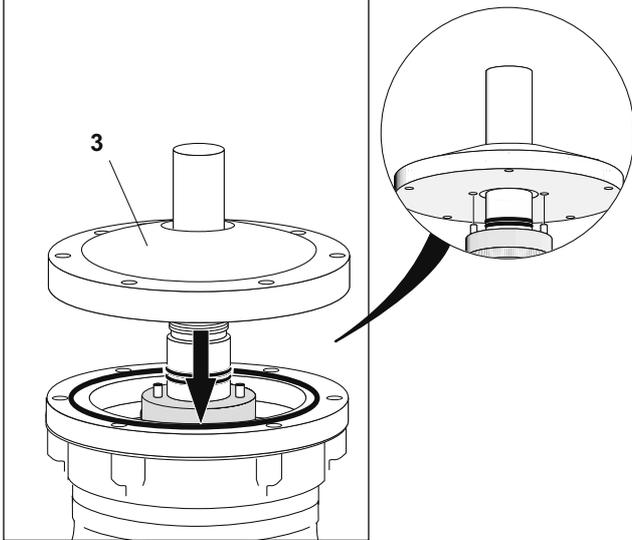


Screw up the support nut by 3 turns.

Slide the 2 O-rings over the lug (1). Position the O-rings in the lug grooves.

Place the sealing ring in the groove of the housing flange. Grease the O-rings with silicone grease.

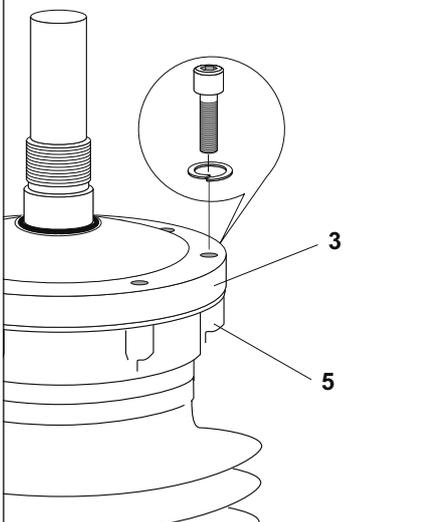


**N6**

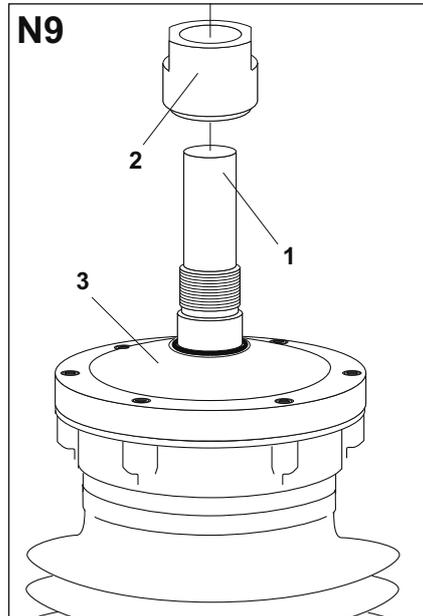
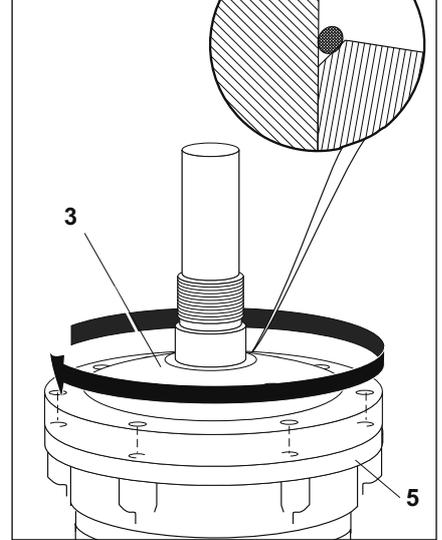
Slide the top plate (3) over the lug.

**Make sure the pins of the support nut fit into the 2 holes in the top plate (see detail).**

Fix the top plate (3) to the composite insulator (5) as shown in the detail. Use a torque of 50 Nm.

**N8**

Grease the top nut (2) inside with silicone grease. Slide the top nut over the lug (1) and fix it firmly to the top plate (3) as shown in detail a.

**N9****N7**

Screw the top plate (3) and sealing ring down until the top plate touches the flange of the composite insulator (5). Turn the top plate one more turn. Make sure its holes are in line with the holes of the composite insulator. Grease the O-ring.

Slide the O-ring over the lug and position it in the groove between the lug and the top plate.

**Termination completed.**

Connect the base plate (6) of the termination to the grounding system of the electric unit, considering the cross section of the cable screen.

Please regard the local requirements.

**Please dispose of all waste according to environmental regulations.**

**N10**