

# Installation Instructions

## 35kV Ranger 2 Shrink fit Silicone Rubber Termination Indoor/Outdoor Application with High-K Stress Relief for Tape shield, Wire Shield & Unishield® Cables

**Contents:** 2-Silicone Rubber Termination Halves, Lubricant, 2-Strips Gray Silicone Rubber Tape, Constant Force Spring, Preformed Ground Braid, 2-Strips Sealing Mastic, 1-Strip Copper Foil Tape, 2-Gloves, Instruction Sheets.

**Optional Contents:** Connector, Cable Support Bracket.

### DANGER

All apparatus must be de-energized during installation or removal of part(s).

Do not touch or move energized products in the work area.

These instructions do not attempt to provide for every possible contingency.

Failure to follow these instructions will result in damage to the product and serious or fatal injury.

This product should be installed only by competent personnel trained in good safety practices involving high voltage electrical equipment. These instructions

FOR MORE INFORMATION ON PARTS, INSTALLATION RATINGS AND COMPATIBILITY, CALL THE NEAREST ELASTIMOLD<sup>®</sup> OFFICE.

### Limited Warranty:

1. T&B warrants that its products will be free from defects in materials or workmanship for a period of two (2) years, except for tools which are warranted separately see warranty accompanying those products). Fisher Pierce® products and Elastimold® Reclosers are warranted for three years; and Joslyn™ VBT and VBU capacitor switches are warranted for four years or 40,000 operations whichever occurs first. Upon prompt notification of a warranted defect, T&B will, at its option, repair or replace the defective product.
2. In no event shall T&B be liable for any consequential, indirect or special damages, nor will T&B be liable for transportation, labor, or other charges arising out of the removal or reinstallation of its products. Liability for breach of warranty is limited to the cost of repair or replacement of the warranted product only.
3. Misuse, misapplication or modification of T&B products immediately voids all warranties.

THE WARRANTIES AND REMEDIES CONTAINED HEREIN ARE EXCLUSIVE AND ARE IN LIEU OF ALL OTHER WARRANTIES AND REMEDIES, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, WHICH ARE SPECIFICALLY DISCLAIMED.

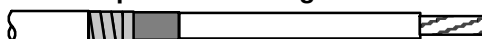
### IMPORTANT

1. Check contents of package to ensure they are complete and undamaged.
2. Check all components to ensure proper fit with cable and/or mating products.
3. Read entire installation instructions before starting.
4. Have all required tools at hand and maintain cleanliness throughout the procedure.

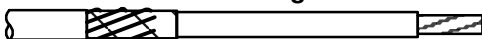
### Termination Selection Chart

| Catalog Number | Dia. Range Over Insulation Inches (mm) | Dia. Over Jacket Inches (mm) | Typical 35kV Cables |
|----------------|----------------------------------------|------------------------------|---------------------|
| R2T35M2        | 0.84-1.38 (20-35)                      | 1.72 (45) MAX                | 1/0-250 Kcmil*      |
| R2T35M4        | 1.30-2.10 (35-55)                      | 2.55 (65) MAX                | 350-1250 Kcmil*     |

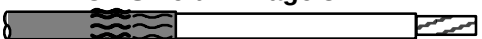
#### Tape Shield - Page 2



#### Wire Shield - Page 5



#### UniShield® - Page 8



### Cable Support Bracket (Optional)

| Catalog Number | Overall Cable Diameter   | Bracket Style |
|----------------|--------------------------|---------------|
| B1             | .800-1.250<br>20 - 32mm  | Single        |
| B2             | 1.100-1.500<br>28 - 38mm | Single        |
| B3             | 1.450-1.950<br>37 - 50mm | Double        |

\* Confirm Cable Insulation Diameter is with the Range Listed

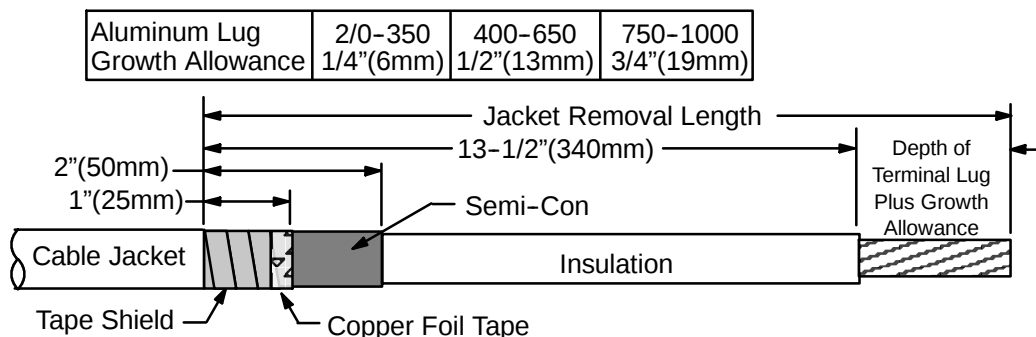
**Thomas & Betts**

A Member of the ABB Group

## Tape Shielded Cable

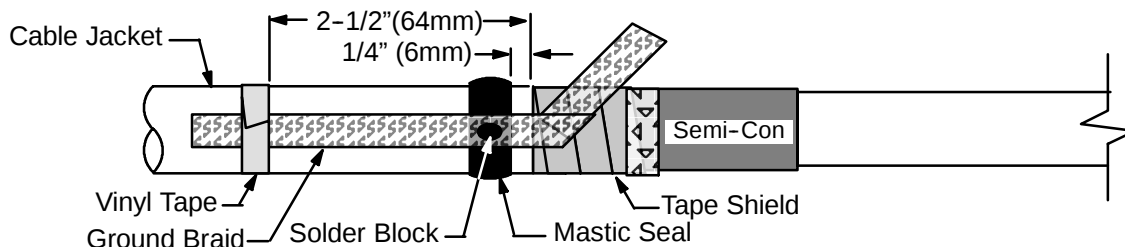
### STEP 1 Prepare Cable

1. Check to be sure cable size fits within insulation range as shown in the Termination Selection Chart, Page 1.
2. Train cable into position and cut to length required for installation.
3. Prepare cable using dimensions shown below. **Be sure to allow for depth of terminal lug.** To prevent tape shield from unrolling, hold down edge with a single wrap of the supplied copper foil tape as shown. **Provide additional exposed conductor distance to account for growth during crimping of ALUMINUM lugs or connectors as follows:**



### STEP 2 Install Ground Braid

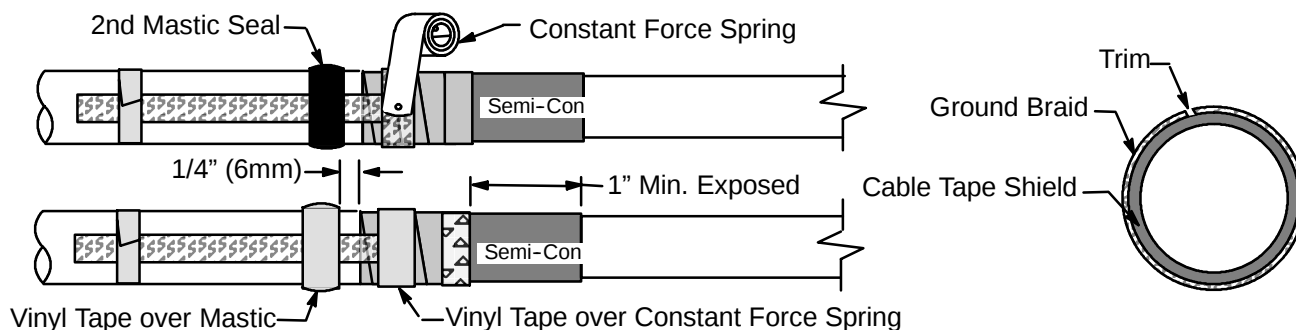
1. Using 50% stretch, carefully wrap one (1) band of mastic around the cable jacket 1/4" (6mm) from jacket end as shown. **Position mastic carefully, it also serves as a marker for positioning the termination. Cut mastic flush, do not overlap.**
2. Position preformed ground braid with short tail over tape shield and solder block centered over mastic strip. Secure ground braid to cable jacket using vinyl tape. Press solder block into mastic. See figure below.



3. Using 50% stretch apply a second mastic band over the solder block and previously applied mastic maintaining the 1/4" (6mm) dimension. **Cut flush, do not overlap.**
4. Wrap two half-lapped layers of vinyl tape around mastic seal, carefully maintaining the 1/4" (6mm) dimension.
5. Wrap ground braid around cable tape shield one complete wrap, trim excess to prevent overlap and secure in place with constant force spring. Wrap spring in same direction as ground braid. **Cinch (tighten) the spring** after wrapping the final winding. Secure spring with two (2) wraps of vinyl tape.

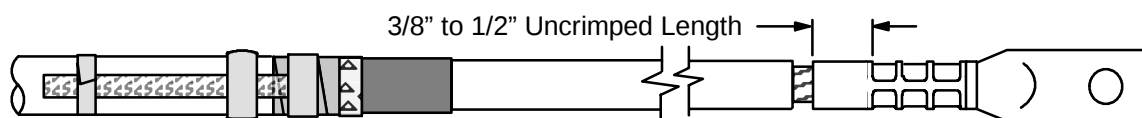
#### SPECIAL NOTE FOR CLOTH OR PAPER SEMI-CON INSULATION SHIELD

In cable with cloth or paper semi-conductive shields it is recommended the shield be over wrapped with one half-lapped layer of highly stretched semi-conductive rubber tape such as Scotch t No. 13.



### STEP 3 Install Lug or Connector

1. Check to ensure termination assembly fits over the selected lug. If lug will not fit through the termination core, clean the insulation and slide termination on cable before installing lug. **Do not remove core at this time.**
2. Position connector/lug and crimp according to manufacturer's directions. Do not crimp the last 3/8" to 1/2" of the connector. Remove excess oxide inhibitor and all sharp crimp flashings and edges following crimping.

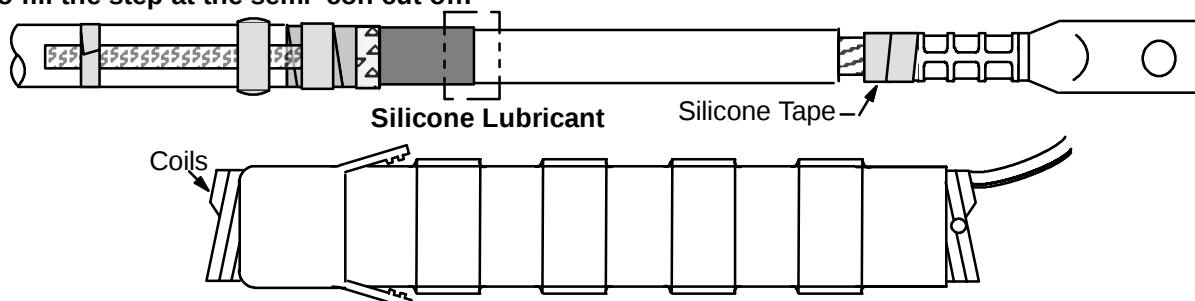


### STEP 4 Clean Cable Insulation and Lug Barrel Using Standard Practice

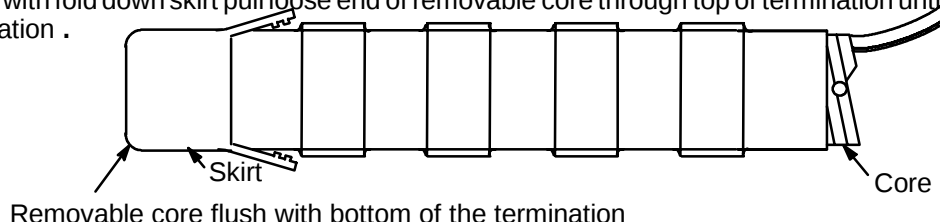
1. Wipe the cable insulation with an approved solvent. **Do not allow solvent to touch semi-con insulation shield.**
2. If abrasive must be used:
  - a. Use on insulation only. **Do not use abrasive on semi-con insulation shield.**
  - b. Use only aluminum oxide abrasive; grit 120 or finer.
  - c. Be careful not to reduce the cable insulation diameter below that allowed by the kit.

### STEP 5 Install Termination

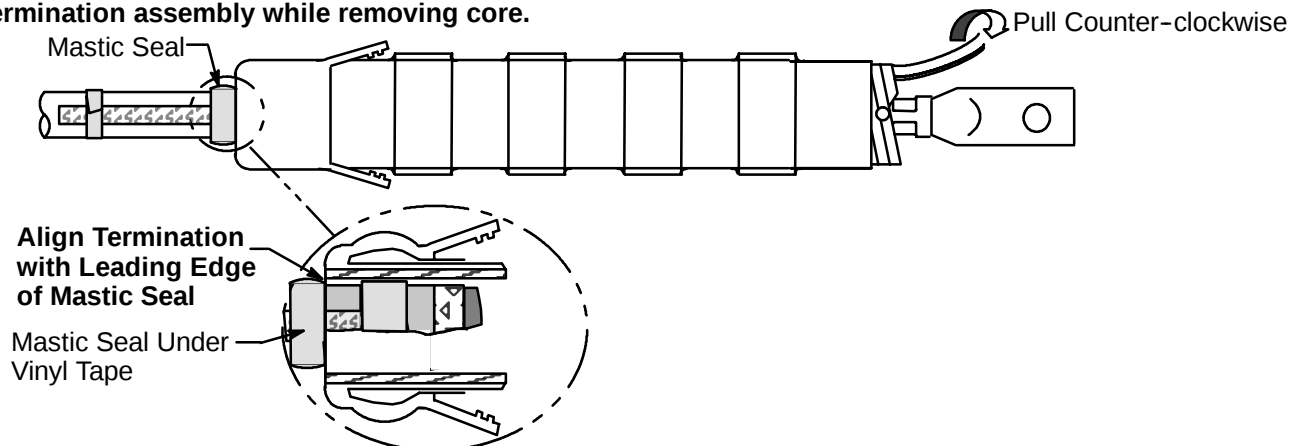
1. **IMPORTANT:** A track resistant moisture seal must be made between termination insulator and lug/connector using gray silicone rubber electrical tape (contained in kit). Wrap a band of silicone tape around the base of the terminal lug.
  - a. If barrel diameter is equal to or greater than cable primary insulation, the tape band should not exceed 2 layers.
  - b. If barrel diameter is smaller than the cable primary insulation, use tape strip to form the tape band equal to insulation diameter, see below.
2. Cover the edge of the semi-con insulation shield with a liberal coating of silicone grease. **On this product the silicone used to fill the step at the semi-con cut off.**



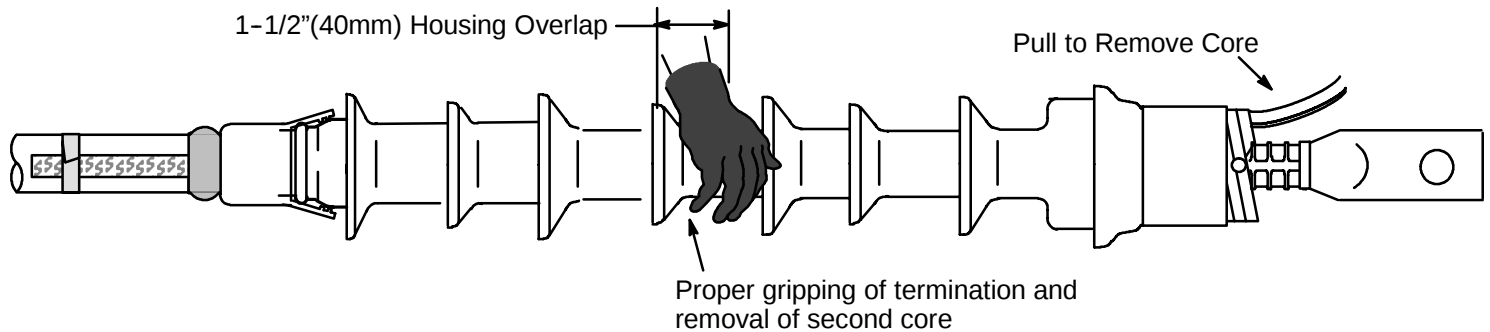
3. On lower termination with fold down skirt pull loose end of removable core through top of termination until the core is flush with bottom of the termination .



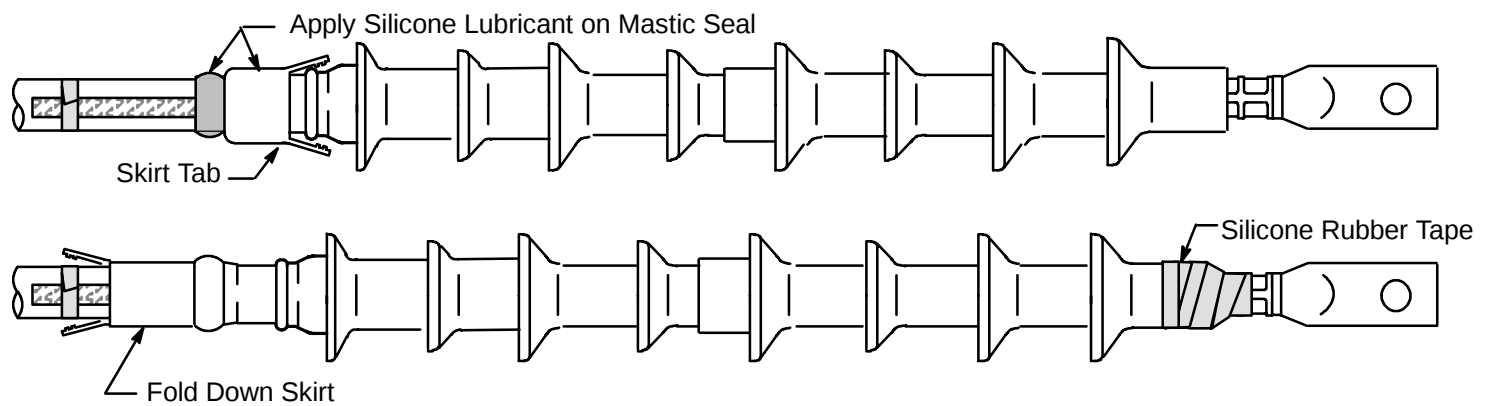
4. Slide the termination body onto the cable, **align termination with forward edge of mastic seal** as shown below. Carefully begin to remove core while unwinding, counter-clockwise, starting with loose end. **Make sure the termination body, not the core is butted up to the leading edge of the mastic seal, see below. Continue to remove core. Do not push or pull on the termination assembly while removing core.**



5. Using second housing, carefully pull core down within 1 coil of bottom. Slide the termination over the cable and carefully pull the core counterclockwise. Overlap the first termination 1-1/2" (40mm).

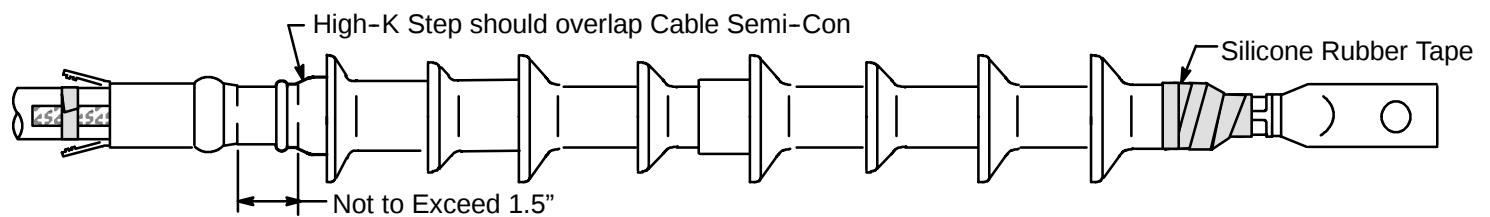


6. Apply a thin film of silicone lubricant to the skirt and mastic seal area. Do not lubricate skirt tabs. Carefully fold down skirt over mastic seal.



7. With termination installed, complete the lug area moisture seal using the remaining gray silicone rubber electrical tape. Overlap the termination insulator by approximately 1" and extend the tape wrapping over a non-crimped region of the lug/connector barrel with half lap configuration. See above.

8. Connect ground braid to system ground.



9. Confirm that High-K step does not exceed 1.5".
-

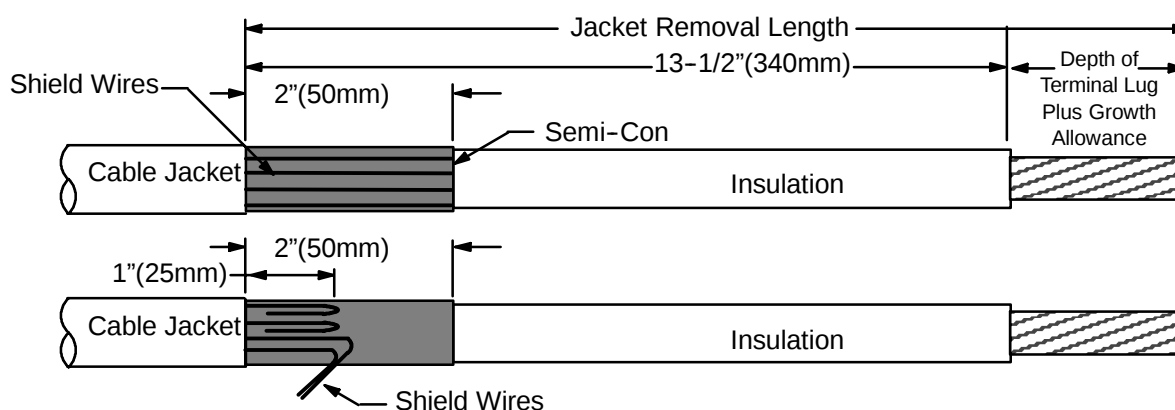
# Wire Shielded Cable

## STEP 1 Prepare Cable

1. Check to be sure cable size fits within insulation range as shown in the Termination Selection Chart, Page 1.
2. Train cable into position and cut to length required for installation.
3. Prepare cable using dimensions shown below. **Be sure to allow for depth of terminal lug. Provide additional exposed conductor distance to account for growth during crimping of ALUMINUM lugs or connectors as follows:**

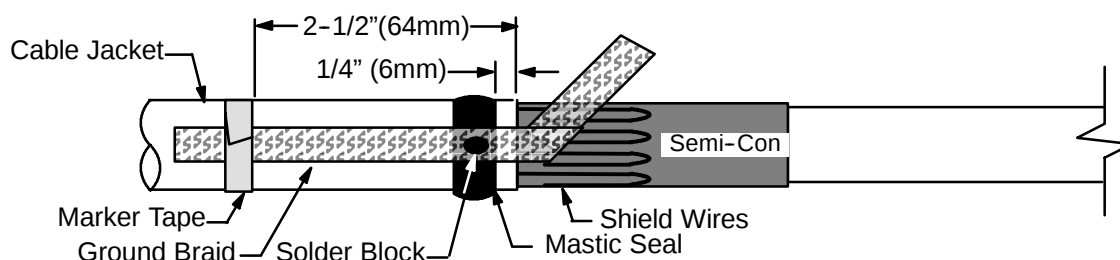
|                                  |                    |                       |                        |
|----------------------------------|--------------------|-----------------------|------------------------|
| Aluminum Lug<br>Growth Allowance | 2-350<br>1/4"(6mm) | 400-650<br>1/2"(13mm) | 750-1000<br>3/4"(19mm) |
|----------------------------------|--------------------|-----------------------|------------------------|

4. Bend leading 1-1/2" (38mm) of exposed shield wires back upon themselves to jacket edge.

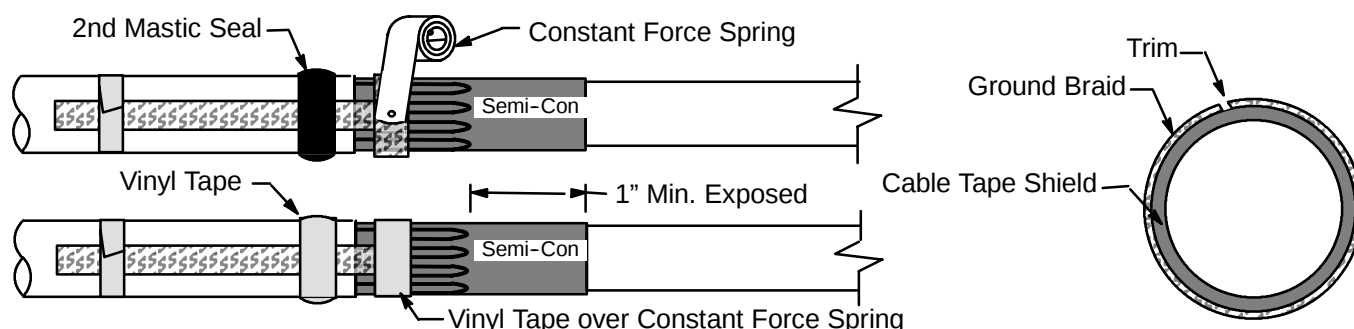


## STEP 2 Install Ground Braid

1. Using 50% stretch, carefully wrap one (1) band of mastic around the cable jacket 1/4" (6mm) from jacket end as shown. **Position mastic carefully, it also serves as a marker for positioning the termination. Cut mastic flush, do not overlap.**
2. Position preformed ground braid with short tail over shield wires and solder block centered over mastic strip. Secure ground braid to cable jacket using vinyl tape. Press solder block into mastic. See figure below.

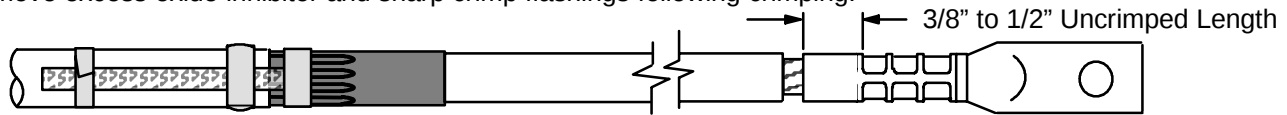


3. Using 50% stretch apply a second mastic band over the solder block and previously applied mastic maintaining the 1/4" (6mm) dimension. **Cut flush, do not overlap.**
4. Wrap two half-lapped layers of vinyl tape around mastic seal, carefully maintaining the 1/4" (6mm) dimension.
5. Wrap ground braid around cable tape shield one complete wrap, trim excess to prevent overlap and secure in place with constant force spring. Wrap spring in same direction as ground braid. **Cinch (tighten) the spring** after wrapping the final winding. Secure spring with two (2) wraps of vinyl tape.



### STEP 3 Install Lug or Connector

1. Check to ensure termination assembly fits over the selected lug. If lug will not fit through the termination core, clean the insulation and slide termination on cable before installing lug. **Do not remove core at this time.**
2. Position connector/lug and crimp according to manufacturer's directions. Do not crimp the last 3/8" to 1/2" of the connector. Remove excess oxide inhibitor and sharp crimp flashings following crimping.

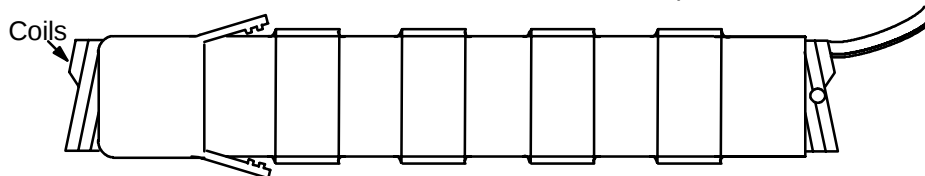
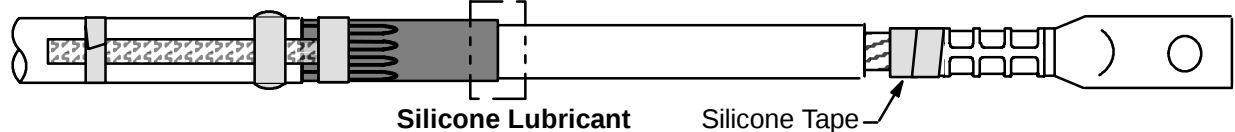


### STEP 4 Clean Cable Insulation and Lug Barrel Using Standard Practice

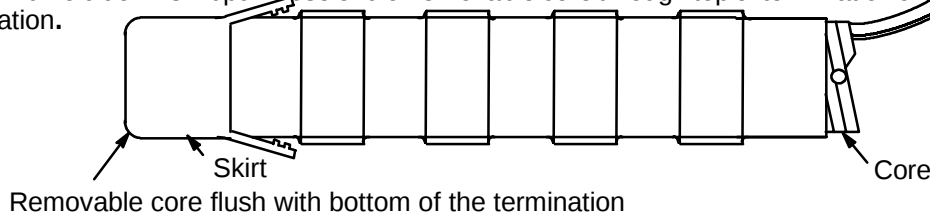
1. Wipe the cable insulation with solvent saturated pads. **Do not allow solvent to touch semi-con insulation shield.**
2. If abrasive must be used:
  - a. Use on insulation only. **Do not use abrasive on semi-con insulation shield.**
  - b. Use only aluminum oxide abrasive; grit 120 or finer.
  - c. Be careful not to reduce the cable insulation diameter below that allowed by the kit.

### STEP 5 Install Termination

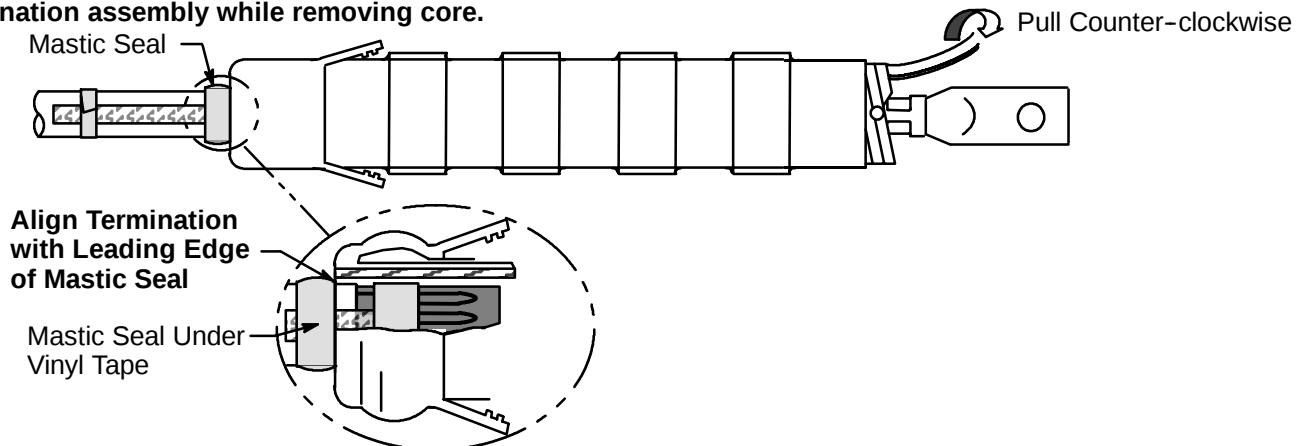
1. **IMPORTANT:** A track resistant moisture seal must be made between termination insulator and lug/connector using gray silicone rubber electrical tape (contained in kit). Wrap a band of silicone tape around the base of the terminal lug.
  - a. If barrel diameter is equal to or greater than cable primary insulation, the tape band should not exceed 2 layers.
  - b. If barrel diameter is smaller than the cable primary insulation, use tape strip to form the tape band equal to insulation diameter, see below..
2. Cover the edge of the semi-con insulation shield with a liberal coating of silicone grease. On this product the silicone is used to fill the step at the semi-con cut off.



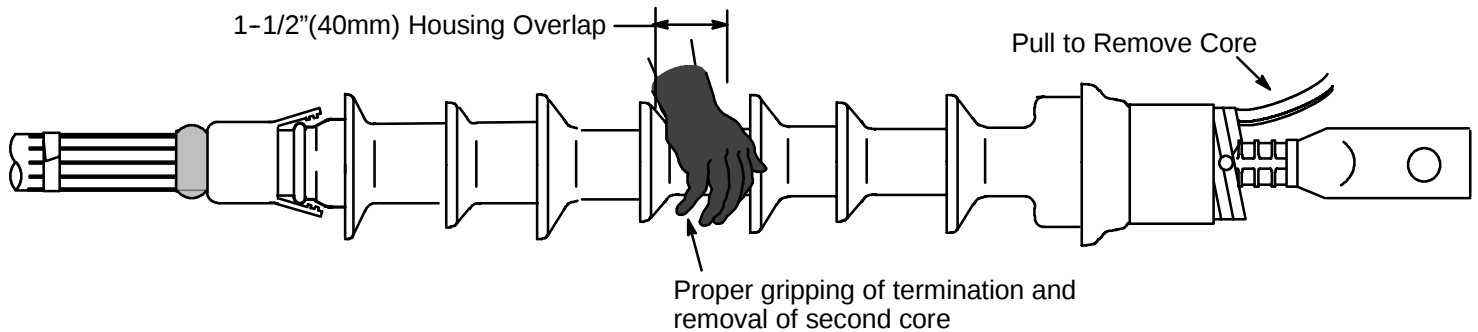
3. On lower termination with fold down skirt pull loose end of removable core through top of termination until the core is flush with bottom of the termination.



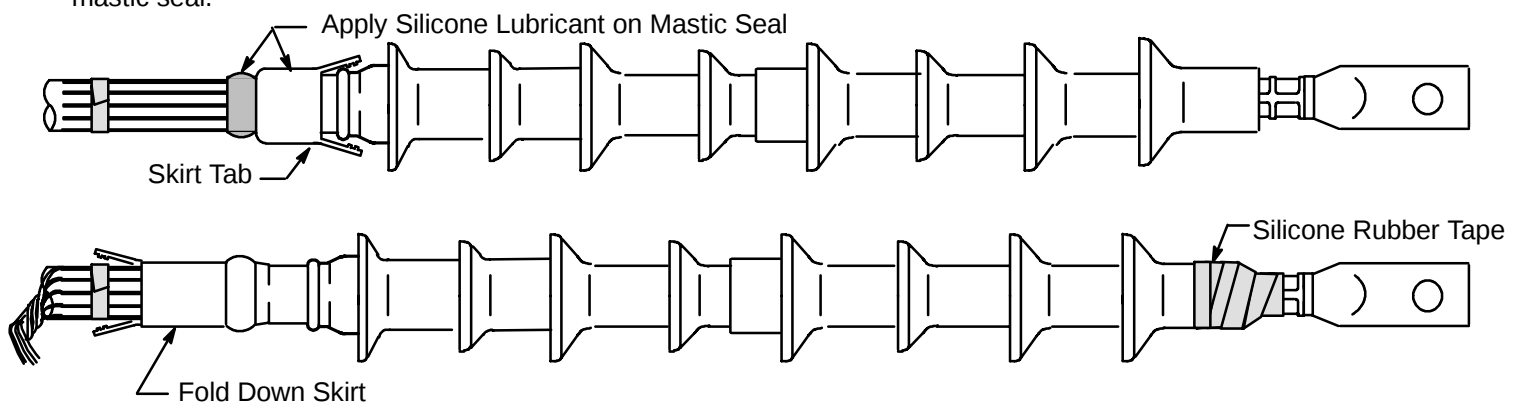
4. Slide the termination body onto the cable, align termination with forward edge of mastic seal as shown below. Carefully begin to remove core while unwinding, counter-clockwise, starting with loose end. **Make sure the termination body, not the core is butted up to the leading edge of the mastic seal, see below. Continue to remove core. Do not push or pull on the termination assembly while removing core.**



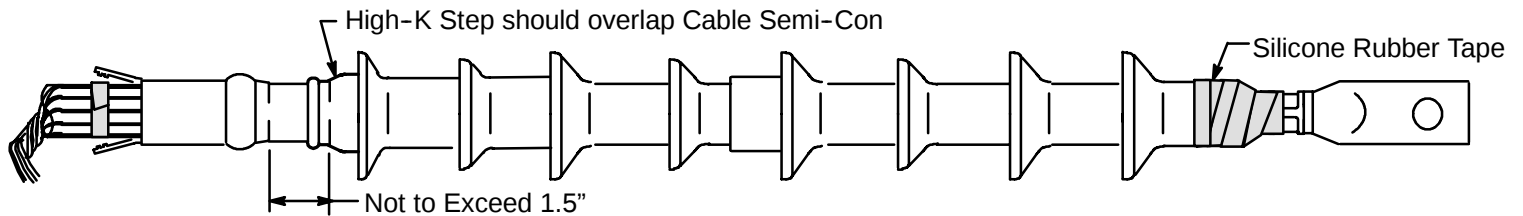
5. Using second housing, carefully pull core down within 1 coil of bottom. Slide the termination over the cable and carefully pull the core counterclockwise. Overlap the first termination 1-1/2" (40mm).



6. Apply a thin film of silicone lubricant to the skirt and mastic seal area. Do not lubricate skirt tab. Carefully fold down skirt over mastic seal.



7. With termination installed, complete the lug area moisture seal using the remaining gray silicone rubber electrical tape. Overlap the termination insulator by approximately 1" and extend the tape wrapping over a non-crimped region of the lug/connector barrel with a half lap configuration, see above.
8. Twist concentric neutral wires together and connect to system ground.



9. Confirm that High-K step does not exceed 1.5".

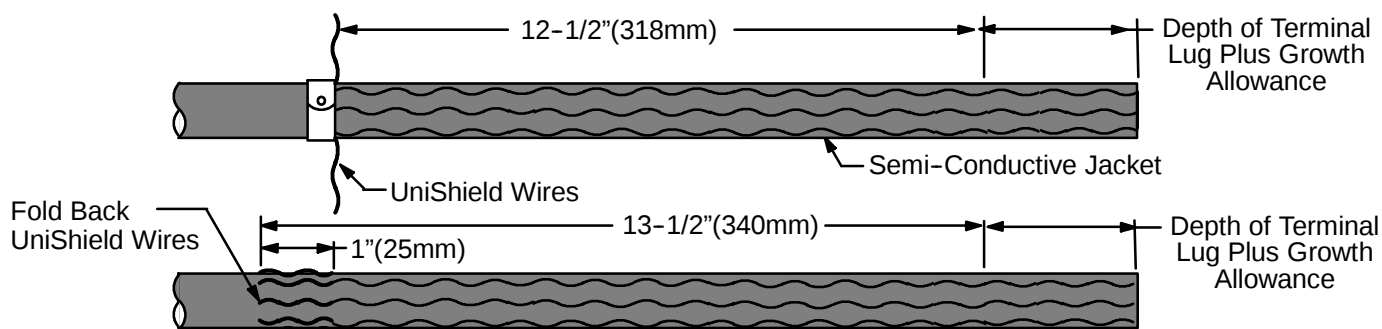
## UniShield® Shield Cable

### STEP 1 Prepare Cable

1. Check to be sure cable size fits within insulation range as shown in the Termination Selection Chart, Page 1.
2. Train cable into position and cut to length required for installation.
3. Prepare cable using dimensions shown below. **Be sure to allow for depth of terminal lug. Provide additional exposed conductor distance to account for growth during crimping of ALUMINUM lugs or connectors as follows:**

|                                  |                    |                       |                        |
|----------------------------------|--------------------|-----------------------|------------------------|
| Aluminum Lug<br>Growth Allowance | 2-350<br>1/4"(6mm) | 400-650<br>1/2"(13mm) | 750-1000<br>3/4"(19mm) |
|----------------------------------|--------------------|-----------------------|------------------------|

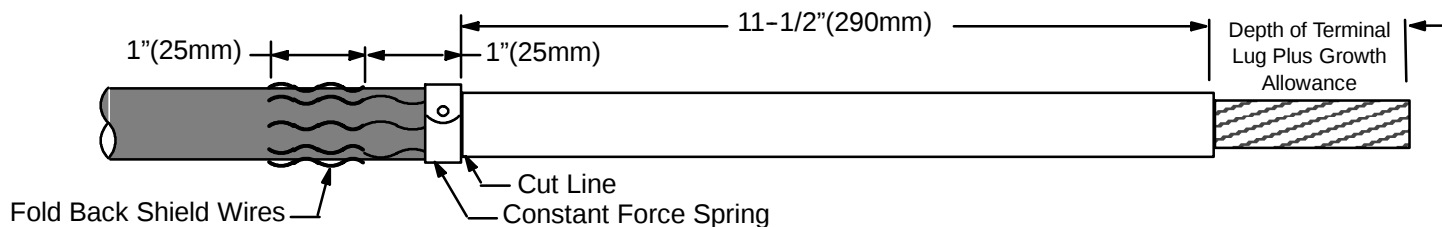
4. Install constant force spring and pull shield wires through semi-conductive jacket to leading edge of spring.
5. Remove constant force spring. Bend unishield wires back upon cable jacket 1"(25mm). Cut excess unishield wire and discard.



6. Remove semi-conductive jacket to dimension shown below.

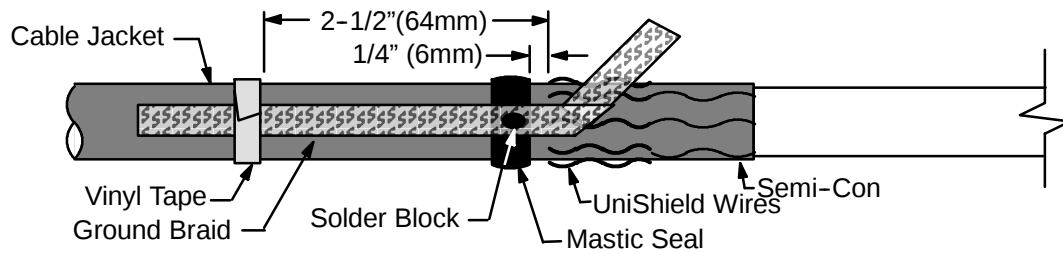
**To ease jacket removal, install constant force spring as shown and ring cut 80% through jacket. Remove jacket sections by pulling against constant force spring. DO NOT BELL SEMI-CON JACKET. Remove constant force spring.**

**Note: Some UniShield® cables feature dual-layer semi-conductive jackets. Both layers must be removed during cable preparation.**

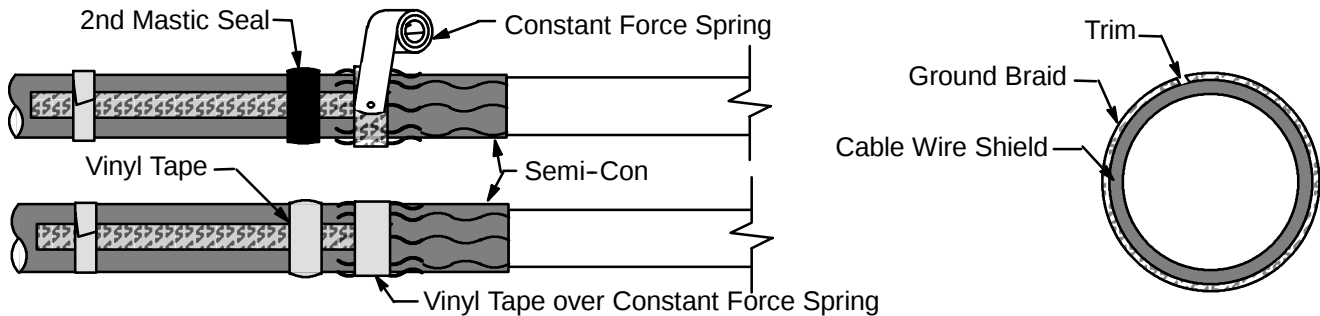


## STEP 2 Install Ground Braid

1. Using 50% stretch, carefully wrap one (1) band of mastic around the cable jacket 1/4" (6mm) from shield wire end as shown. **Position mastic carefully, it also serves as a marker for positioning the termination. Cut mastic flush, do not overlap.**
2. Position preformed ground braid with short tail over unshield wires and solder block centered over mastic strip. Secure ground braid to cable jacket 4-1/2" (114mm) from cable semi-con edge using vinyl tape. Press solder block into mastic. See figure below.

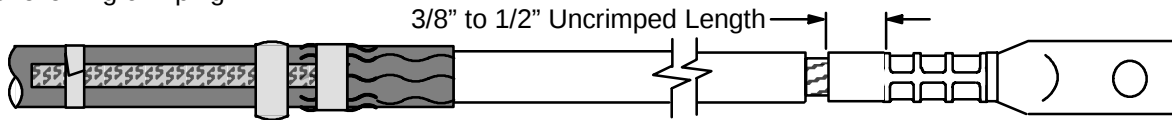


3. Using 50% stretch apply a second mastic band over the solder block and previously applied mastic. **Cut flush, do not overlap.**
4. Wrap two half-lapped layers of vinyl tape around mastic seal, carefully maintaining the 1/4" (6mm) dimension.
5. Wrap ground braid around cable shield wires one complete wrap, trim excess to prevent overlap and secure in place with constant force spring. Wrap spring in same direction as ground braid. **Cinch (tighten) the spring** after wrapping the final winding.



### STEP 3 Install Lug or Connector

1. Check to ensure termination assembly fits over the selected lug. If lug will not fit through the termination core, clean the insulation and slide termination on cable before installing lug. **Do not remove core at this time.**
2. Position connector/lug and crimp according to manufacturer's directions. Remove excess oxide inhibitor and sharp crimp flashings following crimping.

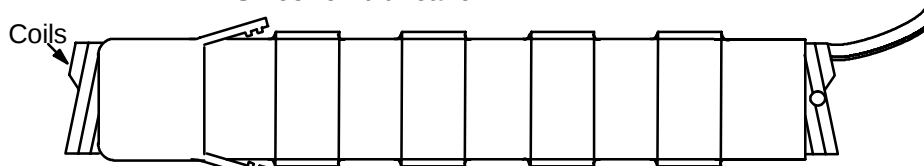
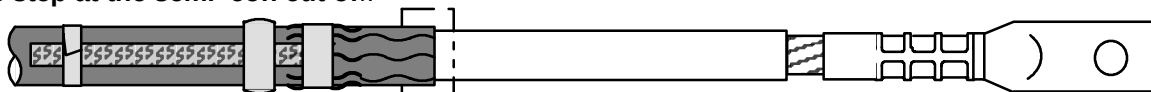


### STEP 4 Clean Cable Insulation and Lug Barrel Using Standard Practice

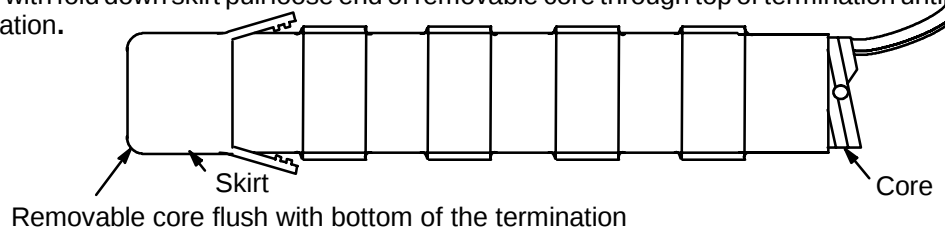
1. Wipe the cable insulation with solvent saturated pads. **Do not allow solvent to touch semi-con insulation shield.**
2. If abrasive must be used:
  - a. Use on insulation only. **Do not use abrasive on semi-con insulation shield.**
  - b. Use only aluminum oxide abrasive; grit 120 or finer.
  - c. Be careful not to reduce the cable insulation diameter below that allowed by the kit.

### STEP 5 Install Termination

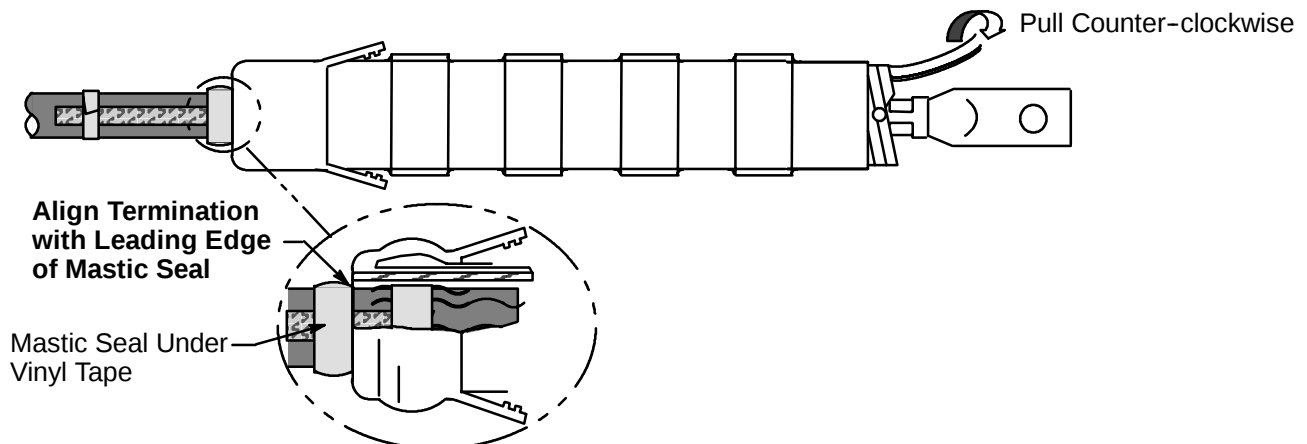
1. **IMPORTANT:** A track resistant moisture seal must be made between termination insulator and lug/connector using gray silicone rubber electrical tape (contained in kit). Wrap a band of silicone tape around the base of the terminal lug.
  - a. **If barrel diameter is equal to or greater than cable primary insulation, the tape band should not exceed 2 layers.**
  - b. **If barrel diameter is smaller than the cable primary insulation, use tape strip to form the tape band equal to insulation diameter, see below.**
2. Cover the edge of the semi-con insulation shield with a liberal coating of silicone grease. **On this product the silicone used to fill the step at the semi-con cut off.**



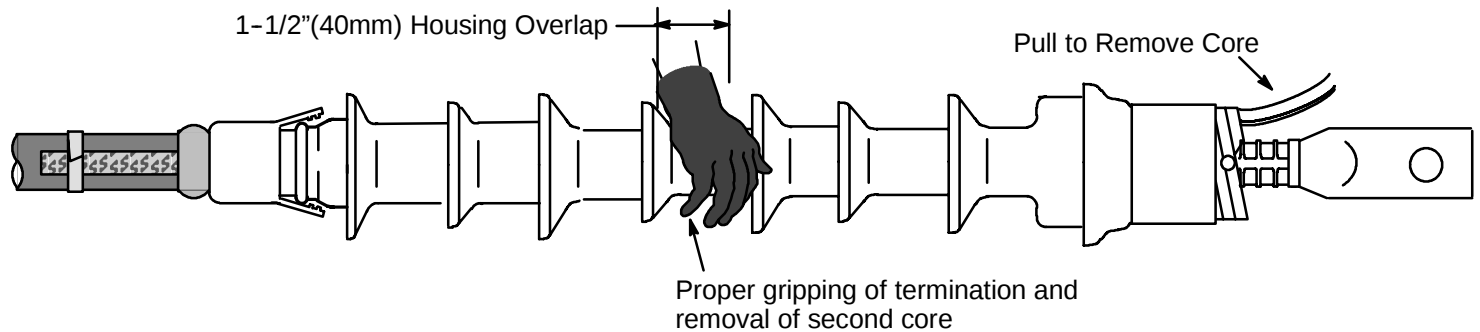
3. On lower termination with fold down skirt pull loose end of removable core through top of termination until the core is flush with bottom of the termination.



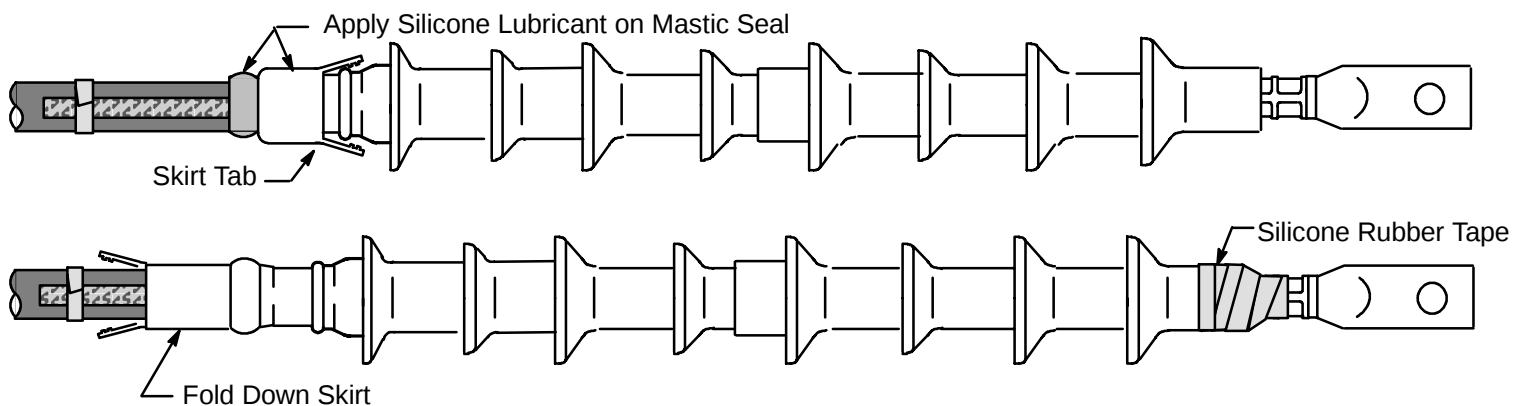
4. Slide the termination body onto the cable, **align termination with forward edge of mastic seal** as shown below. Carefully begin to remove core while unwinding, counter-clockwise, starting with loose end. **Make sure the termination body, not the core is butted up to the leading edge of the mastic seal, see below. Continue to remove core. Do not push or pull on the termination assembly while removing core.**



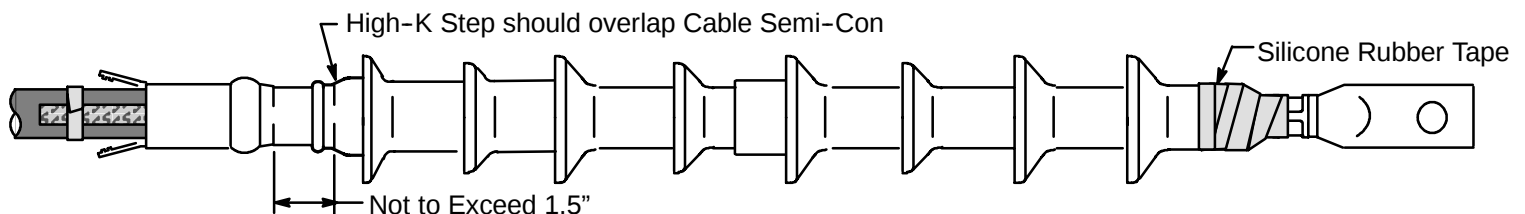
5. Using second housing, carefully pull core down within 1 coil of bottom. Slide the termination over the cable and carefully pull the core counterclockwise. Overlap the first termination 1-1/2" (40mm).



6. Apply a thin film of silicone lubricant to the skirt and mastic seal area. Carefully fold down skirt over mastic seal.



7. With termination installed, complete the lug area moisture seal using the remaining gray silicone rubber electrical tape. Overlap the termination insulator by approximately 1" and extend the tape wrapping over a non-crimped region of the lug/connector barrel with a half lap configuration, see above.
8. Connect ground braid to system ground.



9. Confirm that High-K step does not exceed 1.5\".

**THOMAS & BETTS CORP. PROPRIETARY AND CONFIDENTIAL**

BY ACCEPTANCE OF THIS DOCUMENT YOU AGREE THAT ALL RIGHTS TO THE DRAWINGS AND INFORMATION CONTAINED IN IT, AS WELL AS THE SUBJECT MATTER AND ALL PROPRIETARY AND NOVEL FEATURES DISCLOSED, ARE OWNED BY THOMAS & BETTS CORPORATION ("THE COMPANY" AND A MEMBER OF THE ABB GROUP) AND THAT DEVICES EMBODYING SUCH FEATURES OR INFORMATION DERIVED FROM THESE DRAWINGS WILL NOT BE MANUFACTURED BY OR FOR YOU OR DISCLOSED TO OTHERS WITHOUT THE PRIOR EXPRESS WRITTEN CONSENT OF THE COMPANY. THESE DRAWINGS ARE NOT TO BE COPIED OR REPRODUCED OR DISCLOSED TO OTHERS WITHOUT THE PRIOR EXPRESS WRITTEN CONSENT OF THE COMPANY. ALL DRAWINGS AND INFORMATION ARE TO BE RETURNED TO UPON DEMAND OR UPON COMPLETION OF PURPOSE FOR WHICH LENT. COPYRIGHT THOMAS & BETTS CORP. ALL RIGHTS RESERVED. ALL OTHER TRADEMARKS ARE THE PROPERTY OF THEIR RESPECTIVE OWNERS.