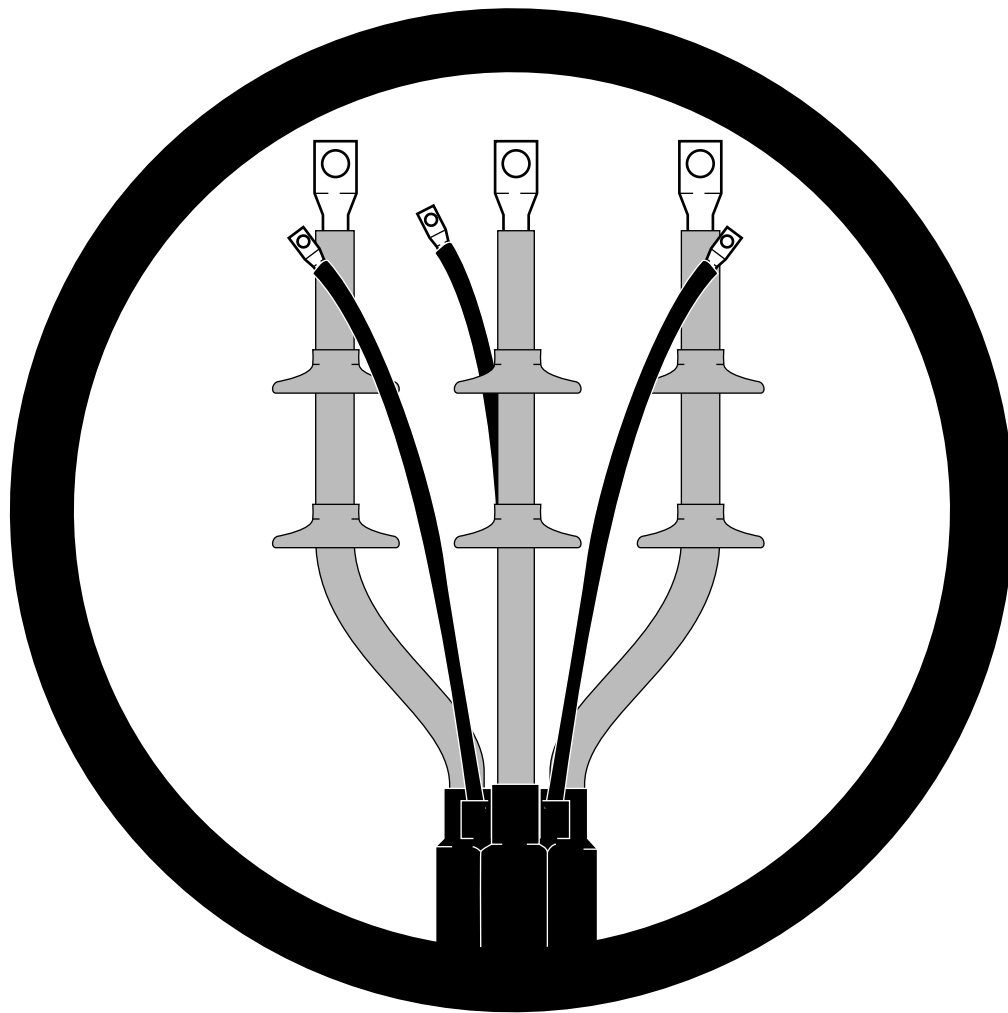


HVT-M 5-25kV Class

High Voltage Terminations for Multi-conductor Mining Cable Types MP-GC and SHD-GC

Danger: Before attempting any cable repairs, make sure that the proper cable is disconnected, locked out, and suitably tagged.



General Instructions

Suggested Installation Equipment (not supplied with kit)

- Cable preparation tools
- Clean, lint-free cloths
- Non-conducting abrasive cloth, 120 grit or finer
- Electrician's tape
- Connector(s) and installation tools
- Raychem recommended torch

Recommended Raychem Torches

Install heat-shrinkable cable accessories with a "clean burning" torch, i.e., a propane torch that does not deposit conductive contaminants on the product.

Clean burning torches include the Raychem FH-2609, FH-2629 (uses refillable propane cylinders) and FH-2616A1 (uses disposable cylinder).

Safety Instructions

Warning: When installing electrical power system accessories, failure to follow applicable personal safety requirements and written installation instructions could result in fire or explosion and serious or fatal injuries.

To avoid risk of accidental fire or explosion when using gas torches, always check all connections for leaks before igniting the torch and follow the torch manufacturer's safety instructions.

To minimize any effect of fumes produced during installation, always provide good ventilation of confined work spaces.

Adjusting the Torch

Adjust regulator and torch as required to provide an overall 12-inch bushy flame. The FH-2629 will

be all blue, the other torches will have a 3- to 4-inch yellow tip. Use the yellow tip for shrinking.

Regulator Pressure

| | |
|-----------|---------------|
| FH-2616A1 | Full pressure |
| FH-2609 | 5 psig |
| FH-2629 | 15 psig |

Cleaning the Cable

Use an approved solvent, such as the one supplied in the P63 Cable Prep Kit, to clean the cable. Be sure to follow the manufacturer's instructions. Failure to follow these instructions could lead to product failure.

Some newer solvents do not evaporate quickly and need to be removed with a clean, lint-free cloth. Failure to do so could change the volume resistivity of the substrate or leave a residue on the surface.

Please follow the manufacturer's instructions carefully.

General Shrinking Instructions

- Apply outer 3- to 4-inch tip of the flame to heat-shrinkable material with a rapid brushing motion.
- Keep flame moving to avoid scorching.
- Unless otherwise instructed, start shrinking tube at center, working flame around all sides of the tube to apply uniform heat.

To determine if a tube has completely recovered, look for the following, especially on the back and underside of the tube:

1. Uniform wall thickness.
2. Conformance to substrate.
3. No flat spots or chill marks.
4. Visible sealant flow if the tube is coated.

Note: When installing multiple tubes, make sure that the surface of the last tube is still warm before positioning and shrinking the next tube. If installed tube has cooled, re-heat the entire surface.

1. Product selection.

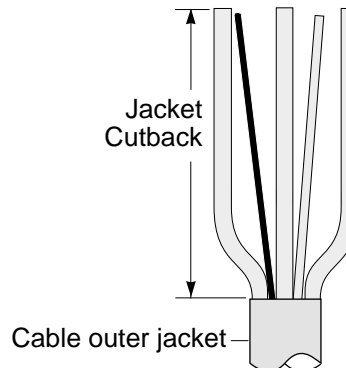
Check kit selection with cable diameter dimensions in the Table 1 below.

Table 1

| | | Power Conductor Size (AWG/kcmil) | | | |
|---------------------|-------------|----------------------------------|--------------------|------------------|-------------------|
| 5-8kV Indoor Kit | Outdoor Kit | 5kV, 3/C MP-GC | 5kV 3/C SHD-GC | 8kV 3/C MP-GC | 8kV 3/C SHD-GC |
| HVT-M-581 | HVT-M-581-S | #2 - 3/0 | #6 - 2/0 | #4 - 2/0 | #4 - #1 |
| HVT-M-582 | HVT-M-582-S | 4/0 - 350 | 3/0 - 300 | 3/0 - 350 | 1/0 - 300 |
| HVT-M-583 | HVT-M-583-S | 500 - 750 | 350 - 500 | 500 - 750 | 350 - 500 |
| 15kV Indoor Kit | Outdoor Kit | 15kV 3/C MP-GC | 15kV 3/C SHD-GC | | |
| HVT-M-151 | HVT-M-151-S | #2 - 4/0 | #2 - 3/0 | | |
| HVT-M-152 | HVT-M-152-S | 250 - 500 | 4/0 - 500 | | |
| 25kV Indoor Kit | Outdoor Kit | 25kV 3/C MP-GC | 25kV 3/C SHD-GC | | |
| HVT-M-251 | HVT-M-251-S | #1 - 250 | #1 - 4/0 | | |
| HVT-M-252 | HVT-M-252-S | 350 - 500 | 250 - 500 | | |

2. Remove cable outer jacket.

Remove cable outer jacket, taking care not to cut into conductor shield. Cutback must be long enough to allow positioning of the insulated conductors without violating the bend radius and fit within the min/max dimensions shown below.



5006a

| Voltage Class | Jacket Cutback | |
|---------------|----------------|--------------|
| | Minimum | Maximum |
| 5 & 8 kV | 19" (483mm) | 46" (1168mm) |
| 15 kV | 23" (584mm) | 46" (1168mm) |
| 25 kV | 34" (863mm) | 46" (1168mm) |

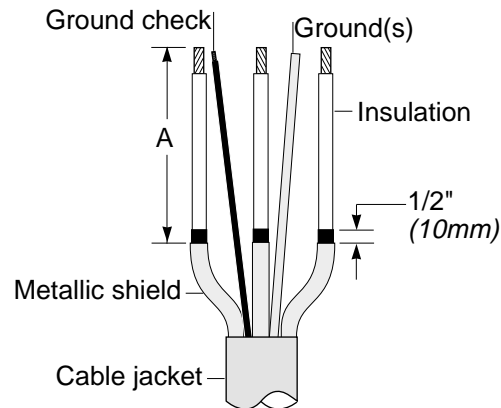
3. Prepare cables.

Using Figure 1 and Table 2 below, remove metallic shield to the dimension "A" shown for the proper voltage class.

Remove semiconductive layer leaving 1/2" extending beyond metallic shield cutback.

Table 2

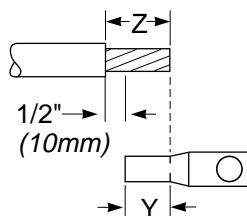
| Voltage Rating | Metallic Shield Removal Dimension "A" |
|----------------|---------------------------------------|
| 5kV & 8kV | 5" + Z |
| 15kV | 10" + Z |
| 25kV | 21" + Z |



5006

Figure 1: Insulation Cutback (Z)

Note: If no lug is used, Z= 2" (50mm)



$$\text{"Z" Insulation Cutback} = \text{"Y" Length of Lug Barrel} + \frac{1}{2}" (10\text{mm})$$

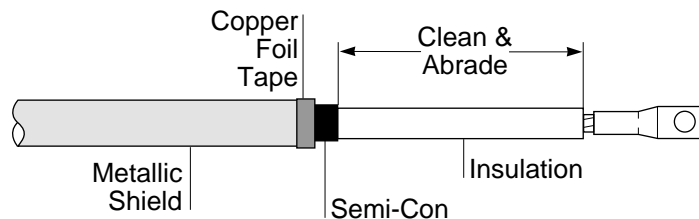
481

4. Install lugs; clean cable as shown.

After installation, clean and deburr lugs.

Secure the end of the copper mesh (SHD-GC) or copper tape shield (MP-GC) with the copper foil tape provided in the kit.

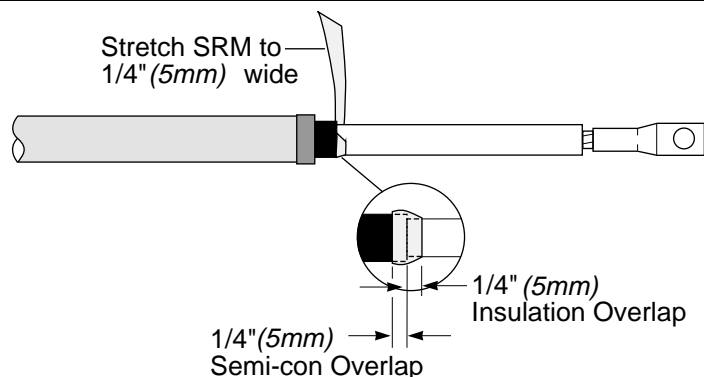
Abrade the insulation, if necessary, to remove imbedded semi-con. Using an approved solvent, clean the cable as shown.



5007

5. Apply Stress Relief Material (SRM) at the semi-con cutback.

Remove backings from the short angle-cut pieces of SRM. Place the tip of the SRM at the semi-con cutback and stretch to 1/2 its original width. Tightly wrap 3 to 4 layers to fill semi-con step. Overlap semi-con and insulation as shown. Taper SRM down to meet insulation.

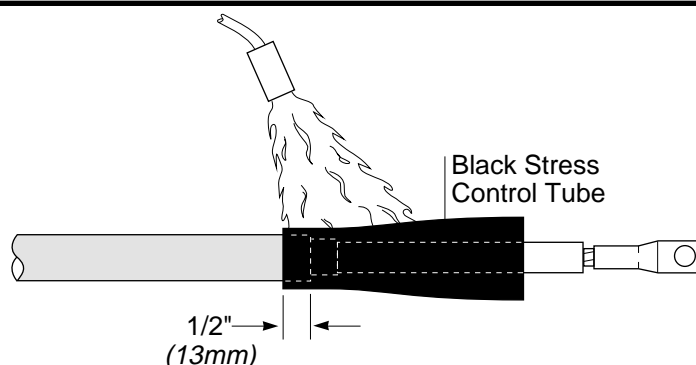


5008

6. Position black stress control tubes; shrink in place.

Position the black stress control tube overlapping onto metallic shield 1/2".

Begin shrinking at metallic shield cutback end and work the torch with a smooth brushing motion around the tube towards the lug end.

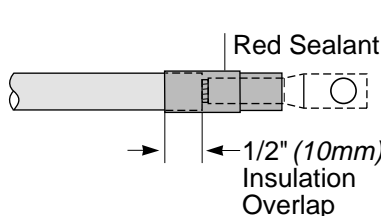


5009

7. Apply red sealant to phase conductors, ground check, and grounds.

a. With lug

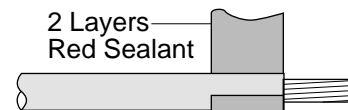
Using light tension, wrap red sealant on the lug barrel. Build up lug diameter to cable insulation and overlap insulation by 1/2".



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b. Without lug

Wrap two layers of red sealant onto the cable insulation as shown.



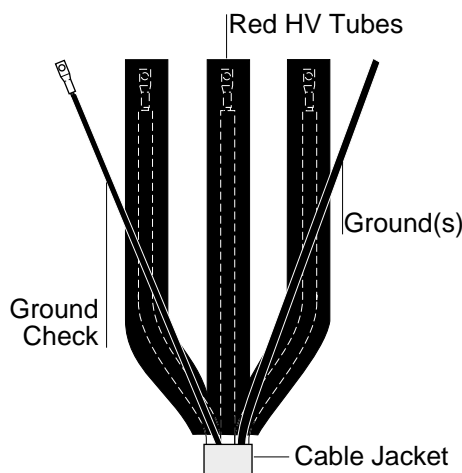
5011

Note: Sealant will not prevent water ingress between the strands on a conductor without a lug.

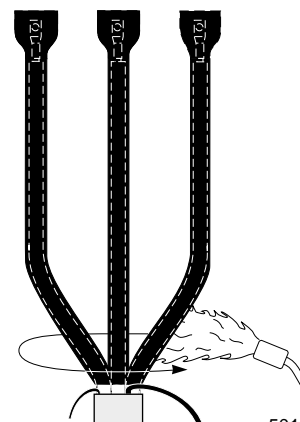
8. Position red HV tubes tubes; shrink into place.

Position the 3 red HV tubes over the phase conductors. Butt the tubes up to the jacket cutback. Begin shrinking at the jacket cutback end and work to the lug.

Note: The red tube should be within 1" (25mm) of the cable jacket on the bottom end and should cover the sealant (installed in step 7) on the top end.



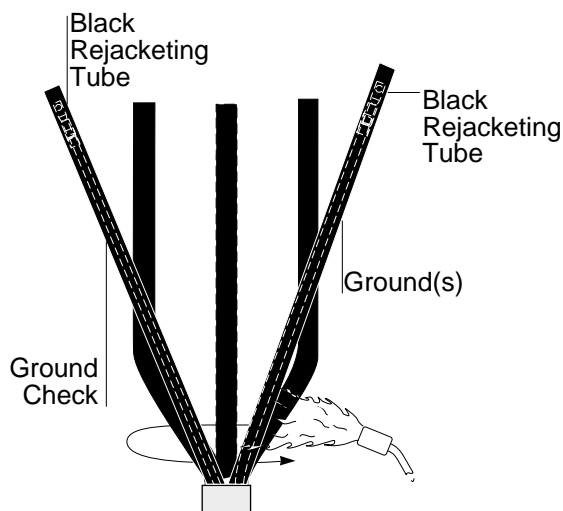
5012



5013

9. Position black re-jacketing tubes; shrink into place.

Position the 3 black tubes over the ground(s) and ground check. If one black tube has a smaller diameter than the other two, use the small tube over the ground check. Butt the tubes up to the jacket cutback. Begin shrinking at the jacket cutback and work to the lug.



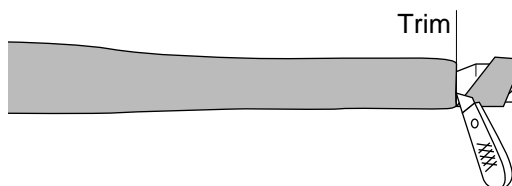
5013a

10. Trim tubes.

Note: Allow the tube to cool enough to touch before proceeding.

If necessary, trim excess tubing from the lug area as shown.

Inspect installation; reheat any flat spots or wrinkles.

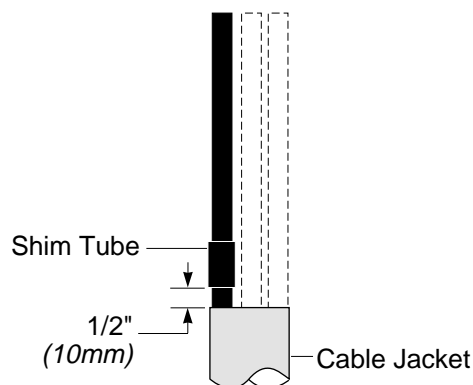


5014

11. Install shim tubes (25kV only)

Position the short black tube over the ground check 1/2" from the cable jacket cutback. Shrink into place.

Note: For 5, 8, and 15kV terminations, skip this step.

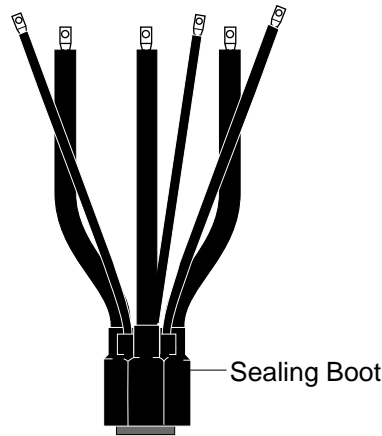


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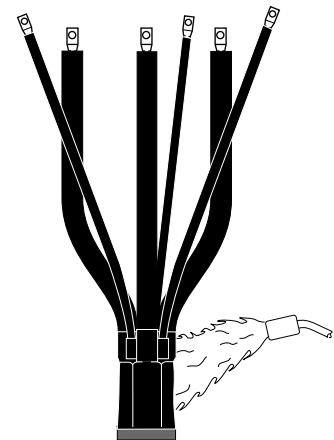
12. Install cable breakout boot.

Clean and abrade cable jacket for 6 to 8" from the cutback. Position the breakout boot securely into the cable crotch. Start shrinking uniformly around the center of the boot, working toward the cable jacket. Return to center and shrink legs. Conductors may be spread to allow heating in the crotch area.

Indoor termination is complete.



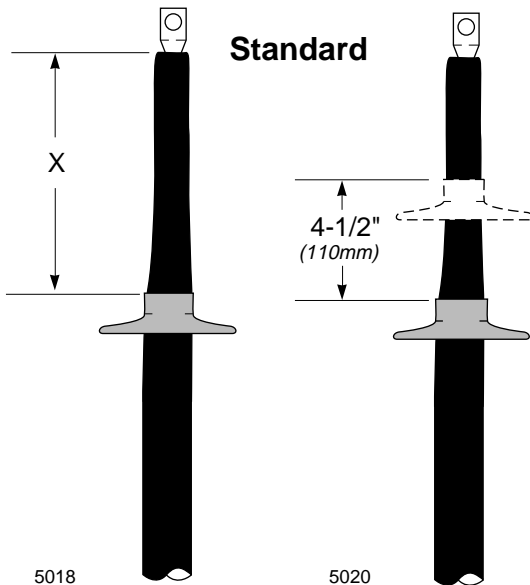
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5017

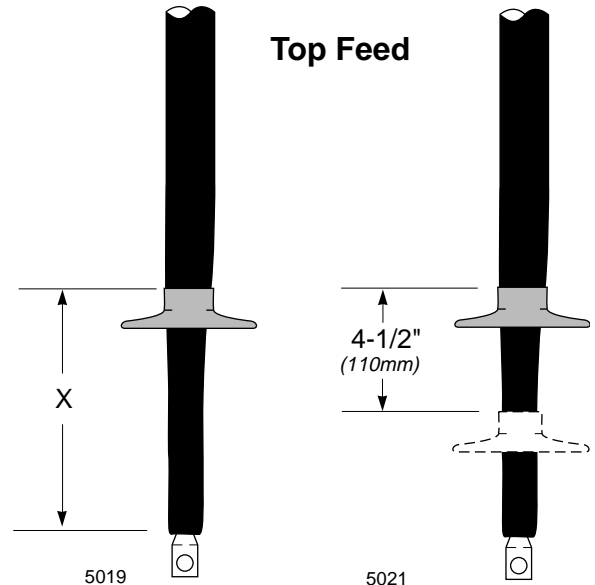
13. For outdoor terminations only; install skirt(s) on each of the phases.

Referring to the table below, position the first skirt as shown and shrink into place. Hold edge of skirt lightly with pliers. Brush flame tip around outside of skirt collar. Only the collar will shrink.



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5020



5019

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Install remaining skirts

| Voltage Class | Total skirts per phase | Standard Dimension "X" | Top Feed Dimension "Y" |
|---------------|------------------------|------------------------|------------------------|
| 5 & 8kV | 1 | 4-1/2" (115mm) | 5-1/2" (140mm) |
| 15kV | 2 | 9" (115mm) | 10" (250mm) |
| 25KV | 3 | 13-1/2" (340mm) | 14-1/2" (370mm) |

Refer to table above, position remaining skirts as required for voltage class and shrink into place.

Outdoor termination is complete.