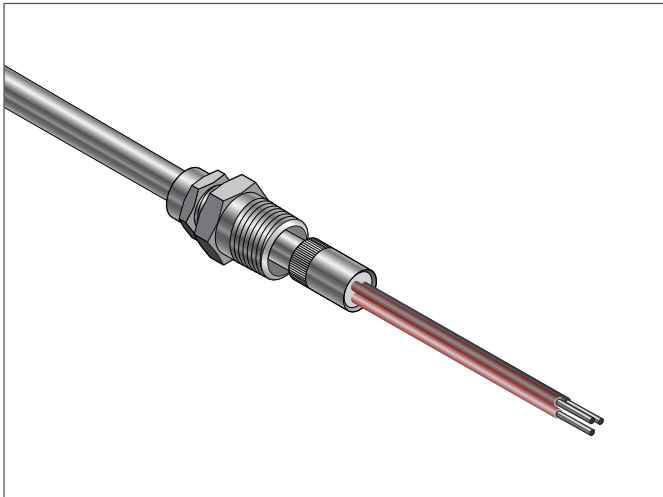




## PYROTENAX

# PYROPAK TERMINATION KIT

## Installation Instructions for Shielded Twisted Pair Mineral Insulated (MI) Cables



### APPROVALS

#### Ordinary Locations

#### Hazardous Locations



Class I, Div. 1 and 2, Groups A, B, C, D  
Class II, Div. 1 and 2, Groups E, F, G  
Class III, Div. 1 and 2

### KIT CONTENTS

The Pyropak kit contains sufficient material to terminate both ends of a cable.

Item	Qty	Description
A	2	Spacer disk and insulating sleeving assembly
B	2	Brass gland connector
C	2	Drain wire ring assembly
D	1	Popsicle stick
E	1	Brass bushing
F	2	Brass self-threading pot
G	2	Torque tag
H	2	Mastic or epoxy sealing compound

### DESCRIPTION

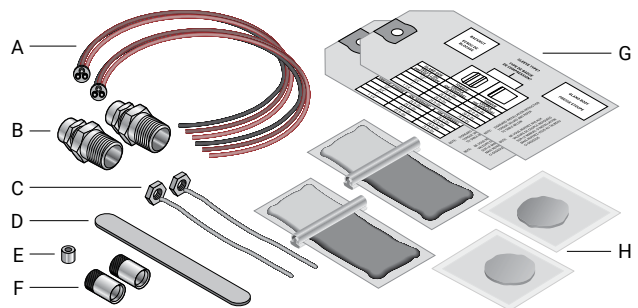
The nVent PYROTENAX Pyropak termination kit is used to terminate shielded twisted pair copper sheathed MI cables. The cable end must be sealed using either the mastic sealing compound or the epoxy sealing compound. Determine which sealing compound has been supplied and read the appropriate instruction steps completely before performing the termination procedure.

For a step-by-step demonstration of this procedure, a video "PyroPak Termination Procedure for Shielded Twisted Pair MI Communication Cable" is available on our YouTube Channel by searching for "Pyrotanax".

For technical support contact your nVent representative or nVent at (800) 545-6258.

### TOOLS REQUIRED

- nVent PYROTENAX Sheathmaster Stripping Tool
- Hand-type or screw-type crimping and compression tool (if using mastic sealing compound)
- Oxyacetylene or mapp gas torch
- nVent PYROTENAX Handvise
- Medium grit emery paper
- Hacksaw
- Flat file
- Scribe or pick
- Tape measure or ruler
- nVent PYROTENAX Pyropotter Tool
- Jumper cable or black electrical tape
- Allen key (see Pyropotter Tool instruction for size)
- Multimeter or continuity tester
- Adjustable pliers/vise grips
- Clean, dry cloth or rag
- Safety glasses and gloves
- Permanent marker
- 500-Vdc megohmmeter
- Diagonal (side) cutters
- Twisted pair drain wire tool



### WARNING:

This component is an electrical device that must be installed correctly to ensure proper operation and to prevent shock or fire. Read these important warnings carefully and follow all installation instructions.

- When MI cable is stripped and terminated, cut metal edges can cause cuts and loose powder can cause eye irritation. To prevent injury, gloves

and safety glasses must be worn when carrying out these operations.

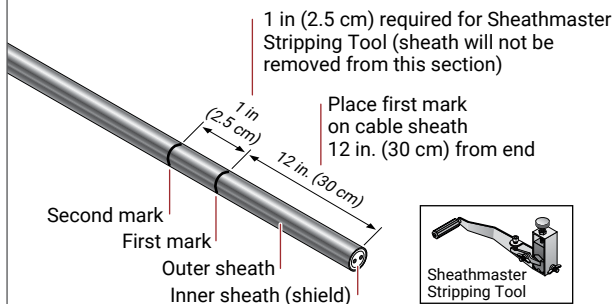
- To prevent burns when drying out the cable (Appendix B), allow it to cool until warm to the touch before completing the remaining termination instructions.

### CAUTION:

**HEALTH HAZARD.** Contact your nVent representative or call (800) 545-6258 for safety information regarding the mastic sealing compound or epoxy sealing compound.

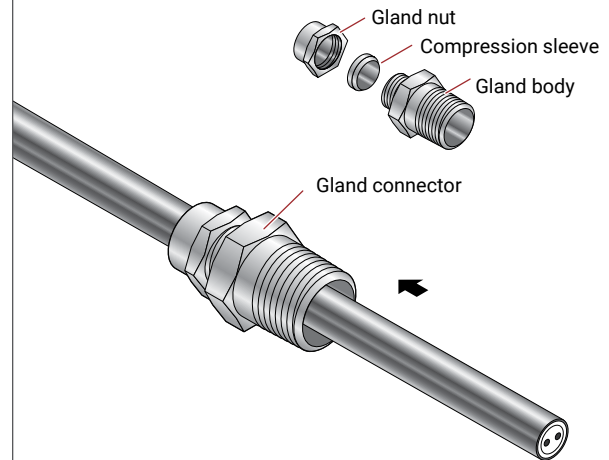
1

- With a hacksaw, cut the end of the MI cable square and file the end smooth.
- Ensure that the end of the MI cable is straight for approximately 15 in (38 cm) and place a mark on the sheath 12 in (30 cm) from the end of the cable. This is the length of the outer copper sheath to remove; inner sheath (shield) will be exposed.
- If using the Sheathmaster Stripping Tool, place a second mark 1 in (2.5 cm) behind this first mark as shown.
- For details on using the Sheathmaster Stripping Tool, refer to the instruction supplied with the tool; An alternate method of stripping the cable sheath using a tubing cutter and side cutters is shown in Appendix D.



2

- Place the brass gland connector over the cable sheath. The gland connector is made up of three parts: the gland nut, the compression sleeve and the gland body. It should be placed on to the cable with all three pieces assembled.

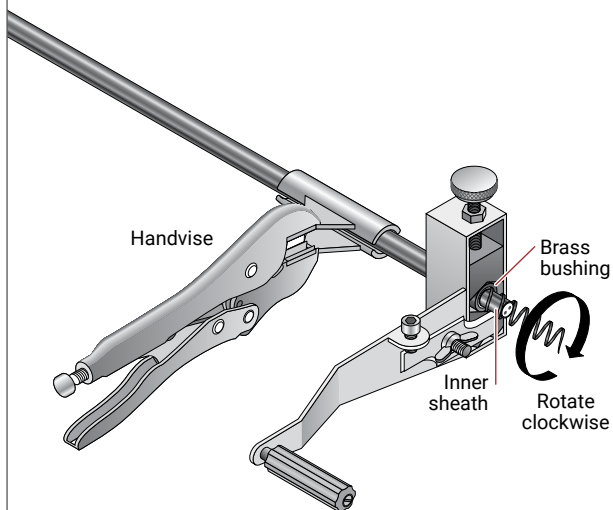


3

Remove the outer copper sheath as follows:

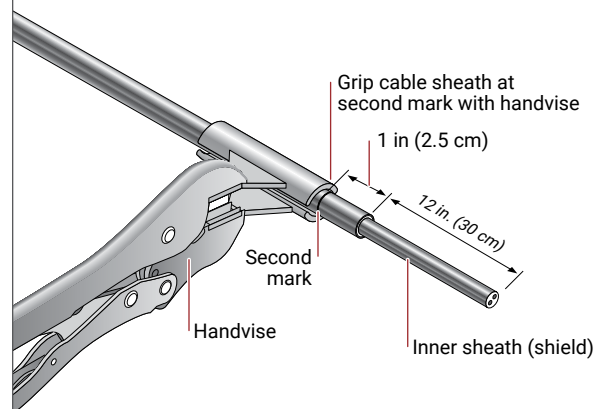
- Grip the cable with the Handvise.
- Using the sheath stripping tool, begin stripping the outer copper sheath back towards the first mark.
- After the first 1/2 inch (13 mm) of the outer sheath has been removed, check the inner copper sheath (shield) to make sure that the blade did not cut into the inner sheath. Adjust blade depth if necessary to avoid cutting the inner sheath.

**Note:** Ensure blade depth is set so that it does not cut into the inner sheath.



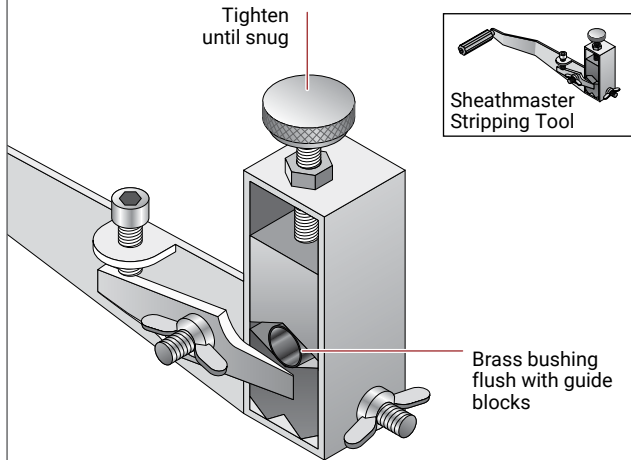
4

- For final stripping of the outer copper sheath, grip the cable with the Handvise at the second mark. When the stripping tool touches the edge of the Handvise, it will stop and make a clean cut on the outer cable sheath at the first mark. At this point, the inner copper sheath will be exposed.



5

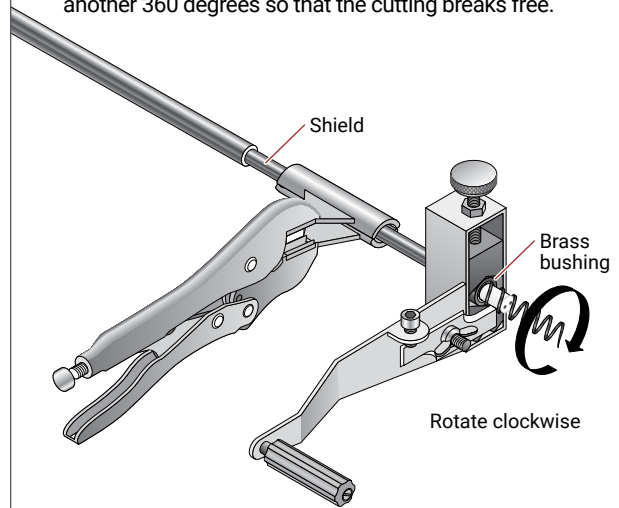
- Insert the brass bushing supplied with the termination kit into the Sheathmaster Stripping Tool, making sure that it is flush with the guide blocks at the blade end of the tool.
- Tighten the guide block to lock the bushing in place.



6

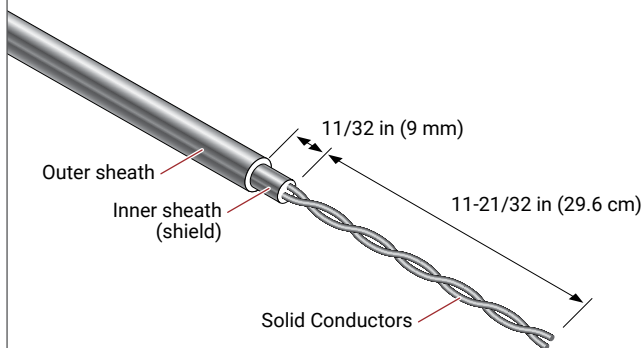
Next, strip the shield back to accommodate the drain wire nut as follows:

- Wipe the shield with a clean dry cloth to remove loose powder.
- Strip the shield until the inside edge of the bushing contacts the outer sheath. While stripping the shield, reposition the Handvise as necessary to prevent the shield from bending. When the bushing meets the outer sheath, turn the handle another 360 degrees so that the cutting breaks free.



7

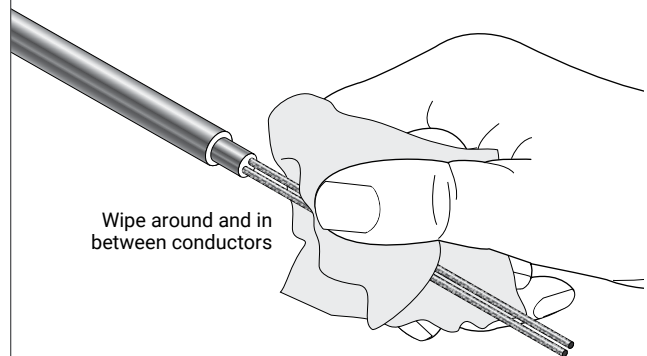
- Remove sheath stripping tool; 11/32 in (9 mm) of the shield and about 12 inches (30 cm) of the twisted conductors (or tails) should be left protruding from the end of the cable.



8

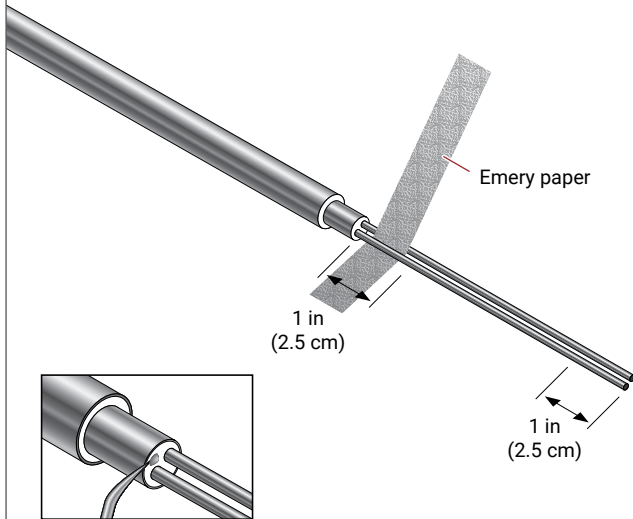
- Straighten the conductors and ensure that they are evenly spaced.
- Wipe around and in between all conductors and end of sheath to remove loose powder.
- Visually inspect the magnesium oxide powder at the face of the cable for traces of copper filings and burrs. If present, gently remove with a pick or tap them out, but do not blow them out as this can introduce moisture into the end of the cable

**Note:** Do not remove more powder from the face of the cable than is necessary.



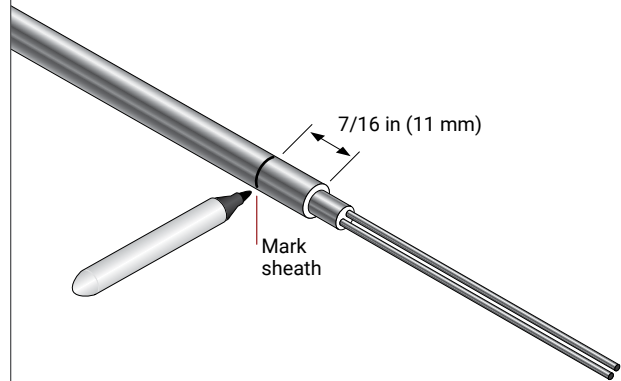
9

- Using emery paper, lightly sand around and in between all conductors for a length of 1 in (2.5 cm) from the face of the cable and the ends of the conductors.
- Avoid contaminating the magnesium oxide powder in the exposed cable end with the metal filings; if contaminated, remove with a pick or tap them out.



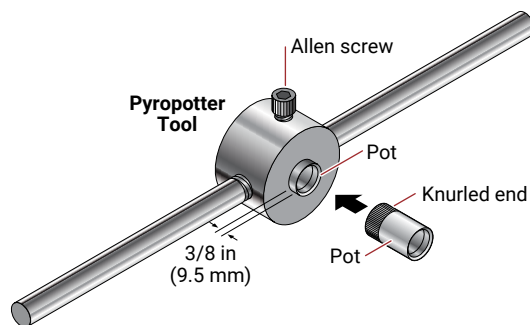
10

- Place a mark on the cable sheath 7/16 in (11 mm) back from the end of the outer sheath. You will screw the pot on to the sheath so that the back of the pot aligns with the mark.



11

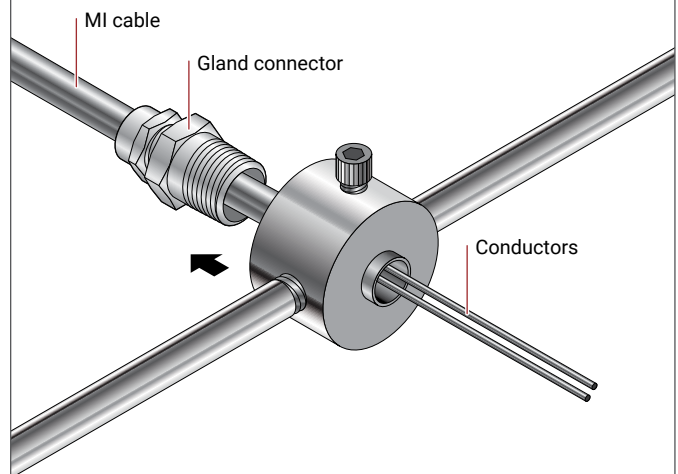
- Place the 3/4 in self-threading pot into the non-threaded end of the Pyropotter Tool with the larger hole of the pot facing outwards and protruding about 3/8 in (9.5 mm) past the end of the tool. Refer to Pyropotter Tool instruction H59038 for details on using the tool.
- Tighten the screw on to the pot with a 3/16" Allen key.



**Note:** Ensure that the Allen screw is tightened onto the knurled end of the pot

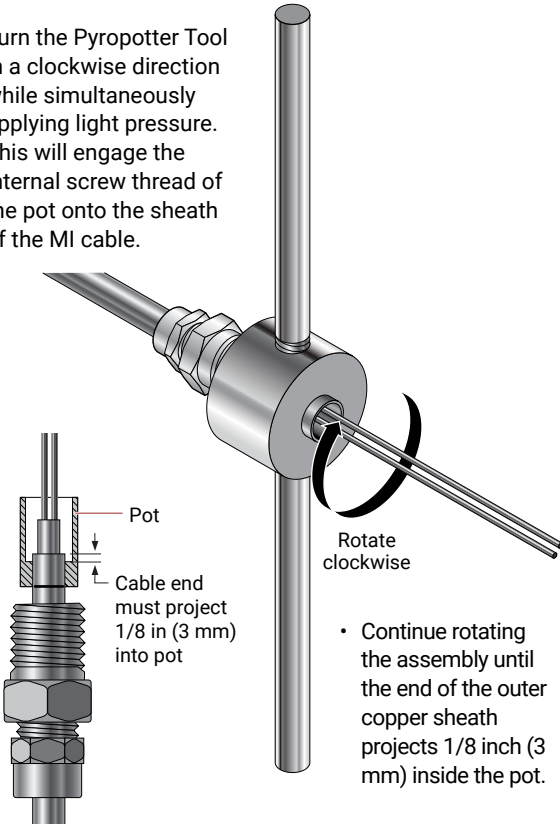
12

- Slide the assembly over the exposed conductors, threaded end of Pyropotter first, until it stops at the face of the cable.
- Screw the gland connector (already on the cable) all the way into the threaded end of the Pyropotter Tool – finger tight is sufficient.

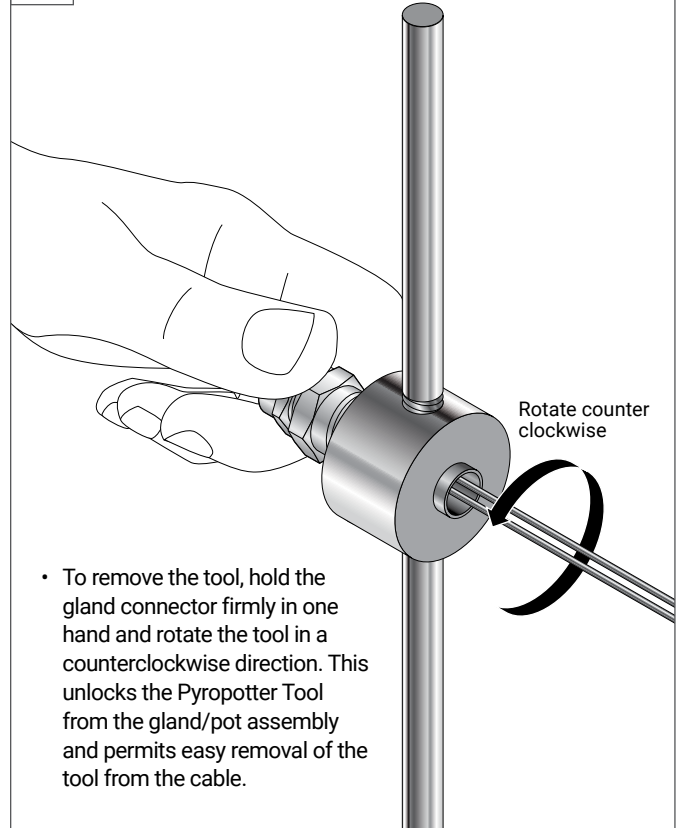


13

- Turn the Pyropotter Tool in a clockwise direction while simultaneously applying light pressure. This will engage the internal screw thread of the pot onto the sheath of the MI cable.



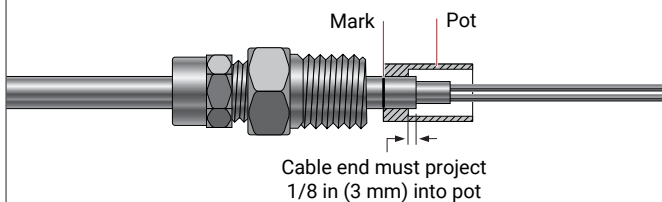
14



15

- Verify that the back of the pot aligns with the mark made on the copper sheath in Step 10. If the pot is behind the mark on the cable, vise grips may be used to screw the pot to the mark.

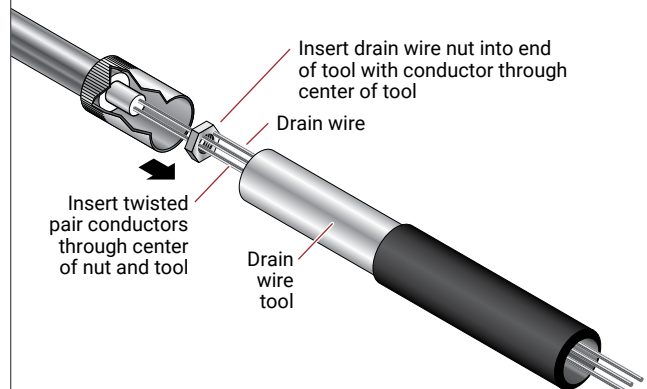
**Important: Outer sheath must project 1/8 in (3 mm) into pot in order to make an effective seal.**



16

Next, install the drain wire nut onto the shield of the MI cable as follows:

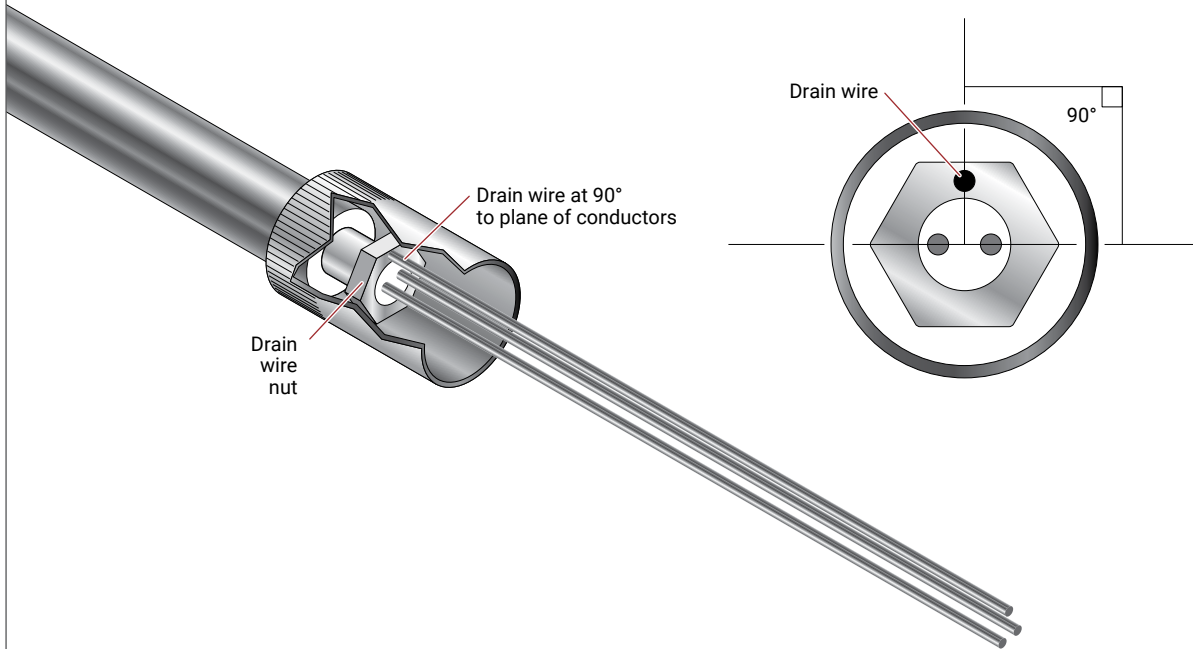
- Insert the drain wire nut into the hex wrench of the drain wire tool with the drain wire down the center of the tool.
- Insert the twisted pair conductors through the hole in the nut and the center of the drain wire tool.



17

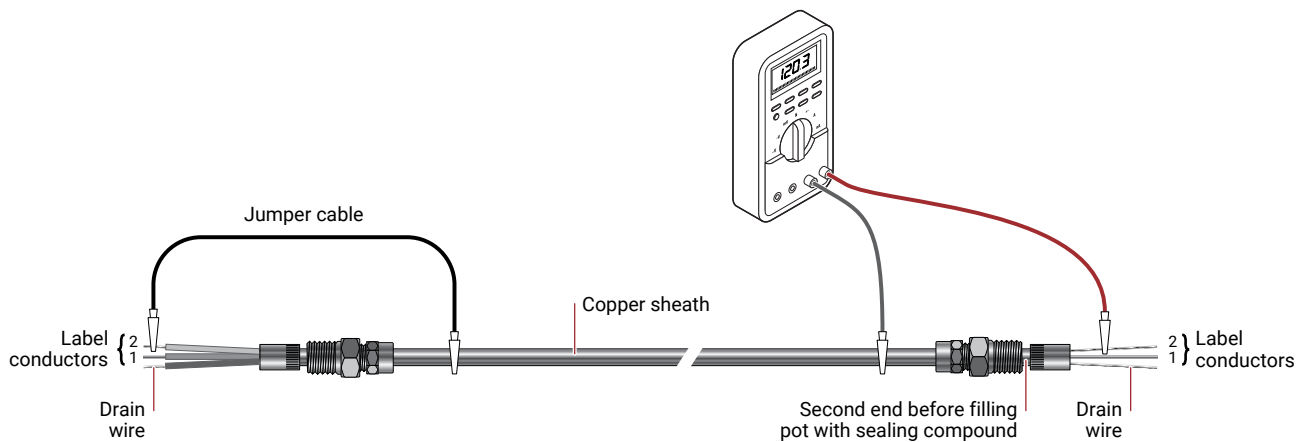
- Screw the drain wire nut onto the shield of the MI cable stopping when the top of the drain wire nut is flush with the end of the shield.

- Align the drain wire nut/wire by turning it to a position 90 degrees from the two conductors.



18

- If terminating the first end of the cable, go to Step 19. If terminating the second end of the cable, you must first test the end-to-end continuity of the conductors with a continuity tester or multimeter to ensure that each conductor will be terminated with the same color sleeving at both ends. The procedure to identify matching conductors at the cable ends is shown in Appendix C.



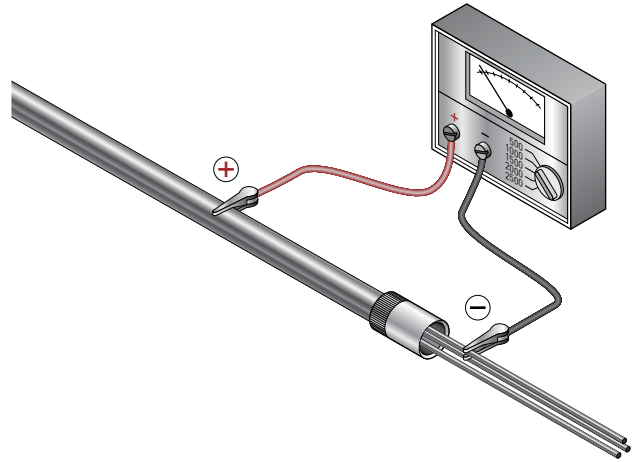
- Using a 500-Vdc megohmmeter, check the insulation resistance (IR) of the cable to ensure it is free of grounds and shorts. Check IR between the two twisted conductors, between the twisted conductors and inner sheath, and between the inner sheath and the outer sheath. See Appendix A for detailed test procedure and IR test criteria.

**Note:** Low IR results indicate that moisture is present in the end of the MI cable and must be removed before finishing the termination. If neither cable end has yet been terminated and IR readings are low, dry out both ends following the procedure in Appendix B or cut off shorted end and re-test. Once IR readings are satisfactory, apply a temporary moisture resistant seal, such as hot melt glue or adhesive lined heat-shrink tubing, to opposite cable end to prevent further moisture absorption.

**Note:** Opposite end of cable must also be dry and free of grounds and shorts to obtain an acceptable IR reading. Low IR readings should be expected if the opposite end has already been terminated with epoxy sealing compound which has not fully cured (IR will increase once the epoxy has cured).

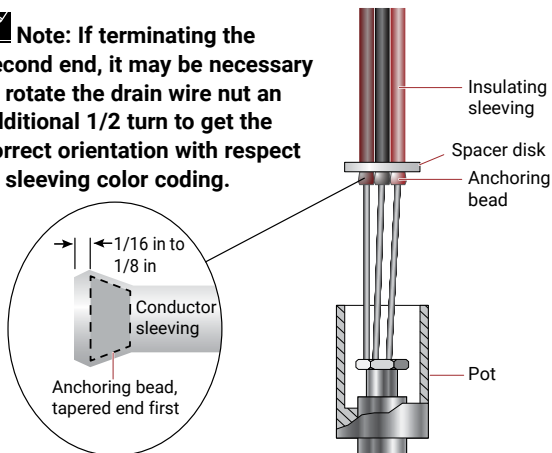
- If moisture was removed from the end of the cable using the procedure in Appendix B, allow the cable to cool until warm to the touch and continue with the steps to seal the end of the cable.

- Once IR readings are satisfactory, immediately apply the appropriate sealing compound as described in the steps following. A delay will cause the IR to drop and the cable must be retested prior to sealing the end.



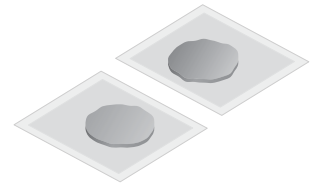
- Slide spacer disk and insulating sleeving sub-assembly over conductors, anchoring bead end first. The brown sleeving must be placed over the drain wire.

**Note:** If terminating the second end, it may be necessary to rotate the drain wire nut an additional 1/2 turn to get the correct orientation with respect to sleeving color coding.



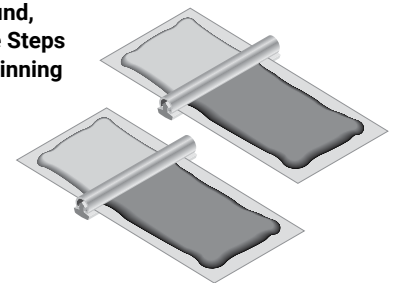
**Note:** Always ensure anchoring beads are in the assembly (inside all insulating sleeveings) before sliding the sleeving sub-assembly over the conductors. If missing, look for bead inside the kit bag/box and re-insert the bead into the sleeving, tapered end first. Push the bead in so that it is entirely covered by the sleeving but is not pushed beyond 1/16 in to 1/8 in past the sleeving end.

For kits supplied with mastic sealing compound, immediately complete Steps 22 through 27 (beginning on page 8).



**CAUTION:** Health Hazard. Consult your nVent representative or call nVent at (800) 545-6258 for safety information regarding the mastic sealing compound.

For kits supplied with epoxy sealing compound, immediately complete Steps 22A through 25A (beginning on page 10).




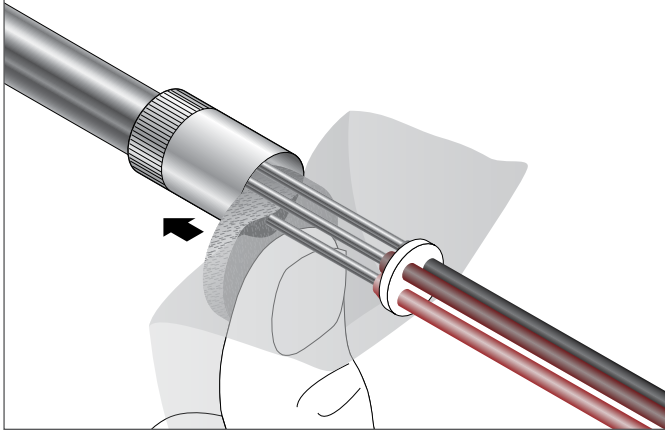
**CAUTION:** Health Hazard. Consult your nVent representative or call nVent at (800) 545-6258 for safety information regarding the epoxy sealing compound.



## 22 (for kits with Mastic Sealing Compound)

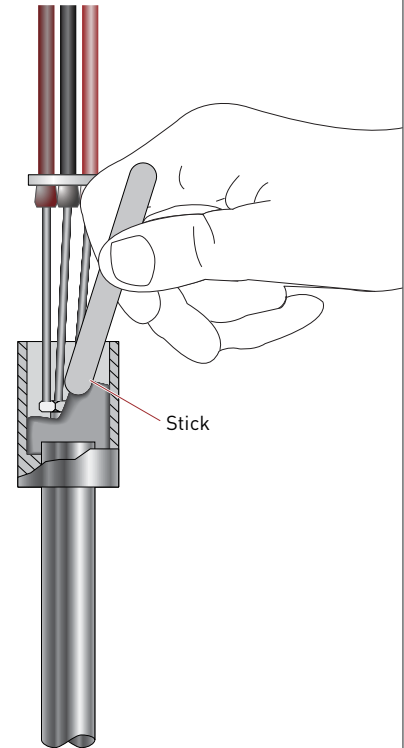
- Withdraw spacer disk and sleeving sub-assembly slightly to allow sealing compound to be packed into the pot.
- Ensure conductors are spaced an equal distance apart from each other and the inside of the pot.
- The pot should still be warm if you had to follow the drying out procedure during the IR test, if not, heat the cable and then the pot with the torch until just warm to the touch before filling with mastic sealing compound.
- Do not allow compound to become contaminated with any foreign matter once package is opened. Press mastic sealing compound into pot with thumb behind the wrapper to ensure cleanliness and fill the pot with sealing compound by pressing down from one side only until drain wire nut is covered.

 **Note:** Store mastic sealing compound at room temperature or an inside shirt pocket until ready to use. Mastic compound may be installed as low as 14°F (-10°C) providing compound is kept warm prior to use.



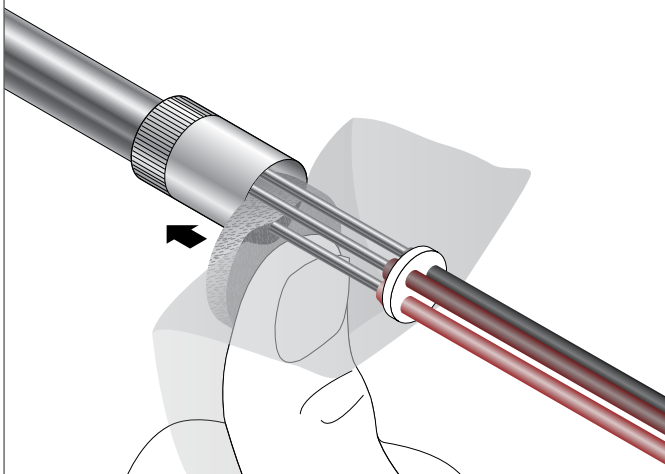
## 23 (for kits with Mastic Sealing Compound)

- Using the stick provided, tamp the compound down between the pot and the drain wire nut to ensure the cable end beneath the nut is well covered and void of air pockets.




## 24 (for kits with Mastic Sealing Compound)

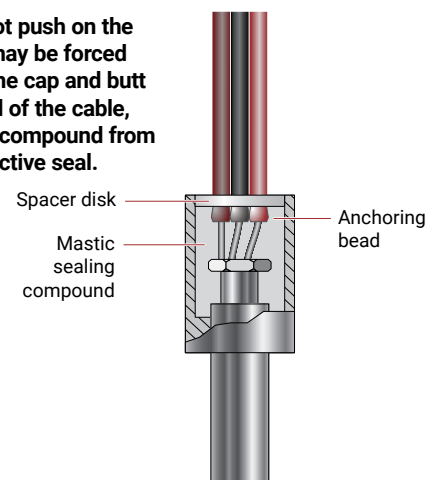
- Continue filling pot with compound, from one side only, until slightly overfilled. Sealing compound will come out the opposite side of the pot when full.



## 25 (for kits with Mastic Sealing Compound)

- Using a screwdriver or other tool, push spacer disk into open end of the pot. Pull gently on the sleeving to ensure the anchoring beads are snug against the inside face of the spacer disk.

 **Note:** Do not push on the sleeving as it may be forced back through the cap and butt against the end of the cable, preventing the compound from making an effective seal.





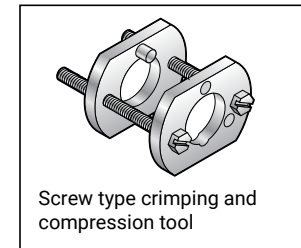
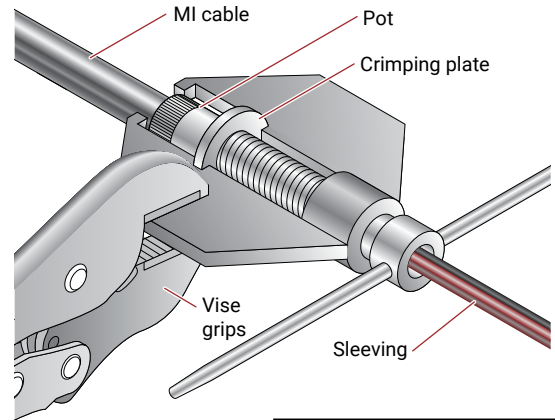
## 26 (for kits with Mastic Sealing Compound)

- Place the pot into the body of the crimping and compression tool (hand adjustable type shown) making sure that the sleeving is inserted through the center of the MI crimping tool. The end of the pot with the spacer disk must fit inside the three cone shaped points on the crimping plate of the MI crimping and compression tool.

**Note:** Hold the tool firmly, with vise grips if needed, to prevent the tool from turning the pot.

- Apply even pressure on the spacer disk by tightening the tool until the spacer disk is snugly seated inside the opening of the pot and the cone-shaped points have crimped the side of the pot. This will retain the spacer disk in position. The termination is now complete.

**Note:** It is normal for the mastic sealing compound to squeeze out the side of the pot as pressure is applied with the crimping and compression tool.

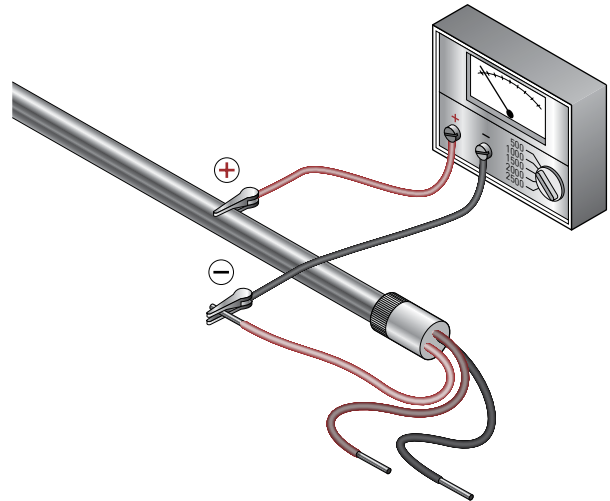


## 27 (for kits with Mastic Sealing Compound)

- On completion of the termination, check the IR again with the 500-Vdc megohmmeter (see Appendix A).

**Note:** Under adverse weather conditions, IR readings may be lower than the values shown in Appendix A.

- If the other end of the cable has not yet been terminated, complete the termination following the same procedure.



## 22A (for kits with Epoxy Sealing Compound)

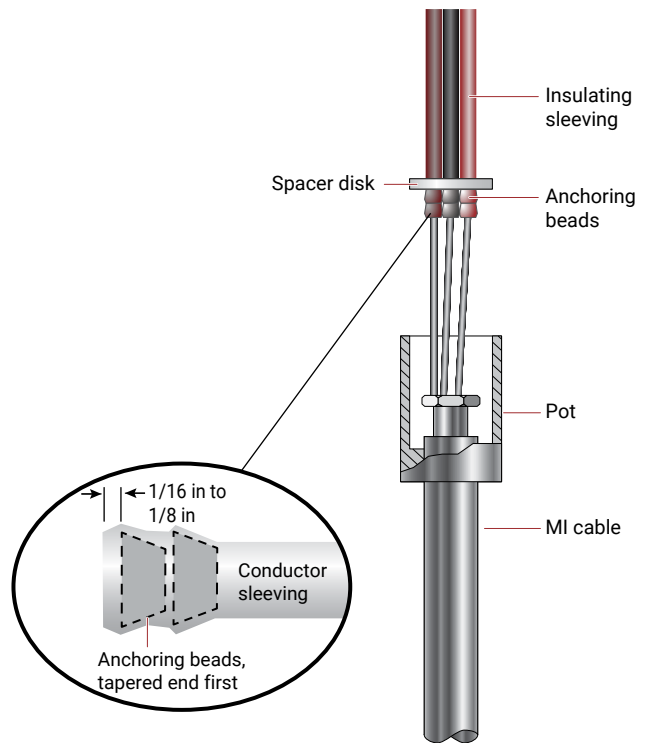
- Withdraw the spacer disk and sleeving sub-assembly slightly to allow space to fill the pot with epoxy.
- Ensure conductors are spaced an equal distance apart from each other and the inside of the pot.
- Prepare epoxy sealing compound in accordance with the instructions on the epoxy package.

**Note:** Use epoxy within 10 minutes after mixing.

- The pot should still be warm following the drying out procedure, if not, heat the cable and then the pot with the torch until just warm to the touch before filling with epoxy.

**Important:** To avoid forming bubbles in the epoxy, do not apply heat to the cable or the pot during or after filling with epoxy.

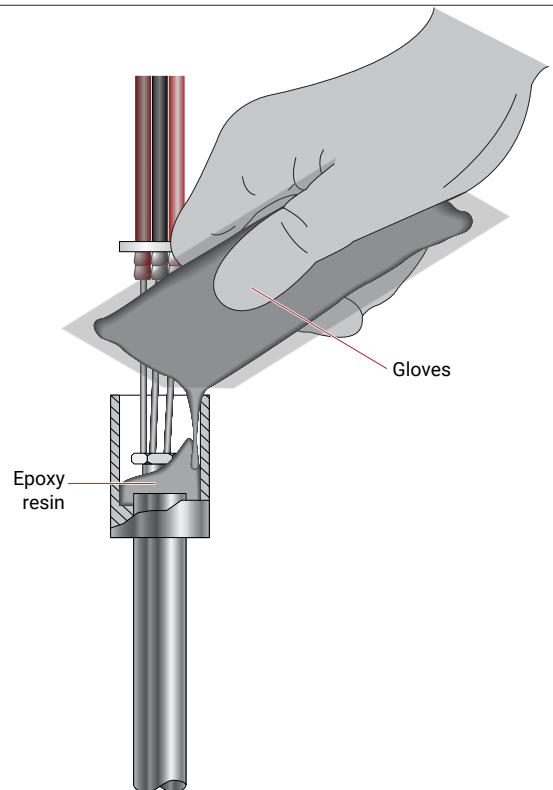
**Note:** Always ensure anchoring beads are in the assembly (inside all insulating sleeveings) before sliding the sleeving sub-assembly over the conductors. If missing, look for beads inside the kit bag/box and re-insert the beads into the sleeving, tapered end first. Push the beads in so that they are entirely covered by the sleeving but are not pushed beyond  $1/16$  in to  $1/8$  in past the sleeving end.



## 23A (for kits with Epoxy Sealing Compound)


- Cut one corner of plastic package containing epoxy to make an opening of  $1/8$  in (3 mm).
- Maintaining cable end vertically, squeeze the epoxy into the pot. Pour it down one side of the pot until it is completely filled.

**Note:** Store epoxy sealing compound between  $65^{\circ}\text{F}$  and  $77^{\circ}\text{F}$  ( $18^{\circ}\text{C}$  and  $25^{\circ}\text{C}$ ) until ready to use. The minimum installation temperature for the epoxy sealing compound is  $65^{\circ}\text{F}$  ( $18^{\circ}\text{C}$ ).



#### 24A (for kits with Epoxy Sealing Compound)

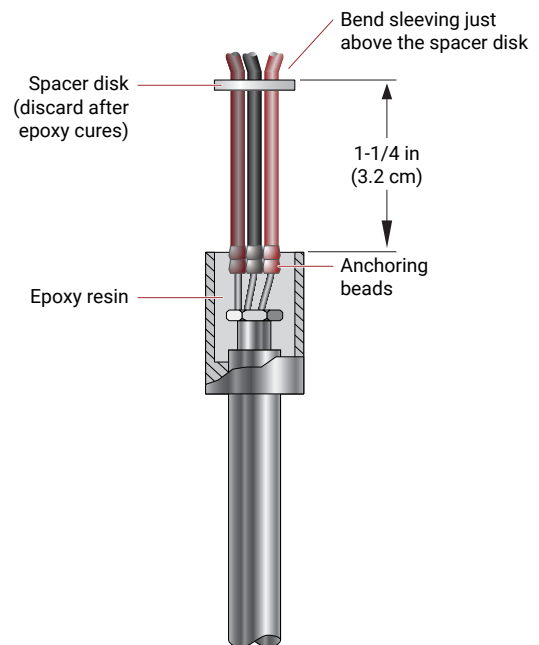
- Slide sleeving towards pot and adjust its position so that the bottom anchoring beads and half of the upper beads are immersed in the epoxy. Maintain proper spacing of conductors with spacer disk and keep disk about 1-1/4 in (3.2 cm) above the pot.

 **Note:** Bend the conductors slightly so that the sleeving does not slide down into the epoxy.

- Allow the epoxy to cure for at least 16 hours, at 65°F (18°C) minimum, before moving the termination from the vertical position.

 **Note:** Discard spacer disk after the epoxy cures.

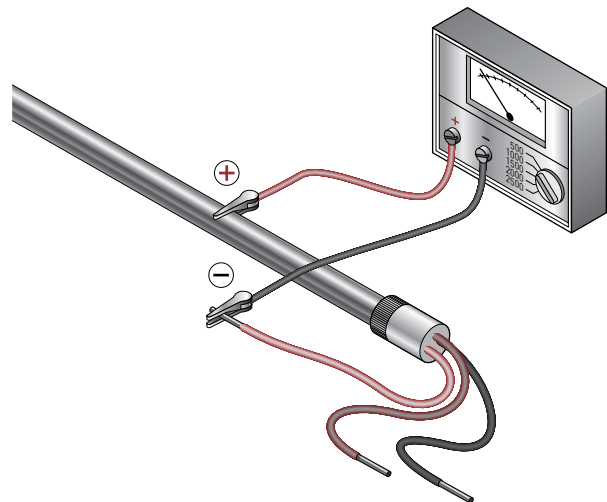
- If the other end of the cable has not yet been terminated, complete the termination following the same procedure.



#### 25A (for kits with Epoxy Sealing Compound)

- After the epoxy compound at both ends has fully cured (16 hours), check the IR again with the 500-Vdc megohmmeter (see Appendix A).

 **Note:** Under adverse weather conditions, IR readings may be lower than the values shown in Appendix A.



## Appendix A: Insulation Resistance (IR) Test

### Test Equipment

500-Vdc Megohmmeter

### IR Testing

IR testing is conducted using a megohmmeter and tests the integrity of the cable between the two twisted conductors, between the twisted conductors and inner sheath, and between the inner sheath and the outer sheath.

### Test Criteria

When received:

- Check cable on reel. Note that ends may need to be prepared to allow insulation resistance (IR) readings to be taken. IR readings must not be less than 200 M $\Omega$  under any conditions.

After installing termination kit:

- In a warm, dry environment, IR readings should be 200 M $\Omega$  or higher.
- In an outdoor environment or indoors in wet or humid conditions, IR readings should all be above 100 M $\Omega$ .
- Similar cables exposed to similar conditions should all have IR readings in the same general range. Where a large difference in readings is encountered, high readings can be accepted; low readings (below 100 M $\Omega$ ) should be checked as described below.

**Note:** Under some installation conditions it may not be possible to obtain IR readings above 100 M $\Omega$ . If IR readings are between 25 M $\Omega$  and 100 M $\Omega$ , wait 24 hours and recheck the IR using the same equipment. If the IR reading has not decreased, the termination is good - a constant low IR reading can result from moisture entrained in the cable while making a good seal; this moisture will not increase. If the IR reading has decreased, the cable must be re-terminated - a low IR reading can result from a poorly made seal which will allow continuing moisture ingress, requiring that the termination be redone.

If the IR reading is less than 25 M $\Omega$ , the cable must be re-terminated following the "drying out" procedure in Appendix B.

**Note:** If IR readings are low, follow the instructions in Appendix B to dry out the cable.

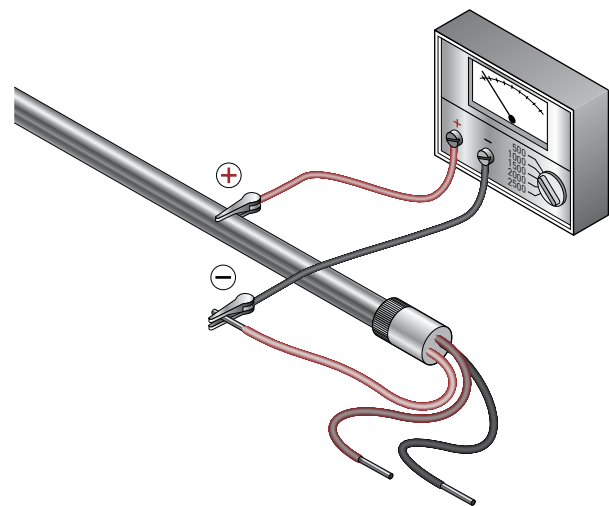
### Test Procedure

1. Set megohmmeter test voltage at 0 Vdc or off.
2. Connect the positive (+) (earth) lead to the inner cable sheath (or drain wire if cable is terminated).
3. Connect the negative (-) (line) lead to one of the twisted conductors.
4. Turn on the megohmmeter and set the voltage to 500 Vdc; apply the voltage for one minute. Meter needle should stop moving. Rapid deflection indicates a short. Note the insulation resistance value. It should correspond to the values shown under Test Criteria.
5. Turn off the megohmmeter

**WARNING: Shock Hazard.** The MI cable can store a large electrical charge after the insulation resistance test is performed. To prevent personal injury from electrical shock, fully discharge the cable prior to disconnecting the megohmmeter. Many meters will discharge automatically. However, it may be necessary to short the cable leads. Contact your supervisor or the instrument manufacturer to verify the safest practice.

6. Repeat procedure above for the other twisted conductor.
7. Next, check IR between the twisted conductors by connecting the red lead to one conductor and the black lead to the other conductor and repeating Steps 4 and 5 above.
8. Finally, check the IR between the outer sheath and the inner sheath (or drain wire) and repeating Steps 4 and 5 above.
9. Testing is complete. If the megohmmeter does not self-discharge, discharge phase connection to ground with a suitable grounding rod. Disconnect the megohmmeter.

**Note:** If IR readings are low, follow the drying out procedure in Appendix B to remove moisture from the end of the cable.



## Appendix B: Improving Insulation Resistance

To maintain the high performance of MI cable, the cable must be properly stored and the ends must remain sealed. Damaged terminations or heat-shrinkable end caps that are damaged, missing, or removed will cause the magnesium oxide insulation (white powder) to absorb moisture, resulting in low IR readings. The cable must be "heated out" to remove the moisture and bring the IR back to an acceptable level. Drying out the MI cable to remove any moisture will normally be unnecessary providing the termination seal is completed within a few minutes of removing the sheath.

If moisture is found in the cable when checking IR, it may be removed using one of the following methods:

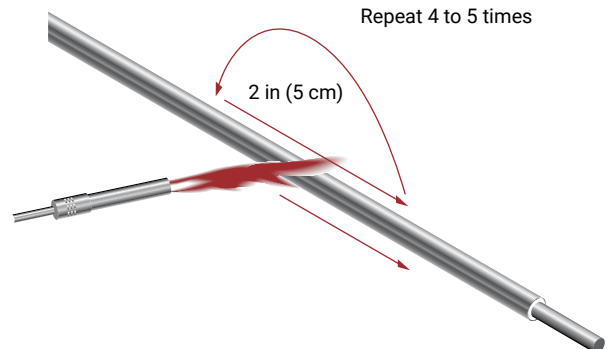
1. If excess cable is available, 6 to 12 in (15 to 30 cm) of cable may be removed from the end before sealing the cable.
2. Apply heat to the cable following the procedure below.

 **Note: Moisture will not normally penetrate more than 12 in (30 cm) into the cable.**

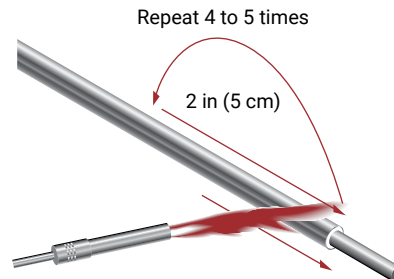
If moisture is detected in the cable, use an oxyacetylene or mapp gas torch with a large flame and "heat out" the cable beginning 12 in (30 cm) back from the end. Gradually move the flame toward and past the cable end. nVent PYROTENAX copper sheathed cables should be heated to a bluish-gray color. Take care not to overheat any one area of the cable sheath as this could damage the cable.

Use a short sweeping motion of the torch and heat about 2 in (5 cm) of cable at a time, repeating 4 to 5 times.

Move the flame towards the cable end as shown. Do not sweep the flame in the opposite direction as this will drive the moisture back into the cable.



Gradually move the flame toward the end while maintaining the short sweeping motion of the torch. If you heat toward the cable end too quickly you may skip over the moisture and drive it further back into the cable.



It may be necessary to repeat the above procedure several times to completely remove all moisture from the cable. Allow the cable to cool before repeating.

## Appendix C: Identifying Conductors

**Note:** If one end of the cable has been terminated, the conductors should be rung out with a multimeter (or continuity tester) to ensure that each conductor has the same colored sleeving at both ends.

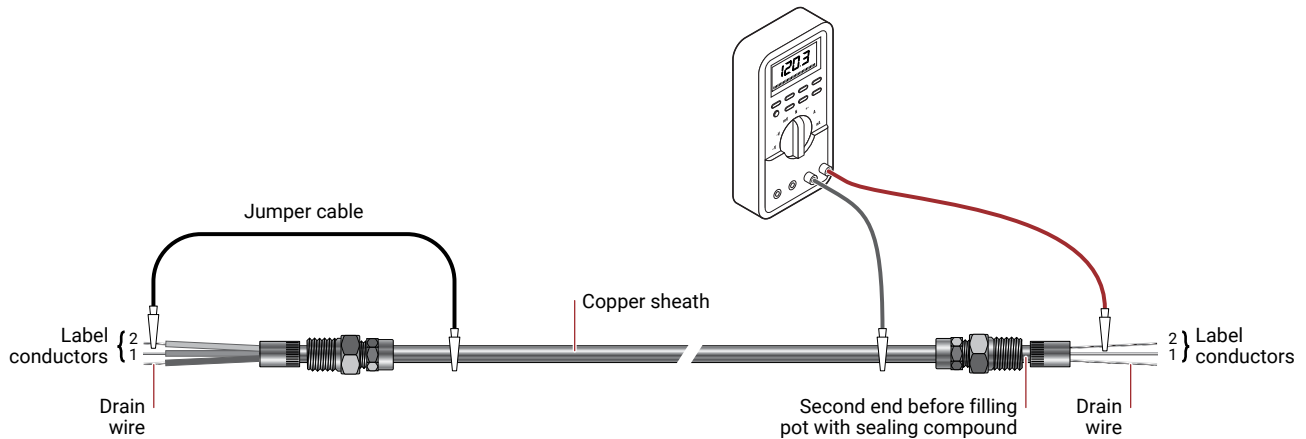
- 1 Start with the end of MI cable which has just been terminated. Connect one end of a jumper cable to the conductor with the red sleeving and the other end to the outer copper sheath of the cable as shown below. Alternately, electrical tape may be used hold the bare conductor to the cable sheath.
- 2 Ensure that the test leads are placed into the correct terminals on the multimeter; the black test lead connects into the common or black terminal and the red test lead into volts/ohms terminal.
- 3 Turn the multi-meter on. If your multi-meter does not automatically change settings, set it to the lowest "Ohms" setting.

4 On the other end of the MI cable which has not been sealed, clip the black lead to the outer copper sheath of the MI cable. Now, alternately touch the red lead from the multimeter to the two conductors in the inner sheath (it is not necessary to touch the drain wire).

5 When you touch the matching conductor (i.e. the conductor shorted to the sheath on the other end), the multimeter will indicate a low "Ohms" reading. The resistance of the other conductor should show infinity or "OL" (overlimit).

Label the conductor on both ends to identify them when making the second termination. This is necessary so that each conductor is terminated with the same colored sleeving on both ends.

6 Move the jumper cable to the conductor with the black sleeving. Connect the red test lead of the multimeter to the other conductor at the unterminated end to verify that it is the same as the conductor with the black sleeving. The multimeter should display a low "Ohms" reading.

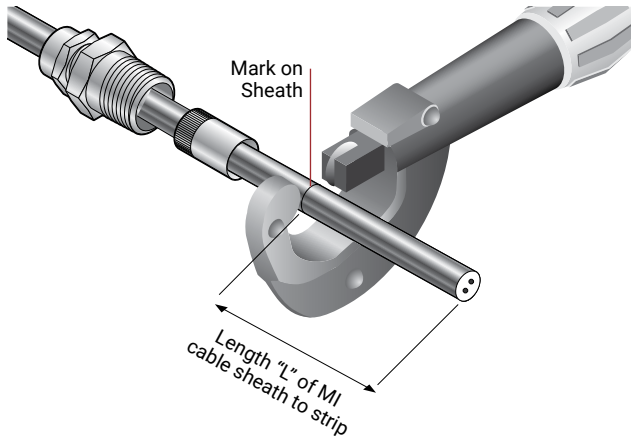


## Appendix D: Stripping Copper Sheathed MI Cable

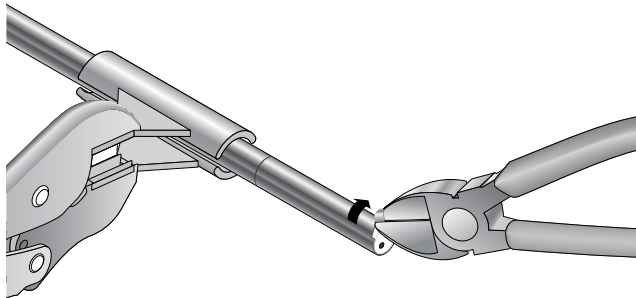
### Using diagonal cutters

Measure, from cable end, length of cable sheath to strip and mark sheath with marking pen. Use a tube cutter to score around the sheath at the mark. This will cause the sheath to peel away at the score providing a smooth end when the sheath is stripped. The correct depth of score is half the thickness of the sheath.

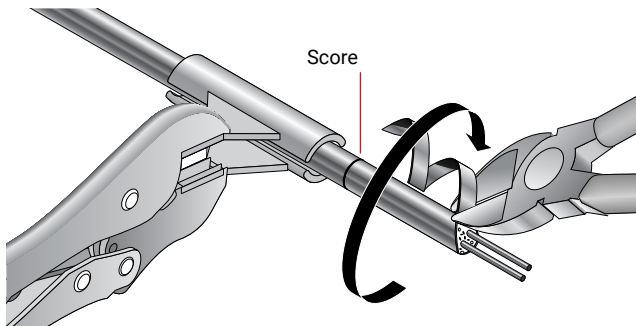
Do not cut completely through the cable sheath as this will cause the sheath to curve inwards toward the conductor(s).



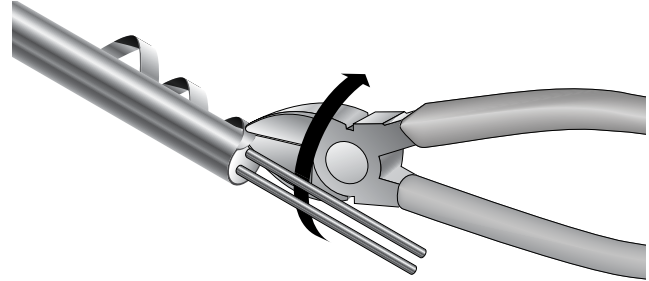
Hold the cable with the hand vise behind the score on the sheath. Grip the edge of the sheath between the jaws of the side cutters and twist clockwise (twist counter-clockwise if left-handed), then take a new grip and rotate through a small angle.



Continue this motion in a series of short "rips", keeping the side cutters at about 45° to the line of the cable, removing sheath spirally. Remove compacted powder insulation to expose conductors.



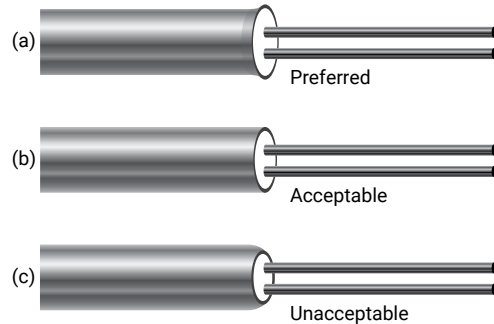
Continue removing the sheath to the score mark. When about to break into the score, bring side cutters to right angle with cable. Finish off with point of side cutters held parallel to the cable. The sheath will peel away leaving a clean cut when the score mark is reached.



The cable sheath is correctly stripped, with the sheath flared slightly outwards, as shown in (a).

In (b) the sheath is neither flared outwards nor beveled inwards, but is acceptable.

Ensure that the sheath is not curved or beveled inward as shown in (c). This will occur if the score made with the tube cutter is too deep. In this case, remove a further 1/4 in (6 mm) of sheath. Cable is now ready to be sealed.





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