

Variable Frequency Drive Cable Termination Guide

Overview

Variable Frequency Drive (VFD) cable can help minimize a variety of system issues ranging from cable failure and drive over-voltage trips, to premature motor and PLC failures. However, unless these cables are properly installed and terminated, much of the benefit derived from using a VFD cable may not be realized. This document provides useful information on terminating your VFD cables to maximize the cable's performance, and should be used in conjunction with the VFD drives manufacturers' installation specifications and all applicable codes.

Perhaps the most critical component of a VFD cable is the cable shield which can consist of armor, copper tape, or a copper braid and aluminum foil combination. This termination guide will provide certain recommendations with respect to terminating copper tape and copper braid/aluminum foil shielded cables. For CCW[®] armor shielded hazardous location cables; you would terminate with a gland for best performance. Procedures for preparing General Cable's CCW line of VFD cables for installation of the appropriate gland suited to the application per the manufacturer's instructions can be found in the technical information section of the General Cable CCW Cable Catalog. The instructions include detailed guidelines for proper removal of the non-metallic jacket and sheath from the cable. There is also an extensive explosion-proof gland cross-reference. To review these procedures in their entirety click [here](#).

Why is Correct Termination so Important?

Two common causes of issues in a VFD system are common mode currents (CMC) and electromagnetic radiation. Both are generated as an unwanted by-product of the drive's high frequency pulse width modulated waveforms.

A properly terminated VFD cable will:

1. provide a controlled path for the drive's CMC (limiting the current traveling through the ground grid);
2. provide a continuous shield over the entire cable from the inverter to the motor (minimizing the amount of electromagnetic radiation that can escape from the cable which can cause interference with other systems);
3. effectively ground the motor (reducing shock hazard).

Other Considerations

Most drive manufacturers recommend that a VFD cable's shield be bonded at both ends to provide an effective path for the common mode current. The cable termination should also be in electrical contact with the cable shield on all sides (360°) to provide the best low impedance path from the cable shield to the entry point at both the motor and the drive. This termination method also minimizes electromagnetic radiation from the cable.

In addition to proper terminations, make sure the cable jacket is left intact between the inverter and the motor terminations. The cable jacket will act as an insulator to prevent common mode current traveling down the cable's shield from jumping off to the building ground.

It is a wise practice to keep input/output cables to one side of a cabinet and separate any Programmable Logic Controller (PLC) and other control and communication equipment cables to the opposite side of the cabinet to reduce the effects of electromagnetic interference from the drives.

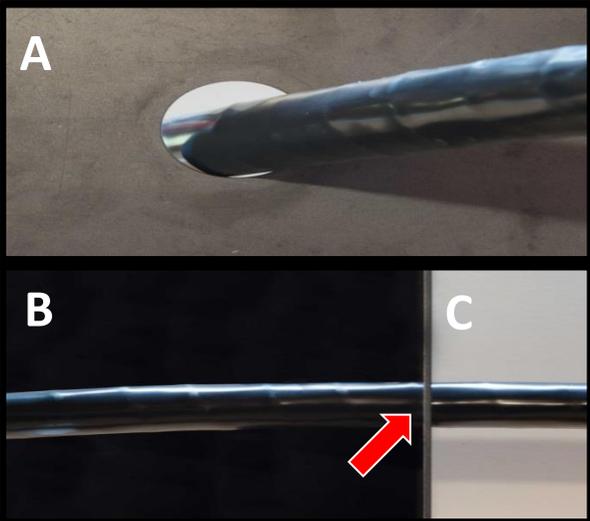
Non-Armored VFD Cable Termination Kits

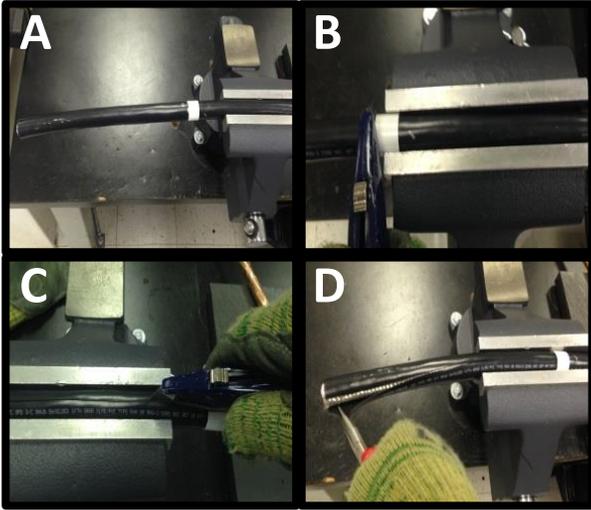
Components of a termination kit are available through various distributors. Such a kit consists of:

- 1) Conductive copper foil adhesive tape
- 2) A constant force spring
- 3) Copper braid grounding strip(s)

Non-Armored VFD Cable Termination Instructions

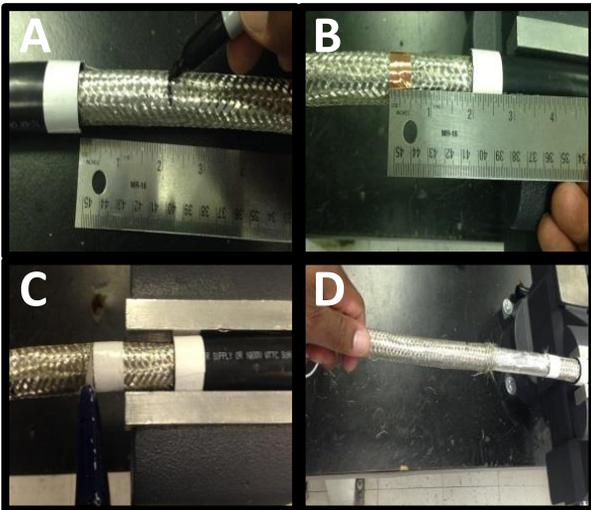
The instructions below apply to both the drive and the motor end of the cable, and pertain to both copper tape shield and copper braid/aluminum foil shielded VFD cables.

	<p>Marking the Jacket...</p> <p>A. Insert the cable into the enclosure. Securely route the cable through the enclosure to the drive (or motor) terminals allowing a sufficient length of cable to be routed to minimize cable strain.</p> <p>B. Measure the length of cable necessary to reach the designated termination points, allowing excess length for trimming once the cable is routed to the termination points after preparation.</p> <p>C. Mark the jacket at the enclosure entry point. This is where the cable jacket will be cut and stripped.</p>
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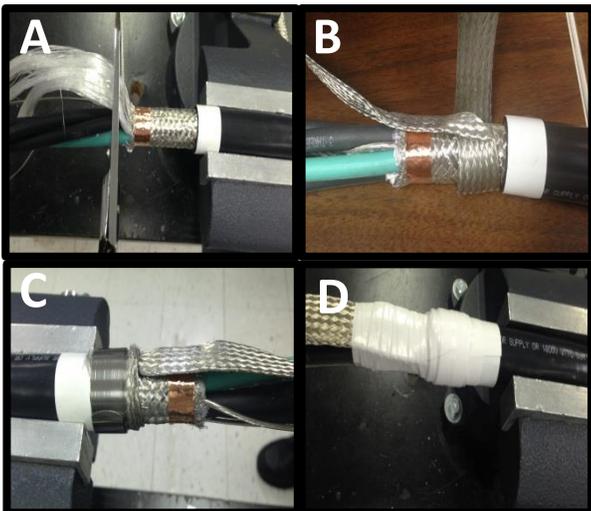
Removing the Jacket...

- A. Wrap electrical tape around the jacket at the mark previously made with the leading edge of the tape lined up with the mark.
- B. Cut around the jacket along the leading edge of the tape down to the shield layer without cutting through the shield.
- C. Cut longitudinally from the cable end to the leading edge of the tape down to the shield layer.
- D. Remove the jacket.



Removing the Shield...

- A. Measure two inches from the previously cut edge of the jacket and mark.
- B. Wrap a strip of copper tape (length equal to approximately one and a half times the circumference of the shield) around the shield with the leading edge of the tape lined up with the mark.
- C. Align and wrap electrical tape over the copper tape (for contrast with shield when cutting), and then cut around the shield at the leading edge of the tape down to the cabled assembly layer.
- D. Remove the shield and remove the electrical tape applied in "C" leaving the copper tape.



Attaching the Ground Strap...

- A. Remove fillers. Twist drain wires together and wrap wires with electrical tape.
- B. Place soldered section of ground strap flush against the shield. Wrap ground strap around shield while maintaining tension to avoid spreading the strap's braid.
- C. Secure ground strap to shield by applying a constant force spring in the same direction as the shield was wrapped.
- D. Wrap electrical tape around the spring and ground strap to secure to the shield.



Terminating the Ground Strap...

- A . If you will be securing the cable to the enclosure (or motor junction box) with a cable fitting (gland), place the fitting (gland) over the cable before proceeding.
- B . Broaden the exposed end of the ground strap.
- C . Clean the back plate surface so when the ground strap is connected to it, there is a good low impedance path for the common mode current flowing through the ground strap.
- D . Attach the ground strap and wrapped drain wire(s) (if present) to the back plate surface using a large flat washer. If installing the termination at the motor end of the cable, attach the ground strap and wrapped drain wire(s) (if present) to a wall of the junction box.

Terminating the Conductors...

- A . Route the phase conductors and grounds to the proper termination points in both the drive enclosure and the motor junction box.
- B . Trim away any excess length while leaving sufficient material for phase reversal if required.
- C . Attach lugs to the phase conductors in accordance with the drive and motor manufacturers' instructions.

For additional assistance with regard to terminating General Cable VFD products, please contact your General Cable sales representative.

USING THIS TERMINATION GUIDE

The information contained herein is intended for evaluation and use by technically skilled and appropriately trained persons. Although the information is believed to be accurate as of the date of printing, General Cable makes no representations or warranties, expressed or implied, with respect to the accuracy or completeness of this document, nor does General Cable assume any obligation to update or correct the same in the future. You should always consult a trained professional for the most current industry practices and procedures unique to your application.

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