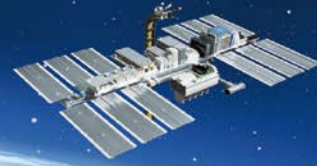


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## Shield termination guide for LUTZE VFD cables

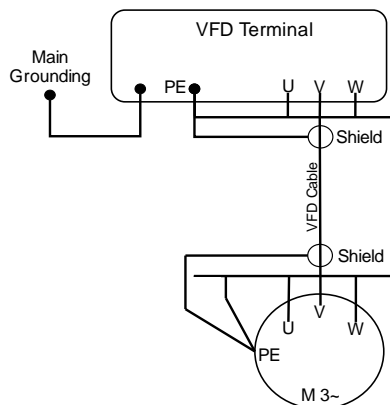
Proper grounding and shield termination is very important in VFD installations. Follow all instructions given by the VFD manufacturer. The system specific VFD manufacturer's instructions should supersede any generic instructions for shield terminations.

Most VFD cables use a dual layer combination of foil and braid shields. Other VFD cables may use a single layer, overlapping copper tape shield, which is not as flexible. In either case the shield is designed to capture noise and power distortions created by the pulse width modulation inside the VFD. The foil and braid design has the advantage of better cable flexibility and yields a smaller cable bending radius for tight installations. Regardless of which shielding system is used, the shield should be grounded to provide a low resistance path to ground so that the electrical noise can be drained.

If the shield is not properly terminated, the electrical noise that is captured by the shielding system is not able to drain and can cause system malfunction.

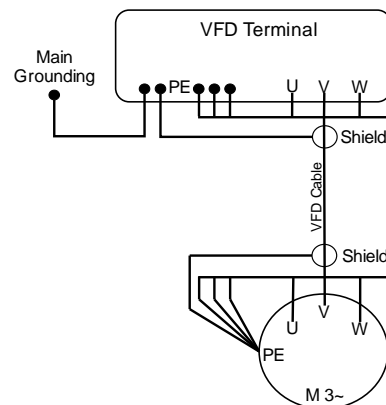
Unlike signaling technology, in which the shield is only to be terminated on the source end, it is recommended for the shield of the VFD cable in power circuits to be terminated on both ends; the cabinet and the motor side. If the VFD manual recommends something different, the VFD manufacturer's instructions must be followed.

### Classic Four Conductor VFD Cable



Shield is terminated to ground on VFD and motor end

### Three Symmetrical Ground VFD Cable



Shield and all three grounding conductors are terminated to ground on VFD and motor end

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VFDs with proprietary grounding connections can also be used with LUTZE VFD cables with foil and braid shield. The foil and braid design is an industry standard for VFD cables where the foil is designed to capture higher frequency noise and the braid to capture low frequency noise. The combination of both makes up a shielding system covering a wide range of frequencies.

The shield acts as a conductor to contain electrical noise and common mode currents. Failure to terminate the shield and grounding conductor(s) as shown in the illustrations above can result in electrical noise or common mode noise currents to remain in the system and may lead to system failure.

There are different options to terminate the shields as shown below:

## Most effective method at drive end: Cable preparation for 360° shield termination

Step 1



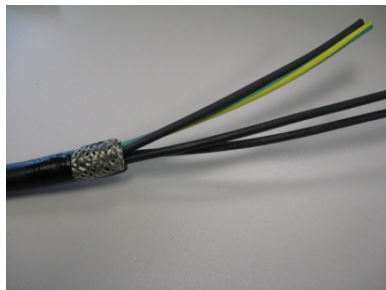
Strip the jacket with a jacket stripper. LUTZE VFD cables are designed for easy jacket removal. Strip the jacket back as short as possible.

Step 2



Roll the braid shield back over the remaining jacket and cut the foil shield back. The remaining foil shield stays in contact with the braid and drain wire underneath the jacket. Cut the drain wire and braid shield back to desired length.

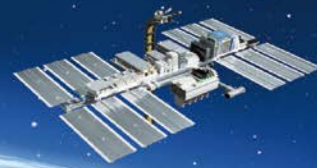
Step 3



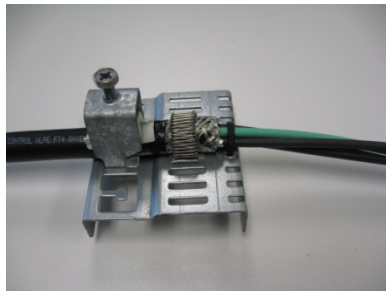
The braid remains rolled back over the jacket. Secure the braid and drain wire to the jacket by wrapping them tightly with electrical tape or install shrink tubing.

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Step 4



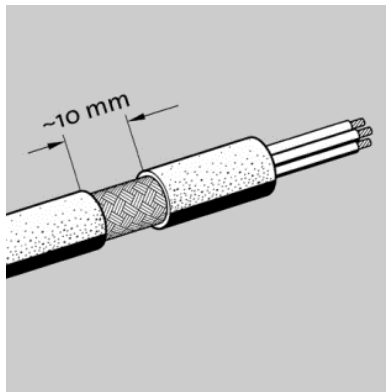
Install the cable with the optional LUTZE EMC grounding rail and shield clamp or with a shield termination kit of your choice that allows to make 360° contact with the surface of the braid.

## Most effective method at motor end: 360° shield termination with EMC conductive gland



Conductive cable glands or fittings such as the LUTZE TOP-T EMC2 provide 360° shield termination for VFD cables at the motor end. It is recommended to use them in combination with special metal cutting locknuts which cut through the paint and make a metal to metal connection with the motor junction box.

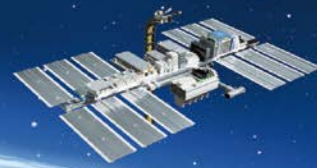
Step 1



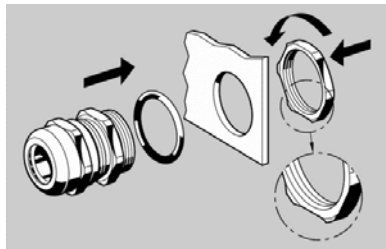
Remove jacket to expose at least 10 mm ( $\approx$  3/8 inch) of the braid underneath.

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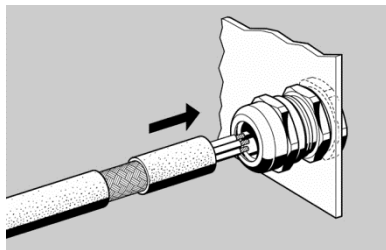


Step 2



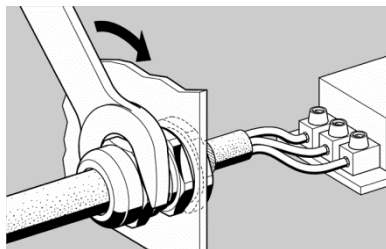
Install fitting assembly in motor junction box. Special metal cutting locknuts are recommended to create metal to metal contact. Do not completely tighten the dome-nut yet.

Step 3



Install the cable. The proper cable position is for the exposed shield to be aligned and make contact with the inner conductive contact fingers of the gland and the cable jacket to sit right at the inner clamping ring.

Step 4



Now tighten the dome nut to clamp the strain relief and make contact with the shield at the same time.

Following these instructions should reduce EMC related malfunctions in your VFD applications and give you the best performance and efficiency of the overall system.

Additionally there is another, less effective option called the “pig tail method” to terminate the cable shield by using the drain wire and braid shield at motor and/or drive end. It is only an acceptable method for some installations, and the 360° method should always be given preference as it captures more surface of the shield. If the pig tail method is being used, the following two important factors should be considered:

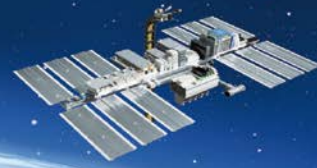
1. The pig tail must remain as short as possible as it otherwise becomes an antenna for the noise especially at high frequencies.
2. The pig tail should include the braid and drain wire to provide as much copper as possible to make up the pig tail.

It is **not recommended** to use just the drain wire as the pig tail. Instead use the drain wire and braid combination as shown below to maintain as much copper surface area as possible.



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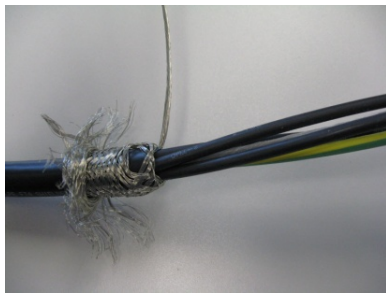
## Less effective method at drive and/or motor end: Pig tail method utilizing braid and drain wire

Step 1



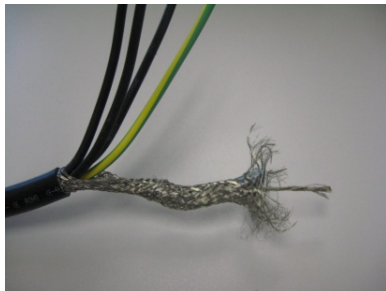
Strip the jacket with a jacket stripper. LUTZE VFD cables are designed for easy jacket removal. Strip the jacket back as short as possible.

Step 2



Roll the braid shield back over the remaining jacket and cut the foil shield back. The remaining foil shield stays in contact with the braid and drain wire underneath the jacket. Cut the drain wire and braid shield back to desired length. Open a hole in the braid by using a pencil.

Step 3



Thread each insulated conductor through the braid opening without damaging the braid. The uninsulated drain wire should stay inside the braid and be directed towards the side.

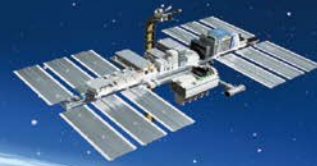
Step 4



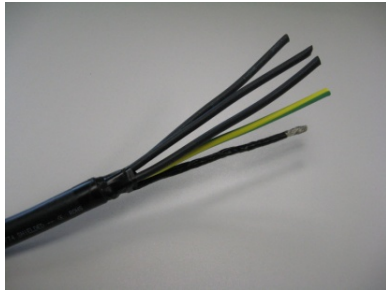
Twist the braid and drain wire together to retain as much copper as possible to form the pig tail. It is not recommended to use the drain wire without the braid as the lesser amount of copper affects the resistance negatively.

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Step 5



Wrap the pig tail with electrical tape or apply shrink tubing. Also apply tape or shrink tubing to the end of the cable jacket. The pig tail can be terminated like any other conductor. The pig tail should stay as short as possible.

Shielded VFD cable is the best cabling option to connect PWM AC drives and motors. Single conductors in conduit do not offer any shielding capability to properly drain electrical noise from the system. LUTZE VFD cables offer the best combination of electrical performance, ease of installation and code compliance.



Stefan Grunwald  
Product Manager  
LUTZE Inc  
13330 South Ridge Drive  
Charlotte, NC 28273  
[www.lutze.com](http://www.lutze.com)