OKONITE VFD CABLE

Okonite offers a full line of armored and non-armored cables for any VFD application. Okonite VFD cables are designed to minimize the detrimental effects of

a) **Common Current and Motor Standing Voltage:**
   By reducing the grounding circuit resistance with symmetrical ground and power conductors and with the continuous aluminum sheath C-L-X.

b) **Reflected Waves:**
   Okolene thermost XLPE insulation can withstand continuous voltage spikes >1000V.

C) **Motor Circuit Cross Talk:**
   C-L-X cables will contain any interference with the aluminum sheath. Type TC-ER cables will mitigate interference with the copper take shield. In both cases the symmetrical cable design will keep any stray currents centered around the ground plane.

d) **Induced Ground Current in the Drive System Ground:**
   Here again, the symmetrical cable design will keep any stray current centered around the ground plane.

Depending on your application, Okonite can provide either armored (C-L-X) or non-armored (Type TC-ER) constructions. If you need help selecting what VFD cable is right for your application, we can assist you with our staff of Application Engineers. Contact your local Okonite sales office for information.

Okonite has been in business since 1878, making us one of the foremost manufacturers in the wire and cable industry. Employee owned since 1976, we are dedicated to manufacturing 100% in the USA.

### OKONITE CLX MOTOR/VFD CABLE EASY SELECTION GUIDE
#### General Guidelines for Typical Installations

<table>
<thead>
<tr>
<th>OKO Cat #</th>
<th>AWG</th>
<th>Armor OD (in) without jacket</th>
<th>Overall OD (in)</th>
<th>230V 3ph</th>
<th>460V 3ph</th>
<th>575V 3ph</th>
<th>2300V 3ph</th>
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* non-stock

**NOTES:**
- Selections based on NEC 2011 Table 430.250 Full-Load Current, 3 ph AC motors and NEC 2011 Article 430.22 Conductors that supply a single motor used in a continuous duty application shall have an amperage of no less than 125% of the motor’s full-load current rating.
- Amperage ratings of the 230V, 460V, and 575V cables are based on NEC 2011 Table 310.15(B)(16) for 90°C rated conductors and limited for small conductors by NEC 2011 Article 240.4(D).
- Amperage ratings of the 2300V cables are based on NEC 2011 Table 310.60(C)(71) for 90°C rated conductors.
- Consult drive/motor manufacturer for exact FLA ratings as well as any temperature deratings that may apply.
- Consult drive manufacturer for recommended maximum cable lengths between drive and motor.
- Consult Okonite for applicable recommendations on 4160V and higher.

### OKONITE MOTOR/NON-ARMORED VFD CABLE SELECTION GUIDE
#### General Guidelines for Typical Installations

<table>
<thead>
<tr>
<th>OKO Cat #</th>
<th>AWG/ kcmil</th>
<th>Overall OD (in)</th>
<th>230V 3ph</th>
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<td>500 HP</td>
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</table>

**NOTES:**
- Selections based on NEC 2017 Table 430.250 Full-Load Current, 3ph AC Motors and NEC 2017 Article 430.22 Conductors that supply a single motor used in a continuous duty application shall have an amperage of no less than 125% of the motor’s full-load current rating.
- Amperage ratings for the 230V, 460V, and 575V cables are based on NEC 2017 Table 310.15(B)(16) for 90°C rated conductors and limited for small conductors by NEC 2017 Article 240.4(D).
- Consult drive/motor manufacturer for exact FLA ratings as well as any temperature deratings that may apply.
- Consult drive manufacturer for recommended maximum cable lengths between drive and motor.
C-L-X® Type MC-HL (XHHW-2)
600V Power MC-HL Cable-Aluminum Sheath
600/1000V Marine Cable
3/C VFD & 4/C Copper Conductors/90°C Wet or Dry Rating
For Cable Tray Use - Sunlight Resistant - For Direct Burial

Insulation
X-Olene® is Okonite's trade name for its chemically cross-linked polyethylene, with high dielectric strength.

Assembly and Coverings
The individual conductors are cabled together with non-hygroscopic fillers and a binder tape overall. The C-L-X sheath exceeds the grounding conductor requirements of Table 250.122 of the NEC and UL 1569. A bare stranded copper grounding conductor(s), located in the outer interstices, is provided for grounding. The impervious, continuous, welded, corrugated aluminum C-L-X sheath provides complete protection against moisture, liquids and gases and has excellent mechanical strength. For direct burial in the ground, embedment in concrete, or for areas subjected to corrosive atmospheres, the C-L-X sheath is protected with a low temperature black Okoseal (PVC) jacket.

Applications
C-L-X Type MC-HL cables with the impervious, continuous, corrugated aluminum sheath are recommended as an economical alternate to a wire in conduit system. In addition, the aluminum CLX sheath exceeds the equipment grounding requirements of NEC Section 250.118 and 250.122, and can be used as the equipment grounding conductor in non-HL areas.
They are authorized for use on services, feeders and branch circuits for power, lighting, control and signaling circuits in accordance with Article 330 and 725 of the NEC.
C-L-X Type MC-HL cables may be installed indoors or outdoors, in wet or dry locations, as open runs of cable secured to supports spaced not more than six feet apart, in cable tray, as aerial cable on a messenger, in any approved raceway, direct burial, or encased in concrete. C-L-X type MC-HL cables are also approved for Classes I, II and III, Division 1 and 2 and Class I, Zones 1 and 2 hazardous locations per NEC Articles 501,502, 503 and 505; in Zone 1, Zone 2, Class II Div 2, Class III Div 1 and Class III Div 2 per CEC.

Specifications
Conductors: Uncoated soft copper per ASTM B-3. Sizes smaller than #8 are compress stranded per ASTM B-8. Sizes #8 and larger are compact stranded per ASTM B-496.
Conductor Identification: Control Sizes, #9 AWG and smaller, color coded insulation. Power Sizes, #8 AWG and larger, black with printed words of number and color.

Grounding Conductor(s): One or three bare soft copper per ASTM B-3. Stranded in accordance with UL 1581. Meets or exceeds requirements of NEC Table 250.122.
Sheath: Close fitting, impervious, continuous, welded, corrugated aluminum C-L-X per UL 1569. Exceeds grounding conductor requirements of NEC Table 250.122.
Jacket: Black Okoseal (PVC) per UL1569. Meets ASTM D746 brittle point at -40°C.

Product Features
- UL Listed as Type MC-HL cable per UL 2225 (E38916).
- UL Listed for cable tray use, direct burial and sunlight resistant.
- UL 1393 (CWMC) listed & UL classified in accord with IEEE 1390 as Marine Shipboard Cable Rated 600/1000 volts.
- Passes the IEEE 383-1974 and IEEE 1202 vertical tray flame tests.
- Passes the 210,000 BTU ISEA T-29-520 Vertical Tray Flame Test.
- Complete pre-packaged, factory-tested wiring system; color coded.
- C-L-X cables are quality control inspected to meet or exceed applicable UL standards.
- 90°C continuous operating temperature in all types of installations.
- 130°C emergency rating.
- 250°C short circuit rating.
- Good EMI shielding characteristics.
- Impervious, continuous metallic sheath excludes moisture, gases and liquids.
- Lower installed system cost than conduit or EMT systems.
- Provides excellent grounding safety.
- Excellent compression and impact resistance.
- Continuous long lengths.
- Installation temperature of -40°C or less.
- Complies with NEC Articles 501, 502 and 503 for hazardous locations.
- American Bureau of Shipping Type approved as CWMC Type MC-HL.
- Three symmetrical grounding conductors with the CLX sheath provide a superior low resistance return path for VFD and other modern ac drive/motor applications.
- CSA C22.2 No. 123 Type RA90.
- CSA C22.2 No. 174 Type HL.
- CSA listed as FT4 and LTGG (-40°C).
- CSA Type RA90 HL complies with CEC Zone 1, Zone 2, Class II Div 2, Class III Div 1 and Class III Div 2 Hazardous Locations.
X-Olene®- Okoseal® Shielded VFD
UL Type TC-ER (XHHW-2) and cUL Type CIC
600V VFD Power and Control Tray Cable
Three Copper Conductors, 90°C Wet or Dry
With Three Symmetrical Grounding Conductors and One Copper Shield Tape
For Cable Tray Use - Sunlight Resistant - For Direct Burial

**Insulation**
X-Olene is Okonite's trade name for its cross-linked polyethylene, with high dielectric strength insulation.

**Assembly and Coverings**
The three insulated conductors with three bare grounding conductors located in the outer interstices are cabled together per UL 1277 with fillers as needed and a binder tape overall. A 5 mil bare copper tape is helically wrapped over the cable assembly with a 25% overlap. Extruded over the tape shield is a sunlight-resistant, flame retardant, black Okoseal® (PVC) jacket which has excellent resistance to acids and most chemicals and is rated for low temperature applications.

**Applications**
X-Olene shielded Type TC-ER cables are used to supply power to motors from variable frequency drives, where an economical design is desired. These cables can also be used for other power, lighting, control or signal circuits; indoors or outdoors; in cable trays, raceways, direct burial, or where supported by messenger wire; for Class 1 circuits as permitted in Article 725 of the NEC; and in cable trays in Class I, Division 2 hazardous locations in industrial establishments where the conditions of maintenance and supervision assure that only qualified persons will service the installation. Cables marked TC-ER may also be used between a cable tray and the utilization equipment or device, when installed in accordance with NEC 336.10 (7).

**Specifications**
- **Conductors**: Uncoted soft copper per ASTM B-3. Sizes smaller than 8 AWG are compressed-stranded per ASTM B-8. Sizes 8 AWG and larger are compact stranded per ASTM B-496.
- **Insulation**: X-Olene per IEC 60906-2-17, NEMA WC70, and UL 44, Listed UL Type XHHW-2.
- **Conductor Identification**: Sizes 14, 12 and 10 AWG color-coded insulation per IEC 60906-2-17, NEMA WC57, Method 1, Table E-2 color sequence. Sizes 8 AWG and larger black insulation with surface printing of numbers and colors per IEC 60906-2-17, NEMA WC57, Method 3, Table E-2.
- **Grounding Conductor(s)**: Three bare soft copper per ASTM B-3. Sizes 10 AWG and smaller are compressed stranded per ASTM B-8, and sizes 8 AWG and larger are compact stranded per ASTM B-496. Meets or exceeds requirements of NEC Table 250.122.
- **Shield**: A 5 mil bare copper tape is helically applied with 25% minimum overlap.

**Jacket**: The Okoseal (PVC) compound meets or exceeds the requirements of UL 1277 as tested in accordance with UL 1581.

**Product Features**
- Insulated conductors are UL Listed Type XHH/XHHW-2.
- 95°C continuous rating in wet or dry locations.
- 130°C emergency overload rating.
- 250°C short circuit rating.
- Three symmetrical grounding conductors and a helically applied copper tape provides a relatively low resistance return path, adequate for VFD and other modern AC drive/motor applications.
- Type TC-ER VFD cables are quality control inspected to meet or exceed applicable industry standards.
- Thermal stability at elevated temperatures.
- Mechanically rugged.
- High dielectric strength.
- Small diameter, lightweight.
- Minimum installation temperature of -40°C.

**Applicable Standards**
- UL Listed per Standard 1277 as Type TC-ER cable per E60422.
- UL Listed for cable tray use, direct burial and sunlight resistant.
- CSA C22.2 No. 239 Type CIC (Control and Instrumentation Cable) for sizes 4/0 AWG and smaller.