



## VFD Additional features

**Why a semi conductive layer?** Semi-conductive material extruded over the conductor is a very common process used in the high voltage cable industry to help maintain the cables overall performance while under extreme conditions. Likewise the application of the semi-conductive layer over the conductor helps to relieve electrical stress that is experienced by the Lapp VFD cable during periods of high voltage spikes. The semi-conductive layer disperses the high voltage spike so that the primary insulation is not damaged. Therefore no degradation to the primary insulation begins and the cable remains in operation with no disruption in service. All Lapp PVC insulated VFD cables have an extruded thermoplastic semi conducting layer applied directly over the conductor which helps to insure long service life and trouble free operation.

Other cable companies that use semi conductive insulation are involved with the manufacture of high voltage cables. These manufacturers provide cables to customers such as major utilities and power companies. Depending upon the manufacturer these companies offer cables that use semi conductive insulation in their designs for cables that are rated for 5,000 to 138,000 Volts. Some these High Voltage cable manufacturers include:

- The Okonite Company
- General Cable
- USA Wire & Cable, Inc.
- Nexans Energy
- Kerite

**What is Corona?** Corona is the ionization of the nitrogen in the air caused by an intense electrical field. Corona can be detected as a crackling or hissing type of audible sound and it also produces light, which can be seen by the naked eye in darkness.

**Why is Corona not good for insulation?** Corona causes ozone and also nitric acid that occurs in the presence of moisture in the air and then accumulates as a white or dirty powder on the insulator. When the nitric acid accumulates micro arcing occurs creating carbon tracks across the insulating material. This can lead to defects in the insulating material over time eventually causing cable failure.

**What is Corona Inception Voltage?** The voltage level at which corona initiates or begins, highest level desirable.

**What is Corona Extinction Voltage?** The voltage level at which corona ceases or stops, highest level desirable.

## **LAPP VFD TESTING**

### **LAPP Coronal Testing per ICEA T-24-380**

The method of testing cable for corona levels is indicated by the equipment and procedure indicated below:

Apparatus Required:

1. AC Power Supply	3. Discharge measuring device
2. Voltage measuring device	4. Cable sample

Proper connections are made so that when voltage is applied to the cable sample, both voltage and discharge levels can be measured. The cable samples tested were 50 ft. in length and the threshold used for inception and extinction was 5 Pico coulombs. The discharge-measuring device will display corona inception and extinction levels occur by means of an oscilloscope. The voltage-measuring device will display the corona inception and extinction voltage levels. Voltage is applied gradually to the cable sample until the corona inception has been reached, then the voltage is gradually reduced until the corona extinction has been reached.

Several cables were tested at an independent third party facility using ICEA T-24-380 as the reference test specification. Three 12 AWG four conductor samples were tested as shown below:

Sample #	Description: Shielded Cables Insulation	Jacket	Corona Inception Voltage	Corona Extinction Voltage
1	PVC	PVC	2200	1800
2	XLPE	PVC	2400	1900
3	SC/PVC	PVC	2900	2500

Both corona inception and extinction voltage levels were significantly higher for sample 3 when compared to both samples 1 & 2. Sample 3 used Lapps unique primary insulation construction of a semi conductive thermoplastic layer applied directly over the conductor with a PVC insulating covering. In short the higher the corona inception and extinction levels the better long-term protection a cable has to offer when exposed to high voltage conditions that are experienced with VFD cables.

## VFD PRODUCT COMPARISON

Product Name	Insulation Compound	Jacket Compound	Shield Types	Cond./Pair AWG Range	Agency Approvals	Application / Features
VFD	SC Polyvinylchloride / Polyvinylchloride / Nylon  Black conductors + Green/Yellow	Orange PVC	Inner PVC Jacket Overall Foil & TC Braid	18 - 2	UL: AWM 1000V (16 & 18AWG) UL: Bus Drop Cable CSA: AWM II A/B FT1	Machine Area Excellent Oil Environment Extra Mechanical EMI Protection /  Meets Oil Res. I/II
VFD Slim	SC Polyvinylchloride / Polyvinylchloride / Nylon  Black conductors + Green/Yellow	Black PVC	Overall Foil & TC Braid	18 - 2	UL: TC-ER, DP-1 AWM 20886 C(UL): CIC/TC FT4 CSA: AWM II A/B FT4 MSHA: Part 7, Title 30 CFR	Building Infrastructure Industrial Cable Trays Machine Area Outdoor & Direct Burial /  Smaller Diameter Easy to Install in Tight Areas
FD VFD	SC Polyvinylchloride / Polyvinylchloride / Nylon  Black conductors + Green/Yellow	Black TPE Blend	Overall Foil & TC Braid	14 – 10	UL: TC-ER, DP-1 AWM 20886 C(UL): CIC/TC FT4 CSA: AWM II A/B FT4	Continuous Flexing Building Infrastructure Industrial Cable Trays Machine Area Outstanding Oil Environment /  Oil Resistant II Design for Cable Track Gasoline Resistant†
VFD & Signal	SC Polyvinylchloride / Polyvinylchloride / Nylon  Power: Black conductors + G/Y  Pairs: Black conductors	Black TPE Blend	Overall Foil & TC Braid + Pair with individual Foil	18 – 12 / 16 - 18	UL: TC-ER, DP-1 AWM 20886 C(UL): CIC/TC FT4 CSA: AWM II A/B FT4 MSHA: Part 7, Title 30 CFR	Building Infrastructure Industrial Cable Trays Machine Area Power & Signal Control Outstanding Oil Environment /  Oil Resistant II Easy to Install in Tight Areas Gasoline Resistant†
VFD Symmetrical Ground	Crosslinked Polyethylene  Power: Black conductors  Grounds: Bare	Black PVC	Overall Corrugated Copper Tape	1 - 500 MCM	UL: TC-ER C(UL): CIC/TC FT4 MSHA: Part 7, Title 30 CFR	Building Infrastructure Industrial Cable Trays Machine Area Heavy Duty Mechanical Protection /  CSA TC: Cold Impact @-25°C Corrugated Tape
Olflex Servo 2SYSLCY-JB	Polyethylene  Power: Black, Brown, Blue  Grounds: 3 Green/ Yellow	Black PVC	Overall Foil & TC Braid	3 / Cond. + 3 Grounds  1 – 300 KCML + 8 – 6AWG	CE UL- AWM†	Outstanding for flexing Application Machine Area /  High Stranding count Easy to Install in Tight Areas Especially for Large Gauge

\* All Products comply with RoHS Directive EN 2002/95/EC

† UL Pending