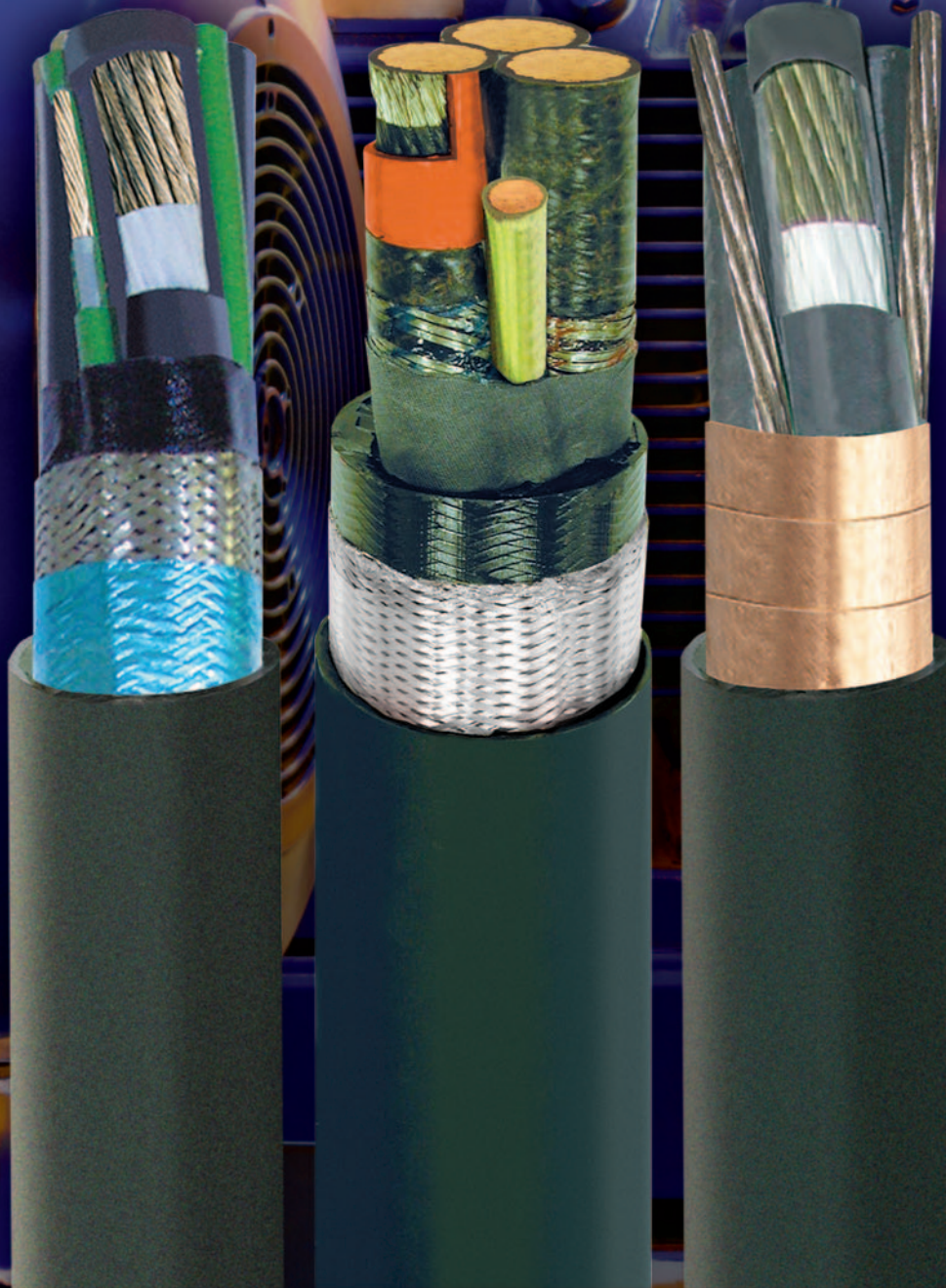


# VFD CABLES

100% EMI CONTAINMENT  
FOR INDUSTRIAL APPLICATIONS





# INDUSTRIAL VFD CABLES

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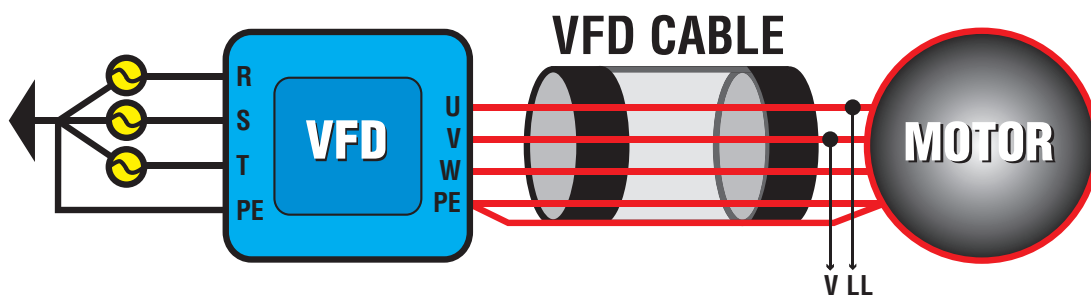
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**Low-Smoke Halogen-Free and Fire Resistant**  
constructions available.  
Contact your AmerCable rep.



Nexans AmerCable believes the information presented throughout this catalog to be reliable and current. All information is subject to change without notice. The information listed is approximate, and is presented only as a guide for product selection. We make no claims or warranties for the suitability of any product for any particular application.

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**Made in America**

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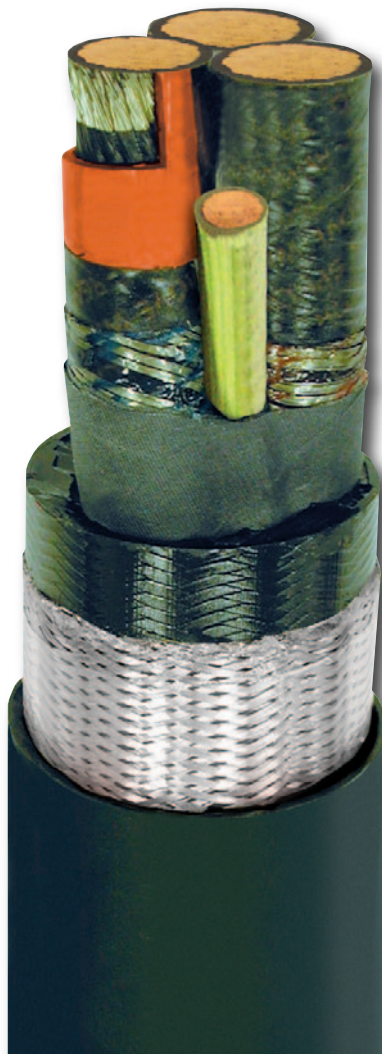
# OUR COMMITMENT TO INDUSTRIAL PRODUCTIVITY



Nexans AmerCable Industrial VFD Cables are specially engineered to provide 100% containment of EMI emissions and provide longer cable life in harsh operating conditions.

Nexans AmerCable VFD cables feature symmetrical ground conductors that reduce induced voltage imbalances and carry common mode noise back to the drive.

Nexans AmerCable's high strand count conductors and braid shield design is much more flexible, easier to install and more resistant to vibration than Type MC cable.



[www.AmerCable.nexans.com](http://www.AmerCable.nexans.com)

e-mail: [industrial.sales@nexans.com](mailto:industrial.sales@nexans.com)



# FLEXIBLE TC-ER VFD POWER CABLE

Three Conductor • 90°C • 1000V\*

## Power Conductors (x3)

Soft annealed flexible stranded tinned copper per ASTM B-33

## Insulation

Cross-linked, flexible, low dielectric constant compound rated 90°C.

Sizes larger than 4/0 AWG – individual conductors colored black with conductor number surface printed in contrasting ink.

Sizes 4/0 AWG and smaller – individually colored conductors – red, white, black.

## Jacket

Flame retardant, moisture and sunlight resistant Polyvinyl Chloride (PVC). Colored black.

## Symmetrical Ground Conductors (x3)

Three symmetrically placed flexible stranded tinned copper conductors in direct contact with the shield.

## Metallic Shield

Sizes 8 AWG and Larger – Helically applied bare copper tape.

Sizes Smaller than 8 AWG – tin-coated copper braid plus aluminum/polyester tape.

Both shielding systems provide 100% coverage.



## TC-ER Ratings & Approvals

- \* ■ UL Listed as Type TC-ER 600V
- \* ■ UL Listed as 1000V flexible motor supply cable (up to 4/0 AWG)
  - 90°C Temperature Rating
  - FT-4 and IEEE 1202 flame ratings
  - Sunlight resistant
  - Direct burial



## APPLICATION

A flexible shielded power cable specifically engineered for use in variable frequency AC motor drive (VFD) applications.

## FEATURES

- Specially engineered cable design produces a longer cable life in VFD applications.
- Overall shield provides 100% coverage containing VFD EMI emissions.
- Symmetrical ground conductors reduce induced voltage imbalances and carry common mode noise back to the drive.
- High strand count design is much more flexible, easier to install and more resistant to vibration than Type MC cable.
- Meets crush and impact requirements for Type MC cable.
- AmerCable's specially formulated insulation material has a lower dielectric constant (standard XLPE and EPR insulation materials have higher dielectric constants) which withstands reflected voltages. This allows for longer output cable distances and minimizes the effect of high frequency noise induced into the plant ground system.
- Permitted for Exposed Run ("ER") use in accordance with the NEC.
- Permitted for use in Class I, Division 2 and Zone 2 industrial hazardous locations per the NEC.
- Gas and vapor tight – impervious to water and air.
- Reduced tray fill (up to 35% less) than Type MC.
- Reduced installation time and cost compared to Type MC.
- Glands for this product cost up to 50% LESS than those for Type MC.
- Bend radius 12X O.D.

## 37-108 VFD • FLEXIBLE TC-ER VFD • 1000 VOLTS

Size AWG/ kcmil	Size (mm <sup>2</sup> )	Part No. 37-108	Nominal Diameter (inches)	Weight (lbs/ 1000ft)	DC Resistance at 25°C (ohms/1000ft)	AC Resistance 90°C, 60Hz (ohms/1000ft)	Inductive Reactance (ohms/ 1000ft)	Voltage Drop 90°C, 60Hz (Volts/Amp/ 1000ft)	Grounding Conductor (x3) Size (AWG)	Ampacity		
										In Free Air	In Cable Tray	In Conduit
14	2.08	-508VFD	0.466	158	2.907	3.635	0.036	5.069	18	15	15	15
12	3.29	-516VFD	0.509	199	1.826	2.283	0.034	3.195	16	20	20	20
10	5.23	-308VFD	0.522	258	1.153	1.441	0.032	2.028	14	30	30	30
8	8.30	-309VFD	0.653	368	0.708	0.885	0.036	1.262	14	65	55	48
6	13.21	-310VFD	0.737	517	0.445	0.556	0.034	0.804	12	87	75	65
4	21.17	-312VFD	0.956	814	0.300	0.376	0.031	0.552	12	114	95	89
2	35.00	-314VFD	1.103	1178	0.184	0.230	0.030	0.349	10	152	130	119
1	42.52	-315VFD	1.221	1462	0.147	0.184	0.031	0.287	10	177	150	137
1/0	50.00	-316VFD	1.447	1714	0.117	0.147	0.030	0.235	10	205	170	163
2/0	66.12	-317VFD	1.538	1951	0.093	0.117	0.029	0.193	10	237	195	186
4/0	95.00	-319VFD	1.883	3102	0.058	0.075	0.028	0.133	8	316	260	253
262	120	-320VFD	1.981	3642	0.048	0.063	0.026	0.114	6	362	297	286
313	150	-321VFD	2.082	4185	0.040	0.053	0.026	0.100	6	404	328	324
373	185	-322VFD	2.215	4834	0.034	0.045	0.025	0.088	6	449	364	357
444	240	-323VFD	2.371	5634	0.028	0.039	0.025	0.079	6	497	402	396
535	272.68	-324VFD	2.616	7592	0.024	0.033	0.025	0.071	6	556	446	441
646	300	-326VFD	2.878	9183	0.020	0.028	0.025	0.065	4	617	496	489
777	400	-327VFD	3.089	10834	0.016	0.025	0.025	0.060	4	688	546	537

- Cable diameters are subject to a +/- 5% manufacturing tolerance
- Ampacity In Free Air: Based on 90°C conductor temperature and 30°C ambient temperature per 2008 NEC Table B.310.3
- Ampacity In Cable Tray: Based on 90°C conductor temperature and 30°C ambient temperature per 2008 NEC Table 310.16
- Ampacity In Conduit: Based on 90°C conductor temperature and 30°C ambient temperature per 2008 NEC Table B.310.1

### STRANDING PROFILE

Size AWG/kcmil	Size (mm <sup>2</sup> )	Number of Strands	Uninsulated Conductor Diameter (inch)
14	2.08	19	0.074
12	3.29	19	0.093
10	5.23	37	0.113
8	8.30	133	0.159
6	13.21	133	0.201
4	21.17	259	0.255
2	35	259	0.321
1	42.52	259	0.361
1/0	50	266	0.413
2/0	66.12	323	0.455
4/0	95	532	0.584
262	120	646	0.654
313	150	777	0.720
373	185	925	0.785
444	240	1110	0.860
535	272.68	1332	0.941
646	300	1591	1.029
777	400	1924	1.132



## 37-600VFD

# TC-ER VFD POWER CABLE

PVC Jacket • Three Conductor • 90°C • 600V

### POWER CONDUCTORS (X3)

Soft annealed stranded bare copper per ASTM B3, B496

### INSULATION

Low dielectric constant XLPE meeting XHHW-2 per UL 44

### JACKET

Flame retardant, moisture and sunlight resistant Polyvinyl Chloride (PVC) per UL 1277. Colored black.

### SYMMETRICAL GROUND CONDUCTORS (X3)

Three symmetrically placed stranded bare copper conductors in direct contact with the shield.

### METALLIC SHIELD

Helically applied bare copper tape for provide 100% coverage.



## RATINGS & APPROVALS

- UL Listed as Type TC-ER 600V
- 90°C Wet/Dry Temperature Rating
- FT-4/ IEEE 1202 Flame Rating
- Sunlight Resistant
- For Direct Burial



## APPLICATION

TC-ER VFD cable is used to supply power to motors, or for connection to other power devices in industrial settings. Primary installations include cable trays, raceways, and outdoor locations supported by a messenger wire. Type TC-ER VFD is Listed for direct burial or in underground ducts and for use in Class 1, Division 2 hazardous locations and Class 1 control circuits. This cable may be used in wet or dry locations at temperatures not to exceed 90°C. The cable is specifically engineered for use in variable frequency AC motor drive (VFD) applications.

## FEATURES

- Specially engineered cable design produces a longer cable life in VFD applications.
- Overall shield provides 100% coverage containing VFD EMI emissions.
- Symmetrical ground conductors reduce induced voltage imbalances and carry common mode noise back to the drive.
- Meets crush and impact requirements for Type MC
- AmerCable's specially formulated XLPE insulation material has a lower dielectric constant which withstands reflected voltages. This allows for longer output cable distances and minimizes the effect of high frequency noise induced into the plant ground system.
- Permitted for Exposed Run ("ER" use in accordance with the NEC 336.10(7).
- Permitted for use in Class I, Division 2 and Zone 2 industrial hazardous locations per the NEC.
- Gas and vapor tight – impervious to water and air.
- Bend radius 12X O.D.
- Color code per ICEA S-58-679 Method 4



## 37-600VFD • FLEXIBLE TC-ER VFD • 600 VOLTS

Conductor Size	Wire Count	Part No. 37-600	Conductor Diameter	Insulation Thickness	Insulation Diameter	Ground Size	Jacket Thickness	Jacket Diameter	Weight	NEC Ampacities					
										In Free Air 90°C		In Free Air 75°C		In Free Air 90°C	
14	7	-508VFDCT	0.073	0.030	0.145	18	0.060	0.460	162	15	13	15	13	15	13
12	7	-516VFDCT	0.092	0.030	0.165	16	0.060	0.495	208	20	18	20	18	20	18
10	7	-308VFDCT	0.112	0.030	0.180	14	0.060	0.530	269	30	27	30	27	30	27
8	7	-309VFD	0.141	0.045	0.242	14	0.060	0.665	384	65	58	55	49	48	43
6	7	-310VFD	0.169	0.045	0.269	12	0.060	0.725	522	87	77	75	67	65	58
4	7	-312VFD	0.213	0.045	0.312	12	0.060	0.820	719	114	101	95	84	89	79
2	7	-314VFD	0.268	0.045	0.369	10	0.080	0.980	1090	152	135	130	115	119	106
1	18	-315VFD	0.299	0.055	0.416	10	0.080	1.085	1321	177	157	150	133	137	121
1/0	18	-316VFD	0.336	0.055	0.451	10	0.080	1.160	1569	205	182	170	151	163	145
2/0	19	-317VFD	0.379	0.055	0.497	10	0.080	1.255	1904	237	210	195	173	186	165
3/0	18	-318VFD	0.423	0.055	0.540	8	0.080	1.355	2381	274	243	225	200	214	190
4/0	18	-319VFD	0.475	0.055	0.595	8	0.080	1.470	2847	316	280	260	231	253	224
250	36	-330VFD	0.520	0.065	0.667	6	0.080	1.630	3479	351	311	290	255	276	245
350	36	-331VFD	0.616	0.065	0.757	6	0.110	1.880	4662	430	381	350	310	345	306
500	36	-333VFD	0.736	0.065	0.880	6	0.110	2.145	6402	531	471	430	381	427	379
750	61	-334VFD	0.908	0.080	1.090	4	0.110	2.600	9447	671	595	535	474	529	469

- Cable diameters are subject to a +/- 5% manufacturing tolerance
- Ampacity In Free Air: Based on 90°C conductor temperature and 30°C ambient temperature per 2014 NEC Table B.310.15(B)(2)(3)
- Ampacity In Cable Tray: Based on 90°C conductor temperature and 30°C ambient temperature per 2014 NEC Table 310.15(B)(16)
- Ampacity In Conduit: Based on 90°C conductor temperature and 30°C ambient temperature per 2014 NEC Table B.310.15(B)(2)(1)



**37-000VFD**

# **XLPE/PVC TC-ER VFD POWER CABLE**

**THREE CONDUCTOR • 90°C • 2000V**

## **POWER CONDUCTORS (X3)**

Soft annealed stranded bare copper per ASTM B3, B496

## **INSULATION**

Low dielectric constant XLPE meeting RHH/RHW-2 per UL 44

## **SYMMETRICAL GROUND CONDUCTORS (X3)**

Three symmetrically placed stranded bare copper conductors in direct contact with the shield.

## **METALLIC SHIELD**

Helically applied bare copper tape for provide 100% coverage.

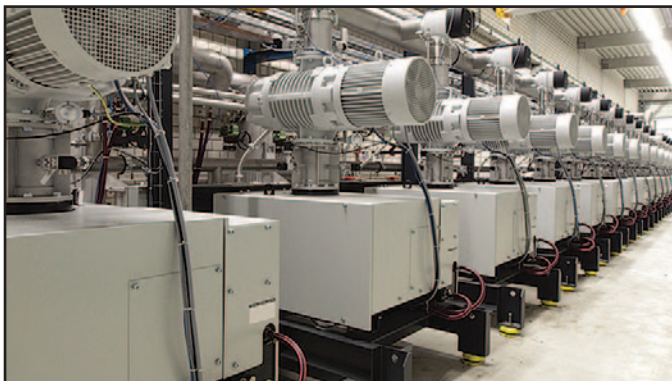
## **JACKET**

Flame retardant, moisture and sunlight resistant Polyvinyl Chloride (PVC) per UL 1277. Colored black.



## **RATINGS & APPROVALS**

- UL Listed as Type TC-ER 2000V
- 90°C Wet/Dry Temperature Rating
- FT-4/ IEEE 1202 Flame Rating
- Sunlight Resistant
- For Direct Burial



## **APPLICATION**

TC-ER VFD cable is used to supply power to motors, or for connection to other power devices in industrial settings. Primary installations include cable trays, raceways, and outdoor locations supported by a messenger wire. Type TC-ER VFD is Listed for direct burial or in underground ducts and for use in Class 1, Division 2 hazardous locations and Class 1 control circuits. This cable may be used in wet or dry locations at temperatures not to exceed 90°C. The cable is specifically engineered for use in variable frequency AC motor drive (VFD) applications.

## **FEATURES**

- Specially engineered cable design produces a longer cable life in VFD applications.
- Overall shield provides 100% coverage containing VFD EMI emissions.
- Symmetrical ground conductors reduce induced voltage imbalances and carry common mode noise back to the drive.
- Meets crush and impact requirements for Type MC
- AmerCable's specially formulated XLPE insulation material has a lower dielectric constant which withstands reflected voltages. This allows for longer output cable distances and minimizes the effect of high frequency noise induced into the plant ground system.
- Permitted for Exposed Run ("ER" use in accordance with the NEC 336.10(7)).
- Permitted for use in Class I, Division 2 and Zone 2 industrial hazardous locations per the NEC.
- Gas and vapor tight – impervious to water and air.
- Bend radius 12X O.D.
- Color code per ICEA S-58-679 Method 4
- Cables are fully compliant with NFPA 79-2018



## 37-000VFD • TC-ER VFD • 2000 VOLTS

Size AWG/ kcmil	Size mm <sup>2</sup>	Part No. 37-000	Nominal Diameter Inches*	Weight (Lbs./ 1000 Ft.)	DC Resist. @ 25°C (Ohms/ 1000 Ft.)	AC Resist. @ 90°C, 60 Hz (Ohms/ 1000 Ft.)	Inductive Reactance (Ohms/ 1000 Ft.)	Voltage Drop (Volts/Amp/ 1000 Ft.)	Grounding Conductor Size (3x) (AWG)	NEC Ampacities					
										In Free Air		Single Tray		In Conduit	
										90°C	75°C	90°C	75°C	90°C	75°C
14	2.1	-508VFDCT	0.570	158	2.680	3.350	0.046	4.684	18	15	13	15	13	15	13
12	3.3	-516VFDCT	0.610	199	1.680	2.100	0.043	2.951	18	20	18	20	18	20	18
10	5.2	-308VFDCT	0.655	258	1.060	1.325	0.040	1.876	14	30	27	30	27	30	27
8	8.3	-309VFD	0.770	368	0.6663	0.8329	0.040	1.194	14	65	58	55	49	48	43
6	13.2	-310VFD	0.885	517	0.4192	0.5240	0.038	0.765	12	87	77	75	67	65	58
4	21	-312VFD	0.975	814	0.2636	0.3295	0.036	0.493	12	114	101	95	84	89	79
2	35	-314VFD	1.090	1178	0.1659	0.2074	0.034	0.322	10	152	135	130	115	119	106
1	43	-315VFD	1.225	1462	0.1315	0.1644	0.034	0.263	10	177	157	150	133	137	121
1/0	50	-316VFD	1.330	1714	0.1042	0.1304	0.033	0.215	10	205	182	170	151	163	145
2/0	66	-317VFD	1.420	1951	0.0827	0.1034	0.032	0.176	10	237	210	195	173	186	165
3/0	86	-318VFD	1.520	2607	0.0655	0.0819	0.031	0.146	8	274	243	225	200	214	190
4/0	95	-319VFD	1.635	3102	0.0520	0.0653	0.030	0.122	8	316	280	260	231	253	224
250	126	-330VFD	1.855	3836	0.0440	0.0553	0.030	0.108	8	351	311	290	255	276	245
350	178	-331VFD	2.060	5141	0.0314	0.0396	0.029	0.085	6	430	381	350	310	345	306
500	250	-333VFD	2.325	6977	0.0220	0.0280	0.028	0.068	6	531	471	430	381	427	379
750	379	-334VFD	2.809	10051	0.0147	0.0191	0.028	0.055	4	671	595	535	474	529	469

- Cable diameters are subject to a +/- 5% manufacturing tolerance
- Ampacity In Free Air: Based on 90°C conductor temperature and 30°C ambient temperature per 2014 NEC Table B.310.15(B)(2)(3)
- Ampacity In Cable Tray: Based on 90°C conductor temperature and 30°C ambient temperature per 2014 NEC Table 310.15(B)(16)
- Ampacity In Conduit: Based on 90°C conductor temperature and 30°C ambient temperature per 2014 NEC Table B.310.15(B)(2)(1)



# EXTRA FLEXIBLE VFD POWER CABLE

## GEXOL® INSULATED

Three Conductor • 2kV • Rated 110°C

### Power Conductors (x3)

Soft annealed flexible stranded tinned copper per IEEE 1580 Table 11.

### Insulation (2kV)

Gexol® cross-linked flame retardant polyolefin, meeting the requirements for Type P of IEEE 1580 and Type X110 of UL 1309/CSA 245.

Color: Gray with printed phase I.D. (Black-White-Red)

### Jacket

A black, arctic grade, flame retardant, oil, abrasion, chemical and sunlight resistant thermosetting compound meeting UL 1309/CSA 245 and IEEE 1580.

### Armor (Optional)

Tinned copper basket weave wire armor per IEEE 1580 and UL 1309/CSA 245.

### Ground Conductors (x3)

Soft annealed flexible stranded tinned copper per IEEE 1580 Table 11.

Gexol® insulated and sized per UL 1277.

Color: Green

### Shield

Overall tinned copper braid plus aluminum/polyester tape providing 100% coverage.

### Sheath (Optional)

A black, arctic grade, flame retardant, oil, abrasion, chemical and sunlight resistant thermosetting compound meeting UL 1309/CSA 245 and IEEE 1580.



**Note:** For armored versions the braid is placed between the inner jacket and outer sheath where it serves as both the EMI shield and armor.

## Ratings & Approvals

- 110°C Temperature Rating
- UL Listed as Marine Shipboard Cable: (E111461)
- UL Listed as Type TC-ER (E123629)
- United States Coast Guard: November 2, 1987 / 9304
- CSA listed as Marine Shipboard Cable (82346)
- Flame resistance: IEEE 1202/FT-4
- Sunlight resistant

**Halogen-Free and Fire Resistant constructions available by request.**

## APPLICATION

A flexible, braid and foil shielded, 2kV power cable specifically engineered for use in variable frequency AC motor drive (VFD) applications.

## FEATURES

- Specially engineered cable design produces a longer cable life in VFD applications.
- Overall braid plus foil shield is engineered with 100% coverage and a surface transfer impedance <50 milliohms at 10MHz to contain EMI.
- Symmetrical insulated ground conductors reduce induced voltage imbalances and carry common mode noise back to the drive.
- High strand count conductors and braid shield design is much more flexible, easier to install and more resistant to vibration than Type MC cable.
- Gexol's lower dielectric constant (standard XLPEs, EPRs and other Type P insulation materials have higher dielectric constants) reduces reflected wave peak voltage magnitudes. This allows for longer output cable distances and minimizes the effect of high frequency noise induced into the plant ground system.
- 2kV insulation thickness is used to resist the potential 2-3x reflected voltages experienced in 600V VFD applications.
- Dual certified IEEE 1580 Type P and UL 1309/CSA 245 Type X110.
- Highest ampacity ratings: ABS 100°C, DNV 95°C, LRS 95°C, Transport Canada 95°C.
- Severe cold durability: exceeds CSA cold bend/cold impact (-40°C/-35°C).
- Flame retardant: IEC 332-3 Category A and IEEE 1202.
- Optional braid armor of bronze, aluminum or tinned copper.

Gexol® is a registered trademark of AmerCable Incorporated



## 37-102VFD • EXTRA FLEXIBLE VFD POWER CABLE GEXOL® INSULATED

		Unarmored			Armored & Sheathed (TS)			Grounding Conductor* Size (AWG)	NEC Ampacities		
Size AWG/kcmil	mm <sup>2</sup>	Part No. 37-102	Nominal Diameter Inches*	Weight Lbs./1000 Ft.	Part No. 37-102	Nominal Diameter Inches*	Weight Lbs./1000 Ft.		In Free Air	In Cable Tray	In Conduit
4	21	-312VFD	1.100	925	-312TSVFD	1.262	1138	12	114	95	89
2	34	-314VFD	1.235	1421	-314TSVFD	1.392	1512	10	152	130	119
1	43	-315VFD	1.340	1517	-315TSVFD	1.509	1851	10	177	150	137
1/0	54	-316VFD	1.450	1803	-316TSVFD	1.615	2136	10	205	170	163
2/0	70	-317VFD	1.580	2120	-317TSVFD	1.792	2660	10	237	195	186
3/0	86	-318VFD	1.750	2827	-318TSVFD	1.959	3269	8	274	225	214
4/0	109	-319VFD	1.900	3416	-319TSVFD	2.101	3864	8	316	260	253
262	132	-320VFD	2.050	4210	-320TSVFD	2.258	4661	6	362	297	286
313	159	-321VFD	2.130	5105	-321TSVFD	2.353	5325	6	404	328	324
373	189	-322VFD	2.275	5521	-322TSVFD	2.483	6674	6	449	364	357
444	227	-323VFD	2.425	6440	-323TSVFD	2.634	6994	6	497	402	396
535	273	-324VFD	2.643	7547	-324TSVFD	2.931	8477	6	556	446	441
646	326	-326VFD	2.920	8916	-326TSVFD	3.178	9888	4	617	496	489
777	394	-327VFD	3.102	10909	-327TSVFD	3.510	11803	4	688	546	537

- Cable diameters are subject to a +/- 5% manufacturing tolerance
- Ampacity In Free Air: Based on 90°C conductor temperature and 30°C ambient temperature per 2008 NEC Table B.310.3
- Ampacity In Cable Tray: Based on 90°C conductor temperature and 30°C ambient temperature per 2008 NEC Table 310.16
- Ampacity In Conduit: Based on 90°C conductor temperature and 30°C ambient temperature per 2008 NEC Table B.310.1
- IEEE ampacities are based on IEEE Std. 45 with a 45°C ambient and arranged in a single bank per hanger. For those instances where cable must be double banked, the ampacities should be multiplied by 0.8.

\*3 Grounding Conductors – Green Insulated



# CIR® TYPE VFD UL LISTED AS TYPE TC-ER-HL\*

Three Conductor • Gexol® Insulated • 2kV • Rated 90°C

## Power Conductors (x3)

Soft annealed flexible stranded tinned copper per IEEE 1580 Table 11.

## Insulation (2kV)

Gexol® cross-linked flame retardant polyolefin, meeting the requirements for Type P of IEEE 1580 and Type X110 of UL 1309/CSA 245. Color: Gray with printed phase I.D. (Black-Red-Blue)

## Jacket

A black, flame retardant, oil, abrasion, chemical and sunlight resistant thermoset CPE meeting UL 1309/CSA 245 and IEEE 1580.

## Ground Conductors (x3)

Soft annealed flexible stranded tinned copper per IEEE 1580 Table 11. Gexol® insulation sized per UL 1277. Color: Green

## Shield

Overall tinned copper braid plus aluminum/polyester tape providing 100% coverage.

## Safer to Handle

CIR® has no sharp metal armor edges that imperil worker's hands during splicing and installation of connectors



## APPLICATION

A flexible, braid and foil shielded, 2kV power cable specifically engineered for use in variable frequency AC motor drive (VFD) applications.

## FEATURES

- Specially engineered cable design produces a longer cable life in VFD applications in severe cold environments.
- Exceeds CSA cold bend/cold impact (-40°C/-35°F)
- Brittlepoint as per ASTM D 7646-07 exceeds -65°C for Jacket and -75°C for insulation
- Overall braid and foil shield provides 100% coverage containing VFD EMI emissions.
- Symmetrical insulated ground conductors reduce induced voltage imbalances and carry common mode noise back to the drive.
- High strand count conductors and braid shield design is much more flexible, easier to install and more resistant to vibration than Type MC cable.
- Gexol's lower dielectric constant (standard XLPEs, EPRs and other Type P insulation materials have higher dielectric constants) reduces reflected wave peak voltage magnitudes. This allows for longer output cable distances and minimizes the effect of high frequency noise induced into the plant ground system.
- 2kV insulation thickness resists the repetitive 2x voltage spikes from 600V VFDs and reduces drive over current trip problems due to cable charging current.
- Passes the same stringent crush and impact testing required by UL 2225 for Type MC-HL
- Gas & vapor tight – impervious to water and air
- Smaller bend radius (up to 40% smaller) than Type MC
- Reduced tray fill compared to Type MC
- Considerably more flexible than Type MC
- Reduced installation time and cost
- Glands cost up to 50% less

## CIR® Ratings & Approvals

- 90°C temperature rating
- UL Listed as Marine Shipboard Cable (E111461)
- UL Listed as Type TC-ER
- UL Listed as TC-ER-HL (cables up to 1" in diameter)
- American Bureau of Shipping (ABS) (99-BT5905-X)
- Flame Retardant – IEEE 1202
- Suitable for use in Class I, Div 2 and Zone 2 environments
- Suitable for Class 1, Div 1 and Zone 1 environments (cables up to 1" in diameter)

\*Cables up to 1" in diameter



Size AWG/ kcmil	Part No. 37-102	Nominal Diameter Inches*	Weight Per 1000 Ft.	DC Resist. @ 25°C (Ohms/1k ft)	AC Resist. @ 90°C, 60 Hz (Ohms/1k ft)	Inductive Reactance (Ohms/1k ft)	Voltage Drop @ 90°C (Volts/Amp/1k ft)	Green Insulated Grounding Size (AWG)	IEEE Ampacity 90°C	NEC Ampacity 90°C	IEEE Ampacity 75°C	NEC Ampacity 75°C	
TC-ER-HL	14	-508CIRVFDA	0.742	283	2.907	3.635	0.040	5.073	18	24	15	20	15
	12	-516CIRVFDA	0.815	378	1.826	2.283	0.038	3.199	18	29	20	24	20
	10	-308CIRVFDA	0.871	473	1.153	1.441	0.036	2.032	14	38	30	32	30
	8	-309CIRVFDA	0.893	553	0.708	0.885	0.037	1.263	14	48	55	41	50
	6	-310CIRVFDA	1.093	797	0.445	0.556	0.033	0.804	12	65	75	54	65
	4	-312CIRVFDA	1.225	929	0.300	0.376	0.031	0.552	12	83	95	70	85
	2	-314CIRVFDA	1.341	1276	0.184	0.230	0.029	0.348	10	111	130	93	115
	1	-315CIRVFDA	1.447	1576	0.147	0.184	0.029	0.285	10	131	145	110	130
	1/0	-316CIRVFDA	1.566	2144	0.117	0.147	0.029	0.234	10	150	170	126	150
	2/0	-317CIRVFDA	1.733	2144	0.093	0.117	0.028	0.192	10	173	195	145	175
	4/0	-319CIRVFDA	1.874	3131	0.058	0.075	0.027	0.132	8	232	260	194	230
	262	-320CIRVFDA	2.031	3875	0.048	0.063	0.027	0.115	6	273	297	228	262
	313	-321CIRVFDA	2.130	4709	0.040	0.053	0.026	0.100	6	298	328	249	292
	373	-322CIRVFDA	2.257	5209	0.034	0.045	0.025	0.088	6	332	364	277	322
	444	-323CIRVFDA	2.400	6310	0.028	0.039	0.025	0.080	6	382	402	319	355
	535	-324CIRVFDA	2.705	7193	0.024	0.033	0.026	0.072	6	407	446	340	394
	646	-326CIRVFDA	2.898	9217	0.020	0.028	0.026	0.065	4	474	496	396	438
	777	-327CIRVFDA	3.102	10340	0.016	0.025	0.025	0.060	4	516	546	431	483

\*Cable diameters are subject to a +/- 5% manufacturing tolerance

Ampacities are based on Table 310.15 (B) (16) of the National Electrical Code (NEC) for conductors rated 90°C, in a multi-conductor cable, at an ambient temperature of 30°C. The 75°C column is provided for additional information. The ampacities shown apply to open runs of cable, installation in any approved raceway. Derating for more than three current carrying conductors within the cable is in accordance with NEC Table 310.15 (B) (3) (a). The ampacities shown also apply to cables installed in cable tray in accordance with NEC Section 392.80.



**37-105VFD**

# MMV-VFD POWER CABLE

Three Conductor: 8kV – 15kV • 133% Insulation Level • Rated 90°C

## Conductors (3)

Soft annealed flexible stranded tinned copper per IEEE 1580 Table 11.

## Insulation

Extruded thermosetting 90°C Ethylene Propylene Rubber (EPR), meeting UL 1309 (Type E), IEEE 1580 (Type E) and UL 1072.

## Insulation Shield

Composite shield consisting of 0.0126" tinned copper braided with nylon providing 60% copper shielded coverage meeting UL 1309, IEEE Std. 1580, and UL 1072. The nylon is colored for easy phase identification (three conductor = black, blue, red) without the need to remove the shield to find an underlying colored tape.

Low smoke  
halogen-free  
jacket available.

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## Conductor Shield

A combination of semi-conducting tape and extruded thermosetting semi-conducting material meeting UL 1309, IEEE 1580 and UL1072.

## Insulation Shield

Semi-conducting layer meeting UL 1309, IEEE 1580 and UL 1072.

## Symmetrical Insulated Grounding Conductors (3)

Soft annealed flexible stranded tinned copper conductor per IEEE 1580 Table 11. Gexol Insulation sized per Table 23.2 of UL1072. Color: Green

## Jacket

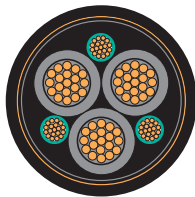
A black, arctic grade, flame retardant, oil, abrasion, chemical and sunlight resistant thermosetting compound meeting UL 1309/CSA 245, IEEE 1580, and UL 1072. This jacket allows for isolation between the insulation shields and overall shield. Shields can then be terminated on opposite ends to minimize circulating currents.

## Armor/EMI Shield

Overall tinned copper braid plus aluminum/polyester tape provides 100% coverage. This braid serves as both an armor and EMI shield meeting both IEEE 1580 and UL 1307/CSA 245.

## Sheath (optional)

A black, arctic grade, flame retardant, oil, abrasion, chemical and sunlight resistant thermosetting compound meeting UL 1309/CSA 245, IEEE 1580, and UL 1072. Colored jackets for signifying different voltage levels are also available on special request (orange = 8kV and red = 15kV).



## Ratings & Approvals

- UL Listed as Marine Shipboard Cable (E111461)
- American Bureau of Shipping (ABS)
- Det Norske Veritas (DNV) Pending
- Lloyd's Register of Shipping (LRS) Pending
- 90°C Temperature Rating
- Voltage Rating – 8kV to 15kV (25kV available on request)

## APPLICATIONS

A flexible, braid and foil shielded, power cable specifically engineered for use in medium voltage variable frequency AC drive (VFD) applications.

## FEATURES

- Flexible stranded conductors and braided shields. Suitable for applications involving repeated flexing and high vibration.
- Small minimum bending radius (8x OD) for easy installation.
- Insulation has a very low dielectric constant. This allows for longer output cable distances and minimizes common mode current.
- Overall braid plus foil shield is engineered with 100% coverage and a surface transfer impedance <50 milliohms at 10MHz to contain EMI.
- Symmetrical insulated ground conductors reduce induced voltage imbalances and carry common mode noise back to the drive.
- High strand count conductors and braid shield design is much more flexible, easier to install and more resistant to vibration than Type MC cable.
- Severe cold durability: exceeds CSA cold bend/cold impact (-40°C/-35°C).
- Flame retardant: IEC 332-3 Category A and IEEE 1202.
- Suitable for use in Class I, Division 1, and Zone 1 environments.





## THREE CONDUCTOR TYPE MMV-VFD MEDIUM VOLTAGE – 8KV • 133% INSULATION LEVEL

Ampacity											
Size AWG/ kcmil	mm <sup>2</sup>	Part No. 37-105	Nominal Diameter (inches)	Weight (Lbs./ 1000 Ft.)	In Free Air (amps)	Single Banked in Trays (amps)	DC Resistance at 25°C (ohms/1000 Ft.)	AC Resistance at 90°C, 60Hz (ohms/1000 Ft.)	Inductive Reactance (ohms/ 1000 Ft.)	Voltage Drop (Volts per amp per 1000 Ft.)	Green Insulated Grounding Conductor (3x) Size (AWG)
6	12.5	-332TSVFD	1.687	1634	88	75	0.445	0.556	0.048	0.820	10
4	21	-333TSVFD	1.868	2074	116	99	0.300	0.376	0.043	0.564	10
2	34	-334TSVFD	2.071	2625	152	129	0.184	0.230	0.040	0.359	10
1	43	-335TSVFD	2.161	3022	175	149	0.147	0.184	0.038	0.294	8
1/0	54	-336TSVFD	2.262	3373	201	171	0.117	0.147	0.037	0.242	8
2/0	70	-337TSVFD	2.381	3826	232	197	0.093	0.117	0.036	0.199	8
3/0	86	-338TSVFD	2.489	4411	266	226	0.074	0.094	0.035	0.166	6
4/0	109	-339TSVFD	2.631	5093	306	260	0.058	0.075	0.033	0.139	6
262	132	-340TSVFD	3.857	5993	348	296	0.048	0.063	0.032	0.121	6
313	159	-341TSVFD	3.030	6867	386	328	0.040	0.053	0.032	0.106	6
373	189	-342TSVFD	3.164	7810	429	365	0.034	0.045	0.031	0.094	4
444	227	-343TSVFD	3.319	8855	455	387	0.028	0.039	0.030	0.085	4
535	273	-344TSVFD	3.492	9905	528	449	0.024	0.033	0.030	0.076	4

- Cable diameters are subject to a +/- 5% manufacturing tolerance

## THREE CONDUCTOR TYPE MMV-VFD MEDIUM VOLTAGE 15KV • 133% INSULATION LEVEL

Ampacity											
Size AWG/ kcmil	mm <sup>2</sup>	Part No. 37-105	Nominal Diameter (inches)	Weight (Lbs./ 1000 Ft.)	In Free Air (amps)	Single Banked in Trays (amps)	DC Resistance at 25°C (ohms/1000 Ft.)	AC Resistance at 90°C, 60Hz (ohms/1000 Ft.)	Inductive Reactance (ohms/ 1000 Ft.)	Voltage Drop (Volts per amp per 1000 Ft.)	Green Insulated Grounding Conductor (3x) Size (AWG)
2	34	-357TSVFD	2.403	3231	156	133	0.184	0.230	0.0440	0.364	10
1	43	-358TSVFD	2.468	2959	178	151	0.147	0.184	.0430	0.299	8
1/0	54	-359TSVFD	2.596	4090	205	174	0.117	0.147	.041	0.246	8
2/0	70	-360TSVFD	2.714	4615	234	199	0.093	0.117	0.0390	0.203	8
3/0	86	-361TSVFD	2.875	5306	269	229	0.074	0.094	.038	0.170	6
4/0	109	-362TSVFD	3.028	6131	309	263	0.058	0.075	0.037	0.142	6
262	132	-363TSVFD	3.260	7074	352	299	0.048	0.063	0.035	0.124	6
313	159	-364TSVFD	3.363	7787	389	331	0.040	0.053	0.034	0.109	6
373	189	-365TSVFD	3.500	8703	432	367	0.034	0.045	0.034	0.097	4
444	227	-366TSVFD	3.652	9912	456	388	0.028	0.039	0.033	0.080	4

- Cable diameters are subject to a +/- 5% manufacturing tolerance
- Ampacity in Free Air: Based on 105°C conductor temperature and 40°C ambient temperature per 2008 NEC Table 310.71
- Ampacity in Conduit Air: Based on 105°C conductor temperature and 40°C ambient temperature per 2008 NEC Table 310.75

# CABLE SELECTION GUIDE FOR VFD APPLICATIONS

The circuit of a typical voltage source PWM drive is shown in Figure 1. Each part of the equipment is bonded to the safety earth system to ensure personnel safety if faults occur.

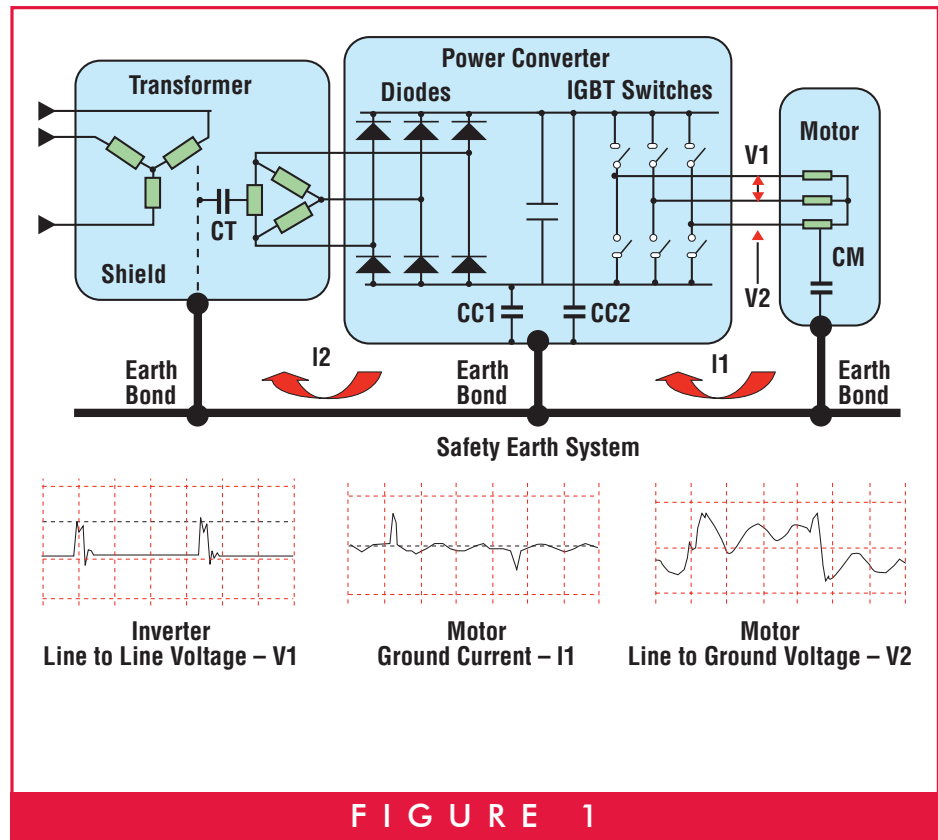
All parts have capacitance to ground shown by:

- CM for the motor windings.
- CC1 and CC2 for the power converter circuits.
- CT for the transformer's secondary winding to the transformers' screen.

The IGBT switches are in constant operation at high frequency and this produces an inverter output voltage with a PWM wave shape as shown by the voltage V1 (Figure 1).

This IGBT switches also cause a motor line to ground voltage V2 (Figure 1), normally called a common mode voltage.

The common mode voltages cause short high-frequency pulses of common mode current to flow in the safety earth circuits, shown by currents I1 and I2 (Figure 1), unless the design includes cable features to stop this from happening.



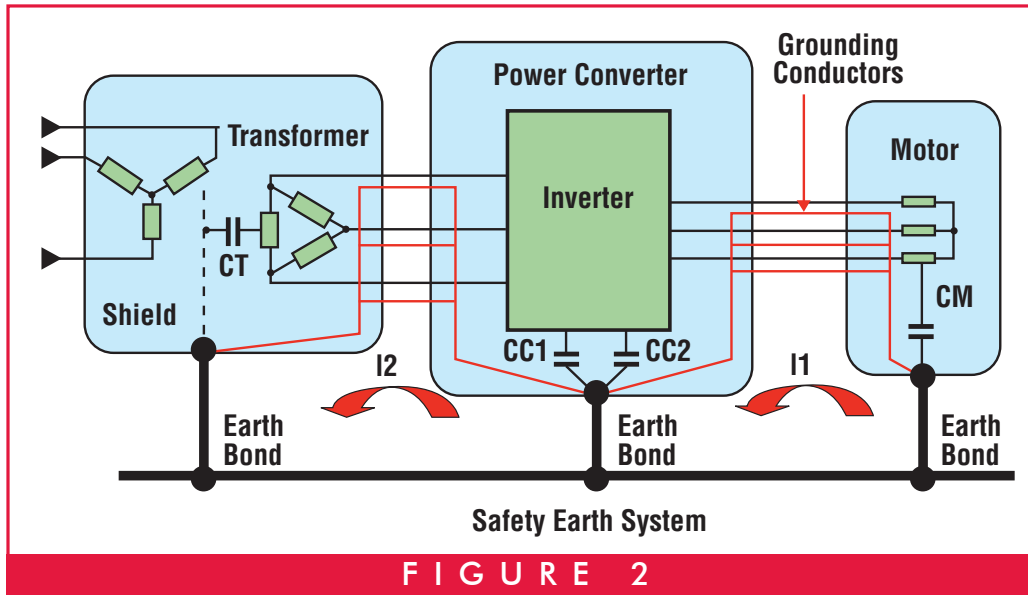
It is essential that the common mode currents return to the inverter without causing EMC - EMI problems in other equipment, and this means that the common mode currents I1 and I2 must not flow in the safety earthing system.

For the motor, this is achieved by connecting a set of wires from the motor to the inverter that run with the main power cables. These are called symmetrical grounding conductors, see Figure 2. These conductors have a very low impedance compared with the other return path via the safety earthing system.

The three symmetrical grounding conductors and overall shields are connected as shown in Figure 3. This 360° connection is essential.

The common mode currents I1 and I2 now flow in the symmetrical grounding conductors. This happens because the symmetrical grounding conductors are close to the power conductors giving a low impedance route for the currents I1 and I2 compared with the safety earthing system. As I1 and I2 flow near the power conductors this avoids creating external EMC - EMI problems.



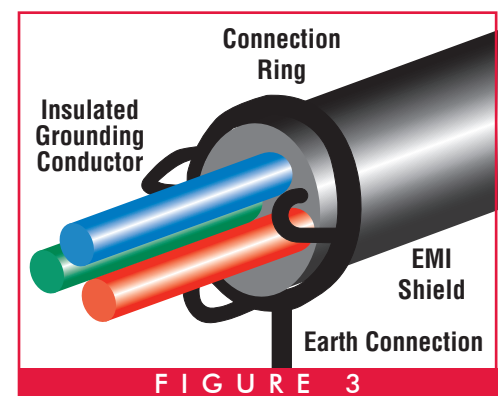


If symmetrical grounding conductors and an overall EMI shield are not used, EMC - EMI problems are very likely to occur.

For cables used with voltage source PWM drives, a number of features are required to ensure correct operation, avoid overheating and achieve longer service life.

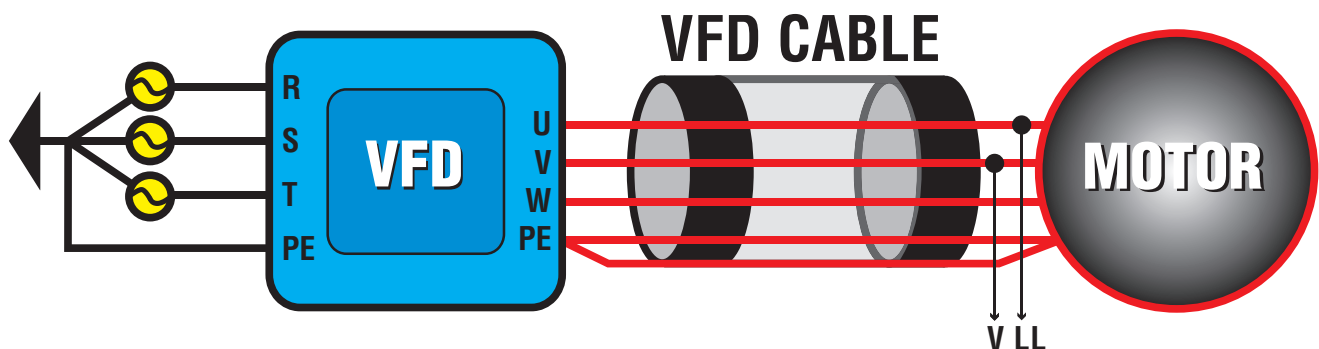
The essential features of a medium voltage cable for PWM drives are :

- Insulation designed to withstand the transients produced by the PWM
- Insulation with a dielectric constant no greater than 3.0 to minimize capacitance
- Voltage rating of 3x the operating voltage to prevent corona
- Three symmetrical grounding conductors. Some cables only have one grounding conductor. This is not acceptable as it produces circulating currents in the earth system
- Extremely fine strands to carry the harmonic currents without overheating (i.e. the inductance of fine stranded conductors is less than 7, 19, 37 strand conductors)
- Overall shield to stop the radiation of voltage EMI fields
- Correct termination at both ends
- Semi-conducting shield around each insulation layer (MMV only)
- Metallic layer around each semi-conducting shield to earth the semi-conducting shield (MMV only).

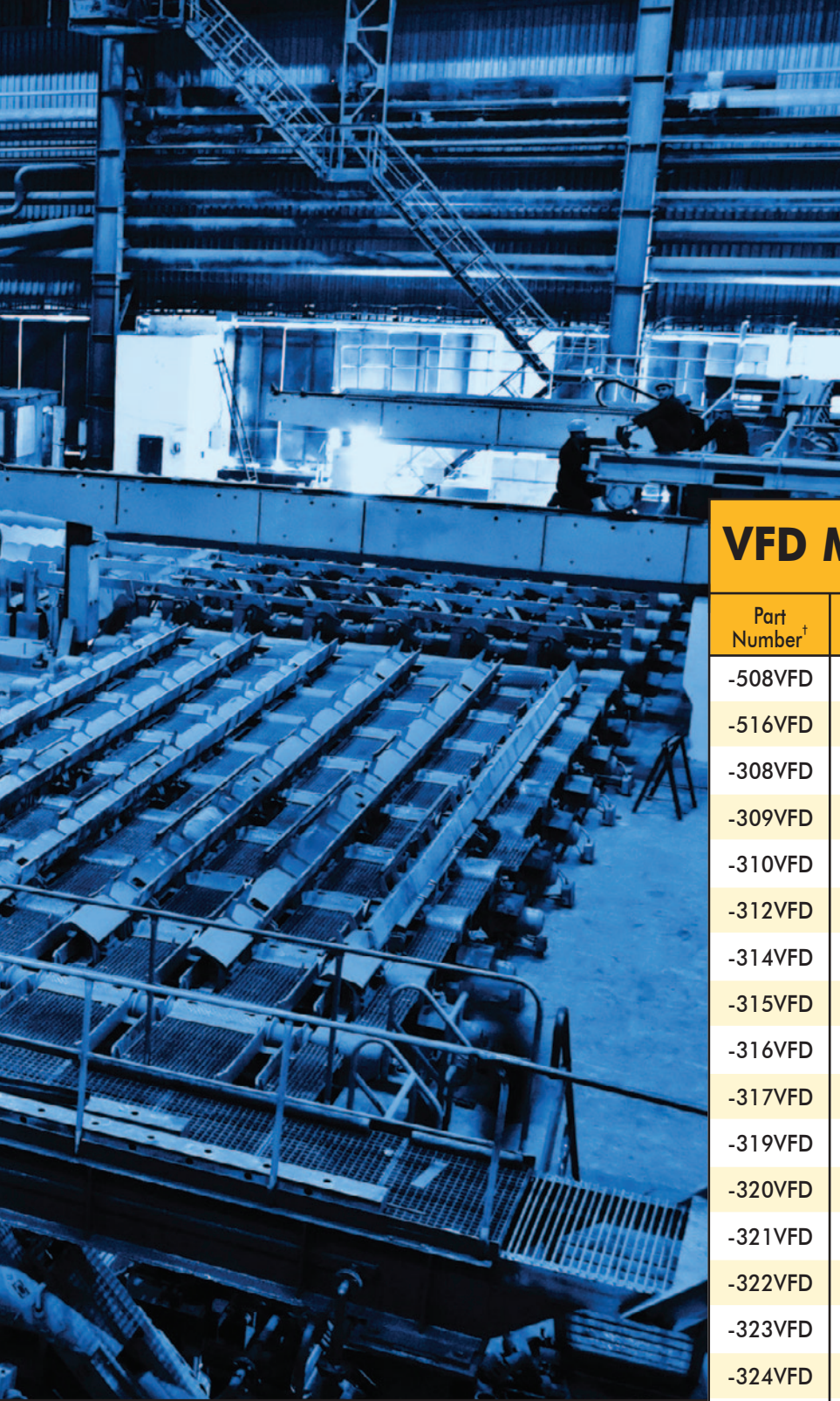


*Figures 1 - 3 courtesy of Convertteam*

**Nexans AmerCable's  
high strand-count  
conductors and  
braid shield design is  
much more flexible,  
easier to install  
and more resistant  
to vibration than  
Type MC cable.**







## VFD Maximum Horsepower\*

Part Number <sup>†</sup>	AWG/kcmil	230V 3Φ	460V 3Φ	575V 3Φ
-508VFD	14	3 HP	7.5 HP	10 HP
-516VFD	12	5 HP	10 HP	10 HP
-308VFD	10	7.5 HP	15 HP	20 HP
-309VFD	8	15 HP	40 HP	50 HP
-310VFD	6	25 HP	50 HP	60 HP
-312VFD	4	30 HP	60 HP	75 HP
-314VFD	2	40 HP	75 HP	100 HP
-315VFD	1	50 HP	100 HP	125 HP
-316VFD	1/0	60 HP	125 HP	150 HP
-317VFD	2/0	60HP	150 HP	200 HP
-319VFD	4/0	100 HP	200 HP	250 HP
-320VFD	262	100 HP	200 HP	300 HP
-321VFD	313	125 HP	250 HP	300 HP
-322VFD	373	125 HP	250 HP	350 HP
-323VFD	444	150 HP	300 HP	400 HP
-324VFD	535	150 HP	350 HP	450 HP
-326VFD	646	200 HP	400 HP	500 HP
-327VFD	777	-	450 HP	-

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\*Recommended horsepower are based on the Full-Load Current in Table 430.250 of the 2008 NEC and multiplied by 1.25 according to Article 430.22(A). The cable ampacities are based on 90°C conductor and cable installed in free based on Table B.310.3 in the NEC.

Actual horsepower will be subject to drive/motor manufacturer nameplate full-load current and local authority having jurisdiction.

<sup>†</sup> Complete part number can be determined by selecting the appropriate construction and adding the part number prefix (e.g. 37-102-319VFD for 4/0 Standard Gexol VFD)





**Nexans AmerCable** manufactures high-quality flexible VFD cables for a wide variety of specialized industrial applications.



**Nexans AmerCable** is an ISO 9001 certified cable manufacturer that combines leading-edge technology, proven manufacturing techniques, and high-quality service to deliver the finest industrial and utility cable products available.

Nexans AmerCable serves a worldwide customer base from our manufacturing facility in El Dorado, Arkansas. Our professional field engineering and sales force work directly with customers, or in partnership with our network of independent distributors, to identify and fulfill your specific cable requirements.



Manufacturing facility and corporate headquarters - El Dorado, Arkansas.



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