INDUSTRIAL VFD CABLES

100% EMI Emission Containment

Designed for Longer Service Life in High Vibration Environments

Highly Flexible for Easier Handling and Faster Installation

Nexans

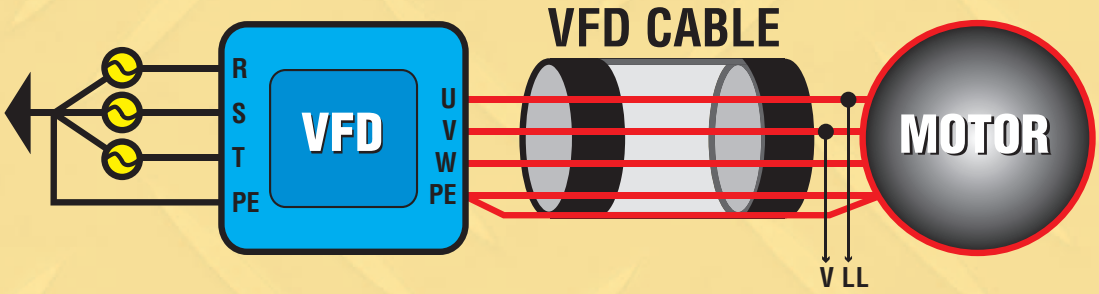
AmerCable

Industrial VFD Cables

Index

■ Variable Frequency Drive (VFD) Power Cables

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



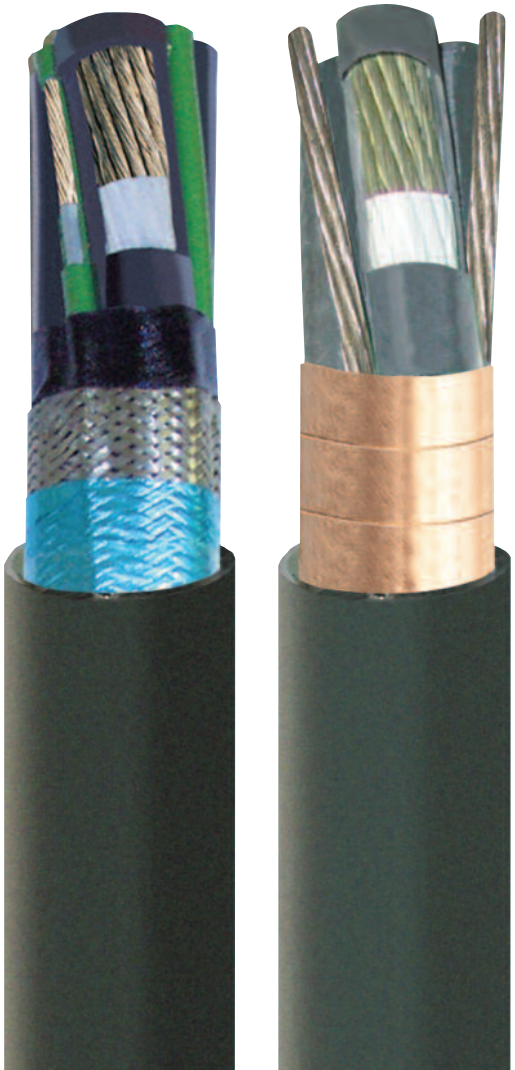
Made in America

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.NexansAmerCable.com

e-mail: industrial@nexansamercable.com

37-102VFD

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 UL1309/ 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.

37-102VFD • Extra Flexible VFD Power Cable • Gexol® Insulated

		Unarmored			Armored & Sheathed (TS)						
Size AWG/ kcmil	mm²	Part No. 37-102	Nominal Diameter Inches*	Weight Lbs./ 1000 Ft.	Part No. 37-102	Nominal Diameter Inches*	Weight Lbs./ 1000 Ft.	Grounding Conductor* Size (AWG)	NEC Ampacities		
									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	201	188	173
3/0	86	-318VFD	1.750	2827	-318TSVFD	1.959	3269	8	237	195	186
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

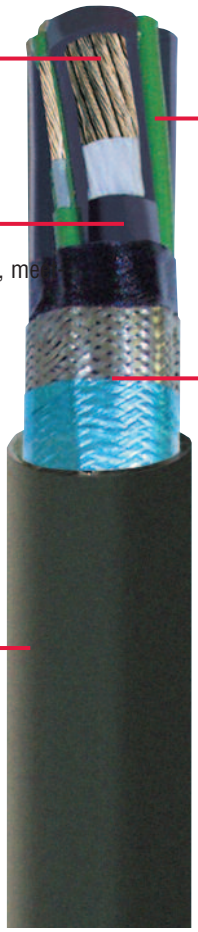
CIR® (Crush & Impact Resistant) VFD Power Cable UL Listed as Type TC-ER

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

Power Conductors (x3)
Soft annealed flexible stranded tinned copper per ASTM B-33.

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 thermoplastic compound meeting UL 1309/CSA 245 and IEEE 1580.



Ground Conductors (x3)
Soft annealed tinned copper per ASTM B-33 flexible stranding with 600/1000V Gexol® insulation sized per UL 1277. Color: Green

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

Safe to Handle
CIR® is a safe, flexible alternative to metal-clad cables.

CIR® VFD Ratings & Approvals

- 90°C temperature rating
- UL Listed as Type TC-ER (E123629)
- Flame Retardant – IEEE 1202/FT-4
- Suitable for Class 1, Div 1 and Zone 1 environments
- UL Listed as Marine Shipboard Cable (E111461)
- Sunlight resistant
- Direct burial

Also available in Arctic Grade:
Rated TC-ER-HL for cable diameters up to 1"

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.
- 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 (up to 35% less) compared to Type MC
- Considerably more flexible 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

37-102 CIR VFD • 2000 Volts • Crush & Impact Resistant

Size AWG/ kcmil	mm²	Part No. 37-102	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 @ 90°C (Volts/Amp/ 1000 Ft.)	Green Insulated Grounding* Size (AWG)	NEC Ampacities		
										In Free Air	In Cable Tray	In Conductor
14	2.1	-508CIRVFD	0.768	297	2.907	3.635	0.040	5.073	18	15	15	15
12	3.3	-516CIRVFD	0.792	376	1.826	2.283	0.038	3.199	18	20	20	20
10	5.2	-308CIRVFD	0.888	492	1.153	1.441	0.036	2.032	14	30	30	30
8	7.6	-309CIRVFD	0.926	560	0.708	0.885	0.037	1.263	14	65	55	48
6	12.5	-310CIRVFD	1.051	826	0.445	0.556	0.033	0.804	12	87	75	65
4	21	-312CIRVFD	1.093	945	0.300	0.376	0.031	0.552	12	114	95	89
2	34	-314CIRVFD	1.225	1298	0.184	0.230	0.029	0.348	10	152	130	119
1/0	54	-316CIRVFD	1.447	1908	0.117	0.147	0.029	0.234	10	205	170	163
2/0	70	-317CIRVFD	1.566	2287	0.093	0.117	0.028	0.192	10	237	195	186
4/0	109	-319CIRVFD	1.874	3360	0.058	0.075	0.027	0.132	8	316	260	253
262	132	-320CIRVFD	2.031	4200	0.048	0.063	0.027	0.115	6	362	297	286
373	189	-322CIRVFD	2.257	5634	0.034	0.045	0.025	0.088	6	449	364	357
535	273	-324CIRVFD	2.705	7853	0.024	0.033	0.026	0.072	6	556	446	441
777	394	-327CIRVFD	3.102	11137	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

*3 Grounding Conductors – Green Insulated

NEC ampacities are based on Table 310.15 (B) (16) of the National Electrical Code (NEC) for conductors rate 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.

CIR VFD Stranding Profile

Size AWG/kcmil	Number of Strands	Closest IEEE 45 Std. Size	Equivalent Metric Size (mm2)	Uninsulated Conductor Dia. (inches)
14	19	4	2.08	0.074
12	19	6	3.29	0.093
10	37	10	5.23	0.113
8	37	16	7.57	0.136
6	61	26	12.49	0.175
4	133	41	21.11	0.258
2	133	66	33.51	0.324
1	209	83	42.79	0.361
1/0	266	106	54.45	0.407
2/0	342	133	70.01	0.461
3/0	418	168	85.57	0.510
4/0	532	212	108.91	0.575
262	646	262	132.25	0.654
313	777	313	159.06	0.720
373	925	373	189.36	0.785
444	1110	444	227.23	0.860
535	1332	535	272.68	0.941
646	1591	646	325.70	1.029
777	1924	777	393.87	1.132

Standard CIR® Type VFD
Arctic Grade • 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

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*

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

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
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.

See next pages 4-5 for Stranding Profile

37-108VFD

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 (mm2)	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	-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	-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	-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 (mm2)	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

37-105VFD

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.

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.

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

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.

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).

Low smoke halogen-free jacket available.

Contact your AmerCable rep.

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

Size AWG/ kcmil	mm2	Part No. 37-105	Nominal Diameter (inches)	Weight (Lbs./ 1000 Ft.)	Ampacity: In Free Air (amps)	Ampacity: 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

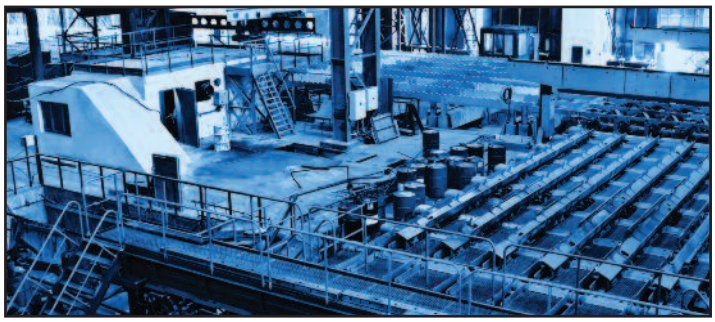
Three Conductor Type MMV-VFD Medium Voltage – 15kV • 133% Insulation Level

Size AWG/ kcmil	mm2	Part No. 37-105	Nominal Diameter (inches)	Weight (Lbs./ 1000 Ft.)	Ampacity: In Free Air (amps)	Ampacity: 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.

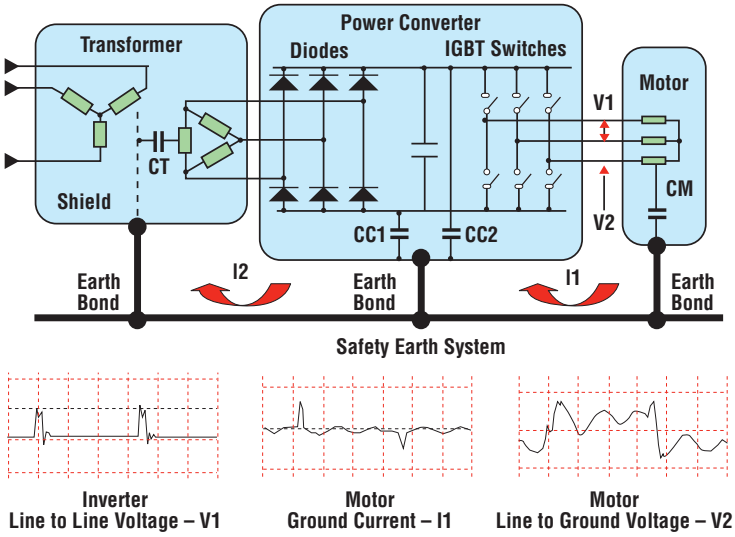


FIGURE 1

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.

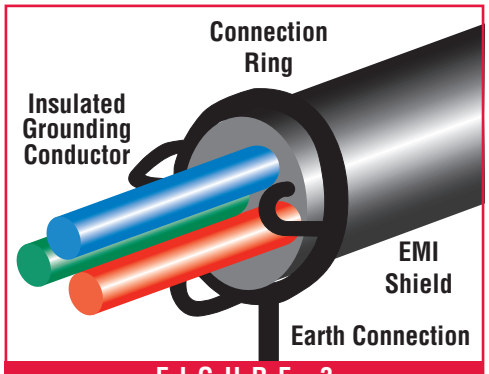


FIGURE 3

Figures 1 - 3 courtesy of Converteam

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.

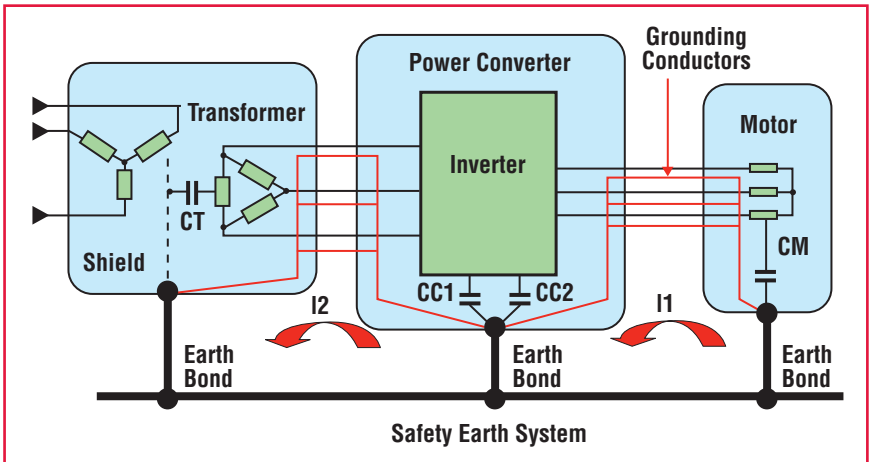
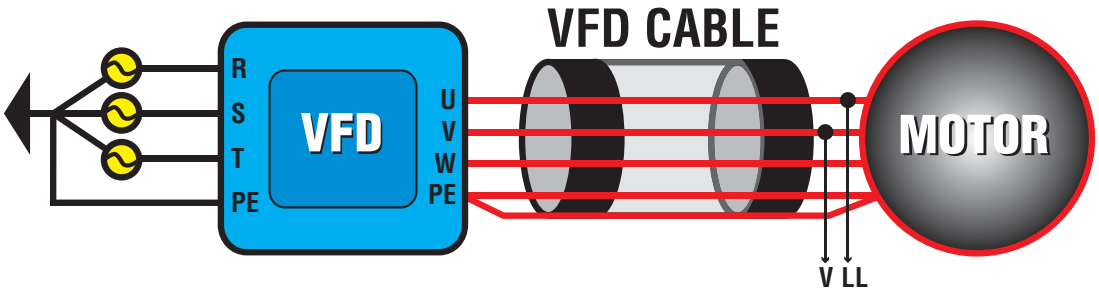


FIGURE 2

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)



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

Nexans AmerCable

Industrial Cables

Nexans AmerCable's manufacturing facility and corporate headquarters in El Dorado, Arkansas.

Selected Maximum Horsepower for VFD Cables*

VFD Maximum Horsepower*

Part Number†	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	-

*Recommended horsepowers 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.

† 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 jacketed electrical cables for a wide variety of specialized industrial and utility 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.

Made in America

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www.nexansamercable.com

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