Arctic Grade CIR® Control Cable Type TC-ER-HL*

Multi-Conductor • Gexol® Insulated • 0.6/1kV • Rated 90°C

Insulation

GEXOL® cross-linked flame retardant polyolefin, meeting the requirements for Type P of IEEE 1580 and Type X110 of UL 1309/CSA 245. 600V/IEC 1000V.

For Cable Color Codes and Stranding Information, see page 12.

Safe to Handle

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

Conductor

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

Ground

Brittlepoint as per ASTM D 746-07 exceeds -65°C for Jacket and -75°C for Insulation

Jacket

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

See page 8 for Arctic CIR Ratings & Approvals

Application

Designed and constructed to be a flexible alternative to Type MC cable where user desires crush and impact protection in arctic conditions.

Features

- Complies with the requirements for TC-ER-HL per UL 2225*
- Exceeds CSA cold bend / cold impact (-40°C / -35°C)
- Gas & vapor tight – impervious to water & 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

Conductor Size		Number of Conductors	Part No. 37-102*	Ground		Diameter (inches)	Weight (lbs/1000 ft.)	90°C NEC Ampacity	DC Resistance 75°C NEC Ampacity	AC Resistance at 25°C (ohms/1000 ft.)	Voltage Drop at 90°C, 60Hz (ohms/1000 ft.)	(Volts/Amp/ 1000 ft.)
AWG	mm2			Number	AWG							
14	2.1	2	-507CIRGAG	1	14	0.500	137	15	15	2.91	3.64	5.069
14	2.1	3	-508CIRGAG	1	14	0.532	165	15	15	2.91	3.64	5.069
14	2.1	4	-509CIRGAG	1	14	0.572	195	15	15	2.91	3.64	5.072
14	2.1	5	-510CIRGAG	1	14	0.673	261	15	15	2.91	3.64	5.072
14	2.1	7	-521CIRGAG	1	14	0.800	345	15	14	2.91	3.64	5.072
14	2.1	9	-764CIRGAG	1	14	0.813	372	15	14	2.91	3.64	5.072
14	2.1	12	-585CIRGAG	1	14	0.850	447	12	10	3.00	3.75	5.224
14	2.1	19	-765CIRGAG	1	14	1.090	698	12	10	3.00	3.75	5.224
14	2.1	37	-514CIRGAG	1	14	1.455	1211	10	8	3.00	3.75	5.224
12	3.3	2	-515CIRGAG	1	12	0.539	175	20	20	1.83	2.28	3.195
12	3.3	3	-516CIRGAG	1	12	0.580	213	20	20	1.83	2.28	3.195
12	3.3	4	-517CIRGAG	1	12	0.685	288	20	20	1.83	2.28	3.198
12	3.3	5	-560CIRGAG	1	12	0.740	333	20	20	1.83	2.28	3.198
12	3.3	7	-712CIRGAG	1	12	0.865	442	20	17	1.83	2.28	3.198
12	3.3	9	-766CIRGAG	1	12	0.910	483	20	17	1.83	2.28	3.198
12	3.3	12	-750CIRGAG	1	12	0.935	578	15	12	1.88	2.35	3.294
12	3.3	19	-767CIRGAG	1	12	1.180	920	15	12	1.88	2.35	3.294
12	3.3	37	-520CIRGAG	1	12	1.500	1548	12	10	1.88	2.35	2.028
10	5.2	2	-553CIRGAG	1	10	0.582	229	30	30	1.15	2.35	2.028
10	5.2	3	-308CIRGAG	1	10	0.685	310	30	30	1.15	1.44	2.031
10	5.2	4	-408CIRGAG	1	10	0.740	371	30	28	1.15	1.44	2.031
10	5.2	5	-561CIRGAG	1	10	0.800	433	30	28	1.15	1.44	2.031
10	5.2	7	-591CIRGAG	1	10	0.930	569	28	24	1.15	1.44	2.031
10	5.2	9	-768CIRGAG	1	10	1.060	712	28	24	1.15	1.44	2.031
10	5.2	12	-762CIRGAG	1	10	1.135	868	20	17	1.18	1.48	2.092

Ampacities are based on Table 310.16 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) (2) (a). The ampacities shown also apply to cables installed in cable tray in accordance with NEC Section 392.11.

**cables up to 1" in diameter)*

37-102 CIRAG

Arctic Grade CIR® Instrumentation Cable Type TC-ER-HL*

Individually Shielded Pairs/Triads • Gexol® Insulated • 0.6/1kV • Rated 90°C

Insulation

GEXOL® cross-linked flame retardant polyolefin, meeting the requirements for Type P of IEEE 1580 and Type X110 of UL 1309/CSA 245. 600V/IEC 1000V.

Safer to Handle

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

Brittlepoint as per ASTM D 746-07 exceeds -65°C for Jacket and -75°C for Insulation

Conductor

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

Pairs/Triads

Each pair/triad is twisted with a bare tinned drain wire. Each pair/triad is shielded with polyester-backed aluminum foil tape to afford 100% coverage. Pair to pair, or triad to triad, isolation – plus overall shielding – is provided.

Jacket

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

Application

Designed and constructed to be a flexible alternative to Type MC cable where user desires crush and impact protection in arctic conditions.

Features

- Complies with the requirements for TC-ER-HL per UL 2225*
- Exceeds CSA cold bend / cold impact (-40°C / -35°C)
- Gas & vapor tight – impervious to water & 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

**cables up to 1" in diameter*

For Cable Color Codes and Stranding Information See Back Cover

See page 8 for Arctic Grade CIR Ratings & Approvals

Conductor Size		Pairs	Triads	Part No. 37-102*	Nominal Diameter (inches)	Weight (lbs/1000 ft.)	DC Resistance 20°C (ohms/1000 ft.)	Mutual Capacitance (nF/1000 ft.)	Inductance (mH/1000 ft.)
AWG	mm2								
16	1.3	1	–	-610CIRAG	0.451	106	4.52	32	0.20
16	1.3	2	–	-611CIRAG	0.725	279	4.52	32	0.20
16	1.3	4	–	-613CIRAG	0.770	340	4.52	32	0.20
16	1.3	8	–	-616CIRAG	1.075	702	4.52	32	0.20
16	1.3	12	–	-618CIRAG	1.235	1062	4.52	32	0.20
16	1.3	24	–	-699CIRAG	1.650	1560	4.52	32	0.20
16	1.3	–	1	-668CIRAG	0.470	128	4.52	32	0.20
16	1.3	–	4	-698CIRAG	0.960	453	4.52	32	0.20
16	1.3	–	8	-677CIRAG	1.200	825	4.52	32	0.20
16	1.3	–	12	-734CIRAG	1.395	1235	4.52	32	0.20

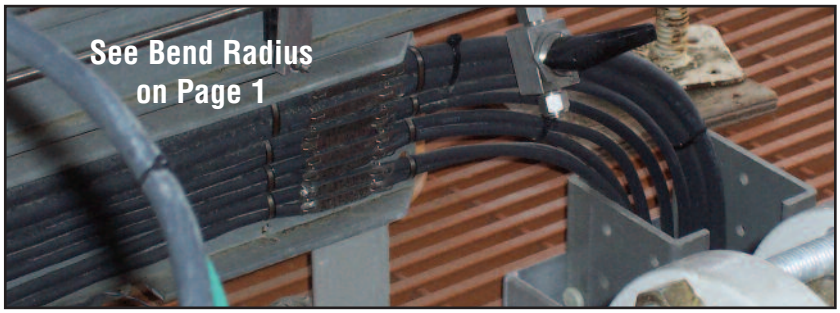
VALUES:

#16 Pairs / Triads

Capacitance – nF/1000 feet = 32

Inductance – mH/1000 = 0.20

Resistance – Ohms/1000 feet = 4.52 (@ 20°C)



37-102 CIRVFDA

Arctic Grade CIR® Type VFD Power Cable
UL Listed as Type TC-ER & 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® VFD 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*
- American Bureau of Shipping (ABS)
- 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*

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 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
- 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

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.

Control Cables
Colored Insulation

Conductor #	Base Color	Tracer Color
1	Black	–
2	Red	–
3	Blue	–
4	Orange	–
5	Yellow	–
6	Brown	–
7	Red	Black
8	Blue	Black
9	Orange	Black
10	Yellow	Black
11	Brown	Black
12	Black	Red
13	Blue	Red
14	Orange	Red
15	Yellow	Red
16	Brown	Red
17	Black	Blue
18	Red	Blue
19	Orange	Blue
20	Yellow	Blue
21	Brown	Blue
22	Black	Orange
23	Red	Orange
24	Blue	Orange
25	Yellow	Orange
26	Brown	Orange
27	Black	Yellow
28	Red	Yellow
29	Blue	Yellow
30	Orange	Yellow
31	Brown	Yellow
32	Black	Brown
33	Red	Brown
34	Blue	Brown
35	Orange	Brown
36	Yellow	Brown
37	Black	–

Power Cables
6 AWG and smaller = colored insulation
4 AWG and larger = print

Conductor #	Color
1	Black
2	Red
3	Blue
4	Orange

Instrumentation Cables

Pairs	Black, White
Triads	Black, White, Red

Pair / Triad number printed on conductors

AmerCable ISO 9001

CIR Stranding Profiles

Size AWG/kcmil	No. of Strands	Individual Strand Dia. (inches)	Closest IEEE 45 Standard Size	Equivalent Metric Size (mm2)	Uninsulated Conductor Dia. (Inches)
16	19	0.0117	3	1.32	0.059
14	19	0.0147	4	2.08	0.074
12	19	0.0185	6	3.29	0.093
10	37	0.0167	10	5.23	0.113
8	37	0.0201	16	7.57	0.136
6	61	0.0201	26	12.49	0.175
4	133	0.0177	41	21.11	0.258
2	133	0.0223	66	33.51	0.324
1/0	266	0.0201	106	54.45	0.407
2/0	342	0.0201	133	70.01	0.461
4/0	532	0.0201	212	108.91	0.575
250	627	0.0201	250	127	0.634
350	888	0.0201	350	177	0.757
500	1221	0.0201	500	253	0.888
750	1850	0.0201	750	380	1.093

The True Cable Cost Comparison: Lower Total Installed Cost

AmerCable CIR® vs. Type CWCMC (MC-HL)

Based on 100 ft. of cable, 2 glands and installation labor (cable & glands)

16 AWG 1 Shielded Pair ..... **CIR® Saves you 36%**

14 AWG 3/C+G ..... **CIR® Saves you 37%**

6 AWG 3/C+G ..... **CIR® Saves you 38%**

4 AWG 3/C+G ..... **CIR® Saves you 33%**

2/0 4/C+G ..... **CIR® Saves you 10%**

Glands for CIR Cables cost up to 50% LESS than those for Type MC

Data Basis:
1. Labor rate $35.00/hr.
2. Labor time quotes based on long established Fluor Daniel Project Controls Standard Unit for Type TC and Type CWCMC cables for installation tray.
3. Identical installation for both products using a 100 ft. run basis.
4. Hawke A121 series glands used for CIR® cables and Hawke N701 glands used for Type CWCMC cables.
5. MRO pricing is used for cables and glands.

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