



HWC
HOUSTON WIRE & CABLE COMPANY
PRODUCT CATALOG




HOUSTON WIRE & CABLE COMPANY
PRODUCT CATALOG



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ABOUT HOUSTON WIRE & CABLE COMPANY

For over 40 years, Houston Wire & Cable Company (NASDAQ: HWCC) has been a master distributor of industrial wire and cable, supplying electrical distributors throughout the United States. Our team has the robust product knowledge, technical expertise, industry insight and application experience to guide you in selecting the right solution for your wire and cable needs.

Whether your needs range from stock items to customized cuts and labelling - or even total cable management systems and shelf goods - HWC's dedicated staff of experts will work with your team to deliver on our commitment to Right Product, at the Right Place, at the Right Time®.

HWC's commitment is backed by our dedicated 24/7/365 customer service, strategically located sales and distribution centers, depth of inventory from a breadth of leading manufacturers, and tenured professionals who work tirelessly in every facet of our organization.

We therefore proudly present to you HWC's latest product catalog. Over the years, the printed and online versions of this catalog have become valued and well-used reference tools by industry professionals such as yourself.

To learn more, please visit us at www.houwire.com or speak with a wire and cable professional at 1-800-HOUWIRE.

We value your business, and thank you for your trust and patronage.

Houston Wire & Cable Company

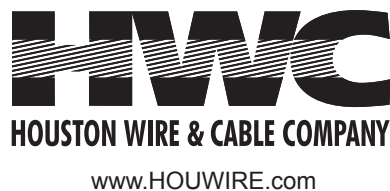


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AWG TO METRIC CONVERSION CHART

AWG or Kcmil	Cross Sectional Area Mils	Cross Sectional Area MM ²	Metric Size
	987	0.50	0.50
20 AWG	1,020	0.52	
	1,480	0.75	0.75
18 AWG	1,620	0.82	
	1,974	1.00	1.00
16 AWG	2,580	1.31	
	2,960	1.50	1.50
14 AWG	4,110	2.08	
	4,934	2.50	2.50
12 AWG	6,530	3.31	
	7,894	4.00	4
10 AWG	10,380	5.26	
	11,840	6.00	6
8 AWG	16,510	8.36	
	19,740	10.00	10
6 AWG	26,240	13.30	
	31,580	16.00	16
4 AWG	41,740	21.15	
	49,340	25.00	25
2 AWG	66,360	33.62	
	69,100	35.00	35
1 AWG	83,690	42.41	
	98,680	50.00	50
1/0 AWG	105,600	42.41	
2/0 AWG	133,100	67.43	
	138,200	70.00	70
3/0 AWG	167,800	85.03	
	187,500	95.00	95
4/0 AWG	211,600	107.20	
	236,800	120.00	120
250 Kcmil	250,000	126.64	
	296,000	150.00	150
350 Kcmil	350,000	177.35	
	365,000	185.00	185
400 Kcmil	400,000	202.71	
	473,000	240.00	240
500 Kcmil	500,000	253.35	
	592,100	300.00	300
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	789,400	400.00	400
	986,800	500.00	500
1000 Kcmil	1,000,000	506.60	

SECTION A

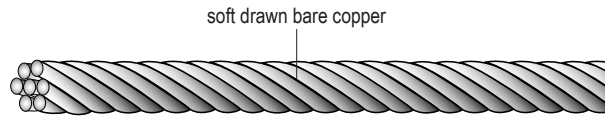
Bare Copper & Building Wire

DESCRIPTION	INSULATION/JACKET	SPECIFICATION	PAGE
Bare Copper	N/A	HW000	2
Power and Control Cable	THHN or THWN-2, PVC/Nylon	HW001	3
Power and Control Cable	XHHW-2, FR-XLP	HW002	4
Power and Control Cable	RHW-2 or RHH or USE-2, FR-XLP	HW003	5
Power and Control Cable	RHW-2 or RHH or USE-2, FR-EP	HW004	6
Power and Control Cable	RHW-2 or RHH or USE-2, EPR/CPE	HW005	7
Cathodic Protection	HMWPE	HW006	8
Power Cable	XHHW-LS	HW010	9
Power Cable	RHW-LS or RHH-LS	HW020	10

SPECIFICATION HW000

BARE COPPER

Soft Drawn Solid or Stranded



Catalog Number	Size AWG/kcmil	Cross Sectional Area Circular Mils	Number of Strands	Overall Diameter Inches	Net Weight Lbs/Mft
SOFT DRAWN BARE COPPER - SOLID					
HW000 0801S	8	16510	Solid	0.12	50
HW000 0601S	6	26240	Solid	0.16	79
HW000 0401S	4	41740	Solid	0.20	126
HW000 0201S	2	66360	Solid	0.25	201
SOFT DRAWN BARE COPPER - STRANDED					
HW000 01401	14	4110	7	0.07	13
HW000 01201	12	6530	7	0.09	20
HW000 01001	10	10380	7	0.11	32
HW000 00801	8	16510	7	0.14	51
HW000 00601	6	26240	7	0.18	81
HW000 00401	4	41740	7	0.23	129
HW000 00201	2	66360	7	0.29	205
HW000 00101	1	83690	19	0.33	258
HW000 10101	1/0	10560	19	0.37	326
HW000 20101	2/0	133100	19	0.41	411
HW000 30101	3/0	167800	19	0.47	518
HW000 40101	4/0	211600	19	0.52	653
HW000 25001	250	250000	37	0.57	772
HW000 35001	350	350000	37	0.68	1081
HW000 50001	500	500000	37	0.81	1544
HW000 75001	750	750000	61	0.99	2316
HW000 10001	1000	1000000	61	1.15	3088

APPLICATION:

For use on insulators for overhead distribution circuits or for grounding conductors.

CONDUCTOR:

Soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8. Bare or tin-coated soft, medium-hard, or hard drawn copper wire also available upon request

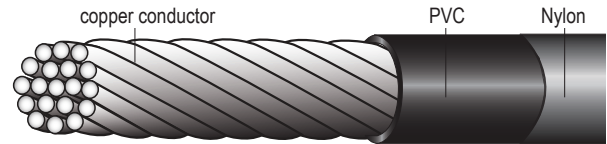
ADDITIONAL STANDARDS:

- Federal Specification CID A-A-59551 (non-insulated)

Also available in Aluminum Conductor.
See the HWC Aluminum Supplement
for more information.

BUILDING WIRE

**600 Volt UL 90°C
THHN/THWN-2
PVC/Nylon Insulation
Copper Conductor**



Catalog Number	Size AWG/kcmil	Number of Strands	PVC Insulation Thickness Mils	Nylon Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
SOFT DRAWN BARE COPPER - SOLID						
HW001 01401	14	Solid	15	4	0.11	15
HW001 01201	12	Solid	15	4	0.12	23
HW001 01001	10	Solid	20	4	0.15	37
SOFT DRAWN BARE COPPER - STRANDED						
HW001 01401	14	19	15	4	0.11	16
HW001 01201	12	19	15	4	0.13	24
HW001 01001	10	19	20	4	0.17	39
HW001 00801	8	19	30	5	0.22	63
HW001 00601	6	19	30	5	0.26	98
HW001 00401	4	19	40	6	0.33	157
HW001 00301	3	19	40	6	0.36	193
HW001 00201	2	19	40	6	0.39	240
HW001 00101	1	19	50	7	0.43	300
HW001 10101	1/0	19	50	7	0.47	376
HW001 20101	2/0	19	50	7	0.52	467
HW001 30101	3/0	19	50	7	0.57	581
HW001 40101	4/0	19	50	7	0.64	724
HW001 25001	250	37	60	8	0.69	855
HW001 30001	300	37	60	8	0.76	1022
HW001 35001	350	37	60	8	0.79	1191
HW001 40001	400	37	60	8	0.85	1345
HW001 50001	500	37	60	8	0.94	1668
HW001 60001	600	61	70	9	1.10	1994
HW001 75001	750	61	70	9	1.16	2465
HW001 10001	1000	61	70	9	1.32	3300

APPLICATION:

For use in general wiring applications for power, lighting, and control circuits. It can be used in conduit, ducts, and cable tray when CT rated for service feeders and branch circuits in industrial and commercial installations. Maximum conductor temperature of 90°C in wet and dry locations. For use in oil or coolants at conductor temperatures not exceeding 75°C. Chemical, gasoline, and oil resistant II.

CONDUCTOR:

- Solid bare, annealed copper per ASTM B3
- Stranded bare annealed copper per ASTM B3 and ASTM B8. 14, 12, 10, and 8 AWG and ASTM B8 for sizes 6 AWG and larger.

NOTE:

- CT rated on sizes 1/0 AWG and larger

INSULATION:

Heat, moisture, and flame retardant PVC per UL Standard 83 and UL Standard 1063.

JACKET:

Clear Nylon per UL Standard 62

FLAME TEST:

- UL 1685 – for CT listed 1/0 AWG and larger
- 14 AWG – 750 kcmil are VW-1 rated

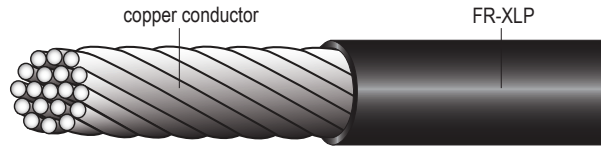
ADDITIONAL STANDARDS:

- Federal Specification CID A-A-59544
- UL 1063 (Type MTW for stranded items)
- RoHS Compliant

SPECIFICATION HW002

BUILDING WIRE

**600 Volt UL 90°C
XHHW-2
FR-XLP Insulation
Copper Conductor**



Catalog Number	Size AWG/kcmil	Number of Strands	Insulation Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW002 01401	14	7	30	0.14	18
HW002 01201	12	7	30	0.16	27
HW002 01001	10	7	30	0.18	40
HW002 00801	8	7	45	0.24	66
HW002 00601	6	7	45	0.28	97
HW002 00401	4	7	45	0.32	145
HW002 00301	3	7	45	0.35	185
HW002 00201	2	7	45	0.38	225
HW002 00101	1	19	55	0.44	290
HW002 10101	1/0	19	55	0.48	360
HW002 20101	2/0	19	55	0.52	450
HW002 30101	3/0	19	55	0.58	565
HW002 40101	4/0	19	55	0.63	705
HW002 25001	250	37	65	0.70	835
HW002 35001	350	37	65	0.80	1155
HW002 40001	400	37	65	0.84	1310
HW002 50001	500	37	65	0.93	1630
HW002 60001	600	61	65	1.04	1965
HW002 75001	750	61	80	1.14	2445
HW002 10001	1000	61	80	1.29	3230

APPLICATION:

For use in harsh environments for general wiring applications for lighting and power in conduits, ducts, cable tray when CT rated, or other approved raceways with maximum conductor temperature of 90°C in wet or dry locations. Chemical, gasoline and oil resistant.

CONDUCTOR:

Soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8

INSULATION:

Flame-retardant cross-linked polyethylene (FR-XLP) per ICEA S-95-658 and UL Standard 44 for Type XHHW-2, VW-1 conductors

FLAME TEST:

- UL 1685 – for CT listed sizes 1/0 AWG and larger
- UL VW-1 available upon request

ADDITIONAL STANDARDS:

- NEMA WC-70
- Federal Spec J-C-30B

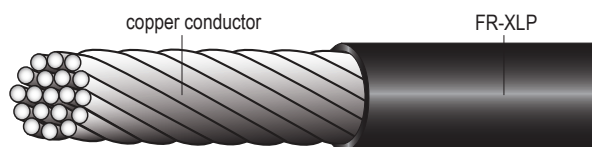
NOTE:

- CT rated on sizes 1/0 AWG and larger

Also available in Aluminum Conductor.
See the HWC Aluminum Supplement
for more information.

BUILDING WIRE

**600 Volt UL 90°C
RHW-2 or RHH or USE-2
FR-XLP Insulation
Copper Conductor**



Catalog Number	Size AWG/kcmil	Number of Strands	Insulation Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW003 01401	14	7	45	0.17	22
HW003 01201	12	7	45	0.19	32
HW003 01001	10	7	45	0.21	57
HW003 00801	8	7	60	0.27	71
HW003 00601	6	7	60	0.37	105
HW003 00401	4	7	60	0.36	155
HW003 00201	2	7	60	0.42	240
HW003 00101	1	19	80	0.49	310
HW003 10101	1/0	19	80	0.53	380
HW003 20101	2/0	19	80	0.58	470
HW003 30101	3/0	19	80	0.63	585
HW003 40101	4/0	19	80	0.69	730
HW003 25001	250	37	95	0.76	870
HW003 35001	350	37	95	0.86	1190
HW003 50001	500	37	95	0.99	1670
HW003 60001	600	61	110	1.11	2034
HW003 75001	750	61	110	1.20	2500
HW003 10001	1000	61	110	1.35	3290

APPLICATION:

For use in harsh environments for general wiring applications for lighting and power in conduits, ducts, cable tray when CT rated, direct burial or other approved raceways with maximum conductor temperature of 90°C in wet or dry locations. Chemical, gasoline and oil resistant.

CONDUCTOR:

Soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8

INSULATION:

Flame-retardant cross-linked polyethylene (FR-XLP) per ICEA S-95-658, UL Standard 854 for Type USE-2 and UL Standard 44 for Types RHH and RHW-2.

FLAME TESTS:

- UL 1685 – for CT listed sizes 1/0 AWG and larger
- UL VW-1 available upon request

ADDITIONAL STANDARDS:

- NEMA WC-70
- Federal Specification J-C-30B

NOTE:

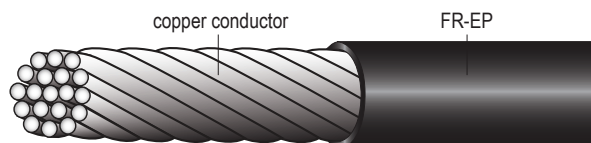
- CT rated on sizes 1/0 AWG and larger

Also available in Aluminum Conductor.
See the HWC Aluminum Supplement
for more information.

SPECIFICATION HW004

BUILDING WIRE

**600 Volt UL 90°C
RHW-2 or RHH or USE-2
FR-EP Insulation
Copper Conductor**



Catalog Number	Size AWG/kcmil	Number of Strands	Insulation Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW004 01401	14	7	45	0.17	25
HW004 01201	12	7	45	0.19	34
HW004 01001	10	7	45	0.21	48
HW004 00801	8	7	60	0.27	78
HW004 00601	6	7	60	0.31	114
HW004 00401	4	7	60	0.36	169
HW004 00201	2	7	60	0.42	254
HW004 00101	1	19	80	0.49	327
HW004 10101	1/0	19	80	0.53	402
HW004 20101	2/0	19	80	0.58	495
HW004 30101	3/0	19	80	0.63	613
HW004 40101	4/0	19	80	0.69	759
HW004 25001	250	37	95	0.77	905
HW004 35001	350	37	95	0.87	1235
HW004 50001	500	37	95	1.00	1663
HW004 75001	750	61	110	1.22	2573
HW004 10001	1000	61	110	1.37	3381

APPLICATION:

For use in harsh environments in a broad range of commercial, industrial and utility applications where reliability and maximum performance is required. Approved for installation in conduits, ducts, cable tray when CT rated, direct burial or other approved raceways with maximum conductor temperature of 90°C in wet or dry locations.

CONDUCTOR:

Soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8

INSULATION:

Flame-retardant ethylene-propylene-rubber (FR-EP) per ICEA S-95-658, UL Standard 854 for Type USE-2 and UL Standard 44 for Types RHH and RHW-2, VW-1 conductor.

FLAME TESTS:

- UL 1685 – for CT listed sizes 1/0 AWG and larger
- UL VW-1 available upon request

ADDITIONAL STANDARDS:

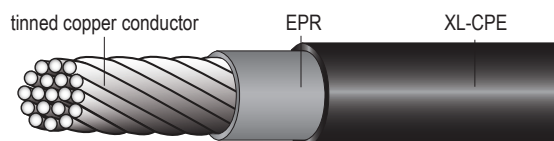
- NEMA WC-70
- Federal Spec J-C-30B

NOTE:

- CT rated on sizes 1/0 AWG and larger

BUILDING WIRE

**600 Volt UL 90°C
RHW-2 or RHH or USE-2
EPR Insulation
XL-CPE Jacket
Tinned Copper Conductor**



Catalog Number	Size AWG/kcmil	Number of Strands	EPR Insulation Thickness Mils	CPE Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW005 01401	14	7	30	15	0.17	25
HW005 01201	12	7	30	15	0.19	35
HW005 01001	10	7	30	15	0.21	50
HW005 00801	8	7	45	15	0.26	81
HW005 00601	6	7	45	30	0.35	130
HW005 00401	4	7	45	30	0.40	185
HW005 00201	2	7	45	30	0.46	275
HW005 00101	1	19	55	45	0.54	360
HW005 10101	1/0	19	55	45	0.59	440
HW005 20101	2/0	19	55	45	0.63	535
HW005 30101	3/0	19	55	45	0.68	655
HW005 40101	4/0	19	55	45	0.74	810
HW005 25001	250	37	65	65	0.85	990
HW005 35001	350	37	65	65	0.96	1335
HW005 50001	500	37	65	65	1.10	1850
HW005 75001	750	61	80	65	1.32	2720
HW005 10001	1000	61	80	65	1.47	3560

APPLICATION:

For use in harsh environments in a broad range of commercial, industrial and utility applications where reliability and maximum performance is required. Approved for installation in conduits, ducts, cable tray when CT rated, direct burial or other approved raceways with maximum conductor temperature of 90°C in wet or dry locations.

CONDUCTOR:

Tin-coated, soft annealed copper per ASTM B-33, Class B stranding per ASTM B-8

INSULATION:

Lead-free ethylene propylene rubber (EPR) per ICEA S-95-658, UL Standard 854 for Type USE-2 and UL Standard 44 for Types RHH and RHW-2, VW-1 conductors

JACKET:

Cross-linked chlorinated polyethylene per UL Standard 44. Sunlight resistant on sizes 1/0 AWG and larger.

FLAME TESTS:

- UL 1685 – for CT listed sizes 1/0 AWG and larger
- UL VW-1 available upon request

ADDITIONAL STANDARDS:

- NEMA WC-70
- Federal Spec J-C-30B

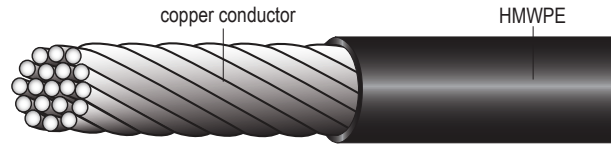
NOTE:

- CT rated on sizes 1/0 AWG and larger

SPECIFICATION HW006

CATHODIC PROTECTION

**600 Volt 75°C
HMW Polyethylene Insulation
Copper Conductor**



Catalog Number	Size AWG/kcmil	Number of Strands	Insulation Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW006 01001	10	7	110	0.34	80
HW006 00801	8	7	110	0.38	92
HW006 00601	6	7	110	0.41	128
HW006 00401	4	7	110	0.46	185
HW006 00201	2	7	110	0.52	272
HW006 00101	1	19	125	0.59	340
HW006 10101	1/0	19	125	0.63	415
HW006 20101	2/0	19	125	0.67	509
HW006 30101	3/0	19	125	0.72	624
HW006 40101	4/0	19	125	0.78	771
HW006 25001	250	37	155	0.89	925
HW006 35001	350	37	155	0.99	1260
HW006 50001	500	37	155	0.14	1770

APPLICATION:

For use in systems designed to protect against electrolytic and galvanic corrosion in pipelines, storage tanks, steel pilings, well casings, and other buried or water-submerged metallic surfaces. The high molecular weight polyethylene (HMWPE) used in cathodic protection cable provides outstanding dielectric strength with excellent resistance against moisture, abrasion, and corrosive chemicals.

CONDUCTOR:

Soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8

INSULATION:

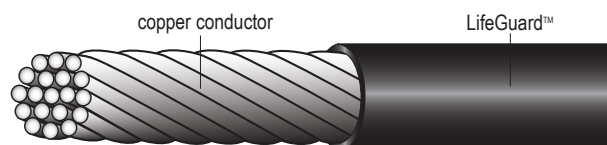
High molecular weight polyethylene (HMWPE)

ADDITIONAL STANDARDS:

- ASTM D1248, Type 1, Class C, Category 5, Grades E-5 and J-1 (HMWPE)

POWER CABLE

**600 V UL 90°C
XHHW-LS, VW-1
XLP Low Smoke Zero Halogen Insulation/Jacket
Copper Conductor**



Catalog Number	Size AWG/kcmil	Number of Strands	Insulation Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW010 01401	14	7	30	0.13	18
HW010 01201	12	7	30	0.15	27
HW010 01001	10	7	30	0.17	40
HW010 00801	8	7	45	0.23	64
HW010 00601	6	7	45	0.27	98
HW010 00401	4	7	45	0.32	150
HW010 00301	3	7	45	0.34	182
HW010 00201	2	7	45	0.37	231
HW010 00101	1	19	55	0.43	291
HW010 10101	1/0	19	55	0.47	362
HW010 20101	2/0	19	55	0.51	451
HW010 30101	3/0	19	55	0.26	563
HW010 40101	4/0	19	55	0.62	704
HW010 25001	250	37	65	0.69	835
HW010 35001	350	37	65	0.79	1155
HW010 50001	500	37	65	0.92	1632
HW010 75001	750	61	80	1.13	2411
HW010 10001	1000	61	80	1.28	3231

APPLICATION:

LifeGuard™ Low Smoke Zero Halogen cable is for use in harsh environments for power control and lighting circuits in a broad range of commercial, industrial and utility applications. It is highly flame retardant, produces very small amounts of smoke when burned and contains no halogens. LifeGuard™ cable is ideal for applications where a high degree of safety and protection is required.

LifeGuard™ cable is NEC listed as Type XHHW-LS and approved for installation in conduit, duct, cable tray when CT Rated; or other approved raceways. It may be installed in temperatures as low as -30°C and is rated for use at 75°C in wet locations and 90°C in dry locations.

CONDUCTOR:

Soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8

INSULATION:

Thermoset, flame-retardant Low Smoke Zero Halogen polyolefin per ICEA S-95-658, UL Standard 1685 and UL Standard 44 for type XHHW conductors

PRODUCT FEATURES:

- Cable tray rated on sizes 1/0 AWG and larger
- Tinned conductor provides ease of termination and added protection in caustic environments
- Very low smoke production when burned
- LifeGuard™ jacket produces zero halogens during fire – less toxic and corrosive
- LifeGuard™ jacket is environmentally safe – lead, sulfur and halogen free
- Highly chemical resistant
- Very flame retardant
- Burns to an ash – does not exhibit thermoplastic drip
- Excellent compression and impact resistance
- Superior tensile strength and abrasion resistance
- Mechanically superior insulation with low coefficient of friction

FLAME TESTS:

- 1/0 AWG – 750 MCM, IEEE 1202 (70,000 BTU/hr) Flame Test
- UL VW-1

ADDITIONAL STANDARDS:

- Nema WC-70

COLOR OPTIONS:

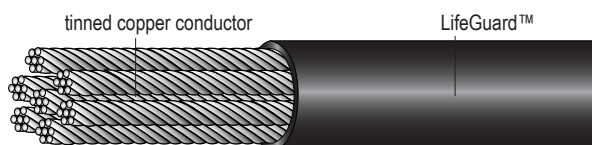
Black, white, red, green and blue

SPECIFICATION

HW020

POWER CABLE

**600 Volt UL 90°C
RHH-LS or RHW-LS, VW-1
Low Smoke Zero Halogen Insulation/Jacket
Tinned Copper Conductor**



Catalog Number	Size AWG/kcmil	Number of Strands	Insulation Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW020 01401	14	41	45	0.16	27
HW020 01201	12	65	45	0.18	36
HW020 01001	10	49	45	0.20	50
HW020 00801	8	49	60	0.27	82
HW020 00601	6	63	60	0.33	117
HW020 00401	4	105	60	0.39	178
HW020 00201	2	161	60	0.45	260

APPLICATION:

LifeGuard™ Low Smoke Zero Halogen cable is for use in harsh environments in a broad range of commercial, industrial and utility applications where reliability and maximum performance is required. It is highly flame retardant, produces very small amounts of smoke when burned and contains no halogens. LifeGuard™ cable is ideal for applications where a high degree of safety and equipment protection is required.

It is rated for use at 75°C in wet locations and 90°C in dry locations and approved for installation in conduit, duct, cable tray when CT rated; or other approved raceways.

CONDUCTOR:

Tin coated soft annealed copper per ASTM B-33, Class K, G or I flexible stranding per ASTM B-172, B-173, B-174

INSULATION/JACKET:

Thermoset, sunlight-resistant and flame-retardant Low Smoke Zero Halogen polyolefin per ICEA S-95-658, UL Standard 44 and UL Standard 1685

PRODUCT FEATURES:

- Cable tray rated on sizes 1/0 AWG and larger
- Sunlight-resistant
- Tinned conductor provides ease of termination and added protection in caustic environments
- Very low smoke production when burned
- LifeGuard™ jacket produces zero halogens during fire, less toxic and corrosive
- LifeGuard™ jacket is environmentally safe – lead, sulfur and halogen free
- Highly chemical resistant
- Very flame retardant
- Burns to an ash – does not exhibit thermoplastic drip
- Excellent compression and impact resistance
- Superior tensile strength and abrasion resistance
- Flexible jacket with low coefficient of friction

FLAME TESTS:

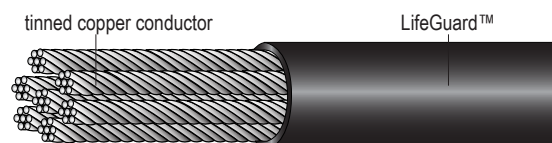
- 8 AWG – 750 MCM, IEEE 1202 (70,000 BTU/hr) Flame Test
- UL VW-1

ADDITIONAL STANDARDS:

- NEMA WC-70

POWER CABLE

**600 V UL 90°C
RHH-LS or RHW-LS, VW-1
Low Smoke Zero Halogen Insulation/Jacket
Tinned Copper Conductor**



Catalog Number	Size AWG/kcmil	Number of Strands	Insulation Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW020 10101	1/0	26	80	0.58	423
HW020 20101	2/0	342	80	0.63	538
HW020 40101	4/0	532	80	0.74	759
HW020 35001	350	882	95	0.95	1302
HW020 50001	500	1225	95	1.09	1831
HW020 75001	750	1862	110	1.33	2752

APPLICATION:

LifeGuard™ Low Smoke Zero Halogen cable is for use in harsh environments in a broad range of commercial, industrial and utility applications where reliability and maximum performance is required. It is highly flame retardant, produces very small amounts of smoke when burned and contains no halogens. LifeGuard™ cable is ideal for applications where a high degree of safety and equipment protection is required.

It is rated for use at 75°C in wet locations and 90°C in dry locations and approved for installation in conduit, duct, cable tray when CT rated; or other approved raceways.

CONDUCTOR:

Tin coated soft annealed copper per ASTM B-33, Class K, G or I flexible stranding per ASTM B-172, B-173, B-174

INSULATION/JACKET:

Thermoset, sunlight-resistant and flame-retardant Low Smoke Zero Halogen polyolefin per ICEA S-95-658, UL Standard 44 and UL Standard 1685

PRODUCT FEATURES:

- Cable tray rated on sizes 1/0 AWG and larger
- Sunlight-resistant
- Tinned conductor provides ease of termination and added protection in caustic environments
- Very low smoke production when burned
- LifeGuard™ jacket produces zero halogens during fire – less toxic and corrosive
- LifeGuard™ jacket is environmentally safe – lead, sulfur and halogen free
- Highly chemical resistant
- Very flame retardant
- Burns to an ash – does not exhibit thermoplastic drip
- Excellent compression and impact resistance
- Superior tensile strength and abrasion resistance
- Flexible jacket with low coefficient of friction

FLAME TESTS:

- 8 AWG – 750 MCM, IEEE 1202 (70,000 BTU/hr) Flame Test
- UL VW-1

ADDITIONAL STANDARDS:

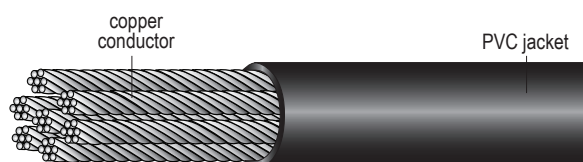
- Nema WC-70

SECTION B

Hook-Up, Lead & High Temperature Cable

DESCRIPTION	TYPE	TEMPERATURE	SPECIFICATION	PAGE
Hook-Up Wire	UL 1007/UL 1569	90°C/105°C	HW030	13
Hook-Up Wire	UL 1015	105°C	HW031	14
Hook-Up Wire	UL 1028	75°C	HW032	15
Hook-Up Wire	UL 1061	80°C	HW033	16
Hook-Up Wire	UL 1283	105°C	HW034	17
Switchboard Wire	SIS	90°C	HW050	18
Switchboard Wire, Flexible Strand	SIS	90°C	HW051	19
Switchboard Wire, Flexible Strand, VW-1	SIS	90°C	HW052	20
Motor Lead, Appliance and Fixture Wire	SFF-2/SRG	150°C	HW053	21
Appliance and Fixture Wire	SF-2/SRG	200°C	HW054	22
Lead Wire & Power Cable	SRK	200°C	HW055	23
Industrial Power and Apparatus Wire	FEP	200°C	HW056	24
Appliance Apparatus and Motor Lead Wire	TGGT	250°C	HW057	25
Appliance Wire	MGT	450°C/538°C	HW058	26
Extreme Heat Cable		450°C/538°C	HW059	27
Circuit Integrity Cable		200°C	HW060	29

UL 1007/UL 1569
300 Volt, 90°C and 105°C
PVC Insulation
Solid or Stranded Copper Conductor



Catalog Number	Size AWG/kcmil	Number of Strands	Insulation Thickness Mils	Nominal Cond. Diameter Inch	Overall Diameter Inches	Net Weight Lbs/Mft
HW030 28	28	7/36	16	0.015	0.047	1.56
HW030 26	26	7/34	16	0.019	0.051	1.98
HW030 24	24	7/32	16	0.024	0.056	2.77
HW030 22	22	7/30	16	0.030	0.063	3.65
HW030 20	20	10/30	16	0.037	0.070	4.79
HW030 18	18	16/30	16	0.048	0.080	6.98
HW030 16	16	26/30	16	0.060	0.092	10.45
HW030 14	14	41/30	16	0.075	0.105	15.61
HW030 12	12	65/30	16	0.096	0.127	24.68
HW030 10	10	105/30	16	0.130	0.157	37.34

APPLICATION:

Used as internal wiring for appliances and electrical and electronic equipment. Also used for wiring and cable assemblies in data and electronic equipment.

CONDUCTOR:

Solid or stranded annealed bare or tinned copper per ASTM B33

INSULATION:

Flame, chemical and moisture resistant PVC

CHARACTERISTICS:

- UL VW-1 Vertical Flame Test:
 UL 1007 – 32 AWG to 16 AWG
 UL 1569 – 32 AWG to 14 AWG
 CSA – 28 AWG to 14 AWG
- Temperature Range:
 -25°C to 105°C UL 1569 AWM
 -25°C to 90°C CSA TR-64
 -25°C to 80°C UL 1007 AWM
- Voltage Rating: 300 Volt RMS
- UL and CSA Dual Rated Wire

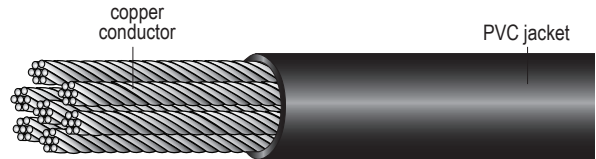
STOCK COLORS:

Multiple colors available

SPECIFICATION
HW031

UL 1015

600 Volt, 105°C
PVC Insulation
Solid or Stranded Copper Conductor



Catalog Number	Size AWG/kcmil	Number of Strands	Insulation Thickness Mils	Nominal Cond. Diameter Inch	Overall Diameter Inches	Net Weight Lbs/Mft
HW031 26	26	7/34	32	0.019	0.081	3.890
HW031 24	24	7/32	32	0.024	0.086	4.850
HW031 22	22	7/30	32	0.030	0.093	5.910
HW031 20	20	10/30	32	0.037	0.100	7.250
HW031 18	18	16/30	32	0.048	0.109	9.730
HW031 16	16	26/30	32	0.060	0.122	13.550
HW031 14	14	41/30	32	0.075	0.137	19.150
HW031 12	12	65/30	32	0.096	0.157	28.540
HW031 10	10	105/30	32	0.130	0.187	42.170

APPLICATION:

Used as internal wiring for appliances and electrical and electronic equipment. Also used for wiring and cable assemblies in data and electronic equipment.

CONDUCTOR:

Solid or stranded annealed bare or tinned copper per ASTM B33

INSULATION:

Flame, chemical and moisture resistant PVC

CHARACTERISTICS:

- UL VW-1 Vertical Flame Test:
- Temperature Range:
-20°C to 105°C UL 1015,
CSA TEW-105
- Voltage Rating: 600 Volt RMS
- UL and CSA Style TEW, MTW

STOCK COLORS:

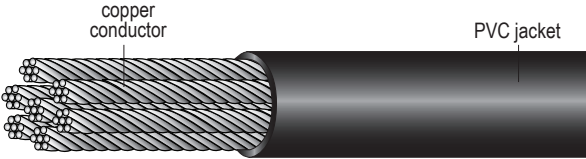
Multiple colors available

STYLE OPTIONS:

- 1011 80°C VW-1
- 1013 90°C VW-1
- 1015 105°C VW-1
- 1032 90°C VW-1 – 1000 Volt
- 1230 105°C VW-1 – Moisture Resistant 60°C

HOOK UP, LEAD & HIGH TEMP CABLE

UL 1028
600 Volt, 105°C
PVC Insulation
Solid or Stranded Copper Conductor



Catalog Number	Size AWG/kcmil	Number of Strands	Insulation Thickness Mils	Nominal Cond. Diameter Inch	Overall Diameter Inches	Net Weight Lbs/Mft
HW032 08	8	133/29	47	0.166	0.260	72

APPLICATION:
 Used as internal wiring for appliances and electrical and electronic equipment. Also used for wiring and cable assemblies in data and electronic equipment.

CONDUCTOR:
 Solid or stranded annealed bare or tinned copper per ASTM B33

INSULATION:
 Flame, chemical and moisture resistant PVC

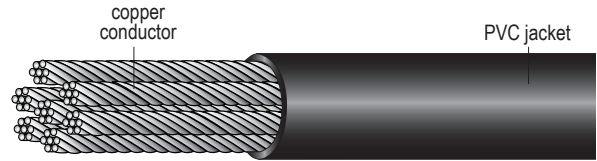
- CHARACTERISTICS:**
- UL VW-1 Vertical Flame Test
 - Temperature Range:
 -20°C to 105°C
 CSA TEW-105
 - Voltage Rating: 600 Volt RMS
 - UL and CSA TEW, MTW

STOCK COLORS:
 Multiple colors available

SPECIFICATION
HW033

UL 1061

**300 Volt, 80°C
PVC Insulation
Solid or Stranded Copper Conductor**



Catalog Number	Size AWG/kcmil	Number of Strands	Insulation Thickness Mils	Nominal Cond. Diameter Inch	Overall Diameter Inches	Net Weight Lbs/Mft
HW033 30	30	7/38	9	0.012	0.032	0.09
HW033 28	28	7/36	9	0.015	0.035	1.08
HW033 26	26	7/34	9	0.019	0.039	1.46
HW033 24	24	7/32	9	0.024	0.044	2.18
HW033 22	22	7/30	9	0.030	0.051	3.29
HW033 20	20	10/30	9	0.037	0.058	4.05
HW033 18	18	16/30	9	0.048	0.068	6.12
HW033 16	16	26/30	9	0.060	0.080	9.42

APPLICATION:

Used as internal wiring for appliances and electrical and electronic equipment. Also used for wiring and cable assemblies in data and electronic equipment.

CONDUCTOR:

Solid or stranded annealed bare or tinned copper per ASTM B33

INSULATION:

Flame, chemical and moisture resistant PVC

CHARACTERISTICS:

- UL VW-1 Vertical Flame Test
- Temperature Range:
-10°C to 80°C UL1061,
CSA T11 SR-PVC 80°C
- Voltage Rating: 300 Volt RMS
- UL and CSA Dual Rated Wire

STOCK COLORS:

Multiple colors available

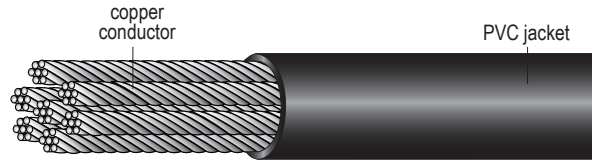
HOOK UP, LEAD & HIGH TEMP CABLE

UL 1283

600 Volt, 105°C

PVC Insulation

Solid or Stranded Copper Conductor



Catalog Number	Size AWG/kcmil	Number of Strands	Insulation Thickness Mils	Nominal Cond. Diameter Inch	Overall Diameter Inches	Net Weight Lbs/Mft
HW034 06	6	133/27	62	0.213	0.334	115.29
HW034 04	4	133/25	62	0.265	0.388	169.54

APPLICATION:

Used as internal wiring for appliances and electrical and electronic equipment. Also used for wiring and cable assemblies in data and electronic equipment.

CONDUCTOR:

Solid or stranded annealed bare or tinned coated copper per ASTM B33

INSULATION:

Flame, chemical and moisture resistant PVC

CHARACTERISTICS:

- UL VW-1 Vertical Flame Test
- Temperature Range:
-20°C to 105°C 1283
CSA TEW-105
- Voltage Rating: 600 Volt RMS
- UL and CSA TEW, MTW

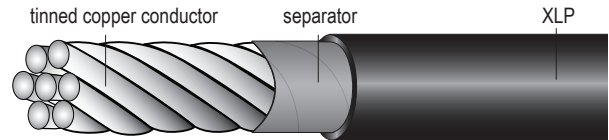
STOCK COLORS:

Black, green, grey, red and white

SPECIFICATION
HW050

SWITCHBOARD WIRE

**600 Volt UL Type SIS 90°C
XLP Insulation
Tinned Copper Conductor**



Catalog Number	Size AWG	Number of Strands	Insulation Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW050 01801	18	7	30	0.11	10
HW050 01601	16	7	30	0.12	14
HW050 01401	14	7	30	0.14	19
HW050 01201	12	7	30	0.15	27
HW050 01001	10	7	30	0.18	42

APPLICATION:

For use in power and control circuits in switchboards, control panels and recognized raceways in applications not exceeding 600 volts. UL approved for NEC continuous operations at 75°C in wet locations and 90°C in dry locations.

CONDUCTOR:

Tin-coated, soft annealed copper per ASTM B-33, Class B stranding per ASTM B-8

INSULATION:

Cross-linked polyethylene (XLP) per UL Standard 44

FLAME TESTS:

- UL 44 Horizontal Flame Test

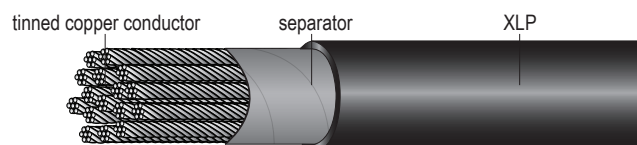
STOCK COLORS:

Black, white, red, green, orange, blue and gray

NOTE:

- Special colors available upon request
- Flexible stranding available upon request (see HW051)
- 18 AWG — 16 AWG: Switchboard wire/UL AWM 3320 or UL 3173 or FFH-2

SWITCHBOARD WIRE
600 Volt UL Type SIS 90°C
XLP Insulation
Flexible Strand
Tinned Copper Conductor



Catalog Number	Size AWG	Number of Strands	Insulation Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW051 01801	18	16	30	0.11	10
HW051 01601	16	26	30	0.12	14
HW051 01401	14	41	30	0.14	19
HW051 01201	12	65	30	0.15	27
HW051 01001	10	105	30	0.18	42
HW051 00801	8	133	45	0.27	72
HW051 00601	6	133	45	0.30	105
HW051 00401	4	133	45	0.36	152
HW051 00201	2	133	45	0.43	240

APPLICATION:

For use in power and control circuits in switchboards, control panels and recognized raceways in applications not exceeding 600 volts. UL approved for NEC continuous operations at 75°C in wet locations and 90°C in dry locations.

CONDUCTOR:

- 18 AWG — 10 AWG: Tin-coated, soft annealed copper per ASTM B-33, Class K stranding per ASTM B-174
- 8 AWG — 2 AWG: Tin-coated, soft annealed copper per ASTM B-33, Class H stranding per ASTM B-173

INSULATION:

Cross-linked polyethylene (XLP) per UL Standard 44

FLAME TESTS:

- UL 44 Horizontal Flame Test

STOCK COLORS:

Black, white, red, green, orange, blue and gray

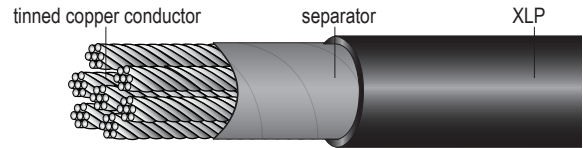
NOTE:

- 7 strand available upon request (see HW050)
- Special colors available upon request
- 18 AWG — 16 AWG: Switchboard wire/UL AWM 3320 or UL 3173 or FHH-2

**SPECIFICATION
HW052**

SWITCHBOARD WIRE

**600 Volt UL Type SIS 90°C
XLP Insulation, VW-1
Flexible Strand
Tinned Copper Conductor**



Catalog Number	Size AWG	Number of Strands	Insulation Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW052 01401	14	41	30	0.14	19
HW052 01201	12	65	30	0.15	27
HW052 01001	10	105	30	0.18	42
HW052 00801	8	133	45	0.27	72
HW052 00601	6	133	45	0.30	105
HW052 00401	4	133	45	0.36	152
HW052 00201	2	133	45	0.43	240

APPLICATION:

For use in power and control circuits in switchboards, control panels and recognized raceways in applications not exceeding 600 volts. UL approved for NEC continuous operations at 75°C in wet locations and 90°C in dry locations.

CONDUCTOR:

- 14 AWG – 10 AWG: Tin-coated, soft bare annealed copper per ASTM B-33, Class K stranding per ASTM B-174
- 8 AWG – 2 AWG: Tin-coated, soft bare annealed copper per ASTM B-33, Class H stranding per ASTM B-173

INSULATION:

Cross-linked polyethylene (XLP), rated VW-1 per UL Standard 44

FLAME TESTS:

- VW-1 Flame Test
- UL 44 Horizontal Flame Test

STOCK COLORS:

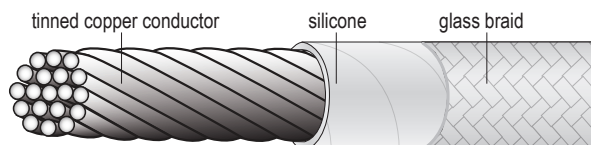
Black, white, red, green, orange, blue and gray

NOTE:

- Special colors available upon request
- 7 strand available upon request

**MOTOR LEAD, APPLIANCE
& FIXTURE WIRE, SRG**

**600 Volt UL Type SFF-2, CSA SEWF-2 150°C
Silicone Rubber Insulation
Glass Braid Jacket
Flexible Strand & Tinned Copper Conductor**



Catalog Number	Size AWG	Number of Strands	Insulation Thickness Mils	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW053 01801	18	16	30	6	0.12	12
HW053 01601	16	26	30	6	0.13	16
HW053 01401	14	41	30	6	0.15	22
HW053 01201	12	65	30	6	0.16	32
HW053 01001	10	105	45	6	0.23	62
HW053 00801	8	133	60	15	0.31	90
HW053 00601	6	133	60	15	0.36	140

APPLICATION:

For use in high and low temperature environments where moisture and abrasion resistance is required in internal wiring of appliances and electrical equipment, motor lead and fixture applications.

CONDUCTOR:

- 18 AWG — 10 AWG: Tin-coated, soft annealed copper per ASTM B-33, Class K stranding per ASTM B-174
- 8 AWG — 6 AWG: Tin-coated, soft annealed copper per ASTM B-33, Class H stranding per ASTM B-173

INSULATION:

Silicone rubber

JACKET:

Glass braid treated with a flame, heat and moisture resistant finish

FLAME TESTS:

- VW-1 Flame Test
- FT-1 Flame Test

STOCK COLORS:

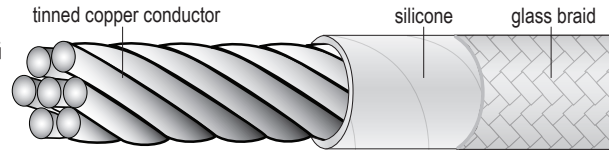
Black, white, red, green, blue and yellow

NOTE:

- 18 AWG – 10 AWG: CSA SFF-2
- 12 AWG – 6 AWG: CSA SEWF-2
- 8 AWG – 6 AWG: CSA AWM Styles

SPECIFICATION
HW054

APPLIANCE & FIXTURE WIRE, SRG
600 Volt UL Type SF-2, CSA SEW-2 200°C
Silicone Rubber Insulation
Glass Braid Jacket
Tinned Copper Conductor



Catalog Number	Size AWG	Number of Strands	Insulation Thickness Mils	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW054 01801	18	7	30	6	0.12	12
HW054 01601	16	7	30	6	0.13	16
HW054 01401	14	7	30	6	0.14	22
HW054 01201	12	19	30	6	0.17	32
HW054 01001	10	19	45	6	0.23	62
HW054 00801	8	49	60	15	0.31	90
HW054 00601	6	49	60	15	0.36	140
HW054 00401	4	133	60	15	0.46	190
HW054 00301	3	133	60	15	0.50	226
HW054 00201	2	133	60	15	0.54	270

APPLICATION:

For use in high and low temperature environments where moisture and abrasion resistance is required in internal wiring of appliances and electrical equipment, motor lead and fixture applications.

CONDUCTOR:

- 18 AWG – 10 AWG: Tin-coated, soft annealed copper per ASTM B-33, Class B stranding per ASTM B-8
- 8 AWG – 6 AWG: Tin coated, soft annealed copper per ASTM B-33, Class G stranding per ASTM B-173
- 4 AWG – 2 AWG: Tin coated, soft annealed copper per ASTM B-33, Class H stranding per ASTM B-173

INSULATION:

Silicone rubber

JACKET:

Glass braid treated with a flame, heat and moisture resistant finish

FLAME TESTS:

- VW-1 Flame Test
- FT-1 Flame Fest

STOCK COLORS:

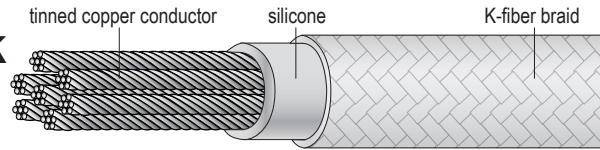
Black, white, red and green

NOTE:

- 18 AWG - 10 AWG: UL SF-2 (per NEC Table 4023)
- 8 AWG - 2 AWG: UL AWM Styles

LEAD WIRE & POWER CABLE, SRK

**600 Volt, Style 3410 200°C
Silicone Rubber Insulation
K-Fiber Braid Jacket
Flexible Strand & Tinned Copper Conductor**



Catalog Number	Size AWG	Number of Strands	Insulation Thickness Mils	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW055 00101	1	259	80	30	0.62	350
HW055 10101	1/0	259	80	30	0.66	420
HW055 20101	2/0	259	80	30	0.71	520
HW055 30101	3/0	259	80	30	0.77	640
HW055 40101	4/0	259	80	30	0.84	780
HW055 25001	250	427	80	30	0.92	940
HW055 35001	350	427	95	30	1.03	1280
HW055 50001	500	427	95	30	1.19	1760
HW055 75001	750	427	110	30	1.40	2630

APPLICATION:

For use in high and low temperature environments where moisture and abrasion resistance is required in internal wiring of appliances and electrical equipment, motor lead and fixture applications.

CONDUCTOR:

Tin-coated, soft annealed copper per ASTM B-33, Class H stranding per ASTM B-173

INSULATION:

Silicone rubber

JACKET:

K-fiber braid treated with a flame, heat moisture and abrasion resistant finish

FLAME TESTS:

VW-1 Flame Test

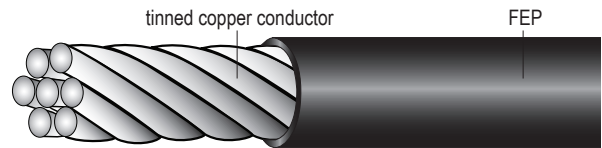
STOCK COLORS:

Black

SPECIFICATION
HW056

**INDUSTRIAL POWER
& APPARATUS WIRE**

**600 Volt UL 200°C
FEP Teflon® Insulation
Tinned Copper Conductor**



HOO K U P, L E A D & H I G H T E M P C A B L E

Catalog Number	Size AWG	Number of Strands	Insulation Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW056 01601	16	7	20	0.09	12
HW056 01401	14	7	20	0.10	19
HW056 01201	12	19	20	0.12	25
HW056 01001	10	37	20	0.15	36
HW056 00801	8	49	30	0.22	70
HW056 00601	6	49	30	0.26	103
HW056 00401	4	133	30	0.32	158
HW056 00201	2	133	30	0.39	251

APPLICATION:

For use in power and control circuits in high temperature, caustic environments where durability, flexibility and resistance to moisture is required.

CONDUCTOR:

16 AWG – 14 AWG: Tin coated, soft annealed copper per ASTM B-33

INSULATION:

FEP Teflon®

FLAME TESTS:

- VW-1 Flame Test
- FT-1 Flame Test

STOCK COLORS:

Black, white, red and green

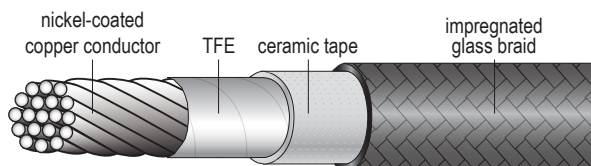
**APPARATUS & MOTOR
LEAD WIRE, TGGT**

600 Volt UL 250°C

TFE Teflon® Ceramic Tape Impregnated Insulation

TFE Teflon® Impregnated Glass Braid Jacket

Flexible Strand & Nickel-Coated Copper Conductor



Catalog Number	Size AWG	Number of Strands	Insulation Thickness Mils	Ceramic Tape Thickness Mils	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW057 01801	18	16	15	10	13	0.11	13
HW057 01601	16	26	15	10	13	0.12	18
HW057 01401	14	41	15	10	13	0.14	24
HW057 01201	12	65	15	10	13	0.16	34
HW057 01001	10	105	15	10	13	0.19	51
HW057 00801	8	133	15	10	13	0.23	65
HW057 00601	6	133	20	15	19	0.29	114
HW057 00401	4	133	20	15	19	0.34	168
HW057 00201	2	133	20	15	19	0.41	246
HW057 10101	1/0	259	35	15	19	0.51	392
HW057 20101	2/0	259	35	15	19	0.57	490
HW057 40101	4/0	259	35	15	19	0.69	746

APPLICATION:

For use in damp and dry high temperature environments for electronic equipment and appliances, and as internal wiring in commercial and industrial heating and cooking equipment.

CONDUCTOR:

- 18 AWG – 10 AWG: Nickel-plated, soft annealed copper per ASTM B-355, Class K stranding per ASTM B-174
- 8 AWG – 4/0 AWG: Nickel-plated, soft annealed copper per ASTM B-355, Class H stranding per ASTM B-173

INSULATION:

TFE Teflon®/ceramic tape

JACKET:

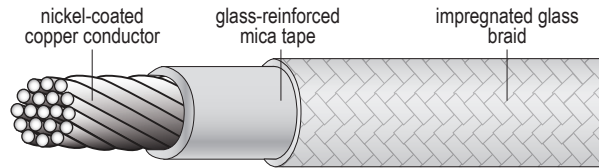
TFE Teflon® impregnated glass braid treated with a flame, heat, moisture and abrasion resistant finish

FLAME TESTS:

- VW-1 Flame Test
- FT-1 Flame Test

SPECIFICATION
HW058

APPLIANCE WIRE, MGT
600 Volt 450°C UL/538°C Non-UL
Glass Reinforced Mica Tape Insulation
Impregnated Glass Braid Jacket
Flexible Strand
Nickel-Coated Copper Conductor



Catalog Number	Size AWG	Number of Strands	Insulation Thickness Mils	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW058 01801	18	16	25	7	0.11	12
HW058 01601	16	26	25	7	0.12	16
HW058 01401	14	41	25	7	0.13	22
HW058 01201	12	65	25	7	0.15	31
HW058 01001	10	105	30	15	0.20	50
HW058 00801	8	133	30	15	0.25	76
HW058 00601	6	133	30	15	0.29	111
HW058 00401	4	133	30	15	0.35	170
HW058 00201	2	133	35	25	0.46	265
HW058 00101	1	259	35	25	0.50	315
HW058 10101	1/0	259	35	25	0.54	391
HW058 20101	2/0	259	35	25	0.60	493
HW058 30101	3/0	259	35	25	0.65	605
HW058 40101	4/0	259	35	25	0.73	760

APPLICATION:

For use in very high temperature environments for wiring in ovens or other high temperature equipment in applications up to 538°C. UL listed per UL Style 5107 for applications up to 450°C.

CONDUCTOR:

- 18 AWG – 10 AWG: 27% nickel-coated, soft annealed copper per ASTM B-355, Class K stranding per ASTM B-174
- 8 AWG – 4/0 AWG: 27% nickel-coated, soft annealed copper per ASTM B-355, Class H stranding per ASTM B-173

INSULATION:

Glass-reinforced mica tapes

JACKET:

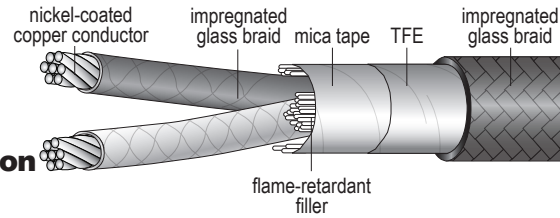
Impregnated glass braid treated with a flame, heat, moisture and abrasion resistant finish

FLAME TESTS:

- VW-1 Flame Test
- FT-1 Flame Test

EXTREME HEAT CABLE

**600 Volt 450°C UL/538°C Non-UL
Mica/Glass & Braided Impregnated Glass Insulation
Mica/Glass, TFE Teflon® Moisture Barrier
Braided Impregnated Glass Jacket
Flexible Strand & Nickel-Coated Copper Conductor**



Catalog Number	Size AWG	Number of Conductors	Number of Strands	Mica/TFE Thickness Mils	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW059 01801	18	1	16	25	10	0.16	20
HW059 01803	18	3	16	25	10	0.32	60
HW059 01804	18	4	16	25	10	0.35	80
HW059 01806	18	6	16	25	15	0.42	112
HW059 01601	16	1	26	25	12	0.18	26
HW059 01602	16	2	26	25	12	0.32	66
HW059 01603	16	3	26	25	12	0.34	97
HW059 01604	16	4	26	25	15	0.38	100
HW059 01606	16	6	26	25	15	0.45	140

APPLICATION:

Highly flame-resistive cable for use in high temperature environments where extreme heat is required. Used for power, control and instrumentation circuits in iron, steel, glass, aluminum and refining applications.

CONDUCTOR:

- 18 AWG – 10 AWG: 27% nickel-coated, soft annealed copper per ASTM B-355, Class K stranding per ASTM B-174
- 8 AWG – 2 AWG: 27% nickel-coated, soft annealed copper per ASTM B-355, Class H stranding per ASTM B-173

INSULATION:

Mica, Glass and TFE Teflon®

JACKET:

Impregnated glass braid treated with a flame, heat, moisture and abrasion resistant finish

FLAME TESTS:

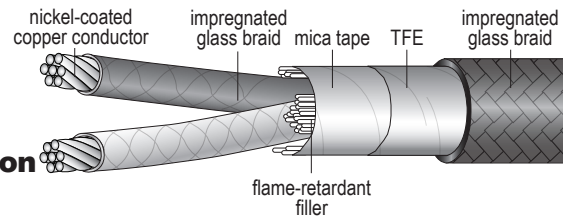
- IEEE 383 modified (210,000 BTU/hr) vertical tray Flame Test
- IEEE 383 Flame Test 2000°F, 2-hours @ 1000 V
- IEEE 383 Flame Test 2000°F, 3-hours @ 480 V
- IEEE 1202/FT4 Flame Test
- ETL Vertical Tray Flame Test
- UL 1685

SPECIFICATION
HW059

HOOK UP, LEAD & HIGH TEMP CABLE

EXTREME HEAT CABLE

600 Volt 450°C UL/538°C Non-UL
Mica/Glass & Braided Impregnated Glass Insulation
Mica/Glass, TFE Teflon® Moisture Barrier
Braided Impregnated Glass Jacket
Flexible Strand & Nickel-Coated Copper Conductor



Catalog Number	Size AWG	Number of Conductors	Number of Strands	Mica/TFE Thickness Mils	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW059 01401	14	1	41	25	10	0.19	30
HW059 01402	14	2	41	25	10	0.34	79
HW059 01403	14	3	41	25	15	0.38	100
HW059 01404	14	4	41	25	15	0.41	126
HW059 01406	14	6	41	25	15	0.49	180
HW059 01201	12	1	65	25	10	0.21	42
HW059 01202	12	2	65	25	10	0.41	108
HW059 01203	12	3	65	25	15	0.42	140
HW059 01204	12	4	65	25	15	0.47	173
HW059 01206	12	6	65	25	15	0.57	248
HW059 01001	10	1	105	30	12	0.27	65
HW059 01002	10	2	105	30	15	0.46	151
HW059 01003	10	3	105	30	15	0.52	208
HW059 01004	10	4	105	30	15	0.56	263
HW059 01006	10	6	105	30	15	0.67	372
HW059 00801	8	1	133	30	10	0.32	98
HW059 00601	6	1	133	30	12	0.45	112
HW059 00401	4	1	133	30	15	0.49	170
HW059 00201	2	1	133	35	15	0.53	270

APPLICATION:

Highly flame-retardant cable for use in high temperature environments where extreme heat is required. Used for power, control and instrumentation circuits in iron, steel, glass, aluminum and refining applications.

CONDUCTOR:

- 18 AWG – 10 AWG: 27% nickel-coated, soft annealed copper per ASTM B-355, Class K stranding per ASTM B-174
- 8 AWG – 2 AWG: 27% nickel-coated, soft annealed copper per ASTM B-355, Class H stranding per ASTM B-173

INSULATION:

Mica, Glass and TFE Teflon®

JACKET:

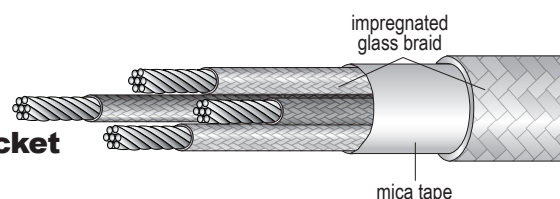
Impregnated glass braid treated with a flame, heat, moisture, and abrasion resistant finish

FLAME TESTS:

- IEEE 383 modified (210,000 BTU/hr) vertical tray Flame Test
- IEEE 383 Flame Test 2000°F, 2-hours @ 1000 V
- IEEE 383 Flame Test 2000°F, 3-hours @ 480 V
- IEEE 1202/FT4 Flame Test
- ETL Vertical Tray Flame Test
- UL 1685

CIRCUIT INTEGRITY CABLE

**Flexible Integrity Cable with Fluoropolymer Jacket
Suitable for Hydrocarbon Fire, 2000°F
Designed as an Alternate to Mineral Insulated (MI) Cable
Suitable for Continuous Use Temperature of 200°C
Nickel-Coated Copper Conductor**



Catalog Number	Size AWG	Number of Conductors	Number of Strands	Insulation Thickness Mils	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW060 01604	16	4	7	55	15	0.53	164
HW060 01404	14	4	19	70	15	0.58	215
HW060 01407	14	7	19	70	15	0.70	297
HW060 01409	14	9	19	70	15	0.84	398
HW060 01412	14	12	19	70	15	0.95	496
HW060 01416	14	16	19	70	15	1.06	639
HW060 01202	12	2	37	70	15	0.54	173
HW060 01203	12	3	37	70	15	0.58	212
HW060 01204	12	4	37	70	15	0.63	263
HW060 01003	10	3	37	70	15	0.62	262
HW060 01004	10	4	37	70	15	0.68	341
HW060 00803	8	3	133	90	15	0.84	455
HW060 00804	8	4	133	90	15	0.84	580
HW060 00603	6	3	133	90	15	0.93	607
HW060 00604	6	4	133	90	15	1.02	769

APPLICATION:

Highly flame-resistive cable for use in high temperature environments where circuit integrity is required. Used for power, control and instrumentation circuits in iron, steel, glass, aluminum and refining applications.

CONDUCTOR:

- 16 AWG – 10 AWG: 27% nickel-coated, soft annealed copper per ASTM B-355, Class K stranding per ASTM B-174

INSULATION:

Pyro-stable, flexible elastomer system, mica/glass braid

JACKET:

Impregnated glass braid treated with a flame, heat, moisture and abrasion resistant finish with overall heat, chemical and UV resistant fluoropolymer jacket, 105°C LSZH TC-ER available

FLAME TESTS:

- Hydrocarbon Pool Fire Test - 60 minutes @ 1093°C/2000°F rise Temperature Curve 480V, 17A heat flux of (65,000 BTU/hr-ft²) per UL-1709
- IEEE 383 Flame Test 2000°F, 2-hours @ 1000 V
- IEEE 383 Flame Test 2000°F, 3-hours @ 480 V
- UL 2196 2-hours Circuit Integrity Fire Test
- IEEE 1202/FT4 Flame Test
- UL 1685
- MIL-W-25038 Fire Test, 2-hours

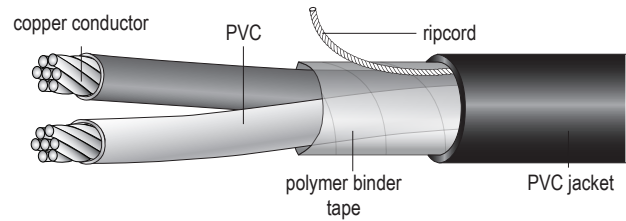
SECTION C

Instrumentation & Thermocouple Cable

DESCRIPTION	SHIELD	INSULATION	JACKET	SPECIFICATION	PAGE
Instrumentation – 300 Volt Type PLTC					
Single Pair/Triad	NON-SHIELDED	PVC	PVC	HW100	31
Single Pair/Triad	O/S	PVC	PVC	HW101	32
Multiple Pairs	O/S	PVC	PVC	HW102	33
Multiple Pairs	I/S & O/S	PVC	PVC	HW103	35
Multiple Triads	I/S & O/S	PVC	PVC	HW104	36
Instrumentation – 600 Volt Type TC					
Multiple Pairs	O/S	TFN PVC/NYLON	PVC	HW105	37
Multiple Pairs	I/S & O/S	TFN PVC/NYLON	PVC	HW106	38
Multiple Pairs	I/S & O/S	THHN THWN PVC/NYLON	PVC	HW107	39
Multiple Triads	I/S & O/S	TFN PVC/NYLON	PVC	HW108	40
Multiple Conductor	O/S	FR-EP	CPE	HW109	41
Multiple Pairs/Triads	I/S & O/S	FR-EP	CPE	HW110	42
Single/Multiple Pairs	I/S & O/S	XLP	LSZH	HW120	59
Single/Multiple Triads	I/S & O/S	XLP	LSZH	HW121	61
Thermocouple Extension: EX, JX, KX, TX – 300 Volt Type PLTC					
Single/Multiple Pairs	O/S	PVC	PVC	HW111	44
Multiple Pairs	I/S & O/S	PVC	PVC	HW112	48
Single Pair 200°C	O/S	FEP	FEP	HW114	56
Thermocouple Extension: EX, JX, KX, TX – 600 Volt Type TC					
Single/Multiple Pairs	I/S & O/S	FR-EP/FR-XLP	CPE	HW113	52
Single Pair	O/S	XLP	LSZH	HW115	57

SPECIFICATION
HW100

INSTRUMENTATION CABLE
300 Volt UL Type PLTC & ITC, 105°C
Single Pair or Triad
Non-Shielded
PVC Insulation & PVC Jacket
Copper Conductors



Catalog Number	Size AWG	Pair or Triad	Insulation Thickness Mils	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW100 01801	18	1 Pair	15	35	0.25	33
HW100 01601	16	1 Pair	15	35	0.27	42
HW100 1801T	18	1 Triad	15	35	0.26	41
HW100 1601T	16	1 Triad	15	35	0.29	54

APPLICATION:

For use in instrumentation and process control applications where protection from electrostatic interference is not required. UL listed as Type PLTC and ITC and approved for installation indoors or outdoors, aerially, in conduits, ducts and cable trays in circuits not exceeding 300 volts. May be used in NEC Class 1, Division 2 hazardous locations.

CONDUCTORS:

7-strand soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8

INSULATION:

Flame-retardant PVC

JACKET:

Sunlight-resistant PVC; a ripcord is applied longitudinally under the jacket to facilitate stripping

FLAME TESTS:

- UL 1581 (70,000 BTU/hr) Flame Test
- CSA FT4 Rated

COLOR CODE:

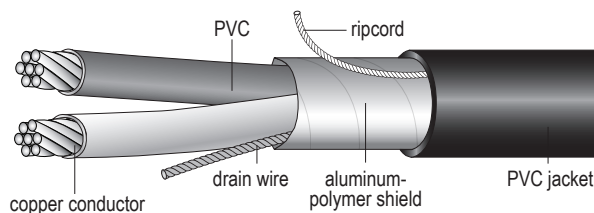
- Pairs: black and white with printed numbers on one conductor
- Triads: black, white and red with printed numbers on one conductor
- Available upon request: black and red for pairs; black, red and blue for triads

ADDITIONAL STANDARDS:

- UL Standard 13
- UL Standard 2250
- NEC Type ITC per Articles 501, 502, 503, and 504
- Approved for Class 2 and Class 3 circuits per Article 725 of the NEC

INSTRUMENTATION CABLE

**300 Volt UL Type PLTC & ITC, 105°C
Single Pair or Triad
Shielded
PVC Insulation & PVC Jacket
Copper Conductors**



Catalog Number	Size AWG	Pair or Triad	Insulation Thickness Mils	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW101 02001	20	1 Pair	15	35	0.24	30
HW101 01801	18	1 Pair	15	35	0.26	37
HW101 01601	16	1 Pair	15	35	0.28	46
HW101 2001T	20	1 Triad	15	35	0.25	36
HW101 1801T	18	1 Triad	15	35	0.28	46
HW101 1601T	16	1 Triad	15	35	0.30	62

APPLICATION:

For use in instrumentation and process control applications where protection from electrostatic interference is required. UL listed as Type PLTC and ITC and approved for installation indoors or outdoors, aerially, in conduits, ducts and cable trays in circuits not exceeding 300 volts. May be used in NEC Class 1, Division 2 hazardous locations.

CONDUCTORS:

7-strand soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8

INSULATION:

Flame-retardant PVC

SHIELD:

Aluminum-polymer tape providing 100% coverage with a flexible 7-strand tinned copper drain wire

JACKET:

Sunlight-resistant PVC; a ripcord is applied longitudinally under the jacket to facilitate stripping

FLAME TESTS:

- UL 1581 (70,000 BTU/hr) Flame Test
- CSA FT4 Rated

COLOR CODE:

- Pairs: black and white with printed numbers on one conductor
- Triads: black, white and red with printed numbers on one conductor
- Available upon request: black and red for pairs; black, red and blue for triads

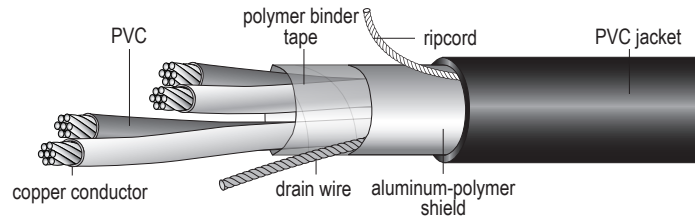
ADDITIONAL STANDARDS:

- UL Standard 13
- UL Standard 2250
- NEC Type ITC per Articles 501, 502, 503, and 504
- Approved for Class 2 and Class 3 circuits per Article 725 of the NEC

SPECIFICATION
HW102

INSTRUMENTATION CABLE

300 Volt UL Type PLTC & ITC, 105°C
Multiple Pairs
Overall Shield
PVC Insulation & PVC Jacket
Copper Conductors



INSTRUMENTATION & THERMOCOUPLE

Catalog Number	Size AWG	Number of Pairs	Insulation Thickness Mils	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW102 02002	20	2	15	40	0.34	52
HW102 02004	20	4	15	40	0.40	78
HW102 02008	20	8	15	50	0.52	143
HW102 02012	20	12	15	50	0.61	195
HW102 02016	20	16	15	60	0.74	261
HW102 02024	20	24	15	60	0.82	356
HW102 02036	20	36	15	70	0.95	513
HW102 02050	20	50	15	70	1.17	692
HW102 01802	18	2	15	40	0.37	64
HW102 01804	18	4	15	50	0.47	113
HW102 01808	18	8	15	50	0.58	187
HW102 01812	18	12	15	60	0.69	271
HW102 01816	18	16	15	60	0.81	341
HW102 01824	18	24	15	60	0.90	479
HW102 01836	18	36	15	70	1.06	695
HW102 01850	18	50	15	70	1.29	930
HW102 01602	16	2	15	50	0.44	94
HW102 01604	16	4	15	50	0.52	148
HW102 01608	16	8	15	60	0.66	264
HW102 01612	16	12	15	60	0.77	367
HW102 01616	16	16	15	70	1.01	503
HW102 01624	16	24	15	70	1.04	683
HW102 01636	16	36	15	70	1.19	970
HW102 01650	16	50	15	80	1.60	1378

APPLICATION:

For use in instrumentation and process control applications where protection from electrostatic interference is required. UL listed as Type PLTC and ITC and approved for installation indoors or outdoors, aerially, in conduits, ducts and cable trays in circuits not exceeding 300 volts. May be used in NEC Class 1, Division 2 hazardous locations.

CONDUCTORS:

7-strand soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8

INSULATION:

Flame-retardant PVC

OVERALL SHIELD:

Aluminum-polymer tape providing 100% coverage with a flexible 7-strand tinned copper drain wire

JACKET:

Sunlight-resistant PVC; a ripcord is applied longitudinally under the jacket to facilitate stripping

FLAME TESTS:

- UL 1581 (70,000 BTU/hr) Flame Test
- CSA FT4 Rated

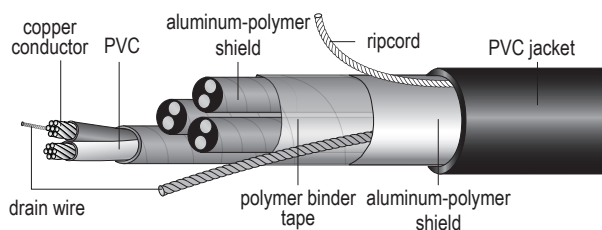
COLOR CODE:

- Pairs: black and white with printed numbers on one conductor
- Available upon request: black and red pairs with printed number

ADDITIONAL STANDARDS:

- UL Standard 13
- UL Standard 2250
- NEC Type ITC per Articles 501, 502, 503, and 504
- Approved for Class 2 and Class 3 circuits per Article 725 of the NEC

INSTRUMENTATION CABLE
300 Volt UL Type PLTC & ITC, 105°C
Multiple Pairs
Individual & Overall Shield
PVC Insulation & PVC Jacket
Copper Conductors



Catalog Number	Size AWG	Number of Pairs	Insulation Thickness Mils	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW103 02002	20	2	15	40	0.36	61
HW103 02004	20	4	15	50	0.46	110
HW103 02008	20	8	15	50	0.58	182
HW103 02012	20	12	15	60	0.71	267
HW103 02016	20	16	15	60	0.81	315
HW103 02024	20	24	15	70	0.97	492
HW103 02036	20	36	15	70	1.11	685
HW103 02050	20	50	15	70	1.33	768
HW103 01802	18	2	15	40	0.40	76
HW103 01804	18	4	15	50	0.50	134
HW103 01808	18	8	15	50	0.63	226
HW103 01812	18	12	15	60	0.78	332
HW103 01816	18	16	15	60	0.89	374
HW103 01824	18	24	15	70	1.08	619
HW103 01836	18	36	15	70	1.23	869
HW103 01850	18	50	15	80	1.49	1047

APPLICATION:

For use in instrumentation and process control applications where superior protection from electrostatic interference is required. UL listed as Type PLTC and ITC and approved for installation indoors or outdoors, aerially, in conduits, ducts and cable trays in circuits not exceeding 300 volts. May be used in NEC Class 1, Division 2 hazardous locations.

CONDUCTORS:

7-strand soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8

INSULATION:

Flame-retardant PVC

INDIVIDUAL SHIELD:

Aluminum-polymer tape providing 100% coverage with a flexible 7-strand tinned copper drain wire

OVERALL SHIELD:

Aluminum-Polymer tape providing 100% coverage with a flexible 7-strand tinned copper drain wire

JACKET:

Sunlight-resistant PVC; a ripcord is applied longitudinally under the jacket to facilitate stripping

FLAME TESTS:

- UL 1581 (70,000 BTU/hr) Flame Test
- CSA FT4 Rated

COLOR CODE:

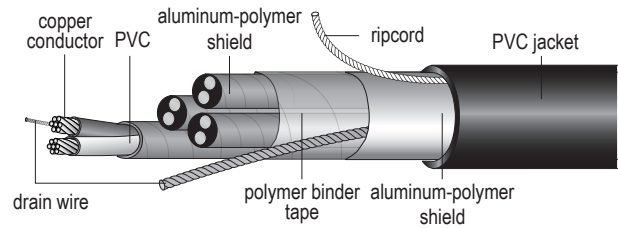
- Pairs: black and white with printed numbers on one conductor
- Available upon request: black and red pairs with printed number

ADDITIONAL STANDARDS:

- UL Standard 13
- UL Standard 2250
- NEC Type ITC per Articles 501, 502, 503, and 504
- Approved for Class 2 and Class 3 circuits per Article 725 of the NEC

SPECIFICATION
HW103

INSTRUMENTATION CABLE
300 Volt UL Type PLTC & ITC, 105°C
Multiple Pairs
Individual & Overall Shield
PVC Insulation & PVC Jacket
Copper Conductors



INSTRUMENTATION & THERMOCOUPLE

Catalog Number	Size AWG	Number of Pairs	Insulation Thickness Mils	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW103 01602	16	2	15	50	0.47	107
HW103 01604	16	4	15	50	0.55	178
HW103 01608	16	8	15	60	0.73	323
HW103 01612	16	12	15	60	0.87	456
HW103 01616	16	16	15	70	1.02	529
HW103 01624	16	24	15	70	1.21	860
HW103 01636	16	36	15	80	1.40	1250
HW103 01650	16	50	15	80	1.68	1453

APPLICATION:

For use in instrumentation and process control applications where superior protection from electrostatic interference is required. UL listed as Type PLTC and ITC and approved for installation indoors or outdoors, aerially, in conduits, ducts and cable trays in circuits not exceeding 300 volts. May be used in NEC Class 1, Division 2 hazardous locations.

CONDUCTORS:

7-strand soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8

INSULATION:

Flame-retardant PVC

INDIVIDUAL SHIELD:

Aluminum-polymer tape providing 100% coverage with a flexible 7-strand tinned copper drain wire

OVERALL SHIELD:

Aluminum-Polymer tape providing 100% coverage with a flexible 7-strand tinned copper drain wire

JACKET:

Sunlight-resistant PVC; a ripcord is applied longitudinally under the jacket to facilitate stripping

FLAME TESTS:

- UL 1581 (70,000 BTU/hr) Flame Test
- CSA FT4 Rated

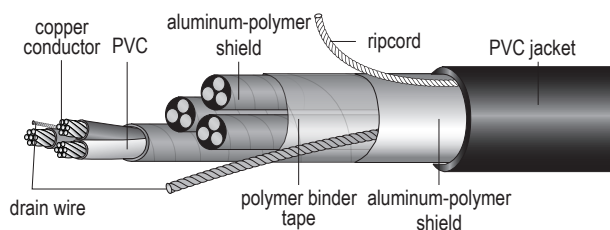
COLOR CODE:

- Pairs: black and white with printed numbers on one conductor
- Available upon request: black and red pairs with printed number

ADDITIONAL STANDARDS:

- UL Standard 13
- UL Standard 2250
- NEC Type ITC per Articles 501, 502, 503, and 504
- Approved for Class 2 and Class 3 circuits per Article 725 of the NEC

INSTRUMENTATION CABLE
300 Volt UL Type PLTC & ITC, 105°C
Multiple Traids
Individual & Overall Shield
PVC Insulation & PVC Jacket
Copper Conductors



Catalog Number	Size AWG	Number of Triads	Insulation Thickness Mils	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW104 02004	20	4	15	50	0.50	136
HW104 02008	20	8	15	50	0.65	214
HW104 02012	20	12	15	60	0.78	338
HW104 02016	20	16	15	60	0.86	428
HW104 02024	20	24	15	70	1.10	591
HW104 02036	20	36	15	70	1.22	887
HW104 01804	18	4	15	50	0.54	134
HW104 01808	18	8	15	60	0.74	293
HW104 01812	18	12	15	60	0.86	332
HW104 01816	18	16	15	70	0.97	420
HW104 01824	18	24	15	70	1.21	768
HW104 01604	16	4	15	50	0.61	229
HW104 01608	16	8	15	60	0.82	395
HW104 01612	16	12	15	70	0.98	621
HW104 01616	16	16	15	70	1.09	794
HW104 01624	16	24	15	80	1.39	1085

APPLICATION:

For use in instrumentation and process control applications where superior protection from electrostatic interference is required. UL listed as Type PLTC and ITC and approved for installation indoors or outdoors, aerially, in conduits, ducts and cable trays in circuits not exceeding 300 volts. May be used in NEC Class 1, Division 2 hazardous locations.

CONDUCTORS:

7-strand soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8

INSULATION:

Flame-retardant PVC

INDIVIDUAL SHIELD:

Aluminum-polymer tape providing 100% coverage with a flexible 7-strand tinned copper drain wire

OVERALL SHIELD:

Aluminum-polymer tape providing 100% coverage with a flexible 7-strand tinned copper drain wire

JACKET:

Sunlight-resistant PVC; a ripcord is applied longitudinally under the jacket to facilitate stripping

FLAME TESTS:

- UL 1581 (70,000 BTU/hr) Flame Test
- CSA FT4 Rated

COLOR CODE:

- Triads: black, white and red with printed numbers on one conductor
- Available upon request: black, red and blue triads with printed number

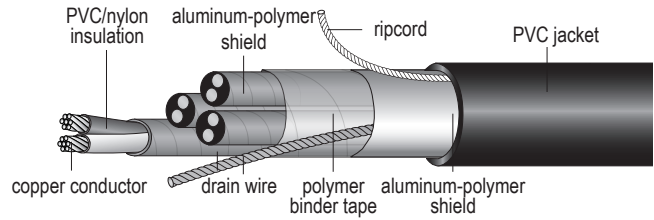
ADDITIONAL STANDARDS:

- UL Standard 13
- UL Standard 2250
- NEC Type ITC per Articles 501, 502, 503, and 504
- Approved for Class 2 and Class 3 circuits per Article 725 of the NEC

SPECIFICATION
HW105

INSTRUMENTATION CABLE

600 Volt UL Type TC, 90°C
Multiple Pairs
Overall Shield
TFN PVC/Nylon Insulation & PVC Jacket
Copper Conductors



INSTRUMENTATION & THERMOCOUPLE

Catalog Number	Size AWG	Number of Pairs	Insulation Thickness Mils	Nylon Covering Thickness Mils	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW105 01802	18	2	15	4	45	0.41	70
HW105 01804	18	4	15	4	45	0.49	118
HW105 01808	18	8	15	4	60	0.65	212
HW105 01812	18	12	15	4	60	0.76	302
HW105 01816	18	16	15	4	80	0.89	374
HW105 01824	18	24	15	4	80	1.03	572
HW105 01836	18	36	15	4	80	1.18	796
HW105 01850	18	50	15	4	80	1.44	1046
HW105 01602	16	2	15	4	45	0.45	89
HW105 01603	16	3	15	4	45	0.52	121
HW105 01604	16	4	15	4	45	0.57	150
HW105 01608	16	8	15	4	60	0.75	283
HW105 01612	16	12	15	4	60	0.88	389
HW105 01616	16	16	15	4	80	1.03	540
HW105 01624	16	24	15	4	80	1.21	742
HW105 01636	16	36	15	4	80	1.40	1038
HW105 01650	16	50	15	4	80	1.61	1436

APPLICATION:

For use in instrumentation and process control applications where protection from electrostatic interference is required. UL listed as Type TC and approved for installation indoors or outdoors, aerially, in conduits, ducts, cable trays and direct burial in circuits not exceeding 600 volts. May be used in NEC Class 1, Division 2 hazardous locations.

CONDUCTORS:

7-strand soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8

INSULATION:

Flame-retardant PVC per UL Standard 62 for Type TFN wire

INSULATION JACKET:

Clear nylon per UL Standard 62 for Type TFN wire <https://www.united.com/web/en-US/default.aspx?root=1>

OVERALL SHIELD:

Aluminum-polymer tape providing 100% coverage with a flexible 7-strand tinned copper drain wire

JACKET:

Sunlight-resistant PVC per UL Standard 1277. A ripcord is applied longitudinally under the jacket to facilitate stripping

FLAME TESTS:

UL 1581 (70,000 BTU/hr) Flame Test

COLOR CODE:

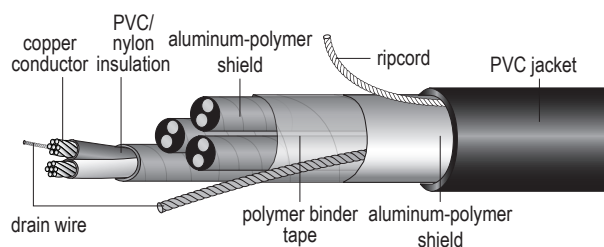
- Pairs: black and white with printed numbers on one conductor
- Available upon request: black and red pairs with printed pair number

ADDITIONAL STANDARDS:

- NEC Type TC for Class I Division 2 areas per Articles 336, 392 and 501, and for Class 1 circuits per NEC Article 725
- NEC Type NPFL for Non Power Limited Fire Protective Signaling circuits per NEC Article 760

INSTRUMENTATION CABLE

**600 Volt UL Type TC, 90°C
Single & Multiple Twisted Pairs
Individual & Overall Shield
TFN PVC/Nylon Insulation & PVC Jacket
Copper Conductors**



Catalog Number	Size AWG	Number of Pairs	Insulation Thickness Mils	Nylon Covering Thickness Mils	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW106 01801	18	1	15	4	45	0.27	42
HW106 01802	18	2	15	4	45	0.44	82
HW106 01804	18	4	15	4	45	0.52	146
HW106 01808	18	8	15	4	60	0.71	279
HW106 01812	18	12	15	4	60	0.85	391
HW106 01816	18	16	15	4	80	1.05	494
HW106 01824	18	24	15	4	80	1.20	752
HW106 01836	18	36	15	4	80	1.37	1053
HW106 01850	18	50	15	4	80	1.71	1300
HW106 01601	16	1	15	4	45	0.29	55
HW106 01602	16	2	15	4	45	0.48	105
HW106 01603	16	3	15	4	45	0.56	136
HW106 01604	16	4	15	4	60	0.63	207
HW106 01606	16	6	15	4	60	0.77	257
HW106 01608	16	8	15	4	60	0.81	349
HW106 01612	16	12	15	4	80	1.11	528
HW106 01616	16	16	15	4	80	1.16	623
HW106 01624	16	24	15	4	80	1.39	944
HW106 01636	16	36	15	4	80	1.59	1331
HW106 01650	16	50	15	4	110	1.96	1731

APPLICATION:

For use in instrumentation and process control applications where superior protection from electrostatic interference is required. UL listed as Type TC and approved for installation indoors or outdoors, aerially, in conduits, ducts, cable trays and direct burial in circuits not exceeding 600 volts. May be used in NEC Class 1, Division 2 hazardous locations.

CONDUCTORS:

7-strand soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8

INSULATION:

Flame-retardant PVC per UL Standard 62 for Type TFN wire

INSULATION JACKET:

Clear nylon per UL Standard 62 for Type TFN wire

INDIVIDUAL SHIELD:

Aluminum-polymer tape providing 100% coverage with a flexible 7-strand tinned copper drain wire.

*Single pairs: Overall shield only

OVERALL SHIELD:

Aluminum-polymer tape providing 100% coverage with a flexible 7-strand tinned copper drain wire

JACKET:

Sunlight-resistant PVC per UL Standard 1277. A ripcord is applied longitudinally under the jacket to facilitate stripping

FLAME TESTS:

UL 1581 (70,000 BTU/hr) Flame Test

COLOR CODE:

- Pairs: black and white with printed numbers on one conductor
- Available upon request: black and red pairs with printed number

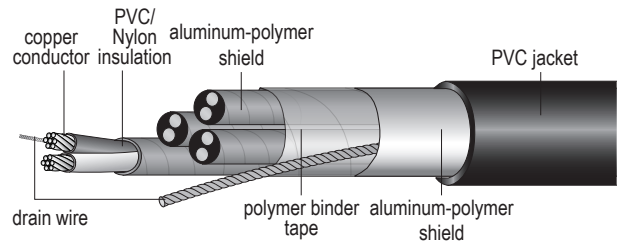
ADDITIONAL STANDARDS:

- NEC Type TC for Class I Division 2 areas per Articles 336, 392 and 501, and for Class 1 circuits per NEC Article 725
- NEC Type NPFL for Non Power Limited Fire Protective Signaling circuits per NEC Article 760

SPECIFICATION
HW107

INSTRUMENTATION CABLE

**600 Volt UL Type TC, 90°C
Multiple Pairs
Individual & Overall Shield
THHN or THWN Insulation & PVC Jacket
Copper Conductors**



INSTRUMENTATION & THERMOCOUPLE

Catalog Number	Size AWG	Number of Pairs	Insulation Thickness Mils	Nylon Covering Thickness Mils	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW107 01402	14	2	15	4	45	0.56	129
HW107 01404	14	4	15	4	60	0.65	258
HW107 01408	14	8	15	4	60	0.87	519
HW107 01412	14	12	15	4	80	1.05	773
HW107 01416	14	16	15	4	80	1.16	849
HW107 01424	14	24	15	4	80	1.44	1548

APPLICATION:

For use in instrumentation and process control applications where superior protection from electrostatic interference is required. UL listed as Type TC and approved for installation indoors or outdoors, aerially, in conduits, ducts, cable trays and direct burial in circuits not exceeding 600 volts. May be used in NEC Class 1, Division 2 hazardous locations. UL approved for NEC continuous operation at 75°C in wet locations, 90°C in dry locations, 130°C for emergency overload conditions, and 250°C for short circuit conditions.

CONDUCTORS:

7-strand soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8

INSULATION:

Flame-retardant PVC per UL Standard 83 for Type THHN or THWN-2 wire

INSULATION JACKET:

Clear nylon per UL Standard 83 for Type THHN or THWN wire

INDIVIDUAL SHIELD:

Aluminum-polymer tape providing 100% coverage with a flexible 7-strand tinned copper drain wire

OVERALL SHIELD:

Aluminum-polymer tape providing 100% coverage with a flexible 7-strand tinned copper drain wire

JACKET:

Sunlight-resistant PVC per UL Standard 1277. A ripcord is applied longitudinally under the jacket to facilitate stripping

FLAME TESTS:

UL 1581 (70,000 BTU/hr) Flame Test

COLOR CODE:

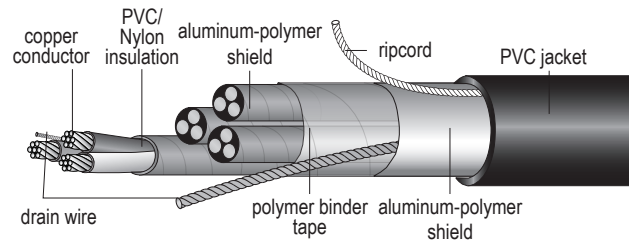
- Pairs: black and white with printed numbers on one conductor
- Available upon request: black and red pairs with printed number

ADDITIONAL STANDARDS:

- NEC Type TC for Class I Division 2 areas per Articles 336, 392 and 501, and for Class 1 circuits per NEC Article 725
- NEC Type NPFL for Non Power Limited Fire Protective Signaling circuits per NEC Article 760

INSTRUMENTATION CABLE

**600 Volt UL Type TC-ER, 90°C
Multiple Triads
Individual & Overall Shield
TFN PVC/Nylon Insulation & PVC Jacket
Copper Conductors**



Catalog Number	Size AWG	Number of Triads	Insulation Thickness Mils	Nylon Covering Thickness Mils	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW108 01804	18	4	15	4	60	0.61	207
HW108 01808	18	8	15	4	60	0.78	355
HW108 01812	18	12	15	4	80	0.98	538
HW108 01824	18	24	15	4	80	1.33	971
HW108 01604	16	4	15	4	60	0.67	233
HW108 01608	16	8	15	4	60	0.90	401
HW108 01612	16	12	15	4	80	1.08	607
HW108 01616	16	16	15	4	80	1.27	838
HW108 01624	16	24	15	4	80	1.48	1100

APPLICATION:

For use in instrumentation and process control applications where superior protection from electrostatic interference is required. UL listed as Type TC and approved for installation indoors or outdoors, aerially, in conduits, ducts, cable trays and direct burial in circuits not exceeding 600 volts. May be used in NEC Class 1, Division 2 hazardous locations. UL approved for NEC continuous operation at 75°C in wet locations, 90°C in dry locations, 130°C for emergency overload conditions, and 250°C for short circuit conditions.

CONDUCTORS:

7-strand soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8

INSULATION:

Flame-retardant PVC per UL Standard 62 for Type TFN wire

INSULATION JACKET:

Clear nylon per UL Standard 62 for Type TFN wire

INDIVIDUAL SHIELD:

Aluminum-polymer tape providing 100% coverage with a flexible 7-strand tinned copper drain wire

OVERALL SHIELD:

Aluminum-polymer tape providing 100% coverage with a flexible 7-strand tinned copper drain wire

JACKET:

Sunlight-resistant PVC per UL Standard 1277. A ripcord is applied longitudinally under the jacket to facilitate stripping

FLAME TESTS:

UL 1581 (70,000 BTU/hr) Flame Test

COLOR CODE:

- Triads: black, white and red with printed numbers on one conductor
- Available upon request: black, red and blue triads with printed number

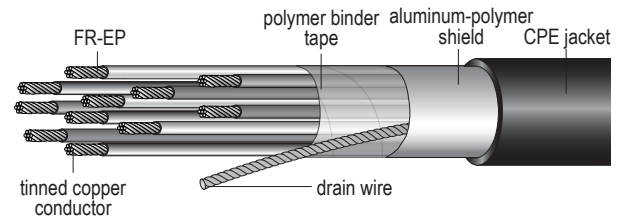
ADDITIONAL STANDARDS:

- NEC Type TC for Class I Division 2 areas per Articles 336, 392 and 501, and for Class 1 circuits per NEC Article 725
- NEC Type NPFL for Non Power Limited Fire Protective Signaling circuits per NEC Article 760
- UL Type TC-ER Rated for Exposed Run

SPECIFICATION
HW109

INSTRUMENTATION CABLE

600 Volt UL Type TC, 90°C
Multiple Conductor
Overall Shield
FR-EP Insulation & CPE Jacket
Tinned Copper Conductors



Catalog Number	Size AWG	Number of Conductors	Insulation Thickness Mils	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW109 01802	18	2	25	45	0.30	42
HW109 01803	18	3	25	45	0.31	53
HW109 01602	16	2	25	45	0.32	52
HW109 01603	16	3	25	45	0.34	66
HW109 01604	16	4	25	45	0.37	80

APPLICATION:

Superior flame-retardant cable for use in instrumentation and process control applications in caustic environments where protection from electrostatic interference is required. UL listed as Type TC and approved for installation indoors or outdoors, aerially, in conduits, ducts, cable trays and direct burial in circuits not exceeding 600 volts. May be installed at temperatures as low as -35°C and used in NEC Class 1, Division 2 hazardous locations. UL approved for NEC continuous operation at 90°C in wet and dry locations, 130°C for emergency overload conditions, and 250°C for short circuit conditions.

CONDUCTORS:

7-strand tin-coated, soft annealed copper per ASTM B-33, Class B stranding per ASTM B-8

INSULATION:

Flame-retardant ethylene propylene rubber (FR-EP) per ICEA S-82-552

OVERALL SHIELD:

Aluminum-polymer tape providing 100% coverage with a flexible 7-strand tinned copper drain wire

JACKET:

Sunlight-resistant chlorinated polyethylene (CPE) per ICEA S-82-552 and UL Standard 1277. A ripcord is applied longitudinally under the jacket to facilitate stripping

FLAME TESTS:

- IEEE 383 (70,000 BTU/hr) Flame Test
- IEEE 1202 (70,000 BTU/hr)
- UL 1277 (70,000 BTU/hr) Flame Test
- ICEA T-29-520 (210,000 BTU/hr) Flame Test
- CSA FT4 Flame Test

COLOR CODE:

- ICEA Method 1, Table E-2
- ICEA Method 1, Table E-1 available upon request

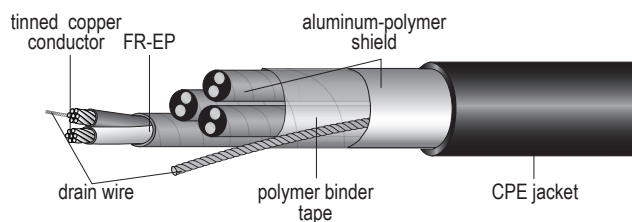
ADDITIONAL STANDARDS:

- NEC Type TC per Articles 336, 392 and 501, and for Class 1 circuits per NEC Article 725
- NEMA WC-55

INSTRUMENTATION & THERMOCOUPLE

INSTRUMENTATION CABLE

**600 Volt UL Type TC-ER, 90°C
Multiple Twisted Pairs
Individual & Overall Shield
FR-EP Insulation & CPE Jacket
Tinned Copper Conductors**



Catalog Number	Size AWG	Number of Pairs	Insulation Thickness Mils	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW110 01802	18	2	25	45	0.48	90
HW110 01804	18	4	25	60	0.59	165
HW110 01808	18	8	25	60	0.75	280
HW110 01812	18	12	25	80	0.93	430
HW110 01816	18	16	25	80	1.05	540
HW110 01824	18	24	25	80	1.24	760

APPLICATION:

Superior flame-retardant cable for use in instrumentation and process control applications in caustic environments where protection from electrostatic interference is required. UL listed as Type TC and approved for installation indoors or outdoors, aerially, in conduits, ducts, cable trays and direct burial in circuits not exceeding 600 volts. May be installed at temperatures as low as -35°C and used in NEC Class 1, Division 2 hazardous locations. UL approved for NEC continuous operation at 90°C in wet and dry locations, 130°C for emergency overload conditions, and 250°C for short circuit conditions.

CONDUCTORS:

7-strand tin-coated, soft annealed copper per ASTM B-33, Class B stranding per ASTM B-8

INSULATION:

Flame-retardant ethylene propylene rubber (FR-EP) per ICEA S-82-552

INDIVIDUAL SHIELD:

Aluminum-polymer tape providing 100% coverage with a flexible 7-strand tinned copper drain wire

OVERALL SHIELD:

Aluminum-polymer tape providing 100% coverage with a flexible 7-strand tinned copper drain wire

JACKET:

Sunlight-resistant chlorinated polyethylene (CPE) per ICEA S-82-552 and UL Standard 1277. A ripcord is applied longitudinally under the jacket to facilitate stripping

FLAME TESTS:

- IEEE 383 (70,000 BTU/hr) Flame Test
- IEEE 1202 (70,000 BTU/hr)
- UL 1277 (70,000 BTU/hr) Flame Test
- ICEA T-29-520 (210,000 BTU/hr) Flame Test
- CSA FT4 Flame Test

COLOR CODE:

- Pairs: black and white with printed numbers on one conductor
- Available upon request: black and red pairs with printed number

ADDITIONAL STANDARDS:

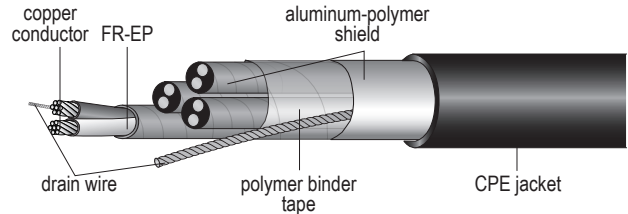
- NEC Type TC per articles 336, 392 and 501, and Class 1 circuits per NEC article 725
- NEMA WC-55
- UL Type TC-ER Rated for Exposed Run

SPECIFICATION
HW110

REV. 11/2016

INSTRUMENTATION CABLE

**600 Volt UL Type TC-ER, 90°C
Multiple Twisted Pairs & Triads
Individual & Overall Shield
FR-EP Insulation & CPE Jacket
Tinned Copper Conductors**



INSTRUMENTATION & THERMOCOUPLE

Catalog Number	Size AWG	Number of Pairs/Triads	Insulation Thickness Mils	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW110 01602	16	2 Pairs	25	60	0.57	130
HW110 01604	16	4 Pairs	25	60	0.66	200
HW110 01606	16	6 Pairs	25	60	0.74	270
HW110 01608	16	8 Pairs	25	60	0.88	380
HW110 01612	16	12 Pairs	25	80	1.04	530
HW110 01616	16	16 Pairs	25	80	1.17	570
HW110 01624	16	24 Pairs	25	80	1.40	960
HW110 1604T	16	4 Triads	25	60	0.72	260
HW110 1608T	16	8 Triads	25	60	0.96	500
HW110 1612T	16	12 Triads	25	80	1.14	705

APPLICATION:

Superior flame retardant cable for use in instrumentation and process control applications in caustic environments where protection from electrostatic interference is required. UL listed as Type TC and approved for installation indoors or outdoors, aerially, in conduits, ducts, cable trays and direct burial in circuits not exceeding 600 volts. May be installed at temperatures as low as -35°C and used in NEC Class 1, Division 2 hazardous locations. UL approved for NEC continuous operation at 90°C in wet and dry locations, 130°C for emergency overload conditions, and 250°C for short circuit conditions.

CONDUCTORS:

7-strand tin-coated, soft annealed copper per ASTM B-33, Class B stranding per ASTM B-8

INSULATION:

Flame-retardant ethylene propylene rubber (FR-EP) per ICEA S-82-552

INDIVIDUAL SHIELD:

Aluminum-polymer tape providing 100% coverage with a flexible 7-strand tinned copper drain wire

OVERALL SHIELD:

Aluminum-polymer tape providing 100% coverage with a flexible 7-strand tinned copper drain wire

JACKET:

Sunlight-resistant chlorinated polyethylene (CPE) per ICEA S-82-552 and UL Standard 1277. A ripcord is applied longitudinally under the jacket to facilitate stripping

FLAME TESTS:

- IEEE 383 (70,000 BTU/hr) Flame Test
- IEEE 1202 (70,000 BTU/hr)
- UL 1277 (70,000 BTU/hr) Flame Test
- ICEA T-29-520 (210,000 BTU/hr) Flame Test
- CSA FT4 Flame Test

COLOR CODE:

- Pairs: black and white with printed numbers on one conductor
- Triads: black, white and red with printed numbers on one conductor
- Available upon request: black and red for pairs; black, red and blue for triads with printed number

ADDITIONAL STANDARDS:

- NEC Type TC per articles 336, 392 and 501, and Class 1 circuits per NEC Article 725
- NEMA WC-55
- UL Type TC-ER Rated for Exposed Run

THERMOCOUPLE EXTENSION CABLE - EX

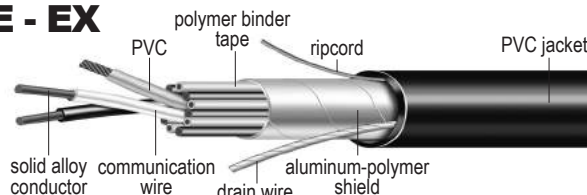
300 Volt UL Type PLTC & ITC, 105°C

Single & Multiple Pairs

Overall Shield

PVC Insulation & PVC Jacket

Solid Alloy Conductors



Catalog Number	ANSI Type	Size AWG	Number of Pairs	Insulation Thickness Mils	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW111 1601E	EX	16	1	15	35	0.28	46
HW111 2004E	EX	20	4	15	40	0.40	78
HW111 2008E	EX	20	8	15	50	0.52	143
HW111 2012E	EX	20	12	15	50	0.61	195
HW111 2016E	EX	20	16	15	50	0.66	257
HW111 2024E	EX	20	24	15	50	0.81	356
HW111 2036E	EX	20	36	15	70	0.95	513

APPLICATION:

For use in thermocouple extension applications where protection from electrostatic interference is required. UL listed as Type PLTC and approved for installation indoors or outdoors, aerially, in conduits, ducts and cable trays in circuits not exceeding 300 volts. May be used in NEC Class 1, Division 2 hazardous locations.

CONDUCTORS:

Annealed, solid thermocouple extension-grade alloys calibrated to standard limits of error per ANSI-MC96.1

INSULATION:

Flame-retardant PVC per UL Standard 13, color coded per ANSI-MC96.1

COMMUNICATION WIRE:

Multipair constructions contain a bare copper orange PVC-insulated communication wire

OVERALL SHIELD:

Aluminum-polymer tape providing 100% coverage with a flexible 7-strand tinned copper drain wire

JACKET:

Sunlight-resistant PVC color coded per ANSI-MC96.1. A ripcord is applied longitudinally under the jacket to facilitate stripping

FLAME TESTS:

UL 1581 (70,000 BTU/hr) Flame Test

ADDITIONAL STANDARDS:

NEC Type ITC approved for use in hazardous locations per Articles 501, 502, 503 and 504

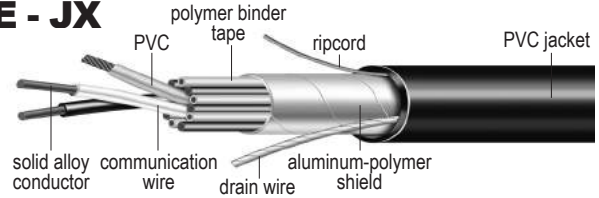
TYPE DESIGNATIONS							
ASA Type	Alloys		Insulation Colors		Jacket Color	Range	Limits of Error
	Positive	Negative	Positive	Negative			
EX	Chromel	Constantan	Purple	Red	Purple	0 to +200	+/- 1.7°C
JX	Iron	Constantan	White	Red	Black	0 to +200	+/- 2.2°C
KX	Chromel	Alumel	Yellow	Red	Yellow	0 to +200	+/- 2.2°C
TX	Copper	Constantan	Blue	Red	Blue	0 to +100	+/- 1.0°C

Note: One conductor in each pair is sequentially numbered for identification.

SPECIFICATION
HW111

THERMOCOUPLE EXTENSION CABLE - JX

300 Volt UL Type PLTC & ITC, 105°C
Single & Multiple Pairs
Overall Shield
PVC Insulation & PVC Jacket
Solid Alloy Conductors



INSTRUMENTATION & THERMOCOUPLE

Catalog Number	ANSI Type	Size AWG	Number of Pairs	Insulation Thickness Mils	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW111 1601J	JX	16	1	15	35	0.28	46
HW111 2004J	JX	20	4	15	40	0.40	78
HW111 2008J	JX	20	8	15	50	0.52	143
HW111 2012J	JX	20	12	15	50	0.61	195
HW111 2016J	JX	20	16	15	50	0.66	257
HW111 2024J	JX	20	24	15	60	0.81	356
HW111 2036J	JX	20	36	15	70	0.95	513

APPLICATION:

For use in thermocouple extension applications where protection from electrostatic interference is required. UL listed as Type PLTC and approved for installation indoors or outdoors, aerially, in conduits, ducts and cable trays in circuits not exceeding 300 volts. May be used in NEC Class 1, Division 2 hazardous locations.

CONDUCTORS:

Annealed, solid thermocouple extension-grade alloys calibrated to standard limits of error per ANSI-MC96.1

INSULATION:

Flame-retardant PVC per UL Standard 13, color coded per ANSI-MC96.1

COMMUNICATION WIRE:

Multipair constructions contain a bare copper orange PVC-insulated communication wire

OVERALL SHIELD:

Aluminum-polymer tape providing 100% coverage with a flexible 7-strand tinned copper drain wire

JACKET:

Sunlight-resistant PVC color coded per ANSI-MC96.1. A ripcord is applied longitudinally under the jacket to facilitate stripping

FLAME TESTS:

UL 1581 (70,000 BTU/hr) Flame Test

ADDITIONAL STANDARDS:

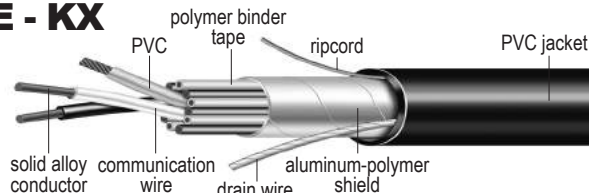
NEC Type ITC approved for use in hazardous locations per Articles 501, 502, 503 and 504

TYPE DESIGNATIONS							
ASA Type	Alloys		Insulation Colors		Jacket Color	Range	Limits of Error
	Positive	Negative	Positive	Negative			
EX	Chromel	Constantan	Purple	Red	Purple	0 to +200	+/- 1.7°C
JX	Iron	Constantan	White	Red	Black	0 to +200	+/- 2.2°C
KX	Chromel	Alumel	Yellow	Red	Yellow	0 to +200	+/- 2.2°C
TX	Copper	Constantan	Blue	Red	Blue	0 to +100	+/- 1.0°C

Note: One conductor in each pair is sequentially numbered for identification.

THERMOCOUPLE EXTENSION CABLE - KX

300 Volt UL Type PLTC & ITC, 105°C
Single & Multiple Pairs
Overall Shield
PVC Insulation & PVC Jacket
Solid Alloy Conductors



Catalog Number	ANSI Type	Size AWG	Number of Pairs	Insulation Thickness Mils	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW111 1601K	KX	16	1	15	35	0.28	46
HW111 2004K	KX	20	4	15	40	0.40	78
HW111 2008K	KX	20	8	15	50	0.52	143
HW111 2012K	KX	20	12	15	50	0.61	195
HW111 2016K	KX	20	16	15	50	0.66	257
HW111 2024K	KX	20	24	15	60	0.81	356
HW111 2036K	KX	20	36	15	70	0.95	513

APPLICATION:

For use in thermocouple extension applications where protection from electrostatic interference is required. UL listed as Type PLTC and approved for installation indoors or outdoors, aerially, in conduits, ducts and cable trays in circuits not exceeding 300 volts. May be used in NEC Class 1, Division 2 hazardous locations

CONDUCTORS:

Annealed, solid thermocouple extension-grade alloys calibrated to standard limits of error per ANSI-MC96.1

INSULATION:

Flame-retardant PVC per UL Standard 13, color coded per ANSI-MC96.1

COMMUNICATION WIRE:

Multipair constructions contain a bare copper orange PVC-insulated communication wire

OVERALL SHIELD:

Aluminum-polymer tape providing 100% coverage with a flexible 7-strand tinned copper drain wire

JACKET:

Sunlight-resistant PVC color coded per ANSI-MC96.1. A ripcord is applied longitudinally under the jacket to facilitate stripping

FLAME TESTS:

UL 1581 (70,000 BTU/hr) Flame Test

ADDITIONAL STANDARDS:

NEC Type ITC approved for use in hazardous locations per Articles 501, 502, 503 and 504

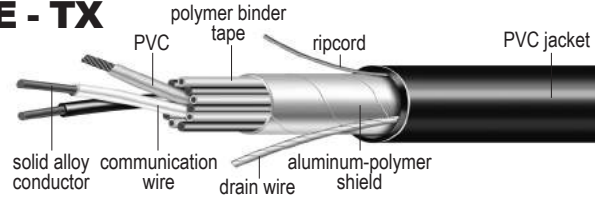
TYPE DESIGNATIONS							
ASA Type	Alloys		Insulation Colors		Jacket Color	Range	Limits of Error
	Positive	Negative	Positive	Negative			
EX	Chromel	Constantan	Purple	Red	Purple	0 to +200	+/- 1.7°C
JX	Iron	Constantan	White	Red	Black	0 to +200	+/- 2.2°C
KX	Chromel	Alumel	Yellow	Red	Yellow	0 to +200	+/- 2.2°C
TX	Copper	Constantan	Blue	Red	Blue	0 to +100	+/- 1.0°C

Note: One conductor in each pair is sequentially numbered for identification.

SPECIFICATION
HW111

THERMOCOUPLE EXTENSION CABLE - TX

300 Volt UL Type PLTC & ITC, 105°C
Single & Multiple Pairs
Overall Shield
PVC Insulation & PVC Jacket
Solid Alloy Conductors



INSTRUMENTATION & THERMOCOUPLE

Catalog Number	ANSI Type	Size AWG	Number of Pairs	Insulation Thickness Mils	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW111 1601T	TX	16	1	15	35	0.28	46
HW111 2004T	TX	20	4	15	45	0.36	69
HW111 2008T	TX	20	8	15	55	0.46	121
HW111 2012T	TX	20	12	15	55	0.54	165
HW111 2016T	TX	20	16	15	55	0.60	207
HW111 2024T	TX	20	24	15	65	0.73	303
HW111 2036T	TX	20	36	15	65	0.82	422

APPLICATION:

For use in thermocouple extension applications where protection from electrostatic interference is required. UL listed as Type PLTC and approved for installation indoors or outdoors, aerially, in conduits, ducts and cable trays in circuits not exceeding 300 volts. May be used in NEC Class 1, Division 2 hazardous locations.

CONDUCTORS:

Annealed, solid thermocouple extension-grade alloys calibrated to standard limits of error per ANSI-MC96.1

INSULATION:

Flame-retardant PVC per UL Standard 13, color coded per ANSI-MC96.1

COMMUNICATION WIRE:

Multipair constructions contain a bare copper orange PVC-insulated communication wire

OVERALL SHIELD:

Aluminum-polymer tape providing 100% coverage with a flexible 7-strand tinned copper drain wire

JACKET:

Sunlight-resistant PVC color coded per ANSI-MC96.1. A ripcord is applied longitudinally under the jacket to facilitate stripping

FLAME TESTS:

UL 1581 (70,000 BTU/hr) Flame Test

ADDITIONAL STANDARDS:

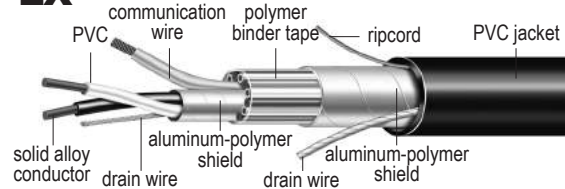
NEC Type ITC approved for use in hazardous locations per Articles 501, 502, 503 and 504

TYPE DESIGNATIONS							
ASA Type	Alloys		Insulation Colors		Jacket Color	Range	Limits of Error
	Positive	Negative	Positive	Negative			
EX	Chromel	Constantan	Purple	Red	Purple	0 to +200	+/- 1.7°C
JX	Iron	Constantan	White	Red	Black	0 to +200	+/- 2.2°C
KX	Chromel	Alumel	Yellow	Red	Yellow	0 to +200	+/- 2.2°C
TX	Copper	Constantan	Blue	Red	Blue	0 to +100	+/- 1.0°C

Note: One conductor in each pair is sequentially numbered for identification.

THERMOCOUPLE EXTENSION CABLE - EX

**300 Volt UL Type PLTC & ITC, 105°C
Multiple Pairs
Individual & Overall Shield
PVC Insulation & PVC Jacket
Solid Alloy Conductors**



Catalog Number	ANSI Type	Size AWG	Number of Pairs	Insulation Thickness Mils	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW112 2004E	EX	20	4	15	50	0.46	110
HW112 2008E	EX	20	8	15	50	0.58	182
HW112 2012E	EX	20	12	15	60	0.71	267
HW112 2016E	EX	20	16	15	60	0.75	411
HW112 2024E	EX	20	24	15	70	0.97	492
HW112 2036E	EX	20	36	15	70	1.11	685

APPLICATION:

For use in thermocouple extension applications where superior protection from electrostatic interference is required. UL listed as Type PLTC and approved for installation indoors or outdoors, aerially, in conduits, ducts and cable trays in circuits not exceeding 300 volts. May be used in NEC Class 1, Division 2 hazardous locations.

CONDUCTORS:

Annealed, solid thermocouple extension-grade alloys calibrated to standard limits of error per ANSI-MC96.1

INSULATION:

Flame-retardant PVC per UL Standard 13, color coded per ANSI-MC96.1

INDIVIDUAL SHIELD:

Aluminum-polymer tape providing 100% coverage with a flexible 7-strand tinned copper drain wire

COMMUNICATION WIRE:

Multipair constructions contain a bare copper orange PVC-insulated communication wire

OVERALL SHIELD:

Aluminum-polymer tape providing 100% coverage with a flexible 7-strand tinned copper drain wire

JACKET:

Sunlight-resistant PVC color coded per ANSI-MC96.1. A ripcord is applied longitudinally under the jacket to facilitate stripping

FLAME TESTS:

UL 1581 (70,000 BTU/hr) Flame Test

ADDITIONAL STANDARDS:

NEC Type ITC approved for use in hazardous locations per Articles 501, 502, 503 and 504

TYPE DESIGNATIONS							
ASA Type	Alloys		Insulation Colors		Jacket Color	Range	Limits of Error
	Positive	Negative	Positive	Negative			
EX	Chromel	Constantan	Purple	Red	Purple	0 to +200	+/- 1.7°C
JX	Iron	Constantan	White	Red	Black	0 to +200	+/- 2.2°C
KX	Chromel	Alumel	Yellow	Red	Yellow	0 to +200	+/- 2.2°C
TX	Copper	Constantan	Blue	Red	Blue	0 to +100	+/- 1.0°C

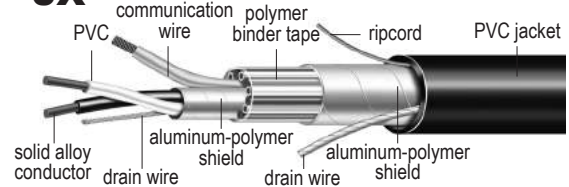
Note: One conductor in each pair is sequentially numbered for identification.

SPECIFICATION
HW112

INSTRUMENTATION & THERMOCOUPLE

THERMOCOUPLE EXTENSION CABLE - JX

300 Volt UL Type PLTC & ITC, 105°C
Multiple Pairs
Individual & Overall Shield
PVC Insulation & PVC Jacket
Solid Alloy Conductors



Catalog Number	ANSI Type	Size AWG	Number of Pairs	Insulation Thickness Mils	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW112 2004J	JX	20	4	15	50	0.46	110
HW112 2008J	JX	20	8	15	50	0.58	182
HW112 2012J	JX	20	12	15	60	0.71	267
HW112 2016J	JX	20	16	15	60	0.76	411
HW112 2024J	JX	20	24	15	70	0.97	492
HW112 2036J	JX	20	36	15	70	1.11	685

APPLICATION:

For use in thermocouple extension applications where superior protection from electrostatic interference is required. UL listed as Type PLTC and approved for installation indoors or outdoors, aerially, in conduits, ducts and cable trays in circuits not exceeding 300 volts. May be used in NEC Class 1, Division 2 hazardous locations.

CONDUCTORS:

Annealed, solid thermocouple extension-grade alloys calibrated to standard limits of error per ANSI-MC96.1

INSULATION:

Flame-retardant PVC per UL Standard 13, color coded per ANSI-MC96.1

INDIVIDUAL SHIELD:

Aluminum-polymer tape providing 100% coverage with a flexible 7-strand tinned copper drain wire

COMMUNICATION WIRE:

Multipair constructions contain a bare copper orange PVC-insulated communication wire

OVERALL SHIELD:

Aluminum-polymer tape providing 100% coverage with a flexible 7-strand tinned copper drain wire

JACKET:

Sunlight-resistant PVC color coded per ANSI-MC96.1. A ripcord is applied longitudinally under the jacket to facilitate stripping

FLAME TESTS:

UL 1581 (70,000 BTU/hr) Flame Test

ADDITIONAL STANDARDS:

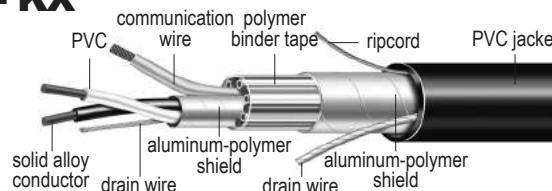
NEC Type ITC approved for use in hazardous locations per Articles 501, 502, 503 and 504

TYPE DESIGNATIONS							
ASA Type	Alloys		Insulation Colors		Jacket Color	Range	Limits of Error
	Positive	Negative	Positive	Negative			
EX	Chromel	Constantan	Purple	Red	Purple	0 to +200	+/- 1.7°C
JX	Iron	Constantan	White	Red	Black	0 to +200	+/- 2.2°C
KX	Chromel	Alumel	Yellow	Red	Yellow	0 to +200	+/- 2.2°C
TX	Copper	Constantan	Blue	Red	Blue	0 to +100	+/- 1.0°C

Note: One conductor in each pair is sequentially numbered for identification.

THERMOCOUPLE EXTENSION CABLE - KX

**300 Volt UL Type PLTC & ITC, 105°C
Multiple Pairs
Individual & Overall Shield
PVC Insulation & PVC Jacket
Solid Alloy Conductors**



Catalog Number	ANSI Type	Size AWG	Number of Pairs	Insulation Thickness Mils	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW112 2004K	KX	20	4	15	50	0.46	110
HW112 2008K	KX	20	8	15	50	0.58	182
HW112 2012K	KX	20	12	15	60	0.71	267
HW112 2016K	KX	20	16	15	60	0.76	411
HW112 2024K	KX	20	24	15	70	0.97	492
HW112 2036K	KX	20	36	15	70	1.11	685

APPLICATION:

For use in thermocouple extension applications where superior protection from electrostatic interference is required. UL listed as Type PLTC and approved for installation indoors or outdoors, aerially, in conduits, ducts and cable trays in circuits not exceeding 300 volts. May be used in NEC Class 1, Division 2 hazardous locations.

CONDUCTORS:

Annealed, solid thermocouple extension-grade alloys calibrated to standard limits of error per ANSI-MC96.1

INSULATION:

Flame-retardant PVC per UL Standard 13, color coded per ANSI-MC96.1

INDIVIDUAL SHIELD:

Aluminum-polymer tape providing 100% coverage with a flexible 7-strand tinned copper drain wire

COMMUNICATION WIRE:

Multipair constructions contain a bare copper orange PVC-insulated communication wire

OVERALL SHIELD:

Aluminum-polymer tape providing 100% coverage with a flexible 7-strand tinned copper drain wire

JACKET:

Sunlight-resistant PVC color coded per ANSI-MC96.1. A ripcord is applied longitudinally under the jacket to facilitate stripping

FLAME TESTS:

UL 1581 (70,000 BTU/hr) Flame Test

ADDITIONAL STANDARDS:

NEC Type ITC approved for use in hazardous locations per Articles 501, 502, 503 and 504

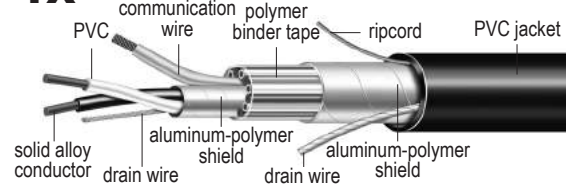
TYPE DESIGNATIONS							
ASA Type	Alloys		Insulation Colors		Jacket Color	Range	Limits of Error
	Positive	Negative	Positive	Negative			
EX	Chromel	Constantan	Purple	Red	Purple	0 to +200	+/- 1.7°C
JX	Iron	Constantan	White	Red	Black	0 to +200	+/- 2.2°C
KX	Chromel	Alumel	Yellow	Red	Yellow	0 to +200	+/- 2.2°C
TX	Copper	Constantan	Blue	Red	Blue	0 to +100	+/- 1.0°C

Note: One conductor in each pair is sequentially numbered for identification.

SPECIFICATION
HW112

THERMOCOUPLE EXTENSION CABLE - TX

300 Volt UL Type PLTC & ITC, 105°C
Multiple Pairs
Individual & Overall Shield
PVC Insulation & PVC Jacket
Solid Alloy Conductors



Catalog Number	ANSI Type	Size AWG	Number of Pairs	Insulation Thickness Mils	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW112 2004T	TX	20	4	15	50	0.46	110
HW112 2008T	TX	20	8	15	50	0.58	182
HW112 2012T	TX	20	12	15	60	0.71	267
HW112 2016T	TX	20	16	15	60	0.76	411
HW112 2024T	TX	20	24	15	70	0.97	492
HW112 2036T	TX	20	36	15	70	1.11	685

APPLICATION:

For use in thermocouple extension applications where superior protection from electrostatic interference is required. UL listed as Type PLTC and approved for installation indoors or outdoors, aerially, in conduits, ducts and cable trays in circuits not exceeding 300 volts. May be used in NEC Class 1, Division 2 hazardous locations.

CONDUCTORS:

Annealed, solid thermocouple extension-grade alloys calibrated to standard limits of error per ANSI-MC96.1

INSULATION:

Flame-retardant PVC per UL Standard 13, color coded per ANSI-MC96.1

INDIVIDUAL SHIELD:

Aluminum-polymer tape providing 100% coverage with a flexible 7-strand tinned copper drain wire

COMMUNICATION WIRE:

Multipair constructions contain a bare copper orange PVC-insulated communication wire

OVERALL SHIELD:

Aluminum-polymer tape providing 100% coverage with a flexible 7-strand tinned copper drain wire

JACKET:

Sunlight-resistant PVC color coded per ANSI-MC96.1. A ripcord is applied longitudinally under the jacket to facilitate stripping

FLAME TESTS:

UL 1581 (70,000 BTU/hr) Flame Test

ADDITIONAL STANDARDS:

NEC Type ITC approved for use in hazardous locations per Articles 501, 502, 503 and 504

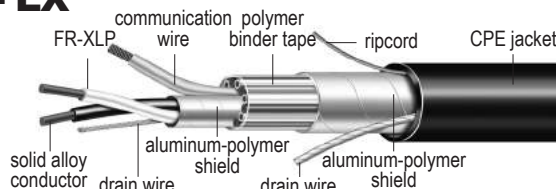
TYPE DESIGNATIONS							
ASA Type	Alloys		Insulation Colors		Jacket Color	Range	Limits of Error
	Positive	Negative	Positive	Negative			
EX	Chromel	Constantan	Purple	Red	Purple	0 to +200	+/- 1.7°C
JX	Iron	Constantan	White	Red	Black	0 to +200	+/- 2.2°C
KX	Chromel	Alumel	Yellow	Red	Yellow	0 to +200	+/- 2.2°C
TX	Copper	Constantan	Blue	Red	Blue	0 to +100	+/- 1.0°C

Note: One conductor in each pair is sequentially numbered for identification.

INSTRUMENTATION & THERMOCOUPLE

THERMOCOUPLE EXTENSION CABLE - EX

**600 Volt UL Type TC, 90°C
Single & Multiple Pairs
Individual & Overall Shield
FR-XLP or FR-EP Insulation & CPE Jacket
Solid Alloy Conductors**



Catalog Number	ANSI Type	Size AWG	Number of Pairs	Insulation Thickness Mils	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW113 1601E	EX	16	1	25	50	0.30	52
HW113 2004E	EX	20	4	25	55	0.44	96
HW113 2008E	EX	20	8	25	55	0.55	156
HW113 2012E	EX	20	12	25	65	0.66	226

APPLICATION:

Superior flame-retardant cable for use in thermocouple extension applications in caustic environments where protection from electrostatic interference is required. UL listed as Type TC and approved for installation indoors or outdoors, aerially, in conduits, ducts and cable trays. May be installed at temperatures as low as -35°C and used in NEC Class 1, Division 2 hazardous locations.

CONDUCTORS:

Annealed, solid thermocouple extension grade alloys calibrated to standard limits of error per ANSI-MC96.1

INSULATION:

Flame-retardant ethylene propylene rubber (FR-EP) color coded per ANSI-MC96.1. Flame-retardant cross-linked polyethylene per ICEA S-66-524

INDIVIDUAL SHIELD:

Aluminum-polymer tape providing 100% coverage with a flexible 7-strand tinned copper drain wire

COMMUNICATION WIRE:

Multipair constructions contain a bare copper orange PVC-insulated communication wire

OVERALL SHIELD:

Aluminum-polymer tape providing 100% coverage with a flexible 7-strand tinned copper drain wire

JACKET:

Sunlight-resistant chlorinated polyethylene (CPE) color coded per ANSI-MC96.1. A ripcord is applied longitudinally under the jacket to facilitate stripping

FLAME TESTS:

- IEEE 383 (70,000 BTU/hr) Flame Test
- IEEE 1202 (70,000 BTU/hr)
- UL Standard 13 (70,000 BTU/hr) Flame Test
- CSA FT4 Flame Test

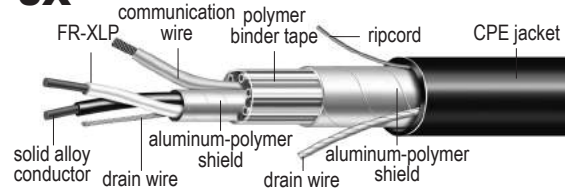
TYPE DESIGNATIONS							
ASA Type	Alloys		Insulation Colors		Jacket Color	Range	Limits of Error
	Positive	Negative	Positive	Negative			
EX	Chromel	Constantan	Purple	Red	Purple	0 to +200	+/- 1.7°C
JX	Iron	Constantan	White	Red	Black	0 to +200	+/- 2.2°C
KX	Chromel	Alumel	Yellow	Red	Yellow	0 to +200	+/- 2.2°C
TX	Copper	Constantan	Blue	Red	Blue	0 to +100	+/- 1.0°C

Note: One conductor in each pair is sequentially numbered for identification.

SPECIFICATION
HW113

THERMOCOUPLE EXTENSION CABLE - JX

600 Volt UL Type TC, 90°C
Single & Multiple Pairs
Individual & Overall Shield
FR-XLP or FR-EP Insulation & CPE Jacket
Solid Alloy Conductors



Catalog Number	ANSI Type	Size AWG	Number of Pairs	Insulation Thickness Mils	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW113 1601J	JX	16	1	25	50	0.30	52
HW113 2004J	JX	20	4	25	55	0.44	96
HW113 2008J	JX	20	8	25	55	0.55	156
HW113 2012J	JX	20	12	25	65	0.66	226

APPLICATION:

Superior flame-retardant cable for use in thermocouple extension applications in caustic environments where protection from electrostatic interference is required. UL listed as Type TC and approved for installation indoors or outdoors, aerially, in conduits, ducts and cable trays. May be installed at temperatures as low as -35°C and used in NEC Class 1, Division 2 hazardous locations.

CONDUCTORS:

Annealed, solid thermocouple extension grade alloys calibrated to standard limits of error per ANSI-MC96.1

INSULATION:

Flame-retardant ethylene propylene rubber (FR-EP) color coded per ANSI-MC96.1. Flame-retardant cross-linked polyethylene per ICEA S-66-524

INDIVIDUAL SHIELD:

Aluminum-polymer tape providing 100% coverage with a flexible 7-strand tinned copper drain wire

COMMUNICATION WIRE:

Multipair constructions contain a bare copper orange PVC-insulated communication wire

OVERALL SHIELD:

Aluminum-polymer tape providing 100% coverage with a flexible 7-strand tinned copper drain wire

JACKET:

Sunlight-resistant chlorinated polyethylene (CPE) color coded per ANSI-MC96.1. A ripcord is applied longitudinally under the jacket to facilitate stripping

FLAME TESTS:

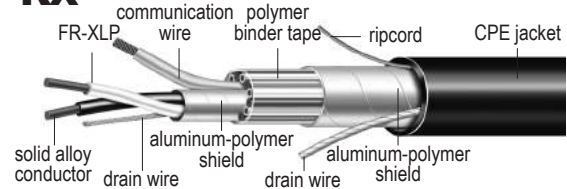
- IEEE 383 (70,000 BTU/hr) Flame Test
- IEEE 1202 (70,000 BTU/hr)
- UL Standard 13 (70,000 BTU/hr) Flame Test
- CSA FT4 Flame Test

TYPE DESIGNATIONS							
ASA Type	Alloys		Insulation Colors		Jacket Color	Range	Limits of Error
	Positive	Negative	Positive	Negative			
EX	Chromel	Constantan	Purple	Red	Purple	0 to +200	+/- 1.7°C
JX	Iron	Constantan	White	Red	Black	0 to +200	+/- 2.2°C
KX	Chromel	Alumel	Yellow	Red	Yellow	0 to +200	+/- 2.2°C
TX	Copper	Constantan	Blue	Red	Blue	0 to +100	+/- 1.0°C

Note: One conductor in each pair is sequentially numbered for identification.

THERMOCOUPLE EXTENSION CABLE - KX

**600 Volt UL Type TC, 90°C
Single & Multiple Pairs
Individual & Overall Shield
FR-XLP or FR-EP Insulation & CPE Jacket
Solid Alloy Conductors**



Catalog Number	ANSI Type	Size AWG	Number of Pairs	Insulation Thickness Mils	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW113 1601K	KX	16	1	25	50	0.30	52
HW113 2004K	KX	20	4	25	55	0.44	96
HW113 2008K	KX	20	8	25	55	0.55	156
HW113 2012K	KX	20	12	25	65	0.66	226

APPLICATION:

Superior flame-retardant cable for use in thermocouple extension applications in caustic environments where protection from electrostatic interference is required. UL listed as Type TC and approved for installation indoors or outdoors, aerially, in conduits, ducts and cable trays. May be installed at temperatures as low as -35°C and used in NEC Class 1, Division 2 hazardous locations.

CONDUCTORS:

Annealed, solid thermocouple extension grade alloys calibrated to standard limits of error per ANSI-MC96.1

INSULATION:

Flame-retardant ethylene propylene rubber (FR-EP) color coded per ANSI-MC96.1. Flame-retardant cross-linked polyethylene per ICEA S-66-524

INDIVIDUAL SHIELD:

Aluminum-polymer tape providing 100% coverage with a flexible 7-strand tinned copper drain wire

COMMUNICATION WIRE:

Multipair constructions contain a bare copper orange PVC-insulated communication wire

OVERALL SHIELD:

Aluminum-polymer tape providing 100% coverage with a flexible 7-strand tinned copper drain wire

JACKET:

Sunlight-resistant chlorinated polyethylene (CPE) color coded per ANSI-MC96.1. A ripcord is applied longitudinally under the jacket to facilitate stripping

FLAME TESTS:

- IEEE 383 (70,000 BTU/hr) Flame Test
- IEEE 1202 (70,000 BTU/hr)
- UL Standard 13 (70,000 BTU/hr) Flame Test
- CSA FT4 Flame Test

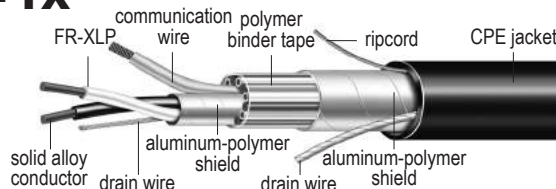
TYPE DESIGNATIONS							
ASA Type	Alloys		Insulation Colors		Jacket Color	Range	Limits of Error
	Positive	Negative	Positive	Negative			
EX	Chromel	Constantan	Purple	Red	Purple	0 to +200	+/- 1.7°C
JX	Iron	Constantan	White	Red	Black	0 to +200	+/- 2.2°C
KX	Chromel	Alumel	Yellow	Red	Yellow	0 to +200	+/- 2.2°C
TX	Copper	Constantan	Blue	Red	Blue	0 to +100	+/- 1.0°C

Note: One conductor in each pair is sequentially numbered for identification.

SPECIFICATION
HW113

THERMOCOUPLE EXTENSION CABLE - TX

600 Volt UL Type TC, 90°C
Single & Multiple Pairs
Individual & Overall Shield
FR-XLP or FR-EP Insulation & CPE Jacket
Solid Alloy Conductors



Catalog Number	ANSI Type	Size AWG	Number of Pairs	Insulation Thickness Mils	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW113 1601T	TX	16	1	25	50	0.30	52
HW113 2004T	TX	20	4	25	55	0.44	96
HW113 2008T	TX	20	8	25	55	0.55	156
HW113 2012T	TX	20	12	25	65	0.66	226

APPLICATION:

Superior flame-retardant cable for use in thermocouple extension applications in caustic environments where protection from electrostatic interference is required. UL listed as Type TC and approved for installation indoors or outdoors, aerially, in conduits, ducts and cable trays. May be installed at temperatures as low as -35°C and used in NEC Class 1, Division 2 hazardous locations.

CONDUCTORS:

Annealed, solid thermocouple extension grade alloys calibrated to standard limits of error per ANSI-MC96.1

INSULATION:

Flame-retardant ethylene propylene rubber (FR-EP) color coded per ANSI-MC96.1. Flame-retardant cross-linked polyethylene per ICEA S-66-524

INDIVIDUAL SHIELD:

Aluminum-polymer tape providing 100% coverage with a flexible 7-strand tinned copper drain wire

COMMUNICATION WIRE:

Multipair constructions contain a bare copper orange PVC-insulated communication wire

OVERALL SHIELD:

Aluminum-polymer tape providing 100% coverage with a flexible 7-strand tinned copper drain wire

JACKET:

Sunlight-resistant chlorinated polyethylene (CPE) color coded per ANSI-MC96.1. A ripcord is applied longitudinally under the jacket to facilitate stripping

FLAME TESTS:

- IEEE 383 (70,000 BTU/hr) Flame Test
- IEEE 1202 (70,000 BTU/hr)
- UL Standard 13 (70,000 BTU/hr) Flame Test
- CSA FT4 Flame Test

TYPE DESIGNATIONS							
ASA Type	Alloys		Insulation Colors		Jacket Color	Range	Limits of Error
	Positive	Negative	Positive	Negative			
EX	Chromel	Constantan	Purple	Red	Purple	0 to +200	+/- 1.7°C
JX	Iron	Constantan	White	Red	Black	0 to +200	+/- 2.2°C
KX	Chromel	Alumel	Yellow	Red	Yellow	0 to +200	+/- 2.2°C
TX	Copper	Constantan	Blue	Red	Blue	0 to +100	+/- 1.0°C

Note: One conductor in each pair is sequentially numbered for identification.

THERMOCOUPLE EXTENSION CABLE - EX, JX, KX, TX

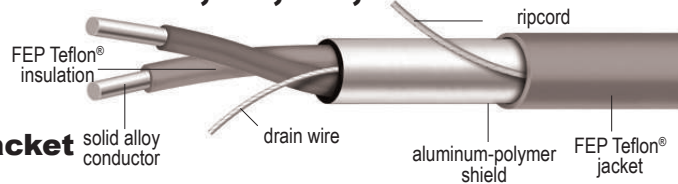
300 Volt UL Type PLTC & ITC, 200°C

Single Pair

Overall Shield

FEP Teflon® Insulation & FEP Teflon® Jacket

Solid Alloy Conductors



Catalog Number	ANSI Type	Size AWG	Number of Pairs	Insulation Thickness Mils	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW114 1602E	EX	16	1	10	12	0.17	32
HW114 1602J	JX	16	1	10	12	0.17	31
HW114 1602K	KX	16	1	10	12	0.17	31
HW114 1602T	TX	16	1	10	12	0.17	32

APPLICATION:

For use in high temperature thermocouple extension applications in caustic environments where protection from electrostatic interference is required. UL listed as Type PLTC and approved for installation indoors or outdoors, aerially, in conduits, ducts and cable trays in circuits not exceeding 300 volts. May be used in NEC Class 1, Division 2 hazardous locations.

CONDUCTORS:

Annealed, solid thermocouple extension grade alloys calibrated to standard limits of error per ANSI-MC96.1

INSULATION:

FEP Teflon® color coded per ANSI-MC96.1

OVERALL SHIELD:

Aluminum-polymer tape providing 100% coverage with a flexible tinned copper drain wire

JACKET:

FEP Teflon® color coded per ANSI-MC96.1. A ripcord is applied longitudinally under the jacket to facilitate stripping

FLAME TESTS:

- UL Standard 13 (70,000 BTU/hr) Flame Test
- UL 910 Steiner Tunnel Flame Test
- Meets CSA FT4/FT6 Flame Test

ADDITIONAL STANDARDS:

- NEC Type ITC per Articles 501, 502, 503, and 504
- NEC Type CL3P/PLTC

TYPE DESIGNATIONS							
ASA Type	Alloys		Insulation Colors		Jacket Color	Range	Limits of Error
	Positive	Negative	Positive	Negative			
EX	Chromel	Constantan	Purple	Red	Purple	0 to +200	+/- 1.7°C
JX	Iron	Constantan	White	Red	Black	0 to +200	+/- 2.2°C
KX	Chromel	Alumel	Yellow	Red	Yellow	0 to +200	+/- 2.2°C
TX	Copper	Constantan	Blue	Red	Blue	0 to +100	+/- 1.0°C

Note: One conductor in each pair is sequentially numbered for identification.

SPECIFICATION
HW115



**THERMOCOUPLE EXTENSION
CABLE: EX, JX, KX, TX**

**600 Volt UL Type TC-LS, 90°C
Single Pair**

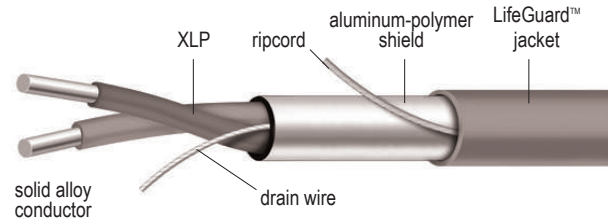
Overall Shield

XLP Insulation

Low Smoke Zero Halogen Jacket

Solid Alloy Conductors

FM Approved



INSTRUMENTATION & THERMOCOUPLE

Catalog Number	ANSI Type	Size AWG	Number of Pairs	Insulation Thickness Mils	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW115 1601E	EX	16	1	30	45	0.32	57
HW115 1601J	JX	16	1	30	45	0.32	57
HW115 1601K	KX	16	1	30	45	0.32	57
HW115 1601T	TX	16	1	30	45	0.32	57

APPLICATION:

LifeGuard™ Low Smoke Zero Halogen* cable is for use in instrumentation and process control applications where superior protection from electrostatic interference is required. LifeGuard™ jacket is highly flame-retardant, produces very small amounts of smoke when burned and contains no halogens. LifeGuard™ cable is ideal for applications where a high degree of safety and equipment protection is required.

LifeGuard™ cable is UL listed as Type TC-LS and approved for installation indoors or outdoors, aurally, in conduits, ducts, cable trays and direct burial in circuits not exceeding 600 volts. It may be installed in temperatures as low as -30°C and used in NEC Class I, Division 2 hazardous locations. It is UL approved for continuous operation at 90°C in wet and dry locations.

PRODUCT FEATURES:

- Tray rated
- Sunlight-resistant
- Approved for direct burial
- Overall shield provides protection from electrostatic interference
- Very low smoke production when burned
- LifeGuard™ jacket produces zero halogens during fire – less toxic and corrosive
- LifeGuard™ jacket is environmentally safe – lead, sulfur and halogen free
- Highly chemical resistant
- Very flame retardant
- Burns to an ash – does not exhibit thermoplastic drip
- Excellent compression and impact resistance
- Superior tensile strength and abrasion resistance
- Flexible jacket with low coefficient of friction



THERMOCOUPLE EXTENSION CABLE: EX, JX, KX, TX

**600 Volt UL Type TC-LS, 90°C
Single Pair**

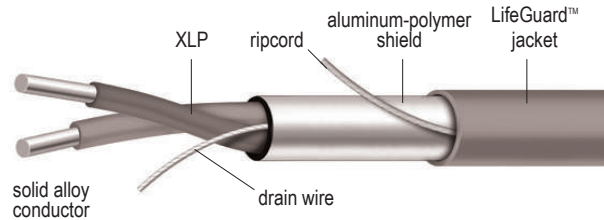
Overall Shield

XLP Insulation

Low Smoke Zero Halogen Jacket

Solid Alloy Conductors

FM Approved



CONDUCTORS:

Annealed, solid thermocouple extension grade alloys calibrated to standard limits of error per ANSI-MC96.1

INSULATION:

Cross-linked polyethylene (XLP) per UL Standard 44, color-coded per ANSI-MC96.1

OVERALL SHIELD:

Aluminum-polymer tape providing 100% coverage with a flexible 7 strand tinned copper drain wire

JACKET:

Sunlight-resistant and flame-retardant, Low Smoke Zero Halogen polyolefin per UL Standard 1277. A ripcord is applied longitudinally under the jacket to facilitate stripping

FLAME TESTS:

- UL Standard 1581 (70,000 BTU/hr) Flame Test
- FM Approved — Class 3972 Specification Test Standard — Cable Fire Propagation Group 1

ADDITIONAL STANDARDS:

- UL Standard 1685
- NEC Type TC per articles 336, 392, and 501.4 (b) and Class 1 circuits per NEC article 725

** Some cable insulations may contain trace amounts of halogens.*

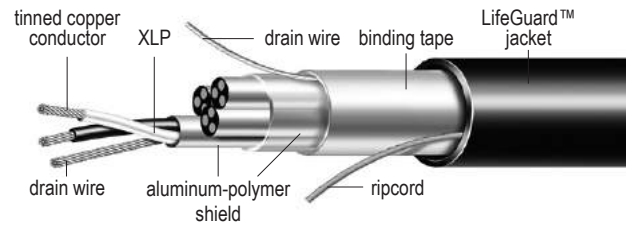
SPECIFICATION
HW120



REV. 11/2016

INSTRUMENTATION CABLE

**600 Volt UL Type TC-LS, 90°C
Single & Multiple Twisted Pairs
Individual & Overall Shield
XLP Insulation
Low Smoke Zero Halogen Jacket
Tinned Copper Conductors
FM Approved**



INSTRUMENTATION & THERMOCOUPLE

Catalog Number	Size AWG	Number of Pairs	Insulation Thickness Mils	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW120 01601	16	1	30	60	0.33	59
HW120 01602	16	2	30	60	0.58	136
HW120 01604	16	4	30	60	0.67	216
HW120 01608	16	8	30	60	0.90	397
HW120 01612	16	12	30	80	1.04	530
HW120 01624	16	24	30	80	1.40	960

APPLICATION:

LifeGuard™ Low Smoke Zero Halogen* cable is for use in instrumentation and process control applications where superior protection from electrostatic interference is required. LifeGuard™ jacket is highly flame-retardant, produces very small amounts of smoke when burned and contains no halogens. LifeGuard™ cable is ideal for applications where a high degree of safety and equipment protection is required.

LifeGuard™ cable is UL listed as Type TC-LS and approved for installation indoors or outdoors, aerially, in conduits, ducts, cable trays and direct burial in circuits not exceeding 600 volts. It may be installed in temperatures as low as -30°C and used in NEC Class I, Division 2 hazardous locations. It is UL approved for continuous operation at 90°C in wet and dry locations, 130°C for emergency overload conditions, and 250°C for short circuit conditions.

PRODUCT FEATURES:

- Tray rated
- Sunlight-resistant
- Approved for direct burial
- Tinned conductors provide ease of termination and added protection in caustic environments
- Superior electrostatic interference protection from individual and Overall shield
- Very low smoke production when burned
- LifeGuard™ jacket produces zero halogens during fire – less toxic and corrosive
- LifeGuard™ jacket is environmentally safe – lead, sulfur and halogen free
- Highly chemical resistant
- Very flame retardant
- Burns to an ash – does not exhibit thermoplastic drip
- Excellent compression and impact resistance
- Superior tensile strength and abrasion resistance
- Flexible jacket with low coefficient of friction



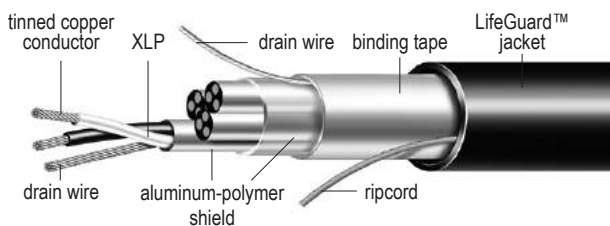
REV. 11/2016

SPECIFICATION HW120

INSTRUMENTATION & THERMOCOUPLE

INSTRUMENTATION CABLE

**600 Volt UL Type TC-LS, 90°C
Single & Multiple Twisted Pairs
Individual & Overall Shield
XLP Insulation
Low Smoke Zero Halogen Jacket
Tinned Copper Conductors
FM Approved**



CONDUCTORS:

7 strand tin coated, soft annealed copper per ASTM B-33, Class B stranding per ASTM B-8

INSULATION:

Cross-linked polyethylene (XLP) per UL Standard 44

INDIVIDUAL SHIELD:

Aluminum-polymer tape providing 100% coverage with a flexible 7 strand tinned copper drain wire

OVERALL SHIELD:

Aluminum-polymer tape providing 100% coverage with a flexible 7 strand tinned copper drain wire

JACKET:

Sunlight-resistant and flame-retardant, Low Smoke Zero Halogen polyolefin per UL Standard 1277. A ripcord is applied longitudinally under the jacket to facilitate stripping

FLAME TESTS:

- UL Standard 1581 (70,000 BTU/hr) Flame Test
- FM Approved — Class 3972 Specification Test Standard — Cable Fire Propagation Group 1

COLOR CODE:

Pairs: black and white with printed numbers on one conductor

ADDITIONAL STANDARDS:

- UL Standard 1685
- NEC Type TC per articles 336, 392, and 501.4 (b) and Class 1 circuits per NEC article 725

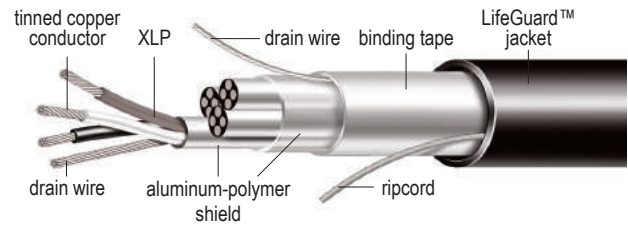
* Some cable insulations may contain trace amounts of halogens.

SPECIFICATION
HW121



INSTRUMENTATION CABLE

600 Volt UL Type TC-LS, 90°C
Single & Multiple Twisted Triads
Individual & Overall Shield
XLP Insulation
Low Smoke Zero Halogen Jacket
Tinned Copper Conductors
FM Approved



Catalog Number	Size AWG	Number of Triads	Insulation Thickness Mils	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW121 1601T	16	1	30	60	0.35	67
HW121 01602	16	2	30	60	0.64	170
HW121 01604	16	4	30	60	0.74	268
HW121 01606	16	6	30	60	0.93	422
HW121 01608	16	8	30	60	0.96	500
HW121 01612	16	12	30	60	1.14	705

INSTRUMENTATION & THERMOCOUPLE



REV. 11/2016

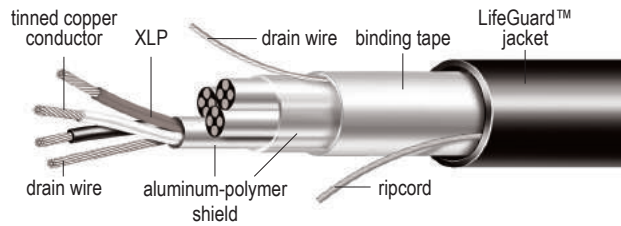
APPROVED

SPECIFICATION HW121

INSTRUMENTATION & THERMOCOUPLE

INSTRUMENTATION CABLE

**600 Volt UL Type TC-LS, 90°C
Single & Multiple Twisted Triads
Individual & Overall Shield
XLP Insulation
Low Smoke Zero Halogen Jacket
Tinned Copper Conductors
FM Approved**



CONDUCTORS:

7 strand tin coated, soft annealed copper per ASTM B-33, Class B stranding per ASTM B-8.

INSULATION:

Cross-linked polyethylene (XLP) per UL Standard 44

INDIVIDUAL SHIELD:

Aluminum-polymer tape providing 100% coverage with a flexible 7 strand tinned copper drain wire.

OVERALL SHIELD:

Aluminum-polymer tape providing 100% coverage with a flexible 7 strand tinned copper drain wire.

JACKET:

Sunlight-resistant and flame-retardant, Low Smoke Zero Halogen polyolefin per UL Standard 1277. A ripcord is applied longitudinally under the jacket to facilitate stripping.

FLAME TESTS:

- UL Standard 1581 (70,000 BTU/hr) Flame Test
- FM Approved — Class 3972 Specification Test Standard — Cable Fire Propagation Group 1

COLOR CODE:

Triads: black, white and red with printed numbers on one conductor

ADDITIONAL STANDARDS:

- UL Standard 1685
- NEC Type TC per articles 336, 392, and 501.4 (b) and Class 1 circuits per NEC article 725

* Some cable insulations may contain trace amounts of halogens.

SECTION D

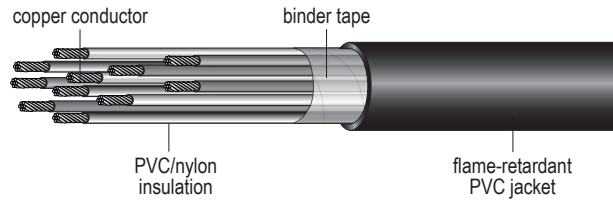
Tray Cables 600 Volt, Control & Power

DESCRIPTION	INSULATION	JACKET	SPECIFICATION	PAGE
Control Cable	TFN, PVC/Nylon	PVC	HW150	64
Control Cable	THHN/THWN, PVC/ Nylon	PVC	HW151	66
Shielded Control Cable	TFN, PVC/Nylon	PVC	HW152	69
Shielded Control Cable	THHN/THWN, PVC/ Nylon	PVC	HW153	71
Power Cable	THHN/THWN, PVC/ Nylon	PVC	HW154	73
Power/Control Composite	THHN/THWN, PVC/ Nylon	PVC	HW155	75
Control Cable	XHHW-2, VW-1, FR-XLP	PVC	HW156	76
Power Cable	XHHW-2, XLP	PVC	HW157	79
Control Cable	XHHW-2, VW-1, FR-EP	CPE	HW158	81
Power Cable	XHHW-2, VW-1, FR-EP	CPE	HW159	84
Control Cable	XLP, XHHW-2	LSZH	HW170	86
Shielded Control Cable	XLP	LSZH	HW171	88
Power Cable	XLP, XHHW-2	LSZH	HW172	90
Shielded Substation Cable	XLP, XHHW-2	LSZH	HW173	92
Shielded Substation Cable	XLP, XHHW-2	LSZH	HW174	94
Non-Shielded Control Cable	PE/PVC	PVC	HW180	96

SPECIFICATION
HW150

TRAY CABLE - CONTROL CABLE

600 Volt UL Type TC-ER*
TFN Insulation
PVC Jacket
Copper Conductors



Catalog Number	Size AWG	Number of Conductors	Number of Strands	Insulation Thickness Mils	Nylon Jacket Thickness Mils	Overall Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW150 01802*	18	2	7	15	4	45	0.19 x 0.28	33
HW150 01803	18	3	7	15	4	45	0.28	43
HW150 01804	18	4	7	15	4	45	0.31	52
HW150 01805	18	5	7	15	4	45	0.33	62
HW150 01806	18	6	7	15	4	45	0.36	72
HW150 01807	18	7	7	15	4	45	0.37	79
HW150 01808	18	8	7	15	4	45	0.38	89
HW150 01809	18	9	7	15	4	45	0.41	104
HW150 01810	18	10	7	15	4	45	0.45	111
HW150 01812	18	12	7	15	4	45	0.46	127
HW150 01815	18	15	7	15	4	45	0.51	157
HW150 01819	18	19	7	15	4	60	0.57	202
HW150 01825	18	25	7	15	4	60	0.65	258
HW150 01830	18	30	7	15	4	60	0.69	300
HW150 01837	18	37	7	15	4	60	0.74	360

* Flat construction

APPLICATION:

General purpose cable for use in power, control and lighting circuits in a broad range of commercial and industrial applications. Approved for continuous operation at 90°C in dry locations, installation indoors or outdoors, aerially, in conduits, ducts, cable trays or direct burial in circuits not exceeding 600 volts. May be used in NEC Class I and II, Division 2 hazardous locations. Exposed Run (ER) rating available upon request.

CONDUCTORS:

Soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8

INSULATION:

Flame-retardant PVC per UL Standard 62 for Type TFN wire

INSULATION JACKET:

Clear nylon per UL Standard 62 for Type TFN wire

JACKET:

Sunlight-resistant PVC per UL Standard 1277

FLAME TESTS:

- IEEE 383 (70,000 BTU/hr) Flame Test
- ICEA (210,000 BTU/hr) Flame Test

COLOR CODE:

ICEA Method 1, Table E-2

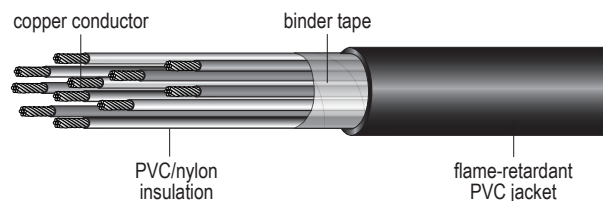
ADDITIONAL STANDARDS:

- UL Type TC per Article 336 of the NEC
- Approved for Class 1 remote-control and signaling circuits per Article 725 of the NEC

*TC-ER rating applies to cables with 3 or more insulated conductors

TRAY CABLE - CONTROL CABLE

**600 Volt UL Type TC-ER*
TFN Insulation
PVC Jacket
Copper Conductors**



Catalog Number	Size AWG	Number of Conductors	Number of Strands	Insulation Thickness Mils	Nylon Jacket Thickness Mils	Overall Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW150 01602*	16	2	7	15	4	45	0.20 x 0.30	42
HW150 01603	16	3	7	15	4	45	0.31	55
HW150 01604	16	4	7	15	4	45	0.34	69
HW150 01605	16	5	7	15	4	45	0.36	83
HW150 01606	16	6	7	15	4	45	0.39	96
HW150 01607	16	7	7	15	4	45	0.39	106
HW150 01608	16	8	7	15	4	45	0.39	122
HW150 01609	16	9	7	15	4	45	0.43	138
HW150 01610	16	10	7	15	4	45	0.46	149
HW150 01612	16	12	7	15	4	45	0.51	174
HW150 01615	16	15	7	15	4	60	0.60	229
HW150 01616	16	16	7	15	4	60	0.60	241
HW150 01619	16	19	7	15	4	60	0.63	275
HW150 01620	16	20	7	15	4	60	0.66	291
HW150 01625	16	25	7	15	4	60	0.72	355
HW150 01630	16	30	7	15	4	60	0.77	414
HW150 01637	16	37	7	15	4	80	0.82	498
HW150 01650	16	50	7	15	4	80	1.01	703

* Flat construction

APPLICATION:

General purpose cable for use in power, control and lighting circuits in a broad range of commercial and industrial applications. Approved for continuous operation at 90°C in dry locations, installation indoors or outdoors, aerially, in conduits, ducts, cable trays or direct burial in circuits not exceeding 600 volts. May be used in NEC Class I and II, Division 2 hazardous locations. Exposed Run (ER) rating available upon request.

CONDUCTORS:

Soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8

INSULATION:

Flame-retardant PVC per UL Standard 62 for Type TFN wire

INSULATION JACKET:

Clear nylon per UL Standard 62 for Type TFN wire

JACKET:

Sunlight-resistant PVC per UL Standard 1277

FLAME TESTS:

- IEEE 383 (70,000 BTU/hr) Flame Test
- ICEA (210,000 BTU/hr) Flame Test
- IEEE 1202 (70,000 BTU/hr) Flame Test

COLOR CODE:

ICEA Method 1, Table E-2

ADDITIONAL STANDARDS:

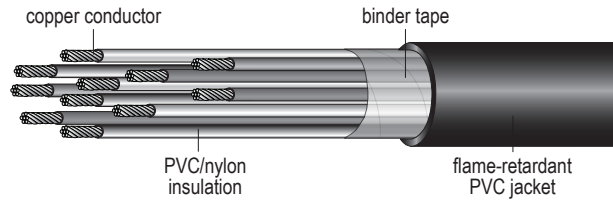
- UL Type TC per Article 336 of the NEC
- Approved for Class 1 remote-control and signaling circuits per Article 725 of the NEC

*TC-ER rating applies to cables with 3 or more insulated conductors

SPECIFICATION
HW151

TRAY CABLE - CONTROL CABLE

600 Volt UL Type TC-ER*
THHN or THWN-2 Insulation
PVC Jacket
Copper Conductors



TRAY CABLES

Catalog Number	Size AWG	Number of Conductors	Number of Strands	Insulation Thickness Mils	Nylon Jacket Thickness Mils	Overall Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW151 01402*	14	2	7	15	4	45	0.22 x 0.33	62
HW151 01403	14	3	7	15	4	45	0.35	80
HW151 01404	14	4	7	15	4	45	0.38	99
HW151 01405	14	5	7	15	4	45	0.41	118
HW151 01406	14	6	7	15	4	45	0.45	140
HW151 01407	14	7	7	15	4	45	0.45	153
HW151 01409	14	9	7	15	4	45	0.52	196
HW151 01410	14	10	7	15	4	60	0.60	230
HW151 01412	14	12	7	15	4	60	0.61	267
HW151 01416	14	16	7	15	4	60	0.68	343
HW151 01419	14	19	7	15	4	60	0.71	396
HW151 01420	14	20	7	15	4	60	0.75	423
HW151 01425	14	25	7	15	4	80	0.83	511
HW151 01430	14	30	7	15	4	80	0.93	636
HW151 01437	14	37	7	15	4	80	0.98	766
HW151 01440	14	40	7	15	4	80	1.01	840
HW151 01450	14	50	7	15	4	80	1.17	1043
HW151 01460	14	60	7	15	4	80	1.21	1200

* Flat construction

APPLICATION:

General purpose cable for use in power, control and lighting circuits in a broad range of commercial and industrial applications. Approved for installation indoors or outdoors, aerially, in conduits, ducts, cable trays or direct burial in circuits not exceeding 600 volts. May be used in NEC Class I and II, Division 2 hazardous locations. UL approved for use in continuous operation at 90°C in wet or dry locations, 130°C for emergency overload conditions, and 250°C for short circuit conditions. Exposed Run (ER) rating available upon request.

CONDUCTORS:

Soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8

INSULATION:

Flame-retardant PVC per UL Standard 83 for Type THHN or THWN wire

INSULATION JACKET:

Clear nylon per UL Standard 83 for Type THHN or THWN wire

JACKET:

Sunlight-resistant PVC per UL Standard 1277

FLAME TESTS:

- IEEE 383 (70,000 BTU/hr) Flame Test
- ICEA (210,000 BTU/hr) Flame Test

COLOR CODE:

ICEA Method 1, Table E-2

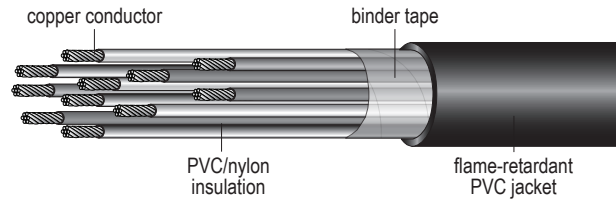
ADDITIONAL STANDARDS:

- UL Type TC per Article 336 of the NEC
- Approved for Class 1 remote-control and signaling circuits per Article 725 of the NEC

*TC-ER rating applies to cables with 3 or more insulated conductors

TRAY CABLE - CONTROL CABLE

**600 Volt UL Type TC-ER*
THHN or THWN Insulation
PVC Jacket
Copper Conductors**



Catalog Number	Size AWG	Number of Conductors	Number of Strands	Insulation Thickness Mils	Nylon Jacket Thickness Mils	Overall Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW151 01202*	12	2	7	15	4	45	0.24 x 0.37	77
HW151 01203	12	3	7	15	4	45	0.39	110
HW151 01204	12	4	7	15	4	45	0.42	138
HW151 01205	12	5	7	15	4	45	0.46	165
HW151 01207	12	7	7	15	4	45	0.50	216
HW151 01209	12	9	7	15	4	60	0.62	297
HW151 01210	12	10	7	15	4	60	0.67	324
HW151 01212	12	12	7	15	4	60	0.69	378
HW151 01215	12	15	7	15	4	60	0.76	468
HW151 01216	12	16	7	15	4	60	0.76	488
HW151 01219	12	19	7	15	4	60	0.80	568
HW151 01220	12	20	7	15	4	80	0.89	642
HW151 01225	12	25	7	15	4	80	0.99	775
HW151 01230	12	30	7	15	4	80	1.03	910
HW151 01237	12	37	7	15	4	80	1.14	1105

* Flat construction

APPLICATION:

General purpose cable for use in power, control and lighting circuits in a broad range of commercial and industrial applications. Approved for installation indoors or outdoors, aerially, in conduits, ducts, cable trays or direct burial in circuits not exceeding 600 volts. May be used in NEC Class I and II, Division 2 hazardous locations. UL approved for use in continuous operation at 75°C in wet locations, 90°C in dry locations, 130°C for emergency overload conditions, and 250°C for short circuit conditions. Exposed Run (ER) rating available upon request.

CONDUCTORS:

Soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8

INSULATION:

Flame-retardant PVC per UL Standard 83 for Type THHN or THWN wire

INSULATION JACKET:

Clear nylon per UL Standard 83 for Type THHN or THWN wire

JACKET:

Sunlight-resistant PVC per UL Standard 1277

FLAME TESTS:

- IEEE 383 (70,000 BTU/hr) Flame Test
- ICEA (210,000 BTU/hr) Flame Test

COLOR CODE:

ICEA Method 1, Table E-2

ADDITIONAL STANDARDS:

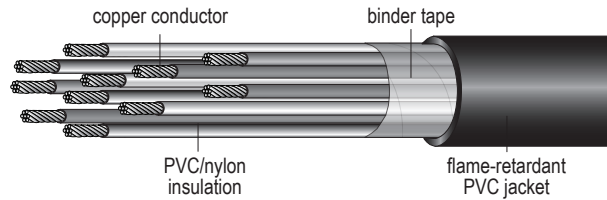
- UL Type TC per Article 336 of the NEC
- Approved for Class 1 remote-control and signaling circuits per Article 725 of the NEC

*TC-ER rating applies to cables with 3 or more insulated conductors

SPECIFICATION
HW151

TRAY CABLE - CONTROL CABLE

600 Volt UL Type TC-ER*
THHN or THWN-2 Insulation
PVC Jacket
Copper Conductors



TRAY CABLES

Catalog Number	Size AWG	Number of Conductors	Number of Strands	Insulation Thickness Mils	Nylon Jacket Thickness Mils	Overall Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW151 01002*	10	2	7	20	4	45	0.27 x 0.44	131
HW151 01003	10	3	7	20	4	45	0.45	169
HW151 01004	10	4	7	20	4	45	0.50	231
HW151 01005	10	5	7	20	4	60	0.58	276
HW151 01006	10	6	7	20	4	60	0.63	329
HW151 01007	10	7	7	20	4	60	0.63	361
HW151 01009	10	9	7	20	4	60	0.73	465
HW151 01012	10	12	7	20	4	80	0.86	647
HW151 01016	10	16	7	20	4	80	0.97	817
HW151 01019	10	19	7	20	4	80	1.02	920

* Flat construction

APPLICATION:

General purpose cable for use in power, control and lighting circuits in a broad range of commercial and industrial applications. Approved for installation indoors or outdoors, aerially, in conduits, ducts, cable trays or direct burial in circuits not exceeding 600 volts. May be used in NEC Class I and II, Division 2 hazardous locations. UL approved for use in continuous operation at 90°C in wet and dry locations, 130°C for emergency overload conditions, and 250°C for short circuit conditions. Exposed Run (ER) rating available upon request.

CONDUCTORS:

Soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8

INSULATION:

Flame-retardant PVC per UL Standard 83 for Type THHN or THWN wire

INSULATION JACKET:

Clear nylon per UL Standard 83 for Type THHN or THWN wire

JACKET:

Sunlight-resistant PVC per UL Standard 1277

FLAME TESTS:

- IEEE 383 (70,000 BTU/hr) Flame Test
- ICEA (210,000 BTU/hr) Flame Test

COLOR CODE:

ICEA Method 1, Table E-2

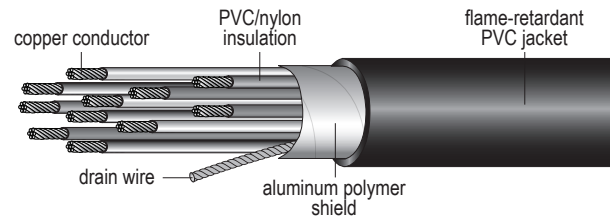
ADDITIONAL STANDARDS:

- UL Type TC per Article 336 of the NEC
- Approved for Class 1 remote-control and signaling circuits per Article 725 of the NEC

*TC-ER rating applies to cables with 3 or more insulated conductors

**TRAY CABLE - SHIELDED
CONTROL CABLE**

**600 Volt UL Type TC-ER*, 90°C
TFN Insulation
PVC Jacket
Copper Conductors**



Catalog Number	Size AWG	Number of Conductors	Number of Strands	Insulation Thickness Mils	Nylon Jacket Thickness Mils	Overall Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW152 01802	18	2	7	15	4	45	0.27	34
HW152 01803	18	3	7	15	4	45	0.28	43
HW152 01804	18	4	7	15	4	45	0.31	52
HW152 01805	18	5	7	15	4	45	0.33	62
HW152 01806	18	6	7	15	4	45	0.36	72
HW152 01807	18	7	7	15	4	45	0.36	79
HW152 01808	18	8	7	15	4	45	0.38	89
HW152 01812	18	12	7	15	4	45	0.46	127
HW152 01819	18	19	7	15	4	60	0.57	202
HW152 01837	18	37	7	15	4	60	0.74	360

APPLICATION:

General purpose cable for use where shielding from electro-static interference is required in power, control and lighting circuits in a broad range of commercial and industrial applications. Approved for continuous operation at 90°C in dry locations, installation indoors or outdoors, aerially, in conduits, ducts, cable trays or direct burial in circuits not exceeding 600 volts. May be used in NEC Class I and II, Division 2 hazardous locations. Exposed Run (ER) rating available upon request.

CONDUCTORS:

Soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8

INSULATION:

Flame-retardant PVC per UL Standard 62 for Type TFN wire

INSULATION JACKET:

Clear nylon per UL Standard 62 for Type TFN wire

OVERALL SHIELD:

Aluminum-polymer tape providing 100% coverage with a flexible 7-strand tinned copper drain wire

JACKET:

Sunlight-resistant PVC per UL Standard 1277

FLAME TESTS:

- IEEE 383 (70,000 BTU/hr) Flame Test
- ICEA (210,000 BTU/hr) Flame Test

COLOR CODE:

ICEA Method 1, Table E-2

ADDITIONAL STANDARDS:

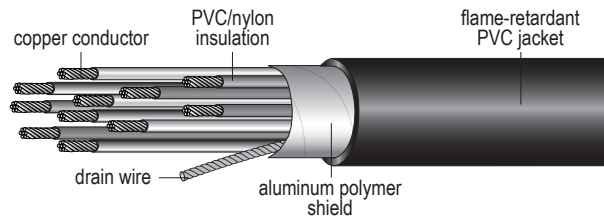
- UL Type TC per Article 336 of the NEC
- Approved for Class 1 remote-control and signaling circuits per Article 725 of the NEC

*TC-ER rating applies to cables with 3 or more insulated conductors

SPECIFICATION
HW152

TRAY CABLE - SHIELDED CONTROL CABLE

**600 Volt UL Type TC-ER*, 90°C
TFN Insulation
PVC Jacket
Copper Conductors**



Catalog Number	Size AWG	Number of Conductors	Number of Strands	Insulation Thickness Mils	Nylon Jacket Thickness Mils	Overall Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW152 01602	16	2	7	15	4	45	0.29	43
HW152 01603	16	3	7	15	4	45	0.31	55
HW152 01604	16	4	7	15	4	45	0.34	69
HW152 01605	16	5	7	15	4	45	0.36	83
HW152 01606	16	6	7	15	4	45	0.39	96
HW152 01607	16	7	7	15	4	45	0.41	106
HW152 01608	16	8	7	15	4	45	0.43	122
HW152 01609	16	9	7	15	4	45	0.46	138
HW152 01610	16	10	7	15	4	45	0.49	149
HW152 01612	16	12	7	15	4	45	0.51	174
HW152 01619	16	19	7	15	4	60	0.63	275
HW152 01625	16	25	7	15	4	60	0.72	355
HW152 01637	16	37	7	15	4	80	0.82	498

APPLICATION:

General purpose cable for use where shielding from electrostatic interference is required in power, control and lighting circuits in a broad range of commercial and industrial applications. Approved for continuous operation at 90°C in dry locations, installation indoors or outdoors, aerially, in conduits, ducts, cable trays or direct burial in circuits not exceeding 600 volts. May be used in NEC Class I and II, Division 2 hazardous locations.

CONDUCTORS:

Soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8

INSULATION:

Flame-retardant PVC per UL Standard 62 for Type TFN wire

INSULATION JACKET:

Clear nylon per UL Standard 62 for Type TFN wire

OVERALL SHIELD:

Aluminum-polymer tape providing 100% coverage with a flexible 7-strand tinned copper drain wire

JACKET:

Sunlight-resistant PVC per UL Standard 1277

FLAME TESTS:

- IEEE 383 (70,000 BTU/hr) Flame Test
- ICEA (210,000 BTU/hr) Flame Test

COLOR CODE:

ICEA Method 1, Table E-2

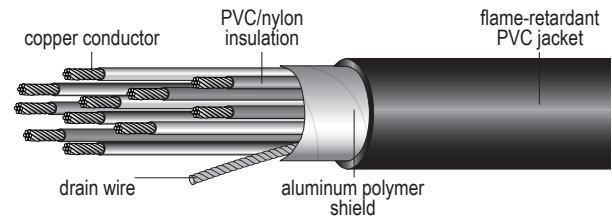
ADDITIONAL STANDARDS:

- UL Type TC per Article 336 of the NEC
- Approved for Class 1 remote-control and signaling circuits per Article 725 of the NEC

*TC-ER rating applies to cables with 3 or more insulated conductors

**TRAY CABLE - SHIELDED
CONTROL CABLE**

**600 Volt UL Type TC-ER*, 90°C
THHN or THWN-2 Insulation
PVC Jacket
Copper Conductors**



Catalog Number	Size AWG	Number of Conductors	Number of Strands	Insulation Thickness Mils	Nylon Jacket Thickness Mils	Overall Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW153 01402	14	2	7	15	4	45	0.33	62
HW153 01403	14	3	7	15	4	45	0.35	80
HW153 01404	14	4	7	15	4	45	0.38	99
HW153 01405	14	5	7	15	4	45	0.41	118
HW153 01407	14	7	7	15	4	45	0.45	153
HW153 01409	14	9	7	15	4	45	0.52	196
HW153 01412	14	12	7	15	4	60	0.61	267
HW153 01419	14	19	7	15	4	60	0.71	396
HW153 01425	14	25	7	15	4	60	0.83	511
HW153 01437	14	37	7	15	4	60	1.02	768

APPLICATION:

General purpose cable for use where shielding from electro-static interference is required in power, control and lighting circuits in a broad range of commercial and industrial applications. Approved for installation indoors or outdoors, aerially, in conduits, ducts, cable trays or direct burial in circuits not exceeding 600 volts. May be used in NEC Class I and II, Division 2 hazardous locations. UL approved for use in continuous operation at 90°C in wet and dry locations, 130°C for emergency overload conditions, and 250°C for short circuit conditions.

CONDUCTORS:

Soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8

INSULATION:

Flame-retardant PVC per UL Standard 83 for Type THHN or THWN wire

INSULATION JACKET:

Clear nylon per UL Standard 83 for Type THHN or THWN wire

OVERALL SHIELD:

Aluminum-polymer tape providing 100% coverage with a flexible 7-strand tinned copper drain wire

JACKET:

Sunlight-resistant PVC per UL Standard 1277

FLAME TESTS:

- IEEE 383 (70,000 BTU/hr) Flame Test
- ICEA (210,000 BTU/hr) Flame Test

COLOR CODE:

Control Sizes: ICEA Method 1, Table E-2

ADDITIONAL STANDARDS:

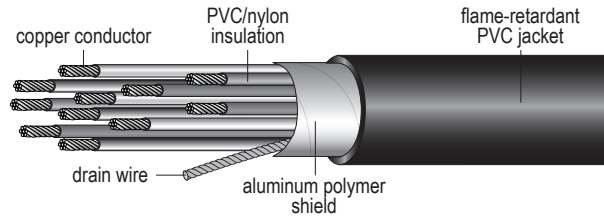
- UL Type TC per Article 336 of the NEC
- Approved for Class 1 remote-control and signaling circuits per Article 725 of the NEC

*TC-ER rating applies to cables with 3 or more insulated conductors

SPECIFICATION
HW153

TRAY CABLE - SHIELDED CONTROL CABLE

**600 Volt UL Type TC-ER*, 90°C THHN or THWN-2 Insulation
PVC Jacket
Copper Conductors**



Catalog Number	Size AWG	Number of Conductors	Number of Strands	Insulation Thickness Mils	Nylon Jacket Thickness Mils	Overall Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW153 01202	12	2	7	15	4	45	0.37	83
HW153 01203	12	3	7	15	4	45	0.39	110
HW153 01204	12	4	7	15	4	45	0.42	138
HW153 01205	12	5	7	15	4	45	0.46	165
HW153 01207	12	7	7	15	4	45	0.50	216
HW153 01209	12	9	7	15	4	60	0.62	297
HW153 01212	12	12	7	15	4	60	0.69	378
HW153 01219	12	19	7	15	4	60	0.80	568
HW153 01237	12	37	7	15	4	60	1.14	1105
HW153 01002	10	2	7	20	4	45	0.43	131
HW153 01003	10	3	7	20	4	45	0.45	169
HW153 01004	10	4	7	20	4	45	0.50	231
HW153 01005	10	5	7	20	4	60	0.58	276
HW153 01012	10	12	7	20	4	60	0.86	647

APPLICATION:

General purpose cable for use where shielding from electro-static interference is required in power, control and lighting circuits in a broad range of commercial and industrial applications. Approved for installation indoors or outdoors, aerially, in conduits, ducts, cable trays or direct burial in circuits not exceeding 600 volts. May be used in NEC Class I and II, Division 2 hazardous locations. UL approved for use in continuous operation at 90°C in wet and dry locations, 130°C for emergency overload conditions, and 250°C for short circuit conditions.

CONDUCTORS:

Soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8

INSULATION:

Flame-retardant PVC per UL Standard 83 for Type THHN or THWN wire

INSULATION JACKET:

Clear nylon per UL Standard 83 for Type THHN or THWN wire

OVERALL SHIELD:

Aluminum-polymer tape providing 100% coverage with a flexible 7-strand tinned copper drain wire

JACKET:

Sunlight-resistant PVC per UL Standard 1277

FLAME TESTS:

- IEEE 383 (70,000 BTU/hr) Flame Test
- ICEA (210,000 BTU/hr) Flame Test

COLOR CODE:

Control Sizes: ICEA Method 1, Table E-2

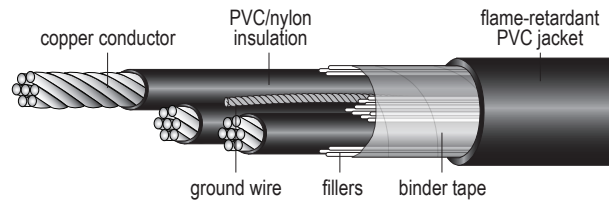
ADDITIONAL STANDARDS:

- UL Type TC per Article 336 of the NEC
- Approved for Class 1 remote-control and signaling circuits per Article 725 of the NEC

*TC-ER rating applies to cables with 3 or more insulated conductors

TRAY CABLE - POWER CABLE

**600 Volt UL Type TC-ER*
THHN or THWN-2 Insulation
PVC Jacket
Copper Conductors**



Catalog Number	Size AWG	Number of Conductors	Number of Strands	Insulation Thickness Mils	Nylon Jacket Thickness Mils	Ground Wire Size AWG	Overall Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW154 01403	14	3	7	15	4	14	45	0.36	91
HW154 01203	12	3	7	15	4	12	45	0.41	126
HW154 01003	10	3	7	20	4	10	45	0.46	191
HW154 00803	8	3	7	30	5	10	60	0.58	220
HW154 00804	8	4	7	30	5	10	60	0.61	286
HW154 00603	6	3	7	30	5	8	60	0.69	386
HW154 00604	6	4	7	30	5	8	60	0.76	505
HW154 00403	4	3	7	40	6	8	60	0.89	630
HW154 00404	4	4	7	40	6	8	80	0.97	828
HW154 00203	2	3	7	40	6	6	80	1.03	930
HW154 00204	2	4	7	40	6	6	80	1.13	1213
HW154 00103	1	3	19	50	7	6	80	1.15	1252

APPLICATION:

General purpose cable for use in primary power and feeder circuits in a broad range of commercial and industrial applications. Approved for installation indoors or outdoors, aerially, in conduits, ducts, cable trays or direct burial in circuits not exceeding 600 volts. May be used in NEC Class I and II, Division 2 hazardous locations. UL approved for use in continuous operation at 90°C in wet and dry locations, 130°C for emergency overload conditions, and 250°C for short circuit conditions.

CONDUCTORS:

Soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8

INSULATION:

Flame-retardant PVC per UL Standard 83 for Type THHN or THWN wire

INSULATION JACKET:

Clear nylon per UL Standard 83 for Type THHN or THWN wire

GROUNDING CONDUCTOR:

Soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8 sized in accordance with UL Standard 1277

JACKET:

Sunlight-resistant PVC per UL Standard 1277

FLAME TESTS:

- IEEE 383 (70,000 BTU/hr) Flame Test
- ICEA (210,000 BTU/hr) Flame Test

COLOR CODE:

8 AWG and larger: ICEA Method 4
14 AWG – 10 AWG: ICEA Method 1, Table E-2

ADDITIONAL STANDARDS:

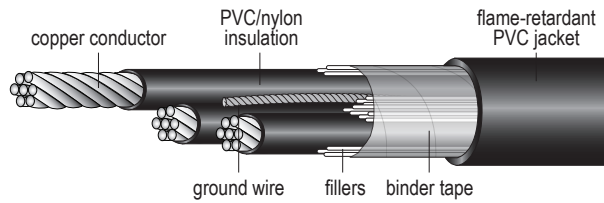
- UL Type TC per Article 336 of the NEC
- UL Type TC-ER Rated for Exposed Run

*TC-ER rating applies to cables with 3 or more insulated conductors

SPECIFICATION
HW154

TRAY CABLE - POWER CABLE

600 Volt UL Type TC-ER*
THHN or THWN-2 Insulation
PVC Jacket
Copper Conductors



TRAY CABLES

Catalog Number	Size AWG	Number of Conductors	Number of Strands	Insulation Thickness Mils	Nylon Jacket Thickness Mils	Ground Wire Size AWG	Overall Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW154 10103	1/0	3	19	50	7	6	80	1.22	1423
HW154 10104	1/0	4	19	50	7	6	80	1.34	1832
HW154 20103	2/0	3	19	50	7	6	80	1.32	1718
HW154 20104	2/0	4	19	50	7	6	80	1.45	2223
HW154 30103	3/0	3	19	50	7	4	80	1.42	2131
HW154 30104	3/0	4	19	50	7	4	80	1.58	2756
HW154 40103	4/0	3	19	50	7	4	80	1.54	2592
HW154 40104	4/0	4	19	50	7	4	80	1.77	3457
HW154 25003	250	3	37	60	8	3	110	1.75	3123
HW154 25004	250	4	37	60	8	3	110	1.94	4046
HW154 35003	350	3	37	60	8	3	110	1.97	4204
HW154 35004	350	4	37	60	8	3	110	2.18	5469
HW154 50003	500	3	37	60	8	2	110	2.26	5792
HW154 50004	500	4	37	60	8	2	110	2.49	7556
HW154 75003	750	3	61	60	9	1	110	2.82	9060

APPLICATION:

General purpose cable for use in primary power and feeder circuits in a broad range of commercial and industrial applications. Approved for installation indoors or outdoors, aerially, in conduits, ducts, cable trays or direct burial in circuits not exceeding 600 volts. May be used in NEC Class I and II, Division 2 hazardous locations. UL approved for use in continuous operation at 90°C in wet and dry locations, 130°C for emergency overload conditions, and 250°C for short circuit conditions.

CONDUCTORS:

Soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8

INSULATION:

Flame-retardant PVC per UL Standard 83 for Type THHN or THWN wire

INSULATION JACKET:

Clear nylon per UL Standard 83 for Type THHN or THWN wire

GROUNDING CONDUCTOR:

Soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8 sized in accordance with UL Standard 1277

JACKET:

Sunlight-resistant PVC per UL Standard 1277

FLAME TESTS:

- IEEE 383 (70,000 BTU/hr) Flame Test
- ICEA (210,000 BTU/hr) Flame Test

COLOR CODE:

ICEA Method 4

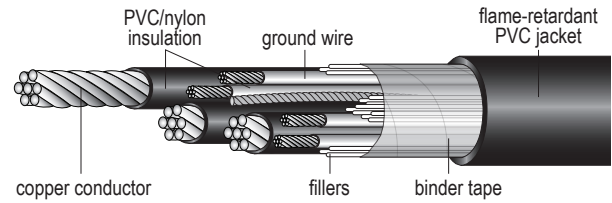
ADDITIONAL STANDARDS:

- UL Type TC per Article 336 of the NEC
- UL Type TC-ER Rated for Exposed Run

*TC-ER rating applies to cables with 3 or more insulated conductors

**TRAY CABLE - POWER &
CONTROL COMPOSITE CABLE**

**600 Volt UL Type TC-ER*
THHN or THWN-2 Insulation
PVC Jacket
Copper Conductors**



POWER CABLES					
Catalog Number	Size AWG	Number of Conductors	Insulation Thickness Mils	Nylon Jacket Thickness Mils	Ground Wire Size AWG
HW155 12014	12	3	15	4	12
HW155 10014	10	3	20	4	10
HW155 08014	8	3	30	5	10
HW155 06014	6	3	30	5	8
HW155 04014	4	3	40	6	8
HW155 02014	2	3	40	6	6
HW155 10012	10	3	20	4	10
HW155 08012	8	3	30	5	10
HW155 06012	6	3	30	5	8
HW155 04012	4	3	40	6	8
HW155 02012	2	3	40	6	6

CONTROL CABLES							
Catalog Number	Size AWG	Number of Conductors	Insulation Thickness Mils	Nylong Jacket Thickness Mils	Overall Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW155 12014	14	4	15	4	45	0.45	190
HW155 10014	14	4	15	4	60	0.55	265
HW155 08014	14	4	15	4	60	0.67	350
HW155 06014	14	4	15	4	60	0.72	458
HW155 04014	14	4	15	4	80	0.93	707
HW155 02014	14	4	15	4	80	1.02	980
HW155 10012	12	4	15	4	60	0.58	280
HW155 08012	12	4	15	4	60	0.71	392
HW155 06012	12	4	15	4	60	0.76	505
HW155 04012	12	4	15	4	80	0.94	735
HW155 02012	12	4	15	4	80	1.01	1030

APPLICATION:

General purpose cable for use in power, control and lighting circuits in a broad range of commercial and industrial applications. Approved for installation indoors or outdoors, aerially, in conduits, ducts, cable trays or direct burial in circuits not exceeding 600 volts. May be used in NEC Class I and II, Division 2 hazardous locations. UL approved for use in continuous operation at 90°C in wet and dry locations, 130°C for emergency overload conditions, and 250°C for short circuit conditions. Exposed Run (ER) rating available upon request.

CONDUCTORS:

7-strand soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8

INSULATION:

Flame-retardant PVC/UL Standard 83 for Type THHN or THWN

INSULATION JACKET:

Clear nylon per UL Standard 83 for Type THHN or THWN wire

GROUNDING CONDUCTOR:

Soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8 sized in accordance with UL Standard 1277

JACKET:

Sunlight-resistant PVC per UL Standard 1277

FLAME TESTS:

- IEEE 383 (70,000 BTU/hr) Flame Test
- ICEA (210,000 BTU/hr) Flame Test

COLOR CODE:

- Power Sizes: ICEA Method 4
- Control Sizes: ICEA Method 1, Table E-2

ADDITIONAL STANDARDS:

- UL Type TC per Article 336 of the NEC
- Approved for Class 1 remote-control and signaling circuits per Article 725 of the NEC

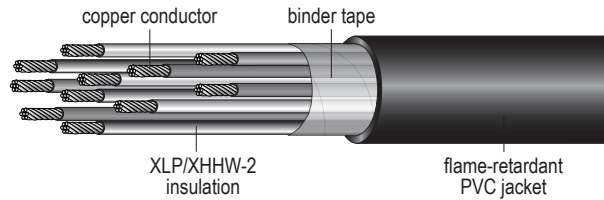
*TC-ER rating applies to cables with 3 or more insulated conductors

TRAY CABLES

SPECIFICATION
HW156

TRAY CABLE - CONTROL CABLE

**600 Volt UL Type TC-ER*, 90°C
FR-XLP XHHW-2 Insulation, VW-1
PVC Jacket
Copper Conductors**



TRAY CABLES

Catalog Number	Size AWG	Number of Conductors	Number of Strands	Insulation Thickness Mils	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW156 01402*	14	2	7	30	45	0.23 x 0.37	71
HW156 01403	14	3	7	30	45	0.39	85
HW156 01404	14	4	7	30	45	0.42	105
HW156 01405	14	5	7	30	45	0.46	125
HW156 01407	14	7	7	30	45	0.50	173
HW156 01409	14	9	7	30	60	0.62	241
HW156 01412	14	12	7	30	60	0.68	302
HW156 01419	14	19	7	30	80	0.81	448
HW156 01425	14	25	7	30	80	0.96	631
HW156 01430	14	30	7	30	80	1.04	721
HW156 01437	14	37	7	30	80	1.13	867

* Flat construction

APPLICATION:

Flame-retardant cable for use in power, control and lighting circuits in a broad range of commercial and industrial applications. Approved for use in wet or dry locations at 90°C, for installation indoors or outdoors, aerially, in conduits, ducts, cable trays or direct burial in circuits not exceeding 600 volts. May be used in NEC Class I and II, Division 2 hazardous locations. UL approved for use at 90°C for continuous operation, 130°C for emergency overload conditions, and 250°C for short circuit conditions. Exposed Run (ER) rating available upon request.

CONDUCTORS:

Soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8

INSULATION:

Flame-retardant cross-linked polyethylene (FR-XLP) per ICEA S-73-532 and UL Standard 44 for Type XHHW-2, VW-1 conductors

JACKET:

Sunlight-resistant PVC per ICEA S-73-532 and UL Standard 1277

FLAME TESTS:

- IEEE 383 (70,000 BTU/hr) Flame Test
- IEEE 1202 (70,000 BTU/hr) CSA FT4 Flame Test
- ICEA (210,000 BTU/hr) Flame Test
- Individual conductors pass the UL VW-1 Flame Test

COLOR CODE:

ICEA Method 1, Table E-2

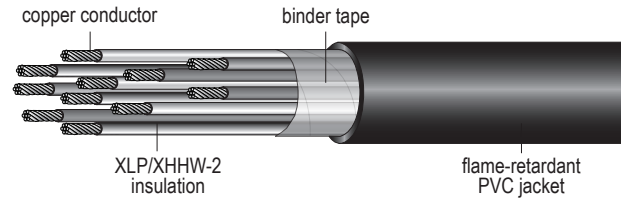
ADDITIONAL STANDARDS:

- UL Type TC per Article 336 of the NEC
- Approved for Class 1 remote-control and signaling circuits per Article 725 of the NEC
- NEMA WC 57
- ICEA S-73-552

*TC-ER rating applies to cables with 3 or more insulated conductors

TRAY CABLE - CONTROL CABLE

**600 Volt UL Type TC-ER*, 90°C
FR-XLP XHHW-2 Insulation, VW-1
PVC Jacket
Copper Conductors**



Catalog Number	Size AWG	Number of Conductors	Number of Strands	Insulation Thickness Mils	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW156 01202*	12	2	7	30	45	0.25 x 0.41	95
HW156 01203	12	3	7	30	45	0.43	135
HW156 01204	12	4	7	30	45	0.47	168
HW156 01205	12	5	7	30	60	0.55	214
HW156 01207	12	7	7	30	60	0.60	290
HW156 01209	12	9	7	30	60	0.69	360
HW156 01212	12	12	7	30	60	0.76	460
HW156 01219	12	19	7	30	80	0.95	663
HW156 01225	12	25	7	30	80	1.08	850
HW156 01230	12	30	7	30	80	1.17	1003
HW156 01237	12	37	7	30	80	1.27	1211

* Flat construction

APPLICATION:

Flame-retardant cable for use in power, control and lighting circuits in a broad range of commercial and industrial applications. Approved for use in wet or dry locations at 90°C, for installation indoors or outdoors, aerially, in conduits, ducts, cable trays or direct burial in circuits not exceeding 600 volts. May be used in NEC Class I and II, Division 2 hazardous locations. UL approved for use at 90°C for continuous operation, 130°C for emergency overload conditions, and 250°C for short circuit conditions. Exposed Run (ER) rating available upon request.

CONDUCTORS:

Soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8

INSULATION:

Flame-retardant cross-linked polyethylene (FR-XLP) per ICEA S-73-532 and UL Standard 44 for Type XHHW-2, VW-1 conductors

JACKET:

Sunlight-resistant PVC per ICEA S-73-532 and UL Standard 1277

FLAME TESTS:

- IEEE 383 (70,000 BTU/hr) Flame Test
- IEEE 1202 (70,000 BTU/hr) CSA FT4 Flame Test
- ICEA (210,000 BTU/hr) Flame Test
- Individual conductors pass the UL VW-1 Flame Test

COLOR CODE:

ICEA Method 1, Table E-2

ADDITIONAL STANDARDS:

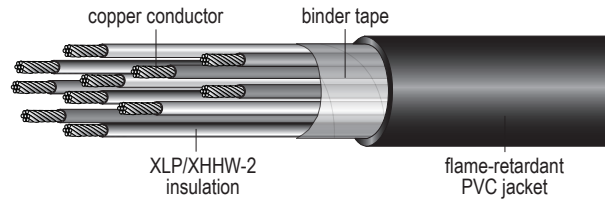
- UL Type TC per Article 336 of the NEC
- Approved for Class 1 remote-control and signaling circuits per Article 725 of the NEC
- NEMA WC 57
- ICEA S-73-532

*TC-ER rating applies to cables with 3 or more insulated conductors

SPECIFICATION
HW156

TRAY CABLE - CONTROL CABLE

**600 Volt UL Type TC-ER*, 90°C
FR-XLP XHHW-2 Insulation, VW-1
PVC Jacket
Copper Conductors**



TRAY CABLES

Catalog Number	Size AWG	Number of Conductors	Number of Strands	Insulation Thickness Mils	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW156 01002*	10	2	7	30	45	0.27 x 0.46	131
HW156 01003	10	3	7	30	45	0.48	169
HW156 01004	10	4	7	30	60	0.56	231
HW156 01005	10	5	7	30	60	0.61	276
HW156 01007	10	7	7	30	60	0.67	328
HW156 01009	10	9	7	30	60	0.78	465
HW156 01012	10	12	7	30	80	0.90	629
HW156 01019	10	19	7	30	80	1.07	900

* Flat construction

APPLICATION:

Flame-retardant cable for use in power, control and lighting circuits in a broad range of commercial and industrial applications. Approved for use in wet or dry locations at 90°C, for installation indoors or outdoors, aerially, in conduits, ducts, cable trays or direct burial in circuits not exceeding 600 volts. May be used in NEC Class I and II, Division 2 hazardous locations. UL approved for use at 90°C for continuous operation, 130°C for emergency overload conditions, and 250°C for short circuit conditions. Exposed Run (ER) rating available upon request.

CONDUCTORS:

Soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8

INSULATION:

Flame-retardant cross-linked polyethylene (FR-XLP) per ICEA S-73-532 and UL Standard 44 for Type XHHW-2, VW-1 conductors

JACKET:

Sunlight-resistant PVC per UL Standard 1277

FLAME TESTS:

- IEEE 383 (70,000 BTU/hr) Flame Test
- IEEE 1202 (70,000 BTU/hr) CSA FT4 Flame Test
- ICEA (210,000 BTU/hr) Flame Test
- Individual conductors pass the UL VW-1 Flame Test

COLOR CODE:

ICEA Method 1, Table E-2

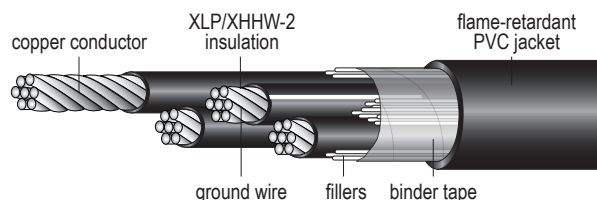
ADDITIONAL STANDARDS:

- UL Type TC per Article 336 of the NEC
- Approved for Class 1 remote-control and signaling circuits per Article 725 of the NEC
- NEMA WC 57
- ICEA S-73-532

*TC-ER rating applies to cables with 3 or more insulated conductors

TRAY CABLE - CONTROL CABLE

**600 Volt UL Type TC-ER*, 90°C
XLP XHHW-2 Insulation
PVC Jacket
Copper Conductors**



Catalog Number	Size AWG	Number of Conductors	Number of Strands	Insulation Thickness Mils	Ground Wire Size AWG	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW157 01203	12	3	7	30	12	45	0.46	145
HW157 01003	10	3	7	30	10	45	0.52	205
HW157 01004	10	4	7	30	10	45	0.60	269
HW157 00803	8	3	7	45	10	60	0.67	324
HW157 00804	8	4	7	45	10	60	0.73	392
HW157 00603	6	3	7	45	8	60	0.77	451
HW157 00604	6	4	7	45	8	80	0.89	595
HW157 00403	4	3	7	45	8	60	0.82	595
HW157 00404	4	4	7	45	8	80	0.95	792
HW157 00203	2	3	7	45	6	80	1.00	922
HW157 00204	2	4	7	45	6	80	1.09	1176
HW157 00103	1	3	19	55	6	80	1.10	1200

APPLICATION:

Flame retardant cable for use in power, control, lighting, and signal circuits in a broad range of commercial and industrial applications. Approved for use in wet or dry locations at 90°C, for installation indoors or outdoors, aerially, in conduits, ducts, cable trays with a messenger. Direct burial in circuits not exceeding 600 volts. May be used in NEC Class I and II, Division 2 hazardous locations. UL approved for use at 90°C for continuous operation, 130°C for emergency overload conditions, and 250°C for short circuit conditions.

*TC-ER rating applies to cables with 3 or more insulated conductors when installed in accordance NEC Article 336.10 (7).

CONDUCTORS:

Soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8

INSULATION:

Cross-linked polyethylene (XLP) per ICEA S-95-658 and UL 44 for Type XHHW-2 conductors.

Sizes 8 AWG and smaller are VW-1.

Sizes 6 AWG and larger are non VW-1.

GROUNDING CONDUCTOR:

Soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8 sized in accordance with UL 1277.

6 AWG and smaller have an insulated green with yellow stripe ground wire.

4 AWG and larger have a bare ground wire.

JACKET:

Sunlight and moisture-resistant black polyvinyl chloride (PVC) per UL 1277

FLAME TEST:

- UL 1685 and IEEE 383 (70,000 BTU/hr) Vertical Tray Flame Test
- IEEE 1202 (70,000 BTU/hr) Flame Test
- ICEA T-29-520 (210,000 BTU/hr) Flame Test

COLOR CODE:

- 10 AWG and smaller: ICEA Method 1
- 8 AWG and larger: ICEA Method 4

ADDITIONAL STANDARDS:

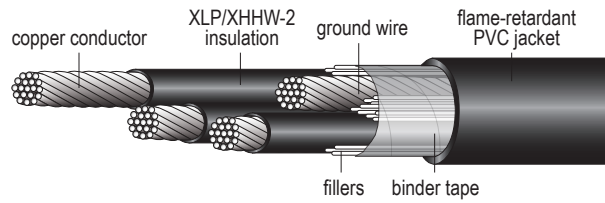
- UL Type TC Tray Cable per Article 336 of the NEC
- NEMA WC 70
- ICEA S-95-658

**Dimensions and weights shown are nominal values, subject to standard industry tolerances.*

SPECIFICATION
HW157

TRAY CABLE - CONTROL CABLE

600 Volt UL Type TC-ER*, 90°C
XLP XHHW-2 Insulation
PVC Jacket
Copper Conductors



TRAY CABLES

Catalog Number	Size AWG/kcmil	Number of Conductors	Number of Strands	Insulation Thickness Mils	Ground Wire Size AWG	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW157 10103	1/0	3	19	55	6	80	1.18	1370
HW157 10104	1/0	4	19	55	6	80	1.31	1772
HW157 20103	2/0	3	19	55	6	80	1.27	1675
HW157 20104	2/0	4	19	55	6	80	1.42	2151
HW157 30103	3/0	3	19	55	4	80	1.40	2156
HW157 30104	3/0	4	19	55	4	80	1.54	2667
HW157 40103	4/0	3	19	55	4	80	1.54	2521
HW157 40104	4/0	4	19	55	4	80	1.66	3243
HW157 25003	250	3	37	65	4	80	1.64	2941
HW157 25004	250	4	37	65	4	110	1.88	3928
HW157 35003	350	3	37	65	3	110	2.00	4103
HW157 35004	350	4	37	65	3	110	2.12	5300
HW157 50003	500	3	37	65	2	110	2.19	5670
HW157 50004	500	4	37	65	2	110	2.43	7391
HW157 75003	750	3	61	80	1	140	2.77	9500
HW157 75004	750	4	61	80	1	140	3.07	12100

APPLICATION:

Flame retardant cable for use in power, control, lighting, and signal circuits in a broad range of commercial and industrial applications. Approved for use in wet or dry locations at 90°C, for installation indoors or outdoors, aerially, in conduits, ducts, cable trays with a messenger. Direct burial in circuits not exceeding 600 volts. May be used in NEC Class I and II, Division 2 hazardous locations. UL approved for use at 90°C for continuous operation, 130°C for emergency overload conditions, and 250°C for short circuit conditions.

*TC-ER rating applies to cables with 3 or more insulated conductors when installed in accordance NEC Article 336.10 (7).

CONDUCTORS:

Soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8

INSULATION:

Cross-linked polyethylene (XLP) per ICEA S-95-658 and UL 44 for Type XHHW-2 conductors. Sizes 8 AWG and smaller are VW-1. Sizes 6 AWG and larger are non VW-1.

GROUNDING CONDUCTOR:

Soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8 sized in accordance with UL 1277. 6 AWG and smaller have an insulated green with yellow stripe ground wire. 4 AWG and larger have a bare ground wire.

JACKET:

Sunlight and moisture-resistant black polyvinyl chloride (PVC) per UL 1277

FLAME TEST:

- UL 1685 and IEEE 383 (70,000 BTU/hr) Vertical Tray Flame Test
- IEEE 1202 (70,000 BTU/hr) Flame Test
- ICEA T-29-520 (210,000 BTU/hr) Flame Test

COLOR CODE:

- 10 AWG and smaller: ICEA Method 1
- 8 AWG and larger: ICEA Method 4

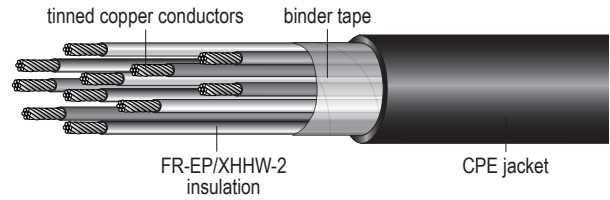
ADDITIONAL STANDARDS:

- UL Type TC Tray Cable per Article 336 of the NEC
- NEMA WC 70
- ICEA S-95-658

**Dimensions and weights shown are nominal values, subject to standard industry tolerances.*

TRAY CABLE - CONTROL CABLE

**600 Volt UL Type TC-ER*, 90°C
FR-EP XHHW-2 Insulation, VW-1
CPE Jacket
Tinned Copper Conductors**



Catalog Number	Size AWG	Number of Conductors	Number of Strands	Insulation Thickness Mils	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW158 01402*	14	2	7	30	45	0.37 x 0.23	71
HW158 01403	14	3	7	30	45	0.39	92
HW158 01404	14	4	7	30	45	0.43	115
HW158 01405	14	5	7	30	45	0.47	139
HW158 01407	14	7	7	30	60	0.51	183
HW158 01409	14	9	7	30	60	0.62	250
HW158 01412	14	12	7	30	60	0.70	317
HW158 01415	14	15	7	30	60	0.76	383
HW158 01419	14	19	7	30	60	0.82	468
HW158 01425	14	25	7	30	60	0.99	645
HW158 01430	14	30	7	30	60	1.05	747
HW158 01437	14	37	7	30	60	1.03	897

* Flat construction

APPLICATION:

Superior flame-retardant cable for use in power, control and lighting circuits in a broad range of commercial and industrial applications where resistance to caustic environments is required. Approved for use in wet or dry locations at 90°C, for installation indoors or outdoors, aerially, in conduits, ducts, cable trays or direct burial in circuits not exceeding 600 volts. May be installed at temperatures as low as -35°C and used in NEC Class I and II, Division 2 hazardous locations. UL approved for use at 90°C for continuous operation, 130°C for emergency overload conditions, and 250°C for short circuit conditions. Exposed Run (ER) rating available upon request.

CONDUCTORS:

Tin-coated, soft annealed copper per ASTM B-33, Class B stranding per ASTM B-8

INSULATION:

Flame-retardant ethylene-propylene-rubber (FR-EP) per ICEA S-73-532 and UL Standard 44 for Type XHHW-2, VW-1 conductors

JACKET:

Sunlight-resistant chlorinated polyethylene (CPE) per ICEA S-73-532 and UL Standard 1277

FLAME TESTS:

- IEEE 383 (70,000 BTU/hr) Flame Test
- IEEE 1202 (70,000 BTU/hr) CSA FT4 Flame Test
- UL Standard 1277 (70,000 BTU/hr) Flame Test
- ICEA T-29-520 (210,000 BTU/hr) Flame Test
- Individual conductors pass the UL VW-1 Flame Test

COLOR CODE:

ICEA Method 1, Table E-1 and E-2

ADDITIONAL STANDARDS:

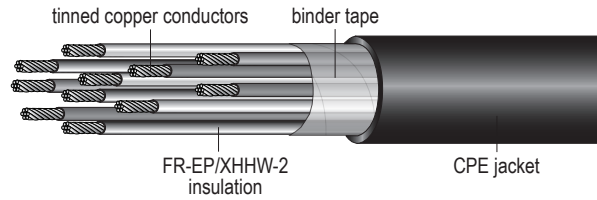
- UL Type TC per Article 336 of the NEC
- Approved for Class 1 remote-control and signaling circuits per Article 725 of the NEC
- NEMA WC 57
- ICEA S-73-552

*TC-ER rating applies to cables with 3 or more insulated conductors

SPECIFICATION
HW158

TRAY CABLE - CONTROL CABLE

**600 Volt UL Type TC-ER*, 90°C
FR-EP XHHW-2 Insulation, VW-1
CPE Jacket
Tinned Copper Conductors**



TRAY CABLES

Catalog Number	Size AWG	Number of Conductors	Number of Strands	Insulation Thickness Mils	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW158 01202*	12	2	7	30	45	0.40 x 0.25	94
HW158 01203	12	3	7	30	45	0.44	124
HW158 01204	12	4	7	30	45	0.48	157
HW158 01205	12	5	7	30	60	0.52	191
HW158 01207	12	7	7	30	60	0.60	268
HW158 01209	12	9	7	30	60	0.70	347
HW158 01212	12	12	7	30	60	0.78	437
HW158 01215	12	15	7	30	60	0.88	561
HW158 01219	12	19	7	30	60	0.96	688
HW158 01225	12	25	7	30	60	1.01	894
HW158 01230	12	30	7	30	60	1.18	1040
HW158 01237	12	37	7	30	60	1.27	1256

* Flat construction

APPLICATION:

Superior flame-retardant cable for use in power, control and lighting circuits in a broad range of commercial and industrial applications where resistance to caustic environments is required. Approved for use in wet or dry locations at 90°C, for installation indoors or outdoors, aerially, in conduits, ducts, cable trays or direct burial in circuits not exceeding 600 volts. May be installed at temperatures as low as -35°C and used in NEC Class I and II, Division 2 hazardous locations. UL approved for use at 90°C for continuous operation, 130°C for emergency overload conditions, and 250°C for short circuit conditions. Exposed Run (ER) rating available upon request.

CONDUCTORS:

Tin-coated, soft annealed copper per ASTM B-33, Class B stranding per ASTM B-8

INSULATION:

Flame-retardant ethylene-propylene-rubber (FR-EP) per ICEA S-73-532 and UL Standard 44 for Type XHHW-2, VW-1 conductors

JACKET:

Sunlight-resistant chlorinated polyethylene (CPE) per ICEA S-73-532 and UL Standard 1277

FLAME TESTS:

- IEEE 383 (70,000 BTU/hr) Flame Test
- IEEE 1202 (70,000 BTU/hr) CSA FT4 Flame Test
- UL Standard 1277 (70,000 BTU/hr) Flame Test
- ICEA T-29-520 (210,000 BTU/hr) Flame Test
- Individual conductors pass the UL VW-1 Flame Test

COLOR CODE:

ICEA Method 1, Table E-1 and E-2

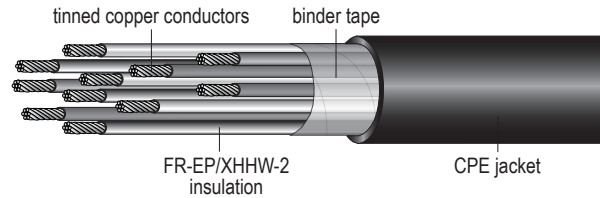
ADDITIONAL STANDARDS:

- UL Type TC per Article 336 of the NEC
- Approved for Class 1 remote-control and signaling circuits per Article 725 of the NEC
- NEMA WC 57
- ICEA S-73-552

*TC-ER rating applies to cables with 3 or more insulated conductors

TRAY CABLE - CONTROL CABLE

**600 Volt UL Type TC-ER*, 90°C
FR-EP XHHW-2 Insulation, VW-1
CPE Jacket
Tinned Copper Conductors**



Catalog Number	Size AWG	Number of Conductors	Number of Strands	Insulation Thickness Mils	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW158 01002*	10	2	7	30	45	0.45 x 0.27	128
HW158 01003	10	3	7	30	45	0.49	172
HW158 01004	10	4	7	30	60	0.56	234
HW158 01005	10	5	7	30	60	0.62	284
HW158 01007	10	7	7	30	60	0.67	381
HW158 01009	10	9	7	30	60	0.79	488
HW158 01012	10	12	7	30	60	0.92	651
HW158 01015	10	15	7	30	60	1.02	812
HW158 01019	10	19	7	30	60	1.08	967
HW158 01024	10	24	7	30	60	1.36	1221
HW158 01037	10	37	7	30	60	2.10	1882

* Flat construction

APPLICATION:

Superior flame-retardant cable for use in power, control and lighting circuits in a broad range of commercial and industrial applications where resistance to caustic environments is required. Approved for use in wet or dry locations at 90°C, for installation indoors or outdoors, aerially, in conduits, ducts, cable trays or direct burial in circuits not exceeding 600 volts. May be installed at temperatures as low as -35°C and used in NEC Class I and II, Division 2 hazardous locations. UL approved for use at 90°C for continuous operation, 130°C for emergency overload conditions, and 250°C for short circuit conditions. Exposed Run (ER) rating available upon request.

CONDUCTORS:

Tin-coated, soft annealed copper per ASTM B-33, Class B stranding per ASTM B-8

INSULATION:

Flame-retardant ethylene-propylene-rubber (FR-EP) per ICEA S-73-532 and UL Standard 44 for Type XHHW-2, VW-1 conductors

JACKET:

Sunlight-resistant chlorinated polyethylene (CPE) per ICEA S-73-532 and UL Standard 1277

FLAME TESTS:

- IEEE 383 (70,000 BTU/hr) Flame Test
- IEEE 1202 (70,000 BTU/hr) CSA FT4 Flame Test
- UL Standard 1277 (70,000 BTU/hr) Flame Test
- ICEA T-29-520 (210,000 BTU/hr) Flame Test
- Individual conductors pass the UL VW-1 Flame Test

COLOR CODE:

ICEA Method 1, Table E-1 and E-2

ADDITIONAL STANDARDS:

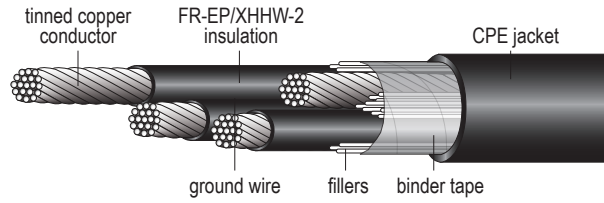
- UL Type TC per Article 336 of the NEC
- Approved for Class 1 remote-control and signaling circuits per Article 725 of the NEC
- NEMA WC 57
- ICEA S-73-552

*TC-ER rating applies to cables with 3 or more insulated conductors

SPECIFICATION
HW159

TRAY CABLE - POWER CABLE

**600 Volt UL Type TC-ER*, 90°C
FR-EP XHHW-2 Insulation, VW-1
CPE Jacket
Tinned Copper Conductors**



Catalog Number	Size AWG/kcmil	Number of Conductors	Number of Strands	Insulation Thickness Mils	Ground Wire Size AWG	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW159 01203	12	3	7	30	12	45	0.44	118
HW159 01003	10	3	7	30	10	60	0.49	237
HW159 00803	8	3	7	45	10	60	0.66	359
HW159 00804	8	4	7	45	10	60	0.72	439
HW159 00603	6	3	7	45	8	60	0.74	513
HW159 00604	6	4	7	45	8	60	0.81	627
HW159 00403	4	3	7	45	8	80	0.88	721
HW159 00404	4	4	7	45	8	80	0.97	897
HW159 00203	2	3	7	45	6	80	1.01	1063
HW159 00204	2	4	7	45	6	80	1.11	1324
HW159 00104	1	4	19	55	6	80	1.13	1190

APPLICATION:

Superior flame-retardant cable for use in caustic environments in power, control and lighting circuits in a broad range of commercial and industrial applications. Approved for use in wet or dry locations at 90°C, for installation indoors or outdoors, aerially, in conduits, ducts, cable trays or direct burial in circuits not exceeding 600 volts. May be installed at temperatures as low as -35°C and used in NEC Class I and II, Division 2 hazardous locations. UL approved for use at 90°C for continuous operation, 130°C for emergency overload conditions, and 250°C for short circuit conditions. Exposed Run (ER) rating available upon request.

CONDUCTORS:

Tin-coated, soft annealed copper per ASTM B-33, Class B stranding per ASTM B-8

INSULATION:

Flame-retardant ethylene-propylene-rubber (FR-EP) per ICEA S-95-658 and UL Standard 44 for Type XHHW-2, VW-1 conductors

GROUNDING CONDUCTOR:

Soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8 sized in accordance with UL Standard 1277

JACKET:

Sunlight-resistant chlorinated polyethylene (CPE) per ICEA S-95-658 and UL Standard 1277

FLAME TESTS:

- IEEE 383 (70,000 BTU/hr) Flame Test
- IEEE 1202 (70,000 BTU/hr) CSA FT4 Flame Test
- UL Standard 1277 (70,000 BTU/hr) Flame Test
- ICEA T-29-520 (210,000 BTU/hr) Flame Test
- Individual conductors pass the UL VW-1 Flame Test

COLOR CODE:

ICEA Method 4

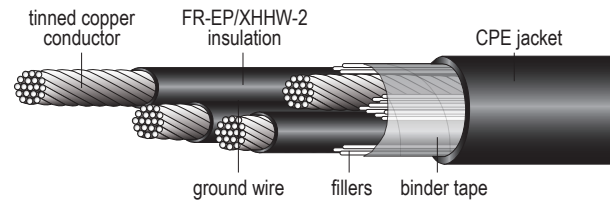
ADDITIONAL STANDARDS:

- UL Type TC per Article 336 of the NEC
- NEMA WC 70
- ICEA S-73-552

*TC-ER rating applies to cables with 3 or more insulated conductors

TRAY CABLE - POWER CABLE

**600 Volt UL Type TC-ER*, 90°C
FR-EP XHHW-2 Insulation, VW-1
CPE Jacket
Tinned Copper Conductors**



Catalog Number	Size AWG/kcmil	Number of Conductors	Number of Strands	Insulation Thickness Mils	Ground Wire Size AWG	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW159 10103	1/0	3	19	55	6	80	1.23	1528
HW159 10104	1/0	4	19	55	6	80	1.34	1934
HW159 20103	2/0	3	19	55	6	80	1.32	1830
HW159 20104	2/0	4	19	55	4	80	1.46	2332
HW159 30103	3/0	3	19	55	4	80	1.43	2500
HW159 30104	3/0	4	19	55	4	80	1.60	2868
HW159 40103	4/0	3	19	55	4	80	1.56	2763
HW159 40104	4/0	4	19	55	4	110	1.79	3630
HW159 25003	250	3	37	65	4	110	1.78	3296
HW159 25004	250	4	37	65	4	110	1.96	4210
HW159 35003	350	3	37	65	3	110	2.00	3643
HW159 35004	350	4	37	65	3	110	2.21	4743
HW159 50003	500	3	37	65	3	110	2.29	6116
HW159 50004	500	4	37	65	2	110	2.54	7881
HW159 75003	750	3	61	80	1	140	2.81	9101

APPLICATION:

Superior flame-retardant cable for use in caustic environments in power, control and lighting circuits in a broad range of commercial and industrial applications. Approved for use in wet or dry locations at 90°C, for installation indoors or outdoors, aerially, in conduits, ducts, cable trays or direct burial in circuits not exceeding 600 volts. May be installed at temperatures as low as -35°C and used in NEC Class I and II, Division 2 hazardous locations. UL approved for use at 90°C for continuous operation, 130°C for emergency overload conditions, and 250°C for short circuit conditions. Exposed Run (ER) rating available upon request.

CONDUCTORS:

Tin-coated, soft annealed copper per ASTM B-33, Class B stranding per ASTM B-8

INSULATION:

Flame-retardant ethylene-propylene-rubber (FR-EP) per ICEA S-95-658 and UL Standard 44 for Type XHHW-2, VW-1 conductors

GROUNDING CONDUCTOR:

Soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8 sized in accordance with UL Standard 1277

JACKET:

Sunlight-resistant chlorinated polyethylene (CPE) per ICEA S-95-658 and UL Standard 1277

FLAME TESTS:

- IEEE 383 (70,000 BTU/hr) Flame Test
- IEEE 1202 (70,000 BTU/hr) CSA FT4 Flame Test
- UL Standard 1277 (70,000 BTU/hr) Flame Test
- ICEA T-29-520 (210,000 BTU/hr) Flame Test
- Individual conductors pass the UL VW-1 Flame Test

COLOR CODE:

ICEA Method 4

ADDITIONAL STANDARDS:

- UL Type TC per Article 336 of the NEC
- NEMA WC 70
- ICEA S-73-552

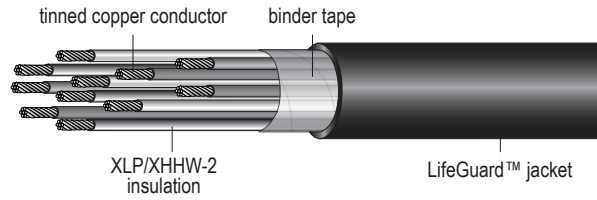
*TC-ER rating applies to cables with 3 or more insulated conductors

SPECIFICATION
HW170



TRAY CABLE - POWER CABLE

600 Volt UL Type TC-LS, 90°C
XLP XHHW-2 Insulation
Low Smoke Zero Halogen Jacket
Tinned Copper Conductors
FM Approved



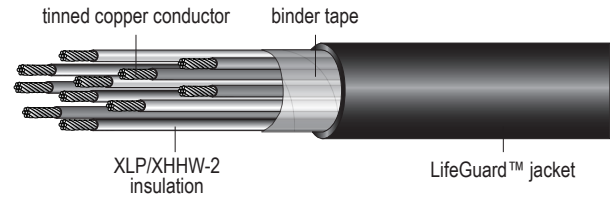
TRAY CABLES

Catalog Number	Size AWG	Number of Conductors	Number of Strands	Insulation Thickness Mils	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW170 01002	10	2	7	30	45	0.45	119
HW170 01003	10	3	7	30	45	0.48	162
HW170 01004	10	4	7	30	60	0.52	207
HW170 01005	10	5	7	30	60	0.58	272
HW170 01007	10	7	7	30	60	0.65	358
HW170 01009	10	9	7	30	60	0.77	459
HW170 01012	10	12	7	30	60	0.91	628
HW170 01019	10	19	7	30	60	1.05	935
HW170 01202	12	2	7	30	45	0.40	87
HW170 01203	12	3	7	30	45	0.42	117
HW170 01204	12	4	7	30	45	0.46	147
HW170 01205	12	5	7	30	60	0.50	178
HW170 01207	12	7	7	30	60	0.58	253
HW170 01209	12	9	7	30	60	0.68	360
HW170 01212	12	12	7	30	60	0.76	409
HW170 01219	12	19	7	30	60	0.93	651
HW170 01225	12	25	7	30	60	1.01	894
HW170 01230	12	30	7	30	60	1.18	1040
HW170 01237	12	37	7	30	60	1.27	1256
HW170 01402	14	2	7	30	45	0.36	66
HW170 01403	14	3	7	30	45	0.38	86
HW170 01404	14	4	7	30	45	0.42	108
HW170 01405	14	5	7	30	45	0.45	130
HW170 01407	14	7	7	30	60	0.49	169
HW170 01409	14	9	7	30	60	0.62	238
HW170 01412	14	12	7	30	60	0.69	298
HW170 01419	14	19	7	30	60	0.80	438
HW170 01425	14	25	7	30	60	0.96	631
HW170 01430	14	30	7	30	60	1.04	721
HW170 01437	14	37	7	30	60	1.13	867



TRAY CABLE - POWER CABLE

**600 Volt UL Type TC-LS, 90°C
XLP XHHW-2 Insulation
Low Smoke Zero Halogen Jacket
Tinned Copper Conductors
FM Approved**



APPLICATION:

LifeGuard™ Low Smoke Zero Halogen* cable is for use in power, control and lighting circuits in a broad range of commercial and industrial applications. LifeGuard™ jacket is highly flame retardant, produces very small amounts of smoke when burned and contains no halogens. LifeGuard™ cable is ideal for applications where a high degree of safety and equipment protection is required.

LifeGuard™ cable is UL listed as Type TC-LS and approved for installation indoors or outdoors, aerially, in conduits, ducts, cable trays and direct burial in circuits not exceeding 600 volts. It may be installed in temperatures as low as -30°C and used in NEC Class I, Division 2 hazardous locations. It is UL approved for continuous operation at 90°C in wet and dry locations, 130°C for emergency overload conditions, and 250°C for short circuit conditions. Exposed Run (ER) rating available upon request.

PRODUCT FEATURES:

- Tray rated
- Sunlight-resistant
- Approved for direct burial
- Tinned conductors provide ease of termination and added protection in caustic environments
- Very low smoke production when burned
- LifeGuard™ jacket produces zero halogens during fire – less toxic and corrosive
- LifeGuard™ jacket is environmentally safe – lead, sulfur and halogen free
- Highly chemical resistant
- Very flame retardant
- Burns to an ash – does not exhibit thermoplastic drip
- Excellent compression and impact resistance
- Superior tensile strength and abrasion resistance
- Flexible jacket with low coefficient of friction

CONDUCTORS:

Tin coated soft annealed copper per ASTM B-33, Class B stranding per ASTM B-8

INSULATION:

Cross-linked polyethylene (XLP) per UL Standard 44 for Type XHHW-2 conductors

JACKET:

Sunlight-resistant and flame-retardant, Low Smoke Zero Halogen polyolefin per UL Standard 1277. A ripcord is applied longitudinally under the jacket to facilitate stripping

FLAME TESTS:

- FM Approved - Class 3972 Specification Test Standard - Cable Fire Propagation Group 1
- UL Standard 1581 (70,000 BTU/hr) Flame Test
- IEEE 383 (70,000 BTU/hr) Flame Test
- ICEA T-29-520 (210,000 BTU/hr) Flame Test
- IEEE 1202/CSA FT4 (70,000 BTU/hr) Flame Test
- UL Standard 1685 (70,000 BTU/hr) Flame Propagation and Smoke Release Test
- Flame Test listings may vary by cable size

COLOR CODE:

ICEA Method 1, Table E-1 and E-2

ADDITIONAL STANDARDS:

NEC Type TC per articles 336, 392, and 501.4 (b) and Class 1 circuits per NEC article 725

* Some cable insulations may contain trace amounts of halogens.

SPECIFICATION
HW171



TRAY CABLE - SHIELDED CONTROL CABLE

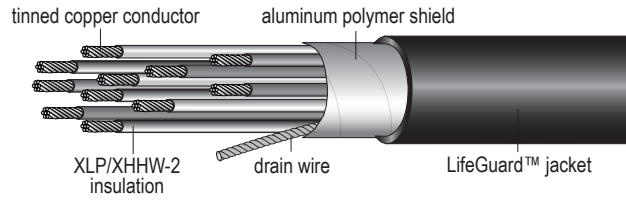
600 Volt UL Type TC-LS, 90°C

XLP Insulation

Low Smoke Zero Halogen Jacket

Tinned Copper Conductors

FM Approved



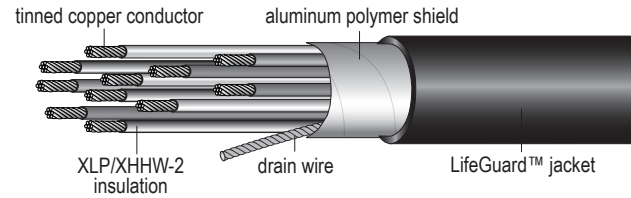
TRAY CABLES

Catalog Number	Size AWG	Number of Conductors	Number of Strands	Insulation Thickness Mils	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW171 01802	18	2	7	30	45	0.31	42
HW171 01803	18	3	7	30	45	0.33	53
HW171 01602	16	2	7	30	45	0.33	59
HW171 01603	16	3	7	30	45	0.35	67
HW171 01604	16	4	7	30	45	0.38	92
HW171 01605	16	5	7	30	45	0.42	109
HW171 01607	16	7	7	30	45	0.45	135
HW171 01609	16	9	7	30	45	0.56	188
HW171 01612	16	12	7	30	45	0.62	232
HW171 01615	16	15	7	30	60	0.69	281
HW171 01619	16	19	7	30	60	0.72	322



TRAY CABLE - SHIELDED CONTROL CABLE

**600 Volt UL Type TC-LS, 90°C
XLP Insulation
Low Smoke Zero Halogen Jacket
Tinned Copper Conductors
FM Approved**



APPLICATION:

LifeGuard™ Low Smoke Zero Halogen* cable is for use in instrumentation and process control applications where protection from electrostatic interference is required. LifeGuard™ jacket is highly flame-retardant, produces very small amounts of smoke when burned and contains no halogens. LifeGuard™ cable is ideal for applications where a high degree of safety and equipment protection is required.

LifeGuard™ cable is UL listed as Type TC-LS and approved for installation indoors or outdoors, aerially, in conduits, ducts, cable trays and direct burial in circuits not exceeding 600 volts. It may be installed in temperatures as low as -30°C and used in NEC Class I and II, Division 2 hazardous locations. It is UL approved for continuous operation at 90°C in wet and dry locations, 130°C for emergency toverload conditions, and 250°C for short circuit conditions. Exposed Run (ER) rating available upon request.

PRODUCT FEATURES:

- Tray rated
- Sunlight-resistant
- Approved for direct burial
- Tinned conductors provide ease of termination and added protection in caustic environments
- Very low smoke production when burned
- LifeGuard™ jacket produces zero halogens during fire – less toxic and corrosive
- LifeGuard™ jacket is environmentally safe – lead, sulfur and halogen free
- Highly chemical resistant
- Very flame retardant
- Burns to an ash – does not exhibit thermoplastic drip
- Excellent compression and impact resistance
- Superior tensile strength and abrasion resistance
- Flexible jacket with low coefficient of friction

CONDUCTORS:

Tin coated soft annealed copper per ASTM B-33, Class B stranding per ASTM B-8

INSULATION:

Cross-linked polyethylene (XLP) per UL Standard 44

OVERALL SHIELD:

Aluminum-polymer tape providing 100% coverage with a flexible 7 strand tinned copper drain wire

JACKET:

Sunlight-resistant and flame-retardant, Low Smoke Zero Halogen polyolefin per UL Standard 1277. A ripcord is applied longitudinally under the jacket to facilitate stripping

FLAME TESTS:

- FM Approved - Class 3972 Specification Test Standard - Cable Fire Propagation Group 1
- UL Standard 1581 (70,000 BTU/hr) Flame Test
- IEEE 383 (70,000 BTU/hr) Flame Test
- ICEA T-29-520 (210,000 BTU/hr) Flame Test
- IEEE 1202/CSA FT4 (70,000 BTU/hr) Flame Test
- UL Standard 1685 (70,000 BTU/hr) Flame Propagation and Smoke Release Test
- Flame Test listings may vary by cable size

COLOR CODE:

ICEA Method 1, Table E-1 and E-2

ADDITIONAL STANDARDS:

NEC Type TC per articles 336, 392, and 501.4 (b) and Class 1 circuits per NEC article 725

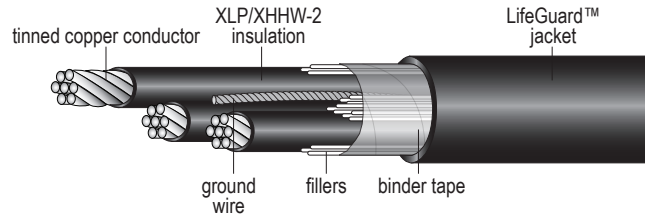
* Some cable insulations may contain trace amounts of halogens.

SPECIFICATION
HW172



TRAY CABLE - POWER CABLE

600 Volt UL Type TC-LS, 90°C
XLP XHHW-2 Insulation
Low Smoke Zero Halogen Jacket
Tinned Copper Conductors
FM Approved



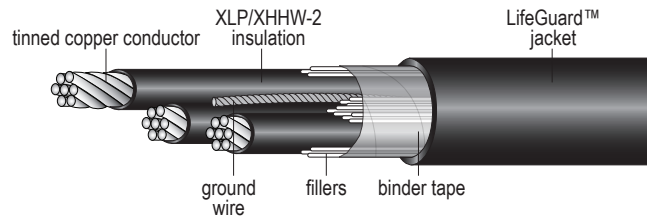
TRAY CABLES

Catalog Number	Size AWG/kcmil	Number of Conductors	Number of Strands	Insulation Thickness Mils	Ground Wire Size AWG	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW172 00803	8	3	7	45	-	60	0.63	238
HW172 0803G	8	3	7	45	10	60	0.63	267
HW172 00804	8	4	7	45	-	60	0.70	305
HW172 0804G	8	4	7	45	10	60	0.70	339
HW172 00603	6	3	7	45	-	60	0.71	390
HW172 0603G	6	3	7	45	8	60	0.71	437
HW172 00604	6	4	7	45	-	60	0.78	497
HW172 0604G	6	4	7	45	8	60	0.78	495
HW172 00403	4	3	7	45	-	80	0.81	564
HW172 0403G	4	3	7	45	8	80	0.81	612
HW172 00404	4	4	7	45	-	80	0.94	763
HW172 0404G	4	4	7	45	8	80	0.94	814
HW172 0203G	2	3	7	45	6	80	0.98	867
HW172 0204G	2	4	7	45	6	80	1.08	1087
HW172 1003G	1/0	3	19	55	6	80	1.20	1390
HW172 1004G	1/0	4	19	55	6	80	1.30	1676
HW172 2004G	2/0	4	19	55	6	80	1.34	1934
HW172 2003G	2/0	3	19	55	4	80	1.44	2780
HW172 4003G	4/0	3	19	55	4	80	1.53	2523
HW172 4004G	4/0	4	19	55	4	110	1.79	3630
HW172 2503G	250	3	37	65	4	110	1.78	3296
HW172 2504G	250	4	37	65	3	110	1.90	4210
HW172 3503G	350	3	37	65	3	110	2.00	3643
HW172 3504G	350	4	37	65	3	110	2.21	4743
HW172 5003G	500	3	37	65	2	110	2.29	6116
HW172 5004G	500	4	37	65	1	110	2.54	7881
HW172 7503G	750	3	61	80	2/0	140	2.81	9101



TRAY CABLE - POWER CABLE

**600 Volt UL Type TC-LS, 90°C
XLP XHHW-2 Insulation
Low Smoke Zero Halogen Jacket
Tinned Copper Conductors
FM Approved**



APPLICATION:

LifeGuard™ Low Smoke Zero Halogen* cable is for use in power, control and lighting circuits in a broad range of commercial and industrial applications. LifeGuard™ jacket is highly flame retardant, produces very small amounts of smoke when burned and contains no halogens. LifeGuard™ cable is ideal for applications where a high degree of safety and equipment protection is required.

LifeGuard™ cable is UL listed as Type TC-LS and approved for installation indoors or outdoors, aerially, in conduits, ducts, cable trays and direct burial in circuits not exceeding 600 volts. It may be installed in temperatures as low as -30°C and used in NEC Class I and II, Division 2 hazardous locations. It is UL approved for continuous operation at 90°C in wet and dry locations, 130°C for emergency overload conditions, and 250°C for short circuit conditions. Exposed Run (ER) rating available upon request.

PRODUCT FEATURES:

- Tray rated
- Sunlight-resistant
- Approved for direct burial
- Tinned conductors provide ease of termination and added protection in caustic environments
- Very low smoke production when burned
- LifeGuard™ jacket produces zero halogens during fire – less toxic and corrosive
- LifeGuard™ jacket is environmentally safe – lead, sulfur and halogen free
- Highly chemical resistant
- Very flame retardant
- Burns to an ash – does not exhibit thermoplastic drip
- Excellent compression and impact resistance
- Superior tensile strength and abrasion resistance
- Flexible jacket with low coefficient of friction

CONDUCTORS:

Tin coated soft annealed copper per ASTM B-33, Class B stranding per ASTM B-8

INSULATION:

Cross-linked polyethylene (XLP) per UL Standard 44 for Type XHHW-2 conductors

JACKET:

Sunlight-resistant and flame-retardant, Low Smoke Zero Halogen polyolefin per UL Standard 1277. A ripcord is applied longitudinally under the jacket to facilitate stripping

FLAME TESTS:

- FM Approved - Class 3972 Specification Test Standard - Cable Fire Propagation Group 1
- UL Standard 1581 (70,000 BTU/hr) Flame Test
- IEEE 383 (70,000 BTU/hr) Flame Test
- ICEA T-29-520 (210,000 BTU/hr) Flame Test
- IEEE 1202/CSA FT4 (70,000 BTU/hr) Flame Test
- UL Standard 1685 (70,000 BTU/hr) Flame Propagation and Smoke Release Test
- Flame Test listings may vary by cable size

COLOR CODE:

ICEA Method 4

ADDITIONAL STANDARDS:

NEC Type TC per articles 336, 392, and 501.4 (b) and Class 1 circuits per NEC article 725

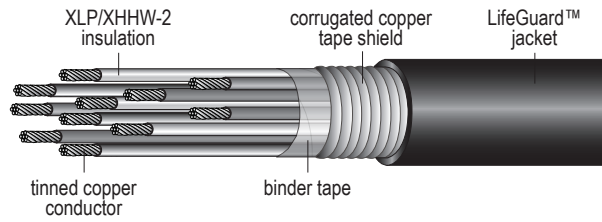
* Some cable insulations may contain trace amounts of halogens.

SPECIFICATION
HW173



TRAY CABLE - SUBSTATION CONTROL CABLE

600 Volt UL Type TC-LS, 90°C
XLP XHHW-2 Insulation
Low Smoke Zero Halogen Jacket
Tinned Copper Conductors
FM Approved



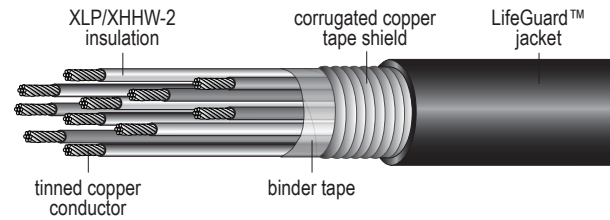
TRAY CABLES

Catalog Number	Size AWG	Number of Conductors	Number of Strands	Insulation Thickness Mils	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW173 01404	14	4	7	30	45	0.48	144
HW173 01407	14	7	7	30	45	0.60	231
HW173 01412	14	12	7	30	60	0.75	348
HW173 01419	14	19	7	30	80	0.90	534
HW173 01204	12	4	7	30	45	0.52	182
HW173 01207	12	7	7	30	45	0.65	296
HW173 01212	12	12	7	30	60	0.82	463
HW173 01219	12	19	7	30	80	0.99	718
HW173 01004	10	4	7	30	45	0.62	265
HW173 01005	10	5	7	30	60	0.61	318
HW173 01007	10	7	7	30	60	0.72	408
HW173 01012	10	12	7	30	80	0.96	695
HW173 01019	10	19	7	30	80	1.12	1015



TRAY CABLE - SUBSTATION CONTROL CABLE

**600 Volt UL Type TC-LS, 90°C
XLP XHHW-2 Insulation
Low Smoke Zero Halogen Jacket
Tinned Copper Conductors
FM Approved**



APPLICATION:

LifeGuard™ Low Smoke Zero Halogen* cable is for use in power, control and lighting circuits in a broad range of utility substation applications where shielding from ambient electrical interference is required. LifeGuard™ jacket is highly flame retardant, produces very small amounts of smoke when burned and contains no halogens. LifeGuard™ cable is ideal for applications where a high degree of safety and equipment protection is required.

LifeGuard™ cable is UL listed as Type TC-LS and approved for installation indoors or outdoors, aerially, in conduits, ducts, cable trays and direct burial in circuits not exceeding 600 volts. It may be installed in temperatures as low as -30°C and used in NEC Class I and II, Division 2 hazardous locations. It is UL approved for continuous operation at 90°C in wet and dry locations, 130°C for emergency overload conditions, and 250°C for short circuit conditions.

PRODUCT FEATURES:

- Tray rated
- Sunlight-resistant
- Approved for direct burial
- Tinned conductors provide ease of termination and added protection in caustic environments
- Very low smoke production when burned
- LifeGuard™ jacket produces zero halogens during fire – less toxic and corrosive
- LifeGuard™ jacket is environmentally safe – lead, sulfur and halogen free
- Highly chemical resistant
- Very flame retardant
- Burns to an ash – does not exhibit thermoplastic drip
- Excellent compression and impact resistance
- Superior tensile strength and abrasion resistance
- Flexible jacket with low coefficient of friction

CONDUCTORS:

Tin coated soft annealed copper per ASTM B-33, Class B stranding per ASTM B-8

INSULATION:

Cross-linked polyethylene (XLP) per UL Standard 44 for Type XHHW-2 conductors

OVERALL SHIELD:

Longitudinally applied 5 mil corrugated copper tape shield

JACKET:

Sunlight-resistant and flame-retardant, Low Smoke Zero Halogen polyolefin per UL Standard 1277. A ripcord is applied longitudinally under the jacket to facilitate stripping

FLAME TEST:

- FM Approved - Class 3972 Specification Test Standard - Cable Fire Propagation Group 1
- UL Standard 1581 (70,000 BTU/hr) Flame Test
- IEEE 383 (70,000 BTU/hr) Flame Test
- ICEA T-29-520 (210,000 BTU/hr) Flame Test
- IEEE 1202/CSA FT4 (70,000 BTU/hr) Flame Test
- UL Standard 1685 (70,000 BTU/hr) Flame Propagation and Smoke Release Test
- Flame Test listings may vary by cable size

COLOR CODE:

ICEA Method 1, Table E-1

ADDITIONAL STANDARDS:

NEC Type TC per articles 336, 392, and 501.4 (b) and Class 1 circuits per NEC article 725

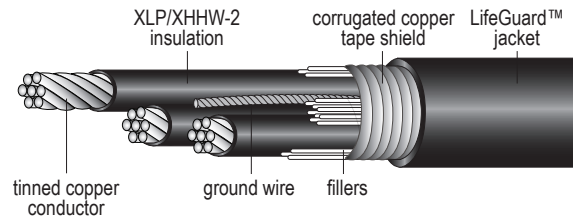
* Some cable insulations may contain trace amounts of halogens.

SPECIFICATION
HW174



TRAY CABLE - SUBSTATION CONTROL CABLE

600 Volt UL Type TC-LS, 90°C
Corrugated 5 Mil Copper Tape Shield
XLP XHHW-2 Insulation
Low Smoke Zero Halogen Jacket
Tinned Copper Conductors
FM Approved



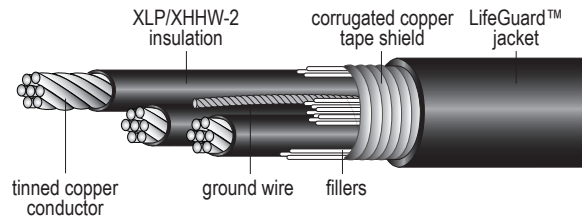
TRAY CABLES

Catalog Number	Size AWG/kcmil	Number of Conductors	Number of Strands	Insulation Thickness Mils	Ground Wire Size AWG	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW174 00804	8	4	7	45	-	60	0.76	422
HW174 0804G	8	4	7	45	10	60	0.76	475
HW174 00604	6	4	7	45	-	60	0.89	513
HW174 0604G	6	4	7	45	8	60	0.89	577
HW174 00404	4	4	7	45	-	60	1.01	750
HW174 0404G	4	4	7	45	8	60	1.01	808
HW174 00204	2	4	7	45	-	80	1.15	890
HW174 0204G	2	4	7	45	6	80	1.15	960
HW174 1004G	1/0	4	19	55	6	80	1.46	2057
HW174 2004G	2/0	4	19	55	6	80	1.56	2464
HW174 4004G	4/0	4	19	55	4	110	1.80	3640
HW174 2503G	250	3	37	65	4	110	1.75	3265
HW174 3503G	350	3	37	65	3	110	2.01	3653
HW174 5003G	500	3	37	65	2	110	2.30	6126



TRAY CABLE - SUBSTATION CONTROL CABLE

**600 Volt UL Type TC-LS, 90°C
Corrugated 5 Mil Copper Tape Shield
XLP XHHW-2 Insulation
Low Smoke Zero Halogen Jacket
Tinned Copper Conductors
FM Approved**



APPLICATION:

LifeGuard™ Low Smoke Zero Halogen* cable is for use in power, control and lighting circuits in a broad range of utility substation applications where shielding from ambient electrical interference is required. LifeGuard™ jacket is highly flame retardant, produces very small amounts of smoke when burned and contains no halogens. LifeGuard™ cable is ideal for applications where a high degree of safety and equipment protection is required.

LifeGuard™ cable is UL listed as Type TC-LS and approved for installation indoors or outdoors, aerially, in conduits, ducts, cable trays and direct burial in circuits not exceeding 600 volts. It may be installed in temperatures as low as -30°C and used in NEC Class I and II, Division 2 hazardous locations. It is UL approved for continuous operation at 90°C in wet and dry locations, 130°C for emergency overload conditions, and 250°C for short circuit conditions.

PRODUCT FEATURES:

- Tray rated
- Sunlight-resistant
- Approved for direct burial
- Tinned conductors provide ease of termination and added protection in caustic environments
- Very low smoke production when burned
- LifeGuard™ jacket produces zero halogens during fire – less toxic and corrosive
- LifeGuard™ jacket is environmentally safe – lead, sulfur and halogen free
- Highly chemical resistant
- Very flame retardant
- Burns to an ash – does not exhibit thermoplastic drip
- Excellent compression and impact resistance
- Superior tensile strength and abrasion resistance
- Flexible jacket with low coefficient of friction

CONDUCTORS:

Tin coated soft annealed copper per ASTM B-33, Class B stranding per ASTM B-8

INSULATION:

Cross-linked polyethylene (XLP) per UL Standard 44 for Type XHHW-2 conductors

OVERALL SHIELD:

Longitudinally applied 5 mil corrugated copper tape shield

GROUNDING CONDUCTOR:

Soft annealed copper per ASTM B-33, Class B stranding per ASTM B-8 sized in accordance with UL Standard 1277

JACKET:

Sunlight-resistant and flame-retardant, Low Smoke Zero Halogen polyolefin per UL Standard 1277. A ripcord is applied longitudinally under the jacket to facilitate stripping

FLAME TEST:

- FM Approved - Class 3972 Specification Test Standard - Cable Fire Propagation Group 1
- UL Standard 1581 (70,000 BTU/hr) Flame Test
- IEEE 383 (70,000 BTU/hr) Flame Test
- ICEA T-29-520 (210,000 BTU/hr) Flame Test
- IEEE 1202/CSA FT4 (70,000 BTU/hr) Flame Test
- UL Standard 1685 (70,000 BTU/hr) Flame Propagation and Smoke Release Test
- Flame Test listings may vary by cable size

COLOR CODE:

ICEA Method M-4

ADDITIONAL STANDARDS:

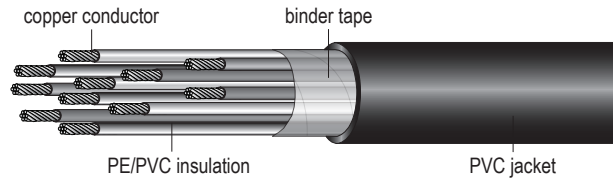
NEC Type TC per articles 336, 392, and 501.4 (b) and Class 1 circuits per NEC article 725

* Some cable insulations may contain trace amounts of halogens.

SPECIFICATION
HW180

**20/10 - NON-SHIELDED
CONTROL CABLE**

**600 Volt Type TC-ER*, 75°C
PE/PVC Insulation
PVC Jacket
Copper Conductors**



TRAY CABLES

Catalog Number	Size AWG/kcmil	Number of Conductors	Number of Strands	Conductor Insulation		Overall Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
				PE Thickness Mils	PVC Thickness Mils			
HW180 01202	12	2	7	0.020	0.010	0.045	0.363	88
HW180 01203	12	3	7	0.020	0.010	0.045	0.433	125
HW180 01204	12	4	7	0.020	0.010	0.045	0.483	152
HW180 01205	12	5	7	0.020	0.010	0.045	0.543	192
HW180 01207	12	7	7	0.020	0.010	0.060	0.583	258
HW180 01209	12	9	7	0.020	0.010	0.060	0.666	325
HW180 01212	12	12	7	0.020	0.010	0.060	0.733	416
HW180 01002	10	2	7	0.020	0.010	0.045	0.433	130
HW180 01003	10	3	7	0.020	0.010	0.045	0.473	170
HW180 01004	10	4	7	0.020	0.010	0.060	0.563	237
HW180 01005	10	5	7	0.020	0.010	0.060	0.603	280
HW180 01007	10	7	7	0.020	0.010	0.060	0.651	365
HW180 01009	10	9	7	0.020	0.010	0.060	0.763	461
HW180 01012	10	12	7	0.020	0.010	0.080	0.893	633

APPLICATION:

For use in control circuits in utility substations, plant generation supervisory control circuits and other metering applications for utility distribution. Constructed with stranded bare copper, PE and PVC insulation and an overall PVC jacket for use in circuits rated 600V and 75°C.

CONDUCTORS:

Soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8

INSULATION:

PE & PVC per ICEA S-73-532

JACKET:

PVC per ICEA S-73-532

COLOR CODE:

ICEA Method 1, Table E-1, per ICEA S-73-532

ADDITIONAL STANDARDS:

- ICEA S-73-532 and NEMA WC-57 for control applications
- RoHS compliant

*TC-ER rating applies to cables with 3 or more insulated conductors

SECTION E

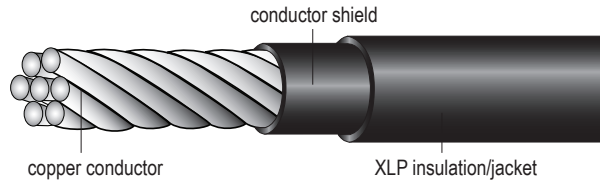
Medium Voltage Power Cable

DESCRIPTION	INSULATION	JACKET	SPECIFICATION	PAGE
2.4kV Non-Shielded	XLP	N/A	HW200	100
2.4kV Non-Shielded	EPR	XL-CPE	HW201	101
5kV Shielded 100% or 133%	XLP	PVC	HW202	102
5kV/8kV Unishield® 133% or 100%	EPR	PVC	HW203	103
5kV/8kV Shielded 133% or 100%	EPR	CPE	HW204	104
15kV Shielded 100%	XLP	PVC	HW205	105
15kV Shielded 133%	XLP	PVC	HW206	106
15kV Shielded 100%	EPR	PVC	HW207	107
15kV Shielded 133%	EPR	PVC	HW208	108
15kV Unishield® 100%	EPR	CPE	HW209	109
15kV Unishield® 133%	EPR	CPE	HW210	110
25kV/35kV Shielded 133% or 100%	EPR	PVC	HW211	111
2.4kV 3-Conductor Non-Shielded	EPR	PVC	HW212	112
5kV/8kV 3-Conductor Shielded 133% or 100%	EPR	PVC	HW213	113
5kV/8kV Shielded 133% or 100%	EPR	LSZH	HW220	114
8kV Shielded 133%	EPR	LSZH	HW221	116
15kV Shielded 133%	EPR	LSZH	HW222	118

SPECIFICATION
HW200

POWER CABLE

**2.4kV UL Type MV-90 Dry, 90°C
Single Conductor, Non-Shielded
XLP Insulation
Copper Conductors**



MEDIUM VOLTAGE POWER CABLES

Catalog Number	Size AWG/kcmil	Number of Strands	Insulation Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW200 00801	8	7	110	0.39	90
HW200 00601	6	7	110	0.42	125
HW200 00401	4	7	110	0.47	180
HW200 00201	2	7	110	0.53	260
HW200 00101	1	19	110	0.57	325
HW200 10101	1/0	19	110	0.62	400
HW200 20101	2/0	19	110	0.66	490
HW200 30101	3/0	19	110	0.71	605
HW200 40101	4/0	19	110	0.77	750
HW200 25001	250	37	120	0.83	890
HW200 35001	350	37	120	0.94	1215
HW200 50001	500	37	120	1.07	1680
HW200 75001	750	61	130	1.28	2515
HW200 10001	1000	61	130	1.43	3320

APPLICATIONS:

For use in power circuits up to 2.4kV when installed in open air, conduit or duct. Used for applications in chemical plants, refineries, steel mills, industrial plants, commercial buildings, utility substations and generating stations. UL approved for use at 90°C for continuous operation, 130°C for emergency overload conditions, and 250°C for short circuit conditions.

CONDUCTOR:

Compressed soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8, with a semi-conducting conductor shield

INSULATION:

Cross-linked polyethylene (XLP) per ICEA standards

ADDITIONAL STANDARDS:

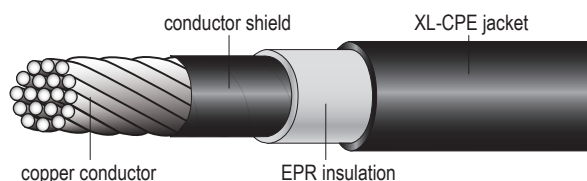
- ICEA S-96-659
- UL Standard 1072
- NEMA WC 71

NOTES:

- Sizes 8-4 AWG approved for 5,000 volt application under FAA AC 150/5345-7E Specification L-824, Type C Underground Electrical Cable for Airport Lighting Circuits.
- Size 8 AWG meets L-824 Type C only, not UL

POWER CABLE

**2.4kV UL Type MV-90 Wet or Dry, 90°C
Single Conductor, Non-Shielded
EPR Insulation, XL-CPE Jacket - Heavy Wall
Copper Conductors**



Catalog Number	Size AWG/kcmil	Number of Strands	Insulation Thickness Mils	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW201 00801	8	7	125	80	0.57	195
HW201 00601	6	7	125	80	0.65	260
HW201 00401	4	7	125	80	0.70	330
HW201 00201	2	7	125	80	0.76	405
HW201 00101	1	19	125	80	0.80	505
HW201 10101	1/0	19	125	80	0.84	590
HW201 20101	2/0	19	125	80	0.88	700
HW201 30101	3/0	19	125	95	0.96	860
HW201 40101	4/0	19	125	95	1.02	1020
HW201 25001	250	37	140	110	1.14	1210
HW201 35001	350	37	140	110	1.24	1525
HW201 50001	500	37	140	110	1.37	2130
HW201 75001	750	61	155	125	1.62	3090
HW201 10001	1000	61	155	125	1.76	3960

MEDIUM VOLTAGE POWER CABLES

APPLICATION:

For use in caustic environments in power circuits up to 2.4kV when installed in open air, conduit, duct, cable tray when CT rated, in wet and dry locations. Used for applications in chemical plants, refineries, steel mills, industrial plants, commercial buildings, utility substations and generating stations.

CONDUCTOR:

Compressed, soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8, with a semi-conducting conductor shield

INSULATION:

Ethylene propylene rubber (EPR) per ICEA standards

JACKET:

XL-CPE per ICEA standards

FLAME TESTS:

UL and IEEE (70,000 BTU/hr) Flame Test for CT-listed sizes 1/0 AWG and larger

ADDITIONAL STANDARDS:

- ICEA S-96-659
- UL Standard 1072
- NEMA WC71

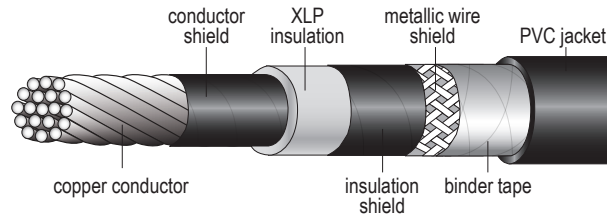
NOTE:

- CT rating must be requested, CT ratings are available on sizes 1/0 AWG and larger.
- PVC jacket available upon request

SPECIFICATION
HW202

POWER CABLE

5kV UL Type MV-90, 90°C
Single Conductor, Shielded
XLP Insulation, PVC Jacket
100% or 133% Insulation Level
Copper Conductors



MEDIUM VOLTAGE POWER CABLES

Catalog Number	Size AWG	Number of Strands	Insulation Thickness Mils	Insulation Diameter Inch	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW202 00801	8	7	90	0.34	60	0.58	165
HW202 00601	6	7	90	0.38	60	0.60	205
HW202 00401	4	7	90	0.45	60	0.71	290
HW202 00201	2	7	90	0.51	60	0.77	385
HW202 00101	1	19	90	0.55	60	0.81	440
HW202 10101	1/0	19	90	0.59	80	0.89	565
HW202 20101	2/0	19	90	0.63	80	0.94	665
HW202 30101	3/0	19	90	0.68	80	0.99	790
HW202 40101	4/0	19	90	0.74	80	1.04	950
HW202 25001	250	37	90	0.80	80	1.10	1095
HW202 35001	350	37	90	0.90	80	1.21	1445
HW202 50001	500	37	90	1.03	80	1.35	1960
HW202 75001	750	61	90	1.22	80	1.54	2825
HW202 10001	1000	61	90	1.37	80	1.69	3645

APPLICATION:

For use in power circuits up to 5kV when installed in open air, conduit, duct, or direct buried in earth, in wet and dry locations. Used for applications in chemical plants, refineries, steel mills, industrial plants, commercial buildings, utility substations and generating stations. UL approved for use at 90°C for continuous operation, 130°C for emergency overload conditions, and 250°C for short circuit conditions.

CONDUCTOR:

Compressed soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8, with a semi-conducting conductor shield

INSULATION:

Cross-linked polyethylene (XLP) per ICEA S-97-682 with a semi-conducting insulation shield

SHIELD:

Shielding wires meet ICEA standards

JACKET:

Sunlight-resistant PVC per ICEA S-97-682 and UL Standard 1072

ADDITIONAL STANDARDS:

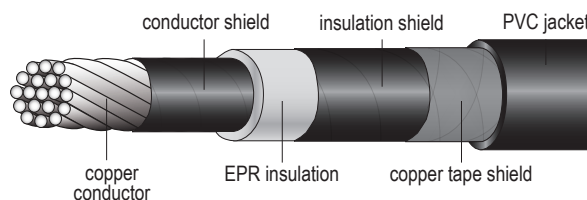
- ICEA S-93-639
- NEMA WC74
- AEIC CS8
- Federal Specification J-C-30B

NOTE:

CT rating must be requested, CT ratings are available on sizes 1/0 AWG and larger.

POWER CABLE

**5kV/8kV UL Type MV-105, 105°C
Single Conductor, Shielded
EPR Insulation, PVC Jacket
5kV 133%, 8kV 100% Insulation Level
Copper Conductors**



Catalog Number	Size AWG	Number of Strands	Insulation Thickness Mils	Insulation Diameter Inch	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW203 00601	6	7	115	0.43	60	0.63	286
HW203 00401	4	7	115	0.50	60	0.71	350
HW203 00201	2	7	115	0.56	60	0.77	460
HW203 00101	1	19	115	0.60	60	0.81	565
HW203 10101	1/0	19	115	0.64	60	0.84	620
HW203 20101	2/0	19	115	0.68	80	0.93	755
HW203 30101	3/0	19	115	0.73	80	0.99	890
HW203 40101	4/0	19	115	0.79	80	1.04	1055
HW203 25001	250	37	115	0.85	80	1.09	1205
HW203 35001	350	37	115	0.95	80	1.20	1570
HW203 50001	500	37	115	1.08	80	1.34	2115
HW203 75001	750	61	115	1.27	80	1.53	2995
HW203 10001	1000	61	115	1.42	80	1.68	3870

MEDIUM VOLTAGE POWER CABLES

APPLICATION:

For use in power circuits up to 8kV when installed in open air, conduit, duct, cable tray when CT rated, or direct buried in earth, in wet and dry locations. Used for applications in chemical plants, refineries, steel mills, industrial plants, commercial buildings, utility substations and generating stations. UL approved for use at 105°C for continuous operation, 140°C for emergency overload conditions, and 250°C for short circuit conditions.

CONDUCTOR:

Compressed soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8, with a semi-conducting conductor shield

INSULATION:

Ethylene propylene rubber (EPR) per ICEA S-97-682 with a semi-conducting insulation shield

SHIELD:

Uncoated copper tape with a minimum 12.5% overlap per ICEA S-97-682

JACKET:

Sunlight-resistant PVC per ICEA S-97-682 and UL Standard 1072

FLAME TESTS:

- See page 101, HW201

ADDITIONAL STANDARDS:

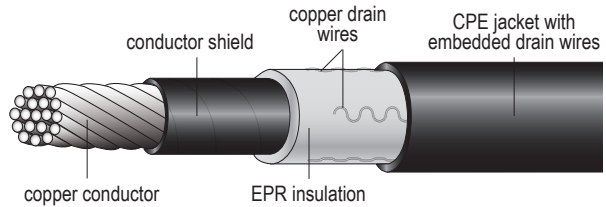
- ICEA S-93-639
- NEMA WC74
- AEIC CS8
- Federal Specification J-C-30B

NOTE:

CT rating must be requested, CT ratings are available on sizes 1/0 AWG and larger.

SPECIFICATION
HW204

POWER CABLE - UNISHIELD®
5kV/8kV UL Type MV-105, 105°C
Single Conductor, Shielded
EPR Insulation, CPE Jacket
5kV 133%, 8kV 100% Insulation Level
Copper Conductors



Catalog Number	Size AWG/kcmil	Number of Strands	Conductor Diameter Inch	Insulation Thickness Mils	Insulation Diameter Inch	Drain Wire Size AWG	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW204 00201	2	7	0.27	115	0.54	20	75	0.71	411
HW204 10101	1/0	19	0.34	115	0.62	20	75	0.79	563
HW204 20101	2/0	19	0.38	115	0.66	19	75	0.89	675
HW204 40101	4/0	19	0.48	115	0.76	19	80	0.94	961
HW204 25001	250	37	0.53	115	0.81	18	80	1.00	1122
HW204 35001	350	37	0.62	115	0.91	18	80	1.11	1476
HW204 50001	500	37	0.74	115	1.03	17	85	1.24	2015
HW204 75001	750	61	0.91	115	1.22	17	85	1.48	2893
HW204 10001	1000	61	1.06	115	1.38	16	100	1.61	3786

APPLICATION:

For use in power circuits up to 8kV when installed in open air, conduit, duct, cable tray when CT rated, or direct buried in earth, in wet and dry locations. Used for critical applications in harsh and caustic environments in chemical plants, refineries, steel mills, industrial plants, commercial buildings, utility substations and generating stations. UL approved for use at 105°C for continuous operation, 140°C for emergency overload conditions, and 250°C for short circuit conditions.

CONDUCTOR:

Anapact™ soft bare annealed copper per ASTM B-3, Compact Class B stranding per ASTM B-8, with a semi-conducting conductor shield

INSULATION:

Ethylene propylene rubber (EPR) per ICEA S-97-682

SHIELD:

Six (6) corrugated copper shield wires longitudinally embedded in an exterior semi-conducting CPE jacket per ICEA S-97-682.

JACKET:

Sunlight-resistant CPE per ICEA S-97-682 and UL Standard 1072

FLAME TESTS:

UL and IEEE (70,000 BTU/hr) Flame Test for CT-listed sizes 1/0 AWG and larger

ADDITIONAL STANDARDS:

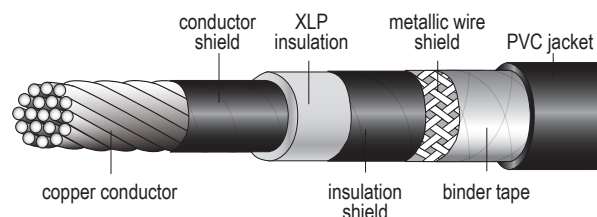
- ICEA S-93-639
- NEMA WC74
- AEIC CS8

NOTE:

CT rating must be requested, CT ratings are available on sizes 1/0 AWG and larger.

POWER CABLE

**15kV UL Type MV-90, 90°C
Single Conductor, Shielded
XLP Insulation, PVC Jacket
100% Insulation Level
Copper Conductors**



Catalog Number	Size AWG/kcmil	Number of Strands	Insulation Thickness Mils	Insulation Diameter Inch	Jacket Thickness Mils	Overall Diameter Inch	Net Weight Lbs/Mft
HW205 00201	2	7	175	0.68	80	0.98	515
HW205 00101	1	19	175	0.72	80	1.02	595
HW205 10101	1/0	19	175	0.76	80	1.06	680
HW205 20101	2/0	19	175	0.81	80	1.10	785
HW205 30101	3/0	19	175	0.86	80	1.15	915
HW205 40101	4/0	19	175	0.91	80	1.20	1085
HW205 25001	250	37	175	0.97	80	1.27	1235
HW205 35001	350	37	175	1.07	80	1.40	1615
HW205 50001	500	37	175	1.20	80	1.53	2130
HW205 75001	750	61	175	1.40	110	1.78	3120
HW205 10001	1000	61	175	1.54	110	1.93	3965

APPLICATION:

For use in power circuits up to 15kV when installed in open air, conduit, duct, or direct buried in earth, in wet and dry locations. Used for applications in chemical plants, refineries, steel mills, industrial plants, commercial buildings, utility substations and generating stations. UL approved for use at 90°C for continuous operation, 130°C for emergency overload conditions, and 250°C for short circuit conditions.

CONDUCTOR:

Compressed soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8, with a semi-conducting conductor shield

INSULATION:

Cross-linked polyethylene (XLP) per ICEA S-97-682 with a semi-conducting insulation shield

SHIELD:

Shielding wires to meet ICEA standards

JACKET:

Sunlight-resistant PVC per ICEA S-97-682 and UL Standard 1072

ADDITIONAL STANDARDS:

- ICEA S-93-639
- NEMA WC74
- AEIC CS8
- Federal Specification J-C-30B

NOTE:

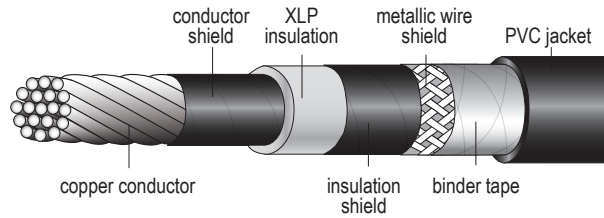
CT rating must be requested, CT ratings are available on sizes 1/0 AWG and larger.

MEDIUM VOLTAGE POWER CABLES

SPECIFICATION
HW206

POWER CABLE

**15kV UL Type MV-90, 90°C
Single Conductor, Shielded
XLP Insulation, PVC Jacket
133% Insulation Level
Copper Conductors**



MEDIUM VOLTAGE POWER CABLES

Catalog Number	Size AWG	Number of Strands	Insulation Thickness Mils	Insulation Diameter Inch	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW206 00201	2	7	220	0.77	80	1.07	585
HW206 00101	1	19	220	0.81	80	1.11	660
HW206 10101	1/0	19	220	0.85	80	1.15	750
HW206 20101	2/0	19	220	0.90	80	1.20	855
HW206 30101	3/0	19	220	0.95	80	1.25	990
HW206 40101	4/0	19	220	1.00	80	1.31	1155
HW206 25001	250	37	220	1.06	80	1.39	1335
HW206 35001	350	37	220	1.17	80	1.49	1705
HW206 50001	500	37	220	1.29	80	1.62	2230
HW206 75001	750	61	220	1.48	110	1.87	3235
HW206 10001	1000	61	220	1.63	110	2.04	4120

APPLICATION:

For use in power circuits up to 15kV when installed in open air, conduit, duct, or direct buried in earth, in wet and dry locations. Used for applications in chemical plants, refineries, steel mills, industrial plants, commercial buildings, utility substations and generating stations. UL approved for use at 90°C for continuous operation, 130°C for emergency overload conditions, and 250°C for short circuit conditions.

CONDUCTOR:

Compressed soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8, with a semi-conducting conductor shield

INSULATION:

Cross-linked polyethylene (XLP) per ICEA S-97-682 with a semi-conducting insulation shield

SHIELD:

Shielding wires to meet ICEA standards

JACKET:

Sunlight-resistant PVC per ICEA S-97-682 and UL Standard 1072

ADDITIONAL STANDARDS:

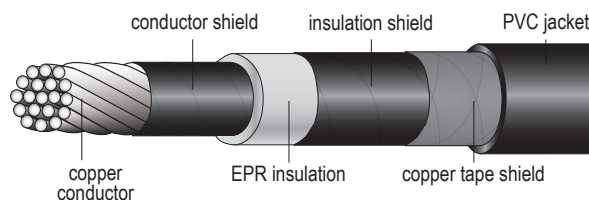
- ICEA S-93-639
- NEMA WC74
- AEIC CS8
- Federal Specification J-C-30B

NOTE:

CT rating must be requested, CT ratings are available on sizes 1/0 AWG and larger.

POWER CABLE

**15kV UL Type MV-105, 105°C
Single Conductor, Shielded
EPR Insulation, PVC Jacket
100% Insulation Level
Copper Conductors**



Catalog Number	Size AWG	Number of Strands	Insulation Thickness Mils	Insulation Diameter Inch	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW207 00201	2	7	175	0.68	80	0.93	590
HW207 00101	1	19	175	0.72	80	0.97	680
HW207 10101	1/0	19	175	0.76	80	1.02	770
HW207 20101	2/0	19	175	0.81	80	1.07	890
HW207 30101	3/0	19	175	0.86	80	1.12	1030
HW207 40101	4/0	19	175	0.91	80	1.16	1220
HW207 25001	250	37	175	1.97	80	1.21	1370
HW207 35001	350	37	175	1.07	80	1.34	1730
HW207 50001	500	37	175	1.20	80	1.47	2340
HW207 75001	750	61	175	1.40	80	1.66	3210
HW207 10001	1000	61	175	1.54	110	1.88	4210

APPLICATION:

For use in power circuits up to 15kV when installed in open air, conduit, duct, cable tray when CT rated, or direct buried in earth, in wet and dry locations. Used for applications in chemical plants, refineries, steel mills, industrial plants, commercial buildings, utility substations and generating stations. UL approved for use at 105°C for continuous operation, 140°C for emergency overload conditions, and 250°C for short circuit conditions.

CONDUCTOR:

Compressed soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8, with a semi-conducting conductor shield

INSULATION:

Ethylene propylene rubber (EPR) per ICEA S-97-682 with a semi-conducting insulation shield

SHIELD:

Uncoated copper tape with a minimum 12.5% overlap per ICEA S-97-682

JACKET:

Sunlight-resistant PVC per ICEA S-97-682 and UL Standard 1072

FLAME TESTS:

IEEE 383 (70,000 BTU/hr) Flame Test – CT-listed sizes 1/0 AWG and larger

ADDITIONAL STANDARDS:

- ICEA S-93-639
- NEMA WC74
- AEIC CS8
- Federal Specification J-C-30B

NOTE:

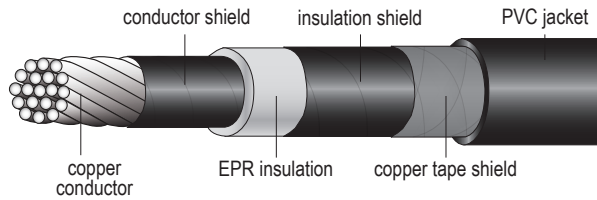
CT rating must be requested, CT ratings are available on sizes 1/0 AWG and larger.

MEDIUM VOLTAGE POWER CABLES

SPECIFICATION
HW208

POWER CABLE

15kV UL Type MV-105, 105°C
Single Conductor, Shielded
EPR Insulation, PVC Jacket
133% Insulation Level
Copper Conductors



MEDIUM VOLTAGE POWER CABLES

Catalog Number	Size AWG	Number of Strands	Insulation Thickness Mils	Insulation Diameter Inch	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW208 00201	2	7	220	0.77	80	1.02	685
HW208 00101	1	19	220	0.81	80	1.06	760
HW208 10101	1/0	19	220	0.85	80	1.10	840
HW208 20101	2/0	19	220	0.89	80	1.14	955
HW208 30101	3/0	19	220	0.95	80	1.19	1115
HW208 40101	4/0	19	220	1.00	80	1.25	1275
HW208 25001	250	37	220	1.06	80	1.33	1465
HW208 35001	350	37	220	1.16	80	1.43	1840
HW208 50001	500	37	220	1.29	80	1.56	2395
HW208 75001	750	61	220	1.48	110	1.81	3415
HW208 10001	1000	61	220	1.63	110	1.98	4415

APPLICATION:

For use in power circuits up to 15kV when installed in open air, conduit, duct, cable tray when CT rated, or direct buried in earth, in wet and dry locations. Used for applications in chemical plants, refineries, steel mills, industrial plants, commercial buildings, utility substations and generating stations. UL approved for use at 105°C for continuous operation, 140°C for emergency overload conditions, and 250°C for short circuit conditions.

CONDUCTOR:

Compressed soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8, with a semi-conducting conductor shield

INSULATION:

Ethylene propylene rubber (EPR) per ICEA S-97-682 with a semi-conducting insulation shield

SHIELD:

Uncoated copper tape with a minimum 12.5% overlap per ICEA S-97-682

JACKET:

Sunlight-resistant PVC per ICEA S-97-682 and UL Standard 1072

FLAME TESTS:

UL and IEEE (70,000 BTU/hr) Flame Test for CT-listed sizes 1/0 AWG and larger

ADDITIONAL STANDARDS:

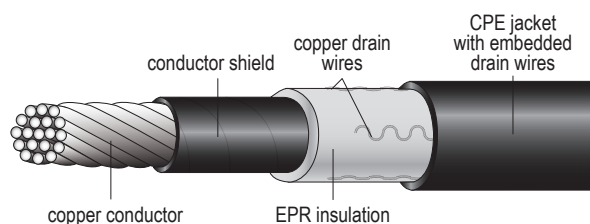
- ICEA S-93-639
- NEMA WC74
- AEIC CS8
- Federal Specification J-C-30B

NOTE:

CT rating must be requested, CT ratings are available on sizes 1/0 AWG and larger.

POWER CABLE – UNISHIELD®

**15kV UL Type MV-105, 105°C
Single Conductor, Shielded
EPR Insulation, CPE Jacket
100% Insulation Level
Copper Conductors**



Catalog Number	Size AWG/kcmil	Number of Strands	Conductor Diameter Inch	Insulation Thickness Mils	Insulation Diameter Inch	Drain Wire Size AWG	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW209 00201	2	7	0.27	175	0.66	19	80	0.84	501
HW209 10101	1/0	19	0.34	175	0.74	19	80	0.92	661
HW209 20101	2/0	19	0.38	175	0.78	19	80	0.99	769
HW209 40101	4/0	19	0.48	175	0.88	18	80	1.07	1079
HW209 25001	250	37	0.52	175	0.94	18	80	1.12	1232
HW209 35001	350	37	0.62	175	1.03	17	85	1.23	1613
HW209 50001	500	37	0.74	175	1.16	17	85	1.36	2149
HW209 75001	750	61	0.91	175	1.34	16	100	1.56	3064
HW209 10001	1000	61	1.06	175	1.50	16	100	1.72	3936

APPLICATION:

For use in power circuits up to 15kV when installed in open air, conduit, duct, cable tray when CT rated, or direct buried in earth, in wet and dry locations. Used for critical applications in harsh and caustic environments in chemical plants, refineries, steel mills, industrial plants, commercial buildings, utility substations and generating stations. UL approved for use at 105°C for continuous operation, 140°C for emergency overload conditions, and 250°C for short circuit conditions.

CONDUCTOR:

Anapact™ soft bare annealed copper per ASTM B-3, Compact Class B stranding per ASTM B-8, with a semi-conducting conductor shield

INSULATION:

Ethylene propylene rubber (EPR) per ICEA S-97-682

SHIELD:

Six (6) corrugated copper shield wires longitudinally embedded in an exterior semi-conducting CPE jacket per ICEA S-97-682.

JACKET:

Sunlight-resistant CPE per ICEA S-97-682 and UL Standard 1072

FLAME TESTS:

UL and IEEE (70,000 BTU/hr) Flame Test for CT-listed sizes 1/0 AWG and larger

ADDITIONAL STANDARDS:

- ICEA S-93-639
- NEMA WC74
- AEIC CS8

NOTE:

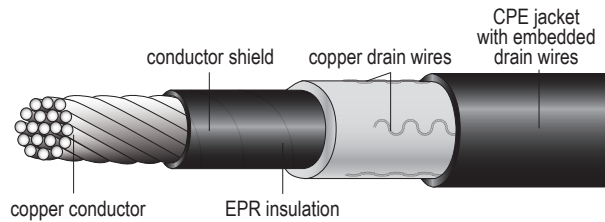
CT rating must be requested, CT ratings are available on sizes 1/0 AWG and larger.

MEDIUM VOLTAGE POWER CABLES

SPECIFICATION
HW210

POWER CABLE – UNISHIELD®

15kV UL Type MV-105, 105°C
Single Conductor, Shielded
EPR Insulation, CPE Jacket
133% Insulation Level
Copper Conductors



MEDIUM VOLTAGE POWER CABLES

Catalog Number	Size AWG/kcmil	Number of Strands	Conductor Diameter Inch	Insulation Thickness Mils	Insulation Diameter Inch	Drain Wire Size AWG	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW210 00201	2	7	0.27	220	0.76	19	80	0.94	574
HW210 10101	1/0	19	0.34	220	0.83	18	80	1.02	753
HW210 20101	2/0	19	0.38	220	0.87	18	80	1.07	867
HW210 40101	4/0	19	0.48	220	0.97	18	80	1.17	1171
HW210 25001	250	37	0.53	220	1.03	17	85	1.24	1349
HW210 35001	350	37	0.62	220	1.12	17	85	1.33	1720
HW210 50001	500	37	0.72	220	1.25	17	85	1.46	2267
HW210 75001	750	61	0.91	220	1.43	16	100	1.67	3216
HW210 10001	1000	61	1.06	220	1.59	15	100	1.86	4164

APPLICATION:

For use in power circuits up to 15kV when installed in open air, conduit, duct, cable tray when CT rated, or direct buried in earth, in wet and dry locations. Used for critical applications in harsh and caustic environments in chemical plants, refineries, steel mills, industrial plants, commercial buildings, utility substations and generating stations. UL approved for use at 105°C for continuous operation, 140°C for emergency overload conditions, and 250°C for short circuit conditions.

CONDUCTOR:

Anapact™ soft bare annealed copper per ASTM B-3, Compact Class B stranding per ASTM B-8, with a semi-conducting conductor shield

INSULATION:

Ethylene propylene rubber (EPR) per ICEA S-97-682

SHIELD:

Six (6) corrugated copper shield wires longitudinally embedded in an exterior semi-conducting CPE jacket per ICEA S-97-682

JACKET:

Sunlight-resistant CPE per ICEA S-97-682 and UL Standard 1072

FLAME TESTS:

UL and IEEE (70,000 BTU/hr) Flame Test for CT-listed sizes 1/0 AWG and larger

ADDITIONAL STANDARDS:

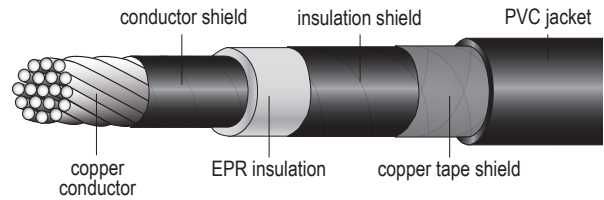
- ICEA S-93-639
- NEMA WC74
- AEIC CS8

NOTE:

CT rating must be requested, CT ratings are available on sizes 1/0 AWG and larger.

POWER CABLE

**25kV/35kV UL Type MV-105, 105°C
Single Conductor, Shielded
EPR Insulation, PVC Jacket
25kV 133%, 35kV 100% Insulation Level
Copper Conductors**



Catalog Number	Size AWG	Number of Strands	Insulation Thickness Mils	Insulation Diameter Inch	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW211 10101	1/0	19	345	1.11	80	1.39	1160
HW211 20101	2/0	19	345	1.15	80	1.44	1290
HW211 30101	3/0	19	345	1.20	80	1.49	1445
HW211 40101	4/0	19	345	1.26	80	1.53	1635
HW211 25001	250	37	345	1.34	80	1.59	1805
HW211 35001	350	37	345	1.43	80	1.69	2205
HW211 50001	500	37	345	1.56	110	1.90	2920
HW211 75001	750	61	345	1.75	110	2.09	2895
HW211 10001	1000	61	345	1.90	110	2.24	4840

APPLICATION:

For use in power circuits up to 35kV when installed in open air, conduit, duct, cable tray when CT rated, or direct buried in earth, in wet and dry locations. Used for applications in chemical plants, refineries, steel mills, industrial plants, commercial buildings, utility substations and generating stations. UL approved for use at 105°C for continuous operation, 140°C for emergency overload conditions, and 250°C for short circuit conditions.

CONDUCTOR:

Compressed soft bare annealed copper per ASTM B-3, Compact Class B stranding per ASTM B-8, with a semi-conducting conductor shield.

INSULATION:

Ethylene propylene rubber (EPR) per ICEA S-97-682

SHIELD:

Uncoated copper tape with a minimum 12.5% overlap per ICEA S-97-682

JACKET:

Sunlight-resistant PVC per ICEA S-97-682 and UL Standard 1072

FLAME TESTS:

UL and IEEE (70,000 BTU/hr) Flame Test for CT-listed sizes 1/0 AWG and larger

ADDITIONAL STANDARDS:

- ICEA S-93-639
- NEMA WC74
- AEIC CS8
- Federal Specification J-C-30B

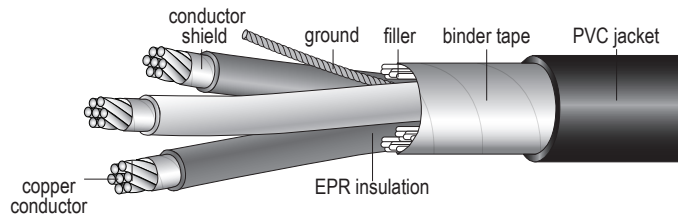
NOTE:

CT rating must be requested, CT ratings are available on sizes 1/0 AWG and larger.

SPECIFICATION
HW212

POWER CABLE

**2.4kV UL Type MV-105, 105°C
Three Conductor, Non-Shielded
EPR Insulation, PVC Jacket
133% Insulation Level
Copper Conductors**



MEDIUM VOLTAGE POWER CABLES

Catalog Number	Size AWG/kcmil	Number of Strands	Insulation Thickness Mils	Insulation Diameter Inch	Jacket Thickness Mils	Copper Grounding Conductor AWG	Overall Diameter Inches	Net Weight Lbs/Mft	Explosion Proof Connector UN
HW212 00603	6	7	115	0.45	80	6	1.16	795	424UN05
HW212 00403	4	7	115	0.50	80	6	1.26	1010	424UN06
HW212 00203	2	7	115	0.56	80	6	1.39	1305	424UN06
HW212 00103	1	19	115	0.60	80	4	1.48	1600	424UN06
HW212 10103	1/0	19	115	0.64	80	4	1.56	1890	424UN06
HW212 20103	2/0	19	115	0.68	80	4	1.66	2150	424UN07
HW212 30103	3/0	19	115	0.73	110	3	1.83	2650	424UN07
HW212 40103	4/0	37	115	0.79	110	3	1.95	3220	424UN07
HW212 25003	250	37	115	0.84	110	3	1.07	3830	424UN07
HW212 35003	350	37	115	0.95	110	2	2.30	4965	424UN08
HW212 50003	500	37	115	1.08	110	1	2.58	6610	424UN09
HW212 75003	750	61	115	1.27	140	1/0	3.05	9490	—

APPLICATION:

For use in primary power and distribution circuits up to 2.4kV when installed in open air, conduit, duct, cable tray when CT rated, or direct buried in earth, in wet and dry locations. Used for applications in chemical plants, refineries, steel mills, industrial plants, commercial buildings, utility substations and generating stations where shielding is not required.

CONDUCTOR:

Compressed soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8, with a semi-conducting conductor shield

INSULATION:

Ethylene propylene rubber (EPR) per ICEA standards. Grounding Conductor: Compressed soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8 sized in accordance to UL Standard 1072

JACKET:

Sunlight-resistant PVC per ICEA Standards and UL Standard 1072

FLAME TESTS:

UL and IEEE (70,000 BTU/hr) Flame Test for CT-listed sizes 1/0 AWG and larger

COLOR CODE:

ICEA Method 4

ADDITIONAL STANDARDS:

- ICEA S-96-659
- NEMA WC71

CONNECTORS:

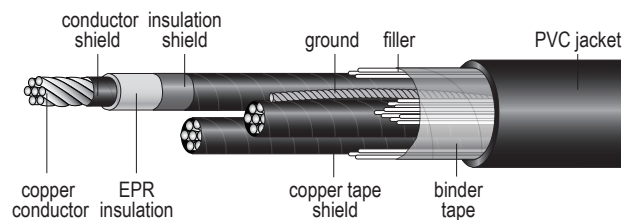
Explosion Proof, Class I, Division 2: 424UN series – aluminum exterior components, nickel-plated brass interior components

NOTE:

CT rating must be requested, CT ratings are available on sizes 1/0 AWG and larger.

POWER CABLE

**5kV/8kV UL Type MV-105, 105°C
Three Conductor, Shielded
EPR Insulation, PVC Jacket
5kV 133%, 8kV 100% Insulation Level
Copper Conductors**



Catalog Number	Size AWG/kcmil	Number of Strands	Insulation Thickness Mils	Insulation Diameter Inch	Jacket Thickness Mils	Copper Grounding Conductor AWG	Overall Diameter Inches	Net Weight Lbs/Mft	Explosion Proof Connector UN
HW213 00603	6	7	115	0.47	80	6	1.38	1052	424UN05
HW213 00403	4	7	115	0.52	80	6	1.48	1265	424UN06
HW213 00203	2	7	115	0.57	80	6	1.61	1608	424UN06
HW213 00103	1	19	115	0.61	110	4	1.75	1989	424UN06
HW213 10103	1/0	19	115	0.65	110	4	1.84	2257	424UN07
HW213 20103	2/0	19	115	0.70	110	4	1.93	2609	424UN07
HW213 30103	3/0	19	115	0.75	110	3	2.04	3073	424UN07
HW213 40103	4/0	19	115	0.80	110	3	2.16	3598	424UN08
HW213 25003	250	37	115	0.86	110	3	2.30	4094	424UN08
HW213 35003	350	37	115	0.96	110	2	2.52	5288	424UN08
HW213 50003	500	37	115	1.09	140	1	2.89	7256	424UN09
HW213 75003	750	37	115	1.28	140	1/0	3.77	10128	—

APPLICATION:

For use in primary power and distribution circuits up to 8kV when installed in open air, conduit, duct, cable tray when CT rated, or direct buried in earth, in wet and dry locations. Used for applications in chemical plants, refineries, steel mills, industrial plants, commercial buildings, utility substations and generating stations. UL approved for use at 105°C for continuous operation, 140°C for emergency overload conditions, and 250°C for short circuit conditions.

CONDUCTOR:

Compressed soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8, with a semi-conducting conductor shield

INSULATION:

Ethylene propylene rubber (EPR) per ICEA S-97-682 with a semi-conducting insulation shield

SHIELD:

Uncoated copper tape with a minimum 12.5% overlap per ICEA S-97-682

GROUNDING CONDUCTOR:

Compressed soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8 sized in accordance to UL Standard 1072

JACKET:

Sunlight-resistant PVC per ICEA S-97-682 and UL Standard 1072

FLAME TESTS:

UL and IEEE (70,000 BTU/hr) Flame Test for CT-listed sizes 1/0 AWG and larger

COLOR CODE:

ICEA Method 4

ADDITIONAL STANDARDS:

- ICEA S-93-639
- NEMA WC74
- AEIC CS8
- Federal Specification J-C-30B

CONNECTORS:

Explosion Proof, Class I, Division 2: 424UN series – aluminum exterior components, nickel-plated brass interior components

NOTE:

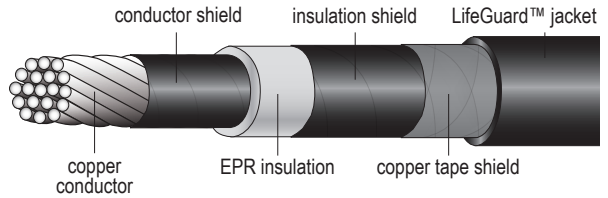
CT rating must be requested, CT ratings are available on sizes 1/0 AWG and larger.

MEDIUM VOLTAGE POWER CABLES

SPECIFICATION
HW220

POWER CABLE

5kV/8kV UL Type MV-105-LS, 105°C
Single Conductor, Shielded
EPR Insulation
Low Smoke Zero Halogen Jacket
5kV 133%, 8kV 100% Insulation Level
f Copper Conductors

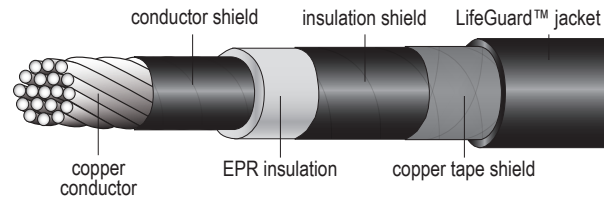


MEDIUM VOLTAGE POWER CABLES

Catalog Number	Size AWG	Number of Strands	Insulation Thickness Mils	Insulation Diameter Inch	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW220 00601	6	7	115	0.43	60	0.63	286
HW220 00401	4	7	115	0.50	60	0.71	350
HW220 00201	2	7	115	0.56	60	0.77	460
HW220 00101	1	19	115	0.60	60	0.81	565
HW220 10101	1/0	19	115	0.64	60	0.84	620
HW220 20101	2/0	19	115	0.68	80	0.93	755
HW220 30101	3/0	19	115	0.73	80	0.99	890
HW220 40101	4/0	19	115	0.79	80	1.04	1055
HW220 25001	250	37	115	0.85	80	1.09	1205
HW220 35001	350	37	115	0.95	80	1.20	1570
HW220 50001	500	37	115	1.08	80	1.34	2115
HW220 75001	750	61	115	1.27	80	1.53	2995
HW220 10001	1000	61	115	1.42	80	1.68	3870

POWER CABLE

**5kV/8kV UL Type MV-105-LS, 105°C
Single Conductor, Shielded
EPR Insulation
Low Smoke Zero Halogen Jacket
5kV 133%, 8kV 100% Insulation Level
Copper Conductors**



APPLICATION:

LifeGuard™ Low Smoke Zero Halogen cable is for use in power circuits in chemical plants, refineries, steel mills, industrial plants, commercial buildings, utility substations and generating stations. It may be installed in open air, conduit, duct, cable tray when CT rated, or direct buried in earth, in wet and dry locations. It is highly flame retardant, produces very small amounts of smoke when burned and contains no halogens. LifeGuard™ cable is ideal for applications where a high degree of safety and equipment protection is required.

It is UL approved for use at 105°C for continuous operation, 140°C for emergency overload conditions, and 250°C for short circuit conditions.

PRODUCT FEATURES:

- Cable tray rated on sizes 1/0 AWG and larger
- Sunlight-resistant
- Approved for direct burial
- Very low smoke production when burned
- LifeGuard™ jacket produces zero halogens during fire – less toxic and corrosive
- LifeGuard™ jacket is environmentally safe – lead, sulfur and halogen free
- Highly chemical resistant
- Very flame retardant
- Burns to an ash – does not exhibit thermoplastic drip
- Excellent compression and impact resistance
- Superior tensile strength and abrasion resistance
- Flexible jacket with low coefficient of friction

CONDUCTOR:

Compressed soft annealed copper per ASTM B-3, Class B stranding per ASTM B-8, with a semi-conducting conductor shield

INSULATION:

Ethylene propylene rubber (EPR) per ICEA S-97-682 Type III with a semi-conducting insulation shield

SHIELD:

Uncoated copper tape with a 25% overlap per ICEA S-97-682

JACKET:

Sunlight-resistant and flame-retardant, Low Smoke Zero Halogen polyolefin per UL Standard 1072 and ICEA T-33-655-1994 Section 5-4

FLAME TESTS:

- CT listed sizes 1/0 AWG and larger
- IEEE 383 (70,000 BTU/hr) Flame Test
- IEEE 1202 (70,000 BTU/hr) Flame Test

ADDITIONAL STANDARDS:

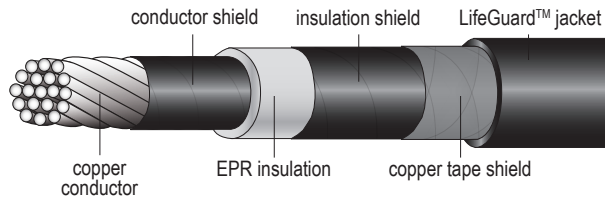
- UL 1685
- AEIC C5-8

* Some cable insulations may contain trace amounts of halogens.
† Tinned Copper Conductor available upon request.

SPECIFICATION
HW221

POWER CABLE

8kV UL Type MV-105-LS, 105°C
Single Conductor, Shielded
EPR Insulation
Low Smoke Zero Halogen Jacket
133% Insulation Level
Copper Conductors

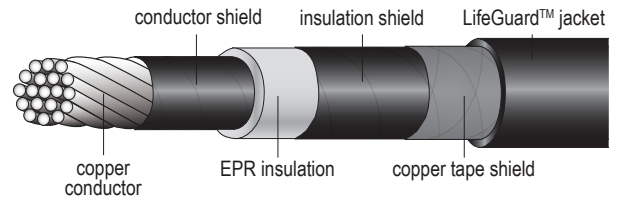


MEDIUM VOLTAGE POWER CABLES

Catalog Number	Size AWG	Number of Strands	Insulation Thickness Mils	Insulation Diameter Inch	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW221 00201	2	7	140	0.813	60	0.81	512
HW221 10101	1/0	19	140	0.920	80	0.93	711
HW221 20101	2/0	19	140	0.960	80	0.98	822
HW221 40101	4/0	19	140	1.065	80	1.09	1136
HW221 35001	350	37	140	1.225	80	1.25	1669
HW221 50001	500	37	140	1.350	80	1.39	2211

POWER CABLE

**8kV UL Type MV-105-LS, 105°C
Single Conductor, Shielded
EPR Insulation
Low Smoke Zero Halogen Jacket
133% Insulation Level
Copper Conductors**



APPLICATION:

LifeGuard™ Low Smoke Zero Halogen cable is for use in power circuits in chemical plants, refineries, steel mills, industrial plants, commercial buildings, utility substations and generating stations. It may be installed in open air, conduit, duct, cable tray when CT rated, or direct buried in earth, in wet and dry locations. It is highly flame retardant, produces very small amounts of smoke when burned and contains no halogens. LifeGuard™ cable is ideal for applications where a high degree of safety and equipment protection is required.

It is UL approved for use at 105°C for continuous operation, 140°C for emergency overload conditions, and 250°C for short circuit conditions.

PRODUCT FEATURES:

- Cable tray rated on sizes 1/0 AWG and larger
- Sunlight-resistant
- Approved for direct burial
- Tinned conductors provide ease of termination and added protection in caustic environments
- Very low smoke production when burned
- LifeGuard™ jacket produces zero halogens during fire – less toxic and corrosive
- LifeGuard™ jacket is environmentally safe – lead, sulfur and halogen free
- Highly chemical resistant
- Very flame retardant
- Burns to an ash – does not exhibit thermoplastic drip
- Excellent compression and impact resistance
- Superior tensile strength and abrasion resistance
- Flexible jacket with low coefficient of friction

CONDUCTOR:

Compressed soft annealed copper per ASTM B-3, Class B stranding per ASTM B-8, with a semi-conducting conductor shield

INSULATION:

Ethylene propylene rubber (EPR) per ICEA S-97-682 Type III with a semi-conducting insulation shield

SHIELD:

Uncoated copper tape with a 25% overlap per ICEA S-97-682

JACKET:

Sunlight-resistant and flame-retardant, Low Smoke Zero Halogen polyolefin per UL Standard 1072 and ICEA T-33-655-1994 Section 5-4

FLAME TESTS:

- CT listed sizes 1/0 AWG and larger
- IEEE 383 70,000 BTU/hr Flame Test
- IEEE 1202 70,000 BTU/hr Flame Test

ADDITIONAL STANDARDS:

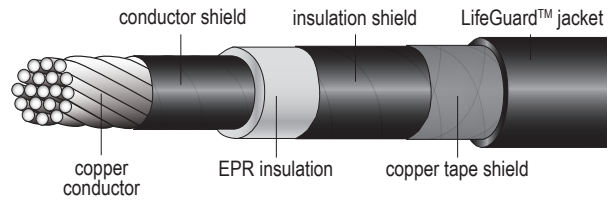
- UL 1685
- AEIC C5-8

* Some cable insulations may contain trace amounts of halogens.

SPECIFICATION
HW222

POWER CABLE

**15kV UL Type MV-105-LS, 105°C
Single Conductor, Shielded
EPR Insulation
Low Smoke Zero Halogen Jacket
133% Insulation Level
f Copper Conductors**

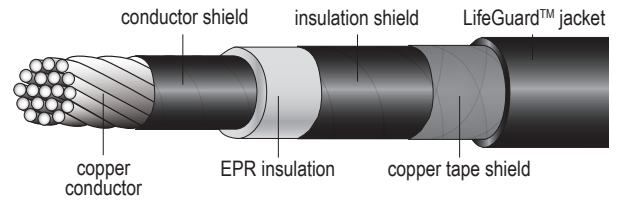


MEDIUM VOLTAGE POWER CABLES

Catalog Number	Size AWG	Number of Strands	Insulation Thickness Mils	Insulation Diameter Inch	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW222 00201	2	7	220	0.77	60	1.02	685
HW222 00101	1	19	220	0.81	60	1.06	760
HW222 10101	1/0	19	220	0.85	60	1.10	840
HW222 20101	2/0	19	220	0.89	80	1.14	955
HW222 30101	3/0	19	220	0.95	80	1.19	1115
HW222 40101	4/0	19	220	1.00	80	1.25	1275
HW222 25001	250	37	220	1.06	80	1.33	1465
HW222 35001	350	37	220	1.16	80	1.43	1840
HW222 50001	500	37	220	1.29	80	1.56	2395
HW222 75001	750	61	220	1.48	110	1.81	3415
HW222 10001	1000	61	220	1.63	110	1.98	4435

POWER CABLE

**15kV UL Type MV-105-LS, 105°C
Single Conductor, Shielded
EPR Insulation
Low Smoke Zero Halogen Jacket
133% Insulation Level
Copper Conductors**



APPLICATION:

LifeGuard™ Low Smoke Zero Halogen cable is for use in power circuits in chemical plants, refineries, steel mills, industrial plants, commercial buildings, utility substations and generating stations. It may be installed in open air, conduit, duct, cable tray when CT rated, or direct buried in earth, in wet and dry locations. It is highly flame retardant, produces very small amounts of smoke when burned and contains no halogens. LifeGuard™ cable is ideal for applications where a high degree of safety and equipment protection is required.

It is UL approved for use at 105°C for continuous operation, 140°C for emergency overload conditions, and 250°C for short circuit conditions.

PRODUCT FEATURES:

- Cable tray rated on sizes 1/0 AWG and larger
- Sunlight-resistant
- Approved for direct burial
- Very low smoke production when burned
- LifeGuard™ jacket produces zero halogens during fire – less toxic and corrosive
- LifeGuard™ jacket is environmentally safe – lead, sulfur and halogen free
- Highly chemical resistant
- Very flame retardant
- Burns to an ash – does not exhibit thermoplastic drip
- Excellent compression and impact resistance
- Superior tensile strength and abrasion resistance
- Flexible jacket with low coefficient of friction

CONDUCTOR:

Compressed soft annealed copper per ASTM B-3, Class B stranding per ASTM B-8, with a semi-conducting conductor shield

INSULATION:

Ethylene propylene rubber (EPR) per ICEA S-97-682 Type III with a semi-conducting insulation shield

SHIELD:

Uncoated copper tape with a 25% overlap per ICEA S-97-682

JACKET:

Sunlight-resistant and flame-retardant, Low Smoke Zero Halogen polyolefin per UL Standard 1072 and ICEA T-33-655-1994 Section 5-4.

FLAME TESTS:

- CT listed sizes 1/0 AWG and larger
- IEEE 383 70,000 BTU/hr Flame Test
- IEEE 1202 70,000 BTU/hr Flame Test

ADDITIONAL STANDARDS:

- UL 1685
- AEIC C5-8

* Some cable insulations may contain trace amounts of halogens.
† Tinned Copper Conductor available upon request.

NOTES

SECTION F

Flexible & Portable Cords

DESCRIPTION	TYPE	SPECIFICATION	PAGE
Flexible and Portable Cords			
600 Volt Power and Control Cable	SOOW	HW250	122
600 Volt Power and Control Cable	SEOOW	HW251	128
600 Volt Perfectaflex® Pendant and Reeling	P&R	HW252	130
600 Volt Welding Cable		HW253	135
2000 Volt Diesel Locomotive Car Wiring	DLO	HW254	136
5KV/15KV Jumper Cable	Transformer Lead Wire	HW255	137
Portable Power			
2000 Volt Power Cable	W	HW256	138
2000 Volt Magnet Crane Cable	W	HW257	141
2000 Volt Power Cable	G	HW258	142
2000 Volt Power Cable	G-GC	HW259	143

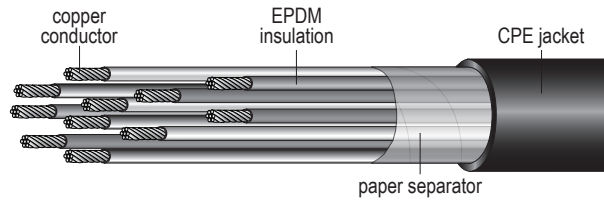
FLEXIBLE & PORTABLE CORDS

SPECIFICATION
HW250

REV 8/16

TYPE SOOW

600 Volt UL/CSA, -40°C to 90°C
Black Jacket
Flexible Copper Conductors



Catalog Number	Size AWG	Number of Conductors	Number of Strands	Insulation Thickness Mils	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW250 01802	18	2	16	30	60	0.34	70
HW250 01803	18	3	16	30	60	0.36	85
HW250 01804	18	4	16	30	60	0.39	100
HW250 01805	18	5	16	30	80	0.46	130
HW250 01806	18	6	16	30	80	0.49	150
HW250 01807	18	7	16	30	80	0.50	160
HW250 01808	18	8	16	30	80	0.53	170
HW250 01810	18	10	16	30	80	0.60	215
HW250 01812	18	12	16	30	80	0.60	245
HW250 01814	18	14	16	30	80	0.66	265
HW250 01816	18	16	16	30	95	0.70	310
HW250 01818	18	18	16	30	95	0.76	340
HW250 01820	18	20	16	30	95	0.79	375
HW250 01824	18	24	16	30	95	0.90	450
HW250 01830	18	30	16	30	95	0.92	520
HW250 01836	18	36	16	30	95	1.05	600

FLEXIBLE & PORTABLE CORDS

APPLICATION:

For use in heavy-duty industrial applications where flexibility and durability is required. Typical uses include portable power distribution for tools, equipment, small motors and machinery. UL listed and CSA certified for indoor and outdoor use.

CONDUCTORS:

Soft bare annealed copper per ASTM B-3, flexible bunch strand per ASTM B-174

INSULATION:

Ethylene propylene diene monomer (EPDM) rubber

JACKET:

Black chlorinated polyethylene (CPE) rubber

FLAME TESTS:

MSHA Flame Test

COLOR CODE:

- ICEA Method 1
- Three conductor – black, white, green

ADDITIONAL STANDARDS:

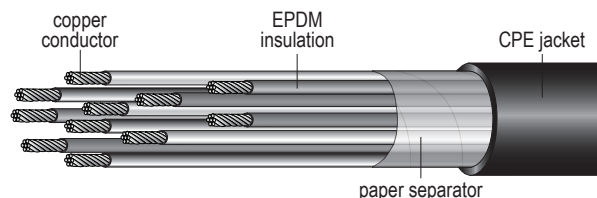
- Flexible Cord – UL Standard 62
- Flexible Cord – CSA C22.2-49
- Pennsylvania Bureau of Mines – MSHA approved
- Federal Specification JC-580

TYPE SOOW

600 Volt UL/CSA, -40°C to 90°C

Black Jacket

Flexible Copper Conductors



Catalog Number	Size AWG	Number of Conductors	Number of Strands	Insulation Thickness Mils	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW250 01602	16	2	26	30	60	0.37	80
HW250 01603	16	3	26	30	60	0.39	105
HW250 01604	16	4	26	30	60	0.42	120
HW250 01605	16	5	26	30	80	0.49	160
HW250 01606	16	6	26	30	80	0.52	175
HW250 01607	16	7	26	30	80	0.55	195
HW250 01608	16	8	26	30	80	0.57	220
HW250 01609	16	9	26	30	80	0.62	250
HW250 01610	16	10	26	30	80	0.65	280
HW250 01612	16	12	26	30	80	0.69	325
HW250 01614	16	14	26	30	95	0.75	355
HW250 01616	16	16	26	30	95	0.74	380
HW250 01618	16	18	26	30	95	0.79	425
HW250 01620	16	20	26	30	95	0.81	480
HW250 01624	16	24	26	30	95	0.92	550
HW250 01630	16	30	26	30	95	1.05	715
HW250 01636	16	36	26	30	95	1.12	800
HW250 01637	16	37	26	30	95	1.18	815
HW250 01640	16	40	26	30	95	1.24	850

APPLICATION:

For use in heavy-duty industrial applications where flexibility and durability is required. Typical uses include portable power distribution for tools, equipment, small motors and machinery. UL listed and CSA certified for indoor and outdoor use.

CONDUCTORS:

Soft bare annealed copper per ASTM B-3, flexible bunch strand per ASTM B-174

INSULATION:

Ethylene propylene diene monomer (EPDM) rubber

JACKET:

Black chlorinated polyethylene (CPE) rubber

FLAME TESTS:

MSHA Flame Test

COLOR CODE:

- ICEA Method 1
- Three conductor – black, white, green

ADDITIONAL STANDARDS:

- Flexible Cord – UL Standard 62
- Flexible Cord – CSA C22.2-49
- Pennsylvania Bureau of Mines – MSHA approved
- Federal Specification JC-580

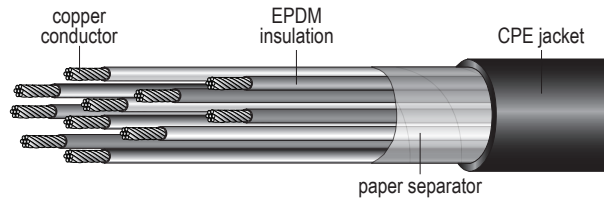
FLEXIBLE & PORTABLE CORDS

SPECIFICATION
HW250

REV 8/16

TYPE SOOW

600 Volt UL/CSA, -40°C to 90°C
Black Jacket
Flexible Copper Conductors



Catalog Number	Size AWG	Number of Conductors	Number of Strands	Insulation Thickness Mils	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW250 01402	14	2	41	45	80	0.50	135
HW250 01403	14	3	41	45	80	0.53	170
HW250 01404	14	4	41	45	80	0.57	205
HW250 01405	14	5	41	45	95	0.65	275
HW250 01406	14	6	41	45	95	0.71	315
HW250 01407	14	7	41	45	95	0.71	345
HW250 01408	14	8	41	45	95	0.76	385
HW250 01409	14	9	41	45	95	0.83	410
HW250 01410	14	10	41	45	95	0.83	430
HW250 01412	14	12	41	45	95	0.87	485
HW250 01414	14	14	41	45	110	1.00	590
HW250 01416	14	16	41	45	110	1.03	665
HW250 01418	14	18	41	45	110	1.10	710
HW250 01420	14	20	41	45	110	1.15	780
HW250 01424	14	24	41	45	125	1.26	985
HW250 01430	14	30	41	45	125	1.34	1130
HW250 01437	14	37	41	45	125	1.48	1330

FLEXIBLE & PORTABLE CORDS

APPLICATION:

For use in heavy-duty industrial applications where flexibility and durability is required. Typical uses include portable power distribution for tools, equipment, small motors and machinery. UL listed and CSA certified for indoor and outdoor use.

CONDUCTORS:

Soft bare annealed copper per ASTM B-3, flexible bunch strand per ASTM B-174

INSULATION:

Ethylene propylene diene monomer (EPDM) rubber

JACKET:

Black chlorinated polyethylene (CPE) rubber

FLAME TESTS:

MSHA Flame Test

COLOR CODE:

- ICEA Method 1
- Three conductor – black, white, green

ADDITIONAL STANDARDS:

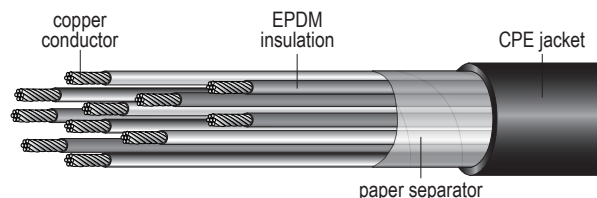
- Flexible Cord – UL Standard 62
- Flexible Cord – CSA C22.2-49
- Pennsylvania Bureau of Mines – MSHA approved
- Federal Specification JC-580

TYPE SOOW

600 Volt UL/CSA, -40°C to 90°C

Black Jacket

Flexible Copper Conductors



Catalog Number	Size AWG	Number of Conductors	Number of Strands	Insulation Thickness Mils	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW250 01202	12	2	65	45	95	0.57	195
HW250 01203	12	3	65	45	95	0.60	220
HW250 01204	12	4	65	45	95	0.65	270
HW250 01205	12	5	65	45	95	0.71	330
HW250 01206	12	6	65	45	95	0.74	362
HW250 01207	12	7	65	45	95	0.77	415
HW250 01208	12	8	65	45	95	0.82	470
HW250 01209	12	9	65	45	95	0.90	515
HW250 01210	12	10	65	45	110	1.00	580
HW250 01212	12	12	65	45	110	1.01	650
HW250 01214	12	14	65	45	110	1.08	740
HW250 01216	12	16	65	45	110	1.13	835
HW250 01218	12	18	65	45	110	1.15	910
HW250 01220	12	20	65	45	110	1.17	990
HW250 01224	12	24	65	45	125	1.40	1240
HW250 01230	12	30	65	45	125	1.50	1415
HW250 01236	12	36	65	45	125	1.65	1670
HW250 01240	12	40	65	45	125	1.69	1830

FLEXIBLE & PORTABLE CORDS

APPLICATION:

For use in heavy-duty industrial applications where flexibility and durability is required. Typical uses include portable power distribution for tools, equipment, small motors and machinery. UL listed and CSA certified for indoor and outdoor use.

CONDUCTORS:

Soft bare annealed copper per ASTM B-3, flexible bunch strand per ASTM B-174

INSULATION:

Ethylene propylene diene monomer (EPDM) rubber

JACKET:

Black chlorinated polyethylene (CPE) rubber

FLAME TESTS:

MSHA Flame Test

COLOR CODE:

- ICEA Method 1
- Three conductor – black, white, green

ADDITIONAL STANDARDS:

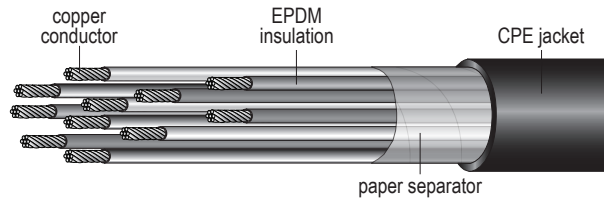
- Flexible Cord – UL Standard 62
- Flexible Cord – CSA C22.2-49
- Pennsylvania Bureau of Mines – MSHA approved
- Federal Specification JC-580

SPECIFICATION
HW250

REV 5/16

TYPE SOOW

600 Volt UL/CSA, -40°C to 90°C
Black Jacket
Flexible Copper Conductors



Catalog Number	Size AWG	Number of Conductors	Number of Strands	Insulation Thickness Mils	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW250 01002	10	2	104	45	95	0.620	270
HW250 01003	10	3	104	45	95	0.660	325
HW250 01004	10	4	104	45	95	0.715	391
HW250 01005	10	5	104	45	95	0.770	455
HW250 01006	10	6	104	45	95	0.870	500
HW250 01008	10	8	104	45	95	0.940	625
HW250 01010	10	10	104	45	110	1.020	765
HW250 01012	10	12	104	45	110	1.070	865
HW250 01016	10	16	104	45	125	1.230	1150
HW250 01020	10	20	104	45	125	1.260	1445

APPLICATION:

For use in heavy-duty industrial applications where flexibility and durability is required. Typical uses include portable power distribution for tools, equipment, small motors and machinery. Excellent abrasion, ozone, sunlight, chemical, oil, and water resistance. UL listed and CSA certified for indoor and outdoor use.

CONDUCTORS:

Soft bare annealed copper per ASTM B-3, flexible bunch strand per ASTM B-174

INSULATION:

Ethylene propylene diene monomer (EPDM) rubber

JACKET:

Black chlorinated polyethylene (CPE) rubber

FLAME TESTS:

MSHA Flame Test
CSA FT-1 and FT-2 Flame Test

COLOR CODE:

- ICEA Method 1
- Three conductor – black, white, green

***ADDITIONAL STANDARDS:**

- Flexible Cord – UL Standard 62
- Flexible Cord – CSA C22.2-49
- Pennsylvania Bureau of Mines – MSHA approved
- Federal Specification JC-580
- RoHS

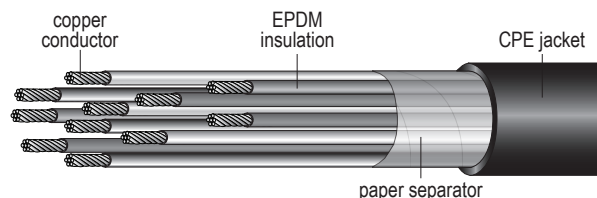
NOTE:

Sizes 8AWG through 2AWG are available in both non-UL/non-CSA and UL/CSA constructions.

FLEXIBLE & PORTABLE CORDS

TYPE SOOW

**600 Volt Non-UL, -40°C to 90°C
Black Jacket
Flexible Copper Conductors**



Catalog Number	Size AWG	Number of Conductors	Number of Strands	Insulation Thickness Mils	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW250 00803	8	3	119	50	79	0.719	360
HW250 00804	8	4	119	50	79	0.786	459
HW250 00805	8	5	119	50	79	0.857	554
HW250 00603	6	3	119	50	79	0.798	473
HW250 00604	6	4	119	50	79	0.873	601
HW250 00605	6	5	119	50	87	0.971	745
HW250 00403	4	3	119	50	106	0.893	604
HW250 00404	4	4	119	50	118	0.999	787
HW250 00405	4	5	119	50	118	1.093	949
HW250 00203	2	3	133	50	110	1.091	984
HW250 00204	2	4	133	50	102	1.181	1251
HW250 00205	2	5	133	50	122	1.331	1573

APPLICATION:

For use in heavy-duty industrial applications where flexibility and durability is required. Typical uses include portable power distribution for tools, equipment, small motors and machinery. Excellent abrasion, ozone, sunlight, chemical, oil, and water resistance.

CONDUCTORS:

Soft bare annealed copper per ASTM B-3, flexible bunch strand per ASTM B-174

INSULATION:

Ethylene propylene diene monomer (EPDM) rubber

JACKET:

Black chlorinated polyethylene (CPE) rubber

FLAME TESTS:

MSHA Flame Test

COLOR CODE:

- ICEA Method 1
- Three conductor – black, white, green

ADDITIONAL STANDARDS:

- Pennsylvania Bureau of Mines – MSHA approved
- Federal Specification JC-580
- RoHS

NOTE:

Sizes 8AWG through 2AWG are available in both non-UL/non-CSA and UL/CSA constructions.

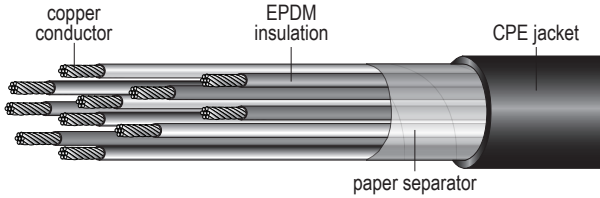
FLEXIBLE & PORTABLE CORDS

SPECIFICATION
HW250UL

REV 5/16

TYPE SOOW

600 Volt UL, -40°C to 90°C
Black Jacket
Flexible Copper Conductors



Catalog Number	Size AWG	Number of Conductors	Number of Strands	Insulation Thickness Mils	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW250 803UL	8	3	133	60	110	0.826	470
HW250 804UL	8	4	133	60	125	0.927	616
HW250 805UL	8	5	133	60	125	1.006	734
HW250 603UL	6	3	133	60	125	0.939	633
HW250 604UL	6	4	133	60	140	1.052	826
HW250 605UL	6	5	133	60	140	1.143	989
HW250 403UL	4	3	133	60	140	1.071	854
HW250 404UL	4	4	133	60	155	1.197	1110
HW250 405UL	4	5	133	60	155	1.299	1329
HW250 203UL	2	3	133	60	155	1.252	1235
HW250 204UL	2	4	133	60	170	1.394	1606
HW250 205UL	2	5	133	60	170	1.516	1923

FLEXIBLE & PORTABLE CORDS

APPLICATION:

For use in heavy-duty industrial applications where flexibility and durability is required. Typical uses include portable power distribution for tools, equipment, small motors and machinery. Excellent abrasion, ozone, sunlight, chemical, oil, and water resistance. UL listed and CSA certified for indoor and outdoor use.

CONDUCTORS:

Soft bare annealed copper per ASTM B-3, flexible bunch strand per ASTM B-174

INSULATION:

Ethylene propylene diene monomer (EPDM) rubber

JACKET:

Black chlorinated polyethylene (CPE) rubber

FLAME TESTS:

MSHA Flame Test
CSA FT-1 and FT-2 Flame Test

COLOR CODE:

- ICEA Method 1
- Three conductor – black, white, green

ADDITIONAL STANDARDS:

- Flexible Cord – UL Standard 62
- Flexible Cord – CSA C22.2-49
- Pennsylvania Bureau of Mines – MSHA approved
- Federal Specification JC-580
- RoHS

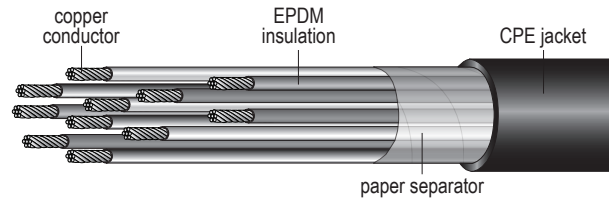
NOTE:

Sizes 8AWG through 2AWG are available in both non-UL/non-CSA and UL/CSA constructions.

SPECIFICATION
HW250J

TYPE SJOOW

300 Volt UL/CSA*, -40°C to 90°C
Black Jacket
Flexible Copper Conductors



Catalog Number	Size AWG	Number of Conductors	Number of Strands	Insulation Thickness Mils	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW250J 01802	18	2	16	30	30	0.285	62
HW250J 01803	18	3	16	30	30	0.305	75
HW250J 01804	18	4	16	30	30	0.330	77
HW250J 01602	16	2	26	30	30	0.310	68
HW250J 01603	16	3	26	30	30	0.330	81
HW250J 01604	16	4	26	30	30	0.365	100
HW250J 01412	14	2	41	30	30	0.340	87
HW250J 01413	14	3	41	30	30	0.370	108
HW250J 01414	14	4	41	30	30	0.410	135
HW250J 01222	12	2	65	30	45	0.410	128
HW250J 01203	12	3	65	30	45	0.430	154
HW250J 01204	12	4	65	30	45	0.475	192
HW250J 01002	10	2	104	45	60	0.560	230
HW250J 01003	10	3	104	45	60	0.580	269
HW250J 01004	10	4	104	45	60	0.655	375

APPLICATION:

For use in heavy-duty industrial applications where flexibility and durability is required. Typical uses include portable power distribution for tools, equipment, small motors and machinery. Excellent abrasion, ozone, sunlight, chemical, oil, and water resistance. UL listed and CSA certified for indoor and outdoor use.

CONDUCTORS:

Soft bare annealed copper per ASTM B-3, flexible bunch strand per ASTM B-174

INSULATION:

Ethylene propylene diene monomer (EPDM) rubber

JACKET:

Black chlorinated polyethylene (CPE) rubber

FLAME TESTS:

MSHA Flame Test

COLOR CODE:

- ICEA Method 1
- Two conductor – black, white
- Three conductor – black, white, green
- Four conductor – black, white, red, green

***ADDITIONAL STANDARDS:**

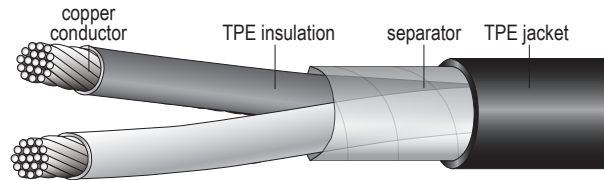
- Flexible Cord – UL Standard 62
- Flexible Cord – CSA C22.2-49
- Pennsylvania Bureau of Mines – MSHA approved
- Federal Specification JC-580
- RoHS

FLEXIBLE & PORTABLE CORDS

SPECIFICATION
HW251

TYPE SEOWW

600 Volt UL/CSA, -50°C to 105°C
Yellow Jacket
Flexible Copper Conductors



Catalog Number	Size AWG	Number of Conductors	Number of Strands	Insulation Thickness Mils	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW251 01802	18	2	16	31	62	0.34	57
HW251 01803	18	3	16	31	62	0.36	69
HW251 01804	18	4	16	31	62	0.39	78
HW251 01602	16	2	26	31	62	0.37	69
HW251 01603	16	3	26	31	62	0.39	80
HW251 01604	16	4	26	31	62	0.42	96
HW251 01402	14	2	41	47	82	0.50	124
HW251 01403	14	3	41	47	82	0.53	149
HW251 01404	14	4	41	47	82	0.57	180
HW251 01202	12	2	65	46	97	0.57	152
HW251 01203	12	3	65	46	97	0.60	197
HW251 01204	12	4	65	46	97	0.64	240
HW251 01002	10	2	104	46	97	0.62	193
HW251 01003	10	3	104	46	97	0.66	257
HW251 01004	10	4	104	46	97	0.70	313

FLEXIBLE & PORTABLE CORDS

APPLICATION:

High-grade yellow jacketed cord for use in harsh industrial applications where flexibility and durability is required. Superior insulation and jacketing material allows cable to be used in -50°C to 105°C environments. Typical uses include stage equipment and lighting, and portable power distribution for tools, equipment, small motors and machinery. UL listed and CSA certified for indoor and outdoor use.

CONDUCTORS:

Soft bare annealed copper per ASTM B-3, flexible bunch strand per ASTM B-174

INSULATION:

Thermoplastic elastomer (TPE)

JACKET:

Yellow thermoplastic elastomer (TPE)

FLAME TESTS:

- UL 1581 Flame Test
- CSA FT2 Flame Test
- MSHA Flame Test

COLOR CODE:

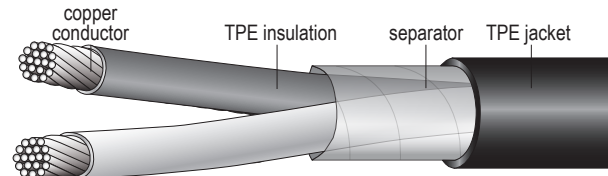
- ICEA Method 1
- Three conductor – black, white, green

ADDITIONAL STANDARDS:

- NEC Article 400
- Flexible Cord – UL Standard 62
- Flexible Cord – CSA C22.2-49
- Pennsylvania Bureau of Mines – MSHA approved
- Federal Specification JC-580B

TYPE SEOOW

**600 Volt UL/CSA, -50°C to 105°C
Yellow Jacket
Flexible Copper Conductors**



Catalog Number	Size AWG	Number of Conductors	Number of Strands	Insulation Thickness Mils	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW251 00802	8	2	96	48	90	0.66	233
HW251 00803	8	3	96	48	90	0.70	327
HW251 00804	8	4	96	48	100	0.78	420
HW251 00602	6	2	96	48	90	0.74	302
HW251 00603	6	3	96	48	100	0.81	458
HW251 00604	6	4	96	48	100	0.88	599
HW251 00402	4	2	96	48	125	0.90	464
HW251 00403	4	3	96	48	125	0.98	667
HW251 00404	4	4	96	48	125	1.09	865
HW251 00202	2	2	96	50	128	1.09	715
HW251 00203	2	3	119	50	128	1.15	971
HW251 00204	2	4	119	50	128	1.26	1225

APPLICATION:

High-grade yellow jacketed cord for use in harsh industrial applications where flexibility and durability is required. Superior insulation and jacketing material allows cable to be used in -50°C to 105°C environments. Typical uses include stage equipment and lighting, and portable power distribution for tools, equipment, small motors and machinery.

CONDUCTORS:

Soft bare annealed copper per ASTM B-3, flexible bunch strand per ASTM B-174

INSULATION:

Thermoplastic elastomer (TPE)

JACKET:

Yellow thermoplastic elastomer (TPE)

FLAME TESTS:

MSHA Flame Test

COLOR CODE:

- ICEA Method 1
- Three conductor – black, white, green

ADDITIONAL STANDARDS:

- NEC Article 400
- Pennsylvania Bureau of Mines – MSHA approved
- Federal Specification JC-580B

NOTE:

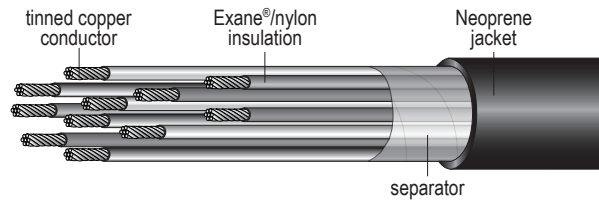
Sizes 8 AWG through 2 AWG are non-UL and non-CSA constructions made in accordance with applicable industry standards

FLEXIBLE & PORTABLE CORDS

SPECIFICATION
HW252

PERFECT-A-FLEX®

600 Volt UL Type TC, -54°C to 90°C
Exane® Insulation
Neoprene Jacket
Tinned Copper Conductors



Catalog Number	Size AWG	Number of Conductors	Number of Strands	Insulation Thickness Mils	Nylon Jacket Thickness Mils	Overall Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW252 01802	18	2	16	16	5	60	0.30	47
HW252 01803	18	3	16	16	5	60	0.31	54
HW252 01804	18	4	16	16	5	60	0.34	65
HW252 01805	18	5	16	16	5	60	0.36	76
HW252 01806	18	6	16	16	5	60	0.39	88
HW252 01807	18	7	16	16	5	60	0.41	99
HW252 01808	18	8	16	16	5	60	0.44	113
HW252 01812	18	12	16	16	5	60	0.49	146

APPLICATION:

Very flexible cable for use on cable tender systems, festooned cable applications, pendant cable drops, overhead bridge cranes, warehouse stacking cranes, motor- or spring-driven reels, or any tough industrial application that requires both strength and flexibility. Approved for use in cable trays, in raceways supported by a messenger wire, in open air, and for direct burial applications. UL approved for use at 90°C for continuous operation, 130°C for emergency overload conditions, and 250°C for short circuit conditions.

CONDUCTORS:

Tinned soft annealed copper per ASTM B-33, Geolay stranding per ASTM B-286

INSULATION:

Irradiated cross-linked polyolefin (Exane®)

INSULATION JACKET:

Clear Nylon

JACKET:

Sunlight-resistant Neoprene per ICEA S-19-81

FLAME TESTS:

- UL and IEEE 383 (70,000 BTU/hr) Flame Test
- ICEA (210,000 BTU/hr) Flame Test
- CSA FT4 Flame Test
- Individual conductors pass the UL VW-1 Flame Test

COLOR CODE:

Control Sizes – ICEA Method 3, Table E-2

ADDITIONAL STANDARDS:

- UL Type TC tray cable per NEC Article 336
- CAN/CSA-C22.2 No. 239-M91 type CIC

FLEXIBLE & PORTABLE CORDS

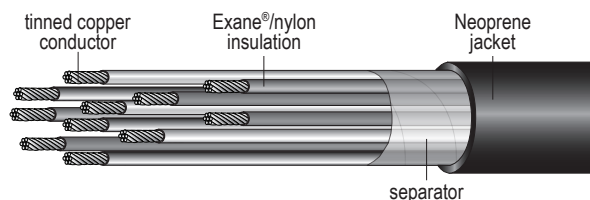
PERFECT-A-FLEX®

600 Volt UL Type TC, -54°C to 90°C

Exane® Insulation

Neoprene Jacket

Tinned Copper Conductors



Catalog Number	Size AWG	Number of Conductors	Number of Strands	Insulation Thickness Mils	Nylon Jacket Thickness Mils	Overall Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW252 01602	16	2	26	16	5	60	0.32	56
HW252 01603	16	3	26	16	5	60	0.33	70
HW252 01604	16	4	26	16	5	60	0.37	90
HW252 01605	16	5	26	16	5	60	0.40	100
HW252 01606	16	6	26	16	5	60	0.42	117
HW252 01607	16	7	26	16	5	60	0.46	131
HW252 01608	16	8	26	16	5	60	0.49	152
HW252 01610	16	10	26	16	5	60	0.50	171
HW252 01612	16	12	26	16	5	60	0.52	190
HW252 01614	16	14	26	16	5	70	0.58	236
HW252 01616	16	16	26	16	5	70	0.60	258
HW252 01620	16	20	26	16	5	70	0.67	332
HW252 01624	16	24	26	16	5	70	0.71	365
HW252 01630	16	30	26	16	5	70	0.75	440
HW252 01637	16	37	26	16	5	70	0.89	560

APPLICATION:

Very flexible cable for use on cable tender systems, festooned cable applications, pendant cable drops, overhead bridge cranes, warehouse stacking cranes, motor- or spring-driven reels, or any tough industrial application that requires both strength and flexibility. Approved for use in cable trays, in raceways supported by a messenger wire, in open air, and for direct burial applications. UL approved for use at 90°C for continuous operation, 130°C for emergency overload conditions, and 250°C for short circuit conditions.

CONDUCTORS:

Tinned soft annealed copper per ASTM B-33, Geolay stranding per ASTM B-286

INSULATION:

Irradiated cross-linked polyolefin (Exane®)

INSULATION JACKET:

Clear Nylon

JACKET:

Sunlight-resistant Neoprene per ICEA S-19-81

FLAME TESTS:

- UL and IEEE 383 (70,000 BTU/hr) Flame Test
- ICEA (210,000 BTU/hr) Flame Test
- CSA FT4 Flame Test
- Individual conductors pass the UL VW-1 Flame Test

COLOR CODE:

Control Sizes – ICEA Method 1, Table E-2

ADDITIONAL STANDARDS:

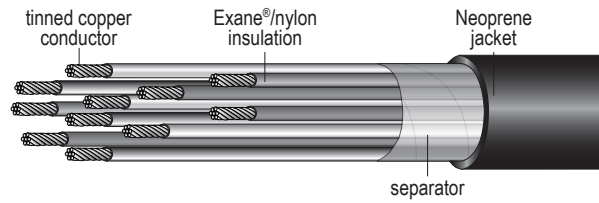
- UL Type TC tray cable per NEC Article 336
- CAN/CSA-C22.2 No. 239-M91 type CIC

FLEXIBLE & PORTABLE CORDS

SPECIFICATION
HW252

PERFECT-A-FLEX®

600 Volt UL Type TC, -54°C to 90°C
Exane® Insulation
Neoprene Jacket
Tinned Copper Conductors



Catalog Number	Size AWG	Number of Conductors	Number of Strands	Insulation Thickness Mils	Nylon Jacket Thickness Mils	Overall Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW252 01403	14	3	41	16	5	60	0.38	102
HW252 01404	14	4	41	16	5	60	0.42	130
HW252 01405	14	5	41	16	5	60	0.45	149
HW252 01406	14	6	41	16	5	60	0.49	174
HW252 01407	14	7	41	16	5	60	0.53	199
HW252 01408	14	8	41	16	5	70	0.58	239
HW252 01410	14	10	41	16	5	70	0.61	292
HW252 01412	14	12	41	16	5	70	0.64	320
HW252 01416	14	16	41	16	5	70	0.69	405
HW252 01420	14	20	41	16	5	90	0.80	493
HW252 01424	14	24	41	16	5	90	0.89	620
HW252 01430	14	30	41	16	5	90	0.92	733
HW252 01437	14	37	41	16	5	90	1.05	886

FLEXIBLE & PORTABLE CORDS

APPLICATION:

Very flexible cable for use on cable tender systems, festooned cable applications, pendant cable drops, overhead bridge cranes, warehouse stacking cranes, motor- or spring-driven reels, or any tough industrial application that requires both strength and flexibility. Approved for use in cable trays, in raceways supported by a messenger wire, in open air, and for direct burial applications. UL approved for use at 90°C for continuous operation, 130°C for emergency overload conditions, and 250°C for short circuit conditions.

CONDUCTORS:

Tinned soft bare annealed copper per ASTM B-33, Geolay stranding per ASTM B-286

INSULATION:

Irradiated cross-linked polyolefin (Exane®)

INSULATION JACKET:

Clear Nylon

JACKET:

Sunlight-resistant Neoprene per ICEA S-19-81

FLAME TESTS:

- UL and IEEE 383 (70,000 BTU/hr) Flame Test
- ICEA (210,000 BTU/hr) Flame Test
- CSA FT4 Flame Test
- Individual conductors pass the UL VW-1 Flame Test

COLOR CODE:

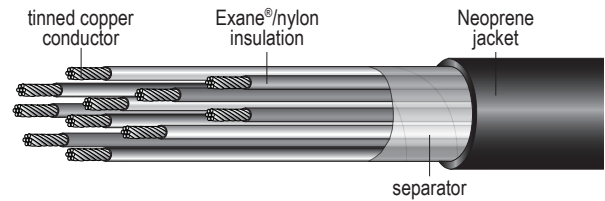
Control Sizes – ICEA Method 1, Table E-2

ADDITIONAL STANDARDS:

- UL Type TC tray cable per NEC Article 336
- CAN/CSA-C22.2 No. 239-M91 type CIC

PERFECT-A-FLEX®

**600 Volt UL Type TC, -54°C to 90°C
Exane® Insulation
Neoprene Jacket
Tinned Copper Conductors**



Catalog Number	Size AWG	Number of Conductors	Number of Strands	Insulation Thickness Mils	Nylon Jacket Thickness Mils	Overall Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW252 01203	12	3	65	21	5	60	0.42	130
HW252 01204	12	4	65	21	5	60	0.47	170
HW252 01205	12	5	65	21	5	60	0.51	195
HW252 01206	12	6	65	21	5	70	0.57	242
HW252 01207	12	7	65	21	5	70	0.62	275
HW252 01208	12	8	65	21	5	70	0.65	315
HW252 01210	12	10	65	21	5	70	0.69	370
HW252 01212	12	12	65	21	5	70	0.71	425
HW252 01216	12	16	65	21	5	70	0.80	545
HW252 01220	12	20	65	21	5	90	0.95	706
HW252 01224	12	24	65	21	5	90	1.00	818
HW252 01230	12	30	65	21	5	90	1.08	1005
HW252 01237	12	37	65	21	5	90	1.20	1200

APPLICATION:

Very flexible cable for use on cable tender systems, festooned cable applications, pendant cable drops, overhead bridge cranes, warehouse stacking cranes, motor- or spring-driven reels, or any tough industrial application that requires both strength and flexibility. Approved for use in cable trays, in raceways supported by a messenger wire, in open air, and for direct burial applications. UL approved for use at 90°C for continuous operation, 130°C for emergency overload conditions, and 250°C for short circuit conditions.

CONDUCTORS:

Tinned soft annealed copper per ASTM B-33, Geolay stranding per ASTM B-286

INSULATION:

Irradiated cross-linked polyolefin (Exane®)

INSULATION JACKET:

Clear Nylon

JACKET:

Sunlight-resistant Neoprene per ICEA S-19-81

FLAME TESTS:

- UL and IEEE 383 (70,000 BTU/hr) Flame Test
- ICEA (210,000 BTU/hr) Flame Test
- CSA FT4 Flame Test
- Individual conductors pass the UL VW-1 Flame Test

COLOR CODE:

Control Sizes – ICEA Method 1, Table E-2

ADDITIONAL STANDARDS:

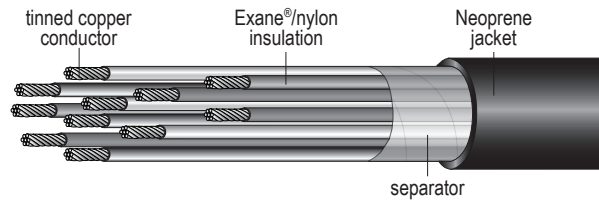
- UL Type TC tray cable per NEC Article 336
- CAN/CSA-C22.2 No. 239-M91 type CIC

FLEXIBLE & PORTABLE CORDS

SPECIFICATION
HW252

PERFECT-A-FLEX®

600 Volt UL Type TC, -54°C to 90°C
Exane® Insulation
Neoprene Jacket
Tinned Copper Conductors



Catalog Number	Size AWG	Number of Conductors	Number of Strands	Insulation Thickness Mils	Nylon Jacket Thickness Mils	Overall Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW252 01003	10	3	105	21	5	60	0.38	102
HW252 01004	10	4	105	21	5	60	0.42	130
HW252 01005	10	5	105	21	5	60	0.45	149
HW252 01006	10	6	105	21	5	60	0.49	174

APPLICATION:

Very flexible cable for use on cable tender systems, festooned cable applications, pendant cable drops, overhead bridge cranes, warehouse stacking cranes, motor- or spring-driven reels, or any tough industrial application that requires both strength and flexibility. Approved for use in cable trays, in raceways supported by a messenger wire, in open air, and for direct burial applications. UL approved for use at 90°C for continuous operation, 130°C for emergency overload conditions, and 250°C for short circuit conditions.

CONDUCTORS:

Tinned soft annealed copper per ASTM B-33, Geolay stranding per ASTM B-286

INSULATION:

Irradiated cross-linked polyolefin (Exane®)

INSULATION JACKET:

Clear Nylon

JACKET:

Sunlight-resistant Neoprene per ICEA S-19-81

FLAME TESTS:

- UL and IEEE 383 (70,000 BTU/hr) Flame Test
- ICEA (210,000 BTU/hr) Flame Test
- CSA FT4 Flame Test
- Individual conductors pass the UL VW-1 Flame Test

COLOR CODE:

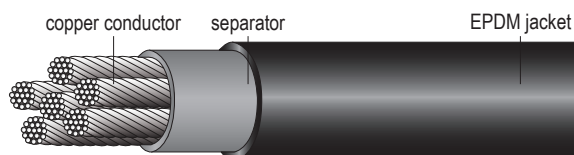
Control Sizes – ICEA Method 1, Table E-2

ADDITIONAL STANDARDS:

- UL Type TC tray cable per NEC Article 336
- CAN/CSA-C22.2 No. 239-M91 type CIC

WELDING CABLE

**600 Volt, -40°C to 90°C
Flexible Copper Conductors**



Catalog Number	Size AWG/kcmil	Number of Strands	Insulation Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW253 00601	6	260	73	0.38	142
HW253 00401	4	374	73	0.40	180
HW253 00201	2	625	73	0.47	270
HW253 00101	1	778	73	0.50	325
HW253 10101	1/0	990	87	0.58	425
HW253 20101	2/0	1251	87	0.62	480
HW253 30101	3/0	1586	105	0.68	650
HW253 40101	4/0	2055	105	0.76	820
HW253 25001	250	2496	119	0.89	965
HW253 35001	350	3432	120	1.07	1345
HW253 50001	500	5054	120	1.20	1950

APPLICATION:

Used in welding applications for connections between the electrode holder and clamp, to the arc welder, bus, welding box or transformer. Recommended for use in industrial applications such as shipyards, mines and construction sites where resistance to extreme physical abuse and high flexibility are required.

CONDUCTOR:

Soft bare annealed copper per ASTM B-3, 30 AWG Class K rope lay stranding per ASTM B-172

INSULATION/JACKET:

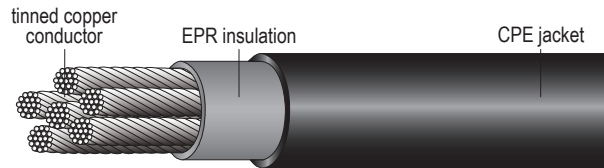
Ethylene propylene diene monomer (EPDM) rubber

FLEXIBLE & PORTABLE CORDS

SPECIFICATION
HW254

DIESEL LOCOMOTIVE (DLO)

2000 Volt, 90°C
RHW-2 or RHH(UL)
EPR Insulation, CPE Jacket
Flexible Copper Conductors



FLEXIBLE & PORTABLE CORDS

Catalog Number	Area Circular Mils	Size AWG/kcmil	Number of Strands	Insulation Thickness Mils	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW254 01401*	3831	14	19	47	20	0.20	30
HW254 01201	6088	12	19	47	20	0.22	40
HW254 01001	10910	10	27	47	20	0.25	55
HW254 00801	14950	8	37	55	20	0.28	75
HW254 00601	24640	6	61	62	31	0.36	125
HW254 00401	42420	4	105	62	31	0.45	200
HW254 00201	60600	2	147	62	31	0.49	265
HW254 00101	90900	1	224	78	47	0.62	415
HW254 10101	111100	1/0	273	78	47	0.66	490
HW254 20101	131300	2/0	323	78	47	0.70	560
HW254 30101	181800	3/0	456	78	47	0.78	755
HW254 40101	222200	4/0	551	78	47	0.84	895
HW254 26201	262600	262	646	94	65	0.95	1085
HW254 31301	313100	313	777	94	65	1.02	1255
HW254 37301	373700	373	925	94	65	1.08	1485
HW254 44401	444400	444	1100	94	65	1.15	1745
HW254 53501	535300	535	1332	109	65	1.26	2090
HW254 64601	646400	646	1591	109	65	1.35	2470
HW254 77701	777700	777	1924	109	65	1.45	2910
HW254 92901	929200	929	2318	109	65	1.59	3515
HW254 11111	1111000	1111	2745	125	65	1.69	4150

*14 AWG is non (UL).

APPLICATION:

For use on diesel-electric locomotive and in applications involving a high amount of durability and flexibility including mining, general construction, temporary power supply motor lead, and cable tray when CT rated. For use in circuits not to exceed 2,000 volts.

CONDUCTORS:

Tin-coated soft annealed copper per ASTM B-33 and AAR 591, stranding per ASTM B-172 or B-174

INSULATION:

Ethylene propylene rubber (EPR) per ICEA 95-658 or ICEA S-75-381

JACKET:

Chlorinated polyethylene (CPE)

FLAME TESTS:

- IEEE 383 (70,000 BTU/hr) Flame Test
- UL 1685 vertical cable tray Flame Test

ADDITIONAL STANDARDS:

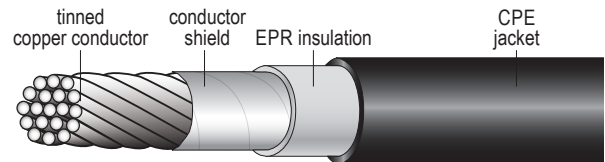
- ICEA S-95-658
- NEMA WC-70
- Association of American Railroads (AAR)
- Pennsylvania Bureau of Mines – MSHA approved

NOTE:

CT ratings are available on sizes 1/0 AWG and larger

JUMPER CABLE

**5KV/15KV, -40°C to 90°C
Tinned Copper Conductors**



Catalog Number	Size AWG/kmcil	Number of Strands	Conductor Diameter Inch	Insulation Thickness Mils	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW255 00201	2	259	0.33	210	65	0.91	550
HW255 00101	1	259	0.38	210	65	0.95	630
HW255 10101	1/0	266	0.42	210	65	1.00	726
HW255 20101	2/0	342	0.47	210	65	1.05	855
HW255 40101	4/0	532	0.60	210	65	1.16	1165
HW255 35001	350	888	0.78	210	65	1.30	1685
HW255 50001	500	1221	0.93	210	65	1.43	2185

APPLICATION:

For use as a temporary jumper cable for portable or mobile substations, or for temporarily bypassing damaged or faulted sections of power cable in circuits up to 15KV.

CONDUCTOR:

Tin-coated, soft annealed copper per ASTM B-33, flexible bunch strand with a semi-conducting conductor shield

INSULATION:

Ethylene propylene rubber (EPR) per ASTM D-2802

JACKET:

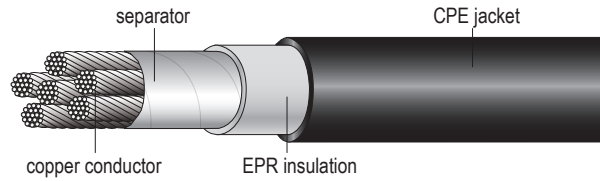
Red thermoset chlorinated polyethylene (CPE) per ASTM D4313

FLEXIBLE & PORTABLE CORDS

SPECIFICATION
HW256

**PORTABLE POWER CABLE:
TYPE W**

**2000 Volt UL, -40°C to 90°C
EPR Insulation, CPE Jacket
Single, Flexible Copper Conductors**



Catalog Number	Size AWG/kcmil	Number of Strands	Insulation Thickness Mils	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW256 00801	8	133	60	75	0.44	155
HW256 00601	6	259	60	95	0.53	267
HW256 00401	4	259	60	95	0.60	369
HW256 00201	2	259	60	95	0.66	458
HW256 10101	1/0	259	80	95	0.79	658
HW256 20101	2/0	259	80	95	0.81	730
HW256 40101	4/0	259	80	95	0.95	1049
HW256 25001	250	627	95	95	1.08	1425
HW256 35001	350	855	95	95	1.20	1971
HW256 50001	500	1235	95	95	1.34	2651

APPLICATION:

Portable power cable designed for heavy duty temporary or permanent use where maximum resistance to flex fatigue is required. Used in extremely demanding applications including trailing cable on mobile mining equipment, diesel electric locomotives, lifting magnets, cranes, cutters, loaders, conveyors, drills and pumps where grounded circuits are not required. For use in circuits not to exceed 2000 volts.

CONDUCTOR:

Soft bare annealed copper, rope stranded per ICEA S-75-381 part 2 and UL requirements

INSULATION:

Ethylene propylene rubber (EPR) per ICEA S-75-381

JACKET:

Chlorinated polyethylene (CPE) rubber per ICEA S-75-381

FLAME TESTS:

MSHA Flame Test

ADDITIONAL STANDARDS:

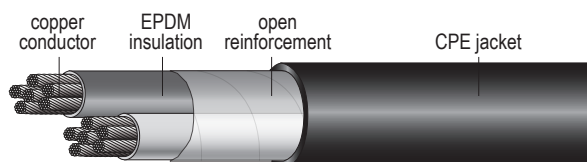
Pennsylvania Bureau of Mines – MSHA approved

NOTE:

Sizes 1/0 AWG and larger are non-UL constructions made in accordance with applicable industry standards

FLEXIBLE & PORTABLE CORDS

**ROUND PORTABLE
POWER CABLE: TYPE W**
2000 Volt UL, -40°C to 90°C
EPR Insulation, CPE Jacket
Multiple, Flexible Copper Conductors



Catalog Number	Size AWG	Number of Conductors	Number of Strands	Insulation Thickness Mils	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW256 00802	8	2	133	60	116	0.82	385
HW256 00803	8	3	133	60	143	0.93	590
HW256 00804	8	4	133	60	146	1.01	715
HW256 00805	8	5	133	60	146	1.06	812
HW256 00602	6	2	133	60	139	0.91	480
HW256 00603	6	3	133	60	152	1.02	775
HW256 00604	6	4	133	60	155	1.11	935
HW256 00605	6	5	133	60	164	1.21	1094
HW256 00402	4	2	133	60	157	1.02	665
HW256 00403	4	3	133	60	172	1.11	980
HW256 00404	4	4	133	60	172	1.22	1200
HW256 00405	4	5	133	60	183	1.39	1506
HW256 00202	2	2	259	60	186	1.23	1015
HW256 00203	2	3	259	60	180	1.30	1380
HW256 00204	2	4	259	60	179	1.39	1680
HW256 00205	2	5	259	60	182	1.61	2239
HW256 00102	1	2	259	80	199	1.42	1195
HW256 00103	1	3	259	80	193	1.48	1705
HW256 00104	1	4	259	80	210	1.62	2213
HW256 00105	1	5	259	80	188	1.91	2800

APPLICATION:

Portable power cable designed for heavy duty temporary or permanent use where maximum resistance to flex fatigue is required. Used in extremely demanding applications including trailing cable on mobile mining equipment, diesel electric locomotives, lifting magnets, cranes, cutters, loaders, conveyors, drills and pumps where grounded circuits are not required. For use in circuits not to exceed 2000 volts.

CONDUCTORS:

Soft bare annealed copper per ASTM B-3, flexible rope lay strand per UL Standard 44

INSULATION:

Ethylene propylene diene monomer (EPDM) rubber per UL Standard 44

JACKET:

Chlorinated polyethylene (CPE) rubber per UL Standard 1581

ASSEMBLY:

Multiple conductor constructions cabled with fillers for roundness, with an open reinforcement over the assembly for mechanical protection

FLAME TESTS:

MSHA Flame Test

COLOR CODE:

- ICEA Method 1
- Three conductor – black, white, green

ADDITIONAL STANDARDS:

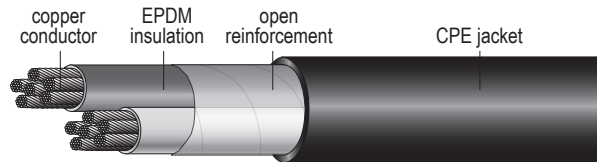
- ICEA S-75-381
- NEMA WC-58
- Pennsylvania Bureau of Mines – MSHA approved

FLEXIBLE & PORTABLE CORDS

SPECIFICATION
HW256

**ROUND PORTABLE
POWER CABLE: TYPE W**

**2000 Volt UL, -40°C to 90°C
EPR Insulation, CPE Jacket
Multiple, Flexible Copper Conductors**



FLEXIBLE & PORTABLE CORDS

Catalog Number	Size AWG/kcmil	Number of Conductors	Number of Strands	Insulation Thickness Mils	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW256 10102	1/0	2	259	80	165	1.52	1500
HW256 10103	1/0	3	259	80	203	1.61	2165
HW256 10104	1/0	4	259	80	193	1.76	2693
HW256 10105	1/0	5	259	80	188	2.03	3065
HW256 20102	2/0	2	259	80	177	1.62	1805
HW256 20103	2/0	3	259	80	198	1.72	2520
HW256 20104	2/0	4	259	80	182	1.89	3326
HW256 20105	2/0	5	259	80	192	2.18	3775
HW256 30102	3/0	2	259	80	182	1.74	2075
HW256 30103	3/0	3	259	80	185	1.85	3180
HW256 30104	3/0	4	259	80	184	2.03	4068
HW256 30105	3/0	5	259	80	182	2.34	4645
HW256 40102	4/0	2	259	80	199	1.90	2585
HW256 40103	4/0	3	259	80	207	2.02	3360
HW256 40104	4/0	4	259	80	221	2.19	4260
HW256 40105	4/0	5	259	80	203	2.54	5515
HW256 25003	250	3	427	95	267	2.36	4645
HW256 35003	350	3	427	95	283	2.50	5225
HW256 50003	500	3	427	95	295	3.00	7985

Application:

Portable power cable designed for heavy duty temporary or permanent use where maximum resistance to flex fatigue is required. Used in extremely demanding applications including trailing cable on mobile mining equipment, diesel electric locomotives, lifting magnets, cranes, cutters, loaders, conveyors, drills and pumps where grounded circuits are not required. For use in circuits not to exceed 2000 volts.

CONDUCTORS:

Soft bare annealed copper per ASTM B-3, flexible rope lay strand per UL Standard 44

INSULATION:

Ethylene propylene diene monomer (EPDM) rubber per UL Standard 44

JACKET:

Chlorinated polyethylene (CPE) rubber per UL Standard 1581

FLAME TESTS:

MSHA Flame Test

ASSEMBLY:

Multiple conductor constructions cabled with fillers for roundness, with an open reinforcement over the assembly for mechanical protection

COLOR CODE:

- ICEA Method 1
- Three conductor – black, white, green
- Two conductor – black, white

ADDITIONAL STANDARDS:

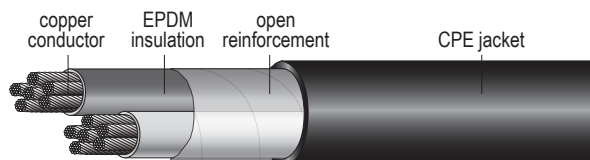
- ICEA S-75-381
- NEMA WC-58
- Pennsylvania Bureau of Mines – MSHA approved

NOTE:

Sizes 1/0 AWG and larger are non-UL constructions made in accordance with applicable industry standards

**MAGNET CRANE CABLE:
TYPE W**

**2000 Volt UL, -40°C to 90°C
EPR Insulation, CPE Jacket
Flexible Copper Conductors**



Catalog Number	Size AWG	Number of Conductors	Number of Strands	Insulation Thickness Mils	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW257 00802	8	2	133	60	107	0.82	355
HW257 00602	6	2	133	60	125	0.92	500
HW257 00402	4	2	133	60	155	1.07	710
HW257 00202	2	2	133	60	165	1.26	970

APPLICATION:

Portable power cable designed for heavy duty temporary or permanent use where maximum resistance to flex fatigue is required. Used in extremely demanding applications including trailing cable on mobile mining equipment, diesel electric locomotives, lifting magnets, cranes, cutters, loaders, conveyors, drills and pumps where grounded circuits are not required. For use in circuits not to exceed 2000 volts.

CONDUCTORS:

Soft bare annealed copper per ASTM B-3, flexible rope lay strand per ASTM B-172

INSULATION:

Ethylene propylene diene monomer (EPDM) rubber per ICEA S-75-381

ASSEMBLY:

Cabled with fillers for roundness, with an open reinforcement over the assembly for mechanical protection

JACKET:

Double-layer, heavy-duty, oil-resistant thermoset Neoprene rubber per ICEA S-75-381

FLAME TESTS:

MSHA Flame Test

COLOR CODE:

ICEA Method 1 – black, white

ADDITIONAL STANDARDS:

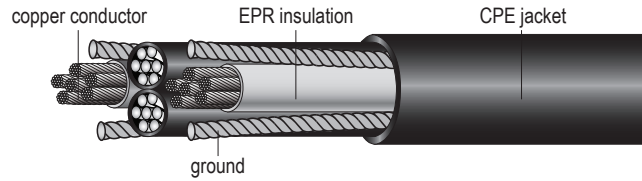
Pennsylvania Bureau of Mines – MSHA approved

FLEXIBLE & PORTABLE CORDS

SPECIFICATION
HW258

**PORTABLE POWER CABLE:
TYPE G**

2000 Volt UL, -40°C to 90°C
Four Conductor
EPR Insulation, CPE Jacket
Flexible Copper Conductors



Catalog Number	Size AWG	Number of Strands	Insulation Thickness Mils	Grounding Conductor Size AWG	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW258 00804	8	133	60	12	146	1.02	829
HW258 00604	6	133	60	12	155	1.13	1046
HW258 00404	4	133	60	10	172	1.24	1363
HW258 00304	3	133	60	10	156	1.31	1550
HW258 00204	2	133	60	9	179	1.40	1802
HW258 00104	1	133	80	8	210	1.64	2620
HW258 10104	1/0	259	80	7	193	1.77	3163
HW258 20104	2/0	259	80	6	182	1.91	3546
HW258 30104	3/0	259	80	5	184	2.05	4360
HW258 40104	4/0	259	80	4	221	2.24	5269

APPLICATION:

Portable power cable designed for heavy duty temporary or permanent use where maximum resistance to flex fatigue is required. Used in extremely demanding applications including mobile mining equipment, cutters, loaders, conveyors, drills and pumps where grounding is required. For use in circuits not to exceed 2,000 volts.

CONDUCTORS:

Soft bare annealed copper per ASTM B-3, flexible rope lay strand

INSULATION:

Ethylene propylene diene monomer (EPDM) rubber

GROUNDING CONDUCTORS:

Four insulated, soft bare annealed copper conductors per ASTM B-3, flexible strand sized in accordance with applicable ICEA standards

ASSEMBLY:

Multiple conductor constructions cabled with fillers for roundness, with an open reinforcement over the assembly for mechanical protection

JACKET:

Chlorinated polyethylene (CPE) rubber

FLAME TESTS:

MSHA Flame Test

COLOR CODE:

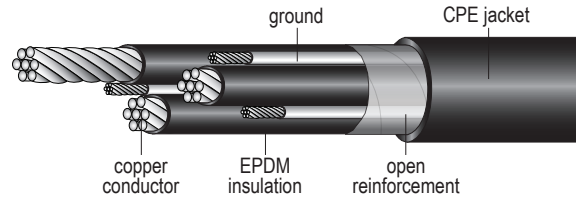
Black, white, red, orange

ADDITIONAL STANDARDS:

- ICEA S-75-381
- Pennsylvania Bureau of Mines – MSHA approved

**PORTABLE POWER CABLE:
TYPE G-GC**

**2000 Volt UL, -40°C to 90°C
Three Conductor
EPR Insulation, CPE Jacket
Flexible Copper Conductors**



Catalog Number	Size AWG	Number of Strands	Insulation Thickness Mils	Grounding Conductor Size AWG	Ground Check Conductor Size	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW259 00803	8	133	60	10	10	143	0.97	675
HW259 00603	6	133	60	10	10	152	1.05	825
HW259 00403	4	259	60	8	10	172	1.19	1125
HW259 00203	2	259	60	7	10	180	1.34	1525
HW259 00103	1	259	80	6	8	193	1.51	1795
HW259 10103	1/0	259	80	5	8	203	1.65	2390
HW259 20103	2/0	259	80	4	8	198	1.75	2790
HW259 30103	3/0	259	80	3	8	185	1.89	3426
HW259 40103	4/0	259	80	2	8	207	2.04	4030
HW259 25003	250	427	95	2	8	267	2.38	5445
HW259 35003	350	427	95	1/0	8	283	2.73	7273
HW259 50003	500	427	95	2/0	8	295	3.02	9439

APPLICATION:

Portable power cable designed for heavy duty temporary or permanent use where maximum resistance to flex fatigue is required. Used in extremely demanding applications including mobile mining equipment, cutters, loaders, conveyors, drills and pumps. For three-phase alternating current circuits, not to exceed 2,000 volts, where grounding conductors and ground check conductors are required.

CONDUCTORS:

Soft bare annealed copper per ASTM B-3, flexible rope lay strand

INSULATION:

Ethylene propylene diene monomer (EPDM) rubber

GROUNDING CONDUCTORS:

Two insulated ground and one insulated ground check, soft bare annealed copper conductors per ASTM B-3, flexible strand sized in accordance with applicable ICEA standards

ASSEMBLY:

Multiple conductor constructions cabled with fillers for roundness, with an open reinforcement over the assembly for mechanical protection

JACKET:

Chlorinated polyethylene (CPE) rubber

FLAME TESTS:

MSHA Flame Test

COLOR CODE:

Black, white, red

ADDITIONAL STANDARDS:

- ICEA S-75-381
- Pennsylvania Bureau of Mines – MSHA approved

FLEXIBLE & PORTABLE CORDS

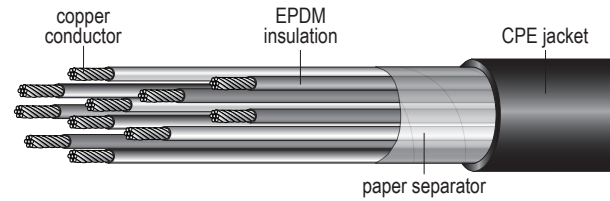
NOTES

SPECIFICATION HW250

REV 5/16

TYPE SOOW

**600 Volt UL/CSA, -40°C to 90°C
Black Jacket
Flexible Copper Conductors**



Catalog Number	Size AWG	Number of Conductors	Number of Strands	Insulation Thickness Mils	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW250 01002	10	2	104	45	95	0.620	270
HW250 01003	10	3	104	45	95	0.660	325
HW250 01004	10	4	104	45	95	0.715	391
HW250 01005	10	5	104	45	95	0.770	455
HW250 01006	10	6	104	45	95	0.870	500
HW250 01008	10	8	104	45	95	0.940	625
HW250 01010	10	10	104	45	110	1.020	765
HW250 01012	10	12	104	45	110	1.070	865
HW250 01016	10	16	104	45	125	1.230	1150
HW250 01020	10	20	104	45	125	1.260	1445

APPLICATION:

For use in heavy-duty industrial applications where flexibility and durability is required. Typical uses include portable power distribution for tools, equipment, small motors and machinery. Excellent abrasion, ozone, sunlight, chemical, oil, and water resistance. UL listed and CSA certified for indoor and outdoor use.

CONDUCTORS:

Soft bare annealed copper per ASTM B-3, flexible bunch strand per ASTM B-174

INSULATION:

Ethylene propylene diene monomer (EPDM) rubber

JACKET:

Black chlorinated polyethylene (CPE) rubber

FLAME TESTS:

MSHA Flame Test

COLOR CODE:

- ICEA Method 1
- Three conductor – black, white, green

*ADDITIONAL STANDARDS:

- Flexible Cord – UL Standard 62
- Flexible Cord – CSA C22.2-49
- Pennsylvania Bureau of Mines – MSHA approved
- Federal Specification JC-580
- RoHS

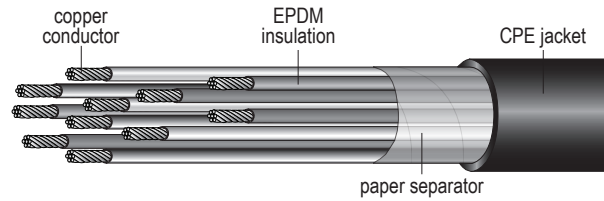
NOTE:

Sizes 8AWG through 2AWG are available in both non-UL/non-CSA and UL/CSA constructions.

FLEXIBLE & PORTABLE CORDS

TYPE SOOW

**600 Volt Non-UL, -40°C to 90°C
Black Jacket
Flexible Copper Conductors**



Catalog Number	Size AWG	Number of Conductors	Number of Strands	Insulation Thickness Mils	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW250 00803	8	3	133	60	110	0.826	470
HW250 00804	8	4	133	60	125	0.927	616
HW250 00805	8	5	133	60	125	1.006	734
HW250 00603	6	3	133	60	125	0.939	633
HW250 00604	6	4	133	60	140	1.052	826
HW250 00605	6	5	133	60	140	1.143	989
HW250 00403	4	3	133	60	140	1.071	854
HW250 00404	4	4	133	60	155	1.197	1110
HW250 00405	4	5	133	60	155	1.299	1329
HW250 00203	2	3	133	60	155	1.252	1235
HW250 00204	2	4	133	60	170	1.394	1606
HW250 00205	2	5	133	60	170	1.516	1923

FLEXIBLE & PORTABLE CORDS

APPLICATION:

For use in heavy-duty industrial applications where flexibility and durability is required. Typical uses include portable power distribution for tools, equipment, small motors and machinery. Excellent abrasion, ozone, sunlight, chemical, oil, and water resistance. UL listed and CSA certified for indoor and outdoor use.

CONDUCTORS:

Soft bare annealed copper per ASTM B-3, flexible bunch strand per ASTM B-174

INSULATION:

Ethylene propylene diene monomer (EPDM) rubber

JACKET:

Black chlorinated polyethylene (CPE) rubber

FLAME TESTS:

MSHA Flame Test

COLOR CODE:

- ICEA Method 1
- Three conductor – black, white, green

ADDITIONAL STANDARDS:

- Pennsylvania Bureau of Mines – MSHA approved
- Federal Specification JC-580
- RoHS

NOTE:

Sizes 8AWG through 2AWG are available in both non-UL/non-CSA and UL/CSA constructions.

SECTION G

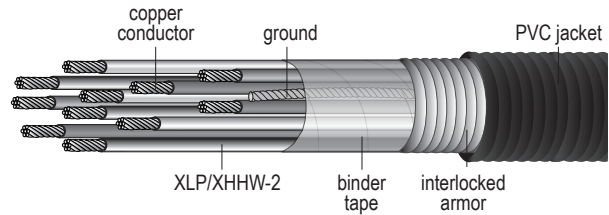
Armored Cable

DESCRIPTION	TYPE	SPECIFICATION	PAGE
Interlocked Armor			
600 Volt Control Cable	MC	HW300	144
600 Volt Power Cable	MC	HW301	147
2.4kV Non-Shielded 100% or 133%	MC	HW302	150
5kV Shielded 100% or 133%	MC	HW315	151
15kV Shielded 100% or 133%	MC	HW303	152
Impervious Continuously Welded Armor			
300 Volt Instrumentation	PLTC	HW304	153
600 Volt Instrumentation	MC-HL	HW305	155
600 Volt Control	MC	HW306	156
600 Volt Power and Control	MC-HL	HW307	159
600 Volt Power and Control Composite	MC	HW308	162
2.4kV Non-Shielded 100% or 133%	MC-HL	HW309	163
5kV Shielded 100% or 133%	MC-HL	HW310	164
15kV Shielded 100% or 133%	MC-HL	HW311	165
600 Volt Control Cable–LifeGuard™	MC-LS	HW320	166
600 Volt Power Cable–LifeGuard™	MC-LS	HW321	168

SPECIFICATION
HW300

**INTERLOCKED AROMOR
– CONTROL CABLE**

**600 Volt UL Type MC, CT USE, 90°C
XLP VW-1 XHHW-2 Insulation
Aluminum Armor
Copper Conductors**



Catalog Number	Size AWG	Number of Conductors	Number of Strands	Insulation Thickness MILS	Ground Wire Size AWG	Armor Diameter Inch	Jacket Thickness MILS	Overall Diameter Inches	Net Weight Lbs/Mft	Class I Div. 2 Connector Number	Rain Tight Connector Number
HW300 01402	14	2	7	30	14	0.50	50	0.61	176	424CU02	416MC02
HW300 01403	14	3	7	30	14	0.52	50	0.63	185	424CU02	416MC03
HW300 01404	14	4	7	30	14	0.56	50	0.67	210	424CU03	416MC03
HW300 01405	14	5	7	30	14	0.60	50	0.71	270	424CU03	416MC03
HW300 01407	14	7	7	30	14	0.65	50	0.76	320	424CU03	416MC03
HW300 01409	14	9	7	30	14	0.73	50	0.84	388	424CU04	416MC04
HW300 01410	14	10	7	30	14	0.77	50	0.88	410	424CU04	416MC04
HW300 01412	14	12	7	30	14	0.80	50	0.91	460	424CU04	416MC04
HW300 01415	14	15	7	30	14	0.84	50	0.95	550	424CU04	416MC04
HW300 01419	14	19	7	30	14	0.92	50	1.03	660	424CU04	416MC05
HW300 01425	14	25	7	30	14	1.06	50	1.17	877	424CU05	416MC06
HW300 01437	14	37	7	30	14	1.21	50	1.32	1200	424CU06	416MC06

APPLICATION:

For use in harsh environments where maximum conductor protection is required. Used for power, control and lighting circuits in a broad range of commercial and industrial pulp and paper, mining, and petroleum applications. Approved for use in wet or dry locations at 90°C, for installation indoors or outdoors, aerially, in conduits, ducts, cable trays or direct burial in circuits not exceeding 600 volts. May be used in NEC Class I and II, Division 2 and Class III, Division 1 and 2 hazardous locations. UL approved for use at 90°C for continuous operation, 130°C for emergency overload conditions, and 250°C for short circuit conditions. Aluminum interlocked armor cable is recommended as an economical alternative to wire in conduit systems.

CONDUCTORS:

Soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8

INSULATION:

Cross-linked polyethylene (XLP) per UL Standard 44 for Type XHHW-2, VW-1 conductors

GROUNDING CONDUCTOR:

Soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8 sized in accordance with UL Standard 1569

ARMOR:

Aluminum interlocked tape armor per UL Standard 1569, also available in galvanized steel armor

JACKET:

Black sunlight-resistant PVC per UL Standard 1569

FLAME TESTS:

UL 1581 (70,000 BTU/hr) Flame Test

COLOR CODE:

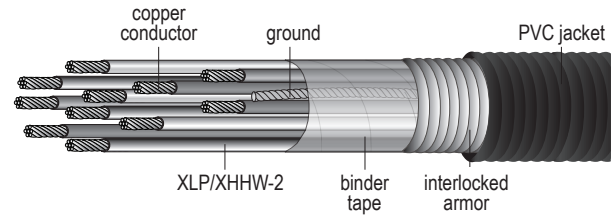
ICEA Method 1, Table E-2

CONNECTORS:

- Explosion Proof, Class 1 Division 2: 424CU series – aluminum exterior components, nickel-plated brass interior components
- Rain Tight: 416MC series – all nickel-plated brass

**INTERLOCKED ARMOR
– CONTROL CABLE**

**600 Volt UL Type MC, CT USE, 90°C
XLP VW-1 XHHW-2 Insulation
Aluminum Armor
Copper Conductors**



Catalog Number	Size AWG	Number of Conductors	Number of Strands	Insulation Thickness Mils	Ground Wire Size AWG	Armor Diameter Inch	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft	Class I Div. 2 Connector Number	Rain Tight Connector Number
HW300 01202	12	2	7	30	12	0.54	50	0.65	185	424CU02	416MC03
HW300 01203	12	3	7	30	12	0.58	50	0.69	215	424CU03	416MC03
HW300 01204	12	4	7	30	12	0.62	50	0.73	295	424CU03	416MC03
HW300 01205	12	5	7	30	12	0.65	50	0.76	325	424CU03	416MC03
HW300 01207	12	7	7	30	12	0.72	50	0.83	400	424CU04	416MC04
HW300 01209	12	9	7	30	12	0.79	50	0.90	460	424CU04	416MC04
HW300 01210	12	10	7	30	12	0.84	50	0.95	560	424CU04	416MC04
HW300 01212	12	12	7	30	12	0.89	50	1.00	615	424CU04	416MC05
HW300 01215	12	15	7	30	12	0.93	50	1.04	680	424CU05	416MC05
HW300 01219	12	19	7	30	12	1.05	50	1.16	900	424CU05	416MC05
HW300 01225	12	25	7	30	12	1.17	50	1.28	1200	424CU06	416MC06
HW300 01237	12	37	7	30	12	1.35	50	1.46	1450	424CU06	416MC07

APPLICATION:

For use in harsh environments where maximum conductor protection is required. Used for power, control and lighting circuits in a broad range of commercial and industrial pulp and paper, mining, and petroleum applications. Approved for use in wet or dry locations at 90°C, for installation indoors or outdoors, aerially, in conduits, ducts, cable trays or direct burial in circuits not exceeding 600 volts. May be used in NEC Class I and II, Division 2 and Class III, Division 1 and 2 hazardous locations. UL approved for use at 90°C for continuous operation, 130°C for emergency overload conditions, and 250°C for short circuit conditions. Aluminum interlocked armor cable is recommended as an economical alternative to wire in conduit systems.

CONDUCTORS:

Soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8

INSULATION:

Cross-linked polyethylene (XLP) per UL Standard 44 for Type XHHW-2, VW-1 conductors

GROUNDING CONDUCTOR:

Soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8 sized in accordance with UL Standard 1569

ARMOR:

Aluminum interlocked tape armor per UL Standard 1569, also available in galvanized steel armor

JACKET:

Black sunlight-resistant PVC per UL Standard 1569

FLAME TESTS:

UL 1581 (70,000 BTU/hr) Flame Test

COLOR CODE:

ICEA Method 1, Table E-2

CONNECTORS:

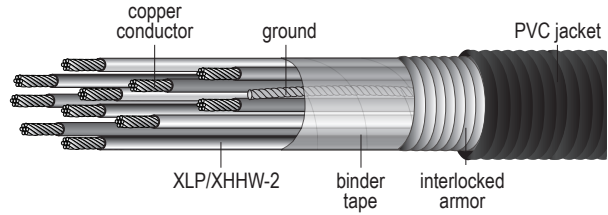
- Explosion Proof, Class 1 Division 2: 424CU series – aluminum exterior components, nickel-plated brass interior components
- Rain Tight: 416MC series – all nickel-plated brass

ARMORED CABLE

SPECIFICATION
HW300

**INTERLOCKED ARMOR
– CONTROL CABLE**

**600 Volt UL Type MC, CT USE, 90°C
XLP VW-1 XHHW-2 Insulation
Aluminum Armor
Copper Conductors**



Catalog Number	Size AWG	Number of Conductors	Number of Strands	Insulation Thickness Mils	Ground Wire Size AWG	Armor Diameter Inch	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft	Class I Div. 2 Connector Number	Rain Tight Connector Number
HW300 01002	10	2	7	30	10	0.59	50	0.70	230	424CU03	416MC03
HW300 01003	10	3	7	30	10	0.61	50	0.72	300	424CU03	416MC03
HW300 01004	10	4	7	30	10	0.68	50	0.79	345	424CU04	416MC04
HW300 01005	10	5	7	30	10	0.72	50	0.83	450	424CU04	416MC04
HW300 01007	10	7	7	30	10	0.78	50	0.89	560	424CU04	416MC04
HW300 01009	10	9	7	30	10	0.88	50	0.99	640	424CU04	416MC04
HW300 01012	10	12	7	30	10	1.02	50	1.13	880	424CU05	416MC05
HW300 01015	10	15	7	30	10	1.07	50	1.18	965	424CU05	416MC05
HW300 01019	10	19	7	30	10	1.16	50	1.27	1300	424CU06	416MC06
HW300 01025	10	25	7	30	10	1.31	50	1.42	1500	424CU06	416MC06
HW300 01037	10	37	7	30	10	1.52	50	1.64	2450	424CU06	416MC07

ARMORED CABLE

APPLICATION:

For use in harsh environments where maximum conductor protection is required. Used for power, control and lighting circuits in a broad range of commercial and industrial pulp and paper, mining, and petroleum applications. Approved for use in wet or dry locations at 90°C, for installation indoors or outdoors, aerially, in conduits, ducts, cable trays or direct burial in circuits not exceeding 600 volts. May be used in NEC Class I and II, Division 2 and Class III, Division 1 and 2 hazardous locations. UL approved for use at 90°C for continuous operation, 130°C for emergency overload conditions, and 250°C for short circuit conditions. Aluminum interlocked armor cable is recommended as an economical alternative to wire in conduit systems.

CONDUCTORS:

Soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8

INSULATION:

Cross-linked polyethylene (XLP) per UL Standard 44 for Type XHHW-2, VW-1 conductors

GROUNDING CONDUCTOR:

Soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8 sized in accordance with UL Standard 1569

ARMOR:

Aluminum interlocked tape armor per UL Standard 1569, also available in galvanized steel armor

JACKET:

Black sunlight-resistant PVC per UL Standard 1569

FLAME TESTS:

UL 1581 (70,000 BTU/hr) Flame Test

COLOR CODE:

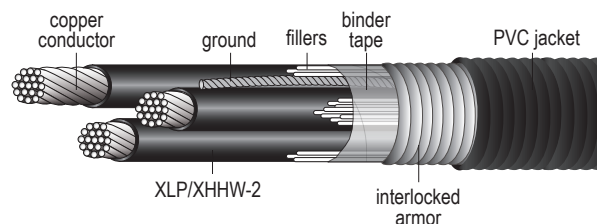
ICEA Method 1, Table E-2

CONNECTORS:

- Explosion Proof, Class 1 Division 2: 424CU series – aluminum exterior components, nickel-plated brass interior components
- Rain Tight: 416MC series – all nickel-plated brass

**INTERLOCKED ARMOR
– POWER CABLE**

**600 Volt UL Type MC, CT USE, 90°C
XLP XHHW-2 Insulation
Aluminum Armor
Copper Conductors**



Catalog Number	Size AWG	Number of Conductors	Number of Strands	Insulation Thickness Mils	Ground Wire Size AWG	Armor Diameter Inch	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft	Class I Div. 2 Connector Number	Rain Tight Connector Number
HW301 00803	8	3	7	45	10	0.75	50	0.86	600	424CU04	416MC04
HW301 00804	8	4	7	45	10	0.81	50	0.92	660	424CU04	416MC04
HW301 00603	6	3	7	45	8	0.83	50	0.94	810	424CU04	416MC04
HW301 00604	6	4	7	45	8	0.91	50	1.02	900	424CU04	416MC05
HW301 00403	4	3	7	45	8	0.93	50	1.04	1000	424CU04	416MC05
HW301 00404	4	4	7	45	8	1.04	50	1.15	1120	424CU05	416MC05
HW301 00203	2	3	7	45	8	1.08	50	1.19	1265	424CU05	416MC05
HW301 00204	2	4	7	45	6	1.18	50	1.29	1550	424CU06	416MC06
HW301 00103	1	3	19	45	6	1.21	50	1.32	1520	424CU06	416MC06
HW301 00104	1	4	19	45	6	1.33	50	1.44	1880	424CU06	416MC06
HW301 10103	1/0	3	19	45	6	1.31	50	1.42	1780	424CU06	416MC06
HW301 10104	1/0	4	19	45	6	1.43	50	1.54	2235	424CU07	416MC07

APPLICATION:

For use in harsh environments where maximum conductor protection is required. Used for power, control and lighting circuits in a broad range of commercial and industrial pulp and paper, mining, and petroleum applications. Approved for use in wet or dry locations at 90°C, for installation indoors or outdoors, aerially, in conduits, ducts, cable trays or direct burial in circuits not exceeding 600 volts. May be used in NEC Class I and II, Division 2 and Class III, Division 1 and 2 hazardous locations. UL approved for use at 90°C for continuous operation, 130°C for emergency overload conditions, and 250°C for short circuit conditions. Aluminum interlocked armor cable is recommended as an economical alternative to wire in conduit systems.

CONDUCTORS:

Soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8

INSULATION:

Cross-linked polyethylene (XLP) per UL Standard 44 for Type XHHW-2 conductors

GROUNDING CONDUCTOR:

Soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8 sized in accordance with UL Standard 1569

ARMOR:

Aluminum interlocked tape armor per UL 1569 and applicable ICEA standards, also available in galvanized steel armor

JACKET:

Black sunlight-resistant PVC per UL Standard 1569

FLAME TESTS:

UL 1581 (70,000 BTU/hr) Flame Test

COLOR CODE:

ICEA Method 4

CONNECTORS:

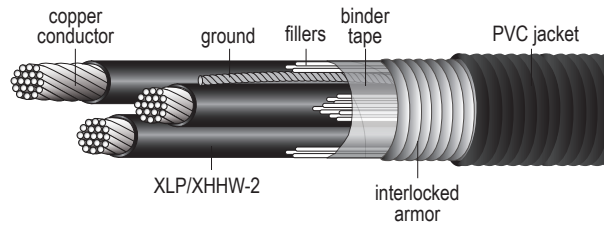
- Explosion Proof, Class 1 Division 2: 424CU series – aluminum exterior components, nickel-plated brass interior components
- Rain Tight: 416MC series – all nickel-plated brass

ARMORED CABLE

SPECIFICATION
HW301

**INTERLOCKED ARMOR
– POWER CABLE**

**600 Volt UL Type MC, CT USE, 90°C
XLP XHHW-2 Insulation
Aluminum Armor
Copper Conductors**



Catalog Number	Size AWG	Number of Conductors	Number of Strands	Insulation Thickness Mils	Ground Wire Size AWG	Armor Diameter Inch	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft	Class I Div. 2 Connector Number	Rain Tight Connector Number
HW301 20103	2/0	3	19	55	6	1.39	50	1.50	2110	424CU06	416MC07
HW301 20104	2/0	4	19	55	6	1.53	50	1.64	2690	424CU06	416MC07
HW301 30103	3/0	3	19	55	6	1.50	50	1.61	2625	424CU06	416MC07
HW301 30104	3/0	4	19	55	4	1.66	50	1.79	3285	424CU07	416MC08
HW301 40103	4/0	3	19	55	4	1.62	60	1.75	3130	424CU07	416MC08
HW301 40104	4/0	4	19	55	4	1.82	60	2.05	4075	424CU07	416MC08

APPLICATION:

For use in harsh environments where maximum conductor protection is required. Used for power, control and lighting circuits in a broad range of commercial and industrial pulp and paper, mining, and petroleum applications. Approved for use in wet or dry locations at 90°C, for installation indoors or outdoors, aerially, in conduits, ducts, cable trays or direct burial in circuits not exceeding 600 volts. May be used in NEC Class I and II, Division 2 and Class III, Division 1 and 2 hazardous locations. UL approved for use at 90°C for continuous operation, 130°C for emergency overload conditions, and 250°C for short circuit conditions. Aluminum interlocked armor cable is recommended as an economical alternative to wire in conduit systems.

CONDUCTORS:

Soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8

INSULATION:

Cross-linked polyethylene (XLP) per UL Standard 44 for Type XHHW-2 conductors

GROUNDING CONDUCTOR:

Soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8 sized in accordance with UL Standard 1569

ARMOR:

Aluminum interlocked tape armor per UL 1569 and applicable ICEA standards, also available in galvanized steel armor

JACKET:

Black sunlight-resistant PVC per UL Standard 1569

FLAME TESTS:

UL 1581 (70,000 BTU/hr) Flame Test

COLOR CODE:

ICEA Method 4

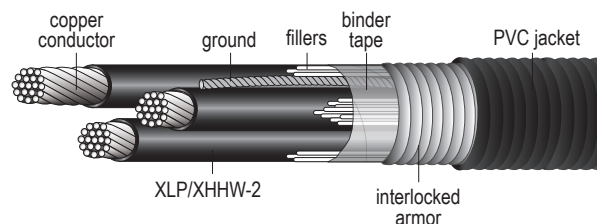
CONNECTORS:

- Explosion Proof, Class 1 Division 2: 424CU series – aluminum exterior components, nickel-plated brass interior components
- Rain Tight: 416MC series – all nickel-plated brass

ARMORED CABLE

**INTERLOCKED ARMOR
– POWER CABLE**

**600 Volt UL Type MC, CT USE, 90°C
XLP XHHW-2 Insulation
Aluminum Armor
Copper Conductors**



Catalog Number	Size AWG	Number of Conductors	Number of Strands	Insulation Thickness Mils	Ground Wire Size AWG	Armor Diameter Inch	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft	Class I Div. 2 Connector Number	Rain Tight Connector Number
HW301 25003	250	3	37	65	4	1.80	60	1.93	3760	424CU07	416MC08
HW301 25004	250	4	37	65	4	1.99	60	2.12	4745	424CU07	416MC08
HW301 30003	300	3	37	65	3	1.94	60	2.07	4460	424CU07	416MC08
HW301 30004	300	4	37	65	3	2.15	60	2.28	5530	424CU08	416MC09
HW301 35003	350	3	37	65	3	2.02	60	2.15	4920	424CU08	416MC09
HW301 35004	350	4	37	65	3	2.24	60	2.37	6220	424CU08	416MC09
HW301 50003	500	3	37	65	2	2.31	75	2.46	6795	424CU09	416MC09
HW301 50004	500	4	37	65	2	2.56	75	2.72	8625	424CU09	416MC09
HW301 75003	750	3	37	80	1	2.77	75	2.93	9690	424CU09	416MC10
HW301 10003	1000	3	37	80	1/0	3.09	85	3.26	12400	424MA10V	416MC10

APPLICATION:

For use in harsh environments where maximum conductor protection is required. Used for power, control and lighting circuits in a broad range of commercial and industrial pulp and paper, mining, and petroleum applications. Approved for use in wet or dry locations at 90°C, for installation indoors or outdoors, aerially, in conduits, ducts, cable trays or direct burial in circuits not exceeding 600 volts. May be used in NEC Class I and II, Division 2 and Class III, Division 1 and 2 hazardous locations. UL approved for use at 90°C for continuous operation, 130°C for emergency overload conditions, and 250°C for short circuit conditions. Aluminum interlocked armor cable is recommended as an economical alternative to wire in conduit systems.

CONDUCTORS:

Soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8

INSULATION:

Cross-linked polyethylene (XLP) per UL Standard 44 for Type XHHW-2 conductors

GROUNDING CONDUCTOR:

Soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8 sized in accordance with UL Standard 1569

ARMOR:

Aluminum interlocked tape armor per UL 1569 and applicable ICEA standards, also available in galvanized steel armor

JACKET:

Black sunlight-resistant PVC per UL Standard 1569

FLAME TESTS:

- UL 1581 (70,000 BTU/hr) Flame Test
- IEEE 1202 Flame Test
- ICEA (210,000 BTU/hr) Flame Test

COLOR CODE:

ICEA Method 4

CONNECTORS:

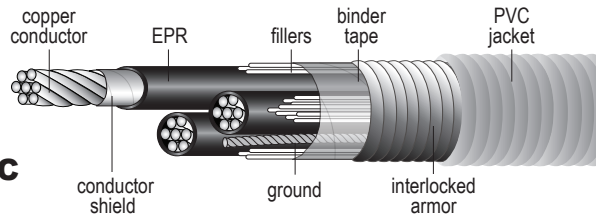
- Explosion Proof, Class 1 Division 2: 424CU series – aluminum exterior components, nickel-plated brass interior components
- Rain Tight: 416MC series – all nickel-plated brass
- For size 1000 kcmil, see 424MA series in Section J

ARMORED CABLE

SPECIFICATION
HW302

**INTERLOCKED ARMOR
– POWER CABLE**

**2.4kV UL Type MV-105 or MC, CT USE, 105°C
Non-Shielded, EPR Insulation
100% and 133% Insulation Level
Aluminum Armor, Copper Conductors**



Catalog Number	Size AWG	Number of Conductors	Number of Strands	Insulation Thickness Mils	Ground Wire Size AWG	Armor Diameter Inch	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft	Class I Div. 2 Connector Number	Rain Tight Connector Number
HW302 00603	6	3	7	115	6	1.19	50	1.30	905	424CU06	416MC06
HW302 00403	4	3	7	115	6	1.29	50	1.40	1115	424CU06	416MC06
HW302 00203	2	3	7	115	6	1.42	50	1.53	1430	424CU06	416MC07
HW302 00103	1	3	19	115	4	1.50	50	1.61	1770	424CU06	416MC07
HW302 10103	1/0	3	19	115	4	1.59	60	1.72	2025	424CU07	416MC08
HW302 20103	2/0	3	19	115	4	1.72	60	1.85	2390	424CU07	416MC08
HW302 30103	3/0	3	19	115	3	1.83	60	1.96	3000	424CU07	416MC08
HW302 40103	4/0	3	19	115	3	1.95	60	2.08	3395	424CU07	416MC08
HW302 25003	250	3	37	115	3	2.07	60	2.20	3900	424CU08	416MC09
HW302 35003	350	3	37	115	2	2.30	75	2.46	5105	424CU09	416MC09
HW302 50003	500	3	37	115	1	2.57	75	2.73	6800	424CU09	416MC09
HW302 75003	750	3	61	115	1/0	2.98	85	3.14	9400	424MA	416MC10

APPLICATION:

For use in harsh environments where maximum conductor protection is required. Used for primary power and feeder circuits in a broad range of commercial and industrial power distribution systems. Approved for use in wet or dry locations at 105°C, for installation indoors or outdoors, aerially, in conduits, ducts, cable trays or direct burial in circuits not exceeding 5000 volts. May be used in NEC Class I and II, Division 2 and Class III, Division 1 and 2 hazardous locations. UL approved for use at 105°C for continuous operation, 140°C for emergency overload conditions, and 250°C for short circuit conditions. Aluminum interlocked armor cable is recommended as an economical alternative to wire in conduit systems.

CONDUCTORS:

Soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8, with a semi-conducting conductor shield

INSULATION:

Ethylene propylene rubber (EPR) per ICEA S-96-659

GROUNDING CONDUCTOR:

Soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8 sized in accordance with UL Standard 1072

ARMOR:

Aluminum interlocked tape armor per UL Standard 1072 and applicable ICEA standards, also available in galvanized steel armor

JACKET:

Yellow sunlight-resistant PVC per UL Standard 1072 and applicable ICEA standards

FLAME TESTS:

- UL 1581 and IEEE 383 (70,000 BTU/hr) Flame Test
- IEEE 1202 (2AWG and larger) CSA FT4 Flame Test
- ICEA T-29-520 (210,000 BTU/hr) Flame Test

COLOR CODE:

ICEA Method 4

ADDITIONAL STANDARDS:

NEMA WC71

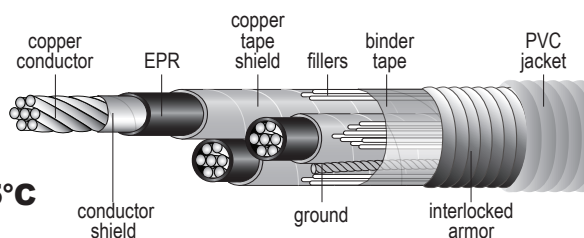
CONNECTORS:

- Explosion Proof, Class 1 Division 2: 424CU series – aluminum exterior components, nickel-plated brass interior components
- Rain Tight: 416MC series – all nickel-plated brass
- For size 750 kcmil, see 424MA series in Section J

ARMORED CABLE

**INTERLOCKED ARMOR
– POWER CABLE**

**5kV/8kV UL Type MV-105 or MC, CT USE, 105°C
Shielded, EPR Insulation
8kV, 100% and 5kV, 133% Insulation Level
Aluminum Armor, Copper Conductors**



Catalog Number	Size AWG	Number of Conductors	Number of Strands	Insulation Thickness Mils	Ground Wire Size AWG	Armor Diameter Inch	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft	Class I Div. 2 Connector Number	Rain Tight Connector Number
HW315 00203	2	3	7	115	6	1.626	60	1.746	1805	424CU06	416MC06
HW315 00103	1	3	7	115	6	1.712	60	1.832	2078	424CU07	416MC07
HW315 10103	1/0	3	7	115	6	1.799	60	1.919	2379	424CU07	416MC08
HW315 20103	2/0	3	19	115	4	1.885	60	2.005	2729	424CU07	416MC07
HW315 30103	3/0	3	19	115	4	1.993	60	2.113	3173	424CU07	416MC08
HW315 40103	4/0	3	19	115	4	2.112	60	2.232	3723	424CU07	416MC08
HW315 25003	250	3	19	115	3	2.231	60	2.351	4202	424CU08	416MC09
HW315 35003	350	3	19	115	3	2.457	75	2.607	5490	424CU09	416MC09
HW315 50003	500	3	37	115	3	2.727	75	2.877	7245	424CU09	416MC09
HW315 75003	750	3	37	115	2	3.132	85	3.302	10180	424MA	416MC10

APPLICATION:

For use in harsh environments where maximum conductor protection is required. Used for primary power and feeder circuits in a broad range of commercial and industrial power distribution systems. Approved for use in wet or dry locations at 105°C, for installation indoors or outdoors, aerially, in conduits, ducts, cable trays or direct burial in circuits not exceeding 5000 volts. May be used in NEC Class I and II, Division 2 and Class III, Division 1 and 2 hazardous locations. UL approved for use at 105°C for continuous operation, 140°C for emergency overload conditions, and 250°C for short circuit conditions. Aluminum interlocked armor cable is recommended as an economical alternative to wire in conduit systems.

CONDUCTORS:

Soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8, with a semi-conducting conductor shield

INSULATION:

Ethylene propylene rubber (EPR) per ICEA S-96-659

GROUNDING CONDUCTOR:

Soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8 sized in accordance with UL Standard 1072

ARMOR:

Aluminum interlocked tape armor per UL Standard 1072 and applicable ICEA standards, also available in galvanized steel armor

JACKET:

Yellow sunlight-resistant PVC per UL Standard 1072 and applicable ICEA standards

FLAME TESTS:

- IEEE 383 (70,000 BTU/hr) Flame Test
- UL 1581 (70,000 BTU/hr) Flame Test
- IEEE 1202 (70,000 BTU/hr) CSA FT4 Flame Test
- ICEA T-29-520 (210,000 BTU/hr) Flame Test
- ICEA T-30-520 (70,000 BTU/hr) Flame Test

COLOR CODE:

ICEA Method 3

ADDITIONAL STANDARDS:

ICEA S-93-639 (NEMA WC71)

CONNECTORS:

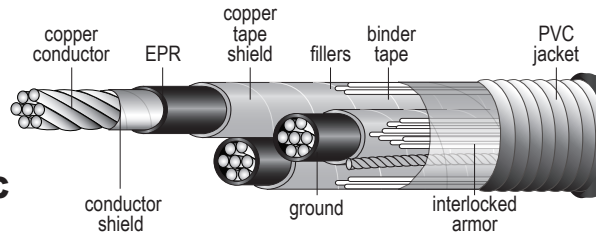
- Explosion Proof, Class 1 Division 2: 424CU series – aluminum exterior components, nickel-plated brass interior components
- Rain Tight: 416MC series – all nickel-plated brass
- For size 750 kcmil, see 424MA series in Section J

ARMORED CABLE

SPECIFICATION
HW303

**INTERLOCKED ARMOR
– POWER CABLE**

**15kV UL Type MV-105 or MC, CT USE, 105°C
Shielded, EPR Insulation
133% Insulation Level
Aluminum Armor, Copper Conductors**



Catalog Number	Size AWG	Number of Conductors	Number of Strands	Insulation Thickness Mils	Ground Wire Size AWG	Armor Diameter Inch	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft	Class I Div. 2 Connector Number	Rain Tight Connector Number
HW303 00203	2	3	7	220	6	2.11	60	2.24	2605	424CU08	416MC09
HW303 00103	1	3	19	220	4	2.08	60	2.21	2835	424CU08	416MC09
HW303 10103	1/0	3	19	220	4	2.17	60	2.30	3100	424CU08	416MC09
HW303 20103	2/0	3	19	220	4	2.27	60	2.39	3530	424CU09	416MC09
HW303 30103	3/0	3	19	220	3	2.37	75	2.53	3990	424CU09	416MC09
HW303 40103	4/0	3	19	220	3	2.49	75	2.65	4615	424CU09	416MC09
HW303 25003	250	3	37	220	3	2.61	75	2.77	5315	424CU09	416MC09
HW303 35003	350	3	37	220	2	2.84	75	2.99	6600	424MA09V	416MC10
HW303 50003	500	3	37	220	1	3.11	85	3.47	8710	424MA10V	416MC10
HW303 75003	750	3	61	220	1/0	3.52	85	3.69	11695	424MA11V	416MC10

ARMORED CABLE

APPLICATION:

For use in harsh environments where maximum conductor protection is required. Used for primary power and feeder circuits in a broad range of commercial and industrial power distribution systems. Approved for use in wet or dry locations at 105°C, for installation indoors or outdoors, aerially, in conduits, ducts, cable trays or direct burial in circuits not exceeding 15000 volts. May be used in NEC Class I and II, Division 2 and Class III, Division 1 and 2 hazardous locations. UL approved for use at 105°C for continuous operation, 140°C for emergency overload conditions, and 250°C for short circuit conditions. Aluminum interlocked armor cable is recommended as an economical alternative to wire in conduit systems.

CONDUCTORS:

Soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8, with a semi-conducting conductor shield

INSULATION:

Ethylene propylene rubber (EPR) per ICEA S-97-682 with a semi-conducting insulation shield

SHIELD:

Uncoated copper tape with a minimum 12.5% overlap per ICEA S-97-682

GROUNDING CONDUCTOR:

Soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8 sized in accordance with UL Standard 1072

ARMOR:

Aluminum interlocked tape armor per UL Standard 1072 and ICEA S-93-639, also available in galvanized steel armor

JACKET:

Red sunlight-resistant PVC per UL Standard 1072 and ICEA S-93-639

FLAME TESTS:

- UL 1581 and IEEE 383 (70,000 BTU/hr) Flame Test
- IEEE 1202 Flame Test
- ICEA T-29-5200 (210,000 BTU/hr) Flame Test

COLOR CODE:

ICEA Method 4

ADDITIONAL STANDARDS:

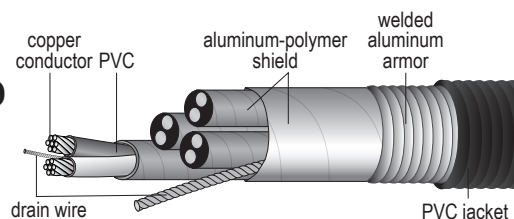
NEMA WC74

CONNECTORS:

- Explosion Proof, Class 1 Division 2: 424CU series – aluminum exterior components, nickel-plated brass interior components
- Rain Tight: 416MC series – all nickel-plated brass
- For sizes 350-500 kcmil, see 424MA series in Section J

**IMPERVIOUS CONTINUOUSLY WELDED
ARMOR – INSTRUMENTATION CABLE**

**300 Volt UL Type PLTC, ITC, 105°C
Single Pair and Triad - Shielded
Multiple Shielded Pairs or Triads with Overall Shield
Aluminum Armor, Copper Conductors**



Catalog Number	Size AWG	Number of Pairs	Insulation Thickness Mils	Inner Jacket Thickness Mils	Inner Jacket Overall Diameter Inch	Armor Overall Diameter Inch	Outer Jacket Overall Diameter Inch	Overall Diameter Inches	Net Weight Lbs/Mft	Class I Div. 2 Connector Number	Rain Tight Connector Number
HW304 1802P	18	2	15	40	0.38	0.58	40	0.66	185	424CU03	416MC03
HW304 1804P	18	4	15	50	0.46	0.70	50	0.80	271	424CU04	416MC04
HW304 1808P	18	8	15	50	0.59	0.84	50	0.94	385	424CU04	416MC04
HW304 1812P	18	12	15	60	0.74	1.02	60	1.14	540	424CU05	416MC05
HW304 1824P	18	24	15	70	1.02	1.33	70	1.47	920	424CU06	416MC06
HW304 1836P	18	36	15	70	1.17	1.51	70	1.65	1190	424CU06	416MC07

APPLICATION:

For use in harsh environments where maximum conductor and electrostatic interference protection is required. Impervious armor prevents the entrance of water, gas and corrosive elements into the electrical core. Used for instrumentation and process and control applications in a broad range of commercial and industrial pulp and paper, mining, and petroleum applications.

Approved for continuous use at 105°C in wet or dry locations. May be installed indoors or outdoors, aerially, in conduits, ducts, cable trays or direct burial in circuits not exceeding 300 volts.

UL listed as, NEC Type MC per UL Standard 1569 and is approved for use in Class I, Division 2 hazardous locations. Impervious continuously welded and corrugated aluminum armor cable is recommended as an economical alternative to wire in conduit systems.

CONDUCTORS:

7-strand soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8

INSULATION:

Flame-retardant PVC

INDIVIDUAL SHIELD:

Aluminum-polymer tape providing 100% coverage with a flexible 7-strand tinned copper drain wire

OVERALL SHIELD:

Aluminum-polymer tape providing 100% coverage with a flexible 7-strand tinned copper drain wire

COMMUNICATION WIRE:

22AWG stranded bare copper wire with PVC insulation

INNER JACKET:

Flame-retardant PVC

ARMOR:

Impervious continuously welded and corrugated aluminum

JACKET:

Black sunlight-resistant PVC

FLAME TESTS:

- UL 1581 (70,000 BTU/hr) Flame Test
- ICEA T-30-520 (70,000 BTU/hr) Flame Test
- IEEE 383 (70,000 BTU/hr) Flame Test
- IEEE 1202 Flame Test
- ICEA T-29-520 (210,000 BTU/hr) Flame Test

COLOR CODE:

Black and white for pairs and black, white and red for triads with printed number

ADDITIONAL STANDARDS:

- Individual conductors UL listed as Type FPL
- Meets requirements of CSA-C22.2 No. 0.3, -40°C cold impact test

CONNECTORS:

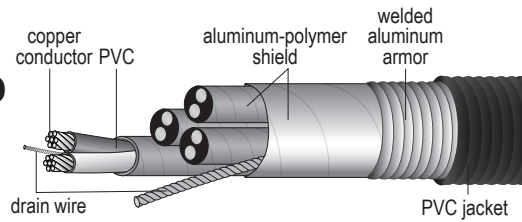
- Explosion Proof, Class 1 Division 2: 424CU series – aluminum exterior components, nickel-plated brass interior components
- Rain Tight: 416MC series – all nickel-plated brass

ARMORED CABLE

SPECIFICATION
HW304

IMPERVIOUS CONTINUOUSLY WELDED ARMOR – INSTRUMENTATION CABLE

**300 Volt UL Type PLTC, ITC, 105°C
Single Pair and Triad - Shielded
Multiple Shielded Pairs or Triads with Overall Shield
Aluminum Armor, Copper Conductors**



Catalog Number	Size AWG	Number of Pairs or Triads	Insulation Thickness Mils	Inner Jacket Thickness Mils	Inner Jacket Overall Diameter Inch	Armor Overall Diameter Inch	Outer Jacket Overall Diameter Inch	Overall Diameter Inches	Net Weight Lbs/Mft	Class I Div. 2 Connector Number	Rain Tight Connector Number
HW304 1601P	16	1 Pair	15	35	0.25	0.40	35	0.47	110	424CU02	416MC02
HW304 1602P	16	2 Pairs	15	50	0.44	0.66	50	0.76	241	424CU03	416MC03
HW304 1603P	16	3 Pairs	15	50	0.47	0.70	50	0.80	280	424CU04	416MC04
HW304 1604P	16	4 Pairs	15	50	0.51	0.74	50	0.84	316	424CU04	416MC04
HW304 1606P	16	6 Pairs	15	50	0.61	0.88	50	0.98	410	424CU04	416MC04
HW304 1608P	16	8 Pairs	15	60	0.68	0.97	60	1.09	511	424CU05	416MC05
HW304 1612P	16	12 Pairs	15	60	0.82	1.13	60	1.25	670	424CU05	416MC06
HW304 1624P	16	24 Pairs	15	70	1.14	1.46	70	1.60	1165	424CU06	416MC07
HW304 1636P	16	36 Pairs	15	80	1.33	1.71	80	1.87	1615	424CU07	416MC08
HW304 1601T	16	1 Triad	15	35	0.27	0.44	35	0.51	129	424CU02	416MC02
HW304 1604T	16	4 Triads	15	50	0.58	0.84	50	0.94	400	424CU04	416MC04

APPLICATION:

For use in harsh environments where maximum conductor and electrostatic interference protection is required. Impervious armor prevents the entrance of water, gas and corrosive elements into the electrical core. Used for instrumentation and process and control applications in a broad range of commercial and industrial pulp and paper, mining, and petroleum applications.

Approved for continuous use at 105°C in wet or dry locations. May be installed indoors or outdoors, aurally, in conduits, ducts, cable trays or direct burial in circuits not exceeding 300 volts.

UL listed as, NEC Type MC per UL Standard 1569 and is approved for use in Class I, Division 2 hazardous locations. Impervious continuously welded and corrugated aluminum armor cable is recommended as an economical alternative to wire in conduit systems.

CONDUCTORS:

7-strand soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8

INSULATION:

Flame-retardant PVC

INDIVIDUAL SHIELD:

Aluminum-polymer tape providing 100% coverage with a flexible 7-strand tinned copper drain wire

OVERALL SHIELD:

Aluminum-polymer tape providing 100% coverage with a flexible 7-strand tinned copper drain wire

COMMUNICATION WIRE:

22 AWG stranded bare copper wire with PVC insulation

INNER JACKET:

Flame-retardant PVC

ARMOR:

Impervious continuously welded and corrugated aluminum

JACKET:

Black sunlight-resistant PVC

FLAME TESTS:

- UL 1581 (70,000 BTU/hr) Flame Test
- ICEA T-30-520 (70,000 BTU/hr) Flame Test
- IEEE 383 (70,000 BTU/hr) Flame Test
- IEEE 1202 Flame Test
- ICEA T-29-520 (210,000 BTU/hr) Flame Test

COLOR CODE:

Black and white for pairs and black, white and red for triads with printed number

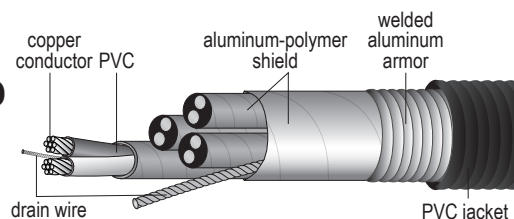
ADDITIONAL STANDARDS:

- Individual conductors UL listed as Type FPL
- Meets requirements of CSA-C22.2 No. 0.3, -40°C cold impact test Connectors
- Explosion Proof, Class 1 Division 2: 424CU series – aluminum exterior components, nickel-plated brass interior components
- Rain Tight: 416MC series – all nickel-plated brass

ARMORED CABLE

IMPERVIOUS CONTINUOUSLY WELDED ARMOR – INSTRUMENTATION CABLE

**600 Volt UL Type MC-HL, CT USE, 105°C
Single Pair and Triad - Shielded
Multiple Shielded Pairs or Triads with Overall Shield
Aluminum Armor, Copper Conductors**



Catalog Number	Size AWG	Number of Pairs or Triads	PVC-Nylon Insulation Thickness Mils	Inner Jacket Thickness Mils	Inner Jacket Overall Diameter Inch	Armor Overall Diameter Inch	Outer Jacket Overall Diameter Inch	Overall Diameter Inches	Net Weight Lbs/Mft	Class I Div. 1 Connector Number	Rain Tight Connector Number
HW305 1601P	16	1 Pair	15-4	40	0.29	0.44	50	0.54	114	424MA02	416MC02
HW305 1602P	16	2 Pairs	15-4	40	0.50	0.70	50	0.80	255	424MA03	416MC04
HW305 1604P	16	4 Pairs	15-4	40	0.61	0.84	50	0.94	355	424MA03	416MC04
HW305 1608P	16	8 Pairs	15-4	40	0.76	1.02	50	1.12	518	424MA04	416MC05
HW305 1612P	16	12 Pairs	15-4	40	0.93	1.19	50	1.29	675	424MA05	416MC06
HW305 1624P	16	24 Pairs	15-4	40	1.21	1.56	60	1.68	1170	424MA06	416MC08
HW305 1636P	16	36 Pairs	15-4	40	1.41	1.80	60	1.92	1607	424MA07	416MC08
HW305 1601T	16	1 Triad	15-4	40	0.31	0.48	50	0.58	165	424MA02	416MC02
HW305 1604T	16	4 Triads	15-4	40	0.68	0.92	50	1.02	430	424MA04	416MC05
HW305 1608T	16	8 Triads	15-4	50	0.97	1.32	50	1.42	962	424MA04	416MC05
HW305 1612T	16	12 Triads	15-4	50	0.93	1.21	50	1.31	1007	424MA05	416MC06

APPLICATION:

For use in harsh environments where maximum conductor and electrostatic interference protection is required. Impervious armor prevents the entrance of water, gas and corrosive elements into the electrical core. Used for instrumentation and process and control applications in a broad range of commercial and industrial pulp and paper, mining, and petroleum applications.

Approved for continuous use at 90°C in wet or dry locations. May be installed indoors or outdoors, aerially, in conduits, ducts, cable trays or direct burial in circuits not exceeding 600 volts.

UL listed, Type MC-HL per UL Standard 2225 for use in Class I, Division I hazardous locations. Impervious continuously welded and corrugated aluminum armor cable is recommended as an economical alternative to wire in conduit systems.

CONDUCTORS:

7-strand soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8

INSULATION:

Heat- and moisture-resistant PVC

CONDUCTOR JACKET:

Clear nylon

INDIVIDUAL SHIELD:

Aluminum-polymer tape providing 100% coverage with a flexible 7-strand tinned copper drain wire

OVERALL SHIELD:

Aluminum-polymer tape providing 100% coverage with a flexible 7-strand tinned copper drain wire

INNER JACKET:

Flame-retardant PVC

ARMOR:

Impervious continuously welded and corrugated aluminum

JACKET:

Black sunlight-resistant PVC

FLAME TESTS:

- UL 1581 (70,000 BTU/hr) Flame Test
- ICEA T-30-520 (70,000 BTU/hr) Flame Test
- IEEE 383 (70,000 BTU/hr) Flame Test
- IEEE 1202 Flame Test
- ICEA T-29-520 (210,000 BTU/hr) Flame Test

COLOR CODE:

Black and white for pairs and black, white and red for triads with printed number

ADDITIONAL STANDARDS:

- UL listed, NEC Type MC, UL Standard 1569
- UL listed Type CWCMC to IEEE 45/IEEE 1580 (46 CFR Part 111.60-23) Marine Shipboard Cable.
- Meets requirements of CSA-C22.2 No. 0.3, -40°C cold impact test

CONNECTORS:

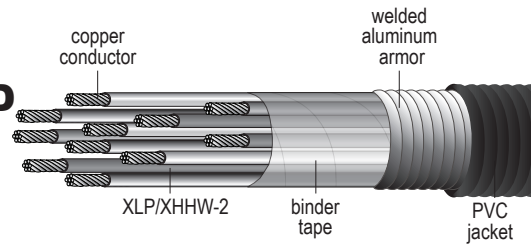
- Explosion Proof, Class I Division 1: 424MA series – all nickel-plated aluminum
- Rain Tight: 416MC series – all nickel-plated brass

ARMORED CABLE

SPECIFICATION
HW306

**IMPERVIOUS CONTINUOUSLY WELDED
ARMOR – CONTROL CABLE**

**600 Volt UL Type MC, CT USE, 90°C
XLP XHHW-2 Insulation
Aluminum Armor
Copper Conductors**



Catalog Number	Size AWG	Number of Conductors	Number of Strands	Insulation Thickness Mils	Armor Diameter Inch	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft	Class I Div. 2 Connector Number	Rain Tight Connector Number
HW306 01402	14	2	7	30	0.44	50	0.55	135	424CU02	416MC02
HW306 01403	14	3	7	30	0.44	50	0.55	155	424CU02	416MC02
HW306 01404	14	4	7	30	0.48	50	0.59	185	424CU02	416MC02
HW306 01405	14	5	7	30	0.54	50	0.65	210	424CU02	416MC03
HW306 01407	14	7	7	30	0.58	50	0.69	250	424CU03	416MC03
HW306 01409	14	9	7	30	0.70	50	0.81	320	424CU04	416MC04
HW306 01412	14	12	7	30	0.74	50	0.85	380	424CU04	416MC04
HW306 01419	14	19	7	30	0.88	50	0.99	530	424CU04	416MC05
HW306 01425	14	25	7	30	1.07	50	1.18	685	424CU05	416MC05
HW306 01437	14	37	7	30	1.26	50	1.37	935	424CU06	416MC06

ARMORED CABLE

APPLICATION:

For use in harsh environments where maximum conductor protection is required. Impervious armor prevents the entrance of water, gas and corrosive elements into the electrical core. Used for power, control and lighting circuits in a broad range of commercial and industrial pulp and paper, mining, and petroleum applications. Approved for use in wet or dry locations at 90°C, for installation indoors or outdoors, aerially, in conduits, ducts, cable trays or direct burial in circuits not exceeding 600 volts. May be used in NEC Class I and II, Division 2 and Class III, Division 1 and 2 hazardous locations. UL approved for use at 90°C for continuous operation, 130°C for emergency overload conditions, and 250°C for short circuit conditions. Impervious continuously welded corrugated armor cable is recommended as an economical alternative to wire in conduit systems.

CONDUCTORS:

Soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8

INSULATION:

Cross-linked polyethylene (XLP) per ICEA S-95-658 and UL Standard 44 for Type XHHW-2 conductors

ARMOR:

Impervious continuously welded and corrugated aluminum

JACKET:

Black sunlight-resistant PVC

FLAME TESTS:

- UL 1581 (70,000 BTU/hr) Flame Test
- ICEA T-30-520 (70,000 BTU/hr) Flame Test
- IEEE 383 (70,000 BTU/hr) Flame Test
- IEEE 1202 Flame Test
- ICEA T-29-520 (210,000 BTU/hr) Flame Test

COLOR CODE:

ICEA Method 1, Table E-2

ADDITIONAL STANDARDS:

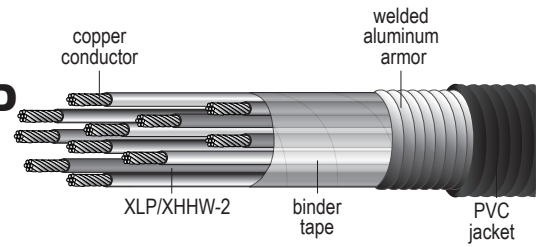
- UL listed, NEC Type MC, UL Standard 1569
- UL listed Type CWCMC to IEEE 45/IEEE 1580 (46 CFR Part 111.60-23) Marine Shipboard Cable
- Meets requirements of CSA-C22.2 No. 0.3, -40°C cold impact test

CONNECTORS:

- Explosion Proof, Class 1 Division 2: 424CU series – aluminum exterior components, nickel-plated brass interior components
- Rain Tight: 416MC series – all nickel-plated brass

**IMPERVIOUS CONTINUOUSLY WELDED
ARMOR – CONTROL CABLE**

**600 Volt UL Type MC, CT USE, 90°C
XLP XHHW-2 Insulation
Aluminum Armor
Copper Conductors**



Catalog Number	Size AWG	Number of Conductors	Number of Strands	Insulation Thickness Mils	Armor Diameter Inch	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft	Class I Div. 2 Connector Number	Rain Tight Connector Number
HW306 01202	12	2	7	30	0.48	50	0.59	165	424CU02	416MC02
HW306 01203	12	3	7	30	0.48	50	0.59	190	424CU02	416MC02
HW306 01204	12	4	7	30	0.54	50	0.65	230	424CU02	416MC03
HW306 01205	12	5	7	30	0.62	50	0.69	265	424CU03	416MC03
HW306 01207	12	7	7	30	0.66	50	0.77	330	424CU03	416MC03
HW306 01209	12	9	7	30	0.74	50	0.85	410	424CU04	416MC04
HW306 01212	12	12	7	30	0.84	50	0.95	500	424CU05	416MC04
HW306 01219	12	19	7	30	0.97	50	1.07	715	424CU05	416MC05

APPLICATION:

For use in harsh environments where maximum conductor protection is required. Impervious armor prevents the entrance of water, gas and corrosive elements into the electrical core. Used for power, control and lighting circuits in a broad range of commercial and industrial pulp and paper, mining, and petroleum applications. Approved for use in wet or dry locations at 90°C, for installation indoors or outdoors, aerially, in conduits, ducts, cable trays or direct burial in circuits not exceeding 600 volts. May be used in NEC Class I and II, Division 2 and Class III, Division 1 and 2 hazardous locations. UL approved for use at 90°C for continuous operation, 130°C for emergency overload conditions, and 250°C for short circuit conditions. Impervious continuously welded corrugated armor cable is recommended as an economical alternative to wire in conduit systems.

CONDUCTORS:

Soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8.

INSULATION:

Cross-linked polyethylene (XLP) per ICEA S-95-658 and UL Standard 44 for Type XHHW-2 conductors.

ARMOR:

Impervious continuously welded and corrugated aluminum.

JACKET:

Black sunlight-resistant PVC

FLAME TESTS:

- UL 1581 (70,000 BTU/hr) Flame Test
- ICEA T-30-520 (70,000 BTU/hr) Flame Test
- IEEE 383 (70,000 BTU/hr) Flame Test
- IEEE 1202 Flame Test
- ICEA T-29-520 (210,000 BTU/hr) Flame Test

COLOR CODE:

ICEA Method 1, Table E-2

ADDITIONAL STANDARDS:

- UL listed, NEC Type MC, UL Standard 1569
- UL listed Type CWCMC to IEEE 45/IEEE 1580 (46 CFR Part 111.60-23) Marine Shipboard Cable.
- Meets requirements of CSA-C22.2 No. 0.3, -40°C cold impact test.

CONNECTORS:

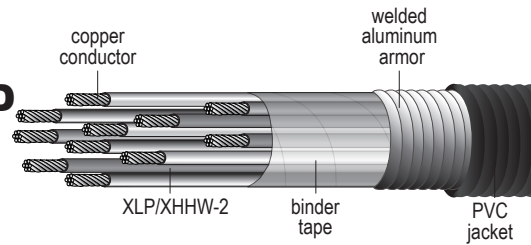
- Explosion Proof, Class 1 Division 2: 424CU series – aluminum exterior components, nickel-plated brass interior components
- Rain Tight: 416MC series – all nickel-plated brass

ARMORED CABLE

SPECIFICATION
HW306

IMPERVIOUS CONTINUOUSLY WELDED ARMOR – CONTROL CABLE

600 Volt UL Type MC, CT USE, 90°C XLP XHHW-2 Insulation Aluminum Armor Copper Conductors



Catalog Number	Size AWG	Number of Conductors	Number of Strands	Insulation Thickness Mils	Armor Diameter Inch	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft	Class I Div. 2 Connector Number	Rain Tight Connector Number
HW306 01002	10	2	7	30	0.54	50	0.65	205	424CU02	416MC03
HW306 01003	10	3	7	30	0.58	50	0.69	240	424CU03	416MC03
HW306 01004	10	4	7	30	0.62	50	0.73	300	424CU03	416MC03
HW306 01005	10	5	7	30	0.66	50	0.77	345	424CU03	416MC03
HW306 01007	10	7	7	30	0.74	50	0.85	440	424CU04	416MC04
HW306 01009	10	9	7	30	0.84	50	0.95	550	424CU04	416MC04
HW306 01012	10	12	7	30	0.97	50	1.07	690	424CU05	416MC05

APPLICATION:

For use in harsh environments where maximum conductor protection is required. Impervious armor prevents the entrance of water, gas and corrosive elements into the electrical core. Used for power, control and lighting circuits in a broad range of commercial and industrial pulp and paper, mining, and petroleum applications. Approved for use in wet or dry locations at 90°C, for installation indoors or outdoors, aerially, in conduits, ducts, cable trays or direct burial in circuits not exceeding 600 volts. May be used in NEC Class I and II, Division 2 and Class III, Division 1 and 2 hazardous locations. UL approved for use at 90°C for continuous operation, 130°C for emergency overload conditions, and 250°C for short circuit conditions. Impervious continuously welded corrugated armor cable is recommended as an economical alternative to wire in conduit systems.

CONDUCTORS:

Soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8

INSULATION:

Cross-linked polyethylene (XLP) per ICEA S-95-658 and UL Standard 44 for Type XHHW-2 conductors

ARMOR:

Impervious continuously welded and corrugated aluminum

JACKET:

Black sunlight-resistant PVC

FLAME TESTS:

- UL 1581 (70,000 BTU/hr) Flame Test
- ICEA T-30-520 (70,000 BTU/hr) Flame Test
- IEEE 383 (70,000 BTU/hr) Flame Test
- IEEE 1202 Flame Test
- ICEA T-29-520 (210,000 BTU/hr) Flame Test

COLOR CODE:

ICEA Method 1, Table E-2

ADDITIONAL STANDARDS:

- UL listed, NEC Type MC, UL Standard 1569
- UL listed Type CWCMC to IEEE 45/IEEE 1580 (46 CFR Part 111.60-23) Marine Shipboard Cable
- Meets requirements of CSA-C22.2 No. 0.3, -40°C cold impact test

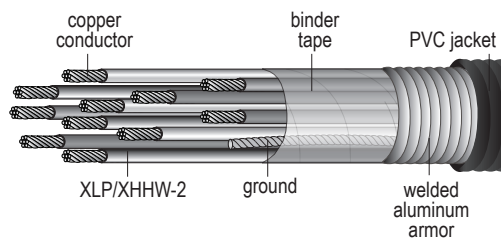
CONNECTORS:

- Explosion Proof, Class 1 Division 2: 424CU series – aluminum exterior components, nickel-plated brass interior components
- Rain Tight: 416MC series – all nickel-plated brass

ARMORED CABLE

**IMPERVIOUS CONTINUOUSLY WELDED
ARMOR – POWER & CONTROL CABLE**

**600 Volt UL Type MC-HL, CT USE, 90°C, TC-ER
XLP XHHW-2 Insulation
Aluminum Armor
Copper Conductors**



Catalog Number	Size AWG	Number of Conductors	Number of Strands	Insulation Thickness Mils	Ground Wire Size AWG	Armor Diameter Inch	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft	Class I Div. 2 Connector Number	Rain Tight Connector Number
HW307 01403	14	3	7	30	3-18	0.56	50	0.66	200	424MA02	416MC02
HW307 01404	14	4	7	30	1-14	0.52	50	0.63	203	424MA02	416MC02
HW307 01405	14	5	7	30	1-14	0.53	50	0.63	224	424MA02	416MC03
HW307 01407	14	7	7	30	1-14	0.60	50	0.71	287	424MA02	416MC03
HW307 01409	14	9	7	30	1-14	0.75	50	0.85	368	424MA03	416MC04
HW307 01412	14	12	7	30	1-14	0.79	50	0.89	425	424MA03	416MC04
HW307 01419	14	19	7	30	1-14	0.92	50	1.02	594	424MA04	416MC05
HW307 01437	14	37	7	30	1-14	1.22	50	1.32	1030	424MA05	416MC06
HW307 01203	12	3	7	30	3-16	0.56	50	0.66	226	424MA02	416MC03
HW307 01204	12	4	7	30	1-12	0.55	50	0.65	246	424MA02	416MC03
HW307 01205	12	5	7	30	1-12	0.61	50	0.71	302	424MA02	416MC03
HW307 01207	12	7	7	30	1-12	0.64	50	0.74	362	424MA03	416MC04
HW307 01209	12	9	7	30	1-12	0.79	50	0.89	458	424MA03	416MC04
HW307 01212	12	12	7	30	1-12	0.83	50	0.94	545	424MA04	416MC05
HW307 01219	12	19	7	30	1-12	0.98	50	1.08	779	424MA04	416MC05
HW307 01237	12	37	7	30	1-12	1.38	50	1.50	1430	424MA05	416MC06

APPLICATION:

For use in harsh environments where maximum conductor protection is required. Impervious armor prevents the entrance of water, gas and corrosive elements into the electrical core. Used for power, control and lighting circuits in a broad range of commercial and industrial pulp and paper, mining, and petroleum applications.

Approved for use in wet or dry locations at 90°C, installation indoors or outdoors, aerially, in conduits, ducts, cable trays or direct burial in circuits not exceeding 600 volts.

UL listed, Type MC-HL per UL Standard 2225 for use in Class I, Division I hazardous locations. National Electric Code approved for use at 90°C for continuous operation, 130°C for emergency overload conditions, and 250°C for short circuit conditions. Impervious continuously welded and corrugated aluminum armor cable is recommended as an economical alternative to wire in conduit systems. Listed as Type TC-ER per UL Standard

CONDUCTORS:

Soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8

INSULATION:

Cross-linked polyethylene (XLP) per ICEA S-95-658 and UL Standard 44 for Type XHHW-2 conductors

GROUNDING CONDUCTOR:

Soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8 sized in accordance with NEC requirements

ARMOR:

Impervious continuously welded and corrugated aluminum

JACKET:

Black flame-retardant and sunlight resistant PVC

FLAME TESTS:

- UL 1685
- ICEA T-29-520 (210,000 BTU/hr) Flame Test
- IEEE 383 (70,000 BTU/hr) Flame Test
- IEEE 1202 Flame Test
- ICEA T-29-520 (210,000 BTU/hr) Flame Test
- IEC 332-3 Category A fire test
- CSA FT4

COLOR CODE:

ICEA Method 1, Table E-2

ADDITIONAL STANDARDS:

- UL listed Type CWCMC to IEEE 45/IEEE 1580 (46 CFR Part 111.60-23) Marine Shipboard Cable
- Meets requirements of CSA-C22.2 No. 0.3, -40°C cold impact test

CONNECTORS:

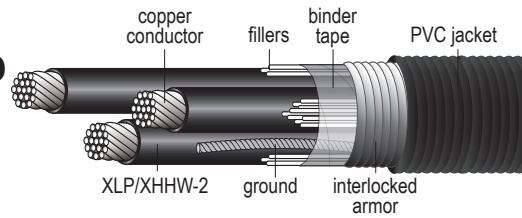
- Explosion Proof, Class I Division 1: 424MA series – all nickel-plated aluminum
- Rain Tight: 416MC series – all nickel-plated brass

ARMORED CABLE

SPECIFICATION
HW307

IMPERVIOUS CONTINUOUSLY WELDED ARMOR – POWER & CONTROL CABLE

600 Volt UL Type MC-HL, CT USE, 90°C XLP XHHW-2 Insulation Aluminum Armor Copper Conductors



Catalog Number	Size AWG	Number of Conductors	Number of Strands	Insulation Thickness Mils	Ground Wire Size AWG	Armor Overall Diameter Inch	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft	Class I Div. 1 Connector Number	Rain Tight Connector Number
HW307 01003	10	3	7	30	3-14	0.62	50	0.66	312	424MA02	416MC03
HW307 01004	10	4	7	30	1-10	0.63	50	0.73	343	424MA02	416MC03
HW307 01009	10	9	7	30	1-10	0.92	50	1.02	630	424MA04	416MC05
HW307 00803	8	3	7	45	3-14	0.75	50	0.86	413	424MA03	416MC04
HW307 00804	8	4	7	45	1-10	0.79	50	0.90	468	424MA03	416MC04
HW307 00603	6	3	7	45	3-12	0.80	50	0.91	542	424MA03	416MC04
HW307 00604	6	4	7	45	1-8	0.96	50	1.07	685	424MA04	416MC04
HW307 00403	4	3	7	45	3-12	0.94	50	1.04	735	424MA04	416MC05
HW307 00404	4	4	7	45	1-8	1.18	50	1.29	980	424MA04	416MC05
HW307 00203	2	3	7	45	3-10	1.13	50	1.24	1097	424MA05	416MC05
HW307 00204	2	4	7	45	1-6	1.37	50	1.49	1410	424MA05	416MC06

APPLICATION:

For use in harsh environments where maximum conductor protection is required. Impervious armor prevents the entrance of water, gas and corrosive elements into the electrical core. Used for power, control and lighting circuits in a broad range of commercial and industrial pulp and paper, mining, and petroleum applications.

Approved for use in wet or dry locations at 90°C, installation indoors or outdoors, aerially, in conduits, ducts, cable trays or direct burial in circuits not exceeding 600 volts.

UL listed, Type MC-HL per UL Standard 2225 for use in Class I, Division I hazardous locations. UL approved for use at 90°C for continuous operation, 130°C for emergency overload conditions, and 250°C for short circuit conditions. Impervious continuously welded and corrugated aluminum armor cable is recommended as an economical alternative to wire in conduit systems.

CONDUCTORS:

Soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8

INSULATION:

Cross-linked polyethylene (XLP) per ICEA S-95-658 and UL Standard 44 for Type XHHW-2 conductors

GROUNDING CONDUCTOR:

Soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8 sized in accordance with NEC requirements

ARMOR:

Impervious continuously welded and corrugated aluminum

JACKET:

Black flame-retardant and sunlight resistant PVC

FLAME TESTS:

- UL 1685
- ICEA T-29-520 (210,000 BTU/hr) Flame Test
- IEEE 383 (70,000 BTU/hr) Flame Test
- IEEE 1202 Flame Test
- ICEA T-29-520 (210,000 BTU/hr) Flame Test
- IEC 332-3 Category A fire test
- CSA FT4

COLOR CODE:

ICEA Method 1, Table E-2

ADDITIONAL STANDARDS:

- UL listed Type CWCMC to IEEE 45/IEEE 1580 (46 CFR Part 111.60-23) Marine Shipboard Cable
- Meets requirements of CSA-C22.2 No. 0.3, -40°C cold impact test

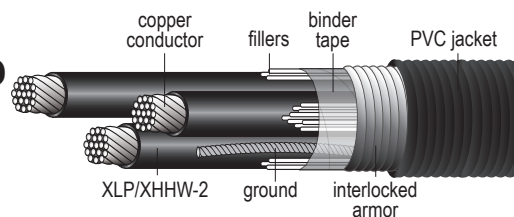
CONNECTORS:

- Explosion Proof, Class I Division 1: 424MA series – all nickel-plated aluminum
- Rain Tight: 416MC series – all nickel-plated brass

ARMORED CABLE

**IMPERVIOUS CONTINUOUSLY WELDED
ARMOR – POWER & CONTROL CABLE**

**600 Volt UL Type MC-HL, CT USE, 90°C, TC-ER
XLP XHHW-2 Insulation
Aluminum Armor
Copper Conductors**



Catalog Number	Size AWG	Number of Conductors	Number of Strands	Insulation Thickness Mils	Ground Wire Size AWG	Armor Overall Diameter Inch	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft	Class I Div. 1 Connector Number	Rain Tight Connector Number
HW307 10103	1/0	3	19	55	3-10	1.35	50	1.46	1592	424MA05	416MC06
HW307 10104	1/0	4	19	55	1-6	1.57	50	1.71	2075	424MA06	416MC07
HW307 20103	2/0	3	19	55	3-10	1.43	50	1.53	1974	424MA06	416MC07
HW307 20104	2/0	4	19	55	1-6	1.57	60	1.71	2440	424MA06	416MC08
HW307 30103	3/0	3	19	55	3-8	1.58	60	1.71	2420	424MA06	416MC08
HW307 30104	3/0	4	19	55	1-4	1.73	60	1.87	3010	424MA06	416MC08
HW307 40103	4/0	3	19	55	3-8	1.71	60	1.81	2905	424MA06	416MC08
HW307 40104	4/0	4	19	55	1-4	1.96	60	2.09	3670	424MA07	416MC08
HW307 25003	250	3	37	65	3-8	1.93	60	2.05	3385	424MA07	416MC08
HW307 25004	250	4	37	65	1-4	1.96	60	2.09	4215	424MA08	416MC09
HW307 35003	350	3	37	65	3-6	2.22	60	2.35	4560	424MA08	416MC09
HW307 35004	350	4	37	65	1-3	2.48	75	2.61	5835	424MA08	416MC09
HW307 50003	500	3	37	65	3-6	2.48	75	2.64	6245	424MA08	416MC09
HW307 50004	500	4	37	65	1-2	2.80	75	2.93	8190	424MA09	416MC09
HW307 75003	750	3	61	80	3-4	3.17	85	3.36	9530	424MA10	416MC10

APPLICATION:

For use in harsh environments where maximum conductor protection is required. Impervious armor prevents the entrance of water, gas and corrosive elements into the electrical core. Used for power, control and lighting circuits in a broad range of commercial and industrial pulp and paper, mining, and petroleum applications.

Approved for use in wet or dry locations at 90°C, installation indoors or outdoors, aerially, in conduits, ducts, cable trays or direct burial in circuits not exceeding 600 volts.

UL listed, Type MC-HL per UL Standard 2225 for use in Class I, Division I hazardous locations. UL approved for use at 90°C for continuous operation, 130°C for emergency overload conditions, and 250°C for short circuit conditions. Impervious continuously welded and corrugated aluminum armor cable is recommended as an economical alternative to wire in conduit systems.

CONDUCTORS:

Soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8

INSULATION:

Cross-linked polyethylene (XLP) per ICEA S-95-658 and UL Standard 44 for Type XHHW-2 conductors

GROUNDING CONDUCTOR:

Soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8 sized in accordance with NEC requirements

ARMOR:

Impervious continuously welded and corrugated aluminum

JACKET:

Black flame-retardant and sunlight resistant PVC

FLAME TESTS:

- UL 1685
- ICEA T-29-520 (210,000 BTU/hr) Flame Test
- IEEE 383 (70,000 BTU/hr) Flame Test
- IEEE 1202 Flame Test
- ICEA T-29-520 (210,000 BTU/hr) Flame Test
- IEC 332-3 Category A fire test
- CSA FT4

COLOR CODE:

- ICEA Method 4

ADDITIONAL STANDARDS:

- UL listed Type CWCMC to IEEE 45/IEEE 1580 (46 CFR Part 111.60-23) Marine Shipboard Cable
- Meets requirements of CSA-C22.2 No. 0.3, -40°C cold impact test

CONNECTORS:

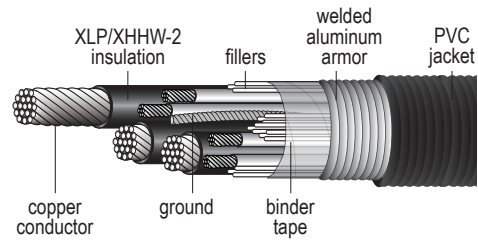
- Explosion Proof, Class I Division 1: 424MA series – all nickel-plated aluminum
- Rain Tight: 416MC series – all nickel-plated brass

ARMORED CABLE

SPECIFICATION
HW308

IMPERVIOUS CONTINUOUSLY WELDED ARMOR – POWER & CONTROL COMPOSITE CABLE

600 Volt UL Type MC-HL, CT USE, 90°C XLP XHHW-2 Insulation Aluminum Armor, Copper Conductors



POWER CABLES				
Catalog Number	Power Size AWG	Number of Conductors	Insulation Thickness Mils	Ground Wire Size AWG
HW308 01003	10	3	30	10
HW308 08003	8	3	45	10
HW308 06003	6	3	45	8
HW308 06004	4	3	45	6

CONTROL CABLES									
Catalog Number	Control Size AWG	Number of Conductors	Insulation Thickness Mils	Armor Diameter Inch	Jacket Thickness Mils	Overall Diameter Inch	Net Weight Lbs/Mft	Class I Div. 1 Explosion Proof Conn. #	Rain Tight Connector #
HW308 01003	12	4	30	0.74	50	0.86	240	424MA03	416MC04
HW308 08003	12	4	30	0.92	50	1.05	510	424MA04	416MC05
HW308 06003	12	4	30	0.97	50	1.09	650	424MA04	416MC05
HW308 06004	12	4	30	1.07	50	1.19	805	424MA04	416MC05

ARMORED CABLE

APPLICATION:

For use in harsh environments where maximum conductor protection is required. Impervious armor prevents the entrance of water, gas and corrosive elements into the electrical core. Used for power, control and lighting circuits in a broad range of commercial and industrial pulp and paper, mining, and petroleum applications. Approved for use in wet or dry locations at 90°C, for installation indoors or outdoors, aerially, in conduits, ducts, cable trays or direct burial in circuits not exceeding 600 volts. UL listed, Type MC-HL per UL Standard 2225 for use in Class I, Division I hazardous locations. UL approved for use at 90°C for continuous operation, 130°C for emergency overload conditions, and 250°C for short circuit conditions. Impervious continuously welded corrugated armor cable is recommended as an economical alternative to wire in conduit systems.

CONDUCTORS:

7-strand soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8

INSULATION:

Cross-linked polyethylene (XLP) per ICEA S-95-658 and UL Standard 44 for Type XHHW-2 conductors

GROUNDING CONDUCTOR:

Soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8 sized in accordance with NEC requirements.

ARMOR:

Impervious continuously welded and corrugated aluminum

JACKET:

Black flame-retardant and sunlight-resistant PVC

FLAME TESTS:

- UL 1581 (70,000 BTU/hr) Flame Test
- ICEA T-30-520 (70,000 BTU/hr) Flame Test
- IEEE 383 (70,000 BTU/hr) Flame Test
- IEEE 1202 Flame Test
- ICEA T-29-520 (210,000 BTU/hr) Flame Test

COLOR CODE:

- Control Conductors: red, blue, orange and yellow
- Power Conductors: ICEA Method 4

ADDITIONAL STANDARDS:

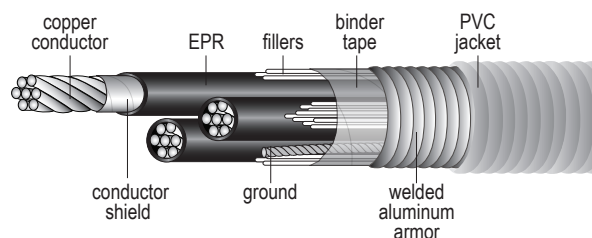
- UL listed Type CWCMC to IEEE 45/IEEE 1580 (46 CFR Part 111.60-23) Marine Shipboard Cable
- Meets requirements of CSA-C22.2 No. 0.3, -40°C cold impact test

CONNECTORS:

- Explosion Proof, Class 1 Division 1: 424MA series – all nickel-plated brass
- Rain Tight: 416MC series – all nickel-plated brass

**IMPERVIOUS CONTINUOUSLY
WELDED ARMOR – POWER CABLE**

**2.4kV UL Type MV-90, CT USE, 90°C
Non-Shielded, EPR Insulation
100% and 133% Insulation Level
Aluminum Armor, Copper Conductors**



Catalog Number	Size AWG/kcmil	Number of Conductors	Number of Strands	Insulation Thickness Mils	Ground Wire Size AWG	Armor Overall Diameter Inch	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft	Class I Div. 1 Connector Number	Rain Tight Connector Number
HW309 00603	6	3	7	90	3-10	1.13	50	1.24	730	424MA04V	416MC06
HW309 00403	4	3	7	90	3-10	1.19	50	1.30	920	424MA04V	416MC06
HW309 00203	2	3	7	90	3-10	1.33	50	1.44	1215	424MA05V	416MC06
HW309 00103	1	3	19	90	1-4	1.46	50	1.57	1525	424MA06V	416MC07
HW309 10103	1/0	3	19	90	3-8	1.56	60	1.69	1810	424MA06V	416MC08
HW309 20103	2/0	3	19	90	3-8	1.64	60	1.77	2130	424MA06V	416MC08
HW309 40103	4/0	3	19	90	3-6	1.94	60	2.07	3040	424MA07V	416MC08
HW309 25003	250	3	19	90	3-6	2.02	60	2.15	3475	424MA07V	416MC08
HW309 35003	350	3	37	90	3-6	2.35	75	2.50	4695	424MA08V	416MC09
HW309 50003	500	3	37	90	3-4	2.62	75	2.78	6315	424MA08V	416MC09

APPLICATION:

For use in harsh environments where maximum conductor protection is required. Used for primary power and feeder circuits in a broad range of commercial and industrial power distribution systems. Approved for use in wet or dry locations at 90°C, for installation indoors or outdoors, aerially, in conduits, ducts, cable trays or direct burial in circuits not exceeding 5000 volts. UL listed, Type MC-HL per UL 2225 for use in Class I, Division I hazardous locations. UL approved for use at 90°C for continuous operation, 130°C for emergency overload conditions, and 250°C for short circuit conditions. Impervious continuously welded and corrugated aluminum armor cable is recommended as an economical alternative to wire in conduit systems.

CONDUCTORS:

Soft bare annealed copper per ASTM B-3, compact Class B stranding per ASTM B-8, with a semi-conducting conductor shield

INSULATION:

Ethylene propylene rubber (EPR) per ICEA S-97-682/S-93-639

GROUNDING CONDUCTOR:

Soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8 sized in accordance with UL 1072

ARMOR:

Impervious continuously welded and corrugated aluminum

JACKET:

Yellow flame-retardant and sunlight-resistant PVC

FLAME TESTS:

- ICEA (70,000 BTU/hr) and (210,000 BTU/hr) Flame Test
- IEEE 1202 Flame Test

COLOR CODE:

ICEA Method 4

ADDITIONAL STANDARDS:

- Single conductors are qualified per AEIC CS8
- Meets requirements of CSA-C22.2 No. 0.3, -40°C cold impact test
- UL listed Type CWCMC to IEEE 45/IEEE 1580 (46 CFR Part 111.60-23) Marine Shipboard Cable

CONNECTORS:

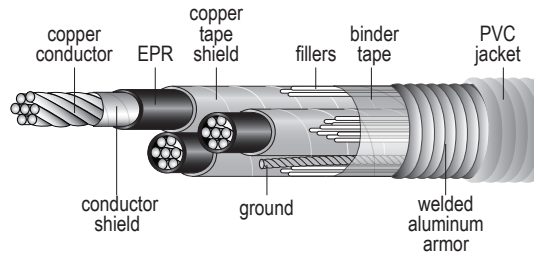
- Explosion Proof, Class I Division 1: 424MA series – all nickel-plated aluminum
- Rain Tight: 416MC series – all nickel-plated brass

ARMORED CABLE

SPECIFICATION
HW310

IMPERVIOUS CONTINUOUSLY WELDED ARMOR – POWER CABLE

**5kV UL Type MV-105, MC-HL, CT Use, 105°C Shielded, EPR Insulation
100% and 133% Insulation Level
Aluminum Armor, Copper Conductors**



Catalog Number	Size AWG/kcmil	Number of Conductors	Number of Strands	Insulation Thickness Mils	Ground Wire Size AWG	Armor Overall Diameter Inch	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft	Class I Div. 1 Connector Number	Rain Tight Connector Number
HW310 00603	6	3	7	115	10-3	1.51	50	1.61	1205	424MA06	416MC07
HW310 00403	4	3	7	115	10-3	1.64	60	1.76	1450	424MA06	416MC08
HW310 00203	2	3	7	115	10-3	1.80	60	1.92	1880	424MA07	416MC08
HW310 00103	1	3	19	115	8-3	1.87	60	1.99	2100	424MA07	416MC08
HW310 10103	1/0	3	19	115	8-3	1.94	60	2.06	2375	424MA07	416MC08
HW310 20103	2/0	3	19	115	8-3	2.02	60	2.14	2715	424MA07	416MC08
HW310 40103	4/0	3	19	115	6-3	2.25	60	2.37	3685	424MA08	416MC09
HW310 25003	250	3	19	115	6-3	2.41	75	2.56	4300	424MA08	416MC09
HW310 35003	350	3	37	115	6-3	2.71	75	2.86	5530	424MA09	416MC09
HW310 50003	500	3	37	115	4-3	3.03	75	3.21	7245	424MA10	416MC10

APPLICATION:

For use in harsh environments where maximum conductor protection is required. Used for primary power and feeder circuits in a broad range of commercial and industrial power distribution systems. Approved for use in wet or dry locations at 105°C, for installation indoors or outdoors, aerially, in conduits, ducts, cable trays or direct burial in circuits not exceeding 8000 volts. UL listed, Type MC-HL per UL Standard 2225 for use in Class I, Division I hazardous locations. UL approved for use at 105°C for continuous operation, 140°C for emergency overload conditions, and 250°C for short circuit conditions. Impervious continuously welded and corrugated aluminum armor cable is recommended as an economical alternative to wire in conduit systems.

CONDUCTORS:

Soft bare annealed copper per ASTM B-3, compact Class B stranding per ASTM B-496, with a semi-conducting conductor shield

INSULATION:

Ethylene propylene rubber (EPR) per ICEA S-97-682/S-93-639 with a semi-conducting insulation shield

SHIELD:

Uncoated 5 mil copper tape with a minimum of 12.5% overlap

GROUNDING CONDUCTOR:

Soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8 sized in accordance with UL Standard 1072

ARMOR:

Impervious continuously welded and corrugated aluminum

JACKET:

Yellow flame-retardant and sunlight-resistant PVC

FLAME TESTS:

- ICEA 70,000 BTU/hr and 210,000 BTU/hr Flame Test
- IEEE 1202 Flame Test

COLOR CODE:

ICEA Method 4

ADDITIONAL STANDARDS:

- UL listed, NEC Type MV-105 and Type MC, UL Standard 1072
- Single conductors are qualified per AEIC CS8.
- UL listed Type CWCMC to IEEE 45/IEEE 1580 (46 CFR Part 111.60-23) Marine Shipboard Cable
- Meets requirements of CSA-C22.2 No. 0.3, -40°C cold impact test

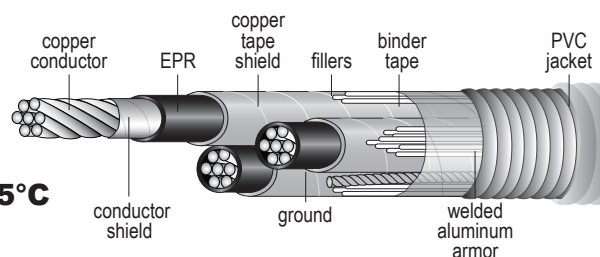
CONNECTORS:

- Explosion Proof, Class I Division 1: 424MA series – all nickel-plated aluminum
- Rain Tight: 416MC series – all nickel-plated brass

ARMORED CABLE

**IMPERVIOUS CONTINUOUSLY
WELDED ARMOR – POWER CABLE**

**15KV UL Type MV-105, MC-HL, CT USE, 105°C
Shielded, EPR Insulation
133% Insulation Level
Aluminum Armor, Copper Conductors**



Catalog Number	Size AWG/kcmil	Number of Conductors	Number of Strands	Insulation Thickness Mils	Ground Wire Size AWG	Armor Overall Diameter Inch	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft	Class I Div. 1 Connector Number	Rain Tight Connector Number
HW311 00203	2	3	7	220	6	2.35	75	2.50	2790	424MA08	416MC09
HW311 00103	1	3	19	220	4	2.35	75	2.50	3180	424MA08	416MC09
HW311 10103	1/0	3	19	220	4	2.47	75	2.62	3425	424MA08	416MC09
HW311 20103	2/0	3	19	220	4	2.55	75	2.70	3850	424MA08	416MC09
HW311 40103	4/0	3	19	220	3	2.81	75	2.96	4950	424MA09	416MC09
HW311 25003	250	3	19	220	3	3.03	75	3.18	5700	424MA10	416MC10
HW311 35003	350	3	37	220	2	3.22	75	3.40	7030	424MA10	416MC10
HW311 50003	500	3	37	220	1	3.41	85	3.59	8690	424MA10	–

APPLICATION:

For use in harsh environments where maximum conductor protection is required. Used for primary power and feeder circuits in a broad range of commercial and industrial power distribution systems. Approved for use in wet or dry locations at 105°C, for installation indoors or outdoors, aerially, in conduits, ducts, cable trays or direct burial in circuits not exceeding 15000 volts. UL listed, Type MC-HL per UL 2225 for use in Class I, Division I hazardous locations. UL approved for use at 105°C for continuous operation, 140°C for emergency overload conditions, and 250°C for short circuit conditions. Impervious continuously welded and corrugated aluminum armor cable is recommended as an economical alternative to wire in conduit systems.

CONDUCTORS:

Soft bare annealed copper per ASTM B-3, compact Class B stranding per ASTM B-496, with a semi-conducting conductor shield

INSULATION:

Ethylene propylene rubber (EPR) per ICEA S-97-682/S-93-639 with a semi-conducting insulation shield

SHIELD:

Uncoated 5 mil copper tape with a minimum 12.5% overlap per ICEA S-97-682

GROUNDING CONDUCTOR:

Soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8 sized in accordance with UL Standard 1072

ARMOR:

Impervious continuously welded and corrugated aluminum

JACKET:

Red flame-retardant and sunlight-resistant PVC

FLAME TESTS:

- ICEA (70,000 BTU/hr and 210,000 BTU/hr) Flame Test
- IEEE 1202 Flame Test

COLOR CODE:

ICEA Method 4

ADDITIONAL STANDARDS:

- UL listed, NEC Type MV-105 and Type MC, UL Standard 1072
- Single conductors are qualified per AEIC CS8
- Meets requirements of CSA-C22.2 No. 0.3, -40°C cold impact test
- UL listed Type CWCMC to IEEE 45/IEEE 1580 (46 CFR Part 111.60-23) Marine Shipboard Cable

CONNECTORS:

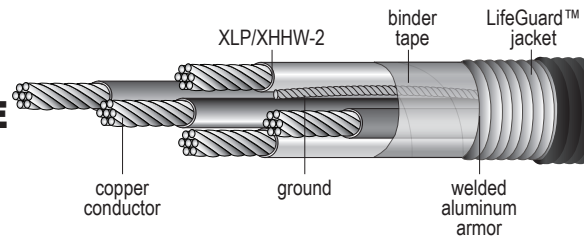
- Explosion Proof, Class I Division 1: 424MA series – all nickel-plated aluminum
- Rain Tight: 416MC series – all nickel-plated brass

ARMORED CABLE

SPECIFICATION
HW320

IMPERVIOUS CONTINUOUSLY WELDED ARMOR – CONTROL CABLE

**600 Volt UL Type MC-LS, CT USE, 90°C
XLP XHHW-2 Insulation
Aluminum Armor, Copper Conductors
Low Smoke Zero Halogen Jacket**

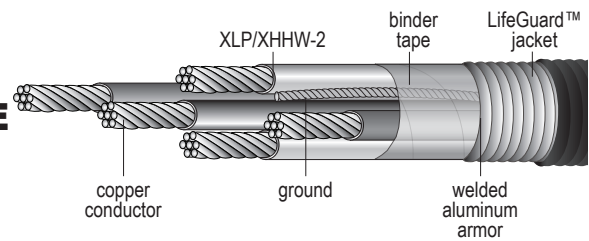


ARMORED CABLE

Catalog Number	Size AWG/kcmil	Number of Conductors	Number of Strands	Insulation Thickness Mils	Ground Wire Size AWG	Armor Diameter Inch	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW320 01402	14	2	7	30	14	0.52	60	0.64	180
HW320 01403	14	3	7	30	14	0.56	60	0.68	210
HW320 01404	14	4	7	30	14	0.60	60	0.72	241
HW320 01407	14	7	7	30	14	0.64	60	0.76	278
HW320 01409	14	9	7	30	14	0.74	60	0.86	337
HW320 01412	14	12	7	30	14	0.83	60	0.95	412
HW320 01419	14	19	7	30	14	0.91	60	1.03	557
HW320 01437	14	37	7	30	14	1.30	60	1.42	987
HW320 01202	12	2	7	30	12	0.56	60	0.68	215
HW320 01203	12	3	7	30	12	0.60	60	0.72	255
HW320 01204	12	4	7	30	12	0.64	60	0.76	296
HW320 01207	12	7	7	30	12	0.69	60	0.81	350
HW320 01209	12	9	7	30	12	0.83	60	0.95	435
HW320 01212	12	12	7	30	12	0.88	60	0.98	513
HW320 01219	12	19	7	30	12	1.06	60	1.16	730
HW320 01237	12	37	7	30	12	1.42	60	1.52	1315
HW320 01002	10	2	7	30	10	0.61	60	0.71	258
HW320 01003	10	3	7	30	10	0.65	60	0.75	310
HW320 01004	10	4	7	30	10	0.70	60	0.80	356
HW320 01007	10	7	7	30	10	0.79	60	0.89	450
HW320 01009	10	9	7	30	10	0.88	60	0.98	555
HW320 01012	10	12	7	30	10	1.06	60	1.12	700

**IMPERVIOUS CONTINUOUSLY
WELDED ARMOR – CONTROL CABLE**

**600 Volt UL Type MC-LS, CT USE, 90°C
XLP XHHW-2 Insulation
Aluminum Armor, Copper Conductors
Low Smoke Zero Halogen Jacket**



APPLICATION:

LifeGuard™ Low Smoke Zero Halogen* cable is for use in power, control and lighting circuits in a broad range of commercial and industrial applications. The impervious armor provides maximum conductor protection and prevents the entrance of water, gas and corrosive elements into the electrical core. The LifeGuard™ jacket is highly flame retardant, produces very small amounts of smoke when burned and contains no halogens. It is ideal for applications where a high degree of safety and equipment protection is required.

LifeGuard™ cable is UL listed, Type MC-LS per UL 1685 and approved for installation indoors or outdoors, aerially, in conduits, ducts, cable trays and direct burial in circuits not exceeding 600 volts. It may be installed in temperatures as low as -30°C and used in hazardous locations. It is UL approved for continuous operation at 90°C in wet and dry locations, 130°C for emergency overload conditions, and 250°C for short circuit conditions.

Impervious continuously welded and corrugated aluminum armor is recommended as an economical alternative to wire in conduit systems.

PRODUCT FEATURES:

- Tray rated
- Sunlight-resistant
- Approved for direct burial
- Very low smoke production when burned
- LifeGuard™ jacket produces zero halogens during fire – less toxic and corrosive
- LifeGuard™ jacket is environmentally safe – lead, sulfur and halogen free
- Highly chemical resistant
- Very flame retardant
- Burns to an ash – does not exhibit thermoplastic drip
- Excellent compression and impact resistance
- Superior tensile strength and abrasion resistance
- Flexible jacket with low coefficient of friction

CONDUCTOR:

Soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8

INSULATION:

Cross-linked polyethylene (XLP) per ICEA S-95-658 and UL Standard 44 for Type XHHW-2 conductors

GROUNDING CONDUCTOR:

Soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8 sized in accordance with UL Standard 1277

ARMOR:

Impervious continuously welded and corrugated aluminum

JACKET:

Sunlight-resistant and flame-retardant, Low Smoke Zero Halogen polyolefin per UL Standard 1277.

FLAME TESTS:

- IEEE 1202 (70,000 BTU/hr) Flame Test
- IEEE 383 (70,000 BTU/hr) Flame Test
- ICEA T-29-520 (210,000 BTU/hr) Flame Test

COLOR CODE:

ICEA Method 1, Table E-2

ADDITIONAL STANDARDS:

- UL 1685
- NEMA WC70

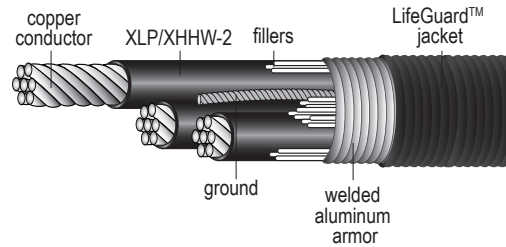
* Some cable insulations may contain trace amounts of halogens.

ARMORED CABLE

SPECIFICATION
HW321

**IMPERVIOUS CONTINUOUSLY
WELDED ARMOR – POWER CABLE**

**600 Volt UL Type MC-LS, CT USE, 90°C
XLP XHHW-2 Insulation
Aluminum Armor, Copper Conductors
Low Smoke Zero Halogen Jacket**

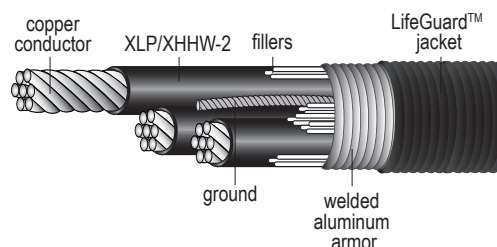


ARMORED CABLE

Catalog Number	Size AWG/kcmil	Number of Conductors	Number of Strands	Insulation Thickness Mils	Ground Wire Size AWG	Armor Diameter Inch	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW321 00803	8	3	7	45	10	0.78	60	0.90	437
HW321 00804	8	4	7	45	10	0.83	60	0.95	507
HW321 00603	6	3	7	45	8	0.87	60	0.99	585
HW321 00604	6	4	7	45	8	0.91	60	1.03	683
HW321 00403	4	3	7	45	8	0.91	60	1.03	747
HW321 00404	4	4	7	45	8	1.05	60	1.17	919
HW321 00203	2	3	7	45	6	1.30	60	1.42	1377
HW321 00204	2	4	7	45	6	1.30	60	1.42	1356
HW321 00103	1	3	19	55	6	1.30	60	1.42	1330
HW321 00104	1	4	19	55	6	1.43	60	1.55	1642
HW321 10103	1/0	3	19	55	6	1.35	60	1.57	1566
HW321 10104	1/0	4	19	55	6	1.47	60	1.59	1950
HW321 20103	2/0	3	19	55	6	1.47	60	1.59	1930
HW321 20104	2/0	4	19	55	4	1.59	70	1.73	2420
HW321 40103	4/0	3	19	55	6	1.67	70	1.81	2782
HW321 40104	4/0	4	19	55	4	1.87	70	2.01	3548
HW321 25003	250	3	37	65	3	1.87	70	2.01	3269
HW321 25004	250	4	37	65	4	2.04	70	2.18	4116
HW321 35003	350	3	337	65	3	2.04	70	2.18	4376
HW321 35004	350	4	37	65	3	2.29	85	2.46	5633
HW321 50003	500	3	37	65	2	2.43	85	2.60	6041
HW321 50004	500	4	37	65	2	2.67	85	2.84	7891
HW321 75003	750	3	61	80	1	2.93	85	3.10	8906
HW321 75004	750	4	61	80	1	3.22	95	3.41	11530

IMPERVIOUS CONTINUOUSLY WELDED ARMOR – POWER CABLE

**600 Volt UL Type MC-LS, CT USE, 90°C
XLP XHHW-2 Insulation
Aluminum Armor, Copper Conductors
Low Smoke Zero Halogen Jacket**



APPLICATION:

LifeGuard™ Low Smoke Zero Halogen* cable is for use in power, control and lighting circuits in a broad range of commercial and industrial applications. The impervious armor provides maximum conductor protection and prevents the entrance of water, gas and corrosive elements into the electrical core. The LifeGuard™ jacket is highly flame retardant, produces very small amounts of smoke when burned and contains no halogens. It is ideal for applications where a high degree of safety and equipment protection is required.

LifeGuard™ cable is UL listed, Type MC-LS per UL 1685 and approved for installation indoors or outdoors, aerially, in conduits, ducts, cable trays and direct burial in circuits not exceeding 600 volts. It may be installed in temperatures as low as -30°C and used in hazardous locations. It is UL approved for continuous operation at 90°C in wet and dry locations, 130°C for emergency overload conditions, and 250°C for short circuit conditions.

Impervious continuously welded and corrugated aluminum armor is recommended as an economical alternative to wire in conduit systems.

PRODUCT FEATURES:

- Tray rated
- Sunlight-resistant
- Approved for direct burial
- Very low smoke production when burned
- LifeGuard™ jacket produces zero halogens during fire – less toxic and corrosive
- LifeGuard™ jacket is environmentally safe – lead, sulfur and halogen free
- Highly chemical resistant
- Very flame retardant
- Burns to an ash – does not exhibit thermoplastic drip
- Excellent compression and impact resistance
- Superior tensile strength and abrasion resistance
- Flexible jacket with low coefficient of friction

CONDUCTOR:

Soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8

INSULATION:

Cross-linked polyethylene (XLP) per ICEA S-95-658 and UL Standard 44 for Type XHHW-2 conductors

GROUNDING CONDUCTOR:

Soft bare annealed copper per ASTM B-3, Class B stranding per ASTM B-8 sized in accordance with UL Standard 1277

ARMOR:

Impervious continuously welded and corrugated aluminum

JACKET:

Sunlight-resistant and flame-retardant, Low Smoke Zero Halogen polyolefin per UL Standard 1277

FLAME TESTS:

- IEEE 1202 (70,000 BTU/hr) Flame Test
- IEEE 383 (70,000 BTU/hr) Flame Test
- ICEA T-29-520 (210,000 BTU/hr) Flame Test

COLOR CODE:

ICEA Method 1, Table E-2

ADDITIONAL STANDARDS:

- UL 1685
- NEMA WC70

SECTION H

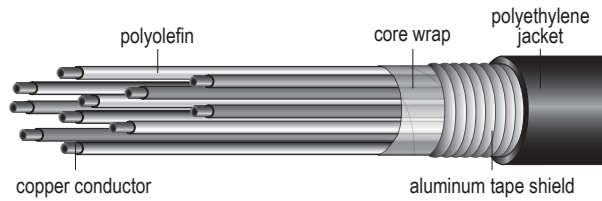
Outside Plant Communication Cable

DESCRIPTION	RUS/REA TYPE	SPECIFICATION	PAGE
Aerial and Duct Telephone Cable	PE-22	HW350	171
Self-Supporting Telephone Cable	PE-38	HW351	172
Filled, Direct Burial, Telephone Cable	PE-39	HW352	173
Filled, Direct Burial, Rodent Resistant Telephone Cable	PE-39	HW353	174
Filled, Double Jacketed, Direct Burial, Telephone Cable	PE-86	HW354	175
Filled, Direct Burial, Foam Skin, Telephone Cable	PE-89	HW355	176

SPECIFICATION
HW350

TELEPHONE CABLE

Aerial and Duct
RUS/REA Specification PE-22
Copper Conductors



Catalog Number	Size AWG	Number of Pairs	Outside Diameter Inches	Net Weight Lbs/Mft
HW350 01906	19	6	0.54	108
HW350 01912	19	12	0.66	180
HW350 01925	19	25	0.82	325
HW350 01950	19	50	1.06	593
HW350 02206	22	6	0.46	69
HW350 02212	22	12	0.54	109
HW350 02225	22	25	0.66	184
HW350 02250	22	50	0.82	324
HW350 22100	22	100	1.06	589
HW350 02406	24	6	0.38	54
HW350 02412	24	12	0.46	81
HW350 02425	24	25	0.53	132
HW350 02450	24	50	0.67	225
HW350 24100	24	100	0.87	401

APPLICATION:

For use in aerial applications when supported by a messenger or in pressurized ducts.

CONDUCTORS:

Solid soft bare annealed copper, individual conductors are twisted into pairs with varying lay lengths to minimize crosstalk

INSULATION:

Solid polyolefin

CORE WRAP:

Non-hygroscopic, dielectric tape with overlap

SHIELD:

Corrugated, copolymer coated, 8-mil aluminum tape longitudinally applied with overlap

JACKET:

Black, sunlight-resistant, linear low-density polyethylene

COLOR CODE:

Color Code Chart 5

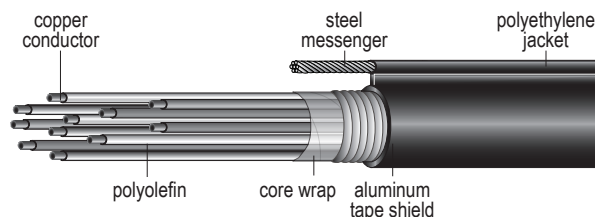
ADDITIONAL STANDARDS:

ANSI/ICEA S-85-625-1996 (formerly REA PE-22)

OUTSIDE PLANT COMMUNICATION

TELEPHONE CABLE

**Self-Supporting Cable (Figure 8)
RUS/REA Specification PE-38
Copper Conductors**



Catalog Number	Size AWG	Number of Pairs	Outside Diameter Inches	Net Weight Lbs/Mft
HW351 01906	19	6	0.96	272
HW351 01912	19	12	1.08	343
HW351 01925	19	25	1.28	496
HW351 01950	19	50	1.56	765
HW351 02206	22	6	0.88	232
HW351 02212	22	12	0.96	270
HW351 02225	22	25	1.08	345
HW351 02250	22	50	1.28	492
HW351 02406	24	6	0.84	217
HW351 02412	24	12	0.88	243
HW351 02425	24	25	0.99	293
HW351 02450	24	50	1.13	383

APPLICATION:

For use in aerial installations as a self-supporting cable that is an integral combination of a support member (messenger) and the cable core. The parallel configuration of the messenger and cable core create a cross-sectional area resembling a Figure 8.

CONDUCTORS:

Solid soft bare annealed copper, individual conductors are twisted into pairs with varying lay lengths to minimize crosstalk

INSULATION:

Solid polyolefin

CORE WRAP:

Non-hygroscopic, dielectric tape with overlap

SHIELD:

Corrugated, copolymer coated, 8-mil aluminum tape longitudinally applied with overlap

SUPPORT MEMBER:

1/4 inch 7-strand extra high strength (EHS) galvanized steel messenger, the messenger is flooded to inhibit corrosion

JACKET:

Black, sunlight-resistant, linear low-density polyethylene

COLOR CODE:

Color Code Chart 5

ADDITIONAL STANDARDS:

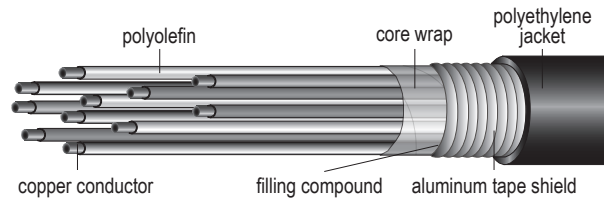
ANSI/ICEA S-85-625-1996 (formerly REA PE-38)

OUTSIDE PLANT COMMUNICATION

SPECIFICATION
HW352

TELEPHONE CABLE

Filled, Direct Burial
RUS/REA Specification PE-39
Copper Conductors



Catalog Number	Size AWG	Number of Pairs	Outside Diameter Inches	Net Weight Lbs/Mft
HW352 01906	19	6	0.63	154
HW352 01912	19	12	0.79	262
HW352 01925	19	25	1.05	479
HW352 01950	19	50	1.37	894
HW352 02206	22	6	0.47	93
HW352 02212	22	12	0.59	149
HW352 02225	22	25	0.75	259
HW352 02250	22	50	0.99	457
HW352 22100	22	100	1.29	835
HW352 02406	24	6	0.41	71
HW352 02412	24	12	0.51	108
HW352 02425	24	25	0.63	180
HW352 02450	24	50	0.83	310
HW352 24100	24	100	1.05	555

OUTSIDE PLANT COMMUNICATION

APPLICATION:

For use in wet environments where protection from moisture is required. Approved for direct burial, duct or aerial installations when supported by a messenger.

CONDUCTORS:

Solid soft bare annealed copper. Individual conductors are twisted into pairs with varying lay lengths to minimize crosstalk.

INSULATION:

Solid polyolefin

FILLING COMPOUND:

Cable core is filled with an extended thermoplastic rubber (ETPR) filling the interstices between the pairs and under the core tape.

CORE WRAP:

Non-hygroscopic, dielectric tape with overlap

SHIELD:

Corrugated, copolymer coated, 8-mil aluminum tape longitudinally applied with overlap, the shield interfaces are flooded with an adhesive compound to provide a moisture barrier and inhibit corrosion.

JACKET:

Black, sunlight-resistant, linear low-density polyethylene

COLOR CODE:

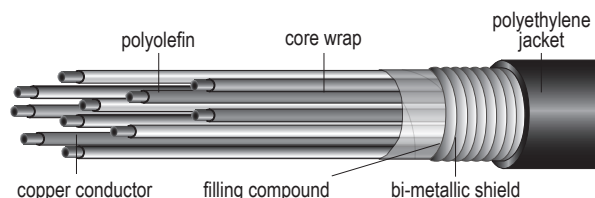
Color Code Chart 5

ADDITIONAL STANDARDS:

- ANSI/ICEA S-84-608-1994
- RUS 7 CFR 1755.390 (formerly REA PE-39)

TELEPHONE CABLE

**Filled, Direct Burial, Rodent Resistant
RUS/REA Specification PE-39
Copper Conductors**



Catalog Number	Size AWG	Number of Pairs	Outside Diameter Inches	Net Weight Lbs/Mft
HW353 01906	19	6	0.63	173
HW353 01912	19	12	0.79	285
HW353 01925	19	25	1.05	513
HW353 01950	19	50	1.37	940
HW353 02206	22	6	0.47	107
HW353 02212	22	12	0.59	167
HW353 02225	22	25	0.75	283
HW353 02250	22	50	0.99	490

APPLICATION:

For use in wet environments where protection from moisture and rodents is required. Approved for direct burial, duct or aerial installations when supported by a messenger.

CONDUCTORS:

Solid soft bare annealed copper. Individual conductors are twisted into pairs with varying lay lengths to minimize cross-talk.

INSULATION:

Solid polyolefin

FILLING COMPOUND:

Cable core is filled with an extended thermoplastic rubber (ETPR) filling the interstices between the pairs and under the core tape

CORE WRAP:

Non-hygroscopic, dielectric tape with overlap

SHIELD:

Corrugated, rodent resistant copper alloy or copper clad steel tape longitudinally applied with overlap, the shield interfaces are flooded with an adhesive compound to provide a moisture barrier and inhibit corrosion

JACKET:

Black, sunlight-resistant, linear low-density polyethylene

COLOR CODE:

Color Code Chart 5

ADDITIONAL STANDARDS:

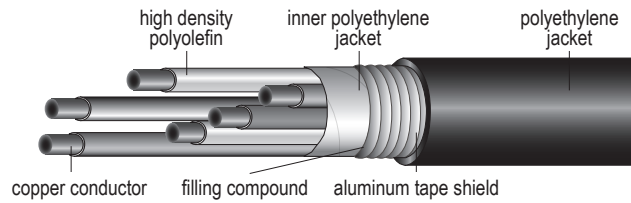
- ANSI/ICEA S-84-608-1994
- RUS 7 CFR 1755.390 (formerly REA PE-39)

OUTSIDE PLANT COMMUNICATION

SPECIFICATION
HW354

TELEPHONE CABLE

**Filled, Double Jacketed, Direct Burial
RUS/REA Specification PE-86
Copper Conductors**



Catalog Number	Size AWG	Number of Pairs	Outside Diameter Inches	Net Weight Lbs/Mft
HW354 01902	19	2	0.37	59
HW354 01913	19	3	0.43	79
HW354 02202	22	2	0.31	40
HW354 02203	22	3	0.33	49

APPLICATION:

For use in wet environments where protection from moisture is required in distribution circuits and service entrance. Approved for direct burial, duct or aerial installations when supported by a messenger.

CONDUCTORS:

Solid soft bare annealed copper. Individual conductors are twisted into pairs with varying lay lengths in order to minimize crosstalk

INSULATION:

Solid high density-polyolefin

FILLING COMPOUND:

Cable core is filled with an extended thermoplastic rubber (ETPR) filling the interstices between the pairs

INNER JACKET:

Black, linear low-density polyethylene

SHIELD:

Smooth, copolymer coated, 8-mil aluminum tape longitudinally applied over the inner jacket

JACKET:

Black, sunlight-resistant, linear low-density polyethylene

COLOR CODE:

Color Code Chart 5

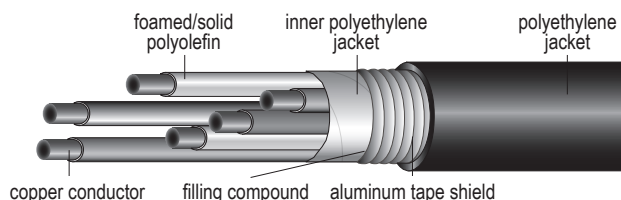
ADDITIONAL STANDARDS:

- ANSI/ICEA S-86-634-1996
- BDW G, RUS PE-86

OUTSIDE PLANT COMMUNICATION

TELEPHONE CABLE

**Filled, Direct Burial
RUS/REA Specification PE-89
Copper Conductors**



Catalog Number	Size AWG	Number of Pairs	Outside Diameter Inches	Net Weight Lbs/Mft
HW355 01906	19	6	0.55	127
HW355 01912	19	12	0.65	211
HW355 01925	19	25	0.86	382
HW355 01950	19	50	1.13	693
HW355 02206	22	6	0.45	82
HW355 02212	22	12	0.53	130
HW355 02225	22	25	0.67	221
HW355 02250	22	50	0.85	386
HW355 22100	22	100	1.13	701
HW355 02406	24	6	0.39	64
HW355 02412	24	12	0.44	96
HW355 02425	24	25	0.57	157
HW355 02450	24	50	0.73	266
HW355 24100	24	100	0.93	472
HW355 24200	24	200	1.21	864
HW355 24300	24	300	1.42	1273

APPLICATION:

For use in wet environments where protection from moisture is required. Approved for direct burial, duct or aerial installations when supported by a messenger.

CONDUCTORS:

Solid soft bare annealed copper. Individual conductors are twisted into pairs with varying lay lengths to minimize crosstalk

INSULATION:

Dual layer of foamed polyolefin and solid polyolefin

FILLING COMPOUND:

Cable core is filled with an extended thermoplastic rubber (ETPR) filling the interstices between the pairs and under the core tape

CORE WRAP:

Non-hygroscopic, dielectric tape with overlap

SHIELD:

Corrugated, copolymer coated, 8-mil aluminum tape longitudinally applied with overlap, the shield interfaces are flooded with an adhesive compound to provide a moisture barrier and inhibit corrosion

JACKET:

Black, sunlight-resistant, linear low-density polyethylene

COLOR CODE:

Color Code Chart 5

ADDITIONAL STANDARDS:

- ANSI/ICEA S-84-608-1994
- RUS 7 CFR 1755.890 (formerly REA PE-89)

OUTSIDE PLANT COMMUNICATION

SECTION I

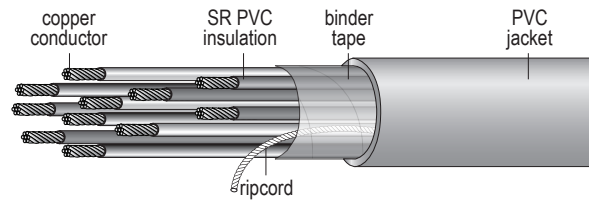
Voice, Data & Premise Wire

DESCRIPTION	SHIELD	TYPE	ARTICLE	SPECIFICATION	PAGE
Voice, Data & Premise Wire					
Multiple Conductor	NON-SHIELED	CMR	725 & 800	HW400	178
Multiple Conductor	O/S	CMR	725 & 800	HW401	179
Multiple Pair	NON-SHIELED	CMR	725 & 800	HW402	180
Multiple Pair	O/S	CMR	725 & 800	HW403	181
Multiple Pair	I/S	CMR	725 & 800	HW404	182
Multiple Conductor	NON-SHIELED	CMP	725 & 800	HW405	183
Multiple Conductor	O/S	CMP	725 & 800	HW406	184
Multiple Pair	O/S	CMP	725 & 800	HW407	186
Multiple Pair	I/S	CMP	725 & 800	HW408	187
Multiple Conductor Fire Alarm	NON-SHIELED	FPLR	760	HW409	188
Multiple Conductor Fire Alarm	O/S	FPLR	760	HW410	189
Multiple Conductor Fire Alarm	NON-SHIELED	FPLR	760	HW411	190
Multiple Conductor Fire Alarm	O/S	FPLR	760	HW412	191
High Speed Data Cable					
Category 3		CMR, CMP		HW413	192
Category 5		CMR, CMP		HW414	193
Category 5e		CMR, CMP		HW415	194
Belden Data Twist® 5e		CM, CMR, CMP		HW416	195
Belden Data Twist® 350		CM, CMR, CMP		HW417	196
Belden Data Twist® 6		CMR, CMP		HW418	197
Belden Media Twist®		CMR, CMP		HW419	198

SPECIFICATION
HW400

MULTIPLE CONDUCTOR

UL Type CMR, CL3R, 75°C
Non-Shielded
PVC Insulation & PVC Jacket
Copper Conductors



Catalog Number	Size AWG	Number of Conductors	Number of Strands	Insulation Thickness Mils	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW400 02202	22	2	7	8	15	0.12	9
HW400 02203	22	3	7	8	15	0.14	13
HW400 02204	22	4	7	8	15	0.16	17
HW400 02206	22	6	7	8	15	0.17	22
HW400 02208	22	8	7	8	15	0.18	27
HW400 02212	22	12	7	8	15	0.22	42
HW400 02002	20	2	7	8	15	0.13	11
HW400 02003	20	3	7	8	15	0.13	18
HW400 02004	20	4	7	8	15	0.14	20
HW400 01802	18	2	7	8	15	0.16	18
HW400 01803	18	3	7	9	15	0.17	24
HW400 01804	18	4	7	9	15	0.18	31
HW400 01806	18	6	7	9	15	0.23	46
HW400 01808	18	8	7	9	15	0.25	59
HW400 01812	18	12	7	9	15	0.29	86
HW400 01602	16	2	19	9	15	0.18	26
HW400 01603	16	3	19	9	15	0.19	35
HW400 01604	16	4	19	9	15	0.21	47
HW400 01402	14	2	19	13	15	0.22	41
HW400 01403	14	3	19	13	15	0.24	55
HW400 01404	14	4	19	13	15	0.26	72
HW400 01202	12	2	19	13	15	0.26	57

APPLICATION:

For use in remote control signaling and power-limited circuit applications where protection from electrostatic interference is not required, for security, intercom, public address, sound and audio systems.

CONDUCTORS:

Stranded soft bare annealed copper per ASTM B-3

INSULATION:

Semi-rigid PVC

JACKET:

Gray PVC with a ripcord applied longitudinally under the jacket to facilitate stripping

FLAME TESTS:

UL 1666 Flame Test

COLOR CODE:

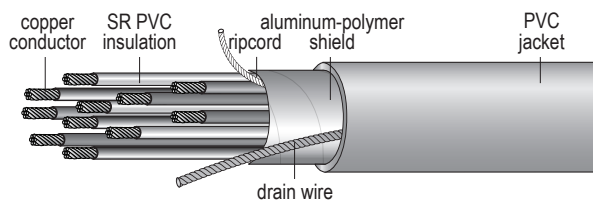
See Appendix, Chart 1

ADDITIONAL STANDARDS:

- 22 AWG -16 AWG – UL Standard 13, NEC Article 725 Type CL3R and UL Standard 444, NEC Article 800 Type CMR
- 14 AWG -12 AWG – UL Standard 13, NEC Article 725 Type CL3R
- RoHS Compliant

MULTIPLE CONDUCTOR

**UL Type CMR, CL3R, 75°C
Overall Shield
PVC Insulation & PVC Jacket
Copper Conductors**



Catalog Number	Size AWG	Number of Conductors	Number of Strands	Insulation Thickness Mils	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW401 02202	22	2	7	8	15	0.13	12
HW401 02203	22	3	7	8	15	0.14	16
HW401 02204	22	4	7	8	15	0.15	20
HW401 02206	22	6	7	8	15	0.17	26
HW401 02208	22	8	7	8	15	0.20	31
HW401 02212	22	12	7	8	15	0.23	42
HW401 02002	20	2	7	8	15	0.15	17
HW401 02003	20	3	7	8	15	0.15	21
HW401 02004	20	4	7	8	15	0.17	25
HW401 01802	18	2	7	9	15	0.16	21
HW401 01803	18	3	7	9	15	0.17	28
HW401 01804	18	4	7	9	15	0.19	35
HW401 01806	18	6	7	9	15	0.23	50
HW401 01808	18	8	7	9	15	0.25	63
HW401 01812	18	12	7	9	15	0.30	90
HW401 01602	16	2	19	9	15	0.19	29
HW401 01603	16	3	19	9	15	0.20	39
HW401 01604	16	4	19	9	15	0.22	50
HW401 01402	14	2	19	13	15	0.25	46
HW401 01403	14	3	19	13	15	0.25	61
HW401 01404	14	4	19	13	15	0.27	79

APPLICATION:

For use in remote control signaling and power-limited circuit applications where protection from electrostatic interference is required, for security, intercom, public address, sound and audio systems.

CONDUCTORS:

Stranded soft bare annealed copper per ASTM B-3

INSULATION:

Semi-rigid PVC

OVERALL SHIELD:

Aluminum-polymer tape providing 100% coverage with a flexible 7-strand tinned copper drain wire

JACKET:

Gray PVC with a ripcord applied longitudinally under the jacket to facilitate stripping.

FLAME TESTS:

UL 1666 Flame Test

COLOR CODE:

See Appendix, Chart 1

ADDITIONAL STANDARDS:

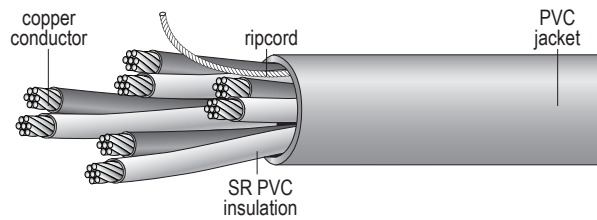
- 22 AWG - 16 AWG: UL Standard 13, NEC Article 725 Type CL3R and UL Standard 444, NEC Article 800 Type CMR
- 14 AWG – UL Standard 13 Type CL3R, NEC Article 725

VOICE, DATA & PREMISE WIRE

SPECIFICATION
HW402

MULTIPLE PAIR

UL Type CMR, CL3R, 75°C
Non-Shielded
PVC Insulation & PVC Jacket
Copper Conductors



Catalog Number	Size AWG	Number of Pairs	Number of Strands	Insulation Thickness Mils	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW402 02202	22	2	7	10	15	0.19	19
HW402 02203	22	3	7	10	15	0.21	26
HW402 02204	22	4	7	10	15	0.23	32
HW402 01802	18	2	7	10	15	0.25	34
HW402 01803	18	3	7	10	15	0.27	48

APPLICATION:

For use in remote control signaling and power-limited circuit applications where protection from electrostatic interference is not required, for security, intercom, public address, sound and audio systems.

CONDUCTORS:

Stranded soft bare annealed copper per ASTM B-3

INSULATION:

Semi-rigid PVC

JACKET:

Gray PVC with a ripcord applied longitudinally under the jacket to facilitate stripping

FLAME TESTS:

UL 1666 Flame Test

COLOR CODE:

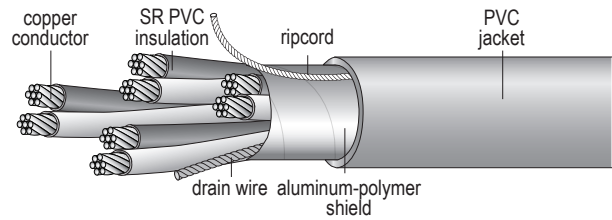
See Appendix, Chart 2

ADDITIONAL STANDARDS:

- UL Standard 13, NEC Article 725 Type CL3R
- UI Standard 444, NEC Article 800 Type CMR

MULTIPLE PAIR

**UL Type CMR, CL3R, 75°C
Overall Shield
PVC Insulation & PVC Jacket
Copper Conductors**



Catalog Number	Size AWG	Number of Pairs	Number of Strands	Insulation Thickness Mils	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW403 02202	22	2	7	10	15	0.20	9
HW403 02203	22	3	7	10	15	0.21	12
HW403 02204	22	4	7	10	15	0.23	15
HW403 02206	22	6	7	10	15	0.28	21

APPLICATION:

For use in remote control signaling and power-limited circuit applications where protection from electrostatic interference is required, for security, intercom, public address, sound and audio systems.

CONDUCTORS:

Stranded soft bare annealed copper per ASTM B-3

INSULATION:

Semi-rigid PVC

OVERALL SHIELD:

Aluminum-polymer tape providing 100% coverage with a flexible 7-strand tinned copper drain wire

JACKET:

Gray PVC with a ripcord applied longitudinally under the jacket to facilitate stripping.

FLAME TESTS:

UL 1666 Flame Test

COLOR CODE:

See Appendix, Chart 2

ADDITIONAL STANDARDS:

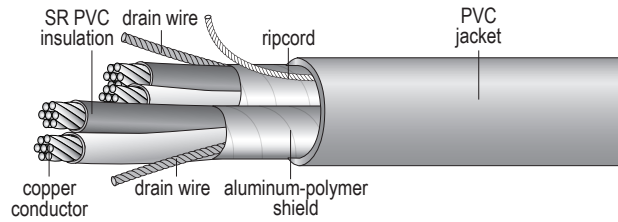
- UL Standard 13, NEC Article 725 Type CL3R
- UI Standard 444, NEC Article 800 Type CMR

VOICE, DATA & PREMISE WIRE

SPECIFICATION
HW404

MULTIPLE PAIR

UL Type CMR, CL3R, 75°C
Individually Shielded Pairs
PVC Insulation & PVC Jacket
Copper Conductors



Catalog Number	Size AWG	Number of Pairs	Number of Strands	Insulation Thickness Mils	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW403 02202	22	2	7	10	15	0.22	25
HW403 02203	22	3	7	10	15	0.24	34
HW403 02204	22	4	7	10	15	0.27	44
HW403 02206	22	6	7	10	15	0.32	64

APPLICATION:

For use in remote control signaling and power-limited circuit applications where superior protection from electrostatic interference is required, for security, intercom, public address, sound and audio systems.

CONDUCTORS:

Stranded soft bare annealed copper per ASTM B-3

INSULATION:

Semi-rigid PVC

INDIVIDUAL SHIELD:

Aluminum-polymer tape providing 100% coverage with a flexible 7-strand tinned copper drain wire

JACKET:

Gray PVC with a ripcord applied longitudinally under the jacket to facilitate stripping

FLAME TESTS:

UL 1666 Flame Test

COLOR CODE:

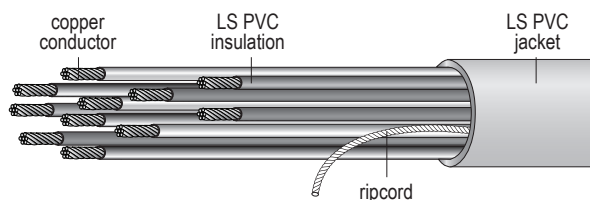
See Appendix, Chart 2

ADDITIONAL STANDARDS:

- UL Standard 13, NEC Article 725 Type CL3R
- UL Standard 444, NEC Article 800 Type CMR

**PLENUM CABLE –
MULTIPLE CONDUCTOR**

**UL Type CMP or CL3P, 75°C
Non-Shielded
LS PVC Insulation & LS PVC Jacket
Copper Conductors**



Catalog Number	Size AWG	Number of Conductors	Number of Strands	Insulation Thickness Mils	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW405 02202	22	2	7	8	15	0.12	12
HW405 02203	22	3	7	8	15	0.13	14
HW405 02204	22	4	7	8	15	0.14	19
HW405 02206	22	6	7	8	15	0.16	24
HW405 02208	22	8	7	8	15	0.18	30
HW405 02212	22	12	7	8	15	0.22	43
HW405 02002	20	2	7	8	15	0.14	16
HW405 02003	20	3	7	8	15	0.15	20
HW405 02004	20	4	7	8	15	0.16	25
HW405 02008	20	8	7	8	15	0.21	42
HW405 02012	20	12	7	8	15	0.25	61
HW405 01802	18	2	7	8	15	0.16	18
HW405 01803	18	3	7	8	15	0.17	25
HW405 01804	18	4	7	8	15	0.19	30
HW405 01806	18	6	7	8	15	0.22	48
HW405 01808	18	8	7	8	15	0.25	61
HW405 01812	18	12	7	8	15	0.29	91
HW405 01602	16	2	19	8	15	0.17	26
HW405 01603	16	3	19	8	15	0.19	36
HW405 01604	16	4	19	8	15	0.20	46
HW405 01606	16	6	19	8	15	0.25	46
HW405 01608	16	8	19	8	15	0.34	62
HW405 01402	14	2	19	8	15	0.22	42
HW405 01403	14	3	19	8	15	0.24	60
HW405 01404	14	4	19	8	15	0.26	78
HW405 01206	12	2	19	8	15	0.26	60

APPLICATION:

For use in plenum areas in remote control signaling and power-limited circuit applications where protection from electrostatic interference is not required, for security systems, intercom and public address systems and sound and audio systems.

CONDUCTORS:

Stranded soft bare annealed copper per ASTM B-3

INSULATION:

Low smoke PVC (LS PVC)

JACKET:

Beige low smoke PVC (LS PVC) with a ripcord applied longitudinally under the jacket to facilitate stripping

FLAME TESTS:

UL 910 Steiner Tunnel Flame Test

COLOR CODE:

See Appendix Chart 1

ADDITIONAL STANDARDS:

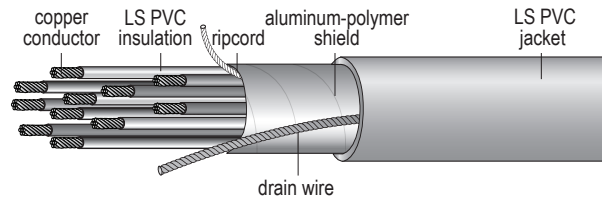
- 22 AWG -16 AWG – UL Standard 13, NEC Article 725 Type CL3P and UL Standard 444, NEC Article 800 Type CMP
- 14 AWG -12 AWG – UL Standard 13, NEC Article 725 Type CL3P

VOICE, DATA & PREMISE WIRE

SPECIFICATION
HW406

**PLENUM CABLE –
MULTIPLE CONDUCTOR**

UL Type CMP or CL3P, 75°C
Overall Shield
LS PVC Insulation & LS PVC Jacket
Copper Conductors



Catalog Number	Size AWG	Number of Conductors	Number of Strands	Insulation Thickness Mils	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW406 02202	22	2	7	8	15	0.13	15
HW406 02203	22	3	7	8	15	0.13	17
HW406 02204	22	4	7	8	15	0.15	19
HW406 02206	22	6	7	8	15	0.17	28
HW406 02208	22	8	7	8	15	0.19	36
HW406 02210	22	10	7	8	15	0.21	39
HW406 02212	22	12	7	8	15	0.22	47
HW406 02002	20	2	7	8	15	0.14	18
HW406 02003	20	3	7	8	15	0.15	22
HW406 02004	20	4	7	8	15	0.17	28
HW406 02008	20	8	7	8	15	0.21	45
HW406 02012	20	12	7	8	15	0.27	61
HW406 01802	18	2	7	8	15	0.16	21
HW406 01803	18	3	7	8	15	0.17	29
HW406 01804	18	4	7	8	15	0.19	35
HW406 01806	18	6	7	8	15	0.22	51
HW406 01808	18	8	7	8	15	0.25	65
HW406 01810	18	10	7	8	15	0.29	79
HW406 01812	18	12	7	8	15	0.30	94

APPLICATION:

For use in plenum areas in remote control signaling and power-limited circuit applications where protection from electrostatic interference is required, for security, intercom, public address, sound and audio systems.

CONDUCTORS:

Stranded soft bare annealed copper per ASTM B-3

INSULATION:

Low smoke PVC (LS PVC)

OVERALL SHIELD:

Aluminum-polymer tape providing 100% coverage with a flexible 7-strand tinned copper drain wire

JACKET:

Beige low smoke PVC (LS PVC) with a ripcord applied longitudinally under the jacket to facilitate stripping

FLAME TESTS:

UL 910 Steiner Tunnel Flame Test

COLOR CODE:

See Appendix Chart 1

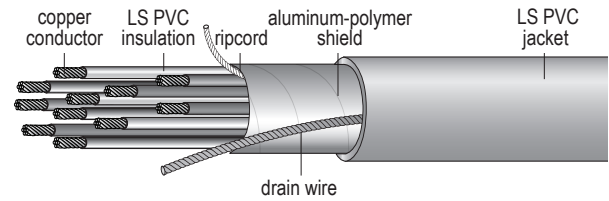
ADDITIONAL STANDARDS:

- 22 AWG - 16 AWG – UL Standard 13, NEC Article 725 Type CL3P and UL Standard 444, NEC Article 800 Type CMP

VOICE, DATA & PREMISE WIRE

**PLENUM CABLE –
MULTIPLE CONDUCTOR**

**UL Type CMP or CL3P, 60°C
Overall Shield
LS PVC Insulation & LS PVC Jacket
Copper Conductors**



Catalog Number	Size AWG	Number of Conductors	Number of Strands	Insulation Thickness Mils	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW406 01602	16	2	19	8	15	0.18	29
HW406 01603	16	3	19	8	15	0.19	38
HW406 01604	16	4	19	8	15	0.22	48
HW406 01606	16	6	19	8	15	0.25	68
HW406 01608	16	8	19	8	15	0.29	93
HW406 01402	14	2	19	8	15	0.22	44
HW406 01403	14	3	19	8	15	0.23	60
HW406 01404	14	4	19	8	15	0.26	78
HW406 01202	12	2	19	8	15	0.24	62

APPLICATION:

For use in plenum areas in remote control signaling and power-limited circuit applications where protection from electrostatic interference is required, for security systems, intercom, public address, sound and audio systems.

CONDUCTORS:

Stranded soft bare annealed copper per ASTM B-3.

INSULATION:

Low smoke PVC (LSPVC)

OVERALL SHIELD:

Aluminum-polymer tape providing 100% coverage with a flexible 7-strand tinned copper drain wire.

JACKET:

Beige low smoke PVC (LS PVC) with a ripcord applied longitudinally under the jacket to facilitate stripping.

FLAME TESTS:

UL 910 Steiner Tunnel Flame Test

COLOR CODE:

See Appendix Chart 1

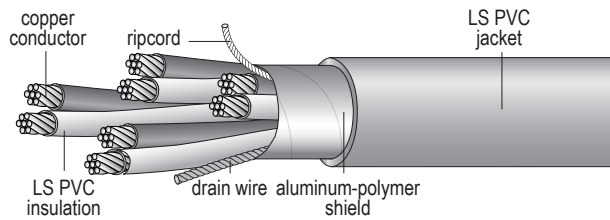
ADDITIONAL STANDARDS:

- 22 AWG - 16 AWG – UL Standard 13, NEC Article 725 Type CL3P and UL Standard 444, NEC Article 800 Type CMP
- 14 AWG - 12 AWG – UL Standard 13, NEC Article 725 Type CL3P

SPECIFICATION
HW407

**PLENUM CABLE –
MULTIPLE PAIR**

UL Type CMP or CL3P, 60°C
Overall Shield
LS PVC Insulation & LS PVC Jacket
Copper Conductors



Catalog Number	Size AWG	Number of Pairs	Number of Strands	Insulation Thickness Mils	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW407 02402	24	2	7	8	15	0.17	17
HW407 02403	24	3	7	8	15	0.18	22
HW407 02404	24	4	7	8	15	0.20	27
HW407 02406	24	6	7	8	15	0.24	37
HW407 02409	24	9	7	8	15	0.28	49
HW407 02202	22	2	7	8	15	0.19	25
HW407 02203	22	3	7	8	15	0.20	28
HW407 02204	22	4	7	8	15	0.22	35
HW407 02206	22	6	7	8	15	0.27	48
HW407 02209	22	9	7	8	15	0.29	68
HW407 01802	18	2	7	8	15	0.25	40
HW407 01804	18	4	7	8	15	0.29	69

APPLICATION:

For use in plenum areas in remote control signaling and power-limited circuit applications where protection from electrostatic interference is required, for security, intercom, public address, sound and audio systems.

CONDUCTORS:

Stranded soft bare annealed copper per ASTM B-3

INSULATION:

Low smoke PVC (LS PVC)

OVERALL SHIELD:

Aluminum-polymer tape providing 100% coverage with a flexible 7-strand tinned copper drain wire

JACKET:

Beige low smoke PVC (LSPVC) with a ripcord applied longitudinally under the jacket to facilitate stripping

FLAME TESTS:

UL 910 Steiner Tunnel Flame Test

COLOR CODE:

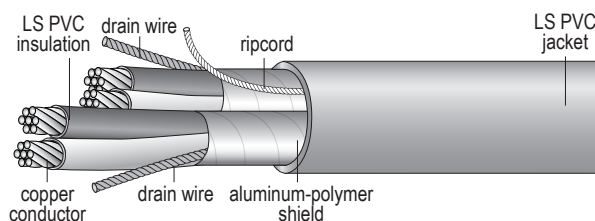
See Appendix Chart 2

ADDITIONAL STANDARDS:

- UL Standard 13, NEC Article 725 Type CL3P
- UL Standard 444, NEC Article 800 Type CMP

**PLENUM CABLE –
MULTIPLE PAIR**

**UL Type CMP, CL3P, 60°C
Individually Shield Pairs
LS PVC Insulation & LS PVC Jacket
Copper Conductors**



Catalog Number	Size AWG	Number of Pairs	Number of Strands	Insulation Thickness Mils	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW408 02202	22	2	7	9	15	0.22	26
HW408 02203	22	3	7	9	15	0.23	37
HW408 02204	22	4	7	9	15	0.26	46
HW408 02206	22	6	7	9	15	0.31	58

APPLICATION:

For use in plenum areas in remote control signaling and power-limited circuit applications where superior protection from electrostatic interference is required, for security, intercom, public address, sound and audio systems.

CONDUCTORS:

Stranded soft bare annealed copper per ASTM B-3

INSULATION:

Low smoke PVC (LS PVC)

INDIVIDUAL SHIELD:

Aluminum-polymer tape providing 100% coverage with a flexible 7-strand tinned copper drain wire

JACKET:

Beige low smoke PVC (LS PVC) with a ripcord applied longitudinally under the jacket to facilitate stripping

FLAME TESTS:

UL 910 Steiner Tunnel Flame Test

COLOR CODE:

See Appendix, Chart 2

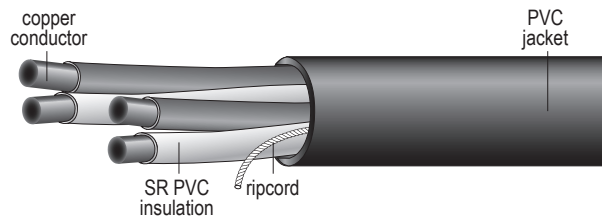
ADDITIONAL STANDARDS:

- UL Standard 13, NEC Article 725 Type CL3P
- UL Standard 444, NEC Article 800 Type CMP

SPECIFICATION
HW409

FIRE ALARM CABLE

UL Type FPLR, 60°C
Non-Shielded
PVC Insulation & PVC Jacket
Copper Conductors



Catalog Number	Size AWG	Number of Conductors	Number of Strands	Insulation Thickness Mils	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW409 01802	18	2	Solid	10	15	0.15	17
HW409 01804	18	4	Solid	10	15	0.18	30
HW409 01806	18	6	Solid	10	15	0.21	43
HW409 01808	18	8	Solid	10	15	0.23	58
HW409 01602	16	2	Solid	10	15	0.17	25
HW409 01604	16	4	Solid	10	15	0.20	45
HW409 01402	14	2	Solid	13	15	0.21	39
HW409 01404	14	4	Solid	13	15	0.25	69
HW409 01202	12	2	Solid	13	15	0.24	31

APPLICATION:

For use in fire protective signaling applications where protection from electrostatic interference is not required, for fire alarms, smoke detectors, burglar alarms, and signal monitoring and detection systems.

CONDUCTORS:

Solid soft bare annealed copper per ASTM B-3

INSULATION:

Semi-rigid PVC

JACKET:

Red PVC with a ripcord applied longitudinally under the jacket to facilitate stripping

FLAME TESTS:

UL 1666 Flame Test

COLOR CODE:

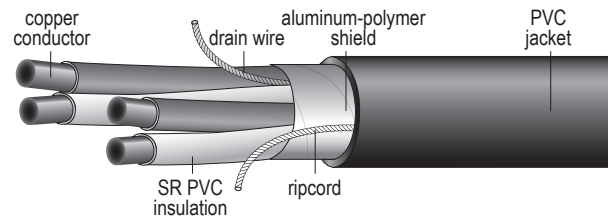
See Appendix, Chart 3

ADDITIONAL STANDARDS:

- NEC Article 760
- UL Standard 1424

FIRE ALARM CABLE

**UL Type FPLR, 60°C
Overall Shield
PVC Insulation & PVC Jacket
Copper Conductors**



Catalog Number	Size AWG	Number of Conductors	Number of Strands	Insulation Thickness Mils	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW410 01802	18	2	Solid	10	15	0.16	21
HW410 01804	18	4	Solid	10	15	0.18	33
HW410 01806	18	6	Solid	10	15	0.22	48
HW410 01808	18	8	Solid	10	15	0.24	61
HW410 01602	16	2	Solid	10	15	0.18	28
HW410 01604	16	4	Solid	10	15	0.21	47
HW410 01402	14	2	Solid	13	15	0.22	44
HW410 01404	14	4	Solid	13	15	0.25	75
HW410 01202	12	2	Solid	13	15	0.25	62

APPLICATION:

For use in fire protective signaling applications where protection from electrostatic interference is not required, for fire alarms, smoke detectors, burglar alarms, and signal monitoring and detection systems.

CONDUCTORS:

Solid soft bare annealed copper per ASTM B-3

INSULATION:

Semi-rigid PVC

OVERALL SHIELD:

Aluminum-polymer tape providing 100% coverage with a flexible 7-strand tinned copper drain wire

JACKET:

Red PVC with a ripcord applied longitudinally under the jacket to facilitate stripping

FLAME TESTS:

UL 1666 Flame Test

COLOR CODE:

See Appendix, Chart 3

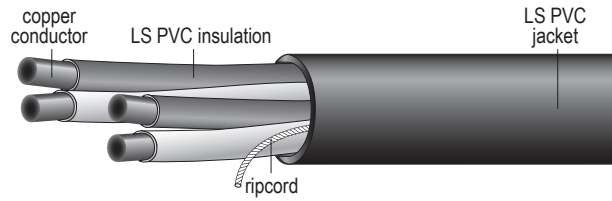
ADDITIONAL STANDARDS:

- NEC Article 760
- UL Standard 1424

SPECIFICATION
HW411

FIRE ALARM CABLE

UL Type FPLP, 60°C
Non-Shielded
LS PVC Insulation & LS PVC Jacket
Copper Conductors



Catalog Number	Size AWG	Number of Conductors	Number of Strands	Insulation Thickness Mils	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW411 01802	18	2	Solid	10	15	0.16	19
HW411 01804	18	4	Solid	10	15	0.18	31
HW411 01806	18	6	Solid	10	15	0.21	47
HW411 01808	18	8	Solid	10	15	0.23	60
HW411 01602	16	2	Solid	10	15	0.17	26
HW411 01604	16	4	Solid	10	15	0.20	47
HW411 01402	14	2	Solid	12	15	0.21	39
HW411 01404	14	4	Solid	12	15	0.24	69
HW411 01202	12	2	Solid	13	15	0.24	55

APPLICATION:

For use in fire protective signaling applications where protection from electrostatic interference is not required, for fire alarms, smoke detectors, burglar alarms, and signal monitoring and detection systems.

CONDUCTORS:

Solid soft bare annealed copper per ASTM B-3

INSULATION:

Low smoke PVC (LS PVC)

JACKET:

Red low smoke PVC (LS PVC) with a ripcord applied longitudinally under the jacket to facilitate stripping

FLAME TESTS:

UL 910 Steiner Tunnel Flame Test

COLOR CODE:

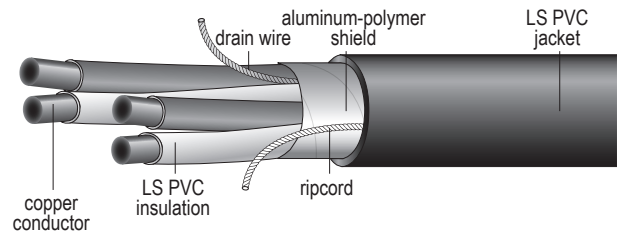
See Appendix, Chart 3

ADDITIONAL STANDARDS:

- NEC Article 760
- UL Standard 1424

FIRE ALARM CABLE

**UL Type FPLP, 60°C
Overall Shield
LS PVC Insulation & LS PVC Jacket
Copper Conductors**



Catalog Number	Size AWG	Number of Conductors	Number of Strands	Insulation Thickness Mils	Jacket Thickness Mils	Overall Diameter Inches	Net Weight Lbs/Mft
HW412 01802	18	2	Solid	10	15	0.16	21
HW412 01804	18	4	Solid	10	15	0.18	35
HW412 01806	18	6	Solid	10	15	0.22	50
HW412 01808	18	8	Solid	10	15	0.23	63
HW412 01602	16	2	Solid	10	15	0.18	29
HW412 01604	16	4	Solid	10	15	0.21	49
HW412 01402	14	2	Solid	12	15	0.21	45
HW412 01404	14	4	Solid	12	15	0.25	76
HW412 01202	12	2	Solid	13	15	0.25	62

APPLICATION:

For use in fire protective signaling applications where protection from electrostatic interference is required, for fire alarms, smoke detectors, burglar alarms, and signal monitoring and detection systems.

CONDUCTORS:

Solid soft bare annealed copper per ASTM B-3

INSULATION:

Low smoke PVC (LS PVC)

OVERALL SHIELD:

Aluminum-polymer tape providing 100% coverage with a flexible 7-strand tinned copper drain wire

JACKET:

Red low smoke PVC (LS PVC) with a ripcord applied longitudinally under the jacket to facilitate stripping

FLAME TESTS:

UL 910 Steiner Tunnel Flame Test

COLOR CODE:

See Appendix, Chart 3

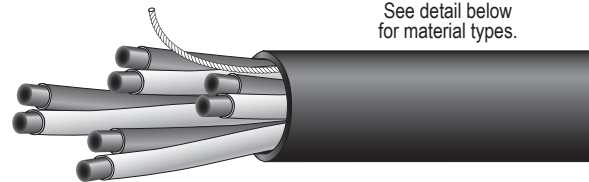
ADDITIONAL STANDARDS:

- NEC Article 760
- UL Standard 1424

SPECIFICATION
HW413

CATEGORY 3

**UL Type CMR and CMP
Copper Conductors**



Catalog Number	Size AWG	Number of Pairs	Overall Diameter Inch	Net Weight Lbs/Mft
TYPE CMR				
HW413 2402R	24	2	0.12	9
HW413 2403R	24	3	0.14	12
HW413 2404R	24	4	0.16	15
HW413 2406R	24	6	0.19	22
HW413 2412R	24	12	0.24	41
HW413 2425R	24	25	0.33	80
HW413 2450R	24	50	0.47	160
HW413 24100R	24	100	0.64	308
HW413 24200R	24	200	0.85	724
TYPE CMP				
HW413 2402P	24	2	0.14	10
HW413 2403P	24	3	0.15	15
HW413 2404P	24	4	0.17	18
HW413 2406P	24	6	0.20	24
HW413 2412P	24	12	0.28	53
HW413 2425P	24	25	0.40	106
HW413 2450P	24	50	0.56	191
HW413 24100P	24	100	0.77	377
HW413 24200P	24	200	1.10	728

APPLICATION:

For use in high speed data transmission in Category 3 applications such as voice telephony, IEEE 802.3, 10 Base T, and 100 Base T.

CONDUCTORS:

Solid soft bare annealed copper per ASTM B-3

INSULATION:

- CMR – Semi-rigid PVC
- CMP – Semi-rigid PVC

JACKET:

- CMR – PVC
- CMP – Low smoke PVC (LS PVC)

FLAME TESTS:

- CMR – UL 1666 Flame Test, CSA FT4
- CMP – UL 910 Flame Test, CSA FT6

COLOR CODE:

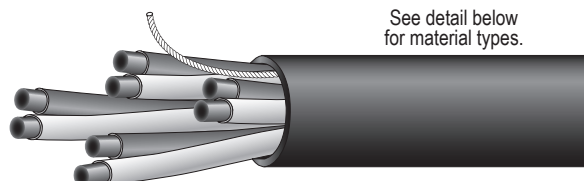
See Appendix, Chart 4

ADDITIONAL STANDARDS:

- CMR – UL Type MRP/CMR, C(UL) CMG
- CMP – UL Type MPP/CMP, C(UL) CMP
- TIA/EIA 568-A Category 3
- IEEE 802.3 10 Base T, 100 Base T4
- NEMA WC-63.1

CATEGORY 5

**UL Type CMR and CMP
Copper Conductors**



Catalog Number	Size AWG	Number of Pairs	Overall Diameter Inch	Net Weight Lbs/Mft
TYPE CMR				
HW414 2402R	24	2	0.16	15
HW414 2404R	24	4	0.20	21
HW413 2425R	24	25	0.50	130
TYPE CMP				
HW414 2402P	24	2	0.18	16
HW414 2404P	24	4	0.20	28
HW413 2425P	24	25	0.55	146

APPLICATION:

For use in high speed data transmission in Category 5 applications such as 10 Base T, 100 Base T, 100 Base VG AnyLan, and 155 ATM.

CONDUCTORS:

Solid soft bare annealed copper per ASTM B-3

INSULATION:

- CMR – Polyolefin
- CMP – Fluorinated ethylene propylene (FEP)

JACKET:

- CMR – PVC
- CMP – Low smoke PVC (LS PVC)

FLAME TESTS:

- CMR – UL 1666 Flame Test CSA FT4
- CMP – UL 910 Flame Test CSA FT6

COLOR CODE:

See Appendix, Chart 4

ADDITIONAL STANDARDS:

- CMR – UL/NEC Type MRP/CMR, C(UL) Type CMG
- CMP – UL/NEC Type MPP/CMP, C(UL) Type CMP
- TIA/EIA 568-A Category 5
- NEMA WC-63.1

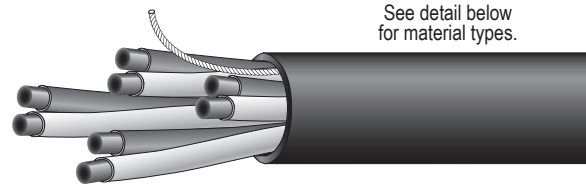
NOTE:

Available with an overall shield of aluminum-polymer tape providing 100% coverage with a flexible 7-strand tinned copper drain wire

SPECIFICATION
HW415

CATEGORY 5E

**UL Type CMR and CMP
Copper Conductors**



Catalog Number	Size AWG	Number of Pairs	Overall Diameter Inches	Nominal Imp. Ohms	Nominal Vel. of Prop %	Nominal Cap. pF/ft	Net Weight Lbs/Mft
TYPE CMR							
HW415 2404R	24	4	0.195	100	69	15	22
TYPE CMP							
HW415 2404P	24	4	0.187	100	71	15	20

APPLICATION:

For use in high speed data transmission in Category 5e applications such as 10 Base T, 100 Base TX, 100 Base VG and 1000 Base T.

CONDUCTORS:

Solid soft bare annealed copper per ASTM B-3

INSULATION:

- CMR – Polyolefin
- CMP – Fluorinated ethylene propylene (FEP)

JACKET:

- CMR – PVC
- CMP – Low smoke PVC (LS PVC)

FLAME TESTS:

- CMR – UL 1666 Flame Test, CSA FT4
- CMP – UL 910 Flame Test, CSA FT6

COLOR CODE:

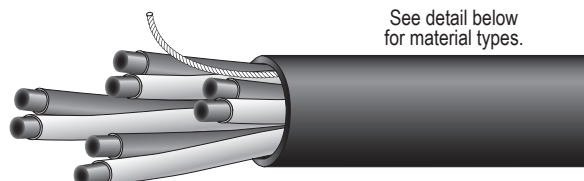
See Appendix, Chart 4

ADDITIONAL STANDARDS:

- CMR – UL/NEC Type CMR, C(UL) Type CMR ANSI/TIA/EIA 568-B.2 Category 5e
- CMP – UL/NEC Type MPP, C(UL) Type CMP ANSI/TIA/EIA 568-A.5 Category 5e
- ISO/IEC 11801 Category 5
- NEMA WC-63.1

BELDEN DATA TWIST®

**Category 5E
UL Type CM, CMR and CMP
Copper Conductors**



Catalog Number	Size AWG	Number of Pairs	Insulation Thickness Mils	Jacket Thickness Mils	Overall Diameter Inch	Nom Conductor DCR Ohms	Nom. Imp. Ohms	Nom. Vel. of Prop %	Nom. Cap.	Net Weight Lbs/Mft
TYPE CM										
HW416 1583A	24	4	7.5	17	0.21	26	100	70	15	24
TYPE CMR										
HW416 1583R	24	4	7.5	18	0.21	26	100	70	15	21
TYPE CMP										
HW416 1583P	24	4	7.0	15	0.20	26	100	72	15	28

APPLICATION:

For use in high speed data transmission in Category 5e applications such as 10 Base T, 100 Base TX, 100 Base VG AnyLan, and 155 ATM, 622 ATM and GigaBit Ethernet.

CONDUCTORS:

Solid soft bare annealed copper per ASTM B-3

INSULATION:

- CM – Polyolefin
- CMR – Polyolefin
- CMP – Fluorinated ethylene propylene (FEP)

JACKET:

- CM – PVC
- CMR – PVC
- CMP – Low smoke PVC (LS PVC)

FLAME TESTS:

- CM – UL 1581 Flame Test, CSA FT1
- CMR – UL 1666 Flame Test CSA FT4
- CMP – UL 910 Flame Test, CSA FT6

COLOR CODE:

See Appendix, Chart 4

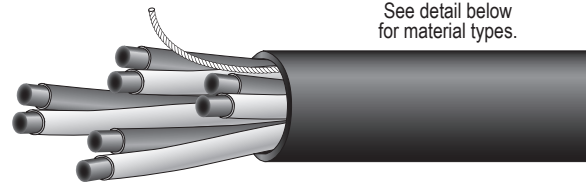
ADDITIONAL STANDARDS:

- CM – UL Type CM, C(UL) Type CM
- CMR – UL Type CMR, C(UL) Type CMR
- CMP – UL Type CMP, C(UL) Type CMP
- UL Verified to Category 5, ANSI/TIA/EIA 568-B.2 Category 5e
- ISO/IEC 11801 Category 5
- IEEE 802.3 10 Base T, 100 Base T4
- NEMA WC-63.1

SPECIFICATION
HW417

BELDEN DATA TWIST®

**Exceeds Category 5E
UL Type CM, CMR and CMP
Copper Conductors**



See detail below
for material types.

Catalog Number	Size AWG	Number of Pairs	Insulation Thickness Mils	Jacket Thickness Mils	Overall Diameter Inch	Nom Conductor DCR Ohms	Nom. Imp. Ohms	Nom. Vel. of Prop %	Nom. Cap.	Net Weight Lbs/Mft
TYPE CM										
HW417 1700A	24	4	9	17	0.21	24	100	70	15	27
TYPE CMR										
HW417 1700R	24	4	9	17	0.21	24	100	70	15	27
TYPE CMP										
HW417 1701P	24	4	8	15	0.21	24	100	72	15	25

APPLICATION:

For use in high speed data transmission in Category 5e applications such as 10 Base T, 100 Base TX, 100 Base VG AnyLan, and 155 ATM. Ideal for use in high bandwidth existing or future applications such as 622 ATM and GigaBit Ethernet. Multimedia applications include AES/EBU digital audio and RS-422 machine control, which normally require shielded twisted pairs. Will also support NTSC and PAL composite serial digital video and NTSC/PAL component serial digital video, which normally require coaxial cables. UL tested for use with high speed Audio-Video Systems in accordance with FCC Class A Digital Devices at a fundamental frequency of 135 MHz (270 Mbps). Ideal for noisy environments such as running next to power cables and transformers.

CONDUCTORS:

Solid soft bare annealed copper per ASTM B-3

INSULATION:

- CM – Polyolefin
- CMR – Polyolefin
- CMP – Fluorinated ethylene propylene (FEP)

JACKET:

- CM – PVC
- CMR – Polyolefin
- CMP – Low smoke PVC (LS PVC)

FLAME TESTS:

- CM – UL 1581 Flame Test, CSA FT1
- CMR – UL 1666 Flame Test, CSA FT4
- CMP – UL 910 Flame Test, CSA FT6

COLOR CODE:

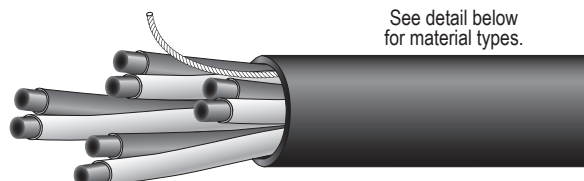
See Appendix, Chart 4

ADDITIONAL STANDARDS:

- CM – UL Type CM, C(UL) Type CM
- CMR – UL Type CMR, C(UL) Type CMR
- CMP – UL Type CMP, C(UL) Type CMP
- ANSI/TIA/EIA 568-B.2 Category 5e
- ISO/IEC 11801 Category 5
- NEMA WC-63.1

BELDEN DATA TWIST® 6

**Meets Category 6 Draft 10 Specs
UL Type CMR and CMP
Copper Conductors**



Catalog Number	Size AWG	Number of Pairs	Insulation Thickness Mils	Jacket Thickness Mils	Overall Diameter Inch	Nom Conductor DCR Ohms	Nom. Imp. Ohms	Nom. Vel. of Prop %	Nom. Cap.	Net Weight Lbs/Mft
TYPE CMR										
HW418 7881A	23	4	10	23	0.24	25	100	72	15	28
TYPE CMP										
HW418 7882A	23	4	8	17	0.23	21	100	72	15	27

APPLICATION:

For use in high speed data transmission applications intended for Category 6 type cables such as 10 Base T, 100 Base T, 155 ATM and GigaBit Ethernet (1000 Base T).

CONDUCTORS:

Solid soft bare annealed copper per ASTM B-3

INSULATION:

- CMR – Polyolefin
- CMP – Fluorinated ethylene propylene (FEP)

JACKET:

- CMR – PVC
- CMP – Low smoke PVC (LS PVC)

FLAME TESTS:

- CMR – UL 1666 Flame Test, CSA FT4
- CMP – UL 910 Flame Test, CSA FT6

COLOR CODE:

See Appendix, Chart 4

ADDITIONAL STANDARDS:

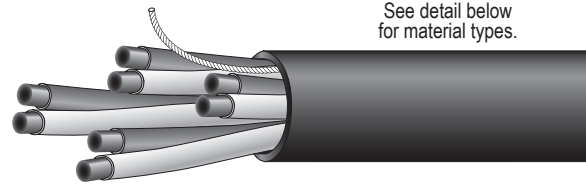
- CMR – UL Type CMR, C(UL) Type CMR
- CMP – UL Type CMP, C(UL) Type CMP
- TIA/EIA Draft 10 Category 6

VOICE, DATA & PREMISE WIRE

SPECIFICATION
HW419

BELDEN MEDIA TWIST®

Exceeds Category 6 Draft 10 Specs
UL Type CMR and CMP
Copper Conductors



Catalog Number	Size AWG	Number of Pairs	Insulation Thickness Mils	Jacket Thickness Mils	Overall Diameter Inch	Nom Conductor DCR Ohms	Nom. Imp. Ohms	Nom. Vel. of Prop %	Nom. Cap.	Net Weight Lbs/Mft
TYPE CMR										
HW419 1872A	23	4	9.0	20	0.37	27.4	100	70	15	29
TYPE CMP										
HW419 1974A	23	4	8.6	20	0.37	27.4	100	72	15	31

APPLICATION:

For use in high speed data transmission in Category 6 applications such as 100 Base TX, 100 Base VG AnyLan, and 155 ATM. Ideal for use in high bandwidth existing or future applications such as 622 ATM and GigaBit Ethernet. Multimedia applications include AES/EBU digital audio and RS-422 machine control, which normally require shielded twisted pairs. Will also support NTSC and PAL composite serial digital video and NTSC/PAL component serial digital video, which normally require coaxial cables. Many of these can be combined for shared-sheath applications – multiple applications using the same cable. UL tested for use with high speed Audio-Video Systems in accordance with FCC Class A Digital Devices at a fundamental frequency of 135 MHz (270 Mbps). Ideal for noisy environments such as running next to power cables and transformers.

CONDUCTORS:

Solid soft bare annealed copper per ASTM B-3

INSULATION:

- CMR – Polyolefin
- CMP – Fluorinated ethylene propylene (FEP)

JACKET:

- CMR – PVC
- CMP – Low smoke PVC (LS PVC)

FLAME TESTS:

- CMR – UL 1666 riser Flame Test
UL 1581 Flame Test
CSA FT4
- CMP – UL 910 Flame Test
CSA FT6

COLOR CODE:

See Appendix, Chart 4

ADDITIONAL STANDARDS:

- CMR – UL Type CMR, CMG, CM, C(UL) Type CMR, CMG, CM
- CMP – UL Type CMP, C(UL) Type CMP
- TIA/EIA Draft 10 Category 6
- TIA/EIA 568B Category 5e
- ISO/IEC 11801 Category 5

SECTION J

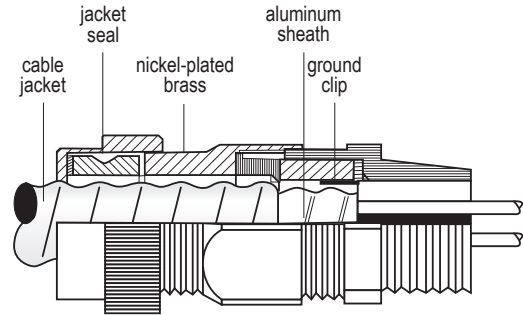
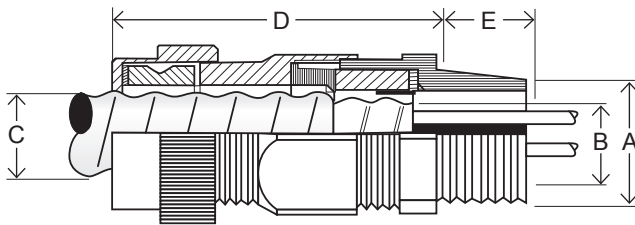
Cable Terminators

DESCRIPTION	SERIES	SPECIFICATION	PAGE
Pirelli Connectors			
Rain Tight	MC	416MC	200
Explosion Proof: Class I, Division 2	CU	424CU	201
Explosion Proof: Class I, Division 2	UN	424UN	202
Explosion Proof: Class I, Division 1	MA	424MA	203
CMP Connectors			
Rain Tight		TMC	204
Rain Tight		MCA	205
Explosion Proof: Class I, Division 1		TMCX	206

SPECIFICATION
416MC

416MC SERIES

Rain Tight Connectors
Non-Hazardous Environment
For Type MC Cables



Catalog Number	NPT Hub Size (A) Inch	Cable Diameters				Connector Dimensions		Weight Lbs
		Overall Armor (B)		Overall (C)		Protrusion Length (D) Inch	Hub Length (E) Inch	
		Min. Inch	Max. Inch	Min. Inch	Max. Inch			
416MC02	½	0.46	0.50	0.56	0.62	1.93	0.54	0.40
416MC03	¾	0.49	0.59	0.51	0.76	2.20	0.63	0.60
416MC04	1	0.65	0.78	0.67	1.05	2.40	0.75	0.75
416MC05	1 ¼	0.87	1.01	0.95	1.30	2.64	0.79	1.20
416MC06	1 ½	1.10	1.24	1.14	1.44	2.68	0.81	1.50
416MC07	2	1.32	1.44	1.36	1.65	2.56	0.85	1.60
416MC08	2 ½	1.51	1.82	1.55	2.22	3.74	1.26	4.95
416MC09	3	2.07	2.42	2.11	2.85	3.90	1.23	5.25
416MC10	3 ½	2.90	3.07	2.76	3.52	4.35	1.38	7.95

APPLICATION:

MC series rain tight connectors provide efficient, cost effective terminations of corrugated metal-clad cable, whether continuous corrugated or interlocked construction. Rain tight connectors are UL approved for use in the most severe outdoor environments.

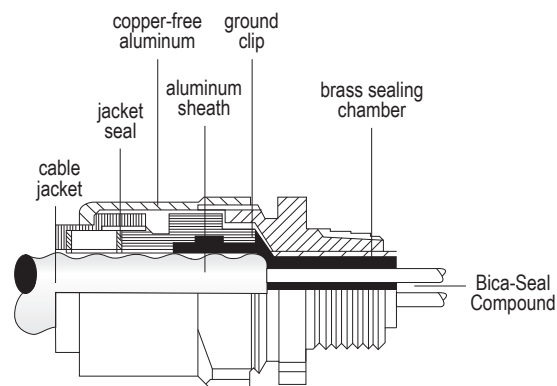
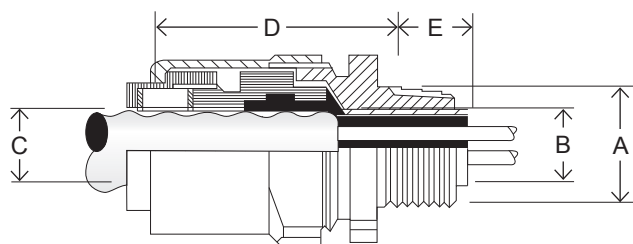
FEATURES:

- All nickel-plated brass construction
- Wide range of cables per connector
- Continuity clip for efficient grounding
- Quick three-step installation
- Water and dust-proof barrier
- Nickel-plated brass construction virtually indestructable

CABLE TERMINATORS

424CU SERIES

Explosion Proof Connectors Class I, Division 2 For Type MC Cables



Catalog Number	NPT Hub Size (A) Inch	Cable Diameters				Connector Dimensions		Weight Lbs
		Overall Armor (B)		Overall (C)		Protrusion Length (D) Inch	Hub Length (E) Inch	
		Min. Inch	Max. Inch	Min. Inch	Max. Inch			
424CU02	½	0.30	0.57	0.35	0.63	1.85	0.54	0.50
424CU03	¾	0.47	0.68	0.51	0.76	2.08	0.55	0.50
424CU04	1	0.63	0.94	0.67	1.05	2.08	0.69	0.75
424CU05	1 ¼	0.83	1.14	0.97	1.30	2.16	0.71	1.25
424CU06	1 ½	1.02	1.54	1.14	1.65	2.16	0.77	1.75
424CU07	2 ½	1.48	2.00	1.61	2.10	2.24	1.14	2.25
424CU08	3	1.81	2.26	1.96	2.44	2.83	1.20	4.25
424CU09	3 ½	2.16	2.81	2.32	2.94	2.91	1.20	5.50

APPROVALS AND ACCEPTANCE:

Underwriters Laboratories

Listed for use in hazardous locations

Class I	Division 2	Groups A & B*
Class I	Division 2	Groups C & D
Class II	Division 2	Groups E, F & G
Class III	-	-

*½ and ¾ inch hub sizes

Canadian Standards Association

Approved for use in hazardous locations

Class I	Division 1 & 2	Groups A, B, C & D
Class II	Division 1 & 2	Groups E, F & G
Class III	-	-

FEATURES:

- Exterior components — aluminum
- Interior components — nickel-plated brass
- Built-in sealing chamber
- Sealing compound extrudes from inside out
- No voids in seal
- Seal completely encapsulates cable core
- Only eight sizes accommodate a wide range of cable sizes
- Built-in free-running hub allows for disconnect and reconnect without affecting integrity of seal
- Use of European-grade copper-free aluminum and/or nickel-plated brass minimizes any potential corrosion
- Effective 360° ground connection to armor

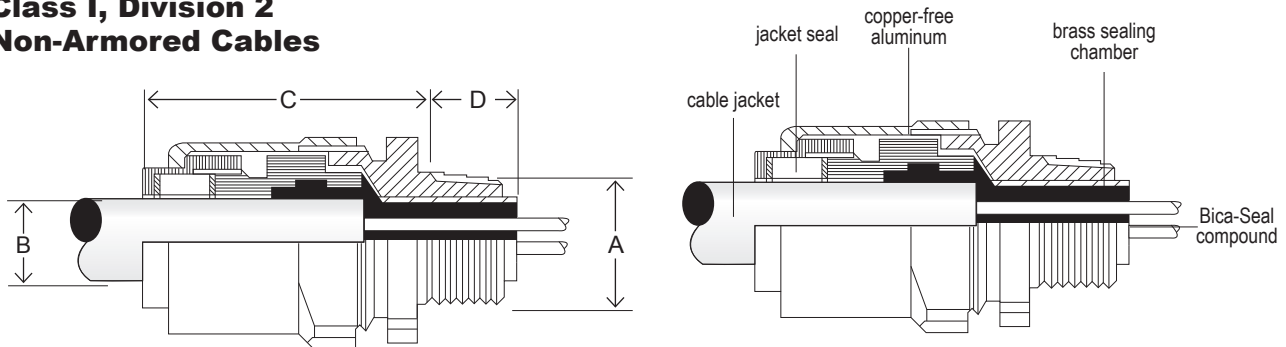
OPTION:

All nickel-plated brass components (424NB), meets requirements of American Bureau of Shipping

SPECIFICATION
424UN

424UN SERIES

Explosion Proof Connectors
Class I, Division 2
Non-Armored Cables



Catalog Number	NPT Hub Size (A) Inch	Cable Diameters		Connector Dimensions		Weight Lbs
		Overall Jacket (B)		Protrusion Length (D) Inch	Hub Length (D) Inch	
		Min. Inch	Max. Inch			
424UN02	½	0.35	0.62	1.85	0.54	0.50
424UN03	¾	0.51	0.76	1.96	0.55	0.50
424UN04	1	0.67	1.06	2.08	0.69	0.75
424UN05	1 ¼	0.95	1.26	2.16	0.71	1.25
424UN15	1 ½	0.95	1.26	2.16	0.73	1.25
424UN06	2	1.14	1.65	2.32	0.77	1.75
424UN07	2 ½	1.61	2.08	2.24	1.14	2.25
424UN08	3	1.96	2.42	2.83	1.20	4.25
424UN09	3 ½	2.15	2.91	2.91	1.20	5.50

APPROVALS AND ACCEPTANCE:

Underwriters Laboratories

Listed for use in hazardous locations

Class I	Division 2	Groups A & B*
Class I	Division 2	Groups C & D
Class II	Division 2	Groups E, F & G
Class III	-	-

*½ and ¾ inch hub sizes

Canadian Standards Association

Approved for use in hazardous locations

Class I	Division 1 & 2	Groups A, B, C & D
Class II	Division 1 & 2	Groups E, F & G
Class III	-	-

FEATURES:

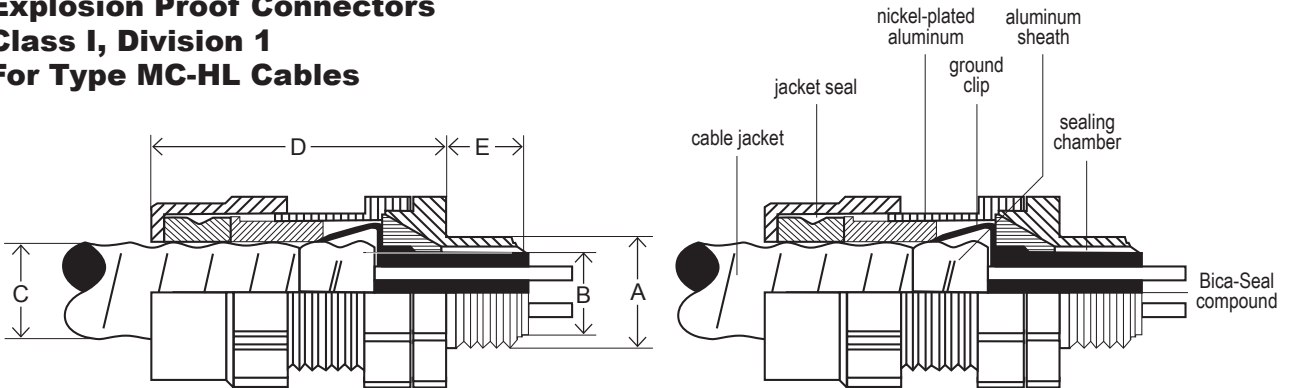
- Exterior components — aluminum
- Interior components — nickel-plated brass
- Built-in sealing chamber
- Sealing compound extrudes from inside out
- No voids in seal
- Seal completely encapsulates cable core
- Only eight sizes accommodate a wide range of cable sizes
- Built-in free-running hub allows for disconnect and reconnect without affecting integrity of seal
- Use of European-grade copper-free aluminum and/or nickel-plated brass minimizes any potential corrosion

OPTION:

All nickel-plated brass components (424BT), meets requirements of American Bureau of Shipping

424MA SERIES

**Explosion Proof Connectors
Class I, Division 1
For Type MC-HL Cables**



Catalog Number	NPT Hub Size (A) Inch	Cable Diameters				Connector Dimensions		Weight Lbs
		Overall Armor (B)		Overall (C)		Protrusion Length (D) Inch	Hub Length (E) Inch	
		Min. Inch	Max. Inch	Min. Inch	Max. Inch			
424MA02V	½	0.37	0.65	0.46	0.75	3.00	0.54	0.60
424MA03V	¾	0.47	0.87	0.54	1.00	3.05	0.55	0.86
424MA04V	1	0.86	1.11	0.89	1.23	2.85	0.69	1.10
424MA05V	1 ¼	1.08	1.36	1.23	1.44	3.20	0.71	1.48
424MA06V	1 ½	1.34	1.78	1.43	1.84	3.85	0.73	2.65
424MA07V	2	1.73	2.09	1.84	2.21	3.70	0.77	3.09
424MA08V	2 ½	2.07	2.60	2.14	2.76	4.25	1.14	4.96
424MA09V	3	2.57	2.87	2.69	3.04	3.35	1.20	4.52
424MA10V	3 ½	2.85	3.46	2.97	3.62	4.90	1.20	6.44
424MA11V	4	3.36	4.01	3.55	4.24	4.65	1.30	8.27

APPROVALS AND ACCEPTANCE:

Underwriters Laboratories

Listed for use in hazardous locations

Class I	Division 1 & 2	Groups A, B, C & D
Class II	Division 1 & 2	Groups E, F & G
Class III	-	-

Canadian Standards Association

Approved for use in hazardous locations

Class I	Division 1 & 2	Groups A, B, C & D
Class II	Division 1 & 2	Groups E, F & G
Class III	-	-

FEATURES:

- All nickel-plated aluminum construction
- Built-in sealing chamber
- No voids in seal
- Compound seal completely encapsulates cable core
- Built-in free-running hub allows for disconnect and reconnect without affecting integrity of seal
- Nickel-plated copper-free aluminum for the most demanding corrosive environments
- Superior 360° cable armor grounding mechanism for short circuit requirements
- Approved to UL Standard 2225 Class I Division 1

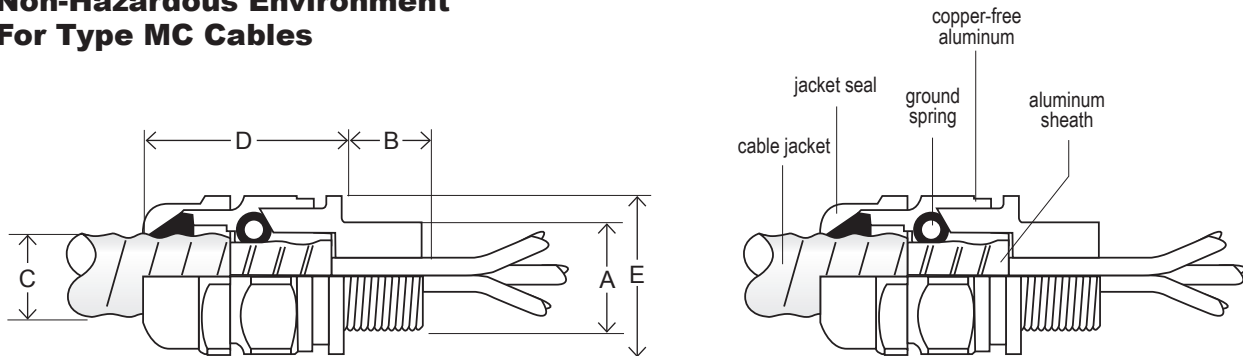
OTHER:

Meets requirements of American Bureau of Shipping

SPECIFICATION
TMC

TMC SERIES

Rain Tight Connectors
Non-Hazardous Environment
For Type MC Cables



Catalog Number	Entry Thread (A) Inch	Min Thread Length (B) Inch	Cable Armor Diameter				Jacket Diameter (C)		Nominal Assembly Length (D)	Envelope Diameter (E)	Shroud Reference
			End Stop In		End Stop Out		Min. Inch	Max. Inch			
			Min. Inch	Max. Inch	Min. Inch	Max. Inch					
TMC 050SA	½ NPT	0.59	–	–	0.34	0.50	0.35	0.55	2.20	1.31	PVC06
TMC 050A	½ NPT	0.59	–	–	0.51	0.67	0.55	0.79	2.20	1.57	PVC09
TMC 075A	¾ NPT	0.59	0.59	0.76	0.76	0.92	0.67	1.04	2.20	1.79	PVC10
TMC 100A	1 NPT	0.63	0.83	0.97	0.97	1.15	0.91	1.27	2.24	2.18	PVC13
TMC 125A	1 ¼ NPT	0.63	1.08	1.23	1.23	1.39	1.16	1.50	2.24	2.40	PVC16
TMC 150A	1 ½ NPT	0.63	1.32	1.46	1.46	1.62	1.40	1.74	2.37	2.62	PVC18
TMC 200SA	2 NPT	0.63	1.51	1.68	1.68	1.85	1.58	2.01	2.58	3.06	PVC21
TMC 200A	2 NPT	0.63	1.77	1.93	1.93	2.09	1.86	2.21	2.49	3.28	PVC24
TMC 250SA	2 ½ NPT	0.90	2.05	2.16	2.16	2.32	2.08	2.44	2.50	3.49	PVC25
TMC 250A	2 ½ NPT	0.90	2.25	2.41	2.41	2.55	2.33	2.68	2.52	3.71	PVC27
TMC 300A	3 NPT	0.98	2.54	2.78	2.78	2.97	2.62	3.13	3.57	4.80	PVC32
TMC 350A	3 ½ NPT	1.44	2.91	3.29	3.29	3.49	2.99	3.83	4.61	5.82	–
TMC 400A	4 NPT	1.44	2.91	3.29	3.29	3.49	2.99	3.83	4.61	5.82	–

APPLICATION:

MCRA series rain tight connectors provide efficient, cost effective terminations of corrugated metal-clad cable, whether continuous corrugated or interlocked construction. Rain tight connectors are UL and CSA approved for use in the most severe outdoor environments.

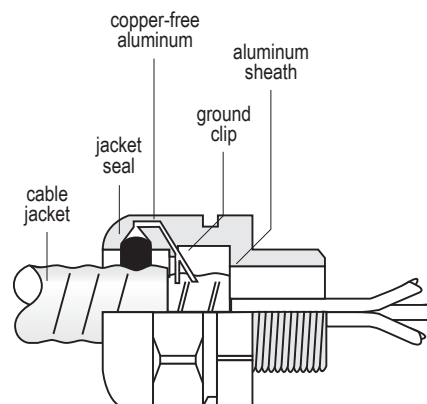
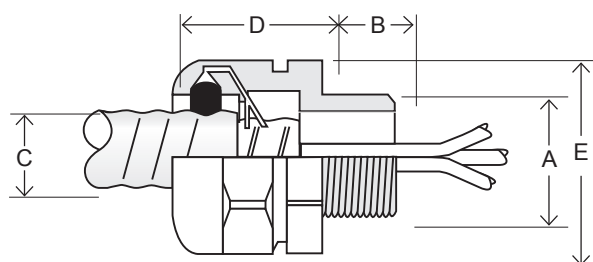
FEATURES:

- All copper-free aluminum construction, also available in brass (*replace the A at the end of the part number with NB*)
- Wide range of cables per connector
- Stainless steel compression spring for efficient grounding
- Quick three-step installation
- Water and dust-proof barrier
- Poseidon O-ring prevents ingress of moisture

CABLE TERMINATORS

MCA SERIES

**Rain Tight Connectors
Non-Hazardous Environment
For Teck Cables**



Catalog Number	Entry Thread (A) Inch	Min Thread Length (B) Inch	Cable Armor Diameter				Jacket Diameter (C)		Nominal Assembly Length (D)	Envelope Diameter (E)	Shroud Reference
			End Stop In		End Stop Out		Min. Inch	Max. Inch			
			Min. Inch	Max. Inch	Min. Inch	Max. Inch					
MCA 05S-1	½ NPT	0.59	–	–	0.34	0.50	0.35	0.55	2.20	1.31	PVC06
MCA 050-1	½ NPT	0.59	–	–	0.51	0.67	0.55	0.79	2.20	1.57	PVC09
MCA 075-1	¾ NPT	0.59	0.59	0.76	0.76	0.92	0.67	1.04	2.20	1.79	PVC10
MCA 100-1	1 NPT	0.63	0.83	0.97	0.97	1.15	0.91	1.27	2.24	2.18	PVC13
MCA 125-1	1 ¼ NPT	0.63	1.08	1.23	1.23	1.39	1.16	1.50	2.24	2.40	PVC16
MCA 150-1	1 ½ NPT	0.63	1.32	1.46	1.46	1.62	1.40	1.74	2.37	2.62	PVC18
MCA 20S-1	2 NPT	0.63	1.51	1.68	1.68	1.85	1.58	2.01	2.58	3.06	PVC21
MCA 200-1	2 NPT	0.63	1.77	1.93	1.93	2.09	1.86	2.21	2.49	3.28	PVC24
MCA 25S-1	2 ½ NPT	0.90	2.05	2.16	2.16	2.32	2.08	2.44	2.50	3.49	PVC25
MCA 250-1	2 ½ NPT	0.90	2.25	2.41	2.41	2.55	2.33	2.68	2.52	3.93	PVC27
MCA 300-1	3 NPT	0.98	2.54	2.78	2.78	2.97	2.62	3.13	3.57	4.80	PVC32
MCA 350-1	3 ½ NPT	1.44	2.91	3.29	3.29	3.49	2.99	3.83	4.61	5.82	–
MCA 400-1	4 NPT	1.44	2.91	3.29	3.29	3.49	2.99	3.83	4.61	5.82	–

APPROVALS AND ACCEPTANCE:

Underwriters Laboratories

CEC Class II Division 1 Groups E, F & G
CEC Class III – –
CEC Ex'e'zone 1 and zone 2

Canadian Standards Association

CSA Standard C22-2 Number 18, 174
Class II Division 1 & 2 Groups E, F & G
Class III – –

FEATURES:

- Copper-free aluminum components
- No disassembly required
- Ultra compact design
- Only 12 sizes accommodate a wide range of cable sizes
- Use of European-grade copper-free aluminum minimizes any potential corrosion
- Effective 360° ground connection to armor

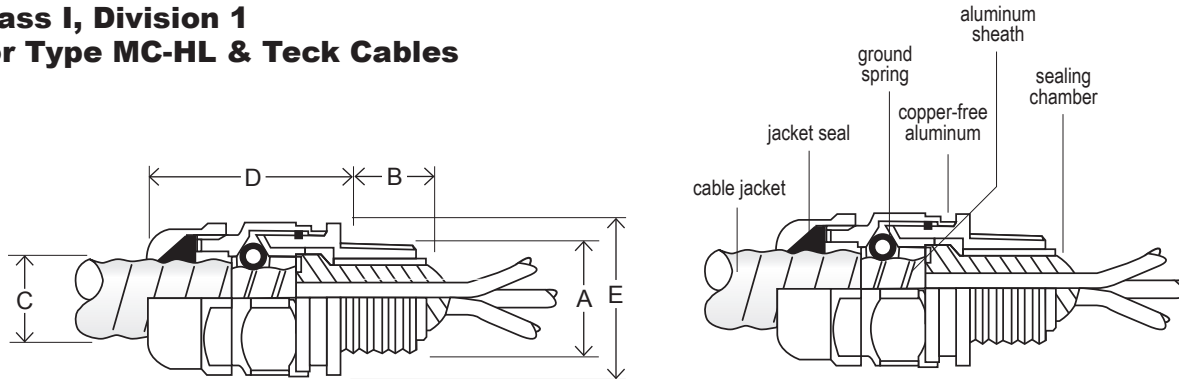
OPTION:

All nickel-plated brass or stainless steel components

SPECIFICATION
TMCX

TMCX SERIES

Explosion Proof Connectors
Class I, Division 1
For Type MC-HL & Teck Cables



Catalog Number	Entry Thread (A) Inch	Min Thread Length (B) Inch	Cable Armor Diameter				Jacket Diameter (C)		Nominal Assembly Length (D)	Envelope Diameter (E)	Shroud Reference
			End Stop In		End Stop Out		Min. Inch	Max. Inch			
			Min. Inch	Max. Inch	Min. Inch	Max. Inch					
TMCX 050A	½ NPT	0.59	–	–	0.34	0.50	0.35	0.55	1.93	1.31	PVC06
TMCX 050A	½ NPT	0.59	–	–	0.51	0.67	0.55	0.79	2.20	1.57	PVC09
TMCX 075A	¾ NPT	0.59	0.59	0.76	0.76	0.92	0.67	1.04	2.20	1.79	PVC10
TMCX 100A	1 NPT	0.63	0.83	0.97	0.97	1.15	0.91	1.27	2.24	2.18	PVC13
TMCX 125A	1 ¼ NPT	0.63	1.08	1.23	1.23	1.39	1.16	1.50	2.24	2.40	PVC16
TMCX 150A	1 ½ NPT	0.63	1.32	1.46	1.46	1.62	1.40	1.74	2.37	2.62	PVC18
TMCX 200SA	2 NPT	0.63	1.51	1.68	1.68	1.85	1.58	2.01	2.60	3.06	PVC21
TMCX 200A	2 NPT	0.63	1.77	1.93	1.93	2.09	1.86	2.21	2.81	3.28	PVC24
TMCX 250SA	2 ½ NPT	0.90	2.05	2.16	2.16	2.32	2.08	2.44	2.58	3.49	PVC25
TMCX 250A	2 ½ NPT	0.90	2.25	2.41	2.41	2.55	2.33	2.68	2.87	3.71	PVC27
TMCX 300A	3 NPT	0.98	2.54	2.78	2.78	2.97	2.62	3.13	3.92	4.80	PVC32
TMCX 350A	3 ½ NPT	1.44	2.91	3.29	3.29	3.49	2.99	3.83	4.61	5.82	–
TMCX 400A	4 NPT	1.44	2.91	3.29	3.29	3.49	2.99	3.83	4.61	5.82	–

APPROVALS AND ACCEPTANCE:

Underwriters Laboratories

Listed for use in hazardous locations

Class I	Division 1 & 2	Groups A, B, C & D
Class II	Division 1 & 2	Groups E, F & G
Class III	–	–

Canadian Standards Association

Approved for use in hazardous locations

Class I	Division 1 & 2	Groups A, B, C & D
Class II	Division 1 & 2	Groups E, F & G
Class III	–	–

FEATURES:

- All copper-free aluminum construction, also available in brass (*replace the A at the end of the part number with NB*)
- Built-in sealing chamber
- Integral deluge-proof O-ring
- No voids in seal
- Compound seal completely encapsulates cable core
- Built-in free-running hub allows for disconnect and reconnect without affecting integrity of seal
- Superior 360° cable armor grounding mechanism for short circuit requirements
- Approved to UL Standard 2225 Class I Division 1
- Approved to CSA Standard C22.2 No 18, 174
- Compact, slim profile

OTHER:

Meets requirements of American Bureau of Shipping

CABLE TERMINATORS

SECTION K

Technical Reference

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NEC SCOPE

The National Electrical Code is revised approximately every three years and the NEC Code is the latest word on safety and acceptable procedures. It is a consensus standard and has therefore been adopted by OSHA.

The National Electrical Code is not a safety manual, nor a design manual; it is not law in and of itself. It is an accumulation of rules which if followed should produce a safe and reliable installation. It becomes law if adopted by individual authorities over specific jurisdictions (i.e., state, city federal construction agencies, etc.).

The NFPA Electrical Committee is organized to contain representatives from each national organization which have a legitimate interest in the NEC, to adopt orderly procedures for change.

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WIRING METHODS

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334.....	Nonmetallic-Sheathed Cable: Types NM, NMC and NMS
336.....	Power and Control Tray Cable: Type TC
338.....	Service-Entrance Cables: Types SE and USE
340.....	Underground Feeder and Branch-Circuit Cable: Type UF
342.....	Intermediate Metal Conduit: Type IMC
344.....	Rigid Metal Conduit: Type RMC
348.....	Flexible Metal Conduit: Type FMC
350.....	Liquidtight Flexible Metal Conduit: Type
353.....	High Density Polyethylene Conduit: Type HDPE Conduit
354.....	Nonmetallic Underground Conduit with Conductors: Type NUCC
355.....	Reinforced Thermosetting Resin Conduit: Type RTRC
356.....	Liquidtight Flexible Nonmetallic Conduit: Type LFNC
358.....	Electrical Metallic Tubing: Type EMT
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760	Fire Alarm Systems
770.....	Optical Fiber Cables and Raceways
800.....	Communications Circuits

NEC & CSA DESIGNATIONS

NEC WIRE TYPE

DESCRIPTION

MV-HL	Suffix "-HL" indicates acceptable for hazardous locations
ITC	Instrumentation tray cable, several combinations for insulations and jacket compounds
MV-LS	Suffix "-LS" indicates acceptable for limited smoke applications
MC	Metal clad cable, thermoplastic or crosslinked individual conductors, aluminum or steel interlocked armor
MTW	Machine tool wire, thermoplastic insulation (PVC), with or without Nylon, 90°C, dry locations
MV-90	Medium voltage cable rated at 90°C
MV-105	Medium voltage cable rated at 105°C
PLTC	Power-limited tray cable, several combinations of insulations and jacket compounds
RHH	Rubber or equivalent insulation, high heat resistant 90°C rating, dry or damp locations
RHW-2	Rubber or equivalent insulation, heat resistant 90°C rating, wet locations
SF-2	Silicone insulated fixture wire, solid or 7-strand
SFF-2	Silicone insulated fixture wire, flexible strand
SIS	Flame retardant thermoset switchboard wire
TC	Tray cable, several combinations of insulation and jacket compounds, cable tray use
TFFN	Thermoplastic insulation (PVC), flexible fixture wire, 90°C, dry locations, Nylon jacket
TFN	Thermoplastic insulation (PVC), fixture wire, 90°C, dry locations, Nylon jacket
THHN	Thermoplastic insulation (PVC), high heat resistant, 90°C rating, dry locations, Nylon jacket
THWN	Thermoplastic insulation (PVC), heat resistant 75°C rating, dry and wet locations, Nylon jacket
THWN-2	Thermoplastic insulation (PVC), high heat resistant 90°C rating, wet and dry locations, Nylon jacket
USE-2	Underground service entrance, cross-linked insulation, direct burial, 90°C rating
XHHW-2	Cross-linked insulation, high heat resistant 90°C rating, wet and dry locations

CSA WIRE TYPE

DESCRIPTION

AC90	600 Volt XLPE insulation aluminum or steel interlocked armored cable
ACIC	300 or 600 Volt armored instrument and control cable. A CSA type designation used to describe armored instrumentation and control cable. Available in either 300 Volt or 600 Volt with thermoset or thermoplastic insulation, this cable can be supplied with an overall shield, shielded pairs, shielded triads or unshielded in multi-conductor constructions from 2 to 72 conductors. The overall interlocked armor and PVC jacket provide a (-40°C), HL, FT4 product (CDS reference standard C22.2 No. 239)
ACWU90 (-40°C)	600 Volt XLPE insulation aluminum or steel interlocked armored cable with PVC jacket*
HL	Designation for hazardous locations (CSA STD C22.2 NO174)
NMD90	300 Volt non-metallic sheath cable with XLPE or PVC/Nylon insulation
NMWU	300 Volt non-metallic sheath cable with PVC insulation
RA90 (-40°C)	600 and 5000 Volt single and multiple conductor with seamless corrugated aluminum armor. A CSA type destination for single conductor or multi-conductor constructions similar to AC90 and ACWU90 except no bonding (grounding) conductor is required in the cable assembly. Also, the armor is a corrugated aluminum sheath that serves as a bonding (grounding) conductor. The overall PVC covering on RA90 is required for wet or direct burial applications (CSA reference standard C22.2 No. 123)*
RW90 XLPE (-40°C)	600 and 5000 Volt thermoset insulation 90°C wet or dry locations*
RWU90 XLPE (-40°C)	600 and 1000 Volt thermoset insulation 90°C direct burial*
SEW-2	600 Volt silicone rubber insulated equipment wire solid or 7-strand
SEWF-2	600 Volt silicone rubber insulated equipment wire with flexible strand
TECK90 (-40°C)	600 and 5000 Volt single and multiple conductor cable with inner jacket, aluminum* or steel interlocked armor with PVC jacket
TC	Tray cable certified for use in Class I Division 2 areas
TW75	600 Volt thermoplastic (PVC) insulated cable suitable for wet locations
TWU (-40°C)	600 Volt thermoplastic (PVC) insulated cable suitable for direct burial

* Passes -40°C Cold Impact Test

AMPACITY CALCULATIONS

Houston Wire & Cable Company recommends that wire and cable ampacities be determined using the latest NEC tables and text. In particular, attention should be given to Articles 310, 392, 400-5 (flexible cords) and 501 Class I, 502 Class II and 503 Class III, Divisions 1 and 2 hazardous locations. Remember to use the "Ampacity Correction Factors" when the Ambient Temperature is different than those indicated in the Tables. Also, derating is required when using more than three conductors in a Raceway or Cable. Appendix B also contains helpful tables for Ampacity.

ARTICLE 310: CONDUCTORS FOR GENERAL WIRING

NEC TABLE 310.15(B)(3)(a)

Table 310.15(B)(3)(a) Adjustment Factors for More Than Three Current-Carrying Conductors in a Raceway or Cable

Number of Current-Carrying Conductors	Percent of Values in Tables 310.15(B)(16) through 310.19(B)(19) as Adjusted for Ambient Temperature if Necessary
4-6	80
7-9	70
10-20	50
21-30	45
31-40	40
41 and above	35

ARTICLE 310: CONDUCTORS FOR GENERAL WIRING

NEC TABLE 310.15(B)(16)

Table 310.15(B)(16) (formerly Table 310.16) Allowable Ampacities of Insulated Conductors Rated up to and Including 2000 Volts, 60°C Through 90°C (140°F Through 194°F), Not More Than Three Current-Carrying Conductors in Raceway, Cable or Earth (Directly Buried), Based on Ambient Temperature of 30°C (86°F)*

Size AWG or kcmil	Temperature Rating of Conductor [See Table 310.104(A), NEC2011]						Size AWG or kcmil
	60°C (140°F)	75°C (167°F)	90°C (194°F)	60°C (140°F)	75°C (167°F)	90°C (194°F)	
	Types TW, UF	Types RHW, THHW, THW, THWN, XHHW, USE, ZW	Types TBS, SA, SIS, FEP, FEPB, MI, RHH, RHW-2, THHN, THHW, THW-2, THWN-2, USE-2, XHH, XHHW, XHHW-2, ZW-2	Types TW, UF	Types RHW, THHW, THW, THWN, XHHW, USE, ZW	Types TBS, SA, SIS, FEP, FEPB, MI, RHH, RHW-2, THHN, THHW, THW-2, THWN-2, USE-2, XHH, XHHW, XHHW-2, ZW-2	
	COPPER			ALUMINUM OR COPPER-CLAD ALUMINUM			
18	—	—	14	—	—	—	—
16	—	—	18	—	—	—	—
14**	15	20	25	—	—	—	—
12**	20	25	30	15	20	25	12**
10**	30	35	40	25	30	35	10**
8	40	50	55	35	40	45	8
6	55	65	75	40	50	55	6
4	70	85	95	55	65	75	4
3	85	100	115	65	75	85	3
2	95	115	130	75	90	100	2
1	110	130	145	85	100	115	1
1/0	125	150	170	100	120	135	1/0
2/0	145	175	195	115	135	150	2/0
3/0	165	200	225	130	155	175	3/0
4/0	195	230	260	150	180	205	4/0
250	215	255	290	170	205	230	250
300	240	285	320	195	230	260	300
350	260	310	350	210	250	280	350
400	280	335	380	225	270	305	400
500	320	380	430	260	310	350	500
600	350	420	475	285	340	385	600
700	385	460	520	315	375	425	700
750	400	475	535	320	385	435	750
800	410	490	555	330	395	445	800
900	435	520	585	355	425	480	900
1000	455	545	615	375	445	500	1000
1250	495	590	665	405	485	545	1250
1500	525	625	705	435	520	585	1500
7500	545	650	735	455	545	615	1750
2000	555	665	750	470	560	630	2000

* Refer to 310.15(B)(2) for the ampacity correction factors where the ambient temperature is other than 30°C (86°F).

** Refer to 240.4(D) for the conductor overcurrent protection limitations.

ARTICLE 310: CONDUCTORS FOR GENERAL WIRING

NEC TABLE 310.15(B)(17)

Table 310.15(B)(17) (formerly Table 310.17) Allowable Ampacities of Single-Insulated Conductors Rated up to and Including 2000 Volts in Free Air, Based on Ambient Air Temperature of 30°C (86°F)*

Size AWG or kcmil	Temperature Rating of Conductor [See Table 310.104(A), NEC2011]						Size AWG or kcmil
	60°C (140°F)	75°C (167°F)	90°C (194°F)	60°C (140°F)	75°C (167°F)	90°C (194°F)	
	Types TW, UF	Types RHW, THHW, THW, THWN, XHHW, USE, ZW	Types TBS, SA, SIS, FEP, FEPB, MI, RHH, RHW-2, THHN, THHW, THW-2, THWN-2, USE-2, XHH, XHHW, XHHW-2, ZW-2	Types TW, UF	Types RHW, THHW, THW, THWN, XHHW, USE, ZW	Types TBS, SA, SIS, FEP, FEPB, MI, RHH, RHW-2, THHN, THHW, THW-2, THWN-2, USE-2, XHH, XHHW, XHHW-2, ZW-2	
COPPER			ALUMINUM OR COPPER-CLAD ALUMINUM				
18	–	–	18	–	–	–	–
16	–	–	24	–	–	–	–
14**	25	30	35	–	–	–	–
12**	30	35	40	25	30	35	12**
10**	40	50	55	35	40	45	10**
8	60	70	80	45	55	60	8
6	80	95	105	60	75	85	6
4	105	125	140	80	10	115	4
3	120	145	165	95	115	130	3
2	140	170	190	110	135	150	2
1	165	195	220	130	155	175	1
1/0	195	230	260	150	180	205	1/0
2/0	225	265	300	175	210	235	2/0
3/0	260	310	350	200	240	270	3/0
4/0	300	360	405	235	280	315	4/0
250	340	405	455	265	315	355	250
300	375	445	500	290	350	395	300
350	420	505	570	330	395	445	350
400	455	545	615	355	425	480	400
500	515	620	700	405	485	545	500
600	575	690	780	455	545	615	600
700	630	755	850	500	595	670	700
750	655	785	885	515	620	700	750
800	680	815	920	535	645	725	800
900	730	870	980	580	700	790	900
1000	780	935	1055	625	750	845	1000
1250	890	1065	1200	710	855	965	1250
1500	980	1175	1325	795	950	1070	1500
7500	1070	1280	1445	875	1050	1185	1750
2000	1155	1385	1560	960	1150	1295	2000

* Refer to 310.15(B)(2) for the ampacity correction factors where the ambient temperature is other than 30°C (86°F).

** Refer to 240.4(D) for the conductor overcurrent protection limitations.

ARTICLE 310: CONDUCTORS FOR GENERAL WIRING

NEC TABLE 310.15(B)(18)

Table 310.15(B)(18) (formerly Table 310.18) Allowable Ampacities of Insulated Conductors Rated up to and Including 2000 Volts, 150°C Through 250°C (302°F Through 482°F). Not More Than Three Current-Carrying Conductors in Raceway or Cable, Based on Ambient Air Temperature of 40°C (104°F)*

Size AWG or kcmil	Temperature Rating of Conductor [See Table 310.104(A), NEC2011]				Size AWG or kcmil
	150°C (302°F)	200°C (392°F)	250°C (482°F)	150°C (302°F)	
	Type Z	Types FEP, FEPB, PFA, SA	Types PFAH, TFE	Type Z	
	COPPER		NICKEL OR NICKEL-COATED COPPER	ALUMINUM OR COPPER-CLAD ALUMINUM	
14	34	36	39	–	14
12	43	45	54	30	12
10	55	60	73	44	10
8	76	83	93	57	8
6	96	110	117	75	6
4	120	125	148	94	4
3	143	152	166	109	3
2	160	171	191	124	2
1	186	197	215	145	1
1/0	215	229	244	169	1/0
2/0	251	260	273	198	2/0
3/0	288	297	308	227	3/0
4/0	332	346	361	260	4/0

*Refer to 310.15(15)(B)(2) for the ampacity correction factors where the ambient temperature is other than 40°C (104°F)

ARTICLE 310: CONDUCTORS FOR GENERAL WIRING

NEC TABLE 310.15(B)(19)

Table 310.15(B)(19) (formerly Table 310.19) Allowable Ampacities of Insulated Conductors Rated up to and Including 2000 Volts, 150°C Through 250°C (302°F Through 482°F), in Free Air, Based on Ambient Air Temperature of 40°C (104°F)*

Size AWG or kcmil	Temperature Rating of Conductor [See Table 310.104(A), NEC2011]				Size AWG or kcmil
	150°C (302°F)	200°C (392°F)	250°C (482°F)	150°C (302°F)	
	Type Z	Types FEP, FEPB, PFA, SA	Types PFAH, TFE	Type Z	
	COPPER		NICKEL OR NICKEL-COATED COPPER	ALUMINUM OR COPPER-CLAD ALUMINUM	
14	45	54	59	—	14
12	60	68	78	47	12
10	80	90	107	63	10
8	106	124	142	83	8
6	155	165	205	112	6
4	190	220	278	148	4
3	214	252	327	170	3
2	255	293	381	198	2
1	293	344	440	228	1
1/0	339	399	532	263	1/0
2/0	390	467	591	305	2/0
3/0	451	546	708	351	3/0
4/0	529	629	830	411	4/0

*Refer to 310.15(15)(B)(2) for the ampacity correction factors where the ambient temperature is other than 40°C (104°F)

ARTICLE 310: CONDUCTORS FOR GENERAL WIRING

NEC TABLE 310.15(B)(20)

Table 310.15(B)(20) (formerly Table 310.20) Ampacities of Not More Than Three Single Insulated Conductors Rated up to and Including 2000 Volts, Supported on a Messenger, Based on Ambient Air Temperature of 40°C (104°F)*

Size AWG or kcmil	Temperature Rating of Conductor [See Table 310.104(A), NEC2011]				Size AWG or kcmil
	150°C (302°F)	200°C (392°F)	250°C (482°F)	150°C (302°F)	
	Type Z	Types FEP, FEPB, PFA, SA	Types PFAH, TFE	Type Z	
	COPPER		NICKEL OR NICKEL-COATED COPPER	ALUMINUM OR COPPER-CLAD ALUMINUM	
8	57	66	44	51	8
6	76	89	59	69	6
4	101	117	78	91	4
3	118	138	92	107	3
2	135	158	106	123	2
1	158	185	123	144	1
1/0	183	214	143	167	1/0
2/0	212	247	165	193	2/0
3/0	245	287	192	224	3/0
4/0	287	335	224	262	4/0
250	320	374	251	292	250
300	359	419	282	328	300
350	397	464	312	364	350
400	430	503	339	395	400
500	496	580	392	458	500
600	553	647	440	514	600
700	610	714	488	570	700
750	638	747	512	598	750
800	660	773	532	622	800
900	704	826	572	669	900
1000	748	879	612	716	1000

*Refer to 310.15(15)(B)(2) for the ampacity correction factors where the ambient temperature is other than 40°C (104°F)

ARTICLE 310: CONDUCTORS FOR GENERAL WIRING

NEC TABLE 310.21

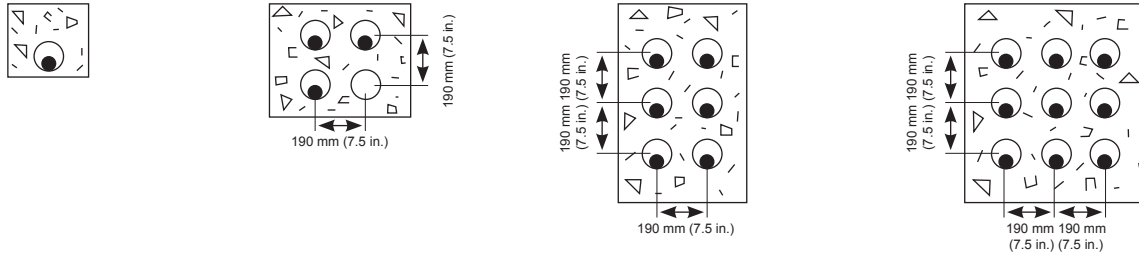
Table 310.15(B)(21) (formerly Table 310.21) Ampacities of Bare or Covered Conductors in Free Air, Based on 40°C (104°F) Ambient, 80°C (176°F) Total Conductor Temperature, 610 mm/sec (2ft/sec) Wind Velocity

Copper Conductors			
Bare		Covered	
AWG or kcmil	Amperes	AWG or kcmil	Amperes
8	98	8	103
6	124	6	130
4	155	4	163
2	209	2	219
1/0	282	1/0	297
2/0	329	2/0	344
3/0	382	3/0	401
4/0	444	4/0	466
250	494	250	519
300	556	300	584
500	773	500	812
750	1000	750	1050
1000	1193	1000	1253

ARTICLE 310: CONDUCTORS FOR GENERAL WIRING

NEC FIGURE 310.60

Figure 310.60. Cable installation dimensions for use with Tables 310.60(C)(77) through 310.60(C)(86).



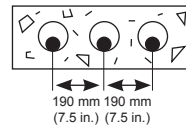
Detail 1
290 mm x 290 mm
(11.5 in. x 11.5 in.)
Electrical duct bank
One electrical duct

Detail 2
475 mm x 475 mm
(19 in. x 19 in.)
Electrical duct bank
Three electrical ducts

Detail 3
475 mm x 675 mm
(19 in. x 19 in.)
Electrical duct bank
Six electrical ducts

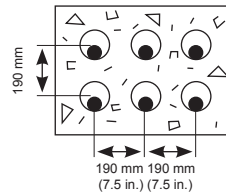
Detail 4
675 mm x 675 mm
(27 in. x 27 in.)
Electrical duct bank
Nine electrical ducts

OR



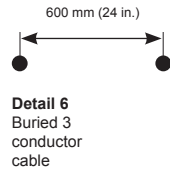
675 mm x 290 mm
(27 in. x 11.5 in.)
Electrical duct bank
Three electrical ducts

OR

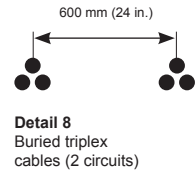


675 mm x 475 mm
(27 in. x 19 in.)
Electrical duct bank
Six electrical ducts

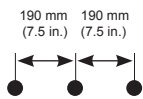
Detail 5
Buried 3
conductor
cable



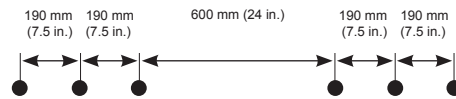
Detail 7
Buried triplex
cables (1 circuit)



Detail 8
Buried triplex
cables (2 circuits)



Detail 9
Buried single-conductor
cables (1 circuit)



Detail 10
Buried single-conductor
cables (2 circuits)

LEGEND	
	Backfill (earth or concrete)
	Electrical Duct
	Cable or Cables

Note: Minimum burial depths to top electrical ducts or cables shall be in accordance with 300.50. Maximum depth to the top of electrical duct banks shall be 750 mm (30 in.) and maximum depth to the top of direct buried cables shall be 900 mm (36 in.)

ARTICLE 310: CONDUCTORS FOR GENERAL WIRING

NEC TABLE 310.104(E)

Table 310.104(E). Thickness of Insulation for Shielded Solid Dielectric Insulated Conductors Rated 2001 to 35,000 Volts.

Conductor Size (AWG or kcmil)	2,001-5,000 Volts		5,001-8,000 Volts						8,001-15,000 Volts						15,001-25,000 Volts					
	100 Percent Insulation Level ¹		100 Percent Insulation Level ¹		133 Percent Insulation Level ²		173 Percent Insulation Level ³		100 Percent Insulation Level ¹		133 Percent Insulation Level ²		173 Percent Insulation Level ³		100 Percent Insulation Level ¹		133 Percent Insulation Level ²		173 Percent Insulation Level ³	
	mm	mils	mm	mils	mm	mils	mm	mils	mm	mils	mm	mils	mm	mils	mm	mils	mm	mils	mm	mils
8	2.29	90	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
6-4	2.29	90	2.92	115	3.56	140	4.45	175	–	–	–	–	–	–	–	–	–	–	–	–
2	2.29	90	2.92	115	3.56	140	4.45	175	4.45	175	5.59	220	6.60	260	–	–	–	–	–	–
1	2.29	90	2.92	115	3.56	140	4.45	175	4.45	175	5.59	220	6.60	260	6.60	260	8.13	320	10.67	420
1/0-2000	2.29	90	2.92	115	3.56	140	4.45	175	4.45	175	5.59	220	6.60	260	6.60	260	8.13	320	10.67	420

Conductor Size (AWG or kcmil)	25,001-28,000 Volts						28,001-35,000 Volts					
	100 Percent Insulation Level ¹		133 Percent Insulation Level ²		173 Percent Insulation Level ³		100 Percent Insulation Level ¹		133 Percent Insulation Level ²		173 Percent Insulation Level ³	
	mm	mils	mm	mils	mm	mils	mm	mils	mm	mils	mm	mils
1	7.11	280	8.76	345	11.30	445	–	–	–	–	–	–
1/0-2000	7.11	280	8.76	345	11.30	445	8.76	345	10.67	420	14.73	580

- ¹ **100 Percent Insulation Level.** Cables in this category shall be permitted to be applied where the system is provided with relay protection such that ground faults will be cleared as rapidly as possible but, in any case, within 1 minute. While these cables are applicable to the great majority of cable installations that are on grounded systems, they shall be permitted to be used also on other systems for which the application of cables is acceptable, provided the above clearing requirements are met in completely de-energizing the faulted section.
- ² **133 Percent Insulation Level.** This insulation level corresponds to that formerly designated for ungrounded systems. Cables in this category shall be permitted to be applied in situations where the clearing time requirements of the 100 percent level category cannot be met and yet there is adequate assurance that the faulted section will be de-energized in a time not exceeding 1 hour. Also, they shall be permitted to be used where additional insulation strength over the 100 percent level category is desirable.
- ³ **173 Percent Insulation Level.** Cables in this category shall be permitted to be applied under all of the following conditions:
 - (1) In industrial establishments where the conditions of maintenance and supervision ensure that only qualified persons service the installation
 - (2) Where the fault clearing time requirements of the 133 percent level category cannot be met
 - (3) Where an orderly shutdown is essential to protect equipment and personnel
 - (4) There is adequate assurance that the faulted section will be de-energized in an orderly shutdown

Also, cables with this insulation thickness shall be permitted to be used in 100 or 133 percent insulation level applications where additional insulation strength is desirable.

ARTICLE 310: CONDUCTORS FOR GENERAL WIRING

NEC TABLES 310.60(C)(67) AND 310.60(C)(69)

Table 310.60(C)(67) Ampacities of Insulated Single Copper Conductor Cables Triplexed in Air Based on Conductor Temperatures of 90°C (194°F) and 105°C (221°F) and Ambient Air Temperature of 40°C (104°F)*

Table 310.60(C)(69) Ampacities of Insulated Single Copper Conductor Isolated in Air Based on Conductor Temperatures of 90°C (194°F) and 105°C (221°F) and Ambient Air Temperature of 40°C (104°F)*

Temperature Rating of Conductor [See table 310.104(C)]				
Conductor Size (AWG or kcmil)	2,001-5,000 Volts Ampacity		5,001-35,000 Volts Ampacity	
	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105
8	65	74	—	—
6	90	99	100	110
4	120	130	130	140
2	160	175	170	195
1	185	205	195	225
1/0	215	240	225	255
2/0	250	275	260	295
3/0	290	320	300	340
4/0	335	375	345	390
250	375	415	380	430
350	465	515	470	525
500	580	645	580	650
750	750	835	730	820
1000	880	980	850	950

Temperature Rating of Conductor [See table 310.104(C)]						
Conductor Size (AWG or kcmil)	2,001-5,000 Volts Ampacity		5,001-15,000 Volts Ampacity		15,001-35,000 Volts Ampacity	
	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105
8	83	93	—	—	—	—
6	110	120	110	125	—	—
4	145	160	150	165	—	—
2	190	215	195	215	—	—
1	225	250	225	250	225	250
1/0	260	290	260	290	260	290
2/0	300	330	300	335	300	330
3/0	345	385	345	385	345	380
4/0	400	445	400	445	395	445
250	445	495	445	495	440	490
350	550	615	550	610	545	605
500	695	775	685	765	680	755
750	900	1000	885	990	870	970
1000	1075	1200	1060	1185	1040	1160
1250	1230	1370	1210	1350	1185	1320
1500	1365	1525	1345	1500	1315	1465
1750	1495	1665	1470	1640	1430	1595
2000	1605	1790	1575	1755	1535	1710

*Refer to 310.60(C)(2) for the ampacity correction factors where the ambient temperature is other than 40°C (104°F)

ARTICLE 310: CONDUCTORS FOR GENERAL WIRING

NEC TABLES 310.60(C)(71), 310.60(C)(73) AND 310.60(C)(75)

Table 310.60(C)(71) Ampacities of an Insulated Three Conductor Copper Cable Isolated in Air Based on Conductor Temperatures of 90°C (194°F) and 105°C (221°F) and Ambient Air Temperature of 40°C (104°F)*

Temperature Rating of Conductor [See table 310.104(C)]				
Conductor Size (AWG or kcmil)	2,001-5,000 Volts Ampacity		5,001-35,000 Volts Ampacity	
	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105
8	59	66	—	—
6	79	88	93	105
4	105	115	120	135
2	140	154	165	185
1	160	180	185	210
1/0	185	205	215	240
2/0	215	240	245	275
3/0	250	280	285	315
4/0	285	320	325	360
250	320	355	360	400
350	395	440	435	490
500	485	545	535	600
750	615	685	670	745
1000	705	790	770	860

Table 310.60(C)(73) Ampacities of an Insulated Triplexed or Three-Conductor Copper Cables in Isolated Conduit in Air Based on Conductor Temperatures of 90°C (194°F) and 105°C (221°F) and Ambient Air Temperature of 40°C (104°F)*

Temperature Rating of Conductor [See table 310.104(C)]				
Conductor Size (AWG or kcmil)	2,001-5,000 Volts Ampacity		5,001-35,000 Volts Ampacity	
	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105
8	55	61	—	—
6	75	84	83	93
4	97	110	110	120
2	130	145	150	165
1	155	175	170	190
1/0	180	200	195	215
2/0	205	225	225	255
3/0	240	270	260	290
4/0	280	305	295	330
250	315	355	330	365
350	385	430	395	40
500	475	530	480	535
750	600	665	585	655
1000	690	770	675	755

Table 310.60(C)(75) Ampacities of an Insulated Three Conductor Copper Cable Isolated in Air Based on Conductor Temperatures of 90°C (194°F) and 105°C (221°F) and Ambient Air Temperature of 40°C (104°F)*

Temperature Rating of Conductor [See table 310.104(C)]				
Conductor Size (AWG or kcmil)	2,001-5,000 Volts Ampacity		5,001-35,000 Volts Ampacity	
	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105
8	52	58	—	—
6	69	77	83	92
4	91	100	105	120
2	125	135	145	165
1	140	155	165	185
1/0	165	185	195	215
2/0	190	210	220	245
3/0	220	245	250	280
4/0	255	285	290	320
250	280	315	315	350
350	350	390	385	430
500	425	475	470	525
750	525	585	570	635
1000	590	660	650	725

*Refer to 310.60(C)(2) for the ampacity correction factors where the ambient temperature is other than 40°C (104°F)

ARTICLE 310: CONDUCTORS FOR GENERAL WIRING

NEC TABLE 310.60(C)(77) AND 310.60(C)(79)

Table 310.60(C)(77) Ampacities of Three Single-Insulated Copper Conductors in Underground Electrical Ducts (Three Conductors per Electrical Duct) Based on Ambient Earth Temperature of 20°C (68°F), Electrical Duct Arrangement in Accordance with Figure 310.60, 100 Percent Load Factor, Thermal Resistance (RHO) of 90, Conductor Temperatures of 90°C (194°F) and 105°C (221°F)

Temperature Rating of Conductor [See table 310.104(C)]				
Conductor Size (AWG or kcmil)	2,001-5,000 Volts Ampacity		5,001-35,000 Volts Ampacity	
	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105
One Circuit [See Figure 310.60, Detail 1]				
8	64	69	—	—
6	85	92	90	97
4	110	120	115	125
2	145	155	155	165
1	170	180	175	185
1/0	195	210	200	215
2/0	220	265	230	245
3/0	250	270	260	275
4/0	290	310	295	315
250	320	345	325	345
350	385	415	390	415
500	470	505	465	500
750	585	630	656	610
1000	670	720	640	690
Three Circuit [See Figure 310.60, Detail 2]				
8	56	60	—	—
6	73	79	77	83
4	95	100	99	105
2	125	130	130	135
1	140	150	145	155
1/0	160	175	165	175
2/0	185	195	185	200
3/0	210	225	210	225
4/0	235	255	240	255
250	260	280	260	280
350	315	335	310	330
500	375	405	370	395
750	460	495	440	475
1000	525	565	495	535
Six Circuit [See Figure 310.60, Detail 3]				
8	48	52	—	—
6	62	67	64	68
4	80	86	82	88
2	105	110	105	115
1	115	125	120	125
1/0	135	145	135	145
2/0	150	160	150	165
3/0	170	185	170	185
4/0	195	210	190	205
250	210	225	210	225
350	250	270	245	265
500	300	325	290	310
750	365	395	350	375
1000	410	445	390	415

Table 310.60(C)(79) Ampacities of Three Insulated Copper Conductors Cabled Within an Overall Covering (Three Conductor Cable) in Underground Electrical Ducts (One Cable per Electrical Duct) Based on Ambient Earth Temperature of 20°C (68°F), Electrical Duct Arrangement in Accordance with Figure 310.60, 100 Percent Load Factor, Thermal Resistance (RHO) of 90, Conductor Temperatures of 90°C (194°F) and 105°C (221°F)

Temperature Rating of Conductor [See table 310.104(C)]				
Conductor Size (AWG or kcmil)	2,001-5,000 Volts Ampacity		5,001-35,000 Volts Ampacity	
	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105
One Circuit [See Figure 310.60, Detail 1]				
8	59	64	—	—
6	78	84	88	95
4	100	110	115	125
2	135	145	150	160
1	155	165	170	185
1/0	175	190	195	210
2/0	200	220	220	235
3/0	230	250	250	270
4/0	265	285	285	305
250	290	315	310	335
350	355	380	375	400
500	430	460	450	485
750	530	570	545	585
1000	600	645	615	660
Three Circuit [See Figure 310.60, Detail 2]				
8	53	57	—	—
6	69	74	75	81
4	89	96	97	105
2	115	125	125	135
1	135	145	140	155
1/0	150	165	160	175
2/0	170	185	185	195
3/0	195	210	205	220
4/0	225	240	230	250
250	245	265	255	270
350	295	315	305	325
500	355	380	360	385
750	430	465	430	465
1000	485	520	485	515
Six Circuit [See Figure 310.60, Detail 3]				
8	46	50	—	—
6	60	65	63	68
4	77	83	81	87
2	98	105	105	110
1	110	120	115	125
1/0	125	135	130	145
2/0	145	155	150	160
3/0	165	175	170	180
4/0	185	200	190	200
250	200	220	205	220
350	240	270	245	275
500	290	310	290	305
750	350	375	340	365
1000	390	420	380	405

ARTICLE 310: CONDUCTORS FOR GENERAL WIRING

NEC TABLE 310.60(C)(81) AND 310.60(C)(83)

Table 310.60(C)(81) Ampacities of Single Insulated Copper Conductors Directly Buried in Earth Based on Ambient Earth Temperature of 20°C (68°F), Arrangement per Figure 310.60, 100 Percent Load Factor, Thermal Resistance (RHO) of 90, Conductor Temperatures of 90°C (194°F) and 105°C (221°F)

Table 310.60(C)(83) Ampacities of Three Insulated Copper Conductors Cabled Within an Overall Covering (Three Conductor Cable), Directly Buried in Earth Based on Ambient Earth Temperature of 20°C (68°F), Arrangement per Figure 310.60, 100 Percent Load Factor, Thermal Resistance (RHO) of 90, Conductor Temperatures of 90°C (194°F) and 105°C (221°F)

Temperature Rating of Conductor [See table 310.104(C)]				
Conductor Size (AWG or kcmil)	2,001-5,000 Volts Ampacity		5,001-35,000 Volts Ampacity	
	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105
One Circuit, Three Conductors [See Figure 310.60, Detail 9]				
8	110	115	—	—
6	140	150	130	140
4	180	195	170	180
2	230	250	210	225
1	260	280	240	260
1/0	295	320	275	295
2/0	335	365	310	335
3/0	385	415	355	380
4/0	435	465	405	435
250	470	510	440	475
350	470	615	535	575
500	690	745	650	700
750	845	910	805	865
1000	980	1055	930	1005
Two Circuit, Six Conductors [See Figure 310.60, Detail 10]				
8	100	110	—	—
6	130	140	120	130
4	165	180	160	170
2	215	230	195	210
1	240	260	225	240
1/0	275	295	255	275
2/0	310	335	290	315
3/0	355	380	330	355
4/0	400	430	375	405
250	435	470	410	440
350	520	560	495	530
500	630	680	600	645
750	775	835	740	795
1000	890	960	855	920

Temperature Rating of Conductor [See table 310.104(C)]				
Conductor Size (AWG or kcmil)	2,001-5,000 Volts Ampacity		5,001-35,000 Volts Ampacity	
	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105
One Circuit, Three Conductors [See Figure 310.60, Detail 5]				
8	85	89	—	—
6	105	115	115	120
4	135	150	145	155
2	180	190	185	200
1	200	215	210	225
1/0	230	245	240	255
2/0	260	280	270	290
3/0	295	320	305	330
4/0	335	360	350	375
250	365	395	380	410
350	240	475	460	495
500	530	570	550	590
750	650	700	665	720
1000	730	785	750	810
Two Circuit, Six Conductors [See Figure 310.60, Detail 6]				
8	80	84	—	—
6	100	105	105	115
4	130	140	135	145
2	165	180	170	185
1	185	200	195	210
1/0	215	230	220	235
2/0	240	260	250	270
3/0	275	295	280	305
4/0	310	335	320	345
250	340	365	350	375
350	410	440	420	450
500	490	525	500	535
750	595	640	605	650
1000	665	715	675	730

ARTICLE 310: CONDUCTORS FOR GENERAL WIRING

NEC TABLE 310.60(C)(85)

Table 310.60(C)(85) Ampacities of an Three Triplexed Single Insulated Copper Conductors Directly Buried in Earth Based on Ambient Earth Temperatures of 20°C (68°F), Arrangement per Figure 310.60, 100 Percent Load Factor, Thermal Resistance (RHO) of 90, Conductor Temperatures 90°C (194°F) and 105°C (221°F)

Temperature Rating of Conductor [See table 310.104(C)]				
Conductor Size (AWG or kcmil)	2,001-5,000 Volts Ampacity		5,001-35,000 Volts Ampacity	
	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105
One Circuit, Three Conductors [See Figure 310.60, Detail 7]				
8	90	95	—	—
6	120	130	115	120
4	150	165	150	160
2	195	205	190	205
1	225	240	215	230
1/0	255	270	245	260
2/0	290	310	275	295
3/0	330	360	315	340
4/0	375	405	360	385
250	410	445	390	410
350	490	580	470	505
500	590	635	565	605
750	725	780	685	740
1000	825	885	770	830
Two Circuit, Six Conductors [See Figure 310.60, Detail 8]				
8	85	90	—	—
6	110	115	105	115
4	140	150	140	150
2	180	195	175	190
1	205	220	200	215
1/0	235	250	225	240
2/0	265	285	255	275
3/0	300	320	290	315
4/0	340	365	325	350
250	370	395	355	380
350	445	480	425	455
500	535	575	510	545
750	650	700	615	660
1000	740	795	690	745

ARTICLE 400: FLEXIBLE CORDS AND CABLES

NEC TABLE 400.5(A)(2)

Table 400.5(A)(2) Ampacity of Cable Types SC, SCE, SCT, PPE, G, G-GC and W. Based on Ambient Temperature of 30°C (86°F) [See Table 400.4]

Copper Conductor Size (AWG or kcmil)	Temperature Rating of Cable								
	60°C (140°F)			75°C (167°F)			90°C (194°F)		
	D ¹	E ²	F ³	D ¹	E ²	F ³	D ¹	E ²	F ³
12	–	31	26	–	37	31	–	42	35
10	–	44	37	–	52	43	–	59	49
8	60	55	48	70	65	57	80	74	65
6	80	72	63	95	88	77	105	99	87
4	105	96	84	125	115	101	140	130	114
3	120	113	99	145	135	118	165	152	133
2	140	128	112	170	152	133	190	174	152
1	165	150	131	195	178	156	220	202	177
1/0	195	173	151	230	207	181	260	234	205
2/0	225	199	174	265	238	208	300	271	237
3/0	260	230	201	310	275	241	350	313	274
4/0	300	265	232	360	317	277	405	361	316
250	340	296	259	405	354	310	455	402	352
300	375	330	289	445	395	346	505	449	393
350	420	363	318	505	435	381	570	495	433
400	455	392	343	545	469	410	645	535	468
500	515	448	392	620	537	470	700	613	536
600	575	–	–	690	–	–	780	–	–
700	630	–	–	755	–	–	855	–	–
750	655	–	–	785	–	–	885	–	–
800	680	–	–	815	–	–	920	–	–
900	730	–	–	870	–	–	985	–	–
1000	780	–	–	935	–	–	1055	–	–

- ¹ The ampacities under subheading D shall be permitted for single-conductor Types SC, SCE, SCT, PPE and W cable only where the individual conductors are not installed in raceways and are not in physical contact with each other except in lengths not to exceed 600 mm (24 in.) where passing through the wall of an enclosure.
- ² The ampacities under subheading E apply to two-conductor cables and other multiconductor cables connected to utilization equipment so that only two conductors are current carrying.
- ³ The ampacities under subheading F apply to three-conductor cables and other multiconductor cables connected to utilization equipment so that only three conductors are current carrying.

ARTICLE 400: FLEXIBLE CORDS AND CABLES

NEC TABLES 400.5(A)(1) AND 400.5(A)(3)

Table 400.5(A)(1) Allowable Ampacity for Flexible Cords and Cables Based on Ambient Temperature of 30°C (86°F)
[See 400.13 and Table 400.4]

Conductor Size (AWG or kcmil)	Thermoplastic Types TPT, TST	Thermoset Types C, E, EO, PD, S, SJ, SJO, SJOW, SJOO, SJOOW, SO, SOW, SOO, SOOW, SP-1, SP-2, SP-3, SRD, SV, SVO, SVOO		Types HPD, HPN, HSJ, HSJO, HSJOO
		Thermoplastic Types ET, ETLB, TEP, ETT, SE, SEW, SEO, SEOW, SEOOW, SJE, SJEW, SJEO, SJEOW, SJEOWW, SJT, SJTW, SJTO, SJTOW, SJTOO, SJTOOW, SPE-1, SPE-2, SPE-3, SPT-1, SPT-1W, SPT-2, STP-2W, SPT-3, ST, SRDE, SRDT, STO, STOW, STOO, STOOW, SVE, SVEO, SVT, SVTO, SVTOO		
		A ⁺	B ⁺	
27*	0.5	—	—	—
20	—	5**	***	—
18	—	7	10	10
17	—	—	12	13
16	—	10	13	15
15	—	—	—	17
14	—	15	18	20
12	—	20	25	30
10	—	25	30	35
8	—	35	40	—
6	—	45	55	—
4	—	60	70	—
2	—	80	95	—

Table 400.5(A)(3) Adjustment Factors for More Than Three
Current-Carrying Conductors in a Flexible Cord or Cable

Number of Current-Carrying Conductors	Percent of Values in Tables 400.5(A)(1) through 310.19(A)(2)
4-6	80
7-9	70
10-20	50
21-30	45
31-40	40
41 and above	35

* *Tinsel cord.*

** *Elevator cables only.*

*** *7 amperes for elevator cables only; 2 amperes for other types.*

+ The allowable currents under subheading A apply to 3-conductor cords and other multiconductor cords connected to utilization equipment so that only 3 conductors are current-carrying. The allowable currents under subheading B apply to 2-conductor cords and other multiconductor cords connected to utilization equipment so that only 2 conductors are current carrying.

ARTICLE 402: FIXTURE WIRES

NEC TABLE 402.5

Table 402.5 Allowable Ampacities for Fixture Wires

Size (AWG)	Allowable Ampacity
18	6
16	8
14	17
12	23
10	28

ANNEX B: APPLICATION INFORMATION FOR AMPACITY CALCULATION ITEMS B.310.15(B)(1) THROUGH B.310.15(B)(7)

B.310.15(B)(1) EQUATION APPLICATION INFORMATION

This informative annex provides application information for ampacities calculated under engineering supervision.

B.310.15(B)(2) TYPICAL APPLICATIONS COVERED BY TABLES

Typical ampacities for conductors rated 0 through 2,000 volts are shown in Table B.310.15(B)(2)(1) through Table B.310.15(B)(2)(10). Table B.310.15(B)(2)(11) provides the adjustment factors for more than three current-carrying conductors in a raceway or cable with load diversity. Underground electrical duct bank configurations, as detailed in Figure B.310.15(B)(2)(3), Figure B.310.15(B)(2)(4) and Figure B.310.15(B)(2)(5), are utilized for conductors rated 0 through 5,000 volts. In Figure B.310.15(B)(2)(2) through Figure B.310.15(B)(2)(5), where adjacent duct banks are used, a separation of 1.5 m (5 ft) between the centerlines of the closest ducts in each bank or 1.2 m (4 ft) between the extremities of the concrete envelopes is sufficient to prevent derating of the conductors due to mutual heating. These ampacities were calculated as detailed in the basic ampacity paper, AIEE Paper 57-660, *The Calculation of the temperature Rise and Load Capability of Cable Systems*, by J. H. Neher and M. H. McGrath. For additional information concerning the application of these ampacities, see IEEE/ICEA Standard S-135/p-46-426, *Power Cable Ampacities*, and IEEE Standard 835-1,994, *Standard Power Cable Ampacity Tables*.

Typical values of thermal resistivity (Rho) are as follows:

- Average Soil (90% of USA) = 90
- Concrete = 55
- Damp Soil (coastal areas, high water table) = 60
- Paper Insulation = 550
- Polyethylene (PE) = 450
- Polyvinyl Chloride (PVC) = 650
- Rubber and Rubber-Like = 500
- Very Dry Soil (rocky or sandy) = 120

Thermal resistivity, as used in this informative annex, refers to the heat transfer capability through a substance by conduction. It is the reciprocal of thermal conductivity and is normally expressed in the units °C-cm/watt. For additional information on determining soil thermal resistivity (Rho), see ANSI/IEEE Standard 442-1,996, *Guide for Soil thermal Resistivity Measurements*.

B.310.15(B)(3) CRITERIA MODIFICATIONS

Where values of load factor and Rho are known for a particular electrical duct bank installation and they are different from those shown in a specific table or figure, the ampacities shown in the table of figure can be modified by the application of factors derived from the use of Figure B.310.15(B)(2)(1).

Where two different ampacities apply to adjacent portions of a circuit, the higher ampacity can be used beyond the point of transition, a distance equal to 3 m (10 ft) or 10 percent of the circuit length calculated at the higher ampacity, whichever is less.

Where the burial depth of direct burial or electrical duct bank circuits are modified from the values shown in a figure or table, ampacities can be modified as shown in (a) and (b) as follows.

(a) Where burial depths are increased in part(s) of an electrical duct run to avoid underground obstructions, no decrease in ampacity of the conductors is needed, provided the total length of parts of the duct run increased in depth to avoid obstructions is less than 25 percent of the total run length.

(b) Where burial depths are deeper than shown in a specific underground ampacity table or figure, an ampacity derating factor of 6 percent per increased 300 mm (foot) of depth for all values of Rho can be utilized. No rating change is needed where the burial depth is decreased.

B.310.15(B)(4) ELECTRICAL DUCTS

The term electrical duct(s) is defined in 310.60.

B.310.15(B)(5) TABLES B.310.15(B)(2)(6) AND B.310.7(B)(2)(7)

(a) To obtain the ampacity of cables installed in two electrical ducts in one horizontal row with 190-mm (7.5 in) center-to-center spacing between electrical ducts, similar to Figure B.310.15(B)(2)(2), Detail 1, multiply the ampacity shown for one duct in Table B.310.15(B)(2)(6) and Table B.310.15(B)(2)(7) by 0.88.

(b) To obtain the ampacity of cables installed in four electrical ducts in one horizontal row with 190-mm (7.5 in) center-to-center spacing between electrical ducts, similar to Figure B.310.15(B)(2)(2), Detail 2, multiply the ampacity shown for three electrical ducts in Table B.310.15(B)(2)(2) and Table B.310.15(B)(2)(2) by 0.94.

B.310.15(B)(6) ELECTRICAL DUCTS USED IN FIGURE B.310.15(B)(2)(2)

If spacing between electrical ducts, as shown in Figure B.310.15(B)(2)(2), is less than specified in Figure B.310.15(B)(2)(2), where electrical ducts enter equipment enclosures from underground, the ampacity of conductors contained within such electrical ducts need not be reduced.

B.310.15(B)(7) EXAMPLES SHOWING USE OF FIGURE B.310.15(B)(2)(1) FOR ELECTRICAL DUCT BANK AMPACITY MODIFICATIONS

Figure B.310.15(B)(2)(1) is used for interpolation or extrapolation for values of Rho and load factor for cables installed in electrical ducts. The upper family of curves shows the variation in ampacity and Rho at unity load factor in terms of I_1 , the ampacity for Rho = 60 and 50 percent load factor. Each curve is designated for a particular ratio I_2/I_1 , where I_2 is the ampacity at Rho = 120 and 100 percent load factor. The lower family of curves shows the relationship between Rho and load factor that will give substantially the same ampacity as the indicated value of Rho at 100 percent load factor.

As an example, to find the ampacity of a 500 kcmil copper cable circuit for six electrical ducts as shown in Table B.310.15(B)(2)(5): At the Rho = 60, LF = 50, $I_1 = 583$; for Rho = 120 and LF = 100, $I_2 = 400$. The ratio $I_2/I_1 = 0.686$. Locate Rho = 90 at the bottom of the chart and follow the 90 Rho line to the intersection with 100 percent load factor where the equivalent Rho = 90. Then follow the 90 Rho line to I_2/I_1 ratio of 0.686 where $F = 0.74$. The desired ampacity = $0.74 \times 583 = 431$, which agrees with the table for Rho = 90, LF = 100.

To determine the ampacity for the same circuit where Rho = 80 and LF = 75, using Figure B.310.15(B)(2)(1), the equivalent Rho = 43, $F = 0.855$ and the desired ampacity = $0.855 \times 583 = 498$ amperes. Values for using Figure B.310.15(B)(2)(1) are found in the electrical duct bank ampacity tables of this informative annex.

Where the load factor is less than 100 percent and can be verified by measurement or calculation, the ampacity of electrical duct bank installations can be modified as shown. Different values of Rho can be accommodated in the same manner.

ANNEX B: APPLICATION INFORMATION FOR AMPACITY CALCULATION TABLES B.310.15(B)(2)(1) AND B.310.15(B)(2)(3)

Table B.310.15(B)(2)(1) Ampacities of Two or Three Insulated Conductors, Rated 0 Through 2,000 Volts, Within an Overall Covering (Multiconductor Cable), in Raceway in Free Air Based on Ambient Air Temperature of 30°C (86°F)*

Temperature Rating of Conductor [See Table 310.104(A), NEC2011]							
Size AWG or kcmil	60°C (140°F)	75°C (167°F)	90°C (194°F)	60°C (140°F)	75°C (167°F)	90°C (194°F)	Size AWG or kcmil
	Types TW, UF	Types RHW, THHW, THW, THWN, SHHW, ZW	Types THHN, THHW, THW-2, THWN-2, RHH, RWH-2, USE-2, XHHW, XHHW-2, ZW-2	Types TW, UF	Types RHW, THHW, THW, THWN, SHHW, ZW	Types THHN, THHW, THW-2, THWN-2, RHH, RWH-2, USE-2, XHHW, XHHW-2, ZW-2	
COPPER				ALUMINUM OR COPPER-CLAD ALUMINUM			
14	16**	18**	21**	—	—	—	14
12	20**	24**	27**	16**	18**	21**	12
10	27**	33**	36**	21**	25**	28**	10
8	36	43	48	28	33	37	8
6	48	58	65	38	45	51	6
4	66	79	89	51	61	69	4
3	76	90	102	59	70	79	3
2	88	105	119	69	83	93	2
1	102	121	137	80	95	106	1
1/0	121	145	163	94	113	127	1/0
2/0	138	166	186	108	129	146	2/0
3/0	158	189	214	124	147	167	3/0
4/0	187	223	253	147	176	197	4/0
250	205	245	276	160	192	217	250
300	234	281	317	185	221	250	300
350	255	305	345	202	242	273	350
400	274	328	371	218	261	295	400
500	315	378	427	254	303	342	500
600	343	413	468	279	335	378	600
700	349	452	514	310	371	420	700
750	387	466	529	321	384	435	750
800	397	479	543	331	397	450	800
900	415	500	570	350	421	477	900
1000	448	542	617	382	460	521	1000

Table B.310.15(B)(2)(3) Ampacities of Multiconductor Cables with Not More Than Three Insulated Conductors, Rated 0 Through 2,000 Volts, in Free Air Based on Ambient Air Temperature of 40°C (104°F)(types TC, MC, MI, UF and USE Cables)*

Temperature Rating of Conductor [See Table 310.104(A), NEC2011]									
Size AWG or kcmil	60°C (140°F)	75°C (167°F)	85°C (185°F)	90°C (194°F)	60°C (140°F)	75°C (167°F)	85°C (185°F)	90°C (194°F)	Size AWG or kcmil
	COPPER				ALUMINUM OR COPPER-CLAD ALUMINUM				
18	—	—	—	11	—	—	—	—	18
16	—	—	—	16	—	—	—	—	16
14	18	21	24	25	—	—	—	—	14
12	21	28	30	32	18	21	24	25	12
10	28	36	41	43	21	28	30	32	10
8	39	50	56	59	30	39	44	46	8
6	52	68	75	79	41	53	59	61	6
4	69	89	100	104	54	70	78	81	4
3	81	104	116	121	63	81	91	95	3
2	92	118	132	138	72	92	103	108	2
1	107	138	154	161	84	108	120	126	1
1/0	124	160	178	186	97	125	139	145	1/0
2/0	143	184	206	215	111	144	160	168	2/0
3/0	165	213	238	249	129	166	185	194	3/0
4/0	190	245	274	287	149	192	214	224	4/0
250	212	274	305	320	166	214	239	250	250
300	237	306	341	357	186	240	268	280	300
350	261	337	377	394	205	265	296	309	350
400	281	363	406	425	222	287	317	334	400
500	321	416	465	487	255	330	368	385	500
600	354	459	513	538	284	368	410	429	600
700	387	502	562	589	306	405	462	473	700
750	404	523	586	615	328	424	473	495	750
800	415	539	604	633	339	439	490	513	800
900	438	570	639	670	362	469	514	548	900
1000	461	601	674	707	385	499	558	584	1000

*Refer to 310.15(B)(2) for the ampacity correction factors where the ambient temperature is other than 40°C (104°F)

** Unless otherwise specifically permitted elsewhere in this Code, the overcurrent protection for these conductor types shall not exceed 15 amperes for 14 AWG, 20 amperes for 12 AWG and 30 amperes for 10 AWG copper; or 15 amperes for 12 AWG and 25 amperes for 10 AWG aluminum and copper-clad aluminum

ANNEX B: APPLICATION INFORMATION FOR AMPACITY CALCULATION TABLES B.310.15(B)(2)(5) AND B.310.15(B)(2)(6)

Table 310.15(B)(2)(5) Ampacities of Single Insulated Conductors, Rated 0 Through 2,000 Volts, in Nonmagnetic Underground Electrical Ducts (One Conductor per Electrical Duct), Based on Ambient Earth Temperature of 20°C (68°F), Electrical Duct Arrangement in Accordance with Figure B.310.15(B)(2)(2), Conductor Temperature 75°C (167°F)

Size AWG or kcmil	3 Electrical Ducts (Fig. B.310.15(B)(2)(2), Detail 2)			6 Electrical Ducts (Fig. B.310.15(B)(2)(2), Detail 3)			9 Electrical Ducts (Fig. B.310.15(B)(2)(2), Detail 4)			3 Electrical Ducts (Fig. B.310.15(B)(2)(2), Detail 2)			6 Electrical Ducts (Fig. B.310.15(B)(2)(2), Detail 3)			9 Electrical Ducts (Fig. B.310.15(B)(2)(2), Detail 4)			Size AWG or kcmil
	Types RHW, THHW, THW, THWN, XHHW, USE			Types RHW, THHW, THW, THWN, XHHW, USE			Types RHW, THHW, THW, THWN, XHHW, USE			Types RHW, THHW, THW, THWN, XHHW, USE			Types RHW, THHW, THW, THWN, XHHW, USE			Types RHW, THHW, THW, THWN, XHHW, USE			
COPPER										ALUMINUM OR COPPER-CLAD ALUMINUM									
	RHO	RHO	RHO	RHO	RHO	RHO	RHO	RHO	RHO	RHO	RHO	RHO	RHO	RHO	RHO	RHO	RHO	RHO	
	60	90	120	60	90	120	60	90	120	60	90	120	60	90	120	60	90	120	
	LF	LF	LF	LF	LF	LF	LF	LF	LF	LF	LF	LF	LF	LF	LF	LF	LF	LF	
	50	100	100	50	100	100	50	100	100	50	100	100	50	100	100	50	100	100	
250	410	344	327	386	295	275	369	270	252	320	269	256	302	230	214	288	211	197	250
350	503	418	396	472	355	330	446	322	299	393	327	310	369	277	258	350	252	235	350
500	624	511	484	583	431	400	545	387	360	489	401	379	457	337	313	430	305	284	500
750	794	640	603	736	534	494	674	469	434	626	505	475	581	421	389	538	375	347	750
1000	936	745	700	864	617	570	776	533	493	744	593	557	687	491	453	629	432	399	1000
1250	1055	832	781	970	686	632	854	581	536	848	668	627	779	551	508	703	478	441	1250
1500	1160	907	849	1063	744	685	918	619	571	941	736	689	863	604	556	767	517	477	1500
1750	1250	970	907	1142	793	729	975	651	599	1026	796	745	937	651	598	823	550	507	1750
2000	1332	1027	959	1213	836	768	1030	683	628	1103	850	794	1005	693	636	877	581	535	2000
Ambient Temp. (°C)	Correction Factors																	Ambient Temp. (°F)	
6-10	1.09			1.09			1.09			1.09			1.09			1.09			43-50
11-15	1.04			1.04			1.04			1.04			1.04			1.04			52-59
16-20	1.00			1.00			1.00			1.00			1.00			1.00			61-68
21-25	0.95			0.95			0.95			0.95			0.95			0.95			70-77
26-30	0.90			0.90			0.90			0.90			0.90			0.90			79-86

Table 310.15(B)(2)(6) Ampacities of Three Insulated Conductors, Rated 0 Through 2,000 Volts, Within an Overall Covering (Three Conductor Cable), in Underground Electrical Ducts (One Cable per Electrical Duct) Based on Ambient Earth Temperature of 20°C (68°F), Electrical Duct Arrangement in Accordance with Figure B.310.15(B)(2)(2), Conductor Temperature 75°C (167°F)

Size AWG or kcmil	3 Electrical Ducts (Fig. B.310.15(B)(2)(2), Detail 1)			6 Electrical Ducts (Fig. B.310.15(B)(2)(2), Detail 2)			9 Electrical Ducts (Fig. B.310.15(B)(2)(2), Detail 3)			3 Electrical Ducts (Fig. B.310.15(B)(2)(2), Detail 1)			6 Electrical Ducts (Fig. B.310.15(B)(2)(2), Detail 2)			9 Electrical Ducts (Fig. B.310.15(B)(2)(2), Detail 3)			Size AWG or kcmil
	Types RHW, THHW, THW, THWN, XHHW, USE			Types RHW, THHW, THW, THWN, XHHW, USE			Types RHW, THHW, THW, THWN, XHHW, USE			Types RHW, THHW, THW, THWN, XHHW, USE			Types RHW, THHW, THW, THWN, XHHW, USE			Types RHW, THHW, THW, THWN, XHHW, USE			
COPPER										ALUMINUM OR COPPER-CLAD ALUMINUM									
	RHO	RHO	RHO	RHO	RHO	RHO	RHO	RHO	RHO	RHO	RHO	RHO	RHO	RHO	RHO	RHO	RHO	RHO	
	60	90	120	60	90	120	60	90	120	60	90	120	60	90	120	60	90	120	
	LF	LF	LF	LF	LF	LF	LF	LF	LF	LF	LF	LF	LF	LF	LF	LF	LF	LF	
	50	100	100	50	100	100	50	100	100	50	100	100	50	100	100	50	100	100	
8	58	54	53	59	48	46	53	42	39	45	42	41	43	37	36	41	32	30	8
6	77	71	69	74	63	60	70	54	51	60	55	54	57	49	47	54	42	39	6
4	101	93	91	96	81	77	91	69	65	78	72	71	75	63	60	71	54	51	4
2	132	121	118	126	105	100	119	89	83	103	94	92	98	82	78	92	70	65	2
1	154	140	136	146	121	114	137	102	95	120	109	106	114	94	89	107	79	74	1
1/0	177	160	156	168	137	130	157	116	107	138	125	122	131	107	101	122	90	84	1/0
2/0	203	183	178	192	156	147	179	131	121	158	143	139	150	122	115	140	102	95	2/0
3/0	233	210	204	221	178	158	205	148	137	182	164	159	172	139	131	160	116	107	3/0
4/0	268	240	232	253	202	190	234	168	155	209	187	182	198	158	149	183	131	121	4/0
250	297	265	256	280	222	209	258	184	169	233	207	201	219	174	163	202	144	132	250
350	363	321	310	340	267	250	312	219	202	285	252	244	267	209	196	245	172	158	350
500	444	389	375	414	320	299	377	261	240	352	308	297	328	254	237	299	207	190	500
750	552	478	459	511	388	362	462	314	288	446	386	372	413	314	293	374	254	233	750
1000	682	539	518	579	435	405	522	351	321	521	447	430	480	361	336	433	291	266	1000
Ambient Temp. (°C)	Correction Factors																	Ambient Temp. (°F)	
6-10	1.09			1.09			1.09			1.09			1.09			1.09			43-50
11-15	1.04			1.04			1.04			1.04			1.04			1.04			52-59
16-20	1.00			1.00			1.00			1.00			1.00			1.00			61-68
21-25	0.95			0.95			0.95			0.95			0.95			0.95			70-77
26-30	0.90			0.90			0.90			0.90			0.90			0.90			79-86

ANNEX B: APPLICATION INFORMATION FOR AMPACITY CALCULATION TABLES B.310.15(B)(2)(7) AND B.310.15(B)(2)(8)

Table 310.15(B)(2)(7) Ampacities of Three Single Insulated Conductors, Rated 0 Through 2,000 Volts, in Underground Electrical Ducts (Three Conductors per Electrical Duct), Based on Ambient Earth Temperature of 20°C (68°F), Electrical Duct Arrangement in Accordance with Figure B.310.15(B)(2)(2), Conductor Temperature 75°C (167°F)

Size AWG or kcmil	1 Electrical Duct (Fig. B.310.15(B)(2)(2), Detail 1)			3 Electrical Ducts (Fig. B.310.15(B)(2)(2), Detail 2)			6 Electrical Ducts (Fig. B.310.15(B)(2)(2), Detail 3)			1 Electrical Duct (Fig. B.310.15(B)(2)(2), Detail 1)			3 Electrical Ducts (Fig. B.310.15(B)(2)(2), Detail 2)			6 Electrical Ducts (Fig. B.310.15(B)(2)(2), Detail 3)			Size AWG or kcmil
	Types RHW, THHW, THW, THWN, XHHW, USE			Types RHW, THHW, THW, THWN, XHHW, USE			Types RHW, THHW, THW, THWN, XHHW, USE			Types RHW, THHW, THW, THWN, XHHW, USE			Types RHW, THHW, THW, THWN, XHHW, USE			Types RHW, THHW, THW, THWN, XHHW, USE			
COPPER									ALUMINUM OR COPPER-CLAD ALUMINUM										
	RHO	RHO	RHO	RHO	RHO	RHO	RHO	RHO	RHO	RHO	RHO	RHO	RHO	RHO	RHO	RHO	RHO	RHO	
	60	90	120	60	90	120	60	90	120	60	90	120	60	90	120	60	90	120	
	LF	LF	LF	LF	LF	LF	LF	LF	LF	LF	LF	LF	LF	LF	LF	LF	LF	LF	
	50	100	100	50	100	100	50	100	100	50	100	100	50	100	100	50	100	100	
8	63	58	57	61	51	49	57	4	41	49	45	44	47	40	38	45	34	32	8
6	84	77	75	80	67	63	75	56	53	66	60	58	63	52	49	59	44	41	6
4	111	100	98	105	86	81	98	73	67	86	78	76	79	97	63	7	57	52	4
3	129	116	113	122	99	94	113	83	77	101	91	89	83	77	73	84	65	60	3
2	147	132	128	139	112	106	129	93	86	115	103	100	108	87	82	101	73	67	2
1	171	153	148	161	128	121	149	106	98	133	119	115	126	100	94	116	83	77	1
1/0	197	175	169	185	146	137	170	121	111	153	136	132	144	114	107	133	94	87	1/0
2/0	226	200	193	212	166	156	194	136	126	176	156	151	165	130	121	151	106	98	2/0
3/0	260	228	220	243	189	177	222	154	142	203	178	172	189	147	138	173	121	111	3/0
4/0	301	263	253	280	215	201	255	175	161	235	205	198	219	168	157	199	137	126	4/0
250	334	290	279	310	236	220	281	192	176	261	227	218	242	185	172	220	150	137	250
300	373	321	308	344	260	242	310	210	192	293	252	242	272	204	190	245	165	151	300
350	409	354	337	377	283	264	340	228	209	321	276	265	296	222	207	266	179	164	350
400	442	376	361	394	302	280	368	243	223	349	297	284	321	238	220	288	191	174	400
500	503	427	409	460	341	316	412	273	249	397	338	323	364	270	250	326	216	197	500
600	552	468	447	511	371	343	457	296	270	446	373	356	408	296	274	365	236	215	600
700	602	509	486	553	402	371	492	319	291	488	408	389	443	321	297	394	255	232	700
750	632	529	505	574	417	385	509	330	301	508	425	405	461	334	309	409	265	241	750
800	654	544	520	597	428	395	527	338	308	530	439	418	481	344	318	427	273	247	800
900	692	575	549	628	450	415	554	355	323	563	466	444	510	365	337	450	288	261	900
1000	730	605	576	659	472	435	581	372	338	597	494	471	538	385	355	475	304	276	1000
Ambient Temp. (°C)	Correction Factors																	Ambient Temp. (°F)	
6-10	1.09			1.09			1.09			1.09			1.09			1.09			43-50
11-15	1.04			1.04			1.04			1.04			1.04			1.04			52-59
16-20	1.00			1.00			1.00			1.00			1.00			1.00			61-68
21-25	0.95			0.95			0.95			0.95			0.95			0.95			70-77
26-30	0.90			0.90			0.90			0.90			0.90			0.90			79-86

Table 310.15(B)(2)(7) Ampacities of Three Single Insulated Conductors, Rated 0 Through 2,000 Volts, in Underground Electrical Ducts (Three Conductors per Electrical Duct), Based on Ambient Earth Temperature of 20°C (68°F), Electrical Duct Arrangement in Accordance with Figure B.310.15(B)(2)(2), Conductor Temperature 75°C (167°F)

Size AWG or kcmil	1 Cable (Fig. B.310.15(B)(2)(2), Detail 5)		2 Cable (Fig. B.310.15(B)(2)(2), Detail 6)		1 Cable (Fig. B.310.15(B)(2)(2), Detail 5)		2 Cable (Fig. B.310.15(B)(2)(2), Detail 6)		Size AWG or kcmil	
	60°C (140°F)	75°C (167°F)	60°C (140°F)	75°C (167°F)	60°C (140°F)	75°C (167°F)	60°C (140°F)	75°C (167°F)		
	Type UF	RHW, THHW, THW, THWN, XHHW, USE	Type UF	RHW, THHW, THW, THWN, XHHW, USE	Type UF	RHW, THHW, THW, THWN, XHHW, USE	Type UF	RHW, THHW, THW, THWN, XHHW, USE		
COPPER					ALUMINUM OR COPPER-CLAD ALUMINUM					
8	64	75	60	79	51	59	47	55	8	
6	85	100	81	95	68	75	60	70	6	
4	107	125	100	117	83	97	78	91	4	
2	137	161	128	150	107	126	110	117	2	
1	155	182	145	170	121	142	113	132	1	
1/0	177	208	165	193	138	162	129	151	1/0	
2/0	201	236	188	220	157	184	146	171	2/0	
3/0	229	269	213	250	179	210	166	195	3/0	
4/0	259	304	241	282	203	238	188	220	4/0	
250	—	333	—	308	—	261	—	241	250	
350	—	401	—	370	—	315	—	290	350	
500	—	81	—	442	—	381	—	350	500	
750	—	585	—	535	—	473	—	433	750	
1000	—	657	—	600	—	545	—	497	1000	
Ambient Temp. (°C)	Correction Factors									Ambient Temp. (°F)
6-10	1.12	1.09	1.12	1.09	1.12	1.09	1.12	1.09	43-50	
11-15	1.06	1.04	1.06	1.04	1.06	1.04	1.06	1.04	52-59	
16-20	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	61-68	
21-25	0.94	0.95	0.94	0.95	0.94	0.95	0.94	0.95	70-77	
26-30	0.87	0.90	0.87	0.90	0.87	0.90	0.87	0.90	79-86	

ANNEX B: APPLICATION INFORMATION FOR AMPACITY CALCULATION TABLES B.310.15(B)(2)(9) AND B.310.15(B)(2)(10)

Table 310.15(B)(2)(9) Ampacities of Three Triplexed Single Insulated Conductors, Rated 0 Through 2,000 Volts, Directly Buried in Earth Based on Ambient Earth Temperature of 20°C (68°F), Electrical Duct Arrangement in Accordance with Figure B.310.15(B)(2)(2), 100 Percent Load Factor, Thermal Resistance (Rho) 90

Size AWG or kcmil	See Fig. B.310.15(B)(2)(2) Detail 7		See Fig. B.310.15(B)(2)(2) Detail 8		See Fig. B.310.15(B)(2)(2) Detail 7		See Fig. B.310.15(B)(2)(2) Detail 8		Size AWG or kcmil
	60°C (140°F)	75°C (167°F)	60°C (140°F)	75°C (167°F)	60°C (140°F)	75°C (167°F)	60°C (140°F)	75°C (167°F)	
	Type UF	Type USE	Type UF	Type USE	Type UF	Type USE	Type UF	Type USE	
	COPPER				ALUMINUM OR COPPER-CLAD ALUMINUM				
8	72	84	66	77	55	65	51	60	8
6	91	107	84	99	72	84	66	77	6
4	119	139	109	128	92	108	85	100	4
2	153	179	140	164	119	139	109	128	2
1	173	203	159	186	135	158	124	145	1
1/0	197	231	181	212	154	180	141	165	1/0
2/0	223	262	205	240	175	205	159	187	2/0
3/0	254	298	232	272	199	233	181	212	3/0
4/0	289	339	263	308	226	265	206	241	4/0
250	–	370	–	336	–	289	–	263	250
350	–	445	–	403	–	349	–	316	350
500	–	536	–	483	–	424	–	382	500
750	–	654	–	587	–	525	–	471	750
1000	–	744	–	665	–	608	–	544	1000
Ambient Temp. (°C)	Correction Factors								Ambient Temp. (°F)
6-10	1.12	1.09	1.12	1.09	1.12	1.09	1.12	1.09	43-50
11-15	1.06	1.04	1.06	1.04	1.06	1.04	1.06	1.04	52-59
16-20	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	61-68
21-25	0.94	0.95	0.94	0.95	0.94	0.95	0.94	0.95	70-77
26-30	0.87	0.90	0.87	0.90	0.87	0.90	0.87	0.90	79-86

Table 310.15(B)(2)(10) Ampacities of Three Single Insulated Conductors, Rated 0 Through 2,000 Volts, Directly Buried in Earth Based on Ambient Earth Temperature of 20°C (68°F), Electrical Duct Arrangement in Accordance with Figure B.310.15(B)(2)(2), 100 Percent Load Factor, Thermal Resistance (Rho) 90

Size AWG or kcmil	See Fig. B.310.15(B)(2)(2) Detail 9		See Fig. B.310.15(B)(2)(2) Detail 10		See Fig. B.310.15(B)(2)(2) Detail 9		See Fig. B.310.15(B)(2)(2) Detail 10		Size AWG or kcmil
	60°C (140°F)	75°C (167°F)	60°C (140°F)	75°C (167°F)	60°C (140°F)	75°C (167°F)	60°C (140°F)	75°C (167°F)	
	Type UF	Type USE	Type UF	Type USE	Type UF	Type USE	Type UF	Type USE	
	COPPER				ALUMINUM OR COPPER-CLAD ALUMINUM				
8	84	98	78	92	66	77	61	72	8
6	107	126	101	118	84	98	78	92	6
4	139	163	130	152	108	127	101	118	4
2	179	209	165	194	139	163	129	151	2
1	201	236	187	219	157	184	146	171	1
1/0	230	270	212	249	179	210	165	194	1/0
2/0	261	306	241	283	204	239	188	220	2/0
3/0	297	348	274	321	232	272	213	250	3/0
4/0	336	394	309	362	262	307	241	283	4/0
250	–	429	–	394	–	335	–	308	250
350	–	516	–	474	–	403	–	370	350
500	–	626	–	572	–	490	–	448	500
750	–	767	–	700	–	605	–	552	750
1000	–	887	–	808	–	706	–	642	1000
1250	–	979	–	891	–	787	–	716	1250
1500	–	1063	–	965	–	862	–	783	1500
1750	–	1133	–	1027	–	930	–	843	1750
2000	–	1195	–	1082	–	990	–	897	2000
Ambient Temp. (°C)	Correction Factors								Ambient Temp. (°F)
6-10	1.12	1.09	1.12	1.09	1.12	1.09	1.12	1.09	43-50
11-15	1.06	1.04	1.06	1.04	1.06	1.04	1.06	1.04	52-59
16-20	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	61-68
21-25	0.94	0.95	0.94	0.95	0.94	0.95	0.94	0.95	70-77
26-30	0.87	0.90	0.87	0.90	0.87	0.90	0.87	0.90	79-86

BENDING RADII AND PULLING TENSIONS

BENDING RADII AND PULLING TENSIONS

“Training” is the positioning of the cable when NOT under tension. “Bending” is under tension. The minimum bending radius applies to the inner surface of the cable and not to the cable axis. “Sidewall pressure” or loading is the radial force exerted on a cable when pulled around a bend or sheave. Excessive sidewall pressure will crush the cable.

SIDEWALL LOADING

Where **T** is tension out of a bend, in pounds, and **R** is the radius of a bend, in feet.

$$\begin{aligned} 1/C \text{ per Conduit: } SW &= \frac{T}{R} \\ 3-1/C \text{ Cradled: } SW &= \left[\frac{3w-2}{3} \right] \frac{T}{R} \\ 3-1/C \text{ Triangular: } SW &= \left[\frac{w}{2} \right] \frac{T}{R} \end{aligned}$$

TYPICAL SIDEWALL LOADINGS	LBS./FT.
600v Non-shielded Control	300
600v & 1KV Non-shielded EP and XLP	500
5 & 15 KV Unshield & EP/XLP	500
25-35 KV Power	300
Interlocked Armored Cable (All Voltage Classes)	300

MINIMUM BENDING RADII

POWER CABLES WITHOUT METALLIC SHIELDING, UP TO 600v

The minimum bending radii for both single and multiple-conductor cables with or without lead sheath and without metallic shielding are as follows:

Thickness of Conductor Insulation in Mils	Minimum Bending Radius as a Multiple of Cable Diameter		
	Overall diameter of Cable in Inches		
	1,000 and Less	1,001 - 2,000	2,001 and Over
155 and Less	4	5	6
170-310	5	6	7
325 and Over	-	7	8

POWER CABLES WITH METALLIC AND LEAD COVERED SHIELDING (ALL VOLTAGES)

1. For all shielded cables, the minimum bending radius is twelve times (12) the overall diameter of the completed cable.

POWER CABLES OVER 600 VOLTS, NON-SHIELDED, NON-ARMORED

1. The minimum bending radius for all cables is eight times (8) the overall cable diameter.

INTERLOCKED ARMORED CABLE, ALL VOLTAGES

1. The minimum bending radius for cables with non-shielded conductors is seven times (7) the armor O.D.

2. The minimum bending radius for cables with shielded conductors is twelve times (12) the diameter of one phase conductor/seven times (7) the armor O.D., whichever is larger.

PULLING TENSIONS

The following recommendations are based on a study sponsored by the ICEA. These recommendations may be modified if experience and more exact information so indicate.

A. Maximum Pulling Tension on Cable

1. With pulling eye attached to copper conductors, the maximum pulling tension in pounds should not exceed 0.008 times cir-mil area.

2. With pulling eye attached to 3/4 aluminum conductors, the maximum pulling tension in pounds should not exceed 0.006 times cir-mil area.

$$T_M = 0.008 \times n \times CM$$

Where:

T_M = Max Tension (Lbs.)
 n = Number of Conductors
 CM = Cir-Mil Area of Each Conductor

3. With cable grip over a lead sheath, the maximum pulling tension in pounds should not exceed 1,500 lbs./sq. inch of lead sheath cross-sectional area for commercial lead

$$T_M = 4,712t \text{ (D-t)}$$

Where:

t = Sheath Thickness (in.)
 D = Overall Diameter of Cable (in.)

4. With cable grip over a non-lead cable, the maximum pulling tension should not exceed 1,000 lbs. and may not exceed the maximum tension based on 0.008 or 0.006 x total conductor area.

5. When more than three conductors are pulled together, reduce the pulling tension 20%

B. Maximum Permissible Pulling Lengths

$$L_M = \frac{T_M}{CW}$$

Where:

L_M = Pulling Length, (Ft. Straight Section)
 T_M = Max Tension (Lbs.)

C. Pulling Tension Requirements in ducts or Conduits:

1. For straight sections, the pulling tension in pounds equals the length of duct multiplied by the weight per foot of cable and the coefficient of friction (paragraph B, above)

2. For curved sections, the following formula applies:

$$T_T = T_2 + T_1 e^{fa}$$

Where:

T_2 = Tension for Straight Section at Pulling End (Lbs.)
 T_1 = Tension for Straight Section at Feeding End (Lbs.)
 T_T = Total Tension
 a = Angle of Bend in Radians (1 Radian = 57.3 deg.)
 F = Coefficient of Friction (Usually 0.5)
 $e^{fa} = \log_{10}^{-1} \frac{fa}{2.303}$
 e = Napierian Logarithm Base = 2.718

3. The maximum pulling tension in pounds shall not exceed 300 times the radius of curvature of the duct expressed in ft.

CONDUCTORS IN PARALLEL OR AS ASSEMBLIES

SOFT DRAWN COPPER OR HARD DRAWN ALUMINUM

The following maximum tensions are for direct attachment to the conductor. However, the pulling force must not exceed the smallest value of 1) conductor tension, or 2) pulling device tension, or 3) sidewall load.

Number of Conductors	1	2	3	4	5	6
AWG/kcmil	Maximum Allowable conductor tension (LBS)					
20	8	16	24	26	33	39
18	13	26	39	41	52	62
16	21	41	62	66	83	99
14	33	66	99	100	130	150
12	52	100	150	160	200	250
11	66	130	190	210	260	310
10	83	160	240	260	330	390
9	100	200	310	330	410	500
8	130	260	390	420	520	630
6	210	420	630	670	840	1000
4	330	660	1000	1060	1330	1600
3	420	840	1260	1340	1680	2020
2	530	1060	1590	1690	2120	2540
1	670	1330	2000	2140	2670	3210
1/0	840	1690	2530	2700	3370	4050
2/0	1060	2130	3190	3400	4250	5110
3/0	1340	2680	4020	4290	5370	6440
4/0	1690	3380	5070	5410	6500	6500
250	2000	4000	6000	6400	6500	6500
300	2400	4800	6500	6500	6500	6500
350	2800	5600	6500	6500	6500	6500
400	3200	6400	6500	6500	6500	6500
450	3600	6500	6500	6500	6500	6500
500	4000	6500	6500	6500	6500	6500
600	4800	6500	6500	6500	6500	6500
700	5000	6500	6500	6500	6500	6500
750	5000	6500	6500	6500	6500	6500
800	5000	6500	6500	6500	6500	6500
900	5000	6500	6500	6500	6500	6500
1000	5000	6500	6500	6500	6500	6500

This chart may also be used for hard tempered aluminum conductors. However, use 1/2 of these chart values for all other UL labeled cables having aluminum conductors, such as THW, XHHW wire or SE cables.

MULTICONDUCTOR CABLES HAVING EQUAL-SIZED CONDUCTORS, WITHOUT SUBASSEMBLIES; SOFT DRAWN COPPER

The following maximum tensions are for direct attachment to the conductor. However, the pulling force must not exceed the smallest value of 1) conductor tension, or 2) pulling device tension, or 3) sidewall load.

AWG	20	18	16	14	12	11	10	9
Number of Conductors	Maximum Allowable conductor tension (LBS)							
2	16	26	41	66	100	130	160	200
3	24	39	62	99	150	190	240	310
4	33	52	83	130	200	260	330	410
5	41	65	100	160	260	320	410	520
6	49	78	120	190	310	390	490	620
7	49	78	120	190	310	390	490	620
8	52	83	130	210	330	420	530	670
9	59	93	140	230	370	470	590	750
10	65	100	160	260	410	520	660	830
11	72	110	180	280	460	570	730	920
12	78	120	190	310	500	630	790	1000
13	85	130	210	340	540	680	860	1000
14	91	140	130	360	580	730	930	1000
15	98	150	240	390	620	790	990	1000
16	100	160	260	420	660	840	1000	1000
17	110	170	280	440	710	890	1000	1000
18	110	180	290	470	750	940	1000	1000
19	120	190	310	500	790	1000	1000	1000
20	130	200	330	520	830	1000	1000	1000
22	140	220	360	570	910	1000	1000	1000
24	150	240	390	630	1000	1000	1000	1000
26	170	270	420	680	1000	1000	1000	1000
28	180	290	460	730	1000	1000	1000	1000
30	190	310	490	780	1000	1000	1000	1000
32	200	330	520	840	1000	1000	1000	1000
34	220	350	560	890	1000	1000	1000	1000
36	230	370	590	940	1000	1000	1000	1000
38	240	390	620	1000	1000	1000	1000	1000
40	260	410	660	1000	1000	1000	1000	1000
42	270	430	690	1000	1000	1000	1000	1000
44	280	450	720	1000	1000	1000	1000	1000
46	300	470	760	1000	1000	1000	1000	1000
48	310	490	790	1000	1000	1000	1000	1000
50	320	510	820	1000	1000	1000	1000	1000

The Maximum Limit is 1,000 Lbs.

COPPER CONDUCTOR AND STRANDING DATA

				CONCENTRIC STRAND					ROPE LAY			
Approx. O.D.	Pounds /1000 ft	Circular Mils	Size AWG /CM	Class AA	Class A	Class B	Class C	Class D	CONCENTRIC STRAND		BUNCH STRAND	
									Class G	Class H	Class K 30 AWG (0.010")	Class M 34 AWG (0.0063")
0.0050	0.0757	25.00	36									
0.0056	0.0954	31.52	35									
0.0063	0.1203	39.75	34									
0.0071	0.1517	50.13	33									
0.0080	0.1913	63.21	32									
0.0089	0.2413	79.70	31									
0.0100	0.3042	100.5	30									
0.0113	0.3836	126.7	29									
0.0126	0.4837	159.8	28									
0.0142	0.6100	201.5	27									
0.0159	0.7692	254.1	26									
0.0179	0.9699	320.4	25									
0.0201	1.2230	404.0	24									
0.0226	1.5420	509.5	23									
0.0254	1.9450	642.4	22									
0.0285	2.4520	810.1	21									
0.0363	3.1540	1,020	20			7	19				10	26
0.0456	5.0150	1,620	18			7	19				16	41
0.0576	7.9740	2,580	16			7	19				26	65
0.0726	12.680	4,110	14			7	19	37	49		41	104
0.0915	20.160	6,530	12			7	19	37	49		65	168
0.1160	32.060	10,380	10			7	19	37	49		104	259
0.1600	40.420	13,090	9			7	19	37	49	133		
0.1460	51.000	16,510	8			7	19	37	49	133	168	420
0.1840	80.900	26,240	6			7	19	37	49	133	266	665
0.2320	129.00	41,740	4	3	7	7	19	37	49	133	420	1064
0.2600	162.00	52,620	3	3	7	7	19	37	49	133	532	1323
0.2990	205.00	66,630	2	3	7	7	19	37	49	133	665	1666
0.3320	259.00	83,690	1	3	7	19	37	61	133	259	836	2107
0.3730	326.00	105,600	1/0	7	7	19	37	61	133	259	1064	2646
0.4190	411.00	133,100	2/0	7	7	19	37	61	133	259	1323	3325
0.4700	518.00	167,800	3/0	7	7	19	37	61	133	259	1666	4256
0.5280	653.00	211,600	4/0	7	7	19	37	61	133	259	2107	5320
0.5750	772.00	250,000	250,000	12	19	37	61	91	259	427	2499	6384
0.6300	925.00	300,000	300,000	12	19	37	61	91	259	427	2989	7581
0.6810	1080.0	350,000	350,000	12	19	37	61	91	259	427	3458	8806
0.7280	1236.0	400,000	400,000	19	19	37	61	91	259	427	3990	10,101
0.8130	1542.0	500,000	500,000	19	37	37	61	91	259	427	5054	12,691
0.8930	1850.0	600,000	600,000	37	37	61	91	127	427	703	5985	14,945
0.9980	2316.0	750,000	750,000	37	61	61	91	127	427	703	7581	18,788
1.1520	3086.0	1,000,000	1,000,000	37	61	61	91	127	427	703	10,101	25,193

Technical Reference

COPPER CONDUCTOR AND STRANDING DATA

DIMENSIONS AND WEIGHTS OF SOLID COPPER WIRE				
Size AWG	Approx. Diameter	Circular Mils	Square Inches	Approx. Lbs./Mft
34	0.0063	39.7	0.0000312	0.120
32	0.0080	64.0	0.0000503	0.194
30	0.0100	100	0.0000785	0.303
29	0.0113	128	0.000100	0.387
28	0.0126	159	0.000125	0.481
27	0.0142	202	0.000158	0.610
26	0.0159	253	0.000199	0.765
25	0.0179	320	0.000252	0.970
24	0.0201	404	0.000317	1.22
23	0.0226	511	0.000401	1.55
22	0.0253	640	0.000503	1.94
21	0.0285	812	0.000638	2.46
20	0.0320	1020	0.000804	3.08
18	0.0403	1620	0.00128	4.90
16	0.0508	2580	0.00203	7.80
14	0.0641	4110	0.00323	12.4
12	0.0808	6530	0.00513	19.8
10	0.1019	10,380	0.00815	31.40
9	0.1144	13,090	0.01028	39.60
8	0.1300	16,510	0.01297	49.90
7	0.1443	20,820	0.01635	63.00
6	0.1620	26,240	0.02061	79.30
5	0.1819	33,090	0.02599	100.0
4	0.2043	41,740	0.03278	126.0
3	0.2294	52,620	0.04133	159.0
2	0.2576	66,360	0.05212	200.0

STRANDING-CLASS CONSTRUCTION AND USES

CONCENTRIC-LAY CONDUCTORS

Class B - Power cables

Class C - Power cables where more flexible stranding from Class B is desired

Class D - Power cables where more flexible stranding is desired

ROPE-LAY AND BUNCH-STRANDED CONDUCTORS

Class G - All cables for portable use

Class H - All cables where extreme flexibility is required, e.g. take-up reels

Class I - Apparatus cable and motor leads

Class K - Cords and cables 30 AWG copper wires - Stationary service

Class M - Cords and cables 34 AWG copper wires - Constant service

Note: Class G and H shall have concentric-lay stranded members and Class I, K and M have bunched stranded members.

METRIC CONVERSION CHART AWG/METRIC PREFERRED SIZES OF CONDUCTORS

AWG/MCM	mm ²	Circular Mils	AWG/MCM	mm ²	Circular Mils
2000		2,000,000		6.0	11,800
	1000	1,970,000			10,380
1750		1,750,000	10	4.0	7,890
	800	1,580,000			6,530
1500		1,500,000	12	2.5	4,930
1250		1,250,000			4,110
	630	1,240,000	14	1.5	2,960
1000		1,000,000			2,580
	500	987,000	16	1.0	1,970
	400	789,000		0.90	1,773
750		750,000			1,620
600		600,000	18	0.80	1,576
	300	592,000		0.75	1,480
500		500,000		0.60	1,182
	240	474,000			1,020
400		400,000	20	0.50	987
	185	365,000			640
350		350,000	22	0.20	404
300		300,000	24		253
	150	296,000	26		159
250		250,000	28		100
	120	237,000	30	.05	64.0
4/0		211,600	32		39.7
	95	187,000	34	.02	25.0
3/0		167,000	36		16.0
	70	138,000	38	.005	9.61
2/0		133,100	40		
1/0		105,600			
	50	98,700			
1		83,690			
	35	69,100			
2		66,360			
3		52,620			
	25	49,300			
4		41,740			
	16	31,600			
6		26,240			
	10	19,700			
8		16,510			

ELECTRICAL CONDUCTORS INTERNATIONAL STANDARD SIZES CONVERSION CHART (ANNEALED COPPER STRANDED CONDUCTORS)

Nominal Area			B & SG (AWG)	Stranding and Wire Diameter		Approx Overall (Equivalent) Diameter		Calculated Electrical Area			Nominal Weight		Standard Resistance at 20°C (68°F) (Plain Wire)	
inch ²	mm ²	cir mils		inch	mm	inch	mm	inch ²	mm ²	cir mils	lb/K yd.	kg/km	Ω/K yd	Ω/km
-	0.50	1,020	20			0.032	0.81	0.0008042	0.5188	1024	9.30	4.613	30.38	33.23
-	-	1,020	20	7/0.0121	7/0.307	0.036	0.91	0.0007914	0.5106	1008	9.47	4.698	30.88	33.77
0.001	-	-	-			0.036	0.91	0.001018	0.6567	1296	11.77	5.838	24.01	26.26
0.001	-	-	-	3/0.020	3/0.508	0.043	1.09	0.000924	0.5961	1176	11.11	5.512	26.45	28.92
-	0.75	-	-			0.039	0.99	0.001195	0.7707	1521	13.81	6.851	20.46	22.37
-	-	1,620	18	1/0.0403	1/1.02	0.040	1.02	0.00128	0.8239	1630	14.75	7.316	19.16	20.95
-	-	1,620	18			0.046	1.16	0.001249	0.8057	1590	14.94	7.410	19.57	21.40
0.0015	-	-	-	1/0.044	1/1.12	0.044	1.12	0.001521	0.9810	1936	17.58	8.721	16.07	17.58
-	1.0	-	-			0.045	1.14	0.001590	1.026	2025	18.39	9.122	15.36	16.80
-	1.0	-	-	7/0.017	7/0.432	0.051	1.30	0.001562	1.008	1989	18.68	9.266	15.64	17.11
0.002	-	-	-			0.062	1.59	0.001943	1.253	2474	23.37	11.59	12.58	13.76
-	-	2,580	16	1/0.0508	1/1.29	0.051	1.29	0.00203	1.308	2585	23.43	11.63	12.06	13.19
-	-	2,580	16			0.058	1.46	0.001993	1.286	2537	23.83	11.82	12.26	13.41
-	1.5	-	-	1/0.055	1/1.40	0.055	1.40	0.002376	1.533	3025	27.47	13.63	10.29	11.25
-	1.5	-	-			0.063	1.60	0.002384	1.538	3035	28.51	14.14	10.25	11.21
0.003	-	-	-	3/0.036	3/0.914	0.078	1.97	0.002994	1.931	3812	36.01	17.86	8.163	8.927
0.003	-	-	-			0.064	1.63	0.003217	2.075	4096	37.20	18.45	7.596	8.307
-	-	4,110	14	1/0.0641	1/1.63	0.064	1.63	0.00323	2.082	4113	37.31	18.351	7.572	8.281
-	-	4,110	14			0.073	1.84	0.003166	2.042	4031	37.86	18.78	7.719	8.442
-	2.5	-	-	1/0.071	1/1.80	0.071	1.80	0.003959	2.554	5041	45.78	22.71	6.172	6.750
-	2.5	-	-			0.081	2.06	0.003941	2.542	5017	47.13	23.38	6.201	6.782
0.0045	-	-	-	7/0.029	7/0.737	0.087	2.21	0.004546	2.933	5788	54.37	26.97	5.375	5.879
-	-	6,530	12			0.081	2.05	0.00513	3.308	6532	59.29	29.41	4.766	5.212
-	-	6,530	12	7/0.0305	7/775	0.092	2.32	0.005028	3.244	6402	60.14	29.84	4.860	5.315
-	4	-	-			0.089	2.26	0.006221	4.014	7921	71.93	35.68	3.928	4.296
-	4	-	-	7/0.034	7/0.864	0.102	2.59	0.006249	4.032	7956	74.74	37.08	3.911	4.277
0.007	-	-	-			0.108	2.74	0.007005	4.520	8920	83.80	41.57	3.489	3.815
-	-	10,380	10	1/0.1019	1/2.59	0.102	2.59	0.008155	5.261	10380	94.29	46.77	2.996	3.277
-	-	10,380	10			0.116	2.93	0.008012	5.169	10200	95.83	47.54	3.050	3.335
-	6	-	-	1/0.109	1/2.77	0.109	2.77	0.09331	6.020	11880	107.9	53.52	2.619	2.864
-	6	-	-			0.126	3.21	0.009535	6.152	12140	114.0	56.55	2.563	2.803
-	-	13,090	9	1/0.114	1/2.91	0.1144	2.91	0.01028	6.634	13090	118.8	58.93	2.377	2.600
-	-	13,090	9			0.130	3.30	0.01009	6.508	12840	120.7	59.86	2.422	2.649
0.01	-	-	-	7/0.044	7/1.12	0.132	3.35	0.01046	6.751	13320	125.2	62.11	2.335	2.555
-	-	16,510	8			0.128	3.26	0.01297	8.366	16510	150.0	74.36	1.884	2.061
-	-	16,510	8	7/0.0486	7/1.23	0.146	3.70	0.01277	8.237	18260	152.7	75.75	1.914	2.093
0.0145	-	-	-			0.156	3.96	0.01462	9.430	18610	174.8	86.71	1.672	1.828
-	10	-	-	1/0.141	1/3.58	0.141	3.58	0.01561	10.07	19880	180.5	89.54	1.565	1.711
-	10	-	-			0.162	4.12	0.01576	10.17	20070	188.5	93.51	1.550	1.695
-	-	20,820	7	1/0.1443	1/3.67	0.144	3.67	0.01635	10.55	20820	189.1	93.80	1.494	1.634
-	-	20,820	7			0.164	4.15	0.01606	10.36	20440	192.0	95.24	1.522	1.664
-	-	26,240	6			0.162	4.11	0.02061	13.30	26240	238.3	118.2	1.185	1.296
-	-	26,240	6	7/0.0612	7/1.55	0.184	4.66	0.02025	13.06	25780	242.2	120.1	1.207	1.320
0.0225	-	-	-			0.192	4.68	0.02214	14.28	28190	264.9	131.4	1.104	1.207
-	16	-	-	7/0.068	7/173	0.204	5.18	0.02499	16.12	31820	299.0	148.3	0.9777	1.069
-	-	33,090	5			0.206	5.24	0.02559	16.51	32580	306.0	151.8	0.9550	1.044
0.03	-	-	-	19/0.044	19/1.12	0.220	5.59	0.02835	18.29	36100	340.4	168.9	0.8619	0.9425
-	-	41,740	4			0.232	5.88	0.03222	20.78	41020	385.3	191.1	0.7585	0.8295
-	25	-	-	7/0.085	7/2.16	0.255	6.48	0.3905	25.19	49720	467.1	231.7	0.6257	0.6843
0.04	25	-	-	19/0.052	19/1.32	0.260	6.60	0.03960	25.55	50420	475.3	235.8	0.6171	0.6748
-	-	52,620	3			0.260	6.61	0.04063	26.21	51730	486.0	241.1	0.6014	0.6577
-	-	66,360	2	7/0.0974	7/2.47	0.292	7.42	0.05128	33.08	65290	613.3	304.2	0.4765	0.5211
-	35	-	-			0.300	7.62	0.05405	34.87	68820	646.5	320.7	0.4521	0.4944
-	35	-	-	19/0.061	19/1.55	0.305	7.75	0.05450	35.16	69390	654.2	324.5	0.4484	0.4904
0.06	-	-	-	19/0.064	19/1.63	0.320	8.13	0.05999	38.70	76380	720.2	357.3	0.4074	0.4455
-	-	83,690	1			0.332	8.43	0.06457	41.66	82210	775.1	384.5	0.3784	0.4139
0.075	-	-	-	19/0.072	19/1.83	0.360	9.14	0.07592	48.98	96660	911.4	452.1	0.3219	0.3520
-	50	-	-			0.365	9.27	0.07805	50.35	99380	936.9	464.8	0.3131	0.3424
-	-	105,600	1/0	.0745	19/1.89	0.373	9.46	0.08129	52.44	103500	975.8	484.1	0.3006	0.3288
1	-	-	-			0.415	10.5	0.1009	65.09	128500	1212.0	601.2	0.2422	0.2649
-	-	133,100	2/0	19/0.0837	19/2.13	0.419	10.6	0.1026	66.19	130600	1232.0	611.1	0.2382	0.2605
-	70	-	-			0.430	10.9	0.1083	69.87	137900	1300.0	645.0	0.2256	0.2467

Technical Reference

ELECTRICAL CONDUCTORS INTERNATIONAL STANDARD SIZES CONVERSION CHART (ANNEALED COPPER STRANDED CONDUCTORS)

Nominal Area			B & SG (AWG)	Stranding and Wire Diameter		Approx Overall (Equivalent) Diameter		Calculated Electrical Area			Nominal Weight		Standard Resistance at 20°C (68°F) (Plain Wire)	
inch ²	mm ²	cir mils		inch	mm	inch	mm	inch ²	mm ²	cir mils	lb/K yd.	kg/km	Ω/K yd	Ω/km
0.12	—	—	—	37/0.064	37/1.63	0.448	11.4	0.1168	45.33	148700	1403	696.0	0.2093	0.2289
—	—	167,800	3/0	19/0.094	19/2.39	0.470	11.9	0.1294	83.49	164800	1553	770.4	0.1888	0.2065
—	—	167,800	3/0	37/0.0673	37/1.71	0.471	12.0	0.1291	83.29	164400	1551	469.4	0.1888	0.2070
—	95	—	—	19/0.101	19/2.57	0.505	12.8	0.1494	96.39	190200	1793	889.4	0.1893	0.1789
0.15	95	—	—	37/0.072	37/1.83	0.504	12.8	0.1478	95.34	188100	1776	881.0	0.1636	0.1808
—	—	211,600	4/0	19/0.1055	19/2.68	0.528	13.4	0.1630	105.2	207500	1957	970.8	0.1499	0.1639
—	120	—	—	37/0.081	37/2.06	0.567	14.4	0.1870	120.7	238100	2247	1115	0.1307	0.1429
—	—	250,000	—	37/0.0822	37/2.09	0.575	14.6	0.1926	124.3	245200	2314	1148	0.1269	0.1388
0.20	—	—	—	37/0.083	37/2.11	0.581	14.8	0.1964	126.7	250000	2360	1171	0.1244	0.1361
—	150	300,000	—	37/0.090	37/2.29	0.630	16.0	0.2309	149.0	294000	2774	1376	0.1058	0.1157
0.25	—	—	—	37/0.093	37/2.36	0.651	16.5	0.2465	159.1	313900	2963	1470	0.09911	0.1084
—	—	350,000	—	37/0.0973	37/2.47	0.681	17.3	0.2699	174.1	343600	3243	1609	0.09055	0.09903
—	185	—	—	37/1.00	37/2.54	0.700	17.8	0.2851	183.9	363000	3426	1699	0.08572	0.09375
0.30	—	—	—	37/0.103	37/2.62	0.721	18.3	0.3024	195.1	385000	334	1803	0.08081	0.08837
—	—	400,000	—	37/0.104	37/2.64	0.728	18.5	0.3083	198.9	392500	3705	1838	0.07926	0.08668
—	240	—	—	37/0.114	37/2.90	0.798	20.3	0.3705	239.0	471700	4452	2208	0.06596	0.07214
—	240	—	—	61/0.089	61/2.26	0.801	20.3	0.3722	240.0	473900	4474	2219	0.06566	0.07181
—	—	500,000	—	37/0.1162	37/2.95	0.813	20.7	0.3849	248.3	490100	4625	2294	0.06349	0.06943
—	—	500,000	—	61/0.0905	61/2.30	0.814	20.7	0.3848	248.3	490000	4626	2295	0.06350	0.06944
0.40	—	—	—	61/0.093	61/2.36	0.837	21.3	0.4064	262.2	517400	4885	2423	0.06013	0.06576
—	300	—	—	61/0.099	61/2.51	0.891	22.6	0.4605	297.1	586500	5536	2746	0.05306	0.05803
—	—	600,000	—	61/0.0922	61/2.52	0.893	22.7	0.4624	298.3	588700	5558	2747	0.05285	0.05780
0.50	—	—	—	61/0.103	61/2.62	0.927	23.5	0.4985	321.6	634700	5992	2972	0.04902	0.05361
—	—	700,000	—	61/0.1071	61/2.72	0.964	24.5	0.5389	347.7	686200	6479	3214	0.04534	0.04959
—	—	750,000	—	61/0.1109	61/2.82	0.998	25.4	0.5779	372.8	735800	6947	3446	0.04229	0.04625
—	—	750,000	—	91/0.0908	91/2.31	0.999	25.4	0.5778	372.8	735700	6948	3447	0.04229	0.04625
0.60	—	—	—	91/0.093	91/2.36	1.023	26.0	0.6062	391.1	771800	7289	3616	0.04032	0.04409
—	400	—	—	61/0.114	61/2.90	1.026	26.1	0.6106	393.9	777400	7341	3642	0.04002	0.04377
—	—	800,000	—	61/0.1145	61/2.91	1.031	26.2	0.6160	397.4	784300	7405	3673	0.03967	0.04338
—	—	800,000	—	91/0.0938	91/2.38	1.032	26.2	0.6166	397.8	785100	7414	3678	0.03963	0.04334
0.75	—	—	—	91/0.103	91/2.62	1.133	28.8	0.7435	479.7	946700	8940	4435	0.03287	0.03594
—	500	1,000,000	—	61/0.1280	61/3.25	1.152	29.3	0.7698	496.6	980100	9254	4590	0.03174	0.03472
—	—	1,000,000	—	91/0.1048	91/2.66	1.153	29.3	0.7697	496.6	980100	9255	4591	0.03175	0.03472
0.85	—	—	—	127/0.093	127/2.36	1.209	30.7	0.8459	545.8	1077000	10173	5046	0.02889	0.03159
—	625	—	—	91/0.117	91/2.97	1.287	32.7	0.9594	619.0	1222000	11536	5722	0.02547	0.02786
—	—	1,250,000	—	91/0.1172	91/2.98	1.289	32.7	0.9627	621.1	1226000	11575	5742	0.02538	0.02776
—	—	1,250,000	—	127/0.0992	127/2.52	1.290	32.8	0.9625	620.9	1225000	11574	5741	0.02539	0.02777
1.0	—	—	—	127/0.103	127/2.62	1.339	34.0	1.0375	669.4	1321000	12478	6190	0.02355	0.02575
—	—	1,500,000	—	91/0.1284	91/3.26	1.412	35.9	1.155	745.5	1471000	13893	6892	0.02115	0.02313
—	—	1,500,000	—	127/0.1087	127/2.76	1.413	35.9	1.156	745.6	1471000	13897	6894	0.02115	0.02312
—	800	—	—	91/0.132	91/3.35	1.452	36.9	1.221	787.7	1555000	14683	7284	0.02001	0.02188
1.25	—	—	—	127/0.112	127/2.84	1.456	37.0	1.227	791.5	1562000	14784	7319	0.01992	0.02178
1.50	—	—	—	169/0.107	169/2.72	1.605	40.8	1.490	961.3	1897000	17920	8889	0.01640	0.01794
—	1000	—	—	91/0.147	91/3.73	1.617	41.1	1.514	976.8	1928000	18210	9033	0.01614	0.01765
—	—	2,000,000	—	127/0.1255	127/3.19	1.632	41.5	1.540	993.8	1961000	18525	9189	0.01586	0.01735
—	—	2,000,000	—	169/0.1088	169/2.76	1.632	41.5	1.541	993.9	1962000	18528	9191	0.01586	0.01735

British Sizes

- B.S.7: 1953 and B.S480: 1954

B & SG (AWG) Sizes

- Based on C.E.S.A. C68A; A.S.T.M. B8-53 and I.P.C.E.A. 5-19-8
- Classes B & C (preferred sizes)

Metric Sizes

- V.D.E. 0255/551 and 026/52

British Sizes

The following tolerances on resistance are permitted in:

British Standard Specifications	Percent
Single Wires, Tinned, below 0.036 in. diameter	+5
Single Wires, Tinned, 0.036 in diameter and above	+4
Single Wires, Plain	+3
Standard conductor, Tinned, below 0.036 in. diameter	+4
Standard Conductor, tinned, 0.036 in. diameter and above	+3
Standard Conductor, Plain	+2

A further increase in resistance of 2 percent is allowable for the laying-up of twin and multicore cables.

Technical Reference

MATERIAL TEMPERATURE COMPARISONS

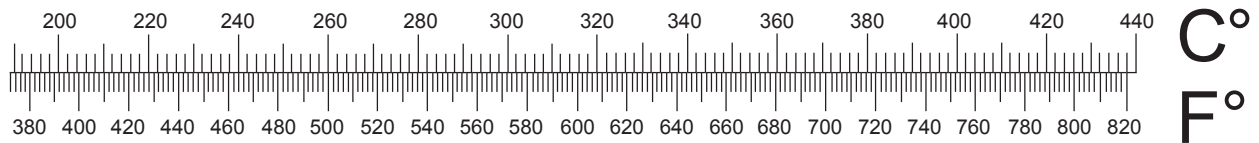
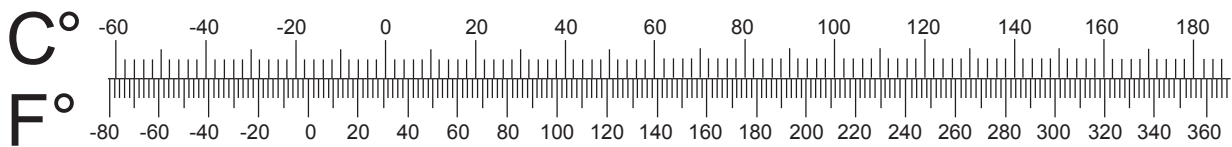
NOMINAL TEMPERATURE RANGE/INSULATING AND JACKETING COMPOUNDS				
Compound	Normal Low	Normal High	Special Low	Special High
Chlorosulfonated Polyethylene (Hypalon*)	-20	90	-40	105
EPDM (Ethylene-Propylene-Diene Monomer)	-55	105	-	150
Neoprene	-20	60	-55	90
Polyethylene (Solid and Cellular)	-60	80	-	-
Polypropylene (Solid and Cellular)	-10	105	-	-
Rubber (EPR, Hypalon)	-30	60	-55	75
FEP Teflon*	-70	200	-	-
PVC	-20	80	-55	150
Silicone**	-80	150	-	200
Halar***	-70	150	-	-
Tefzel*	-65	150	-	-
TFE Teflon (Harsher Environments)	-70	260	-	-

*DuPont Trademark

** General Electric TradeMark

*** Ausimont Corporation Trademark

Technical Reference



JACKET & INSULATION MATERIALS COMPARISON CHART

THERMOPLASTIC PROPERTIES

Insulation or Jacket Material	Chlorinated Polyethylene (CPE)	Polyvinyl Chloride (PVC)	Lowdensity Polyethylene (LDPE)	Cellular Polyethylene	Highdensity Polyethylene	Polyurethane	Polypropylene	Nylon	Teflon®	TPE
Oxidation Resistance	E	E	E	E	E	E	E	E	O	E
Heat Resistance	G-E	G-E	G	G-E	E	E	G	E	O	G
Oil Resistance	E	E	G-E	G-E	G-E	G-E	E	E	O	P
Low Temp. Flexibility	G	P-G	G-E	E	E	E	G	G	O	E
Weather Resistance	E	G-E	E	E	E	E	F-G	E	O	E
Ozone Resistance	E	E	E	E	E	E	E	E	E	E
Abrasion Resistance	E	F-G	F-G	G	E	F-G	O	E	G-E	F
Electrical Properties	F	F-G	E	E	E	E	G	F	E	G
Flame Resistance	F	E	P	P	P	P	P	P	O	F-G
Nuclear Radiation Resistance	G-E	P-F	G	G	G	F	G	F-G	P-F	F
Water Resistance	G	E	E	E	E	E	P	P-F	E	E
Acid Resistance	G-E	G-E	G-E	G-E	G-E	E	F	E	E	G
Alkali Resistance	G-E	G-E	G-E	G-E	G-E	E	F	G	E	G
Gasoline, Kerosene, Etc. (Aliphatic Hydrocarbons) Resistance	F	G-E	P-F	P-F	P-F	P-F	F	G	E	P
Benzol, Toluol, Etc. (Aromatic Hydrocarbons) Resistance	F	P-F	P	P	P	P	F	G	E	P
Degreaser Solvents (Halogenated Hydrocarbons) Resistance	P	P-F	P	P	P	P	P	P	E	P
Alcohol Resistance	G	G-E	E	E	E	E	P	P	E	E

Any given property can generally be improved by the use of selective compounding.

LEGEND
P = Poor
F = Fair
G = Good
E = Excellent
O = Outstanding

JACKET & INSULATION MATERIALS COMPARISON CHART

THERMOSET PROPERTIES

Insulation or Jacket Material	Styrene Butadiene Rubber (SBR)	Natural Rubber	Synthetic Rubber	Polybutadiene	Neoprene	Hypalon® Chlorosulfonated Polyethylene (CSPE)	Nitrile or Rubber Butadiene Nitrile (NBR)	Nitrile/ Polychloride (NBR/PVC)	Ethylene Propylene Rubber (EPR)	Crosslinked Polyethylene (XLPE)	Chlorinated Polyethylene (CPE)	Silicone Rubber
Oxidation Resistance	F	F	G	G	G	E	F	E	G	E	E	E
Heat Resistance	F-G	F	F	F	G	E	G	G	E	G	E	E
Oil Resistance	P	P	P	P	G	G	G-E	G	F	G	P	F-G
Low Temp. Flexibility	F-G	G	E	E	F-G	F	F	F	G-E	O	E	O
Weather Resistance	F	F	F	F	G	E	F-G	G	E	G	E	O
Ozone Resistance	P	P	P	P	G	E	P	G	E	E	E	O
Abrasion Resistance	G-E	E	E	E	G-E	G	G-E	E	G	F-G	F	F
Electrical Properties	E	E	E	E	F	G	P	F	E	E	G	O
Flame Resistance	P	P	P	P	G	G	P	G	P	F-G	F-G	O
Nuclear Radiation Resistance	F-G	F-G	F-G	P	F-G	G	F-G	P	G	E	F	E
Water Resistance	G-E	G-E	E	E	G	G-E	G-E	E	G-E	G-E	E	G-E
Acid Resistance	F-G	F-G	F-G	F-G	G	E	G	G	G-E	G-E	G	F-G
Alkali Resistance	F-G	F-G	F-G	F-G	G	E	F-G	G	G-E	G-E	G	F-G
Gasoline, Kerosene, Etc. (Aliphatic Hydrocarbons) Resistance	P	P	P	P	G	F	E	G-E	P	F	P	P-F
Benzol, Toluol, Etc. (Aromatic Hydrocarbons) Resistance	P	P	P	P	P-F	F	G	G	F	F	P	P
Degreaser Solvents (Halogenerated Hydrocarbons) Resistance	P	P	P	P	P	P-F	P	G	P	F	P	P-G
Alcohol Resistance	F	G	G	F-G	F	G	E	G	P	E	E	G

Any given property can generally be improved by the use of selective compounding.

LEGEND

P = Poor
 F = Fair
 G = Good
 E = Excellent
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CABLE FLAME TESTS

FACTORY MUTUAL CABLE FIRE PROPAGATION TEST

A unique test standard whereby a Fire Propagation Index (FPI) is determined based upon a combination heat release and ignition test. The FPI is used to determine a 1, 2, or 3 Group rating. The lower Group ratings are the better performing cables.

ICEA T-29-520 VERTICAL-TRAY FLAME TEST (210,000 BTU)

Similar to 70,000 BTU per hour test but heat source increased to 210,000 BTU per hour.

IEEE 383 VERTICAL FLAME TEST

The Institute of Electrical and Electronic Engineers (IEEE) has established IEEE-383, "IEEE Standards for Type Test of Class IE Electric Cables, Field Splices and Connections for Nuclear Generation Stations". Although originally intended for cables essential for emergency operations in nuclear power plants, this test procedure is used for other non-nuclear installations.

In the IEEE-383 fire test cables are supported by a one-foot wide vertical rack eight feet high. The cables are positioned in the center six inches off the rack, spaced one-half cable diameter apart. A ten inch ribbon burner fuel with an air-propane mixture ignites the cable with a 21 kW (70,000 BTU/hr) flame. The burner is positioned two feet above the floor and 9 to 12 inches of cable are exposed to the direct flames for 20 minutes. Cables on which flame extends above the top of the eight foot rack fail this test. NELPIA (ANI) test is a (210,000 BTU/hr) vertical flame test corner configuration.

Flammability Tests	BTU/hr	Locations
IEEE 1202	70,000	General Purpose
UL 1581 (VW-1)	(Bunsen Burner)	Residential & Non-Residential in Conduit
UL 1581 (Vertical Tray)	70,000 (IEEE 383)	General Purpose
UL 1666 (Vertical Chamber)	527,500	Riser and General Purpose
UL 1685	70,000	General Purpose
UL 910 (Steiner Tunnel)	70,000	Air Plenums & General Purpose

UL-910 PLENUM TEST (NFPA 262)

A plenum is defined as any space used as part of an air-handling system. This includes heating/air conditioning ducts and air returns, which frequently include the space between suspended ceilings and the floor above in modern office buildings. The National Electrical Code (NEC) requires that exposed cables (those not in conduit) in plenums be listed as "having adequate fire-resistant and low-smoke producing characteristics...".

A "Standard For Test Method For Fire and Smoke Characteristics of Cables Used in Air-Handling Spaces", was developed by Underwriters Laboratories (UL) to classify cables for this NEC requirement. This test is performed in a 25 foot Stein Tunnel test furnace (also specified in ASTM E-84 test for building materials). Designed to match the rigors of the application, this test is quite demanding.

In the UL-910 test, a single layer of 24 foot lengths of cable are supported by a one foot wide cable rack, which is filled with cables. The cables are ignited by an 88 kW (300,000 BTU/hr) methane flame. Flame spread is aided by a 240 ft/minute draft. During the 20 minute test, flame spread is observed through small windows spaced one foot apart. Smoke is measured by a photocell installed in the exhaust duct.

To qualify, cables must have a flame spread of less than 5 feet beyond the end of the 4-1/2 foot ignition flame, a peak optical density of 0.5 max (33% light transmission) and a max average optical density of 0.15 (70% light transmission).

UL RISER TEST (UL 1666)

Underwriters Laboratories (UL) has established a fire test facility for the purpose of listing cables that meet NEC requirements.

This test chamber is an eight by four simulated shaft, twelve feet high between the source of ignition and the floor above. A very large propane burner, 145 kW (495,000 BTU/hr) is ignited for a period of 30 minutes. Flames must not extend above the 12 foot mark if the cable is to be UL Classified for this duty.

UL VW-1 VERTICAL WIRE FLAME TEST (UL 1581)

The purpose of the UL VW-1 Vertical Wire Flame Test is to screen out flammable wires. The ignition source is small (under 1kW) and is applied for only 75 seconds.

In the UL VW-1 Flame Test, a tirrill burner (similar to a Bunsen burner) is used as the ignition source. The wire sample is mounted and the flame is applied for 15 seconds and then removed. The flame is then reapplied, either after 15 seconds or when the sample ceases to flame (whichever is longer), for a total of five 15-second applications. After the above procedure is completed, a wire sample that passes this test must not burn for more than one minute and must not burn more than 25% of an indicator flag. In addition, surgical cotton at the base of the burner must not be ignited.

COLOR CODE CHARTS

The following paragraphs detail ICEA/NEMA color code methods. Charts detailing ICEA/NEMA Methods 1 and 3, which are referenced in the product pages of this catalog, are included herein.

Industry standard generic Color Code Charts 1 through 5, which also are referenced in the product pages, follow the ICEA/NEMA charts.

ICEA/NEMA Method 1 - Colored insulation with contrasting ink tracers as required. Six different insulation colors and four different colored ink tracers are used to provide positive identification through 21 conductors. The same identification sequence may be repeated for cables containing more than 21 conductors.

ICEA/NEMA Method 2 - A neutral-colored compound is used with single or double spiral ink tracers as required to provide positive identification through 21 conductors. The identification sequence is repeated for cables containing more than 21 conductors.

ICEA/NEMA Method 3 - A neutral- or single-colored insulation compound is surface ink printed with both conductor number and color designation to provide positive identification through 21 conductors. The identification sequence is repeated for colors containing more than 21 conductors.

ICEA/NEMA Method 4 - A neutral- or single-colored insulation compound is surface ink printed with conductor number to provide positive conductor identification through 21 conductors. The identification sequence is repeated for cables containing more than 21 conductors.

ICEA/NEMA Method 5 - A color coding using braids. Also sometimes specified using colored insulation and contrasting tracers as an extension of Method 1 to eliminate duplicate conductors. Up to 127 positive conductor codings are available with this method.

ICEA/NEMA Method 9 - One conductor of each pair should be coded "white" or "black" and the other conductor should be coded with any other contrasting color. Pairs should be identified in sequence by printed numbers on at least one conductor in each pair, beginning with the number 1.

COLOR CODE CHARTS

ICEA METHOD 1, TABLE E-1							
Number of Conductors	Background or Base Color	First Tracer Color	Second Tracer Color	Number of Conductors	Background or Base Color	First Tracer Color	Second Tracer Color
1	Black	–	–	20	Red	Green	–
2	White	–	–	21	Orange	Green	–
3	Red	–	–	22	Black	White	Red
4	Green	–	–	23	White	Black	Red
5	Orange	–	–	24	Red	Black	White
6	Blue	–	–	25	Green	Black	White
7	White	Black	–	26	Orange	Black	White
8	Red	Black	–	27	Blue	Black	White
9	Green	Black	–	28	Black	Red	Green
10	Orange	Black	–	29	White	Red	Green
11	Blue	Black	–	30	Red	Black	Green
12	Black	White	–	31	Green	Black	Orange
13	Red	White	–	32	Orange	Black	Green
14	Green	White	–	33	Blue	White	Orange
15	Blue	White	–	34	Black	White	Orange
16	Black	Red	–	35	White	Red	Orange
17	White	Red	–	36	Orange	White	Blue
18	Orange	Red	–	37	White	Red	Blue
19	Blue	Red	–				

COLOR CODE CHARTS

ICEA METHOD 1, TABLE E-2					
Number of Conductors	Base Color	Spiral Stripe	Number of Conductors	Base Color	Spiral Stripe
1	Black	–	19	Orange	Blue
2	Red	–	20	Yellow	Blue
3	Blue	–	21	Brown	Blue
4	Orange	–	22	Black	Orange
5	Yellow	–	23	Red	Orange
6	Brown	–	24	Blue	Orange
7	Red	Black	25	Yellow	Orange
8	Blue	Black	26	Brown	Orange
9	Orange	Black	27	Black	Yellow
10	Yellow	Black	28	Red	Yellow
11	Brown	Black	29	Blue	Yellow
12	Black	Red	30	Orange	Yellow
13	Blue	Red	31	Brown	Yellow
14	Orange	Red	32	Black	Brown
15	Yellow	Red	33	Red	Brown
16	Brown	Red	34	Blue	Brown
17	Black	Blue	35	Orange	Brown
18	Red	Blue	36	Yellow	Brown

Note: Color code repeats after 36 conductors. No green or white conductors/strips.

ICEA METHOD 3, TABLE E-1			
Number of Conductors	Printing	Number of Conductors	Printing
1	1-Black	11	11-Blue-Black
2	2-White	12	12-Black-White
3	3-Red	13	13-Red-White
4	4-Green	14	14-Green-White
5	5-Orange	15	15-Blue-White
6	6-Blue	16	16-Black-Red
7	7-White-Black	17	17-White-Red
8	8-Red-Black	18	18-Orange-Red
9	9-Green-Black	19	19-Blue-Red
10	10-Orange-Black	20	20-Red_Green
		21	21-Orange-Green

Note: Color code repeats after 21 conductors.

COLOR CODE CHARTS 1-3

CHART 1	
Number of Conductors	Color
1	Black
2	Red
3	White
4	Light Green
5	Light Brown
6	Light Blue
7	Orange
8	Yellow
9	Violet
10	Gray
11	Pink
12	Tan

CHART 2	
Number of Conductors	Color
2	Black, Red
4	Black, Red, Light Blue, Light Brown
6	Black, Red, Light Blue, Light brown, Orange, Yellow
8	Black, Red, Light blue, Light Brown, Orange, Yellow, Purple, Gray

CHART 3			
Number of Pairs	Color	Number of Pairs	Color
1	Black with Red	14	Green with White
2	Black with White	15	Green with Blue
3	Black with Light Green	16	Green with Yellow
4	Black with Blue	17	Green with Brown
5	Black with Yellow	18	Green with Orange
6	Black with Brown	19	White with Blue
7	Black with Orange	20	White with Yellow
8	Red with White	21	White with Brown
9	Red with Light Green	22	White with Orange
10	Red with Blue	23	Blue with Yellow
11	Red with Yellow	24	Blue with Brown
12	Red with Brown	25	Blue with Orange
13	Red with Orange		

COLOR CODE CHART 4

MODIFIED WESTERN ELECTRIC

CHART 4

Number of Pairs	Color	Number of Pairs	Color
1	White/Blue Stripe Blue/White Stripe	14	Black/Brown Stripe Brown/Black Stripe
2	White/Orange Stripe Orange/White Stripe	15	Black/Gray Stripe Gray/Black Stripe
3	White/Green Stripe Green/White Stripe	16	Yellow/Blue Stripe Blue/Yellow Stripe
4	White/Brown Stripe Brown/White Brown	17	Yellow/Orange Stripe Orange/Yellow Stripe
5	White/Gray Stripe Gray/White Stripe	18	Yellow/Green Stripe Green/Yellow Stripe
6	Red/Blue Stripe Blue/Red Stripe	19	Yellow/Brown Stripe Brown/Yellow Stripe
7	Red/Orange Stripe Orange/Red Stripe	20	Yellow/Gray Stripe Gray/Yellow Stripe
8	Red/Green Stripe Green/Red Stripe	21	Purple/Blue Stripe Blue/Purple Steipe
9	Red/Brown Stripe Brown/Red Stripe	22	Purple/Orange Orange/Purple
10	Red/Gray Stripe Gray/Red Stripe	23	Purple/Green Green/Purple
11	Black/Blue Stripe Blue/Black Stripe	24	Purple/Brown Brown/Purple
12	Black/Orange Stripe Orange/Black Stripe	25	Purple/Gray Gray/Purple
13	Black/Green Stripe Green/Black Stripe		

COLOR CODE CHART 5 PAIR IDENTIFICATION COLORS

For pairs numbering 1 through 25, the pair identification colors are outlined below. In cable constructions containing more than 25 pairs, the colors are repeated as necessary. Color coded binders are used to identify 25-pair groups of color.

CHART 5					
Number of Pairs	Tip color	Ring Color	Number of Pairs	Tip color	Ring Color
1	White	Blue	14	Black	Brown
2	White	Orange	15	Black	Slate
3	White	Green	16	Yellow	Blue
4	White	Brown	17	Yellow	Orange
5	White	Slate	18	Yellow	Green
6	Red	Blue	19	Yellow	Brown
7	Red	Orange	20	Yellow	Slate
8	Red	Green	21	Violet	Blue
9	Red	Brown	22	Violet	Orange
10	Red	Slate	23	Violet	Green
11	Black	Blue	24	Violet	Brown
12	Black	Orange	25	Violet	Slate
13	Black	Green			

AWG TO METRIC CONVERSION CHART

AWG or Kcmil	Cross Sectional Area Mils	Cross Sectional Area MM ²	Metric Size
	987	0.50	0.50
20 AWG	1,020	0.52	
	1,480	0.75	0.75
18 AWG	1,620	0.82	
	1,974	1.00	1.00
16 AWG	2,580	1.31	
	2,960	1.50	1.50
14 AWG	4,110	2.08	
	4,934	2.50	2.50
12 AWG	6,530	3.31	
	7,894	4.00	4
10 AWG	10,380	5.26	
	11,840	6.00	6
8 AWG	16,510	8.36	
	19,740	10.00	10
6 AWG	26,240	13.30	
	31,580	16.00	16
4 AWG	41,740	21.15	
	49,340	25.00	25
2 AWG	66,360	33.62	
	69,100	35.00	35
1 AWG	83,690	42.41	
	98,680	50.00	50
1/0 AWG	105,600	42.41	
2/0 AWG	133,100	67.43	
	138,200	70.00	70
3/0 AWG	167,800	85.03	
	187,500	95.00	95
4/0 AWG	211,600	107.20	
	236,800	120.00	120
250 Kcmil	250,000	126.64	
	296,000	150.00	150
350 Kcmil	350,000	177.35	
	365,000	185.00	185
400 Kcmil	400,000	202.71	
	473,000	240.00	240
500 Kcmil	500,000	253.35	
	592,100	300.00	300
750 Kcmil	750,000	379.95	
	789,400	400.00	400
	986,800	500.00	500
1000 Kcmil	1,000,000	506.60	

ASSOCIATIONS AND REFERENCE STANDARDS

Organizations Involved in Specifications for the Wire & Cable Industry

AAR	Association of American Railroads	IMSA	International Municipal Signal Association
AEIC	Association of Edison Illuminating Companies	ICEA	Insulated Cable Engineers Association
ANI	American Nuclear Insurers	MESA	Mine Environmental Safety Act
ASA	American Standards Association, Inc.	NEC	National Electrical Code (under auspices of NFPA)
ASTM	American Society for Testing Materials	NEMA	National Electrical Manufacturer's Association
CAA	Civil Aeronautics Administration	NBS	National Bureau of Standards
CSA	Canadian Standards Association	NBFU	National Board of Fire Underwriters
EIA	Electronic Industries Association	NFPA	National Fire Protection Association International
FAA	Federal Aviation Agency	REA	Rural Electrification Administration
IEEE	Institute of Electrical and Electronics Engineers	UL	Underwriters' Laboratories, Inc.

American Society for Testing and Materials (ASTM)

The ASTM is an organization which develops voluntary consensus standards for materials and material testing. The standards, written by professionals from a wide variety of industries, are recognized nationwide as the preferred materials-testing procedures.

ASTM Manufacturing Specifications in General Use by the Manufacturers of Electrical Wires and Cables:

B1	Hard Drawn Copper Wire	B232	Concentric-Lay Stranded Aluminum Conductors (ACSR)
B3	Soft or Annealed Copper Wire	B246	Tinned Hard Drawn and Medium Hard Drawn Copper Wire
B8	Concentric-Lay, Stranded Copper Conductors	B496	Compact Round Concentric-Lay Stranded Copper Conductors
B33	Tinned Soft or Annealed Copper Wire	D734	Insulated Wire and Cable: Vinyl Chloride Insulating Compound
B172	Rope-Lay-Stranded Copper Conductors (bunch stranded members)	D752	Heavy Duty Black Neoprene Sheath for Wire and Cable
B173	Rope-Lay-Stranded Copper Conductors (concentric-stranded members)	D754	Synthetic Rubber Insulation for Wire and Cable, 75°C Operation
B174	Bunch Stranded Copper Conductors	D1352	Ozone-Resisting Butyl Rubber Insulation for Wire and Cable
B189	Lead Alloy Coated Soft Copper Wire		
B230	Standard Specification for Aluminum 1350-H19 Wire for Electric Purposes		
B231	Concentric-Lay Stranded Aluminum Conductors		

Canadian Standards Association (CSA)

The Canadian certification and test agency, which tests devices, materials and components for quality and safety, is comparable to UL in function. Like the UL label, the CSA seal is recognized in many countries throughout the world.

Electronic Industries Association (EIA)

The EIA was a non-profit organization representing manufacturers of electronic products. There were 300 member companies and approximately 200 committees and working groups in domestic and international standards development. The former sectors of EIA are the Electronics Components Association (ECA), JEDEC, Government Electronics and Information Technology Association (GEIA), now part of Tech America Telecommunications Industry Association (TIA) and Consumer Electronics Association (CEA). The standards below are presented for reference.

EIA RECOMMENDED STANDARDS

RS-214	Ampacity Calculations, method of calculation of current rating on hookup wire.
RS-232-C	Interface between data terminal equipment and data communication equipment employing serial binary data interchange. This is the most common type of microcomputer interface, typically employing a 25-position connector.
RS-422	Electrical characteristics of balanced digital interface circuits.
RS-423	Electrical characteristics of unbalanced digital interface circuits.
RS-449	General purpose 37-position and 9-position interfaces for data terminal equipment and data circuit terminating equipment employing serial binary data interchange with control information on separate control circuits.

ASSOCIATIONS AND REFERENCE STANDARDS

Insulated Cable Engineers Association (IECA)

The Insulated Cable Engineers Association (IECA) is a professional organization dedicated to developing cable standards for the electric power, control and telecommunications industries. Since 1925, the objective has been to ensure safe, economical and efficient cable systems utilizing proven state-of-the-art materials and concepts. Now with the proliferation of new materials and cable designs, this mission has gained in importance. IECA documents are of interest to industry participants worldwide, i.e. cable manufacturers, architects and engineers, utility and manufacturing plant personnel, telecommunication engineers, consultants, and OEM's

IECA is a "Not-For-Profit" association whose members are sponsored by over thirty of North America's leading cable manufacturers. The technical development work is performed in four semi-autonomous sections: namely the Power, Control & Instrumentation, Portable and Communications Cable sections. In addition there are currently two very active major technical advisory committees, one for Telecommunications Wire and Cable Standards (TWCS TAC) and another Utility Power Cable Standards (UPCS TAC).

IECA S-75-381/NEMA WC58	Portable & Power Feeder Cables for Use in Mines and Similar Applications
IECA T-26-465/NEMA WC54	Frequency of Sampling Extruded Dielectric Cables
IECA S-76-474/ANSI S-26-474	Neutral-Supported Power Cable Assemblies with Weather-Resistant Extruded Insulation, 600V
IECA S-73-532/NEMA WC57	Control Cables
IECA S-70-547	Weather-Resistant Polyolefin-Covered Wire & Cable
IECA T-27-581/NEMA WC53	Standard Test Methods

The Insulated Cable Engineers Association (IECA) has issued several new standards for solid-dielectric insulated power cables. Several of these standards are joint-standards with the National Electrical Manufacturers Association (NEMA). The new standards have been submitted to ANSI for recognition as National Standards.

The new IECA standards reflect a change in IECA's standards writing objective. They are written as "application standards" rather than the "insulation material-based standards" of the past. These new standards have been updated to reflect the latest conductor constructions, insulations and jacket materials being used to manufacture wires and cables. The advantage of having an application standard is that all insulations suitable for use on a specific product are contained in one document. With material-based standards, only one type of insulation and its requirements are defined. If a different insulation was to be considered, a separate standard would be required.

As a result of the new IECA / NEMA application standards being issued, the older, more-familiar materials-based IECA/ NEMA standards are being withdrawn. This is necessary to eliminate duplication and because the materials-based standards are no longer being maintained. The withdrawn IECA / NEMA standards are:

IECA S-66-524/NEMA WC7	Cross-Linked-Thermosetting-Polyethylene Insulated Wire and Cable
IECA S-68-516/NEMA WC8	Ethylene-Propylene-Rubber Insulated Wire and Cable
IECA S-61-402/NEMA WC5	Thermoplastic-Insulated Wire and Cable
IECA S-19-81/NEMA WC3	Rubber-Insulated Wire and Cable
IECA S-82-552/NEMA WC55	Instrumentation and Thermocouple Wire and Cable

ASSOCIATIONS AND REFERENCE STANDARDS

Withdrawn Standards	Title	Replacement Standards	Title
ICEA S-66-524/NEMA WC7	Crosslinked -Thermosetting- Polyethylene Insulated Wire & Cable	ICEA S-95-658/NEMA WC70 ICEA S-96-659/NEMA WC71 ICEA S-93-639/NEMA WC74 ICEA S-94-649 ICEA S-97-682 ICEA S-105-692 ICEA S-81-570	Non-shielded 0-2 KV Cables Non-shielded 2,001-5 KV Cables Shielded Power Cable 5-46 KV Concentric Neutral Cables Rated 5-46 KV Utility Shielded Power Cable Rated 5-46 KV 600 V Single Layer Thermoset Insulated Utility Underground Distribution Cable Direct Burial, 600 V Ruggedized Insulation
ICEA S-68-516/NEMA WC8	Ethylene-Propylene-Rubber Insulated Wire & Cable	ICEA S-95-658/NEMA WC70 ICEA S-96-659/NEMA WC71 ICEA S-93-639/NEMA WC74 ICEA S-94-649 ICEA S-97-682 ICEA S-105-692	Non-shielded 0-2 KV Cables Non-shielded 2,001-5 KV Cables Shielded Power Cable 5-46 KV Concentric Neutral Cables Rated 5-46 KV Utility Shielded Power Cable Rated 5-46 KV 600 V Single Layer Thermoset Insulated Utility Underground Distribution Cable
ICEA S-61-402/NEMA WC5	Rubber-Insulated Wire & Cable	ICEA S-95-658/NEMA WC70 ICEA S-96-659/NEMA WC71 ICEA S-93-639/NEMA WC74 ICEA S-94-649 ICEA S-97-682 ICEA S-105-692	Non-shielded 0-2 KV Cables Non-shielded 2,001-5 KV Cables Shielded Power Cable 5-46 KV Concentric Neutral Cables Rated 5-46 KV Utility Shielded Power Cable Rated 5-46 KV 600 V Single Layer Thermoset Insulated Utility Underground Distribution Cable
ICEA S-19-81/NEMA WC3	Thermoplastic-Insulated Wire & Cable	ICEA S-95-658/NEMA WC70	Non-shielded 0-2 KV Cables

NEMA

Adopted in the public interest and designed to eliminate misunderstandings between the manufacturer and the purchaser and to assist the purchaser in selecting and obtaining the proper product for its particular need.

NEMA Code	Same as ICEA
WC53	T-27-581
WC54	T-26-465
WC57	S-73-532
WC58	S-75-381
WC70	S-95-658
WC71	S-96-659
WC74	S-93-639

ASSOCIATIONS AND REFERENCE STANDARDS

Institute of Electrical and Electronic Engineers

IEEE is the world's largest professional engineering society. One of its objectives is to provide standards for rating the performance of equipment and materials. The institute also offers courses to allow engineers to keep abreast of developments in the electrical and electronic engineering fields.

Military and Government Wire Specifications

J-C-90	Flexible Cord and Fixture Wire	MIL-C-25038	Cable, Electrical, High Temperature and Fire Resistant
J-C-96	Neoprene Jacketed Telephone Wire		
J-C-741	Rubber and/or Neoprene Welding Cable	MIL-C-26468	(USAF) - Cables, Guided Missile, Ground Installation, General Requirements
MIL-C-3078	Cable, Electric, Insulated, Low Tension, Single Conductor	MIL-C-27072	Multi-Conductor, Ground Support Cable
MIL-C-3432	300 and 600 V Rubber Insulated Power and Control Cable	MIL-C-27212	Cable, Power, Electrical, Airport Lighting Control
MIL-C-4912A (ASG)	Single Conductor 8 AWG 5 KV Cable with Butyl Compound Insulation and Polychloroprene for Airport Lighting	MIL-C-38359	(USAF) - Power Cable of Two Voltage Range for Airport Lightin, 8 AWG (3-5KV) CCLP Insulated
MIL-C-5756	Low Temperature Rubber Portable Cords	MIL-C-55036	Cable, Telephone, WM130##/6
MIL-C-6166	Cord, Head-Set-Microphone CX1301/AR	MIL-E-9088	(USAF) - Electrical Cord - WF-14/U
MIL-C-7078	600 V Aircraft Wire using MIL-W5086 Components	MIL-R-8333	(USAF) - RF Cable - RG122/U
MIL-C-11097	Cable, Telephone (Wire W-50-A)	MIL-STD-122	Color Code for Chassis Wiring for Electronic Equipment
MIL-C-11440	Cable, Power Electrical	MIL-STD-681	Identification Coding and Application of Hook-Up Wire
MIL-C-12064	Low Temperature Power Cable and Cords for Arctic Service	MIL-W-76	General Purpose Hok-Up Wire, Vinyl Insulated Types LW, MW and HW
MIL-C-12881	Cables, Telephone, Switchboard (Cables and Cable Assemblies)	MIL-W-538	Wire, Magnet, Electrical
MIL-C-13777	Multi-Conductor Missile Ground Support Cable	MIL-W-5274	Spec for Aircraft Wire, Type I 600 V, Type II 600 V, Type III 300 V Rating
MIL-C-14189	Cable, Power, Electrical, 3 KV, for Field Use	MIL-W-6370	Wire, Electrical, Insulated Antenna
MIL-C-18959	Cable, Power, Electrical, Portable, Neoprene Jacketed 600 V	MIL-W-13074	Wire, Electrical (W-27 & WS-19[U])
MIL-C-18962	Cable, Power, Electrical, Direct Burial, Neoprene Jacketed 600 V	MIL-W-13075	Wire, Electrical
MIL-C-19381 (SHIPS)	Cables, Special Purpose, Electrical (Nuclear Plant)	MIL-W-13169	Wire, Electrical (for Instrument Test Leads)
MIL-C-21609	Cable, Electrical, Shield, 600 V (Non-Flexing Service)	MIL-W-13241	Wire, Electrical, Antenna
MIL-C-24640	Cable, Electrical, Lightweight for Shipboard Use	MIL-W-16878	Electronic Hook-Up Wire, Includes Vinyl (Types B, C and D); Teflon (Types ET, E, EE, K and KK); and Polyethylene (Type J)
MIL-C-24643	Cable Cord, Electrical, Low Smoke for Shipboard Use	MIL-W-19583	(Navy) - Wire, Electrical, Magnet, High Temperature, Film Insulated

National Electrical Code (NEC)

The NEC is developed by NFPA's Committee on the National Electrical Code, which consists of 19 code-making panels and a technical correlating committee. Work on the NEC is sponsored by the National Fire Protection Association. The NEC is approved as an American national standard by the American National Standards Institute (ANSI). It is formally identified as ANSO/NFPA 70®.

First published in 1897, the NEC is updated and published every three years. The *National Electrical Code Handbook*®, © 2011, is the current edition (Effective Date: August 25,2010). Most states adopt the most recent edition within a couple of years of its publication. As with any "uniform" ode, a few jurisdictions regularly omit or modify some sections, or add their own requirements (sometimes based upon earlier versions of the NEC, or locally accepted practices). However, the NEC is the least amended model code, even with it setting minimum standards. No court has faulted anyone for using the latest version of the NEC, even when the local code was not updated.

ASSOCIATIONS AND REFERENCE STANDARDS

National Electrical Code (NEC) Cont.

In the United States, anyone, including the city issuing building permits, may face a civil liability lawsuit (be sued) for negligently creating a situation that results in loss of life or property. Those who fail to adhere to well known best practices for safety have been held negligent. This means that the city should adopt and enforce building codes that specify standards and practices for electrical systems (as well as other departments such as water as fuel-gas systems). This creates a system whereby a city can best avoid lawsuits by adopting a single, standard set of building code laws. This has led to the NEC becoming the de facto standard set of electrical requirements. A licensed electrician will have spent years of apprenticeship studying and practicing the NEC requirements prior to obtaining his or her license.

Rural Electrification Administration (REA)

Rural Electrification Administration (REA), former agency of the United States Department of Agriculture charged with administering loan programs for electrification and telephone service in rural areas. The REA was created in 1935 by executive order as an independent federal bureau, authorized by the Congress in 1936, and later reorganized in 1939 reorganized as a division of the U.S. Department of Agriculture. The REA undertook to provide farms with inexpensive electric lighting and power. To implement those goals the administration made long-term, self-liquidating loans to state and local governments, to farmers' cooperatives and to non-profit organizations; no loans were made directly to consumers. In 1949, the REA was authorized to make loans for telephone improvements; in 1988, the REA was permitted to give interest-free loans for job creation and rural electric systems. By the early 1970's, about 98% of all farms in the United States had electric service, a demonstration of REA's success. The administration was abolished in 1994 and its functions assumed by the Rural Utilities Service.

Underwriters Laboratories (UL)

Underwriters Laboratories Inc. (UL) is an independent product safety certification organization. Established in 1894, the company has its headquarters in Northbrook, Illinois. UL develops standards and test procedures for products, materials, components, assemblies, tools and equipment, chiefly dealing with product safety. UL also evaluates and certifies the efficiency of a company's business processes through its management system registration programs. Additionally, UL analyzes drinking and other clean water samples through its drinking water laboratory in South Bend, Indiana and evaluates products for environmental stainability through its subsidiary, UL Environment.

UL is one of several companies approved for such testing by the U.S. federal agency OSHA. OSHA maintains a list of approved testing laboratories, known as Nationally recognized Testing Laboratories.

CABLE STANDARDS

UL Standard 13	Power Limited
UL Standard 4	Armored Cables
UL Standard 62	Flexible Cord and Fixture Wires
UL Standard 44	Thermoset Insulated Wire and Cables
UL Standard 83	Thermoplastic Insulated Wire and Cables
UL Standard 719	Non-Metallic Sheathed Cables

The UL Categories of approval, detailed below, are recognized and respected by electrical inspectors, fire marshals, insurance underwriters and regulatory personnel.

UL LISTED

To be labeled UL Listed, a product must successfully complete a series of mechanical, electrical and thermal characteristic tests which simulate all reasonable and foreseeable hazards. A UL Listing is assigned exclusively for the specific application for which it was tested and not valid for other applications. A UL Listing does not mean that the device will do what it is advertised to do, only that it is reasonably safe.

UL CLASSIFIED

For UL Classified labels, products are evaluated with respect to one or more of the following:

- Specific Hazards Only
- Performance Under Specific Conditions
- Regulatory Codes
- Other Standards, Including International Standards

The UL "Classified" rating is generally restricted to industrial or commercial products.

UL RECOGNIZED

Products bearing UL Recognized labels have been tested for use as a component in a UL Listed package. These component products are tested for electrical, mechanical and thermal characteristics.

UL Recognized is a more general purpose approval than UL Listing in that it allows a product to be certified for a category of equipment uses. An example is hookup wire, which has been UL Recognized as appliance wiring material, a category of uses that includes data communications, telecommunications and instrumentation.

REFERENCE STANDARDS

A

- AAR S-501:** Specification for Wire & Cables
- AAR 581.3:** Specification for Single Conductor, Clean Stripping Rubber Insulated, 0-600 Volts, Neoprene® Jacketed Cable for Locomotive and Car Equipment
- AAR 589:** Specification for Single Conductor Chlorosulfonated Polyethylene Integral Insulated-Jacketed, 0-300V, 0-600V Cable for Locomotive and Car Equipment
- AEIC CS1:** Specifications for Solid-Type Impregnated-Paper-Insulated Metallic Sheathed Cable
- AEIC CS2:** Specifications for Impregnated-Paper and Laminated Paper-Polypropylene Insulated Cable, High-Pressure Pipe-Type
- AEIC CS3:** Specifications for Impregnated-Paper-Insulated, Metallic Sheathed Cable, Low Pressure Gas-Filled Type
- AEIC CS4:** Specifications for Impregnated-Paper-Insulated Low and Medium Pressure Self Contained Liquid Filled Cable
- AEIC CS5:** Specifications for Thermoplastic and Crosslinked Polyethylene Insulated Shielded Power Cables Rated 5 - 69 KV
- AEIC CS6:** Specifications for Ethylene Propylene Rubber Insulated Shielded Power Cables Rated 5 Through 69 KV
- AEIC CS7:** Specifications for Crosslinked Polyethylene Insulated Shielded Power Cables Rated 46 Through 138 KV
- AEIC CS8:** Specification for Extended Dielectric, Shielded Power Cables Rated 5 - 46 KV
- ANSI C2:** National Electrical Safety Code
- ANSI MC96.1:** Thermocouple Extension Wire Calibration
- ANSI N45.2:** Packaging, Shipping, Receiving, Storage and Handling of Items for Nuclear Power Plants
- ASTM B1:** Standard Specification for Hard-Drawn Copper Wire
- ASTM B2:** Standard Specification for Medium-Hard-Drawn Copper Wire
- ASTM B3:** Standard Specification for Soft or Annealed Copper Wire
- ASTM B8:** Standard Specification for Concentric-Lay Stranded Copper Conductors, Hard, Medium-Hard, or Soft
- ASTM B33:** Standard Specification for Tinned Soft or Annealed Copper Wire for Electrical Purposes
- ASTM B105:** Standard Specification for Hard-Drawn Copper Alloy Wires for Electrical Conductors
- ASTM B170:** Standard Specification for Oxygen-Free Electrolytic Copper
- ASTM B172:** Standard Specification for Rope-Lay-Stranded Copper Conductors having Bunch-Stranded Members, for Electrical Conductors
- ASTM B173:** Standard Specification for Rope-Lay-Stranded Copper Conductors Having Concentric-Stranded Members, for Electrical Conductors
- ASTM B174:** Standard Specification for Bunch-Stranded Copper Conductors for Electrical Conductors
- ASTM B189:** Standard Specification for Lead-Coated and Lead-Alloy-Coated Soft Copper Wire for Electrical Purposes
- ASTM B193:** Standard Test Method for Resistivity of Electrical Conductor Materials
- ASTM B226:** Standard Specification for Cored, Annular, Concentric-Lay-Stranded Copper Conductors
- ASTM B227:** Standard Specification for Hard-Drawn Copper-Clad Steel Wire
- ASTM B228:** Standard Specification for Concentric-Lay-Stranded Copper-Clad Steel Conductors
- ASTM B229:** Standard Specification for Concentric-Lay-Stranded Copper and Copper-Clad Steel Composite Conductors
- ASTM B230:** Standard Specification for Aluminum 1350-H19 Wire for Electrical Purposes
- ASTM B230M:** Standard Specification for Aluminum 1350-H19 Wire for Electrical Purposes [Metric]
- ASTM B231:** Standard Specification for Concentric-Lay-Stranded Aluminum 1350 Conductors
- ASTM B231M:** Standard Specification for Concentric-Lay-Stranded Aluminum 1350 Conductors [Metric]
- ASTM B232:** Standard Specification for Concentric-Lay-Stranded Aluminum Conductors, Coated Steel-Reinforced (ACACARSR)
- ASTM B232M:** Standard Specification for Concentric-Lay-Stranded Aluminum Conductors, Coated Steel-Reinforced (ACSR) [Metric]
- ASTM B233:** Standard Specification for Aluminum 1350 Drawing Stock for Electrical Purposes
- ASTM B246:** Standard Specification for Tinned Hard-Drawn and Medium-Hard-Drawn Copper Wire for Electrical Purposes
- ASTM B258:** Standard Specification for Standard Nominal Diameters and Cross-Sectional Areas of AWG Sizes of Solid Round Wires Used as Electrical Conductors
- ASTM B263:** Standard Test Method for Determination of Cross Sectional Area of Stranded Conductors
- ASTM B286:** Standard Specification for Copper Conductors for Use in Hookup Wire for Electronic Equipment
- ASTM B298:** Standard Specification for Silver-Coated Soft or Annealed Copper Wire
- ASTM B324:** Standard Specification for Nickel-Coated Soft or Annealed Copper Wire
- ASTM B341:** Standard Specification for Aluminum-Coated (Aluminized) Steel Core Wire for Aluminum Conductors, Steel Reinforced (ACSR/AZ)
- ASTM B341M:** Standard Specification for Aluminum-Coated (Aluminized) Steel Core Wire for Aluminum Conductors, Steel Reinforced (ACSR/AZ) [Metric]
- ASTM B355:** Standard Specification for Nickel-Coated Soft or Annealed Copper Wire
- ASTM B397:** Standard Specification for Concentric-Lay-Stranded Aluminum-Alloy 5005-H19 Conductors
- ASTM B398:** Standard Specification for Aluminum-Alloy 6201-T81 Wire for Electrical Purposes
- ASTM B398M:** Standard Specification for Aluminum-Alloy 6201-T81 Wire for Electrical Purposes [Metric]
- ASTM B399:** Standard Specification for Concentric-Lay-Stranded Aluminum-Alloy 6201-T81 Conductors

REFERENCE STANDARDS

- ASTM B399M:** Standard Specification for Concentric-Lay-Stranded Aluminum-Alloy 6201-T81 Conductors [Metric]
- ASTM B400:** Standard Specification for Compact Round Concentric-Lay-Stranded Aluminum 1350 Conductors
- ASTM B401:** Standard Specification for Compact Round Concentric-Lay-Stranded Aluminum Conductors, Steel-Reinforced (ACSR/COMP)
- ASTM B416:** Standard Specification for Concentric-Lay-Stranded Aluminum-Clad Steel Conductors
- ASTM B452:** Standard Specification for Copper-Clad Steel Wire for Electronic Application
- ASTM B470:** Standard Specification for Bonded Copper Conductors for Use in Hookup Wires for Electronic Equipment
- ASTM B496:** Standard Specification for Compact Round Concentric-Lay-Stranded Copper Conductors
- ASTM B498:** Standard Specification for Zinc-Coated (Galvanized) Steel Core Wire for Aluminum Conductors, Steel-Reinforced (ACSR)
- ASTM B498M:** Standard Specification for Zinc-Coated (Galvanized) Steel Core Wire for Aluminum Conductors, Steel Reinforced (ACSR) [Metric]
- ASTM B500:** Standard Specification for Zinc-Coated (Galvanized), Zinc-5% Aluminum Mischmetal Alloy-Coated and Aluminum-Coated (Aluminized) Stranded Steel Core for Aluminum Conductors, Steel Reinforced (ACSR)
- ASTM B501:** Standard Specification for Silver-Coated, Copper-Clad Steel Wire for Electronic Application
- ASTM B502:** Standard Specification for Aluminum-Clad Steel Core Wire for Aluminum Conductors, Aluminum-Clad Steel Reinforced
- ASTM B520:** Standard Specification for Tin-Coated, Copper-Clad Steel Wire for Electronic Application
- ASTM B524:** Standard Specification for Concentric-Lay-Stranded Aluminum Conductors, Aluminum-Alloy Reinforced (ACAR, 1350/6201)
- ASTM B524M:** Standard Specification for Concentric-Lay Stranded Aluminum Conductors, Aluminum-Alloy Reinforced (ACAR, 1350/6201) [Metric]
- ASTM B549:** Standard Specification for Concentric-Lay-Stranded Aluminum Conductors, Aluminum-Clad Steel Reinforced (ACSR/AW)
- ASTM B559:** Standard Specification for Nickel-Coated, Copper-Clad Steel Wire for Electronic Application
- ASTM B606:** Standard Specification for High-Strength Zinc-Coated (Galvanized) Steel Core Wire for Aluminum and Aluminum Alloy Conductors, Steel Reinforced
- ASTM B609:** Standard Specification for Aluminum 1350 Round Wire, Annealed and Intermediate Tempers, for Electrical Purposes
- ASTM B609M:** Standard Specification for Aluminum 1350 Round Wire, Annealed and Intermediate Tempers, for Electrical Purposes [Metric]
- ASTM B624:** Standard Specification for High-Strength, High Conductivity Copper-Alloy Wire for Electronic Application
- ASTM B682:** Standard Specification for Standard Metric Sizes of Electrical Conductors
- ASTM B701:** Standard Specification for Concentric-Lay-Stranded Self-Damping Aluminum Conductors, Steel-Reinforced (ACSR/SD)
- ASTM B711:** Standard Specification for Concentric-Lay-Stranded Aluminum-Alloy Conductors, Steel Reinforced (AACSR) (6201)
- ASTM B738:** Standard Specification for Fine-Wire Bunch-Stranded and Rope-Lay Bunch Stranded Copper Conductors for Use as Electrical Conductors
- ASTM B778:** Standard Specification for Shaped Wire Compact Concentric-Lay-Stranded Aluminum Conductors (AAC/TW)
- ASTM B779:** Standard Specification for Shaped Wire Compact Concentric-Lay-Stranded Aluminum Conductors, Steel Reinforced (ACSR/TW)
- ASTM B784:** Standard Specification for Modified Concentric-Lay Stranded Copper Conductors for Use in Insulated Electrical Cables
- ASTM B785:** Standard Specification for Compact Round Modified Concentric-Lay-Stranded Copper Conductors for Use in Insulated Electrical Cables
- ASTM B786:** Standard Specification for 19 Wire Combination Uni-Lay Stranded Aluminum 1350 Conductors for Subsequent Insulation
- ASTM B787:** Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation
- ASTM B801:** Standard Specification for Concentric-Lay-Stranded Conductors of 8000 Series Aluminum Alloy for Subsequent Covering or Insulation
- ASTM B802:** Standard Specification for Zinc-5% Aluminum Mischmetal Alloy-Coated Steel Core Wire for Aluminum Conductors, Steel Reinforced (ACSR)
- ASTM B803:** Standard Specification for High-Strength Zinc-5% Aluminum-Mischmetal Alloy Coated Steel Core Wire for Aluminum and Aluminum-Alloy Conductors, Steel Reinforced
- ASTM D149:** Standard Test Method for Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials at Commercial Power Frequencies
- ASTM D470:** Method of Testing Crosslinked Insulations and Jackets for Wire and Cable
- ASTM D866:** Specification for Styrene-Butadiene (SBR) Synthetic Rubber Jacket for Wire and Cable
- ASTM D1047:** Specification for Polyvinyl Chloride (PVC) Jacket for Wire and Cable
- ASTM D1351:** Specification for Polyethylene Insulation for Wire and Cable
- ASTM D1352:** Specification for Ozone-Resisting Butyl Rubber Insulation for Wire and Cable
- ASTM D1523:** Method for Synthetic Rubber Insulation for Wire and Cable, 90°C Operation
- ASTM D1679:** Specification for Synthetic Rubber Heat and Moisture-Resisting Insulation for Wire and Cable, 75°C Operation
- ASTM D2219:** Specification for Polyvinyl Chloride (PVC) Insulation for Wire and Cable, 60°C Operation
- ASTM D2220:** Specification for Polyvinyl Chloride (PVC) Insulation for Wire and Cable, 75°C Operation
- ASTM D2308:** Specification for Polyethylene Jacket for Electrical Insulated Wire and Cable
- ASTM D2526:** Specification for Ozone-Resisting Silicone Rubber Insulation for Wire and Cable

REFERENCE STANDARDS

ASTM D2655: Specification for Crosslinked Polyethylene Insulation for Wire and Cable Rated 0 to 2000V

ASTM D2656: Specification for Crosslinked Polyethylene Insulation for Wire and Cable Rated 2001 to 35000V

ASTM D2768: Specification for General-Purpose Ethylene-Propylene Rubber Jacket for Wire and Cable

ASTM D2770: Specification for Ozone-Resisting Ethylene-Propylene Rubber Integral Insulation and Jacket for Wire and Cable

ASTM D2802: Specification for Ozone-Resistant Ethylene-Propylene Rubber Insulation for Wire and Cable

ASTM D3004: Specification for Extruded Thermosetting and Thermoplastic Semi-Conducting Conductor and Insulation Shields

ASTM D3485: Specification for Smooth-Wall Coilable Polyethylene (PE) Conduit (Duct) for Preassembled Wire and Cable

ASTM D3554: Specification for Track-Resistant Black Thermoplastic High Density Polyethylene Insulation for Wire and Cable

ASTM D3555: Specification for Track-Resistant Black Crosslinked Thermosetting Polyethylene Insulation for Wire and Cable

ASTM D4244: Specification for General-Purpose, Heavy-Duty and Extra-Heavy Duty Acrylonitrile-Butadiene/ Polyvinyl Chloride (NBR/PVC) Jackets for Wire and Cable

ASTM D4245: Specification for Ozone-Resistant Thermoplastic Elastomer Insulation for Wire and Cable, 90°C Dry-75°C Wet Operation

ASTM D4246: Specification for Ozone-Resistant Thermoplastic Elastomer Insulation for Wire and Cable, 90°C Operation

ASTM D4247: Specification for General-Purpose Black Heavy-Duty and Black Extra-Heavy Duty Polychloroprene Jackets for Wire and Cable

ASTM D4313: Specification for General Purpose Heavy-Duty and Extra-Heavy-Duty Crosslinked Chlorinated Polyethylene Jackets for Wire and Cable

ASTM D4314: Specification for General Purpose Heavy-Duty and Extra-Heavy-Duty Crosslinked Chlorosulfonated Polyethylene Jackets for Wire and Cable

ASTM D4363: Specification for Thermoplastic Chlorinated Polyethylene Jacket for Wire and Cable

ASTM D4496: Test Method of DC Resistance or Conductance of Moderately Conductive Materials

ASTM D4568: Test Methods for Evaluating Compatibility Between Cable Filling and Flooding Compounds and Polyolefin Cable Materials

ASTM D4967: Guide for Selecting Materials to Be Used for Insulation, Jacketing and Strength Components in Fiber Optic Cables

C

CAN3-Z299.0: Guide for Selecting and Implementing the CAN3-Z299 Quality Assurance Program Standards

CAN3-Z299.1: Standard for Quality Assurance Program - Category 1

CAN3-Z299.2: Standard for Quality Assurance Program - Category 2

CAN3-Z299.3: Standard for Quality Assurance Program - Category 3

CAN3-Z299.4: Standard for Quality Assurance Program - Category 4

CAN/CSA C22.2 No. 211: Standard for Cord Sets and Power Supply Cords

CAN/CSA C22.2 No. 48: Standard for Nonmetallic Sheathed Cable

CAN/CSA C22.2 No. 49: Standard for Flexible Cords and Cables

CAN/CSA C22.2 No. 51: Standard for Armored Cable

CAN/CSA C22.2 No. 96: Standard for Portable Power Cables

CAN/CSA C22.2 No. 130.1: Standard for Heat-Tracing Cable Systems for Use in Industrial Locations

CAN/CSA C22.2 No. 131: Standard for Type TECK 90 Cable

CAN/CSA C22.2 No. 203: Standard for Modular Wiring Systems for Office Furniture

CAN/CSA C22.2 No. 210.2: Standard for Appliance Wiring Material Products

CAN/CSA C22.2 No. 214: Standard for Communications Cables

CAN/CSA C22.2 No. 233: Standard for Cords and Cord Sets for Communication Systems

CAN/CSA C22.2 No. 239: Standard for both Control and Instrumentation Cables

CAN/CSA C22.2 No. 241: IEEE Standard for Cable Joints for Use with Extruded Dielectric Cable Rated 5 - 46 KV and Cable Joints for Use with Laminated Dielectric Cable Rated 2,500V Through 500 KV (Adopted IEEE 404-1986)

CAN/CSA C22.3 No. 1: Standard for Overhead Systems

CAN/CSA C22.3 No. 8: Standard for Railway Electrification Guidelines

CAN/CSA C49.1: Standard for Round Wire, Concentric Lay, Overhead Electrical Conductors

CAN/CSA C68.3: Standard for Shielded and Concentric Neutral Power Cables Rated 5-46 KV

CAN/CSA T529: Standard Design Guide for Telecommunications Wiring Systems in Commercial Buildings

CSA C22.1: Canadian Electrical Code, Part 1, Safety Standard for Electrical Installations

CSA C22.2 No. 0.3: Standard for Test Methods for Electrical Wire and Cable

CSA C22.2 No. 16: Standard for Insulated Conductors for Power-Operated Electronic Devices

CSA C22.2 No. 35: Standard for Extra-Low-Voltage Control Circuit Cables, Low-Energy Control Cable and Extra-Low-Voltage Control Cable

CSA C22.2 No. 38: Standard for Thermoset Insulated Wire and Cable

CSA C22.2 No. 52: Standard for Service-Entrance Cables

CSA C22.2 No. 75: Standard for Thermoplastic-Insulated Wire and Cable

CSA C22.2 No. 116: Standard for Coil-Lead Wires

CSA C22.2 No. 123: Standard for Aluminum Sheathed Cables

CSA C22.2 No. 124: Standard for Mineral-Insulated Cable

CSA C22.2 No. 127: Standard for Equipment Wires

CSA C22.2 No. 129: Standard for Neutral Supported Cable

CSA C22.2 No. 130: Standard for Heating Cables and Heating Cable Sets

CSA C22.2 No. 138: Standard for Heat Tracing Cable and Cable Sets for Use in Hazardous Locations

REFERENCE STANDARDS

CSA C22.2 No. 174: Standard for Cables and Cable Glands for Use in Hazardous Locations

CSA C22.2 No. 179: Standard for Airport Series Lighting Cables

CSA C22.2 No. 188: Standard for Splicing Wire and Cable Connectors

CSA C22.2 No. 198.2: Standard for Underground Cable Splicing Kits

CSA C22.2 No. 208: Standard for Fire Alarm and Signal Cable

CSA C22.2 No. 222: Standard for Type FCC Under-Carpet Wiring System

CSA C22.2 No. 230: Standard for Tray Cable

CSA C22.2 No. 232: Standard for Optical Fiber Cables

CSA/CAN3 C22.3 No. 7: Standard for Underground Systems

CSA C49.2: Standard for Compact Aluminum Conductors Steel Reinforced (ACSR)

CSA C49.3: Standard for Aluminum Alloy 1350 Round Wire, All Tempers, for Electrical Purposes

CSA C49.4: Standard for Concentric-Lay Aluminum Stranded Conductors (ASC)

CSA C49.5: Standard for Compact Round Concentric-Lay Aluminum Stranded Conductors (Compact ASC)

CSA CAN3-C49.6: Standard for Zinc-Coated Steel Wires for Use in Overhead Electrical Conductors

CSA CAN3-C49.7: Standard for Aluminum Round Wires for Use in Overhead Electrical Conductors

CSA C68.1: Standard Specifications for Impregnated Paper Insulated, Metallic-Sheathed Cable, Solid-Type

CSA C170.2: Standard for Polyethylene Protective Covering on Paper-Insulated Metallic Sheathed Power Cable

CSA C170.3: Standard for Polyvinyl-Chloride (PVC) Protective Covering on Paper-Insulated Metallic-Sheathed Power Cable

CSA M421: Standard for Use of Electricity in Mines

E

EIA/TIA-568: Commercial Building Telecommunications Wiring Standard

EIA/TIA-569: Commercial Building Standard for Telecommunications Pathways and Spaces

EIA/TIA-606: Administration Standard for the Telecommunications Infrastructure of Commercial Buildings

EIA/TIA TSB-36: Additional Cable Specifications for Unshielded Twisted Pair Cables (Technical Systems Bulletin 36)

EIA/TIA TSB-40: Additional Transmission Specifications for Unshielded Twisted Pair Connecting Hardware (Technical Systems Bulletin 40)

F

FP-4: TM-4 CSA CBC and UL CMR (Riser) Cable

FP-16: TD-16 Plastic Insulated, Two Parallel Conductor, Telephone Drop Wire

FP-28: Air Core, Solid PIC, ALPETH-DCAS Cable & PAP-DCAS Cable

FP-67: PHD Plastic Insulated and Jacketed, Four Conductor,

Telephone Drop Wire

FP-68: TM-68 CSA PCC FT4, Shielded Inside Wiring Cable

FP-71: TM-28 CSA PCC FT4, Inside Wiring Cable

FP-75: PHILPLAST CSA PCC FT4, PVC Insulated and Jacketed, Switchboard Cable

FP-81: TM-81 CSA ZSW FT1, Telephone Station Wire

FP-90: CONCEL Cellular Polyethylene Insulated, Air Core, ALPETH-DCAS Sheathed, Telephone Cable

FP-93: TM-91, TM-92, TM-93 & TM-97, Filled, Buried WireFP-95: Quasi-Solid Polyethylene Insulated, Filled, Regular & Twin Core, ALPETH-DCAS Sheathed Cable

FP-98: CELSEAL Cellular Polyethylene Insulated, Filled, ALPETH-DCAS Sheathed Cable

FP-99: DUCTCEL Cellular Polyethylene Insulated, Air Core, ALPETH-DCAS Sheathed Telephone Cable

FP-8859: PHILSYM UL 444 CMR & CSA PCC FT4 Switchboard Cable

H

HP: See NEMA listing

I

ICEA P-32-382: ICEA Standards Publication for Short Circuit Characteristics of Insulated Cable

ICEA P-45-482: ICEA Standards Publication for Short-Circuit Performance of Metallic Shields and Sheaths of Insulated Cable

ICEA P-53-426: ICEA/NEMA Standards Publication for Ampacities, Including Effect of Shield Losses for Single-Conductor Solid-Dielectric Power Cable 15 kV through 69 kV (NEMA WC 50)

ICEA P-54-440: ICEA/NEMA Standards Publication for Ampacities of Cables in Open-Top Cable Trays (NEMA WC 51)

ICEA P-79-561: ICEA Guide for Selecting Aerial Cable Messengers and Lashing Wires

ICEA P-81-570: ICEA Standards Publication for Direct Burial 600 V Cable with Ruggedized Extruded Insulation

ICEA S-19-81: ICEA/NEMA Standards Publication for Rubber Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy (NEMA WC 3)

ICEA S-56-434: ICEA/ANSI Standards Publication for Polyolefin Insulated Communications Cables for Outdoor Use

ICEA S-61-402: ICEA/NEMA Standards Publication for Thermoplastic Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy (NEMA WC 5)

ICEA S-66-524: ICEA/NEMA Standards Publication for Cross-Linked-Thermosetting Polyethylene-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy (NEMA WC 7)

ICEA S-67-401: ICEA/NEMA Standards Publication for Steel Armor and Associated Coverings for Impregnated-Paper-Insulated Cables (NEMA WC 2)

REFERENCE STANDARDS

ICEA S-68-516: ICEA/NEMA Standards Publication for Ethylene-Propylene-Rubber-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy (NEMA WC 8)

ICEA S-70-547: ICEA/ANSI Standards Publication for Weather Resistant Polyolefin-Covered Wire and Cable

ICEA S-73-532: ICEA/NEMA/ANSI Standards Publication for Control Cables (NEMA WC 57)

ICEA S-75-381: ICEA/NEMA/ANSI Standards Publication for Portable and Power Feeder Cables for Use in Mines and Similar Applications (NEMA WC 58)

ICEA S-76-474: ICEA/ANSI Standards Publication for Neutral Supported Power Cable Assemblies with Weather-Resistant Extruded Insulation, 600 Volts

ICEA S-77-528: ICEA/ANSI Standards Publication for Outside Plant Communications Cables, Specifying Metric Wire Sizes

ICEA S-80-576: ICEA/ANSI Standards Publication for Communications Wire and Cable for Wiring of Premises

ICEA S-81-570: Standard for Direct Burial 600 Volt Ruggedized Insulation

ICEA S-82-552: ICEA/NEMA Standards Publication for Instrumentation Cables and Thermocouple Wire (NEMA WC 55)

ICEA S-83-596: ICEA/ANSI Standards Publication for Fiber Optic Premises Distribution Cable

ICEA S-84-608: ICEA/ANSI Standard Publication Telecommunications Cable, Filled Polyolefin Insulated, Copper Conductor

ICEA S-85-625: ICEA/ANSI Standards Publication for Aircore, Polyolefin Insulated, Copper Conductor Telecommunications Cable

ICEA S-86-634: ICEA/ANSI Standards Publication for Buried Distribution & Service Wire, Filled Polyolefin Insulated, Copper Conductor

ICEA S-87-640: ICEA/ANSI Standards Publication for Fiber Optic Outside Plant Communication Cable

ICEA-S-93-639: ICEA/NEMA Standard for Shielded Power Cables Rated 5 - 46 KV for the Distribution of Electrical Energy (NEMA WC 74)

ICEA-S-94-649: Standard for Concentric Neutral Cables Rated 5 - 46 KV

ICEA S-95-658: ICEA/NEMA Standard for Non-shielded Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy (NEMA WC 70)

ICEA S-96-659: ICEA/NEMA Standard for Non-shielded Cables Rated 2001-5000 Volts for use in the Distribution of Electrical Energy (NEMA WC 71)

ICEA S-97-682: Standard for Utility Shielded Power Cable Rated 5 - 46 KV

ICEA S-105-692: Standard for 600 Volt Single Layer Thermoset Insulated Utility Underground Distribution Cable

ICEA T-22-294: ICEA Standard Test Procedures for Extended Time Testing of Wire and Cable Insulations for Service in Wet Locations

ICEA T-25-425: ICEA Guide for Establishing Stability of Volume Resistivity for Conducting Polymeric Components of Power Cables

ICEA T-26-465: ICEA/NEMA Guide for Frequency of Sampling Extruded Dielectric Power, Control, Instrumentation and Portable Cables for Test (NEMA WC 54)

ICEA T-27-581: ICEA/NEMA Standard Test Methods for Extruded Dielectric Power, Control, Instrumentation and Portable Cables (NEMA WC 53)

ICEA T-28-562: ICEA Standard Test Method for Measurement of Hot Creep of Polymeric Insulations

ICEA T-29-520: ICEA Standard for Vertical Tray Flame Tests at 210,000 Btu

ICEA T-30-520: ICEA Standard for Vertical Tray Flame Tests at 70,000 Btu

ICEA T-31-610: ICEA Standard for Water Penetration Resistance Test, Sealed Conductor

ICEA T-32-645: ICEA Standards Publication for Compatibility of Sealed Conductor Filler Compounds

IEC 92-3: International Electrotechnical Commission Electrical Installation in Ships - Part 3 Cables (Constructions, Testing and Installations)

IEEE 45: IEEE Recommended Practice for Electric Installations on Shipboard

IEEE 48: IEEE Standard Test Procedures and Requirements for High-Voltage Alternating Current Cable Terminations

IEEE 100: IEEE Standard Dictionary of Electrical and Electronics Terms

IEEE 141: IEEE Recommended Practice for Electric Power Distribution for Industrial Plants (IEEE Red Book)

IEEE 142: IEEE Recommended Practice for Grounding of Industrial and Commercial Power Systems (IEEE Green Book)

IEEE 241: IEEE Recommended Practice for Electric Power Systems in Commercial Buildings (IEEE Gray Book)

IEEE 242: IEEE Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems (IEEE Buff Book)

IEEE 323: IEEE Standard for Qualifying Class IE Equipment for Nuclear Power Generating Stations

IEEE 383: IEEE Standard for Type Test of Class IE Electric Cables, Field Splices and Connections for Nuclear Power Generating Stations

IEEE 400: IEEE Guide for Making High-Direct-Voltage Tests on PowerCable Systems in the Field

IEEE 404: IEEE Standard for Cable Joints for Use with Extruded Dielectric Cable Rated 5,000V Through 46,000V and Cable Joints for Use with Laminated Dielectric Cable Rated 2,500V Through 500,000V (Adopted as a National Standard of Canada, CAN/CSA-C22.2 No. 241)

IEEE 446: IEEE Recommended Practice for Emergency and Standby Power Systems for Industrial and Commercial Applications (IEEE Orange Book)

IEEE 493: IEEE Recommended Practice for the Design of Reliable Industrial and Commercial Power Systems (IEEE Gold Book)

IEEE 515: IEEE Recommended Practice for the Testing, Design, Installation and Maintenance of Electrical Resistance Heat Tracing

REFERENCE STANDARDS

for Industrial Applications

IEEE 524: IEEE Guide to the Installation of Overhead Transmission Line Conductors

IEEE 525: IEEE Guide for the Design and Installation of Cable Systems in Substations

IEEE 575: IEEE Guide for the Application of Sheath-Bonding Methods for Single-Conductor Cables and the Calculation of Induced Voltages and Currents in Cable Sheaths

IEEE 576: IEEE Recommended Practice for Installation, Termination and Testing of Insulated Power Cable as Used in the Petroleum and Chemical Industry

IEEE 590: IEEE Cable Plowing Guide

IEEE 602: IEEE Recommended Practice for Electric Systems in Health Care Facilities (IEEE White Book)

IEEE 635: IEEE Guide for Selection and Design of Aluminum Sheaths for Power Cables

IEEE 644: IEEE Standard Procedures for Measurement of Power Frequency Electric and Magnetic Fields from AC Power Lines

IEEE 738: IEEE Standard for Calculation of Bare Overhead Conductor Temperature and Ampacity Under Steady-State Conditions

IEEE 789: IEEE Standard Performance Requirements for Communications and Control Cables for Application in High Voltage Environments **IEEE 802.3:** IEEE Standard for Information Processing Systems - Local and Metropolitan Area Networks - Part 3: Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications (ISO/IEC) (ANSI/IEEE Std 802.3)

IEEE 802.5: IEEE Standard for Information Technology – Local and Metropolitan Area Networks – Part 5: Token Ring Access Method and Physical Layer Specifications (ISO/IEC) (ANSI/IEEE Std 802.5)

IEEE 816: IEEE Guide for Determining the Smoke Generation of Solid Materials Used for Insulations and Coverings of Electric Wire and Cable

IEEE 844: IEEE Recommended Practice for Electrical Impedance, Induction and Skin Effect Heating of Pipelines and Vessels

IEEE 1017: IEEE Recommended Practice for Field Testing Electric Submersible Pump Cable

IEEE 1018: IEEE Recommended Practice for Specifying Electric Submersible Pump Cable – Ethylene-Propylene Rubber Insulation

IEEE 1019: IEEE Recommended Practice for Specifying Electric Submersible Pump Cable – Polypropylene Insulation

IEEE 1120: IEEE Guide to the Factors to Be Considered in the Planning, Design and Installation of Submarine Power and Communications Cables

IEEE 1202: IEEE Standard for Flame Testing of Cables for Use in Cable Tray in Industrial and Commercial Occupancies

IEEE/ICEA S-135: Power Cable Ampacities

M

Mil-C-17: General Specifications for Flexible and Semirigid Radio Frequency Cables

Mil-C-915F: General Specification for Electrical Cable and Conductors for Shipboard Use

Mil-C-13777: General Specification for Special Purpose Electrical Cable

Mil-C-24640: General Specification for Lightweight Electrical Cable for Shipboard Use

Mil-C-24643: General Specification for Low Smoke Electrical Cable and Conductors for Shipboard Use

Mil-C-27500: General Specification for Shielded and Unshielded Electrical Power Cable and Special Purpose Cable

Mil-C-85045: General Specification for Fiber Optic Cables [Metric]

Mil-W-16878: General Specification for Insulated Electrical Wire

Mil-W-22759: General Specification for Copper or Copper Alloy Fluoropolymer-Insulated Electrical Wire

Mil-W-81044: General Specification for Copper or Copper Alloy, Crosslinked Polyalkene, Crosslinked Alkane-Imide Polymer or Polyalkene Insulated Electrical Wire

Mil-W-81381: General Specification for Replacement Wire

Mil-W-85485: General Specification for Radio Frequency Absorptive Filter Line Electrical Cable

N

NAVSEA 6710782: Fiber Optic & Multimode Cable

NEMA HP 3: Electrical and Electronic PTFE (Polytetrafluoroethylene) Insulated High Temperature Hook-Up Wire; Types (600 V), EE (1000 V) and ET (250 V)

NEMA HP 4: Electrical and Electronic FEP Insulated High Temperature Hook-Up Wire; Types K, KK and KT

NEMA HP 100: High Temperature Instrumentation and Control Cable

NEMA HP 100.1: High Temperature Instrumentation and Control Cables Insulated and Jacketed with FEP Fluorocarbons

NEMA HP 100.2: High Temperature Instrumentation and Control Cables Insulated and Jacketed with ETFE Fluoropolymers

NEMA HP 100.3: High Temperature Instrumentation and Control Cables Insulated and Jacketed with Cross-Linked (Thermoset) Polyolefin (XLPO)

NEMA HP 100.4: High Temperature Instrumentation and Control Cables Insulated and Jacketed with ECTFE Fluoropolymers

NEMA WC 2: Steel Armor and Associated Coverings for Impregnated-Paper-Insulated Cables (ICEA S-67-401)

NEMA WC 3: Rubber-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy (ICEA S-19-81)

NEMA WC 5: Thermoplastic-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy (ICEA S-61-402)

NEMA WC 7: Cross-Linked-Thermosetting-Polyethylene-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy (ICEA S-66-524)

NEMA WC 8: Ethylene-Propylene-Rubber-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy (ICEA S-68-516)

REFERENCE STANDARDS

NEMA WC 26: Wire and Cable Packaging

NEMA WC 50: Ampacities, Including Effect of Shield Losses for Single-Conductor Solid Dielectric Power Cable 15 KV - 69 KV (ICEA P-53-426)

NEMA WC 51: Ampacities of Cables in Open-Top Cable Trays (ICEA P-54-440)

NEMA WC 52: High Temperature and Electronic Insulated Wire-Impulse Dielectric Testing

NEMA WC 53: Standard Test Methods for Extruded Dielectric Power, Control, Instrumentation and Portable Cables (ICEA T-27-581)

NEMA WC 54: Guide for Frequency of Sampling Extruded Dielectric Power, Control, Instrumentation and Portable Cables for Test (ICEA T26-465)

NEMA WC 55: Instrumentation Cables and Thermocouple Wire (ICEA S-82-552)

NEMA WC 56: 3.0 kHz Insulation Continuity Proof Testing of Hook-Up Wire

NEMA WC 57: Standard for Control Cables (ICEA S-73-532)

NEMA WC 58: Standard for Portable and Power Feeder Cables for Use in Mines and Similar Applications (ICEA-S-75-381)

NEMA WC 61: Transfer Impedance Testing

NEMA WC 62: Repeated Spark/Impulse Dielectric Testing

NEMA WC 70: Standard for Non-shielded Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy (ICEA S-95-668)

NEMA WC 71: Standard for Non-shielded Cables Rated 2001 - 5 V for Use in the Distribution of Electrical Energy (ICEA S-96-659)

NEMA WC 74: Standard for Shielded Power Cables Rated 5 - 46 KV for the Distribution of Electrical Energy (ICEA S-93-639)

NFPA 70: National Electrical Code

NFPA 70HB: National Electrical Code Handbook

NFPA 262: Test for Fire and Smoke Characteristics of Wire and Cable

O

ONT M-302-84: Cable, Secondary, for Direct Burial

ONT M-355-82: Cable, Primary Submarine

ONT M-538-84: Cable, For Use in Generating Stations (5 KV+)

ONT M-570-84: Cable, For Use in Generating Stations (600 V)

ONT M-695-88: Cable, Primary and Subtransmission Submarine, Concentric Neutral

S

SAE 1560: Low Tension Thin Wall Primary Cable

SAE J1127: Battery Cable

SAE J1128: Low Tension Primary Cable

T

TIA: See EIA/TIA

U

UL 4: Standard for Armored Cable

UL 13: Standard for Power-Limited Circuit Cables

UL 44: Standard for Rubber-Insulated Wires and Cables

UL 62: Standard for Flexible Cord and Fixture Wire

UL 83: Standard for Thermoplastic-Insulated Wires and Cables

UL 183: Standard for Manufactured Wiring Systems

UL 444: Standard for Communications Cables

UL 486A: Standard for Wire Connectors and Soldering Lugs for Use With Copper Conductors

UL 486B: Standard for Wire Connectors and Soldering Lugs for Use With Aluminum Conductors

UL 486C: Standard for Splicing Wire Connectors

UL 486D: Standard for Insulated Wire Connectors for Use With Underground Conductors

UL 486E: Standard for Equipment Wiring Terminals for Use With Aluminum and/or Copper Conductors

UL 493: Standard for Thermoplastic-Insulated Underground Feeder and Branch-Circuit Cables

UL 498: Standard for Attachment Plugs and Receptacles

UL 514B: Standard for Fittings for Conduit and Outlet Boxes

UL 719: Standard for Nonmetallic-Sheathed Cables

UL 758: Standard for Appliance Wiring Material - Component

UL 814: Standard for Gas-Tube-Sign and Ignition Cable

UL 817: Standard for Cord Sets and Power-Supply Cords

UL 854: Standard for Service-Entrance Cables

UL 910: Standard for Test for Flame-Propagation and Smoke Density Values for Electrical and Optical-Fiber Cables Used in Spaces Transporting Environmental Air

UL 1023: Standard for Household Burglar-Alarm System Units

UL 1063: Standard for Machine-Tool Wires and Cables

UL 1072: Standard for Medium-Voltage Power Cables

UL 1084: Standard for Hoistway Cables
UL 1263: Standard for Irrigation Cables

UL 1277: Standard for Electrical Power and Control Tray Cables With Optional Optical Fiber Members

UL 1309: Standard for Marine Shipboard Cable

UL 1424: Standard for Cables for Power-Limited Fire-Protective Signaling Circuits

UL 1426: Standard for Cables for Boats

UL 1446: Standard for Systems of Insulating Materials - General

UL 1462: Standard for Mobile Home Pipe Heating Cable

UL 1569: Standard for Metal-Clad Cables

UL 1581: Reference Standard for Electrical Wires, Cables and Flexible Cords

UL 1588: Standard for Roof and Gutter De-Icing Cable Units

REFERENCE STANDARDS

UL 1666: Standard Test for Flame Propagation Height of Electrical and Optical-Fiber Cables Installed Vertically in Shafts

UL 1673: Standard for Electric Space Heating Cables

UL 1685: Standard for Vertical-Tray Fire-Propagation and Smoke Release Test for Electrical and Optical-Fiber Cables

UL 1690: Standard for Data Processing (DP) Cables

UL 1712: Standard Tests for Ampacity of Insulated Electrical Conductors Installed in the Fire Protective System

UL 1807: Standard for Fire Resistant Cable Coating Materials

UL 2023: Standard Test Method for Flame and Smoke Characteristics of Nonmetallic Wiring Systems (Raceway and Conductors) for Environmental Air-Handling Spaces

UL 2029: Standard for Gas/Vapor-Blocked Cable Classified for Use in Class I Hazardous (Classified) Locations

UL 2049: Standard for Residential Pipe Heating Cable

W

WC: See NEMA listing

Standards are available from the following organizations:

American Association of Railroads (AAR)

50 F Street, NW
Washington, DC 20001
(202) 639-2100

Association of Edison Illuminating Companies (AEIC)

Publication Department
600 North 18th Street
Birmingham, AL 35203

American National Standards Institute (ANSI)

REGISTERED TRADEMARKS

Trademark	Owner	Trademark	Owner
ANAPACT®	GENERAL CABLE	NORDELL®	DUPONT
BELDFOIL®	BELDEN	PERFECT-A-FLEX®	DUPONT
CORFLEX®	NEXANS	ROMEX®	ROCKBESTOS/SURPRENANT
CUPIC®	ESSEX GROUP	SOLEF®	GENERAL CABLE
DURASHEATH®	GENERAL CABLE	STALPETH®	SOLTEX
EXANE®	ROCKBESTOS/SURPRENANT	STALPIC®	ESSEX GROUP
FEP®	DUPONT	SURLYN®	ESSEX GROUP
FG2000®	CABLE USA	TEFLON®	DUPONT
FLAMEARREST®	BELDEN	TEFZEL®	DUPONT
FLAME-GUARD®	GENERAL CABLE	TELDAR®	DUPONT
GARDEX®	ROCKBESTOS/SURPRENANT	TFE®	DUPONT
HALAR®	AUSIMONT	UL®	UNDERWRITERS LAB.
HYPALON®	DUPONT	UNICON®	GENERAL CABLE
INTEGRAFLAME®	CABLE USA	UNISHIELD®	GENERAL CABLE
KYNAR®	PENWALT	VULKENE®	GENERAL CABLE
MYLAR®	DUPONT	ZETABON®	DOW CHEMICAL
NEC®	NFPA	ZYTEL®	DUPONT
NEOPRENE®	DUPONT		

SECTION L

Definitions

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WIRE AND CABLE ABBREVIATIONS

A

A	Asbestos insulated, no braid, for dry locations only. In raceways, only for leads to or within apparatus. Limited to 300 V, 200°C.
AA	Asbestos insulated, asbestos or glass braid. Dry locations only. Open wiring. In raceways only for leads to or within apparatus. Limited to 300 V, 200°C.
AAR	Association of American Railroads.
AB	High voltage butyl cable.
ABC	Armored bushed cabled. BX armored building wire with polyvinyl chloride insulation, 600V.
ABP	Butyl-polyethylene high voltage cable, 75°C.
AC	Branch circuit and feeder cables with flexible metal tape armor.
ACR	Corona-resisting insulation.
ACSR	Aluminum conductor, steel reinforced.
ACT	Armored cable containing plastic conductors.
ACV	Varnished cambric insulation, polyvinylchloride interlocked armor, 5 KV.
AF	Asbestos insulated, single solid or stranded conductor fixture wire. Impregnated with moisture-resistant, flame-retardant compound. With or without braid, 300 V, 150°C.
ALS	A cable assembly having a smooth aluminum sheath.
AN	Aircraft wire.
ANSI	American National Standards Institute.
ASE	Service entrance cable, aboveground use. Some constructions suitable for underground use. Flame-retardant, moisture-resistant, abuse-resistant covering.
ASP	Filled direct burial telephone cable used in areas subject to rodent attack. It contains a filled cable core.
ASTM	American Society for Testing and Materials, a non-profit industrywide organization that publishes standards, methods of testing, recommended practices, definitions and related material.
AV	Asbestos and varnished cambric insulated power and control cables.
AVA	Impregnated asbestos and varnished cambric insulated, with asbestos or glass braid, 600 V, 110°C.

AVC Asbestos and varnished cambric-insulated power and control cables.

AWG American wire gauge. Based on the circular-mil system. 1 mil equals .001 inch.

AWM Appliance wiring material.

B

BW Braid wire armor or basket weave.

BDC Plastic busdrop cable.

BX Armored building wire, 600 V.

C

C Lamp cord, two or more conductors twisted together. Rubber insulation, cotton braid. For pendant or portable use in dry places. No overall covering, 300 V, or 600 V, 60°C.

CATV Community antenna television.

CB Rubber-insulated brewery cord, with weatherproof braid on each conductor. Twisted, no overall covering.

CBO Neoprene-insulated brewery cord for use in damp locations.

CCTV Closed circuit television.

CM Communications general purpose cable suitable for general purpose communications use, with the exception of risers and plenums. Resistant to the spread of fire.

CMG Communications general purpose cable suitable for general purpose communications use, with the exception of risers and plenums. Resistant to the spread of fire.

CMP Communications plenum cable suitable for use in ducts, plenums, and other spaces used for environmental air, with fire-resistant and low smoke producing characteristics.

CMR Communications riser cable suitable for use in a vertical run in a shaft or from floor to floor, with fire-resistant characteristics capable of preventing the carriage of fire from floor to floor.

CSPE Chlorosulfonated polyethylene. An insulating and jacketing compound. Also known as Hypalon®, a DuPont registered trademark.

CPE Chlorinated polyethylene. Has physical-, aging-, flame- and oil-resistant properties comparable to Neoprene® and Hypalon®, but provides processability and economic advantages. Lower coefficient of friction than Neoprene® and Hypalon® for easier installation. CPE has a halogen content equivalent to Hypalon but significantly lower than PVC.

CPS	Cycles per second.	ETT	Elevator lighting and control cable. Thermoplastic insulation, one braid and a thermoplastic jacket. May have a steel support strand in the center, 300 V and 600 V.
CX	Two conductor, 18 AWG, rubber-insulated, twisted Christmas tree cord, 300 V.	ETPC	Abbreviation for electrolytic tough pitch copper with a minimum conductivity of 99.9%.
CXT	Two conductor, 18 AWG, plastic-insulated, twisted Christmas tree wire, 300 V.	E-Z-C	Special ITT-brand jacketing that combines excellent ozones, oil and abrasion resistance, low temperature flexibility and color retention.
D			
D	Used as a suffix to indicate a twin wire with two insulated conductors laid parallel under an outer, non-metallic covering.	F	
dB	Decibel: One tenth of a bel. It is equal to 10 times the logarithm of the power ratio, 20 times the log of the voltage ratio, or 20 times the log of the current ratio. One decibel is the amount by which the pressure of a pure sine wave of sound must be varied in order for the change to be detected by the average human ear. The decibel can express an actual level only when compared to some definite reference level that is assumed to be zero dB.	F	Flat band metallic armor.
DL, DLO	Diesel locomotive.	FCC	Flexible control cable or Federal Communications Commission.
DR	Rubber range and dryer cord (CSA).	FEP	Fluorinated ethylene propylene.
DRO	Neoprene® range and dryer cord (CSA).	FEPB	Fluorinated ethylene propylene insulated wire but with glass or asbestos braid.
DRT	Plastic range and dryer cord (CSA).	FF-1	Fixture wire, flexible, rubber insulated, single conductor, 300 V, 60°C.
DRTP	Deformation-resistant thermoplastic.	FF-2	Same as FFH-1 with 600 V rating.
E			
E	Elevator lighting and control cable. Rubber insulation, three overall braids, flame retardant and moisture resistant. May have steel supporting strand in center, 300 V.	FFH-1	Heat-resistant fixture wire, otherwise same as FF-1, 300 V.
EO	Elevator lighting and control cable. Rubber insulation, cotton braid, neoprene jacket. May have steel supporting strand in center, 300 V and 600 V.	FFH-2	Same as FFH-1, but with 600 V rating.
EP, EPR, EPM, EPDM	Designations for synthetic rubber based upon ethylene-propylene hydrocarbon.	FPA®	A registered trademark of General Cable Corporation for fused polyethylene aluminum. It consists of an 8 mil thick aluminum shield (corrugated or uncorrugated) coated on both sides with a polymer. The degree of bonding of polymer to outer cable jacket is controlled during processing.
EIA	Electronic Industries Association.	FR-1	A flammability rating established by Underwriters.
EMI	Electromagnetic interference.	CMUC	Undercarpet communications wire and cable suitable for undercarpet use. Resistant to the spread of fire.
EPOS	Electronic point-of-sale.	CMX	Limited-use communications riser cable suitable for use in dwellings and raceways. Resistant to the Laboratories for wires and cables that pass a specially designed vertical flame test. This designation has been replaced by VW-1.
ET	Elevator lighting and control cable. Thermoplastic insulation, three braids, flame-retardant and moisture-resistant finish. May have a steel support strand in the center, 300 V and 600 V.	FRMR	Flame-retardant, moisture-resistant finish.
		FX	Single rubber-insulated Christmas tree wire with outer braid, 125 V, 60°C.
		FXT	Single plastic-insulated Christmas tree wire, 125 V, 60°C.

ABBREVIATIONS

G – NRHW

G

- G** Rubber insulated, rubber jacketed, portable power cable with two to five 8AWG or larger conductors with ground wires.
- G-GC** Same as G, but with additional ground check conductor.
- GOR** Gasoline and oil resistant wire.
- GTO** Gas tube sign and oil burner ignition cable, 5 KV-15 KV.

H

- H** Shielded power cable with spiralled metallic shielding tape over insulation with overall protective covering. Multi-conductor cables have paper or varnished cambric insulation applied directly over individual conductors.
- HC** Heater cord with two or more conductors, asbestos and rubber insulation, and cotton braid over each conductor. Twisted, no overall covering.
- HF** Polyethylene-insulated radio hookup wire with or without braid.
- HPD** Rubber- and asbestos-insulated heater cord. No braid on individual conductors but with braid overall. Also made with Neoprene® insulation and no asbestos or PVE/NBR.
- HPN** Two-conductor, Neoprene®-insulated heater cord. Parallel construction. For use in damp locations.
- HS** Rubber- and asbestos-insulated heater cord. Cotton serve and rubber jacketed overall. For use in damp locations, 14 AWG or 12 AWG conductors. Also made with Neoprene®-insulated interior and asbestos.
- HSJ** Same as type HS, but with 18 AWG or 16 AWG conductors and differing thickness of jacket.
- HSJO** Same as type HSJ but with Neoprene® jacket.
- HSO** Neoprene®-jacketed heater cord.

I

- I** Interlocked armor of aluminum, bronze, or steel.

- IPE** Irradiated polyethylene tape.

J

- J** Asphalted jute, non-metallic armor.

K

- K** Constant used to denote insulation resistance.

L

- L** Lead sheath.
- LESCW** Low energy safety circuit wire.
- LW** Radio hookup wire with polyvinyl insulation, with or without Nylon jacket, braid or shielding braid, 300 V.

M

- M** Suffix indicating two or more insulated, twisted conductors under an outer, non-metallic covering.
- MC** Metal clad.
- MI** One or more conductors insulated with highly compressed refractory minerals and enclosed in a liquid- and gas-tight metallic tube sheathing.
- ML** Single-conductor, paper lead cables twisted together without overall covering. Type A: AVC mine locomotive cable; Type B: motor lead wire.
- MM** Mining machine cable.
- MPF** Mine power feeder, 5 KV, 8 KV and 15 KV.
- MPF-GC** Same as MPF, except with ground check conductor.
- MRFR** Moisture-resistant, flame-retardant finish.
- MTW** Thermoplastic-insulated machine tool wire, 600 V, 90°C to 105°C.
- MV** Medium voltage cable between 5 KV and 35 KV.
- MW** Radio hookup wire with polyvinyl insulation and plain or nylon jacket, braid or shield, 1000 V.
- MYD** Marina yard and dock cable.

N

- NBC** A blend of acrylonitrile (butadiene rubber) and polyvinyl chloride used for jacketing.
- NM** Non-metallic sheathed cable, braid or plastic covered. For dry use, 60°C.
- NMC** Non-metallic sheathed cable, plastic or neoprene covered. Wet or dry use, 60°C.
- NRHW** Moisture- and heat-resistant rubber insulation with Neoprene® jacket for use in ducts. Dry and wet locations, 600 V, 75°C. Also RHWN.

O

OSHA Occupational Safety and Health Act of 1970 administered by US Department of Labor. Establishes standards and safety requirements that all businesses must meet.

P

P Two or more rubber-insulated stranded conductors with cotton braid over each. Reinforced with overall covering of cotton braid over rubber filler. For pendant or portable use in damp locations, 300 V - 600 V.

PASP An air core (unfilled) direct burial double-jacketed telephone cable used in areas subject to rodent attack. Consists of unfilled cable core, inner polyethylene jacket, bare corrugated aluminum shield, and coated corrugated steel tape.

PCG Portable mine cable with power, control and ground conductors.

PD Rubber-insulated stranded conductors with cotton braid over each. Conductors twisted with braid overall. Light duty, dry locations on appliances, 300 V.

PG Portable mine cables having power and ground conductors, 600 V.

PL Two rubber-insulated, parallel-laid, lamp cords with overall cotton or rayon braid. For light duty on small appliances in dry locations, 300 V.

PLSJ All-rubber, parallel-jacketed, two-conductor, light duty cord for pendant or portable use in damp locations, 300 V.

PLT Same as PLSJ except thermoplastic insulation.

PNA, PNW Polyethylene-insulated control cables with Nylon sheath on individual conductors. Cabled tape and polyvinyl chloride jacket. Dry or wet locations, 600 V, 75°C.

PO Two stranded copper conductors with separator and code rubber insulation and cotton braid over each. Laid parallel with cotton or rayon braid overall. For use in dry locations on small appliances, 300 V - 600 V.

POSJ All-rubber, parallel, light duty ripcord for use on lamps and small appliances, 300 V, 60°C.

POSJX All-rubber, parallel, 20 AWG ripcord for use on lamps, clocks and Christmas trees, 125 V.

POT Thermoplastic, parallel, light duty rip cord, 300 V, 60°C, to 105°C.

POXT Same as POT, but 20 AWG for clock and Christmas tree use, 125 V.

PPE Portable power cable with thermoplastic elastomer insulation and jacket, with or without grounds designed for extra hard usage.

PS Thermostat cable with solid conductors, individual rubber insulation and cotton braid. Twisted, rubber jacket and cotton braid overall.

PW Moisture-proof, reinforced, portable cord with two or more rubber-insulated conductors with individual cotton braid. Moisture-resistant cotton braid finish over rubber jacket, 300 V-600 V.

R

R Code rubber-insulated building wire, 600 V, 60°C.

RD Rubber-insulated twin conductors, fibrous covered.

RDL Rubber-insulated twin conductors, lead covered.

RF Fixture wire, code or latex rubber insulation and braid over solid or stranded conductor, 60°C.

RFH Same as RF, but rubber or latex rubber insulation heat resistant, 75°C.

RH Rubber-insulated, heat-resistant building wire, 75°C.

RHD Rubber-insulated, twin-conductor, heat-resistant, fibrous covered wire.

RHDL Same as RHD, except lead instead of fibrous covered.

RHH Rubber-insulated, heat-resistant building wire, 90°C.

RHL Same as RHH, but with lead sheath overall.

RHM Rubber-insulated multiple conductors, heat-resistant and overall fibrous covered.

RHML Same as RHM, but with lead cover overall.

RH/RW Rubber-insulated, heat- and moisture-resistant building wire. 75°C dry, 60°C wet.

RHW Rubber-insulated building wire, heat- and moisture resistant, 75°C dry or wet.

RHW-2 Rubber-insulated building wire, heat- and moisture resistant, 90°C dry or wet.

RJ Rubber-insulated and jute-covered cable.

RJFJ Rubber-insulated cable with flat band armor.

RJIJ Rubber-insulated cable with interlock armor.

RL Rubber-insulated cable with lead sheath.

ABBREVIATIONS

RLJFJ – SO

RLJFJ	Rubber-insulated cable with lead, jute, flat band armor and overall jute covering.	SEA	Service entrance cable, steel armored under outer braid, one or two rubber-insulated conductors with neutral conductor served concentrically, moisture resistant tape, weatherproof braid finish, 300 V, 75°C.
RLJWJ	Rubber-insulated cable with lead, jute, steel wire armor and overall jute covering.	SEOW	600 V hard service cord with thermoplastic elastomer insulation and jacket. Jacket is oil-resistant and approved for use in damp locations.
RM	Rubber-insulated multiple conductors with fibrous covering.	SEOOW	600V hard service cord with thermoplastic elastomer insulation and jacket, and oil-resistant conductors. Jacket is oil-resistant and approved in damp locations.
RML	Same as RM, but lead instead of fibrous covering.	SEU	Same as SEA, but not armored.
RP	Performance-grade rubber insulation, 60°C.	SEW, SEWF	Silicone rubber-insulated equipment wire (CSA).
RR	Rubber insulation, neoprene jacket. Also see USE.	SF-2	Silicone rubber-insulated fixture wire, solid or 7-strand conductor, 200°C.
RS	Integral rubber-insulation and jacket on single-conductor cables.	SFF-2	Same as SF, except flexible stranding, 150°C.
RU	Rubber-insulated latex building wire, 60°C.	SG	Same as SW, except with ground wires (CSA).
RUH	Same as RU, but heat resistant, 75°C.	SGO	Same as SWO, except with ground wires (CSA).
RUW	Same as RU, but moisture resistant, 60°C.	SH-A	Portable mine power cable, three or four individually shielded conductors, 5 KV.
RW	Rubber-insulated building wire, moisture resistant, 60°C.	SH-B	Same as SH-A, except shield is overall.
RWS	Same as RW, but synthetic rubber.	SH-C	Same as SH-B, but with grounding conductors.
S			
S	Heavy duty, rubber-insulated portable cord. Stranded copper conductors with separator and individual rubber insulation. Two or more color-coded conductors cabled with filler, wrapped with separator, and rubber jacket overall, 600 V.	SH-D	Same as SH-A, but with grounding conductors.
SA	Silicone rubber insulation, asbestos or glass braid, for use in dry locations. Maximum operating temperature for special applications, 125°C.	SHFS	Polyvinyl insulated with felted asbestos flameproof cotton or rayon braid. Navy switchboard wire, 600 V.
SB	Slow burning wire. Three cotton braids, impregnated, 90°C.	SIS	Used for switchboard wiring only at 90°C. Indicates single conductor having synthetic thermosetting insulation of heat-resistant, flame-retardant grade. Also made with chemically cross-linked polyethylene insulation.
SD	Service drop cable. Two code rubber-insulated conductors, tape, laid parallel with neutral conductor concentric overall. Tape and braid overall. Also round construction.	SJ	Junior hard service, rubber-insulated pendant or portable cord. Same construction as Type S, but 300 V and with thinner jacket.
SDN	Small diameter multi-conductor control cable with Neoprene® jacket and Nylon sheath over polyethylene insulation.	SJO	Same as SJ, but oil- or water-resistant outer jacket, 300 V.
SdT/TC	Thermoplastic 90°C tray cable.	SJT	Junior hard service thermoplastic- or rubber-insulated conductors with overall thermoplastic jacket, 300 V.
SE	Aboveground service entrance cable, not protected against mechanical abuse. Flame-retardant, moisture resistant covering. Overall rubber sheath.	SJTO	Same as SJT, but oil-resistant thermoplastic outer jacket.
		SL	Same as ML. Single-conductor paper lead cables twisted together without overall covering.
		SO	Hard service cord, same construction as Type S, except oil-resistant Neoprene® jacket, 600 V.

ABBREVIATIONS SOO – THWN

SOOW	Hard service cord, same construction as Type SOW, except oil-resistant conductors and jacket.	SVT	Same as SV, except all-thermoplastic construction. With or without third conductor for grounding, 300 V.
SOW	Hard service cord, same construction as Type SO, except oil-resistant conductors and water-resistant jacket.	SVTO	Same as SVT, except with oil-resistant thermoplastic jacket.
SP-1	All-rubber, parallel-jacketed, two-conductor light duty cord for pendant or portable use in damp locations, 300 V.	SW	Rubber-jacketed power supply cable, 8 AWG to 2 AWG, 600 V.
SP-2	Same as SP-1, but heavier construction, with or without third conductor for grounding, 300 V.	SWO	Same as SW, except with Neoprene® jacket.
SP-3	Same as SP-2, but heavier construction for refrigerators or room air conditioners, 300 V.	SWT	Plastic-jacketed power supply cable, 8 AWG to 2 AWG, 600 V.
SPC	Submersible pump cable.	T	
SPT-1	Same SP-1, except all thermoplastic, 300 V, with or without third conductor for grounding.	T	Thermoplastic building wire.
SPT-2	Same as SP-2, except all thermoplastic, 300 V, with or without third conductor for grounding.	TA	Switchboard wire, thermoplastic and asbestos insulation, 90°C.
SPT-3	Same as SP-3, except all thermoplastic, 300 V, with or without third conductor for grounding.	TAA	Flexible nickel or nickel-clad copper, Teflon® tape, felted asbestos, asbestos braid, 200°C.
SR	Silicone rubber control cable, 600 V, 125°C.	TBS	Switchboard wire, thermoplastic insulation, flameproof cotton braid, 600 V, 90°C.
SR-AW	Flexible, nickel-plated copper conductor, silicone rubber insulation, glass braid, 600 V, 200°C.	TBWP	Three cotton braids, weatherproof saturated. Not voltage rated.
SR-C	Solid copper conductor, silicone rubber insulation, glass braid, 600 V, 125°C.	TC	Tray cable.
SRD	Portable range or dryer cable. Three or four rubber-insulated conductors with rubber or Neoprene® jacket, flat or round construction, 300 V, 60°C.	TEW	CSA-type appliance wires. Solid or stranded single conductor, plastic insulated, 600 V, 105°C.
SRDT	Same as SRD, except all thermoplastic with a maximum temperature of 90°C.	TF	Fixture wire, thermoplastic covered or 7-strand.
SR-H	Silicone rubber-insulated, asbestos braid, 300 V, 125°C.	TFE	Tetrafluoroethylene, or Teflon®, a trademark of DuPont.
SRML	Silicone rubber-insulated, glass braid motor lead wire, 600 V, 200°C.	TFF	Same as TF, but flexible stranding, 60°C.
SR-SE	Flexible, nickel-plated copper conductor, silicone rubber insulation, glass braid, 600 V, 200°C.	TFFN	Same as TFF, but with Nylon sheath.
ST	Hard service cord, jacketed, same as Type S except all-plastic construction, 600 V.	TG	Flexible nickel or nickel-clad copper conductor, Teflon® tape, glass braid, 200°C.
STO	Same as ST, but with oil-resistant thermoplastic outer jacket, 600 V.	TGS	Solid or flexible copper, nickel-clad iron or copper, or nickel conductor. Teflon® tape, silicone glass braid, 600 V, 250°C.
SV	Vacuum cleaner cord, two or three conductor, rubber insulated with overall rubber jacket. For light duty in damp locations, 300 V.	THHN	90°C, 600 V, Nylon-jacketed building wire. Dry only.
SVO	Same as SV, except Neoprene® jacket, 300 V.	THW	Thermoplastic-insulated building wire, flame retardant, moisture and heat resistant, 75°C. Dry and wet locations.
		THW-2	Same as THW, but rated 90°C. Dry and wet locations.
		THWN	Same as THW, but with Nylon jacket overall, 75°C. Dry and wet locations.
		THWN-2	90°C 600 V Nylon-jacketed building wire. Dry and wet locations.

ABBREVIATIONS

TP – XT

TP	Parallel tinsel cord. All-rubber insulation and jacket over two extremely flexible conductors. Light duty, attached to appliances of 50 watts or less. For use in damp locations in lengths of 8 feet or less.	VHF	Very high frequency. The spectrum extending from 30 to 300 MHz as designated by the Federal Communications Commission.
TPO	Same construction as Type PO, but with flexible tinsel conductors, 125 V.	VLF	Very low frequency. The spectrum extending from 10 to 30 MHz as designated by the Federal Communications Commission.
TPT	Same as TP, but all-thermoplastic insulation and jacket, 125 V.	VM	Indicates a cable having two or more Type V conductors twisted together under an outer fibrous covering.
TS	Two- or three-conductor rubber-insulated and jacketed tinsel cord. Light duty, attached to an appliance of 50 watts or less. For use in damp locations in lengths of 8 feet or less.	VSWR	Volume standing wave ratio.
TSO	Same as Type TS, but with or fewer jacket, 125 V.	VW-1	A flammability rating established by Underwriters' Laboratories for wires and cables that pass a specially designed vertical flame test. It is a basic flammability test for single conductors using a Tirrill burner applied intermittently to a vertical wire that is not as severe as the vertical tray flame test.
TST	Same as Type TS, but all-thermoplastic insulation and jacket.		
TT	Polyvinylchloride (PVC) insulation and sheath, aerial and duct.		
TW	Thermoplastic-jacketed building wire, moisture resistant.		
	U		
UF	Thermoplastic underground feeder and branch circuit cable.	W	Heavy duty portable power cable, one to six conductors, 600/2,000 V, without grounds.
UHF	Ultrahigh frequency. The spectrum extending from 300 to 3000 MHz as designated by the Federal Communications Commission.	WP	Weatherproof construction, two or three impregnated cotton braids, 80°C.
UL	Underwriters' Laboratories, Inc.		
URC	Weatherproof wire.		
URD	Underground residential distribution cable.		
USE	Underground service entrance cable, rubber insulated, Neoprene® jacket.		
	V		
V	Varnished cambric insulation, with fibrous covering.	X	Two Type FX wires twisted together, color coded, 125 V, 60°C.
VCB	Varnished cambric insulation, cotton braid, flame retardant, moisture-resistant finish.	XHHW	Cross-linked polyethylene building wire 90°C dry, 75°C wet.
VCL	Varnished cambric insulation, lead-covered cable with hermetically sealed ends.	XHHW-2	Cross-linked polyethylene building wire 90°C wet and dry.
VD	Indicates a twin wire having two Type V conductors laid parallel under an outer fibrous covering.	XLPE	Cross-linked polyethylene.
VG	Varnished glass tape over a flexible copper conductor. Varnished glass or Nylon braid, 600 V or 3,000 V, 130°C.	XT	Two Type FXT wires twisted together, color coded, 125 V, 60°C.

GLOSSARY OF TERMS

A

- Abrasion** - The damage caused by scraping or rubbing against a rough, hard surface.
- Abrasion Resistance** - A measure of the ability of a wire, wire covering, or material to resist surface wear.
- Accelerated Aging or Accelerated Life Test** - A test that duplicates longtime environmental conditions in a relatively short time. The conditions to which a cable or material is subjected to, such as temperature and voltage, are increased in magnitude above normal operating values. The observable deterioration in a reasonable period of time provides a relative measure of the probable life under operating conditions.
- Accelerator** - A chemical additive which hastens the chemical reaction under specific conditions; also called a promoter.
- Acceptance Test** - A test designed to demonstrate the degree of compliance with specified requirements.
- Adhesive** - A material capable of holding other materials together by surface attachment.
- Adjacent Conductor** - Any conductor next to another conductor in the same multi-conductor cable layer or in adjacent layers.
- Admittance** - The measure of ease with which an alternating current flows in a circuit.
- Aerial Cable** - Cable suspended in the air on poles or other overhead structures.
- Aerial Distribution Wire** - Designed for temporary use in lieu of or to supplement existing open wire plant, where shielding is not required.
- Aging** - The change in properties of a material with time under given conditions.
- Aging Stability Test** - A test of the flexibility of a cable after subjecting it to a high temperature followed by a low temperature.
- Air Spaced Coaxial Cable** - A cable in which air is essentially the dielectric material. A spirally wound synthetic filament, beads, or braided filaments may be used to center the conductor.
- Alarm Pair** - A dedicated pair connecting a remote contacting device to a central monitoring point.
- Alloy** - A metal formed by combining two or more different metals to obtain desirable properties.
- Alpeth** - Aerial telephone cable with an aluminum shield.
- Alternating Current** - Electric current that periodically and regularly reverses its direction. Expressed in cycles per second (Hertz or Hz).
- Ambient** - Conditions existing at a test or operating location prior to the energizing of equipment.
- American Wire Gauge (AWG)** - The standard measurement to indicate wire diameter. The diameters of successive sizes vary geometrically in retrogression, (i.e., the larger the number, the smaller the wire). Also known as the B&S Standard.
- Ampacity** - The allowable current-carrying capacity of a conductor measured in amperes.
- Angle of Advance** - The angle between a line perpendicular to the axis of the cable and the axis of any one member or strand of the braid; also referred to as braid angle.
- Anneal** - To heat and then gradually cool in order to relieve mechanical stresses. Annealing copper makes it softer and less brittle, thus lowering the tensile strength while improving the flex life.
- Annular Conductor** - A number of wires stranded in three reversed concentric layers around a core.
- Anode** - The positive pole on an electric source.
- Anti-Oxidant** - A substance that prevents or slows oxygen decomposition.
- Anti-Ozonant** - A substance that prevents or slows material degradation due to ozone reaction.
- Appliance Wiring Material (AWM)** - Insulated wire that will be used as component wiring inside a piece of equipment. The wire is usually designated by a four-digit style number, such as UL Style 1015, that establishes the conductor size range, insulation type and thickness, and voltage and temperature rating.
- Arc Resistance** - The time required for an arc to establish a conductive path in a material.
- Armor** - Metallic tape, tube, braid or wire that provides mechanical protection for applications where extreme wear resistance is required.
- Armored Cable** - A cable covered with a heavy outer braid, tape or tube of metal for the purpose of mechanical protection.
- Asbestos** - A silicate mineral that readily separates into flexible fibers suitable for use as an incombustible, non-conducting chemically resistant material. Fibrous asbestos wire and cable insulation is used in the form of yarn servings, felts, lap, roving and braid. Asbestos in these uses may be reinforced by or combined with other materials. Where space is important, asbestos papers and purified asbestos papers may be used.
- Attenuation** - Power drop or signal loss; the loss of electrical energy as it travels along a cable, generally expressed in decibels (dB) per unit, usually 100 feet. As applied to coaxial cables, the power drop or signal loss in a circuit.
- Attenuation Constant** - Cable rating that denotes the relative rate of voltage or current decrease in the direction of travel; measured in dB/unit length.

GLOSSARY

Au – By

Audio Frequency - Frequencies audible to the human ear; approximately 20-20,000 cycles per second.

B

B & S Gauge - See American Wire Gauge. The B & S gauge has been adopted as the AWG standard.

Balanced Line - A cable having two identical conductors with the same electromagnetic characteristics in relation to other conductors and to ground.

Band Marking - A continuous circumferential band applied to a conductor at regular intervals for identification.

Bare Conductor - A conductor not covered with any material.

Baud - Unit of data transmission speed meaning bits per second (500 baud = 500 bits per second).

Bel - A unit that represents the logarithm of the ratio of two levels.

Bell Wire - 18 AWG insulated copper wire used for making doorbell and thermostat connections in homes.

Belt - The number of layers of insulation on a conductor or number of layers of jacket on a cable.

Bend Loss - A form of increased attenuation caused by (a) having an optical fiber curved around a restrictive radius of curvature or (b) microbends caused by minute distortions in the fiber imposed by externally induced perturbations.

Bend Radius - Radius of curvature that a fiber optic or metallic cable can bend without any adverse affects.

BEV - One billion electron volts.

Bit - One binary digit.

Bond Strength - The amount of adhesion between bonded surfaces.

Bonding Braid - A group of metallic filaments woven together to form the electrical equivalent of 6 AWG copper wire. Bonding braid is used to bond to cable sheaths or to provide a ground connection.

Booster - A device used to increase voltage on DC lines.

Boot - (1) Protective covering over any portion of a cable, wire or connector in addition to the normal jacketing or insulation. (2) A form placed around wire termination of a multiple contact connector to contain the liquid potting compound before it hardens. (3) A protective housing usually made from a resilient material to prevent the entry of moisture into a connector.

Braid - A fibrous or metallic woven cylinder covering a conductor or cable that provides mechanical strength and serves as a means of polarity identification. A braid may be composed of filamentary material as cotton, glass, Nylon, tinned copper, silver or asbestos. Woven bare metallic copper wire is used as shielding for wire and cable and as ground wires for batteries of heavy industrial equipment.

Braid Angle - A term used in the determination of the braid configuration relating to the angle of the braided filaments or fibers in relation to the axis of the cable core being braided.

Braid Ends - The number of strands used to make up one carrier. The strands are wound side by side on the carrier bobbin and laid parallel in the finished braid.

Brazing - The joining of ends of two wires, rods or groups of wires with a non-ferrous filler metal at temperatures above 800°F.

Breakdown (Puncture) - A disruptive discharge through the insulation of a wire.

Breakdown Voltage - The voltage at which the insulation between two conductors will break down.

Breakout - The point at which a conductor or conductors break out from a multi-conductor cable to complete circuits at various points along the main cable. This point is usually harnessed or sealed with some synthetic rubber compound.

Buffer (Fiber Optic) - A soft material that mechanically isolates individual fibers in a fiber optic cable or bundle from small geometrical irregularities, distortions, or roughness, or from adjacent surfaces.

Building Wire - Insulated wires used in buildings for light and power rated at 600V or less. They are usually not exposed to outdoor environments.

Buna Rubber - A synthetic rubber made by polymerization of butadiene. Buna-N is a copolymer of butadiene and acrylonitrile. Buna-S is a copolymer of butadiene and styrene.

Bunched Lay or Stranding - A bunched strand is a collection of strands twisted the same direction without regard to geometric arrangement.

Bundle (Fiber Optic) - A number of fibers grouped together, usually carrying a common signal.

Bus Bar Wire - Uninsulated tinned copper wire used as a common lead.

Bushings - A mechanical device used as a lining for an opening to prevent abrasion to wire and cable. Also used as a low cost method of insulating, anchoring, cushioning or positioning. Usually a non-metallic material.

Butt - The joining of two conductors end-to-end, with no overlap and with their axes in line.

Butt Wrap - A spirally wrapped tape over a cable core where the trailing edge of one wrap just meets the leading edge of the preceding wrap with neither overlap nor spacing.

Butyl Rubber - A manmade rubber used for special applications. It has excellent resistance to heat, sunlight, weather, aging and ozone, and is normally rated for 90°C.

Byte - A group of 8 adjacent binary digits.

C

Cable - Single or multiple conductors twisted together with or without insulation and other coverings. Small single conductors are often called wires, and small flexible cables are called cords. Numerous deviations from these definitions are a result of traditional names for items in long-term use.

Cable Assembly - A single coaxial cable with connectors or a group of wires and cables that has been formed in definite order and position, and terminated with connectors. An assembly may include a jacket, strain relief members, potted connectors, and casted or molded junctions.

Cable Clamp - A device used to give mechanical support to the wire bundle or cable at the rear of a plug or receptacle.

Cable Closure - Any of several types of housings that can be fastened around a cable splice to make it water tight; used to enclose cable sheath openings necessary for splicing.

Cable Core - The portion of cable containing the insulated conductors that are under the core wrap or protective coverings.

Cable Core Binder - A wrapping of tapes or cords around the several conductors of a multiple-conductor cable used to hold them together. Cable core binder is usually supplemented by an outer covering of braid, jacket, or sheath.

Cable Filler - Material used in multiple-conductor cables to occupy the interstices formed by the assembly of the insulated conductors, thus forming a cable core of the desired shape, usually circular.

Cable Puller - A tool for pulling cables through a conduit.

Cable Sheath - The protective covering applied to cables.

Cable Terminal - A device that seals cable ends and provides insulated egress for the conductors.

Cable-in-Duct - A system for direct burial in which a flexible conduit is extruded over electrical cables for a single, preassembled unit.

Cabling - The method by which a group of insulated conductors is mechanically assembled or twisted together.

Cabling Factor - Used in a formula for calculating the overall diameter of a cable, $D = fd$, where D = cable diameter, f = factor, and d = diameter of one conductor.

Cadmium-Chromium-Copper - An alloy used in high temperature applications that provides high strength and a good flex life with a slight sacrifice in conductivity.

Cadmium-Copper - A high strength alloy, easy to work with and relatively inexpensive, but with a softening temperature of 175°C to 200°C.

Caged Armor - Armor wires within a polyethylene jacket, often used in submarine cables.

Capacitance - The property of a system of conductors and dielectrics that permits electricity storage when potential differences exist between the conductors. Its value is expressed as the ratio of a quantity of electricity to a potential difference in farads and is always positive. At most commercial voltages and frequencies, the capacitance effects are negligible. At relatively high voltages, the current due to capacitance may reach sufficient value to affect the circuit, and insulation for such applications is designed for moderately low dielectric constant. In communication, the capacitance of the wire determines the maximum length of line over which the signal may be transmitted without excessive attenuation, therefore requiring insulations that have low dielectric constants.

Capacitance Unbalance, Pair-To-Ground - The difference between the capacitance of each conductor in a twisted pair and ground, with ground comprised of the shield and all pairs not under test. Any difference in the wire diameter of the two conductors of a pair, the insulation thickness on the two wires of a pair, and uneven twisting of the conductors of a pair may tend to increase the capacitance unbalance pair-to-ground. Capacitance unbalance is generally measured in picofarads per 1,000 feet.

Capacitance Unbalance, Pair-To-Pair - The difference between the four conductors of two pairs of twinned insulated conductors. The unit of measurement for pair-to-pair capacitance unbalance is usually expressed in picofarads per 1,000 feet. Any difference in the wire diameter, the insulation thickness, uneven twisting of one or both pairs among the four conductors may result in pair-to-pair capacitance unbalance. Similarly, lay length and proximity of the two pairs involved will also affect the capacitance unbalance pair-to-pair.

Capacitance Unbalance, Pair-To-Shield - The difference between the capacitance of each conductor in a twisted pair and the shield. Any difference in the wire diameter of the two conductors of a pair, the insulation thicknesses on the two wires of a pair, and uneven twisting of the conductors of a pair may end to increase the capacitance unbalance pair-to-shield. Capacitance unbalance is generally measured in picofarads per 1,000 feet.

Capacitive Coupling - The electrical interaction between two conductors caused by the capacitance between them.

Capacitive Reactance - The opposition to alternating current due to the capacitance of a capacitor, cable or circuit. It is measured in ohms and is equal to $1/6.28fC$, where f is the frequency in Hz and C is the capacitance in farads.

Capacitor - A device for storing an electrostatic charge.

Capillary Action - The phenomenon of liquid passing along the path of a small interstice due to surface tension.

Capstan - A set of revolving drums used in high speed insulating lines to pull the insulated conductor through the extrusion line in a uniform and vibration-free manner.

Carbon Black - A black pigment produced by the incomplete burning of natural gas or oil. Used in polyethylene jacketing compounds because of its useful ultraviolet protective properties.

GLOSSARY

Car – Com

Carrier - A group of conductors or yarns woven over and under to form a braid.

Cast Tape - A material formed directly into a tape by means of flowing or casting a solution or dispersion of the film-forming material onto a suitable carrier then removing the solvent, as opposed to skiving or slicing a block of material into a tape form.

Casting - The act of forming into desired shape by pouring.

Catalyst - A substance that initiates and/or accelerates a chemical reaction, but normally does not enter the reaction.

Cathode - The negative pole on an electric source.

Cavity - A depression in a mold.

Cellular - Refers to conductor compounds having expanded plastic compounds. Cellular insulations differ from solid insulations by the dispersion of small gaseous cells uniformly distributed throughout the solid plastic resin matrix during the extrusion or insulating process. Foam and foam/skin conductor insulations are commercially developed by this process.

Cellular Polyethylene - Polyethylene in foam form consisting of individual closed cells of inert gas suspended in a polyethylene medium. Reduces dielectric constant, but limited to below 80°C.

Cellulose Acetate - A tough cellulose material used to impregnate cotton insulation.

Center-to-Center Distance - See Pitch.

Characteristic Impedance (of a uniform line) - The ratio of an applied potential difference to the resultant current at the point where the potential difference is applied, when the line is of infinite length. The term applies only to uniform lines such as coaxial cable.

Chromel-Alumel - Two alloys used in forming one type of thermocouple pair. Chromel is primarily an alloy of chrome and nickel, and Alumel is an alloy of aluminum, nickel, manganese, and silicon.

Cigarette Wrap - Tape insulation wrapped longitudinally instead of spirally over a conductor.

Circuit - System of conducting media designed to pass an electric current.

Circuit Sizes - Normally 16 AWG - 10 AWG used for circuit wiring.

Circular Mil (cm) - Used to define cross-sectional areas of conductors. The area of a circle 1/1000 inches in diameter is one circular mil. 1,000,000 cm = 1 circular inch, and 1 cm = $\pi/4$ square mils.

Clad Wire - Wire comprised of a given metal covered with a relatively thick application of a different metal.

Coated Wire - Wire comprised of a given metal covered with a relatively thin application of a different metal, usually tin or a polymer.

Coaxial Cable - Cable containing two cylindrical conductors with a common axis. The two conductors are separated by a dielectric. The outer conductor, normally at ground potential, acts as a return path for current flowing through the center conductor and prevents

energy radiation from the cable. The outer conductor, or shield, is also commonly used to prevent external radiation from affecting the current flowing in the inner conductor. The outer shield consists of woven strands of wire or is a metal sheath.

Coil Effect - The inductive effect exhibited by a spiral-wrapped shield, especially above audio frequencies.

Cold Bend Test - A test procedure where a sample of wire or cable is wound around a mandrel or a specified size in a cold chamber at a specified temperature for a given number of turns at a given rate of speed. The sample is then removed and examined for defects or deterioration in the materials for construction.

Cold Flow (Creep) - The permanent deformation of a material due to mechanical force or pressure and not due to heat softening.

Cold Joint - A soldered joint made with insufficient heat.

Cold Work - The hardening and embrittlement of a metal by repeating flexing action.

Cold-Drawing - Reducing the cross-sectional area by pulling the material through one or more dies at a temperature lower than the recrystallization temperature of the material.

Color Code - A method of identifying different conductors by means of colors, numbers, printing, tracers or braids on the outer surface of a jacket wire.

Combination Stranded Conductor - A conventional concentric conductor in which the wires in the outer layer are larger in diameter than the wire in the inner layer or layers. The diameters of all wires are within 5% of the nominal wire diameter for the same size non-combination stranded conductor.

Commutator - A device that changes AC current to DC.

Composite Cable - A cable that contains more than one gauge or more than one type of circuit such as pairs, quads, video pairs or coaxials.

Composite Conductor - A conductor consisting of two or more types of plain, clad or coated wire stranded together to operate mechanically and electrically as a single conductor.

Compound - An insulating and jacketing material made by mixing two or more ingredients.

Compressed Stranded Conductor - A conventional concentric conductor manufactured to a diameter not more than 3% below the nominal diameter of a non-compressed conductor of the same cross-sectional area.

Compression Cable - A pipe-type cable in which the pressure is separated from the insulation by a membrane or sheath.

Compression Molding - A method of molding thermosets. Compounds, usually preheated, are placed in an open mold. Upon closing the mold, heat and pressure are applied until the material is cured. Also usable with synthetic rubber materials.

Compressive Strength - The crushing load at failure divided by the original sectional area of the specimen.

Concentric - A central core surrounded by one or more layers of helically wound strands in a fixed round geometric arrangement. The direction of lay for successive layers may be reversed or remain the same; the lay length shall increase with each successive layer. The standard direction of lay of the outer layer is left hand.

Concentric Lay Cable - A concentric-lay conductor of a multi-conductor cable composed of a central core surrounded by one or more layers of helically laid wires.

Concentric Lay Conductor - A conductor composed of a central core surrounded by one or more layers of helically laid wires.

Concentric Strand - Consists of an insulated strand as the core around which wires are spirally laid in layers. Each layer after the first has six more strands than the preceding layer and is applied contrahelically.

Concentricity - The measurement in a wire or cable of the location of the center of the conductor with respect to the geometric center of the circular insulation.

Condensation - A chemical reaction in which two or more molecules combine resulting in a molecule of greater density as where water vapor condenses to form water.

Conductance - The ability of a conductor to carry an electric charge. The ratio of the current flow to the potential difference causing the flow. The reciprocal of resistance.

Conductivity - The ability of a material to allow electrons to flow. Measured by the current per unit of voltage applied. The reciprocal of resistivity.

Conductor - Any material capable of easily carrying an electrical charge. Specifically, a wire or combination of bare or insulated wires suitable for carrying electrical current.

Conduit - A solid or flexible protective tube or trough in which wires are run.

Connector - A device used to physically and electrically connect two or more conductors.

Contact - The element in a connector that makes electrical contact between two halves. Also, the point of joining in an electrical connection.

Contamination - The increase in attenuation due to a degradation of characteristics of the dielectric material within a transmission line.

Continuity - The ability of a conductor to carry a current over its entire length.

Continuous Vulcanization - After a rubber or rubber-like compound is extruded onto a conductor, the wire is then passed into a vulcanizing chamber where the insulation or jacket is continuously vulcanized under high pressure and temperature control.

Contrahelical - The direction of a layer with respect to the previous layer. Specifically, spiralling in the opposite direction than the preceding layer.

Control Cable - A cable used for remote operation of any type of electrical power equipment.

Copolene - A dielectric material composed of polyisobutylene and polystyrene developed as a substitute polystyrene.

Copolymer - A compound resulting from the chemical reaction of two chemically different monomers.

Copper - A common metal with the best conductivity of the non-precious metals per volume. Available in rod, sheet, foil, tube and wire forms. Copper and copper alloys offer excellent corrosion resistance, high thermal conductivity, and ease of fabricating, joining and forming. The strength-to-weight ratio of copper is relatively low and loses strength at elevated temperatures. Copper is the most widely used electrical conductor in wire and cable.

Copper-Constantan - An alloy of copper, nickel, manganese and iron used in thermocouple pairs.

Copper-Covered Steel Wire - A wire with a steel core and fused outer shell of copper.

Copperweld® - The trade name for copper-covered steel wire manufactured by the Copperweld Steel Company. A drawing process enables a thick copper covering to be placed over a steel core so that the copperweld performs as one metal. Hot rolling, cold drawing, pounding and temperature changes do not affect its properties.

Cord - A small, flexible conductor or group of conductors insulated one from another and covered by an outer sheath or covering; usually not larger than 10AWG or more than four conductors.

Cord Sets - Portable cords fitted with any type of wiring device at one or both ends.

Core - The component separating the inner or outer conductor within a coaxial cable.

Corona - A high-voltage electrical discharge that attacks insulation. This luminous discharge is caused by the ionization of gas surrounding a conductor around which exists a voltage gradient exceeding a certain critical value.

Corona Resistance - The time that insulation will withstand a specified level of field-intensified ionization that does not result in the immediate and complete breakdown of the insulation.

Corrosion - Chemical or electrical action that destroys the surface of a metal. The latter is known as electrolytic corrosion or electrolysis.

Coulomb - A measure of electrical current; one Coulomb = one amp per second.

Coupling - The transfer of energy between two or more cables or components of a circuit.

GLOSSARY

Cra – Die

Crazing - Minute cracks on or near the surface of materials such as plastics or ceramics.

Creep - The dimensional change of a material under pressure or tension over a period of time.

Creepage - Electrical leakage on a solid dielectric surface.

Creepage Surface - An insulating surface that provides physical separation as a form of insulation between two electrical conductors of different potential.

Cross-Connect Wire (CCW) - Wiring used for cross-connect terminations on various types of distributing frames in the central office or in the field. It can also be installed during building construction, prior to applying drywall on lath where another jacket is not required. 24 AWG is used. Previously called Pre-Wiring Cable.

Cross-Connecting Terminal - A cable terminal at a junction of two cables that terminates pairs from both cables so that they can be cross-connected. Often used at the junction of a feeder cable and the distribution cables it serves.

Cross-Linked Polyethylene - A form of polyethylene with molecules permanently set to produce a greater balance of physical and electrical properties.

Cross-Linking - In polymer molecules, the setup of chemical links between molecular chains. Found in most thermosetting resins.

Cross-Sectional Area (of a conductor) - The sum of the cross-sectional areas of component wires with each wire being measured perpendicular to its individual axis. This measure is expressed in circular mils or square inches.

Crosshead - A device attached to the discharge end of an extruder cylinder to facilitate extruding at an angle.

Crosstalk - Audio signal interference between nearby conductors caused by the pickup of stray energy; also called electro-magnetic coupling. May be reduced by proper overall shielding.

Cupeth - A cable sheath similar to alpeh except copper is used as the shield instead of aluminum.

Cure - To alter the physical properties of a material by chemical reaction, the action of heat and catalysts, alone or in combination, with or without pressure.

Curing Temperature - The temperature at which a material is subjected to curing.

Curing Time - The time required in molding or thermosetting plastics for the material to be properly cured.

Curl - The degree to which a wire tends to form a circle after removal from a spool; indicates the ease with which the wire can be wrapped.

Current - The flow of electricity measured in amps.

Current Carrying Capacity - The maximum current a capacitor can carry without heating beyond a safe limit.

Current Loop - A two-wire transmit/receive interface.

Current Penetration - The depth a current of a given frequency will penetrate into the surface of a conductor carrying the current.

Cut-Through Resistance - The ability of a material to withstand mechanical pressure without separation. Pressure is usually applied as a sharp edge of prescribed radius.

Cycle - The complete sequence of alternation or reversal of flow in an alternating electric current.

D

Dacron® - A polyester fiber plied into two yarns and formed into a braid over a cable insulation or jacket. When impregnated with a high temperature lacquer, the braid forms a layer that will not fray and exhibits a high abrasion resistance. It is limited to use below 150°C.

Decibel - An exponential unit to express differences of power level. The decibel is 10 times the common logarithm of the power ratio. It is used to express power gain in amplifiers or power loss in passive circuits or cables.

Delay Line - A transmission line or equivalent device designed to delay a wave or signal for a specific length of time.

Denier - Describes the weight of a yarn which determines its physical size. Refers to materials other than cotton and spun rayon.

Derating Factor - A factor used to reduce a current-carrying capacity of a wire when used in other environments from that for which the value was established.

Dielectric - A non-conducting material or a material with the property that the energy required to establish an electric field is recoverable, in whole or part, as electric energy. Any insulating medium that intervenes between two conductors and permits electrostatic attraction and repulsion to take place across it.

Dielectric Absorption - The property of an imperfect dielectric whereby there is an accumulation of electric charges within the body of the material when it is placed in an electric field.

Dielectric Breakdown - Any change in the properties of a dielectric that causes it to become conductive; normally a catastrophic failure of an insulation because of excessive voltage.

Dielectric Constant (K) - The property of an insulation that determines the electrostatic energy stored per unit volume for unit potential gradient. Expressed as a ratio. K for air is 1.0, while that for polyethylene is 2.2 times that of air. It is also referred to as Specific Inductive Capacity or Permittivity.

Dielectric Heating - The heating of an insulating material when placed in a radio frequency field, caused by internal losses during the rapid polarization reversal of molecules in the material.

Dielectric Loss - The rate of time at which electric energy is transformed into heat in a dielectric when it is subjected to a changing electric field.

Dielectric Power Factor - An expression of energy loss in an electric current due to the effect of the dielectric.

Dielectric Strength - The maximum voltage insulation can withstand without rupture or breakdown occurring. Usually expressed as a voltage gradient in volts per unit thickness.

Dielectric Tests - Test that consists of the application of voltage higher than the rated voltage for a specific time for the purpose of determining the adequacy against breakdown of insulating materials and spacings under normal conditions.

Digital - Used to describe electronic technology that generates, stores, and processes data in terms of two states: positive and non-positive. Positive is expressed or represented by the number 1 and non-positive by the number 0; data is transmitted or stored as a string of 0s and 1s.

Dip Coating - An insulating coating applied to the conductor by passing the conductor through an applicator containing a liquid insulating medium. Can be used for magnet wire.

Direct Current - Electricity that flows in one direction only.

Direction of Lay - The lateral direction in which the strands of a cable run over the top of the cable as they recede from an observer looking along the axis of the cable. This is the same designation used for thread direction of screws. ASTM symbols are used to indicate direction with "S" for left hand and "A" for right hand.

Dispersion - The cause of bandwidth limitations in an optical fiber. Dispersion causes a broadening of input pulses along the length of a fiber. Mode dispersion is caused by varying optical path lengths in a multimode fiber, and material dispersion is caused by a delay of various wavelengths of light in a wave guide material.

Displacement Current - A current that exists in addition to ordinary conduction current in AC circuits. It is proportional to the rate of change of the electric field.

Disruptive Discharge - The sudden and large increase in current through an insulation medium due to the complete failure of the medium under the electrostatic stress.

Dissipation Factor - The tangent of the loss angle of the insulation material. Also referred to as loss tangent and approximate power factor.

Distortion - An undesired change in wave form as a signal passes through a device.

Distribution Cable - In a CATV system, the transmission cable from the distribution amplifier to the drop cable.

Disturbed Conductor - A conductor carrying energy generated by the field of another conductor or an external source such as a transformer.

Drain Wire - An uninsulated stranded or solid conductor located directly under a shield. Because it comes in contact with the shield throughout the entire length of the cable, it may be used to terminate the shield and eliminate a considerable amount of dispersion.

Drawing - The process of pulling metal through a die or a series of dies to achieve a desired diameter.

Drop Cable - The transmission cable in a CATV system from the distribution cable to a dwelling.

Dual Coaxial Cable - Two individually insulated conductors laid parallel or twisted and placed within an overall shield and sheath.

Duct - Overhead or underground tube used to carry electrical conductors.

Duobond® II - Laminated shielding tape consisting of heat sensitive adhesive, aluminum foil and polyester.

Duofoil® - Belden trademark for a shield in which metallic foil is applied to both sides of a supporting plastic film.

Duplex Cable - A cable composed of two insulated conductors twisted together with no sheath or outer covering. The assembled cables may or may not have a common covering or sheath.

Durometer - A measure of surface resistivity or material hardness, usually referring to thermosetting and thermoplastic materials.

E

Eccentricity - A measure of the center of a conductor's location with respect to the circular cross section of the insulation. Expressed as a percentage of center displacement of one circle within the other.

Elastomer - Any material that will return to its original size after stretching (within reasonable limits).

Electric Gradient - The space rate of change of potential at a point in the direction of the greatest change.

Electrical Length - That length of cable expressed as degrees of a cycle or fraction of a wavelength for the signal transmitted.

Electro Positive - A substance that has a tendency to unite electrons in electrolysis, leaving the electrolyte with a positive charge.

Electrode - Either terminal or electric source (anode and/or cathode).

Electrolysis - The chemical changes produced by passing a current through an electrolyte.

Electrolyte - A substance which in solution conducts electric current.

Electrolytic Corrosion - Corrosion by means of electrochemical erosion.

Electromagnet - A coil of wire, usually wound on an iron core, that produces a strong magnetic field when current is sent through the coil.

Electromagnetic Coupling - The transfer of energy by means of a varying magnetic field; inductive coupling.

Electromagnetic Field - A rapidly moving electric field and its associated moving magnetic field, located at right angles both to the electric lines of force and to their direction of motion.

GLOSSARY

Ele – Fig

Electromagnetic Induction - The production of a voltage in a coil due to a change in the number of magnetic lines of force (flux linkages) passing through the coil.

Electromotive Force (EMF) - The force that determines the flow of electricity; a difference of electric potential.

Electron - The portion of an atom that circles around the center, or nucleus. An electron possesses a negative electric charge and is the smallest charge of negative electricity known.

Electroplate - The term used to indicate the application of a metallic coating on a surface by means of electrolytic action.

Electrostatic - Pertaining to static electricity or electricity at rest.

Electrostatic Coupling - The transfer of energy by means of a varying electrostatic field. Capacitive coupling.

Elongation - The fractional increase in length of a material stressed in tension or by a tension load in a section of a test specimen. It is expressed either as a percentage of the original length between benchmarks or indicated by specifying a minimum distance between benchmarks.

Embossing - Marker identification by means of thermal indentation leaving raised lettering on the cable sheath material.

Enameled Wire - A conductor with a baked-on enamel film insulation used on magnet wire, thermocouple type wires and other wires.

Energy - The capability of doing work.

Energy Dissipation - The loss of energy from a system due to the conversion of work into undesirable forms. An example of this is heat loss due to friction in a mechanical system.

Energy Source - A potential source for electricity, e.g. water, coal, oil, gas, uranium.

Environmental Stress Cracking - The susceptibility of a thermoplastic article to crack or craze formation under influence of certain chemicals and stresses.

Epoxy Resins - Strain-chain thermoplastics and thermosetting resins based on ethylene oxide, its derivatives or homologs.

Equilay - More than one layer of helically laid wires with the length of the lay the same for each layer.

Ethylene Chlorotrifluoroethylene (ECTFE) - A homopolymer of ethylene and chlorotrifluoroethylene. This high temperature resin is well suited for wire insulations and jackets for plenum applications. It can withstand an unusual amount of physical abuse during and after installation, has very good electrical characteristics, good thermal and low temperature properties, and chemical inertness.

Ethylene Tetrafluoroethylene (ETFE) - A homopolymer of ethylene and tetrafluoroethylene. This high temperature resin is well suited for wire insulations and jackets for plenum applications. It can withstand an unusual amount of physical abuse during and after installation, has very good electrical characteristics, good thermal and low temperature properties, and chemical inertness.

Ethylene-Propylene Rubber (EPR) - Chemically cross-linked polymer with physical properties similar to butyl rubber.

Even Count Code - A system of using colored insulation and unit binders so that every pair in a cable can be positively identified. Building blocks are 25-pair binder groups that can be combined to make cables in multiples of 100.

Exchange Area Cable - Cable originally used to provide local loop service in the local area around an exchange. Currently used to describe any multi-pair cable having 0/083 mfd/mile capacitance.

Exothermic - Characterized by the liberation of heat.

Expanded Polyethylene - See Cellular Polyethylene.

External Interference - The effects of any electrical waves or fields that cause sounds other than the desired signal; static.

Extra Pairs - One or more color-coded pairs included in the cable to ensure meeting a cable manufacturers guarantee.

F

Farad - A unit of capacity that will store one Coulomb of electrical charge when one volt of electrical pressure is applied.

Fatigue Resistance - Resistance to metal crystallization that leads to conductors or wires breaking from flexing.

Feedback - The returning of a fraction of the output of an electric oscillation to the input.

Feeder Cable - In a CATV system, the transmission cable from the head end (signal pickup) to the trunk amplifier; also called trunk cable.

Ferrous - Material composed of and/or containing iron. A ferrous metal exhibits magnetic characteristics as opposed to a non-ferrous metal, such as aluminum, which does not.

Fiber - A single, separate optical transmission element characterized by core and cladding.

Fiber Dispersion (Fiber Optic) - Pulse spreading in a fiber caused by differing transit times of various modes.

Fiber Optics - Light transmission through optical fibers for communication and signaling.

Fiber Tubing (Fiber Optic) - A loose crush-resistant cylinder applied over individual fibers to provide mechanical protection.

Fiberglas® - A trademark name for fiberglass, glass that is formed into thin fibers. When twisted and plied into yarns, it is used to form a braid covering for wire and cable. Normally saturated with silicone-base varnish to prevent passage of moisture and fraying of fibers.

Field - The area that electric or magnetic lines of force pass through.

Field Strength - The strength of an electromagnetic field.

Figure 8 Cable - An aerial cable configuration in which the conductors and the steel strand support are integrally jacketed. A cross section of the finished cable approximates the figure 8.

Filled Cable - A telephone cable construction in which the cable core is filled with a material that will prevent moisture from entering or passing through the cable.

Filler - Various material cabled with insulated conductors to achieve roundness, strength or flexibility. Fillers are used in multi-conductor cables to occupy the interstices formed by the assembled conductors. Filler is also a substance, often inert, added to a plastic to improve properties and/or decrease cost.

Flame Resistant - The ability of a material to extinguish flame once the source of heat is removed.

Flammability - The measure of material's ability to support combustion.

Flat Braid - A woven braid, composed of tinned copper strands, that is rolled flat at time of manufacture to a specific width depending upon construction. It is generally used as a high current conductor at low voltages.

Flat Conductor - A wire manufactured in a flattened form, as opposed to round or square conductors.

Flex Life - The time of heat aging that an insulating material, when bent around a specific radius, can withstand before failure. Flex life is used to evaluate thermal endurance.

Flexural Strength - The strength of a material in bending.

Floating - Referring to a circuit that has no connection to ground.

Flow - The movement of a conductor within an insulating or dielectric material.

Fluorinated Ethylene Propylene (FEP) - A homopolymer of ethylene and propylene. This high temperature resin is well suited for wire insulations and jackets for plenum applications. It can withstand an unusual amount of physical abuse during and after installation, has very good electrical characteristics, good thermal and low temperature properties, and chemical inertness.

Fluorocarbons - Resins that include fluorine in their molecular structure; the greater the fluorine content, the better the polymer's electrical, mechanical, thermal and chemical properties. Polyvinylidene fluoride (PVDF), ethylene tetrafluoroethylene (ETFE), fluorinated ethylene propylene (FEP), and ethylene chlorotrifluoroethylene (ECTFE) are common wire insulations and jackets from the fluorocarbon family used for plenum wiring applications. PVDF is used primarily for jacketing purposes only. Also see Fluoropolymer.

Fluoropolymer - Family of polymers of general paraffinic structure in which some or all of the hydrogen replaced by fluorine. Polymer has characteristics that will pass stringent flammability tests, making them desirable for jacket and conductor insulations for inside cables placed in commercial building plenum areas.

Flux - (1) A material that help produce fusion, as solder flux. (2) A continuous flowing or passing, as in the field created by a magnet.

Foam Filled Cable - A jelly-filled (polyethylene modified petrolatum) outside plant cable utilizing foamed polyolefin as the conductor insulation (dielectric).

Foam Skin Cable - A jelly-filled (polyethylene modified petrolatum) outside plant cable utilizing a foamed polyolefin inner layer covered by air outer layer of solid polyolefin as the conductor insulation (dielectric).

Foam-Polyethylene - A polyethylene compound that has been whipped in the presence of an inert gas.

Fraying - In cabling, a term used to describe the unraveling of a fibrous braid.

Frequency - The number of times an alternating current reverses itself in one second.

Frequency Power - The 50 to 60 cycle power available in residential areas.

Frequency Response - The characteristic of a device denoting the range of frequencies over which it may be used effectively.

G

Gain - The increase of electrical power in decibels.

Galvanized Steel Wire - Steel wire covered with zinc.

Galvanometer - A device for detecting the presence or direction of small electrical currents.

Gas-Filled Cable - A self-contained pressure cable in which the pressure medium is an inert gas having access to the insulation.

Gasoline Resistant - A UL listing for insulated wire that has passed the 60-day immersion test in water-saturated gasoline at a temperature of 30°C. This listing does not mean that a wire so marked may be continuously immersed in gasoline. It simply means that the particular wire has passed UL tests to demonstrate a certain degree of gasoline resistance and may therefore be used where occasional splashing or exposure to gasoline is expected.

Gauge - A term to denote size of wire.

Generator - A machine that transforms mechanical energy into electrical energy; also a dynamo.

Geophysical Cable - Cable for exploring for underground oil deposits.

Giga- - *Prefix.* One billion.

Gigahertz (Ghz) - A unit of frequency equal to one billion hertz.

Ground Fault - A failure of transmission involving insulation to shield or insulation to ground wire.

Ground Loop - A completed circuit between shielded pairs of a multiple pair cable created by random contact between the shields. This is an undesirable circuit condition in which interference is created by ground currents when grounds are connected at more than one point.

Ground Potential - The potential of the earth. A circuit, terminal or chassis is said to be at ground potential when it is used as a reference point for other potentials in the system.

GLOSSARY

Gro – Hyg

Ground Rods - A solid metal pipe or rod that is driven into the earth to provide a ground for electrical circuits.

Ground Support Cable - A cable construction, usually rugged and heavy, for use in ground support control or power systems.

Ground Wire - A single soft-drawn copper wire, insulated or bare, used for connecting protectors and cable terminals to a ground.

Grounded Neutral - The neutral wire is metalically connected to ground.

Guider Tip - The device used to center the conductor or cable in the die. It prevents plastic melt from existing at the rear of the crosshead.

H

Halogen - Fluorine, chlorine, brominl, iodine and astative, usually diatomic molecules and toxic.

Hard Drawn Copper Wire - Resistance of material to plastic deformation, usually by indentation. Indentation hardness may be measured by various hardness tests, such as Brinell, Rockwell, and Vickers. Also refers to stiffness or temper, or to resistance to scratching, abrasion, or cutting.

Hardwired - The connection of the telephone set line (mounting) cord to a connecting block with screw terminations. Under the FCC's Registration Program for terminal equipment, only those telephone sets connected to the telecommunications network in a hardwired manner prior to July 1, 1979, may remain connected in such a fashion.

Harness - A group of conductors laid parallel or twisted by hand, usually with many breakouts, laced or bundled together, or pulled into a rubber or plastic sheath, used to interconnect electrical circuits.

Hash Mark Stripe - A non-continuous helical stripe applied to a conductor for circuit identification.

Hazardous Locations - Article 500-504 in the NEC covers hazardous (Classified) locations and the requirements for electrical equipment and wiring in locations where fire or explosive hazards may exist due to flammable gases or vapors, flammable liquids, combustible dust, or ignitable fibers or flyings. Locations are defined by Class and Division depending upon properties and/or mixture of the hazardous elements. Acceptable wiring methods, including types of cables, are mentioned in the NEC articles for the specific Class and Division locations.

Head - The end section of an extruder in which the plastic melt is transferred to the cable.

Heat Distortion - Distortion or flow of a material or configuration due to the application of heat.

Heat Endurance - The time of heat aging that a material can withstand before failing a specific physical test.

Heat Seal - In cabling, a method of sealing a tape wrap jacket by means of thermal fusion.

Heat Shock - A test to determine stability of a material by sudden exposure to a high temperature for a short period of time.

Heater Cord - Cord containing flexible stranded copper conductor, cotton wrap, rubber insulation, and asbestos roving, for indoor use on household appliances.

Helical - Spiral.

Helical Stripe - A continuous, colored, spiral stripe applied to a conductor for circuit identification.

Henry (H) - A practical unit of inductance that will produce a voltage drop of one volt when the current changes at a rate of one ampere per second.

Hertz (Hz) - A unit of measurement of frequency equal to one cycle per second.

Hi-Pot - A test designed to determine the highest potential that can be applied to a conductor without breaking through the insulation.

High Frequency - The band from 3 to 30 Mhz in the radio spectrum, as designated by the Federal Communications Commission.

High Voltage - Generally considered to be a wire or cable with an operating voltage of more than 600 V.

Holding Strength - Ability of a connector to remain assembled to a cable when under tension.

Hook Up Wire - Insulated wire used for low current, low voltage (under 1000 V) applications internally within enclosed electronic equipment.

Horizontal Stripe - A colored stripe running horizontally with the axis of a conductor, sometimes called longitudinal stripe, used as a means of circuit identification.

Hospital Wiring - The NEC, in its section on hospital anesthetizing locations, requires wiring with a dielectric constant of 3.5 or less. This is to minimize capacitive coupling thereby lowering the capacitive leakage current for patient safety reasons.

Hot Tin Dip - A process of passing bare wire through a bath of molten tin to provide a coating.

Hot-Rolled Rod - The as-rolled section, normally round, produced by hot-rolling in a rod mill from a billet or wire bar.

Hum - A term used to describe the 10- or 120-hps sound present in the sound of some communications equipment. Usually hum is the result of undesired coupling to a 60-hps source or to the defective filtering of 120-hps ripple output of a rectifier.

Hybrid Cable - A multi-conductor cable containing two or more types of components.

Hygroscopic - Having the tendency to absorb moisture and retain moisture.

I

ICEA - Abbreviation for Insulated Cable Engineers Association, an association of cable manufacturers that writes standards for insulated wire and cable. The standards are co-sponsored by NEMA (National Electrical Manufacturers Association), which prints and distributes the standards.

Ignition Cable - A cable designed primarily for auto ignition systems.

Impact Bar Specimen - A test specimen of specified dimensions that is utilized to determine the relative resistance of a plastic to fracture by shock.

Impact Resistance - The relative susceptibility of material to fracture by shock.

Impact Strength - A test for determining the punishment a cable can withstand without physical or electrical breakdown by impacting with a given weight, dropped a given distance, in a controlled environment.

Impedance - The resistance to flow of an alternating current; expressed in ohms.

Impedance Matching - Very generally, connecting cables and devices together that have the same impedance value in ohms.

Impedance Matching Sub - A section of transmission line or pair of conductors cut to match the impedance of a load. Also called matching sub.

Impedance Matching Transformer - A transformer designed to match the impedance of one circuit to that of another.

Impedance, Characteristic - In a transmission cable of infinite length, the ratio of the applied voltage to the resultant current at the point the voltage is applied, or the impedance that makes a transmission cable seem infinitely long when connected across the cables output terminals.

Impedance, High - Generally, the area of 25,000 ohms or higher.

Impedance, Low - Generally, the area of 1 - 600 ohms.

Impregnate - To fill the voids and interstices of a material with a compound. This does not imply complete fill or complete coating of the surfaces by a hole-free film.

Incoherent Source (Fiber Optic) - A light source that emits wide, diffused beams of light of many wave lengths. The light waves emitted from an incoherent source are out of phase.

Index Edge - See Reference Edge.

Inductance - The power of an electric current to develop an electromotive force in its own or an adjacent circuit.

Induction - The phenomenon of a voltage, magnetic field, or electrostatic charge being produced in an object by lines of force from the source of fields.

Induction Heating - Heating a conducting material by placing it in a rapidly changing magnetic field. The changing field induces electric currents in the material and I²R losses account for the resultant heat.

Inductive Coupling - Crosstalk resulting from the action of the electromagnetic field of one conductor on the other.

Inhibitor - For example, a corrosion inhibitor is a material that prevents or delays oxidation and galvanic action on a connector surface, or the interface of different conductors. Also, a chemical compound added to a mixture to restrain its chemical reaction until a desired condition exists.

Injection Laser Diode - Sometimes called the semiconductor diode. A laser in which the lasing occurs at the junction of "n" Type and "p" Type semiconductor materials.

Inorganic - Designating or composed of matter other than animal or vegetable, such as earthy or mineral matter.

Input - A signal (power) that is applied to a piece of electric apparatus or the terminals on the apparatus to which a signal or power is applied.

Insertion Loss - A measure of the attenuation of a device by determining the output of a system before and after the device is inserted into the system.

Inside Plant - Usually considered all cable and equipment inside a central office or subscriber's location.

Inside Wire - Wire designed to carry a telephone circuit(s) through the customer's premises. Typically, it consists of four insulated conductors covered by a jacket. Sometimes referred to as station wire.

Inside Wiring Cable - Usually a thermoplastic PVC-insulated and -jacketed cable with fully color-coded insulated non-tinned copper conductors, either 22 AWG or 24 AWG.

Instron - An instrument utilized to determine the tensile properties of materials.

Insulated Wire - A conductor of electricity covered with a non-conducting material (dielectric).

Insulating Wire - Covering a conductor of electricity with a non-conducting material.

Insulation - A conducting substance surrounding the conductor, also called the dielectric. The material has such a low conductivity that the flow of electrical current through it can usually be neglected.

Insulation Adhesion - The degree of looseness or tightness of the insulation over the base conductor measured in terms of force required to remove a specified length of insulation from the wire.

Insulation Level -100% - Cable for use on grounded systems or where the system is provided with relay protection such that ground faults will be cleared as rapidly as possible, but in any case, within one minute.

GLOSSARY

Ins – L

Insulation Level - 133% - Cable for use on ungrounded systems or where the faulted section will be de-energized in a time not exceeding one hour.

Insulation Resistance - The electrical resistance offered by its insulation to an impressed direct current potential tending to produce a leakage of current through the same. For wire usually measured in megohms per 1000 ft.

Insulation Stress - The molecule separation pressure caused by a potential difference across an insulator. The practical stress on insulation is expressed in volts per mil.

Insulator - A material of such low electrical conductivity that it will not support an electrical current.

Integral Belt - In a cable, a layer of insulation or semiconductive material applied usually by extrusion over two or more insulated, twisted or parallel conductors, to form a round smooth diameter.

Intercom Wire - Wire used to connect communications instruments, telephones, or telegraph.

Interconnecting Cable - The wiring between modules, between units, or the larger portions of a system.

Interconnecting Wire - Wire for external use in electronic equipment where exposed to physical abuse. Encompasses both control and power circuits.

Interface - The region where two systems or a major and a minor system meet and interact with each other.

Interference - Any undesirable electromagnetic emission or any electrical or electromagnetic disturbance, phenomenon, signal or emission, man-made or natural that causes (or can cause) an undesired response, malfunctioning or degradation of the electrical performance of electrical and electronic equipment.

Intermediate Frequency - A frequency to which a signal is converted for ease of handling. Receives its name from the fact that it is an intermediate step between the initial and final conversion or detection stages.

Internal Wiring - Electronic wiring that interconnects components, usually within a sealed subsystem.

Interstice - A minute space between one thing and another, especially between items closely set or between the parts of a body.

Interstitial Pairs - One or more pairs laid individually in the spaces between the units, coaxials, or spiral-four quads.

Ion - An electrical portion of matter of subatomic, atomic, or molecular dimensions such as is formed when a molecule of gas loses an electron (when the gas is stressed electrically beyond the critical voltage) or when a neutral atom or group of atoms in a fluid loses or gains one or more electrons.

IR Drop - Designation of a voltage drop in terms of current and resistance.

Isolation - The ability of a circuit or component to reject interference, usually expressed in dB.

J

Jack - A plug-in type terminal widely used in electronic apparatus for temporary connections. A connection is made to a jack simply by plugging into it a probe or plug attached to a flexible insulated wire or cable.

Jacket - 1) A rubber, plastic, or synthetic covering applied over the primary insulation, braids, shields, cable components, or over the cable itself. 2) In fiber optics, a covering, frequently plastic, over a fiber, bundle of fibers, or cable that protects against the environment.

Joule (J) - A unit of energy or work. The absolute joule is equal to 10 million ergs. The internal joule is equal to the work required to maintain a current of one ampere for one second in a resistance of one ohm.

Jumper - A short length of conductor used to make a connection, usually temporary, between terminals, around a break in a circuit, or around an instrument.

Jumper Cable - A short, flat cable interconnecting two wiring boards or devices.

Jumper Wire - PVC-insulated copper conductors twisted together and used for cross-connecting on distributing frames, usually 22 AWG.

Junction - A point in a circuit where two or more wires are connected.

K

Kil- - *Prefix*. Thousand.

Kilocycle - A term denoting one thousand cycles.

Kilovolt (KV) - A term denoting one thousand volts.

Kilowatt (KW) - A term denoting one thousand watts.

Kirchoff's Laws - (1) The algebraic sum of the currents that meet at any point is zero. (2) In any closed circuit, the algebraic sum of the products of the current and the resistance in each conductor in the circuit is equal to the electromotive force in the circuit.

Knock-Out Carton - A bending grade of boxboard having one or more die-cut areas for removal or to aid in breaking down the carton. Usually used for small size telephone wires and cables up to six pair.

KPSI - Tensile strength in thousands of pounds per square inch.

KVA - Kilovolt ampere.

Kynar - Pennwalt Corporation trademark for a thermoplastic fluoropolymer material with excellent chemical resistance, electrical properties, thermal characteristics, and impact resistance. The temperature rating is -20°C to 125°C.

L

L - Symbol for inductance.

Lacquer Finish - A finish applied over braided wire or cable for appearance and protection against fraying, wicking, moisture absorption, abrasion, etc.

Laminated Tape - A term used to describe a tape consisting of two or more layers, usually each layer being a different material, sealed or laminated together to form one tape.

Laminates - Two or more layers, usually of different materials, bonded or laminated together.

LAN (Local Area Network) - A network spanning a limited geographical area, providing data communications between computers and peripherals, and switching equipment.

Lanyard - A device attached to certain quick disconnect connectors which permits uncoupling and separation of connector halves by a pull on a wire or cable.

Laser - A coherent source of light with a narrow beam and a narrow spectral bandwidth (about 2nm).

Laser Diode (Fiber Optic) - A semiconductor diode that lases, that is, when pulsed, a laser diode emits coherent light - light of essentially one wave length, in phase, traveling in the same direction.

Laser Light (Fiber Optic) - Light amplification by stimulated emission of radiation.

Lashing Wire - A thin, high strength, bare metal wire used for spirally wrapping an aerial cable to its suspension strand.

Latex - Rubber material used for wire insulation.

Launch Angle (Fiber Optic) - The angle between the radiation vector and the axis of the fiber or fiber bundle.

Lay - The axial distance required for one cabled conductor or conductor strand to complete one revolution about the axis around which it is cabled.

Lay Direction - The twist in the cable as indicated by the top strands while looking along the axis of the cable away from the observer. Described as "right hand" or "left hand."

Lead Covered Cable (Lead Sheathed Cable) - A cable covered with a sheath of lead for the purpose of excluding moisture and affording mechanical protection.

Lead (pronounced "leed") - A connecting wire, such as a test lead, battery lead, or conductor brought out from a coil or winding.

Lead Dress - The placement or routing of wiring and component leads in an electrical circuit.

Lead-in - The cable that provides the path for r-f energy between the antenna and the receiver or transmitter.

Leakage - The undesirable passage of current over the surface of or through an insulator.

Level - A measure of the difference between a quantity or value and an established reference.

LF - Low frequency.

Life Cycle - A test performed on a material or configuration to determine the length of time before failure in a controlled, usually accelerated, environment.

Light Emitting Diode (LED) (Fiber Optic) - A semiconductor device that emits incoherent optical radiation when biased in the forward direction.

Light Source (Fiber Optic) - Any object capable of emitting light, normally either an LED or a laser.

Lightguide (Fiber Optic) - A flexible bundle of fibers used to transmit light.

Light-Intensity Ratio (Fiber Optic) - Ratio of input light intensity to the output light intensity.

Lightwave Communications (Fiber Optic) - Communications using light instead of an electric current to carry the information. Also called optical communications.

Lightwave Transmission (Fiber Optic) - A transmission method using modulated light frequencies directed through a fiber optic wave guide. Used for local distribution facilities with high bandwidth signals, high capacity long haul facilities, and distribution cabling within digital switching systems.

Limpness - The ability of a cable to lay flat or conform to a surface as with microphone cables.

Line Balance - The degree to which the conductors of a cable are alike in their electrical characteristics with respect to each other, to other conductors, and to ground. Similar to balanced line.

Line Cord - A two-wire cord terminating a two-prong plug at one end used to connect equipment or appliances to a power outlet.

Line Drop - A voltage loss occurring between any two points in a power or transmission line. Such loss, or drop, is due to the resistance, reactance, or leakage of the line.

Line Equalizer - A reactance (inductance and/or capacitance) connected in series with a transmission line to alter the frequency-response characteristics of the line.

Line Level - The amplitude of a signal at a certain point on a transmission line. Usually expressed in dB.

Line Voltage - Value of potential existing on a supply or power line.

Liquor-Finished Wire - Wire, usually of ferrous material, drawn through a wet solution of metallic salts to enhance the appearance and surface characteristics of the finished wire, not to provide the properties of a coated wire.

Listed - UL term to describe a product that has been fully tested for all safety-related functions.

Litz Wire - A conductor made up of several insulated twisted wires to reduce skin effect and lower radio frequency losses.

GLOSSARY

Liv – Meg

Live - Energized wire or circuit connected to a source of an electrical voltage.

Load - Device that consumes power from a source of electrical voltage.

Loaded Line, Loading Line - A transmission line that has lumped elements (inductance or capacitance) added at uniformly spaced intervals. Loading is used to provide a given set of characteristics to a transmission line.

Loading Coil - A coil of wire, wound around a magnetic core, that provides a lumped inductance which can be inserted in series with a cable pair to improve voice frequency transmission.

Loading Section - The length of cable between two load points. 3,000- and 6,000-foot loading sections are the most common.

LOCA - Abbreviation for loss of coolant accident, a system malfunction associated with nuclear generating stations.

Long Pair Twist - Refers to toll quads or pairs in which the pair twist length is approximately 16 to 52 inches. In a quad, the phantom twist length is 5 to 11 inches, depending on the gauge.

Long-wire Antenna - Any conductor length in excess of one-half of a wavelength. In a residential television installation, a horizontal run or unshielded lead-in will act as a long-wire antenna and introduce additional signal on top of the regular antenna signal, causing ghosts.

Longitudinal Shield - A tape shield, flat or corrugated, applied longitudinally with the axis of the core being shielded.

Longitudinal Wrap - A tape applied longitudinally with the axis of the core being covered, as opposed to a helical, or spiral, tape wrapped core.

Loop - The closed path in an electrical circuit.

Loop Resistance - The total resistance of two conductors measured round trip from one end (twisted pair, shield and conductor, etc).

Loss - The portion of energy applied to a system that is dissipated and performs no useful work.

Loss Factor - The product of the dissipation and dielectric constant of an insulating material.

Lossy - Having poor efficiency.

Low Frequency - A band of frequencies extending from 30 to 300 Khz in the radio spectrum, designated by the Federal Communications Commission.

Low Loss Dielectric - An insulating material that has a relatively low dielectric loss, such as polyethylene or Teflon®.

Low Noise Cable - A cable configuration specially constructed to eliminate spurious electrical disturbances caused by capacitance changes or self-generated noise.

Lug - Termination, usually crimped or soldered to the conductor, with provision for screwing to terminal.

M

MA - Milliampere (one-thousandth of an ampere).

Magnet - A body possessing the property of attracting particles of iron. A material capable of maintaining within and about itself a field of magnetic force.

Magnet Wire - Insulated wire intended for use in windings on motor, transformer, and other coils for electromagnetic devices.

Magnetic Field - The region within which a body or current experiences magnetic force.

Magnetic Flux - The rate of flow of magnetic energy across or through a surface (real or imaginary).

Manufacturer's Identification - (1) Colored threads or marker tape under insulation or jacket, or jacket surface printing or marking, intended to identify an inside wire or cable construction as the product of a particular manufacturer. Often required by UL, CSA or Government specifications. (2) On outside plant cables, the manufacturers identification (ESSEX is identified SX), cable size, gauge and year of manufacture are marked on the outer jacket at two-foot intervals.

Margin - Distance between reference edge of cable and nearest edge of first conductor.

Marker Tape - A tape laid parallel to the conductors under the sheath in a cable, imprinted with the manufacturer's name and the specification to which the cable is made. Other information such as manufacturing date or cable type may also be included.

Marker Thread - A colored thread laid parallel and adjacent to the strands of an insulated conductor that identifies the cable manufacturer. It may also denote a temperature rating or the specification to which the cable is made.

Master Carton - A shipping boxboard container used to overpack or unitize a number of individual cartons. Usually used in enclosing four knock-out cartons.

Maximum Operating Temperature - The maximum temperature to which any portion of a cable can be subjected.

Mechanical Protection (MP) - An outer cable covering made up of a corrugated steel tape soldered at the overlap, plus an outer polyethylene jacket. If the steel is unsoldered it is called unsoldered mechanical protection (UM).

Medium-Hard Drawn Wire - Copper wire having tensile strength less than the minimum for hard-drawn wire, but greater than the maximum for soft wire.

Mega- - Prefix. One million.

Megahertz - One million cycles per second.

Megarad - A unit for measuring radiation dosage.

Megavolt - One million volts.

Megawatt - One million watts.

Megohm - One million ohms.

Melt - Plastic material in molten condition.

Melt Extrude - To heat a material above its melt point and extrude it through an orifice.

Melt Index - The amount, in grams, of a thermoplastic resin that can be forced through a 0.0825 inch orifice when subjected to 2160 GMS force in 10 minutes at 190°C.

Member - A group of wires stranded together for combination with other stranded groups into a multiple membered conductor.

-mer - *Suffix*. The repeating structural unit of any high polymer.

Messenger Wire - A metallic supporting member, either solid or stranded, that may also perform the function of a conductor.

MEV - One million electron volts.

MFD - Microfarad (one-millionth of a farad).

MHO - The unit of conductance equal to the reciprocal of the unit of resistance (ohm).

Mica - A silicate which separates into layers and has high insulation resistance, dielectric strength, and heat resistance. It is used as an insulation wrap in wires and cables to a limited degree where radiation resistance requirements are severe and for high temperature work demanding good heat resistance.

Micro- - *Prefix*. One-millionth.

Microbending Loss (Fiber Optic) - Loss due to small geometrical irregularities along the core-clad interface of the fiber.

Microfarad - One-millionth of a farad (uf, ufd, mf, and mfd are common abbreviations).

Microhenry - One-millionth of a henry (1x10⁻⁶ henrys).

Microinch - One-millionth of an inch.

Micromicrofarad - One-millionth of a microfarad (uuf, uufd, mmf, mmfd are common abbreviations). Also, a picofarad (pf or pfd), 1x10⁻¹².

Micron - One-millionth of a meter (1x10⁻⁶ meter).

Microphone Cable - A special shielded cable used to connect a microphone to an amplifier.

Microphonics - The noise caused by mechanical excitation of a system component. In a single-connector microphone, for example, microphonics can be caused by the shield rubbing against the dielectric, as the cable is flexed.

Microwave - A short electrical wave, usually less than 30 cm.

Microwave Frequency - The frequency of a microwave, usually above 1000 megacycles per second.

Mil - A unit of length equal to one-thousandth of an inch.

Milli- - *Prefix*. One-thousandth.

Millivolt - One-thousandth of one volt.

Mineral Insulation (MI) - Mineral-insulated cable and thermocouple wire consists of one or more conductors surrounded by magnesium oxide insulation and enclosed in a liquid gas-tight metal sheathing. Because the construction is completely inorganic, the cable is very heat resistant and inert to most conditions.

Mining Cable - A flame-retardant cable especially constructed to withstand longtime immersion or exposure to moisture for underground use in the environment of a mine or tunnel.

Mismatch - A termination having a different impedance than that for which a circuit or cable is designed.

Mode (Fiber Optic) - One of the components of a general configuration of a propagating wave front. Mode is characterized by a particular geometrical pattern and propagation constant.

Modem - Device that converts signals in one form to another form to be compatible with a different kind of equipment.

Modular - Applied to connection of a telephone line (mounting) cord to the telecommunications network via plugs affixed on the ends of such cords and jacks used in termination of premises station or inside wiring. Modular telephone apparatus consists of mini-plugs and jacks that replace former plus and jack arrangements. These are broken down into three general phases: (a) quarter modular - the telephone mounting cord is equipped with spade tips on one end and a plug on the opposite end. The cord is hard wired in the telephone. (b) half modular - the telephone mounting cord is equipped with a plug on each end. (c) full modular - the telephone mounting and handset cords are equipped with plugs on each end.

Modulation (Fiber Optic) - Manner in which information is coded into light for transmission through a fiber. Modulation method may be either pulse modulation (digital) or intensity modulation (analog).

Modulus of Elasticity - Ratio of stress to strain in an elastic material.

Moisture Absorption - The amount of moisture, in percentage, that a material will absorb under specified conditions.

Moisture Resistance - The ability of a material to resist absorbing moisture from the air or when immersed in water.

Moisture Seal - A layer of material applied for the purpose of impregnating compounds.

Molded Plug - A connector molded on either end of a cord or cable.

GLOSSARY

Mol – Non

Molding - Forming material into a particular shape.

Molecular Weight - The weight of any molecule, which is the sum of the weights of its constituent atoms.

Monofilament - A single-strand filament as opposed to a braided or twisted filament.

Monomer - The basic chemical unit used in building a polymer.

MSHA - Mine Safety and Health Act administered by U.S. Department of Labor. Establishes employee safety standards in all underground and surface mines and preparation plants.

MTW - Thermoplastic insulated machine tool wire.

Multi-Conductor - A combination of two or more conductors cabled together under a common jacket, insulated from one another and from sheath or armor.

Multimode Fiber (Fiber Optic) - Fiber that transmits many modes.

Multiple-Conductor Cable - A combination of two or more conductors cabled together and insulated from one another and from sheath or armor. Special cables are referred to as 3-conductor cable, 7-conductor cable, 50-conductor cable, etc.

Multiplex - Technique for putting two more signals into a single channel.

Multistain Pairs - Pulp-insulated pairs in which the ring side is colored by intermittent bands of stain sprayed on the pulp insulation after application to the conductor.

Munsell Color Code - A means for specifying the colors of insulated conductors within the telecom industry based on the color-perception attributes of hue, chroma, and value. Hue identifies the differing colors, value covers lightness or darkness of the color, and chroma refers to the color quality, whether bright or muted.

Mutual Capacitance - The capacitance between two conductors when all other conductors including ground are connected together and then regarded as an ignored ground.

Mylar® - The DuPont tradename for polyethylene terephthalate (polyester) film.

N

Nano - *Prefix.* One-billionth (1x10⁻⁹).

Nanometer (nm) - One-billionth of a meter.

Nanosecond - One-billionth of a second.

National Electrical Code - A consensus standard published by the National Fire Protection Association (NFPA) and incorporated in OSHA regulations.

National Electrical Manufacturer's Association (NEMA) - An industry association that standardizes specifications for wires, cables and electrical components.

NBR - Nitrile-butadiene rubber, resistant to oil and chemicals.

Near End Crosstalk - Crosstalk measured by applying and measuring the disturbing signal on two pairs at the same end.

NEC - Abbreviation for National Electrical Code, which covers the use of wire and cable in many applications.

NEMA - National Electrical Manufacturer's Association.

Neoprene® - A DuPont trademark for a synthetic rubber known as polychloroprene. The physical properties of CR (chloroprene Rubber) Neoprene® are similar in some respects to natural rubber but it is considerably more resistance to oil, ozone, heat, weather, sunlight, and aging. It does not support combustion and resists abrasion and cutting. It is used for a wide variety of wire and cable jacketing applications. The temperature range of this material can vary from -55°C to 90°C.

Neper - An electrical unit similar to dB, used to express the ratio between two amounts of power existing at two distinct points. A neper is 8.686 decibels.

Nibble - One-half byte (4 bits).

Nickel - This metal offers combination of corrosion resistance, formability, and tough physical properties. For these reasons, nickel is used for alloying purposes and in nickel-clad copper wire.

Nickel Clad - Nickel tube drawn down into copper core.

Nickel Plate - Nickel electroplated on a copper conductor.

Noise - In a cable or circuit, any extraneous sounds or signals that tend to interfere with the sound of signal normally present in or passing through the system.

Nomex® - The DuPont tradename for a temperature-resistant, flame-retardant nylon.

Nominal - The name or identifying value of a measurable property by which a conductor or component or property of a conductor is identified, and to which tolerances are applied.

Non-Conductor - An insulating material.

Non-Contaminating - Type of PVC jacketing material in which the plasticizer will not migrate into the dielectric of a coaxial cable and thus will avoid contaminating and destroying the dielectric.

Non-Contaminating Compound - A compounded material that will not leach ingredients so as to contaminate or degrade adjacent materials under given environmental conditions.

Non-Hygroscopic - The opposite of hygroscopic; that is, not absorbing moisture.

Non-Migrating - Synonymous with non-contaminating.

Non-Modular - Refers to connection of the telephone line (mounting) cord to the telecommunications network via 4-prong plugs and jacks or terminal lugs located on the end of such cords and jacks used to terminate premise station or inside wiring.

Numerical Aperture (NA) (Fiber Optic) - The characteristic of an optic conductor in terms of its acceptance of light. The phrases “degree of openness,” “light gathering ability,” and “angular acceptance” describe this characteristic. Mathematically, numerical aperture equals the sine of one-half of the acceptance angle.

Nylon - A generic trade name of DuPont for synthetic fiber-forming polyamides. A polymer of nitrogen, carbon and oxygen; Nylon’s chemical unbalance and tendency to absorb moisture limit its use as a dielectric or insulating material. However, it is often used in wire and cable as a jacket over polyethylene or polyvinyl chloride to increase temperature stability, chemical and abrasion resistance.

Nylon-Jacketed - Refers to the outer covering of Nylon on wire or cable that can be either an extruded layer or a braid of Nylon filaments.

O

Offgassing - Percentage of a specified gas released during the combustion of insulation or jacketing material.

OFHC - Abbreviation for oxygen-free, high conductivity copper. It has no residual deoxidant, 99.95% minimum copper content, and an average annealed conductivity of 101%.

Ohm - A unit of electrical resistance, the resistance of a circuit in which a potential difference of one volt produces a current of one ampere.

Ohm’s Law - Stated $V = IR$, $I = V / R$ or $R = V / I$, the current I in a circuit is directly proportional to the voltage V, and inversely proportional to the resistance R.

Oil Resistant - A UL listing for an insulation or jacket that has passed an oil immersion test. (Oil Resistant II: 60-day oil immersion test at a temperature of 75°C; Oil Resistant I: Test performed for 96 hours in 100°C oil). These listings do not mean that the wire or cable can be operated continuously immersed in oil. It means that the wire has passed UL tests that demonstrate superior resistance to oil-induced degradation. The wire is thus deemed suitable for occasional splashing or exposure to oil at the elevated temperature indicated by the test.

Oil-Filled Cable - A self-contained pressure cable in which the pressure medium is low viscosity oil having access to the insulation.

Open - A discontinuity in an electrical conductor or piece of electrical equipment.

Open Cell - Foamed or cellular material with cells which are generally interconnected. Closed cells refers to cells which are not interconnected.

Open Wire - A transmission facility comprised of pairs of bare (uninsulated) conductors supported on insulators that are mounted on crossarms or poles to form an aerial (above ground) pole line.

Optical Communication Cable (Fiber Optic) - Fiber with a protective jacket around it. A cable may have one or more fibers within it.

Optical Communication Fiber (Fiber Optic) - A term analogous to a single strand of electrical wire in that it carries information from point to point. See Optical Communication Cable.

Optical Communications (Fiber Optic) - Communications using light, instead of an electric current, to carry the information. Also called Lightwave Communications.

Optical Conductors (Fiber Optic) - Materials that offer a low optical attenuation to transmission of light energy. Types of optical conductors include: (1) Single Fiber - a discreet optical conductor; (2) Bundle - a number of optical conductors in a random arrangement, grouped together and used as a single transmission medium (channel); (3) Single Channel Single Bundle Cable - a bundle with a protective covering; (4) Multi Channel Single Fiber Cable - more than one single fiber cable jacketed; (5) Single Channel Single Fiber Cable - a discreet optical conductor with a protective covering; (6) Multi Channel Bundle Cable - more than one single bundle cable jacketed; (7) Multi Channel Cables - a combination of cables.

Optical Fibers (Fiber Optic) - Filaments comprised of a glass core clad with a glass coating of a different refractive index. These fibers are approximately .005 inches in diameter. Because of the different refractive index of core and cladding, light transmitted through the fiber is continuously reflected off this glass interface and retained within the core for the length of its travel down the tube. Attenuation on lightwave fibers can be as low as on twisted copper pairs or coaxial cable.

Optical Waveguide Fiber - A transparent filament of high refractive index core and low refractive index cladding that transmits light.

Organic - Designating or composed of matter originating in plant or animal life or composed of chemicals of hydrocarbon origin, either natural or synthetic.

Organic Fiber - A fiber derived or composed of matter originating in plant or animal life or composed of chemicals of hydrocarbon origin, either natural or synthetic.

Orifice - The opening in the extruder die.

OSHA - The Occupational Safety and Health Act was written into the Federal Register in 1971. OSHA does not approve, list or label anything, including cables. OSHA is set of U.S. federal regulations that establish safety requirements. Pertaining to cable, an installation subject to OSHA would be in compliance if two criteria are met: (1) The cable or wire is listed by UL or another recognized testing laboratory; and (2) The cable or wire is installed and used in accordance with the NEC.

Out of Round - The condition of a conductor or conductor insulation which when formed does not remain round.

Output - The useful power or signal delivered by a circuit or device.

Outside Plant - Telephone plant poles, conduits, cables or hardware that is outside of the telephone building.

Overcoat - Strands individually tinned, twisted together and retinned.

GLOSSARY

Ox – Pic

Oxidation - The process of uniting a compound with oxygen, usually resulting in an unwanted surface degradation of the material or compound.

Oxygen Index - Percentage of oxygen necessary to support combustion in a gas mixture.

Ozone - Extremely reactive form of oxygen, normally occurring around electrical discharges and present in the atmosphere in small but active quantities. In sufficient concentrations it can break down certain rubber insulations.

Ozone Test - Exposure of material to a high concentration of ozone to give an accelerated indication of oxidation in normal environments and in proximity to ozone-producing apparatus.

P

POS - Point of sale.

Pair - Two wires of a single circuit held together by twisting, binding, or by an overall braid or jacket. The first wire of the pair is designated "tip" and the second "ring" or sometimes "wire" and "mate."

Pair Color - Distinctively colored insulation on a twisted pair, for example, white on one conductor and green on the other.

Pair Twist - The twist imparted to two insulated conductors to hold them together as a pair.

Pair Twist Length - The average distance between successive turns of one wire of a pair around the other.

Pair Type - Designation of the different lengths of pair twist used in a cable.

Paired Cable - Cable in which the conductors are paired, (i.e., two wires that are twisted about each other). Each wire of the pair has its distinctive color of insulation.

Pan Cured - Method of vulcanizing. Coils of unvulcanized insulated wire are coiled in pans and vulcanized under pressure with live steam.

PAP - A term for air core (unfilled) direct burial telephone cable with a corrugated aluminum shield.

Paper - Insulation used for telephone cable, high voltage cable, magnet wire, and with a lead sheath for underground service conductors. Oil-impregnated paper has improved electrical and moisture resistance properties. Paper is also used as a cable filler.

Paper Insulated Cable - Cable in which the conductors are insulated with a paper ribbon either spirally or longitudinally applied.

Parallel - A construction in which two or more conductors are laid parallel and surrounded and separated by an insulating material.

Parallel Circuit - A circuit in which the identical voltage is presented to all components, with current dividing among the components according to the resistances of the impedances of the components.

Parallel Pair - A duplex construction in which two insulated conductors are laid parallel and then covered overall with a braid or jacket. It is often referred to as "duplex cable."

Parallel Stripe - A stripe applied longitudinally on a wire or cable parallel to the axis of the conductor.

PASP - An air core (unfilled) direct burial telephone cable used in areas subject to rodent attack. It consists of an unfilled cable core, corrugated aluminum shield, corrugated steel tape, flooding compound and polyethylene jacket.

Paste Extrude - An extrusion method whereby the extrudable material is in a fine powder form mixed with a lubricant and is forced through a die of given size, without heat, as opposed to melt extrude.

Patch Cable - A cable with plugs or terminals on each end of the conductor or conductors used to temporarily connect circuits of equipment together.

Payoff - The process of feeding a cable or wire from a bobbin, reel, or other packages. Also a device used for paying out wire or cable into a piece of equipment or machinery.

PCP - A commonly used term of air core (unfilled) direct burial cable with a corrugated copper shield.

PE Specifications - See Rural Electrical Administration.

Peak - Maximum instantaneous value of a varying current or voltage.

Peak Voltage - The maximum instantaneous voltage.

Percent Conductivity - Conductivity of a material expressed as a percentage of that of copper.

Periodicity - Uniformly spaced variations in the insulation diameter of a transmission cable that result in reflections of a signal.

Permittivity - See Dielectric Constant.

pH - An expression of the degree of acidity or alkalinity of a substance. Neutrality is pH7 - acid solutions are below 7 and alkaline solutions above 7.

Phase - A particular state or point of advancement in an electrical cycle. The fractional part of the period through which the time has advanced measured from some arbitrary point usually expressed in electrical degrees where 360° represents its one cycle.

Phase Shift - A change in the phase relationship between two alternating quantities.

Photodetector (Receiver) - Converts light energy to electrical energy. The silicon photodiode is most commonly used for relatively fast speeds and good sensitivity in the 0.75um to 0.95um wavelength region. Avalanche photodiodes (APD) combine the detection of optical signals with internal amplification of photocurrent. Internal gain is realized through avalanche multiplication of carriers in the junction region. The advantage in using an APD is its higher signal-to-noise ratio, especially at high bit rates.

PIC - Any type of plastic insulated telephone cable.

Pick - Distance between two adjacent crossover points of braid filaments. The measurement in picks per inch indicates the degree of coverage.

Picks Per Inch - The number of times the carriers in a braid cross over each other in the same direction along the longitudinal axis for each inch of length.

Pickup - Any device that is capable of transforming a measurable quantity of intelligence (such as sound) into relative electrical signals (e.g., a microphone).

Pico- - *Prefix.* One-millionth of one-millionth (1×10^{-12}).

Picofarad - One-millionth of one-millionth of a farad. A micromicrofarad (abbreviation pF).

Pigtail - The splice made by twisting together the bare ends of two conductors laid side by side. Not used in telephone today.

Pin - Denotes an electrical terminal, usually in a connector. Normally a smaller termination than a lug.

Pin diode - A photodetector used to convert optical signals to electrical signals in a receiver.

Pinhole - A very small hole in the extruded resin coating.

Pitch - (1) In flat cable, nominal distance between the index edge of any conductor and the index edge of an adjacent conductor, expressed in decimal inches or millimeters. (2) The distance separating one turn in a coil winding from its successor. See Lay.

Pitch Diameter - Diameter of a circle passing through the center of the conductors in any layer of a multiconductor cable.

Plain Conductor - A conductor made up of one or more plain wires of the same metal.

Plain Wire - Consisting of one metal only.

Planetary Cabler - A versatile cabler capable of laying down any number of overbraided or jacketed singles, pairs, groups, or any combination of conductors in a pre-arranged sequence.

Planetary Twister - A twisting machine whose payoff spools are mounted in rotating cradles that hold the axis of the spool in a fixed direction as the spools are revolved about one another so the wire will not kink as it is twisted.

Plant - Physical property of a telephone company that contributes to the furnishing of communication services. See also "Inside Plant" and "Outside Plant."

Plastic - High polymeric substances, including both natural and synthetic products, but excluding the rubbers that are capable of flowing under heat and pressure.

Plastic Deformation - The change in the dimensions of an object under load that is not recovered when the load is removed.

Plasticizer - A chemical agent added in compounding plastics to make them softer and more flexible.

Plasticizing Extrusion - An extrusion process in which a solid material is fed to the extruder and made plastic (soft) by means of heat within the extruder.

Plastometer - An instrument for determining the flow properties of a thermoplastic resin by forcing the molten resin through a die or orifice of specific size at a specified temperature and pressure.

Plating - One method of applying a coating one metal over another.

Plenum - A compartment or chamber to which one or more air ducts are connected and which forms part of the air distribution system.

Plenum Area - The space between the drop ceiling and the floor above, typically continuous throughout the length and width of each commercial building floor.

Plenum Cables - Low smoke cables approved for use in a plenum area.

PLTC - Designation for power-limited tray cable for use in Class 2 or 3 Power-Limited circuits, instrumentation, supervisory control and thermocouple extension. PLTC are approved for use in circuits up to 300 V.

Pock Mark - Irregular indentations on the surface of the cable caused by air gas entrapment or moisture in the melt.

Point-to-Point Wiring - Continuous conductors terminated at each end to circuit destinations.

Polar Ingredient - Any ingredient in a material or complex capable of ionization.

Polarity - (1) An electrical condition determining the direction in which current tends to flow. (2) The quality of having two opposite charges.

Polarization - The orientation of a flat cable or a rectangular connector. For flat cable, the index edge is used as a reference.

Polishing (Fiber Optic) - The act of smoothing ends of fibers to an optically smooth finish, generally using abrasives. Optically smooth surfaces allow maximum transmission of light between fibers at connections and minimize coupling loss.

Polyamide - A compound characterized by more than one amide group. See Nylon.

Polybutadiene - A type of synthetic rubber often blended with other synthetic rubbers to improve their properties.

Polychloroprene - The chemical name for Neoprene®. Used for wire and cable jacketing where the wire or cable will be subject to rough usage, oils, greases, moisture, solvents, and other chemicals. The name itself indicates that it is a polymer of chloroprene, a combination of vinyl acetylene and hydrogen chloride.

Polyester - A resin formed by the reaction between a dibasic acid and dihydroxy alcohol.

Polyethylene (Solid and Cellular) - A very good insulator in terms of electrical properties. Low and stable dielectric constant over all frequencies, very high insulation resistance. In terms of flexibility, polyethylene can be rated stiff to very hard, depending on molecular weight and density - low density being the most flexible, and with high density, high molecular weight formulation being very hard. Moisture and weather resistance are rated excellent. The dielectric constant is 2.3 for solid insulation and 1.64 for cellular designs.

GLOSSARY

Pol – Pro

Polyhalocarbon - Polymers that contain halogen atoms. The halogens are fluorine, chlorine, bromine, and iodine and astatine.

Polyimide - Available for wire insulation in both film form and as a magnet wire enamel. The resin is produced by reacting pyromellitic dianhydride (PMDA) with an aromatic diamine. The enamel can be used in applications where a wire is required to operate over a wide temperature range as high as 220°C. It is chemically inert and is radiation resistant. One polyimide in film form, in combination with FEP film, is a heat-sealable material that offers possibilities as a space- and weight-saving wire insulation. As a supplementary insulation, particularly with PTFE and FEP insulation, it improves cut-through and abrasion resistance. It possesses very high heat resistance.

Polymer - A substance made of any repeating chemical units or molecules. The term polymer is often used in place of plastic, rubber or elastomer.

Polymerization - A chemical reaction in which low molecular weight molecules unite with each other to form molecules with higher molecular weights.

Polymerize - To change, by union of two or more molecules of the same kind, into another compound having the same elements in the same proportions, but a higher molecular weight and different physical properties.

Polyolefin - Any of the polymers and copolymers of the ethylene family of hydrocarbons.

Polyolefins - Family of plastics based upon the additional polymerization of ethylene polypropylene, butylene and other vinyls. Polyolefins are also used as high speed laminated flat cable insulations.

Propylene (Solid and Cellular) - A plastic made by the polymerization of high-purity propylene gas in the presence of an organometallic catalyst at relatively low pressures and temperatures. It is similar to polyethylene but is lighter and offers even better heat resistance, tensile strength, abrasion resistance and lower dielectric constant. This makes it suitable for thin wall insulation. UL maximum temperature ratings may be 60°C or 80°C. Most UL styles call for 60°C maximum. The dielectric constant is 2.25 for solid and 1.55 for cellular designs.

Polyrad[®] - Brand-Rex trade name for its irradiated polyolefin insulated wires and cables.

Polystyrene - A thermoplastic produced by the polymerization of styrenes, vinyl benzene.

Polytetrafluoroethylene (PTFE) - The most thermally stable and chemically resistant of all carbonaceous insulation compounds. It is unaffected by sunlight, moisture and practically all chemicals. Temperature range is -90-250°C. Electrical properties are very constant over the temperature range and also over a wide range of frequencies.

Polytrifluorochloroethylene (PTFCE) - Similar to PTFE in many properties but characterized by somewhat lower heat resistance.

Polyurethan - Used primarily as a cable jacket material. It has excellent oxidation, oil and ozone resistance. Some formations

also have good flame resistance. It is a hard material with excellent abrasion resistance. It has outstanding "memory" properties, making it an ideal jacket material for retractile cords.

Polyvinyl Acetate - A thermoplastic material composed of polymers of vinyl chloride. A colorless solid with outstanding resistance to water, alcohol and concentrated acids and alkalies.

Polyvinyl Chloride - A thermoplastic material composed of polymers of vinyl chloride. A tough, non-flammable, water-resistant insulator must be used for wire installation for inside wires and cables. It has higher dielectric losses than polyethylene and polypropylene.

Polyvinylidene Fluoride (PVDF) - A PVDF homo- or copolymer. This high temperature resin is well suited for cable jacketing for plenum applications.

Polyvinylidene Fluoride - This thermoplastic resin, a fluorocarbon, is characterized by good mechanical, electrical and chemical properties. In primary insulation and in jackets for multi-conductor cables, it has performed successfully at temperatures from -80° to -300°F.

Portable Power Cable - Flexible, all-rubber insulated cable for hard usage. Some cables have shielded conductors (metallic or non-metallic) and can have neoprene sheath overall.

Power Factor - The ratio of resistance to impedance. The ratio of the actual power of an alternating current to apparent power. Mathematically, the cosine of the angle between the voltage applied and the current resulting.

Power Loss - Difference between the total power delivered to a circuit, cable or device and the power delivered by that device to a load.

Power Ratio - The ratio of power appearing at the load to the input power. Expressed in dB, it is equal to 10 log base 10 (P1/P2) where P1 is input power and P2 is the power at that load.

Preheater - A device used to clean, dry and heat the conductor prior to extruding the insulation material. Its purpose is to prevent rapid freezing of the insulating material.

Premise Wire - 1) Wiring that connects separately housed equipment or system components to one another. 2) Inside cable or wiring that connects equipment or system components to the telephone network interface located at the customer's premises.

Pressurization - The use of pressurized gas or dry air inside of air core cables to prevent the entry of water at faulty splices or minor sheath cracks. It can also trigger an alarm when major faults occur and can assist in locating the damaged areas.

Primary Insulation - The first layer of non-conductive material applied over a conductor, whose prime function is to act as electrical insulation.

Propagation Constant - A complex quantity characteristic of a radio frequency transmission line that indicates the effect of the line on the transmitted wave. The real part indicates the attenuation and the imaginary part of the phase shift.

Propagation Delay - Time required for a signal to pass from the input to the output of a device.

Propagation Time - Time required for a wave to travel between two points on a transmission line.

Propagation Velocity - See Velocity of Propagation.

Pseudo Random NRZ - A wave form of binary signals that may be used in a computer system. It is called NRZ, non-return to zero, because the voltage does not return to zero.

Pulling Eye - A device fastened to a cable to which a hook may be attached in order to pull the cable into or out of a duct.

Pulse - A current or voltage that changes abruptly from one value to another and back to the original value in a finite length of time. Used to describe one particular variation in a series of wave motions.

Pulse Cable - A type of coaxial cable constructed to transmit repeated high voltage pulses without degradation.

Put-Up - Packaging of finished wire or cable.

PVC - Sometimes referred to as vinyl or polyvinyl chloride. Extremely high or low temperature properties cannot be found in one formulation. Certain formulations may have a -55°C to +105°C rating. Other common vinyls may have -20°C. There are many formulations for a variety of different applications. The many varieties of PVC also differ in pliability and electrical properties. The price range can vary accordingly. Typical dielectric constant values can vary from 3.5 to 6.5.

Q

Quad - 1) Four wires. 2) A group of four wires composed of two pairs twisted together. The quad twist is of a shorter length than the pair twist.

Quad Twist or Phantom Twist - The twist by which the two twisted pairs are combined to form the quad.

Quad Type - Designation applied to quads having different lengths of twist to facilitate lay-up in the core and to reduce crosstalk.

Quad-Rated Wire - ITT name for 90°C and 105°C wire that replaces four other types of wire: 90°C TW 600 V, 90°C MTW 600 V, 90°C AWM 1000 V, and 105°C AWM 600 V.

Quadders - Three-bay machines that can twist four wires together. They can be cable braided and shielded wire with varying lay lengths.

Qualified Products List (QPL) - A QPL source of supply is a manufacturer that has been registered by the U.S. government and issued a QPL number as a qualified producer of a given commodity. There are, however, other manufacturers who produce identical products, equal or better in quality and performance, but because unregistered, sell the product at a lower price.

Quench (Thermoplastics) - A process of shock cooling thermoplastic materials from the molten state.

R

R-F - Radio frequency.

Raceways - Metal or plastic channels used for loosely holding electrical and telephone wires in buildings. A raceway is usually located in the floor and usually encased on three/four sides by concrete.

Radio Frequency - The frequencies in the electromagnetic spectrum that are used for radio communications.

Rated Temperature - The maximum temperature at which an electric component can operate for extended periods without loss of its basic properties.

Rated Voltage - That maximum voltage at which an electrical component can operate for extended periods without undue degradation or safety hazard.

Ray (Fiber Optic) - A straight line, representing light, perpendicular to the light wave front and traveling in the same direction. At a boundary surface, or interface such as the surface between a fiber core and cladding, the ray may change direction suddenly but remains a straight line.

REA - Rural Electrification Admin of the U.S. Dept of Agriculture.

Reactance (X) - That part of the impedance of an alternating current circuit due to capacitance or inductance.

Ready Access Closure - A special type of cable closure having a Neoprene® or plastic hood that can be removed easily for termination connections. Used only for PIC cable as the closures are neither gas nor moisture tight.

Receiver - An electronic package that converts light energy to electrical energy in a fiber optic system.

Redrawn - The drawing of wire that has already been drawn to an intermediate size through a series of dies to reach a desired wire size.

Reducing Joint - A joint between two lengths of cable where the conductors are not the same size.

Reduction Gear - The gear device used to reduce the speed between the drive motor and extruder screw. Supplementary speed reduction means may also be used, such as belts and sheaves.

Reel - A revolvable flanged device made of wood, plastic, and/or metal which is used for winding flexible metal wire or cable.

Reference Edge - Edge of cable or conductor from which measurements are made. Sometimes indicated by a thread, identification stripe, or printing. Conductors are usually identified by their sequential position from the reference edge, with number one conductor closest to this edge. Also called index edge.

Reflection - Change in direction (or return) of waves striking a surface.

Reflection (Fiber Optic) - Change in direction of a light wave, or light ray when it strikes a surface.

Reaction Loss - The part of a signal that is lost due to reflection of power at a line discontinuity.

Reflow Soldering - The process of connecting two solder-coated conductive surfaces by remelting the solder.

GLOSSARY

Ref – Roc

Refraction (Fiber Optic) - The bending of light waves or rays as they go from one material to another due to the difference in velocities in the materials.

Refractive Index (Fiber Optic) - The ratio of the velocity of light in a vacuum to its velocity in a material such as a fiber. Also, the ratio of the sine of the angle of incidence of light on the material to the angle of refraction of the light. Refractive index of any material varies with the wavelength of the light. Also called index of refraction. In a fiber, core refractive index must be greater than that of the cladding.

Registration - Alignment of one object with relation to another. Also called register.

Reinforced Sheath - The outermost covering of a cable that has a cable sheath constructed in layers with a reinforcing material, usually a braided fiber, molded in place between layers.

Relative Humidity - The ratio of the quantity of water vapor present in the atmosphere to the quantity that would saturate it at the existing temperature.

Repeater - A receiver and transmitter combination used to regenerate an attenuated signal.

Resin - Any of a class of solid or semi-solid organic products of natural or synthetic origin, generally of high molecular weight with no definite melting point. Most resins are polymers.

Resistance - The property of a wire or conductor that determines the current flow for a given applied voltage measured in ohms.

Resistance Unbalance - The difference in resistance between two wires of a pair.

Resistive Conductor - A conductor used primarily because it possesses the property of high electric resistance.

Resistivity - The ability of a material to resist passage of electrical current either through its bulk or on a surface. The unit of volume resistivity is the Ohm-Cm of surface resistivity, the Ohm.

Resonance - An AC circuit condition in which inductive and capacitive reactances interact to cause a minimum or maximum circuit impedance.

Respool - To rerun material from one package spool to another for various purposes, such as to verify lengths, inspect the defect, etc.

Retractile Cord - A cord having specially treated insulation or jacket so that it will retract like a spring. Retractability may be added to all or part of a cord's length.

RF Cable - Designed for use for frequencies above approximately 1 megacycle.

RF Connector - Connector used for connecting or terminating coaxial cable.

RFI - Radio frequency interference.

RG Cable - Coaxial cable covered by JAN-C-17 or MIL-C-17.

RG/U - Military designation for coaxial cable (RG), general utility (U).

RHH - NEC designation for conductors with heat-resistant rubber or XLPE insulation, for use in wet or dry locations, 90°C.

RHW - NEC conductor type designation for conductors with heat and moisture resistant rubber or XLPE insulation, for use in wet or dry locations, 75°C.

RHW-2 - Rubber-insulated building wire, heat and moisture resistant, 90°C dry or wet.

Ribbon Burner Flame Test - Cable tray flame test using either a 70,000 BTU/Hr or 210,000 BTU/Hr ribbon burner as the flame source. The test procedure first appeared in IEEE STD 383-1974 for qualifying nuclear generating station cables. This test has since been adopted for cables used in fossil-fueled generating stations and in substations of electric utilities. It has entered the industrial cable market by being written into several UL standards (TC Tray Cable, For CT Use). The Navy (MIL-C-915, MIL-C-24643) and Coast Guard (IEEE-45) have also adopted this test for their cables. ICEA has published a guide (T-29-520) for conducting a 210,000 BTU/Hr flame test on cables in tray.

Ribbon Cable - A cable consisting of two or more conductors laid parallel in one plane and held in place by some means. Usually contains molded polyethylene insulation.

Ridge Marker - One or more ridges running laterally along the outer surface of plastic wire for purposes of identification. Readily perceptible to sight and touch, they are formed by minute notching of the extrusion die. Usually associated with aerial drop wire.

Ring - 1) An audible signal by a bell. 2) An application of current to ring a bell or operate an alerting signal. 3) The side of a two wire telephone circuit or loop that is connected to the negative side of a battery located at the telephone company's central office. Comparable to the "hot" side of a residential lighting circuit.

Ring Banding - A method of color coding insulated conductors by means of a small band of colored ink applied circumferentially at regular intervals along the axis of an insulated conductor.

Ring Wire - The second wire of a pair, of which the first wire is the "tip."

Ringing Out - The process of locating or identifying specific conductive paths by means of passing current through selected conductors.

Ripcord - A cord placed usually in inside wires and cables directly under the jacket of a cable or wire in order to facilitate stripping and removal of the jacket.

RMS - Root mean square. Applied to alternating voltage and current, it means the effective value: that is, it produces the same heating effect as a direct current or voltage of the same magnitude.

Rockwell Hardness - A test for hardness (resistance to indentation) of a material in which a hardened steel ball or diamond point is pressed into the material under test.

Rod Mill - A factory in which copper rod is drawn down to a smaller size. This may then be sold to other wire mills for drawing to still smaller sizes.

Roentgen - A unit of radiation exposure equal to the quantity of ionizing radiation that will produce one electrostatic unit of electricity in one cubic centimeter of dry air at 0°C and standard atmospheric pressure.

Rolling Mill - Plant where copper bars or ingots are rolled into copper rods.

Romex - Non-metallic sheath cable.

Root Mean Square (RMS) - The effective value of an alternating periodic voltage or current.

Rope Strand - A conductor composed of a center group of twisted strands surrounded by one or more layers of similar groups of twisted strands.

Rope Unilay - A group of stranded conductors assembled in a unilay manner with left-hand lay.

Rope-Lay Conductor or Cable - A cable composed of a central core surrounded by one or more layers of helically laid groups of wires. (Note: This kind of cable differs from a concentric lay conductor in that the main strands are themselves stranded. In the most common type of rope-lay conductor or cable, all wires are of the same size and the central core is a concentric lay conductor.)

Round Wire - Wire circular in cross section as opposed to flat, square, etc.

Round Wire Shields - Shields constructed from bare, tinned, or silver-plated copper wire. Three types of round wire shields include braided, spiral and reverse spiral.

Routing - The path followed by a cable or conductor.

RS-232C - A technical specification published by the Electronic Industries Association that established mechanical and electrical interface requirements between terminals, computers, modems, and communication lines.

RS-422 - A high speed electrical interface defined by the CCITT (Consultative Committee of International Telegraph and Telephone) as supporting data rates of up to 768 Kbit/s over up to 300 feet of cable.

Rubber (Wire Insulation) - A general term used to describe wire insulations made of thermosetting elastomers, such as natural or synthetic rubbers, EPR, Neoprene®, Hypalon®, butyl rubber, and others.

Rupture - In breaking strength or tensile strength tests, the point at which a material physically comes apart as opposed to yield strength, elongation, etc.

Rural Electrical Administration (REA) - In 1948, the telephone amendment to the Rural Electrification Act was passed under the Rural Electrical Administration (REA) to ensure universal telephone service and area coverage at reasonable and affordable rates

served by rural telephone companies and cooperatives. They developed Plant Engineering (PE) specifications for various outside and inside telecommunication cables. Those current include: PE-22 Aerial Underground Telephone Cable - Air Core Solid Conductor, PE-39 Filled Telephone Cables - Solid Conductor Insulation, PE-89 Filled Telephone Cables - Expanded or Cellular Insulation.

S

Safety Factor - The ratio of the voltage at which it is tested to that at which it is used or designed for.

Sag - 1) Conductor: The vertical distance between a suspended conductor and an imaginary straight line connecting the points of suspension. Sag may be measured at the midpoint between the suspensions, the lowest point of the conductor or at any specified point. 2) The downward curvature of a wire or cable due to its weight.

Scattering (Fiber Optic) - Change in direction of a light ray due to heterogeneity (imperfections) in material. When ray hits an imperfection, it is reradiated in a direction different from that of the original ray.

Screen - 1) A semi-conductor or high resistance material used to reduce stress concentrations at the surface of stranded conductors or edges of outer shielding tapes. May be extruded plastic, rubber-filled tapes, carbon black paper, or thin aluminum foil laminated to paper (metallized paper). In the U.S., a screen at the conductor is frequently called a strand shield although a shielded cable frequently has no strand shield. 2) A cable core design where an aluminum shield divides the cable core into two separate compartments. See T Screen Cables. 3) In cable manufacturing, a woven metal screen or equivalent device that is installed across the flow of the molten plastic (stock) between the tip of the screen and the die and supported by a breaker plate to strain out contaminants or to increase the back pressure or both.

Screened Cables - See T Screen Cables.

Screw Extruder - A machine that conveys solid material under pressure through an orifice via a surrounding barrel by means of one or more rotating screws and pumps.

Screw Flight - The helical metal thread of the screw.

Screw Root or Stem - The continuous central shaft of a screw, usually of cylindrical or conical shape.

Screw Speed - Number of revolutions of screw per minute.

SEALPIC® - ESSEX GROUP, INC. trademark for an outside plant cable having a coated 8 mil thick aluminum (AL) shield polyolefin jacket and plastic insulated conductors (PIC). Designed for aerial and duct use. Can also be used for direct buried applications having a filled cable core where rodent or mechanical protection is not required.

Secondary Insulation - A non-conductive material whose prime functions are to protect the conductor against abrasion, and provide a second electrical barrier placed over the primary insulation or the shield.

GLOSSARY

Sel – Sil

Selenium - A finely ground form of an elementary metal; used as a vulcanizing agent in rubber compounds.

Self Extinguishing - The characteristic of a material whose flame is extinguished after the igniting flame is removed.

Self-Supporting Aerial Cable - A cable consisting of one or more insulated conductors factory-assembled to a messenger that supports the assemblage and does not form a part of the electric circuit. See Figure 8 Cable.

Semi-Conductor - A non-conductive material made slightly conductive by the addition of a specified sum of conductive material.

Semi-Rigid - A cable containing a flexible inner core and a relatively inflexible sheathing material, such as a metallic tube, but can be bent for coiling or spooling and placing in a duct or cable run.

Separator - A layer of insulating material such as textile, paper, etc. that is placed between a conductor and its dielectric, between a cable jacket and the components it covers, or between various components of a multiconductor cable. Used to improve stripping qualities and/or flexibility, or can offer additional mechanical or electrical protection to the components it separates.

Sequential Marks - The manufacturer's identification, cable size, gauge and year of manufacture that are surface marked on the outer cable jacket at 2 ft intervals.

Series Circuit - Components of a circuit arranged end to end to form a single path for a current.

Series Resistance - Any sum of resistances installed in sequential order within one current.

Serve - A type of separator applied directly over the conductor or conductors. The serve may consist of one or more materials such as paper, cotton, silk, nylon, or rayon. These materials may be applied spirally or laterally.

Service Pairs - These pairs are located in the extra unit(s) in BOC screened cables, and located in the interstices of non-Bell cables. They are included in the pair count, and are used for T-carrier service, (e.g., order wire, pressure monitor, etc).

Sheath - The material, usually an extruded plastic or elastomer, applied outermost to a wire or cable. Very often referred to as a jacket, but usually consists of a shield and jacket for outside plant telephone cables.

Shield - A metallic layer applied over the insulated conductor (dielectric) or group of insulated conductors cable core to prevent electrostatic or electromagnetic interference between the enclosed wires and external fields. Shields can be composed of braided or served wires, foil wrap, foil-backed tape, metallic tube or tape (flat or corrugated), or conductive vinyl rubber. Sometimes called "tape" in telephone cables. Shields are usually die-constructed from copper and aluminum (either alone or laminated with a dielectric) bimetallic tape (copper/stainless steel/copper), and bronze.

Shield Coverage Percent - Percentage of the surface area of cable core insulation covered by the shield. Also called Shield Percentage.

Shield Effectiveness - The relative ability of a shield to screen out undesirable signals.

Shield Percentage - See Shield Coverage Percent.

Shielded Cables - A cable in which the insulated conductor or conductors are enclosed within an envelope of conducting material. The shield of conducting metal or other material is applied so every point on the surface of the insulation is at ground potential.

Shielded Conductor - An insulated conductor shielded by a copper braid or tape, aluminum foil, copper foil, or semi-conductive vinyl, to confine or reject extraneous electrical fields.

Shielded Pair - A twisted pair to which a metal covering has been applied, usually in the form of a bare or tinned copper braid but may be metal ribbon or metal-backed Mylar® tape.

Shiner - A hole or bare spot on the insulated conductor through which the copper can be seen.

Shock - A sudden stimulation of the nerve and convulsive contraction of the muscles caused by a discharge of electricity through the body. The severity depends upon (a) the amount of current, (b) whether the path of the current is through the path of a vital organ, and (c) the duration of the current.

Shore Hardness - A measure of the surface hardness of an insulating or jacket material.

Short - A short circuit.

Short Circuit - An accidental or intentional near-zero resistance connection between two sides of a circuit that disrupts transmission and may cause an excessive current flow.

Short Pair Twist - Toll quads in which the pair twist length is approximately 4 to 7 inches. In the quad, the phantom twist length is 6 to 10 inches, depending on the gauge.

Shrinkable Tubing - Tubing used to provide protection against mechanical damage for wires, cables, wire harnesses, splices, terminations, etc., that shrinks to a predetermined size upon application of heat or solvent evaporation.

Shunt - A device used to divert part of an electric current.

Shunt Wire - A conductor joining two parts of an electric circuit to divert part of the current.

Signal - An electric current used to convey information either digital, analog, audio or video.

Signal Cable - A cable designed to carry current of less than one ampere per conductor.

Signal Conductor - An individual conductor used to transmit an impressed signal.

Silica - Silica fibers produced from melted quartz offer properties similar to fiberglass but higher heat resistance, above 2000°F.

Silicone - A thermosetting elastomer insulation with excellent heat resistance; polymeric materials in which the recurring chemical group contains silicon and oxygen atoms as links in the main chain. A thermosetting plastic material used for wire and cable covering that is thermally stable and has electrical properties exceeding those of most organic polymers.

Silver - Similar to gold corrosion resistance, used as a plating or coating. It costs less than other precious metals, is very soft when fully annealed, but hardens work during fabrication. It provides very good conductivity and solderability.

Single Mode Fiber (Fiber Optic) - A fiber wave guide in which only one mode will propagate. The fiber has a very small core diameter of approximately 8 micrometers. It permits signal transmission at extremely high bandwidths and is generally used with laser diodes.

Single-ended - Unbalanced, such as grounding one side of a circuit or transmission line.

Sinter - To thermally cure or treat a material.

Sinusoidal - Varying in proportion to the sine of an angle or time function. Ordinary alternating current is sinusoidal.

Sizing - Applying a material to a surface to fill pores. Also, the surface treatment applied to glass fibers.

Skew Rays - A ray that does not intersect the fiber axis. Generally, a light ray that enters the fiber core at a very high angle.

Skin Effect - The phenomenon wherein the depth of penetration of electric currents into a conductor decreases as the frequency of the current increases.

Sleeve - A braided, knitted, or woven tube used over wires or components as insulation tubing. Also called Sleaving.

Snips - Scissors for cutting wire.

SNM - A cable designed for use in hazardous locations consisting of insulated conductors in an extruded non-metallic jacket which is then covered with an overlapping spiral metal tape and wire shield and jacketed with an extruded moisture-, flame-, oil-, corrosion-, fungus- and sunlight-resistant non-metallic material.

Soft Wire - Wire that has been drawn or rolled to final size and then heated to remove the effects of cold working.

Soft-Drawn Copper Wire - Copper wire annealed just before the final wire drawing process.

Solef® - Soltex's trademark for a reacted fluorocopolymer intended for extrusion of telecommunications wire and cable jacketing, particularly suited to plenum applications. Solef is a registered trademark of Solvay et Cie, s.a. (Brussels, Belgium). Solef is distributed by the Soltex Polymer Corporation in the U.S.

Solid Color Pairs - Pulp-insulated pairs in which the ring side is colored throughout its length by dye mixed in the pulp before application to the conductor.

Solid Conductor - An electrical conductor consisting of a single wire.

Solid Insulation - Refers to conductor insulations not having expanded plastic compounds. Solid insulations differ from that of cellular insulations by having no dispersion of small gaseous cells being uniformly distributed throughout the solid resin matrix during the extrusion or insulating process.

Solid Wire - Wire consisting of a single conductor, not of multiple strands.

Spacing - Distance between the closest edges of two adjacent conductors.

Span - 1) Pertaining to flat conductors, distance from reference edge of the first conductor to the reference edge of the last conductor. 2) Pertaining to round conductors, distance between centers of the first and last conductors.

Spark Test - A continuous test designed to locate pinholes in an insulated wire by application of an electrical potential across the material for a very short period of time while the insulated wire is drawn through an electrode field. One end of the wire is grounded, and if a pinhole exists in the insulation a spark occurs, permanently marking the faulty area. Usually the wire is cut at this spot.

Sparker - A device utilizing AC or DC voltage potential used to detect voids, shiners, or weak spots in the walls of jacketed cables or insulated conductors.

Sparkling - Continuous high voltage testing of insulated wire.

Specific Gravity - The ratio of the weight of any volume of substance to a weight of an equal volume of some substance taken as a standard, usually water for liquids and hydrogen for gases.

Specific Inductive Capacity (SIC) - See Dielectric Constant.

Spectral Bandwidth - The difference between wavelengths at which the radiant intensity of illumination is half its peak intensity.

Spectrum - Frequencies that exist in a continuous range and have a common characteristic. A spectrum may include many spectrums (e.g., the electromagnetic radiation spectrum includes the light spectrum, radio spectrum, infrared spectrum, etc.).

Speed of Light (c) - 2,998 x 10⁸ meters per second; 186,000 miles per second.

Spiral Four Quad Wire - A group of four conductors spiralled together. It is not a true quad, and both side-to-side and side-to-phantom crossstalk are high. Conductors diametrically opposite are used to form a pair.

Spiral Shield - A metallic shield of fine stranded wires applied spirally rather than braided.

Spiral Stripe - A color coding stripe applied helically to the surface of an insulated wire or cable.

Spiral Wrap - A term given to describe the helical wrap of a tape or thread over a core.

Splice - A connection of two or more conductors or cables, usually twisted together at the ends.

GLOSSARY

Spo – Sup

Spool - A circular container on which wire is wound for storage or transit; usually refers to sizes smaller than 18" diameter.

Square Mil - The area of a square one mil by one mil.

Stability Factor - The difference between the percentage power factor at 80 volts/mil and at 40 volts/mil measured on wire immersed in water at 75°C for a specified time.

Stabilizer - An ingredient added to some plastics to maintain physical and chemical properties throughout processing and service life.

Staggered Twist - Cables in which adjacent pairs in a layer have different lengths of twist to reduce crosstalk.

Standing Wave - The stationary pattern of waves produced by two waves of the same frequency traveling in opposite directions on the same transmission line. The existence of voltage and current maxima and minima along a transmission line is a result of reflected energy from an impedance mismatch.

Standing Wave Ratio (swr) - A ratio of the maximum amplitude to the minimum amplitude of a standing wave stated in current or voltage amplitudes.

Static Charge - An electrical charge that is bound to an object. An unmoving electrical charge.

Station - 1) A term used to denote the customer's main telephone.
2) Broadly used term referring to the end of a circuit.

Station Wire (SW) - Station wire is designed for inside-outside use in station installations from the station protector to the telephone terminal block. The jacket is made of a tough weather- and flame-resistant polyvinyl chloride (PVC) that provides protection when exposed to outside weather conditions and inside cleaning aids such as detergents, waxes, moisture, oil, and most solvents. The wire is installed with an appropriate stapling gun. Generally, 22 AWG copper color-coded polyethylene insulated wire conductors with a single overall polyvinyl chloride (PVC) jacket in beige or gray. Available with 2, 3, or 4 conductors. UL listed as CMX.

Station Wire Plenum (SWP) - Station wire plenum is designed for use in air ducts and plenums without metal conduit in PBX, PABX, key system and telephone instrument communication systems. Installations require less station wiring (shorter direct runs), which reduces station installation costs (wire placement vs. wire plus conduit installation). Generally, 22 AWG copper conductors having color-coded fluoropolymer resin insulation and non-colored fluoropolymer resin jacket. Available with 2, 3, or 4 conductors. UL listed as CMP.

Station Wire Twisted (SWT) - Station wire twisted is designed for inside-outside runs from station protectors or building terminals to telephone terminal blocks. The jacket is made of a tough weather- and flame-resistant polyvinyl chloride (PVC) that provides protection when exposed to outside weather conditions and inside cleaning aids such as detergents, waxes, moisture, oil, and most solvents. Generally, 22 AWG copper color-coded polyethylene paired insulated wire with a single overall polyvinyl chloride jacket in beige or gray. Available with 2, 3 or 4 pair sizes. UL listed as CMX.

Stay Cord - A component of a cable, usually a high tensile textile, used to anchor cable ends at their points of termination and to keep any pull on the cable from being transferred to the electrical connections.

Step Index Fiber (Fiber Optic) - A multimode fiber consisting of a core of uniform refractive index, surrounded by cladding of slightly lower refractive index. Accepts light rays over wider angle, but has smaller bandwidth than single mode fiber. See also Single Mode Fiber.

Stiffness - The property of a conductor that causes it to resist permanent deformation by bending.

Stock - Plastic material which is being processed in an extruder.

Stock Temperature - The temperature of molten plastic material.

Strain Gauge - A device for determining the amount of strain (change in dimensions) when a stress is applied.

Strain Hardening - An increase in hardness and strength caused by plastic deformation at temperatures lower than the recrystallization range.

Strand - A wire, or groups of wires, of a stranded conductor.

Strand Lay - The distance of advance of one strand of a spirally stranded conductor, in one turn, measured axially.

Strand Shield - A layer of semiconducting material or tape applied directly over the stranded conductor of cables rated 2000 volts or higher. This reduces the possibility of high stress points occurring between the conductor and insulation.

Stranded Conductor - A conductor composed of a group of wires, or of any combination of groups of wires. The wires in a stranded conductor are usually twisted or braided together.

Stranding - The process of forming the twinned conductors into a small cable or units for a large cable by means of floor-mounted supply stands with a rotating take-up reel. The cable is formed by a closing die followed by a smaller binder die and secured by nylon binder.

Strip Force - The force required to remove a small section of insulating material from the conductor it covers. Usually measured in pounds.

Submarine Cable - Cable used under water from one point to another for power or communication. Usually contains lead sheath and/or rubber jacket.

Subscriber's Loop - The pair of wires or telephone wire from a subscriber's telephone and the central office that receives it.

Subscriber's Loop Resistance - The total effective resistance of the loop from the central office to and including the subscriber's instrument. Usually assumed to be the resistance of the outside plant at 68°F, plus 200 ohms for the subscriber's telephone plus 100 ohms for inside wire, heat coils, temperature variation, etc.

Superconductors - Certain metals, alloys, and ceramics in which the resistance drops to almost zero at temperatures near absolute zero (-273°C), and in some cases at temperatures hundreds of degrees above absolute zero.

Surface Leakage - Passage of current over the boundary surfaces of an insulator as distinguished from passage through its volume.

Surface Resistivity - The ratio of the potential gradient parallel to the current along a material's surface to the current per unit width of the surface, usually expressed in ohms. Surface resistivity of a material is numerically equal to the surface resistance between two electrodes forming opposite sides of a square, the square size being immaterial.

Surge - A temporary but large increase in the current and/or potential at any point in the circuit.

Surging - A pronounced fluctuation in output over a short period of time without deliberate change in operating conditions.

Sweep-Test - A test in which the frequency response is verified by generating an RF voltage whose frequency is swept repeatedly through a given frequency range at a rapid constant rate. The cable response is observed on an oscilloscope. The structural return loss sweep-test measures the magnitude of internal cable reflections. A high structural return loss is desirable.

Switchboard Cable - A cable used within and between the central office main frames and the switchboard, usually containing tinned conductors to facilitate soldering of 24AWG wires. See Tinned Wire.

Switchboard Wire - Chemically cross-linked polyethylene or asbestos insulated wire that is resistant to heat, flame and corrosive vapor.

Synchro-Cure - An improved, perfected method of vulcanizing rubber-insulated cable which makes it possible to balance the cure of the rubber-insulated conductors with the cure of the Neoprene® or rubber outer sheath. By eliminating the possibility of overcure or undercure, maximum physical properties and electrical characteristics are maintained.

T

T Screen Cables - Cable design in which a 4 mil polyolefin-coated flat aluminum shield divides the cable core into two compartments. The integral screen/shield is formed in such a manner that it shields the entire cable core as it screens and isolates each separate compartment. The cable design satisfied the original requirements of two cables under one sheath for pulse code modulation (PCM) carrier applications. Cables are generally manufactured for 24 channel, 0.772 KHz transmission (T1) and for 48 channel 1.576 KHz transmission (T1C). See T1 and T1C cables.

T1 Cables - Cables designed for two-way T1 pulse code modulation (PCM) carrier operation under one cable sheath. The T1 cable design provides superior near and crosstalk loss at 772 KHz compared to the same count cable without the high frequency shield. This permits T1 cables to be used with 100% T1 PCM utilization and maximum repeater spacing. T1 cables are offered in all-filled and air core cable designs.

T1C Cables - Cables are designed for two-way T1C pulse code modulation (PCM) carrier operation under one cable sheath. The T1C cable design provides superior near end crosstalk loss at .576 KHz compared to the same count cable without the high frequency

shield. This permits T1C cables to be used with 100% T1C PCM utilization and maximum repeater spacing. T1C cables are offered in all filled and air core cable designs.

Take-Up - 1) The process of accumulating wire or cable onto a reel, bobbin, or some other type of pack. 2) also refers to the device utilized for pulling wire or cable through a piece of equipment or machine.

Talk Pairs - See Tracer Pairs.

Tank Test - A term used to describe a voltage dielectric test where the specimen to be tested is submerged in a liquid (usually water) and a voltage potential applied between the conductor and the liquid as ground.

Tape - A relatively narrow, woven or cut strip of fabric, paper, film, or metal material. In telephone cable, manufacturing it refers to the shield.

Taped - Layer of tapes wrapped around a cable or conductor so as to form a cushion, insulation, or a seal against material subsequently wrapped.

Tape Cable - A form of multiple conductor consisting of parallel metal strips imbedded in insulating material. Also called Flat Flexible Cable.

Tape Shields - Shields constructed from copper and aluminum (either alone or laminated with a dielectric), bimetallic tape (copper/stainless steel/copper), steel, and bronze. Tape shields are supplied in two forms, flat and corrugated. See Shield.

Tape Wrap - A term denoting a spirally or longitudinally applied tape material wrapped around the wire, either insulated or uninsulated, used as an insulation or mechanical barrier.

Tarnish - A term used to describe a discolored or stained conductor or shield wire caused by exposure to the atmosphere.

Tear Strength - Force required to initiate or continue a tear in a material under specified conditions.

Tear Test - A test to determine tear strength of insulating material.

Teflon® - DuPont's trademark for tetrafluorethylene, a tough heat- and chemical-resistant thermoplastic used as conductor and jacket insulations for plenum cables. Chemical designation is FEP.

Tefzel® - DuPont's trademark for a modified copolymer of ethylene and tetrafluorethylene. Designed to serve as jacket and conductor insulation for plenum area cables. Chemical designation is ETFE.

Telemeter - To measure, transmit, and receive data (temperature, voltage, current, etc.) automatically from a remote source.

Telephone Cable - A multiconductor cable normally made up of twisted pairs for audio use.

Telephone Drop Wire - Wire used to transmit telephone service into a customer's premises. It may be aerial or buried.

Telephone Wire - General term referring to many different types of communication wire; refers to a class of wires and cables, rather than a specific type.

GLOSSARY

Tem – Tor

Temperature Coefficient of Resistivity - The amount of resistance change of a material per degree of temperature rise.

Temperature Rating - The maximum temperature at which the insulating material may be used in continuous operation without loss of its basic properties.

Temperature Stress - The maximum stress that can be applied to a material at a given temperature without tearing or rupturing.

Tensile Strength - A term denoting the greatest longitudinal tensile stress a substance can bear without tearing or rupturing.

Tensile Stress - Force per unit cross-sectional area applied to elongate a material without tearing apart or rupturing.

Tension - (1) Electric potential or potential difference. 2) Mechanical stress caused by forces which tend to stretch the material.

Tension Set - Refers to permanent deformation, caused by stress, that a plastic material exhibits after the stress is removed.

Terminal Block - An insulating mounting equipped with binding post or quick-clip terminals which are usually factory connected to stub cable or to wire leads.

Terminals - Screws, soldering lugs, or wire wrap pins to which an external circuit can be connected.

Terminated - 1) The condition of a wire or cable pair connected to (terminated on) binding posts or a terminal block. 2) The condition of a circuit connected to a network that has the same impedance the circuit would have if it were infinitely long.

Terminating Cable - A multipaired cable usually with twinned conductors and always with fire-resistant insulation that is used primarily between the cable vault and the main distributing frame.

Termination - The connection of a line to a terminal, distributing frame, switch, or matrix.

Thermal Aging - Exposure to a given thermal condition or a programmed series of conditions for prescribed periods of time.

Thermal Alloying - The act of uniting two different metals to make one common metal by the use of heat.

Thermal Conductivity - Ability of a material to conduct heat.

Thermal Expansion - Expansion of a material when subjected to heat.

Thermal Rating - The maximum and/or minimum temperature at which a material will perform its function without undue degradation.

Thermal Resistance - The change in the electrical resistance of a material when subjected to heat. Resistance to heat flow from conductors to outer surface of insulation or sheath in a wire or cable.

Thermal Resistivity - Thermal resistance of a unit cube of material.

Thermal Shock - A test to determine the ability of a material to withstand heat and cold by subjecting it to rapid and wide changes in temperature.

Thermal Stress Cracking - Cracking and cracking of some thermoplastic resins that results from overexposure to elevated temperatures.

Thermocouple - A device for measuring temperature where two electrical conductors of dissimilar metals are joined at the point of heat application and a resulting voltage difference, directly proportional to the temperature, is developed across the free ends and is measured potentiometrically.

Thermocouple Lead Wire - Similar to thermocouple wire except the degree of accuracy in temperature measurements is not as high. Used to transmit thermocouple information to remote indicators.

Thermocouple Wire - Two-conductor cable, each conductor employing a dissimilar metal, made up specifically for temperature measurements.

Thermoplastic - Plastic insulation that will soften and distort from its formed shape by heating above a critical temperature peculiar to the material.

Thermosetting - Plastic insulation that will not resoften or distort from its formed shape by heating until a destructive temperature is reached.

Three-Quarter-Hard-Wire - As applied to aluminum, wire that has been processed to produce a strength approximately midway between that of half-hard wire and that of hard-drawn wire.

Tie - An electrical connection or strap.

Tinned Conductor - A bare copper wire with a thin coating of tin, which acts as a separator between the copper and insulation, and facilitates soldering the wire to a terminating connection.

Tinned Wire - Copper wire, used for strapping or in switchboard cables, that has been coated or plated with a layer of metallic tin or solder to simplify soldering to terminals.

Tinsel Wire - A very flexible conductor made by serving one or more very small flat conductors over a fibrous core such as a high tenacity rayon, Nylon, Fortisan or cotton fibers.

Tip - 1) The first wire in a pair of wires. 2) That side of a two-wire telephone circuit connected to the positive side of a battery at the telephone company's central office. Comparable to the neutral side of a residential lighting circuit.

Tip Wire - First wire of a pair, the second of which is called the "ring."

Tolerance - A specified allowance in weighing, measuring, etc., for deviations from the standard dimensions or weight.

Toll Cable - Cable in which there is low capacitance quads or pairs for long distance voice frequency transmission.

Top Coat - Bare copper strands twisted and then tinned overall.

Torpedo - A streamlined metal block placed in the path of flow of the plastic material in the heating cylinder of the extruder to speed it into thin layers, thus forcing it into intimate contact with the heating areas.

Torque Test - A test designed to ascertain the stiffness of a material under given environmental conditions.

Total L/D Ratio - The distance from the rear edge of the feed opening to the forward end of the barrel bore divided by the bore diameter and expressed as a ratio wherein the diameter is reduced to 1, such as 15:1 or 20:1.

Tracer Pairs - In stripe paper and solid color pulp cables, a distinctively colored pair to provide easy identification at the two ends of the reel. Also called Talk Pairs.

Tracer Stripe - When more than one color-coding stripe is required, the first, or widest, stripe is the base stripe, the other, usually narrower stripes, are called tracer stripes.

Tractor Capstan - The motivating power for large cables consisting of a nip between two moving endless bolts which grip the cable.

Transducer- A device for converting mechanical energy to electrical energy.

Transfer Impedance - For a specified cable length, transfer impedance relates a current on one surface of a shield to the voltage drop generated by this current on the opposite surface of the shield. Transfer impedance is used to determine shield effectiveness against both ingress and egress of interfering signals. Cable shields are normally designed to reduce the transfer of interference, hence shields with lower transfer impedance are more effective than shields with higher transfer impedance.

Transformer - 1) An electrical device that changes voltage in direct proportion to currents and inverse proportion to the ratio of the number of turns of its primary and secondary windings. 2) An electrical device that reduces the voltage in electrical wiring to a low voltage in order to operate a dial light. It plugs into an electrical outlet and has externally located low voltage connections that are extended by inside wiring to the telephone set dial light.

Transmission Cables - Two or more transmission lines. If the structure is flat, it is sometimes called flat transmission cable to differentiate it from a round structure such as a jacketed group of coaxial cables. See Transmission Line.

Transmission Line - An arrangement of two or more conductors or a wave guide used to transfer signal energy from one location to another.

Transmission Loss - The decrease or loss in power during transmission of energy from one point to another. Usually expressed in dB.

Transmitter - The electronic package that converts electrical energy to light energy in a fiber optic system.

Tray - A cable tray system is a unit or assembly of units or sections and associated fittings made of metal or other noncombustible materials that forms a rigid structural system used to support cables. Cable tray systems (previously termed continuous rigid cable supports) include ladders, troughs, channels, solid bottom trays, and similar structures.

Tray Cable - A factory-assembled multiconductor control, signal and power cable specifically approved under the National Electrical Code for installation in trays.

Treeing - A term used to describe a deterioration phenomenon in solid dielectric insulations that form branch-like channels in the insulation wall. These channels or trees reduce the dielectric strength and impulse strength of the insulation, ultimately progressing to the point of electrical failure. All trees form at imperfections in cables, such as voids, contaminants, and protrusions from semiconducting conductor and insulation shield layers.

There are two basic types of trees: 1) electrical trees, which grow under high electrical stress in relatively short times, have measurable corona discharge and do not need the presence of water; and 2) electrochemical trees, commonly called water trees, which require a long period of time at relatively low stress to develop, no corona discharge can be measured, and the presence of water and imperfections in the cable are necessary.

Treeing has been a significant problem in the electric utility industry, which has thousands of miles of buried cables using a concentric neutral, non-jacketed cable design. This problem has not been significant in the industrial market where only a small portion of cables are used below grade and jacketed type cable designs are used rather than conventional concentric neutral cables. There are several ways to reduce the problems of treeing: 1) Reduce the level of imperfections in cable (voids, contaminants, protrusions), 2) Utilize water barriers on cables that will be used where water is present (lead sheath, overall jacket), and 3) Use insulations that are inherently more tree-retardant than others (EPR or TR-XLP rather than XLP).

Triad - A group of three insulated conductors twisted together with or without a sheath overall. Usually color coded for identification; also called a triplex.

Triax - A type of shielded conductor that employs a shield and jacket over the primary insulation plus a second shield and jacket overall. Aside from applications requiring maximum attenuation of radiated signals or minimum pickup of external interference, this cable can also be used to carry two separate signals.

Triaxial - Cable with three concentrically arranged conductors.

Triaxial Cable - A cable construction having three coincident axes, such as conductor, first shield and second shield, all insulated from one another.

Triboelectric Noise - Noise generated in a shielded cable due to variations in capacitance between the shield and conductor as the cable is flexed.

Triplex Cable - A cable having three insulated conductors twisted together without a sheath overall.

Trolley Wire - A round or shaped, solid, bare, hard conductor ordinarily used to supply current to motors through travelling current collectors located on the trolley.

True Concentric - A true concentric stranding or twisted cable is formed when each successive layer has a reversed direction of lay from the preceding layer.

GLOSSARY

Tru – Vol

Trunk Cable - See Feeder Cable.

Tubed - Term to describe a cable with a tube of material over the cable core, which is easily separable from the underlying construction.

Tubing - A tube of extruded non-supported plastic material.

Turbine - Converts stored energy in a source to generate electricity.

Turn-Key - A contractual arrangement in which one party designs and installs a system and another party will operate the system.

Twin Cable - A cable having two insulated conductors, laid parallel and with an overall protective sheath or jacket.

Twin Coaxial - A configuration containing two separate, complete coaxial cables laid parallel or twisted around each other.

Twin Conductor Cable - Varies with specification, but sometimes constructed as two conductors included in a circular core of dielectric material and covered overall with a shield and jacket.

Twin Line or Lead - A type of transmission line with solid insulating material, in which the two conductors are placed in parallel to each other and whose impedance is determined by the diameter and spacing of the conductors and the insulating material.

Twin-Lead - A transmission line with two parallel conductors separated by insulating material. Line impedance is determined by the diameter and spacing of the conductors and the insulating material, and is usually 300 ohms for television receiving antennas.

Twisted Pair - A cable composed of two small insulated conductors, twisted together without a common covering. The two conductors are usually substantially insulated and often color coded.

U

UL (Underwriters Laboratories) - An independent, nonprofit testing laboratory that establishes test procedures and provides a listing service for a wide variety of products including electrical wire and cable, which are recognized for use in accordance with the National Electrical Code (NEC).

UL Approved - Designates a product or device that has been inspected, tested and approved by Underwriters Laboratories. Cable will carry the UL trademark or an "E" listing number printed on the jacket to indicate UL approval.

Ultimate Strength - Term used to describe the maximum unit stress a material will withstand when subjected to an applied load in a compression, tension or shear test.

Ultraviolet Degradation - Caused by longtime exposure of a material to sunlight or other ultraviolet rays.

Unbalanced Line - Transmission line in which voltages on the two conductors are unequal with respect to ground or another pair of conductors.

Underground Cable - Cable installed below ground in conduits or ducts, usually terminating at certain intervals in manholes which allows easy placing, replacing or removal of the cables.

Underwriters Laboratories, Inc. - See UL.

Unidirectional Concentric Stranding - Each successive layer has a different lay length, thereby retaining a circular form without migration of strands from one layer to another.

Unidirectional Stranding - All layers in a stranded conductor have the same direction lay.

Unilay - A conductor with more than one layer of helically laid wires with the direction of lay and length of lay the same for all layers.

Unilay Stranding - A bunched construction having 19, 27, 37 or any number of strands in a concentric stranding.

Units - The grouping of twinned conductors used in forming a cable, usually 25 pairs. The units may be divided into such units of 12 and 13 pairs or 8 and 9 pairs.

V

Velocity of Propagation - The transmission speed of electrical energy in a length of cable compared to the speed of light. Usually expressed as a percentage.

Vertical Tray Flame Test - UL and IEEE test criteria for resistance to flame propagation of conductors or cables; employs a 70,000 BTU/hr flame source applied to the test specimen installed in a vertical cable.

VHF - Very high frequency. Designated by the Federal Communications Commission as the spectrum extending from 30 to 300 Mhz.

Video - Pertains to picture information in a television system.

Video Pair Cable - A transmission cable containing low-loss pairs with an impedance of 125 ohms. Used for TV pick-ups, closed circuit TV, telephone carrier circuits, etc.

Viscosity - A measure of the resistance of a fluid to flow.

VLF - Very low frequency. Designated by the Federal Communications Commission as the spectrum extending from 10 to 30 KHz.

VN-TC® - Brand-Rex trade name for its 90°C, 600-volt power and control cable designed for use in continuous rigid cable supports and in raceways.

Volt - A unit of electrical pressure. One volt is the electrical pressure that will cause an ampere of current to flow through one ohm of resistance.

Voltage - Electrical potential or electromotive force expressed in volts.

Voltage Breakdown - Test to determine maximum voltage of insulated wire before electrical current leakage through insulation.

Voltage Drop - The voltage developed across a component or conductor by the current flow through the resistance or impedance of the component or conductor.

Voltage Levels - Power limited: 0 to 300 V. Low voltage: 600 to 2 KV. Medium voltage: 5 to 35 KV. High voltage: greater than 35 KV.

Voltage Standing Wave Ratio - The ratio of the maximum effective voltage to the minimum effective voltage measured along the length of a mismatched radio frequency transmission line.

Volume Resistivity (Specific Insulation Resistance) - The electrical resistance between opposite faces of a 1 cm cube of insulating material, commonly expressed in ohms/centimeter.

Vulcanization - A chemical reaction in which the physical properties of an elastomer are changed by reaction with sulfur or other cross-linking agents.

VW-1 - A vertical flame test designation applying to single-conductor low voltage wires only. It is a modification of the standard industry vertical flame test using a Terrill burner, with restrictions added regarding reapplication of the burner until all flaming from previous application self-extinguishes. Also, cotton batting is placed beneath the specimen to check for dripping of flaming particles or other material. The test specimen is usually a size 14 AWG wire rated 600 V.

W

Wall Thickness - Term expressing the insulation/jacket layer thickness.

Water Absorption - Ratio of the weight of water absorbed by a material to the weight of the dry material.

Water Absorption Test - A method to determine the amount of water absorbed through an insulating material after a given immersion period.

Water Blocked Cable - A cable specially constructed with no interval voids in order to allow no longitudinal water passage under a given passage under a given pressure.

Watt (W) - A unit of electrical power; the power of one ampere of current pushed by one volt of electromotive force.

Waveguides - A transmission media that can expand capacity of channels for enormous pair gain by utilizing a circular metal tube through which high frequency radio waves travel. More than 200,000 voice channels have been transmitted simultaneously in prototype testing.

Wave Length (Fiber Optic) - The distance, measured in the direction of propagation, of a repetitive electrical pulse or waveform between two successive points that are characterized by the same phase of vibration.

Weight Resistivity - The resistance in ohms at a specified temperature of a body of uniform cross-section and of unit weight and unit length.

Welding - Joining the ends of two wires, rods or groups of wires by 1) fusing, using the application of heat or pressure or both, by means of a flame torch, electric arc or electric current; or 2) cold pressure.

Wetting - The ability of a material to absorb moisture.

Wicking - The longitudinal flow of a liquid in a wire or cable construction due to capillary action.

Width - Pertaining to flat cable, distance between edges of the cable.

Wire Wrapping Tools - Portable electric tools and automatic stationary machines used to make solder-free, wrapped connections of wires to terminals.

Working Life - The period of time during which a liquid resin of adhesive remains usable after mixing with a catalyst, solvent, or other compounding ingredients.

Working Voltage - The recommended maximum voltage of operation for an insulated conductor, usually set at approximately 1/3 of the breakdown voltage.

X

XLP - Term used for cross-linked polyethylene insulation, a popular polymeric type of insulation with outstanding electrical, moisture, and physical properties. XLP is generally physically tougher than EPR. Used in non-jacketed form on low voltage cables such as XHHW and RHH-RHW-USE. Also widely used on medium voltage power cables through 35 KV.

Y

Yield Strength - The minimum stress at which a material will start to physically deform without further increase in load. Below this stress, the material is elastic; above it, viscous.

Yield Value - See Yield Strength.

