KNOW YOUR OPTIONS: 230 KV POWER CABLES

CONDUCTOR MATERIAL AND SIZE

Conductor material is a matter of both customer preference and required current carrying capacity

- At 230 kV, copper is most common
- When both copper and aluminum conductors can meet your requirements, the more economical solution will be a function of the metal and the cable component costs

INSULATION THICKNESS

- For cables with a radial moisture barrier, “Southwire(SW) Standard Wall” reduced insulation thicknesses within AEIC specification CS9 are recommended
- For applications requiring smaller cable diameters, cables with reduced insulation thickness are available upon request within the stress limits in AEIC specification CS9

SHEATH MATERIAL

- Copper and aluminum corrugated sheaths offer the best mechanical and moisture protection for your HV cable, and copper will provide better short circuit performance and improved connectability
- Composite laminate sheaths in both copper and aluminum that offer excellent protection against moisture ingress

JACKET

- Standard outer jacket: extruded LLDPE with a co-extruded outer semi-conductive polyethylene layer for jacket integrity testing
- Halogen Free Fire Retardant (HFFR) compounds are available upon request for installations in cable trays and ventilated troughs

230 kV XLPE - Copper Conductor

SW STANDARD WALL XLPE COPPER CORRUGATED SHEATH

CABLE CONSTRUCTION

- Reverse Concentric Stranded Copper, Compressed Conductor or Milliken
- Super Smooth Conductor Shield
- Super Clean XLPE Insulation
- 850 mil XLPE minimum
- True Triple Extrusion and Dry Cured
- Firmly Bonded Insulation Shield
- Welded Copper Corrugated Sheath
- Polyethylene Jacket with Extruded Semi-Conductive Outer Layer

CABLE DATA	
Voltage Characteristics (kV)	
Max Voltage Rating	245
BIL Rating	1050
Temperatures (°C)	
Nominal Conductor	90
Max. Emergency Conductor	105
Short Circuit Conductor	250
Minimum Installation	-10
Design Characteristics	
Design Standards	AEIC, IEC
Typical Test Voltages	330 kV / 30 min.
XLPE Loss Factor	0.0005
Relative Permittivity	2.3

Conductor Size in kcmil[1]		1000	1250	1500	1750	2000	2500	3000	3500	4000
Dimensional	Nominal									
Conductor Diameter	in	1.12	1.25	1.37	1.48	1.61	1.76	1.92	2.08	2.21
	mm	28.5	31.8	34.8	37.6	40.9	44.7	48.8	52.8	56.1
Insulation Thickness	mils	900	900	890	880	870	850	850	850	850
	mm	22.9	22.9	22.6	22.4	22.1	21.6	21.6	21.6	21.6
Diameter over Insulation	in	3.04	3.17	3.27	3.36	3.44	3.66	3.82	3.98	4.11
	mm	77.2	80.5	83.1	85.3	87.5	93.0	97.1	101.0	104.4
Diameter over Sheath	in	3.61	3.76	3.87	3.98	4.06	4.31	4.49	4.66	4.80
	mm	91.7	95.5	98.4	101.0	103.1	109.4	113.9	118.3	121.9
Overall Jacket Diameter	in	3.89	4.04	4.15	4.26	4.34	4.59	4.77	4.94	5.08
	mm	98.8	120.6	105.5	108.1	110.3	116.6	121.1	125.4	129.0
Total Weight	lbs/ft	8.1	9.2	10.1	11.1	12.0	14.1	16.0	18.0	19.8
Min. Bending Radius (install/perm.)	in	78/58	81/61	83/62	85/64	87/65	92/69	95/71	99/74	102/76
Maximum Pulling Tension	lbs	8,000	10,000	12,000	14,000	16,000	20,000	24,000	28,000	32,000
Typical Shipping Reel Size										
Flange x Traverse	in	158x95	158x95	158x95	158x95	158x95	158x95	158x95	158x95	158x95
Shipping Reel Capacity[2]	ft	3,000	2,925	2,925	2,775	2,775	2,550	2,250	1,925	1,825
Electrical										
Electrical Stress @ U_o										
Conductor Shield	kV/mm	9.0	9.1	8.9	8.8	8.7	8.6	8.5	8.2	8.1
Insulation Shield	kV/mm	3.5	3.9	4.1	4.2	4.3	4.5	4.6	4.7	4.8
Short Circuit for 0.5s[3]										
Conductor	kA	102.5	128.1	153.8	179.4	205.0	256.3	307.5	358.8	410.0
Sheath	kA	45.3	47.1	48.5	49.8	50.9	54.0	56.2	58.3	60.2
Conductor Resistance										
DC @ 20° C	Ω/kft	0.011	0.008	0.007	0.006	0.005	0.004	0.004	0.003	0.003
DC @ 90° C	Ω/kft	0.014	0.011	0.009	0.008	0.007	0.005	0.005	0.004	0.003
Capacitance	pF/ft	43.4	46.4	49.6	52.5	55.3	62.4	66.2	69.8	73.0
Charging Current	Amps/ kft	2.17	2.32	2.48	2.63	2.77	3.12	3.31	3.49	3.65
Ampacity @ 90° C	per circuit									
Typical Single Ductbank[4]	Amps	850	950	1030	1100	1170	1372	1486	1579	1659
Power Rating	MVA	339	379	411	439	467	547	592	630	661
Typical Double Ductbank[4]	Amps	720	800	860	920	960	1137	1225	1296	1357
Power Rating	MVA	287	319	343	367	383	453	489	517	541

[1] 2500-4000 kcmil conductors are 5 segment Milliken conductors.
[2] Increased shipping reel capacity can be accommodated on request.
[3] Declared values for 30 mils copper sheath. Thicker sheath can accommodate more current.
[4] 4ft top of duct, 1°C-m/W native, 0.8°C-m/W ductbank backfill, 25°C Ambient, 75% lf, 9" spacing, single-point or cross bonded

230 kV XLPE - Aluminum Conductor

SW STANDARD WALL XLPE ALUMINUM CORRUGATED SHEATH

CABLE CONSTRUCTION

- Reverse Concentric Stranded Aluminum, Compressed Conductor
- Super Smooth Conductor Shield
- Super Clean XLPE Insulation
- 870 mil XLPE minimum
- True Triple Extrusion and Dry Cured
- Welded Aluminum Corrugated Sheath
- Polyethylene Jacket with Extruded Semi-Conductive Outer Layer
- Firmly Bonded Insulation Shield

CABLE DATA	
Voltage Characteristics (kV)	
Max Voltage Rating	245
BIL Rating	1050
Temperatures (°C)	
Nominal Conductor	90
Max. Emergency Conductor	105
Short Circuit Conductor	250
Minimum Installation	-10
Design Characteristics	
Design Standards	AEIC, IEC
Typical Test Voltages	330 kV / 30 min.
XLPE Loss Factor	0.0005
Relative Permittivity	2.3

Conductor Size in kcmil		1500	1750	2000	2500	3000
Dimensional	Nominal					
Conductor Diameter	in	1.38	1.49	1.61	1.76	1.92
	mm	35.0	37.8	40.9	44.7	48.8
Insulation Thickness	mils	890	880	870	850	850
	mm	22.6	22.4	22.1	21.6	21.6
Diameter over Insulation	in	3.27	3.36	3.44	3.66	3.82
	mm	83.1	85.3	87.5	93.0	97.1
Diameter over Sheath	in	3.99	4.09	4.18	4.43	4.61
	mm	101.3	104.0	106.2	112.5	117.1
Overall Jacket Diameter	in	4.27	4.37	4.46	4.71	4.89
	mm	108.4	111.0	113.3	119.6	124.2
Total Weight	lbs/ft	6.1	6.5	6.8	7.8	8.5
Min. Bending Radius (install/perm.) in	in	85/64	87/66	89/67	94/71	98/73
Maximum Pulling Tension	lbs	9,000	10,500	12,000	15,000	18,000
Typical Shipping Reel Size						
Flange x Traverse	in	158x95	158x95	158x95	158x95	158x95
Shipping Reel Capacity[1]	ft	2,750	2,800	2,625	2,505	1,940
Electrical						
Electrical Stress @ U_o						
Conductor Shield	kV/mm	8.9	8.8	8.7	8.6	8.5
Insulation Shield	kV/mm	4.1	4.2	4.3	4.5	4.6
Short Circuit for 0.5s[2]						
Conductor	kA	101.5	118.5	135.4	169.2	203.1
Sheath	kA	54.5	56	57.2	60.6	63.1
Conductor Resistance						
DC @ 20° C	Ω/kft	0.012	0.010	0.009	0.007	0.005
DC @ 90° C	Ω/kft	0.015	0.013	0.011	0.009	0.007
Capacitance	pF/ft	49.6	52.5	55.3	62.4	66.2
Charging Current	Amps/ kft	2.48	2.63	2.77	3.12	3.31
Ampacity @ 90° C	per circuit					
Typical Single Ductbank[3]	Amps	830	900	960	1072	1173
Power Rating	MVA	331	359	383	391	468
Typical Double Ductbank[3]	Amps	700	750	800	882	960
Power Rating	MVA	279	299	319	352	383

[1] Increased shipping reel capacity can be accommodated on request.
[2] Declared values for 50 mils aluminum sheath. Thicker sheath can accommodate more current.
[3] 4ft top of duct, 1°C-m/W native, 0.8°C-m/W ductbank backfill, 25°C Ambient, 75% lf, 9" spacing, single-point or cross bonded

230 kV XLPE – Copper Conductor

SW STANDARD WALL, COPPER NEUTRALS, COPPER COMPOSITE LAMINATE SHEATH

CABLE CONSTRUCTION

- Reverse Concentric Stranded Copper, Compressed Conductor or Milliken
- Super Smooth Conductor Shield
- Super Clean XLPE Insulation
- 850 mil XLPE minimum
- True Triple Extrusion and Dry Cured
- Firmly Bonded Insulation Shield
- Copper Neutrals with Copper Composite Laminate Sheath
- Polyethylene Jacket with Extruded Semi-Conductive Outer Layer

CABLE DATA	
Voltage Characteristics (kV)	
Max Voltage Rating	245
BIL Rating	1050
Temperatures (°C)	
Nominal Conductor	90
Max. Emergency Conductor	105
Short Circuit Conductor	250
Minimum Installation	-10
Design Characteristics	
Design Standards	AEIC, IEC
Typical Test Voltages	330 kV / 30 min.
XLPE Loss Factor	0.0005
Relative Permittivity	2.3

Conductor Size in kcmil[1]		1000	1250	1500	1750	2000	2500	3000	3500	4000
Dimensional	Nominal									
Conductor Diameter	in	1.12	1.25	1.37	1.48	1.61	1.76	1.92	2.08	2.21
	mm	28.5	31.8	34.8	37.6	40.9	44.7	48.8	52.8	56.1
Insulation Thickness	mils	900	900	890	880	870	850	850	850	850
	mm	22.9	22.9	22.6	22.4	22.1	21.6	21.6	21.6	21.6
Diameter over Insulation	in	3.04	3.17	3.27	3.36	3.44	3.66	3.82	3.98	4.11
	mm	77.1	80.5	83.1	85.3	87.5	93.0	97.1	101.0	104.4
Diameter over Sheath	in	3.42	3.56	3.66	3.75	3.83	4.07	4.23	4.39	4.52
	mm	86.9	90.3	92.8	95.1	97.2	103.4	107.5	111.4	114.8
Overall Jacket Diameter	in	3.74	3.89	3.98	4.07	4.15	4.39	4.55	4.71	4.84
	mm	95.0	98.8	101.0	103.3	105.4	111.5	115.6	119.5	123.0
Total Weight	lbs/ft	8.0	9.0	9.9	10.8	11.7	13.8	15.6	17.5	19.3
Min. Bending Radius (install/perm.)	in	75/56	78/58	80/60	81/61	83/62	88/66	91/68	94/71	97/73
Maximum Pulling Tension	lbs	8,000	10,000	12,000	14,000	16,000	20,000	24,000	28,000	32,000
Typical Shipping Reel Size										
Flange x Traverse	in	150x95	150x95	150x95	158x95	158x95	158x95	158x95	158x95	158x95
Shipping Reel Capacity[2]	ft	3,000	3,000	3,000	2,925	2,925	2,700	2,375	2,100	1,900
Electrical										
Electrical Stress @ U_o										
Conductor Shield	kV/mm	9.4	9.1	8.9	8.8	8.7	8.6	8.5	8.2	8.1
Insulation Shield	kV/mm	3.8	3.9	4.1	4.2	4.3	4.5	4.6	4.7	4.8
Short Circuit for 0.5s[3]										
Conductor	kA	102.5	128.1	153.8	179.4	205	256.3	307.5	358.8	410
Sheath	kA	44.5	44.9	45.1	45.3	45.6	46.2	46.6	47.0	47.4
Conductor Resistance										
DC @ 20° C	Ω/kft	0.011	0.008	0.007	0.006	0.005	0.004	0.004	0.003	0.003
DC @ 90° C	Ω/kft	0.014	0.011	0.009	0.008	0.007	0.005	0.005	0.004	0.003
Capacitance	pF/ft	43.4	46.4	49.6	52.5	55.3	62.4	66.2	69.8	73.0
Charging Current	Amps/kft	2.17	2.32	2.48	2.63	2.77	3.12	3.31	3.49	3.65
Ampacity @ 90° C	per circuit									
Typical Single Ductbank[4]	Amps	860	970	1050	1130	1200	1435	1507	1689	1794
Power Rating	MVA	343	387	419	451	479	572	601	673	715
Typical Double Ductbank[4]	Amps	730	810	880	940	1000	1189	1296	1389	1471
Power Rating	MVA	291	323	351	375	399	474	517	554	587

[1] 2500-4000 kcmil conductors are 5 segment Milliken conductors.
[2] Increased shipping reel capacity can be accommodated on request.
[3] Declared values for 80 x 14 AWG copper wire screen with 6 mil copper tape shield. Larger wires can accommodate more current.
[4] 4ft top of duct, 1°C-m/W native, 0.8°C-m/W ductbank backfill, 25°C Ambient, 75% lf, 9" spacing, single-point or cross bonded

230 kV XLPE – Aluminum Conductor

SW STANDARD WALL, COPPER NEUTRALS, ALUMINUM COMPOSITE LAMINATE SHEATH

CABLE CONSTRUCTION

- Reverse Concentric Stranded Aluminum, Compressed Conductor
- Super Smooth Conductor Shield
- Super Clean XLPE Insulation
- 870 mil XLPE minimum
- True Triple Extrusion and Dry Cured
- Firmly Bonded Insulation Shield
- Copper Neutrals with Aluminum Composite Laminate Sheath
- Polyethylene Jacket with Extruded Semi-Conductive Outer Layer

CABLE DATA	
Voltage Characteristics (kV)	
Max Voltage Rating	245
BIL Rating	1050
Temperatures (°C)	
Nominal Conductor	90
Max. Emergency Conductor	105
Short Circuit Conductor	250
Minimum Installation	-10
Design Characteristics	
Design Standards	AEIC, IEC
Typical Test Voltages	330 kV / 30 min.
XLPE Loss Factor	0.0005
Relative Permittivity	2.3

Conductor Size in kcmil		1500	1750	2000	2500	3000
Dimensional	Nominal					
Conductor Diameter	in	1.38	1.49	1.61	1.76	1.92
	mm	35.0	37.8	40.9	44.7	48.8
Insulation Thickness	mils	890	880	870	850	850
	mm	22.6	22.4	22.1	21.6	21.6
Diameter over Insulation	in	3.27	3.36	3.44	3.66	3.82
	mm	83.1	85.3	87.5	93.0	97.1
Diameter over Sheath	in	3.66	3.75	3.83	4.07	4.23
	mm	92.9	95.2	97.3	103.4	107.4
Overall Jacket Diameter	in	3.98	4.07	4.15	4.39	4.55
	mm	101.1	103.4	105.5	111.5	115.6
Total Weight	lbs/ft	6.5	6.9	7.2	8.1	8.9
Min. Bending Radius (install/perm.)	in	80/60	81/61	83/62	88/66	91/68
Maximum Pulling Tension	lbs	9,000	10,500	12,000	15,000	18,000
Typical Shipping Reel Size						
Flange x Traverse	in	150x95	158x95	158x95	158x95	158x95
Shipping Reel Capacity[1]	ft	3,000	2,925	2,925	2,700	2,650
Electrical						
Electrical Stress @ U_o						
Conductor Shield	kV/mm	8.9	8.8	8.7	8.6	8.5
Insulation Shield	kV/mm	4.1	4.2	4.3	4.5	4.6
Short Circuit for 0.5s[2]						
Conductor	kA	101.5	118.5	135.4	169.2	203.1
Sheath	kA	44.0	44.2	44.4	44.6	44.8
Conductor Resistance						
DC @ 20° C	Ω/kft	0.012	0.010	0.009	0.007	0.005
DC @ 90° C	Ω/kft	0.015	0.013	0.011	0.009	0.007
Capacitance	pF/ft	49.6	52.5	55.3	62.4	66.2
Charging Current	Amps/ kft	2.48	2.63	2.77	3.12	3.31
Ampacity @ 90° C	per circuit					
Typical Single Ductbank[3]	Amps	850	920	980	1113	1227
Power Rating	MVA	339	367	391	444	489
Typical Double Ductbank[3]	Amps	710	770	820	914	1003
Power Rating	MVA	283	307	327	365	400

[1] Increased shipping reel capacity can be accommodated on request.
[2] Declared values for 80 x 14 AWG copper wire screen with 8 mil aluminum tape shield. Larger wires can accommodate more current.
[3] 4ft top of duct, 1°C-m/W native, 0.8°C-m/W ductbank backfill, 25°C Ambient, 75% lf, 9" spacing, single-point or cross bonded