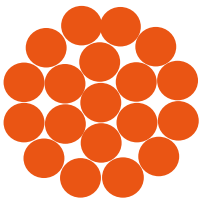
Reference

Stranded Conductor Standards



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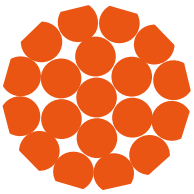

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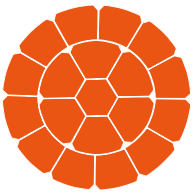

Compact

Conforms to:

ASTM B3

Soft or annealed copper wire

ASTM B8

Concentric lay stranded copper conductors Class B, C and D

ASTM B33

Tinned soft or annealed copper wire

ASTM B172

Rope lay stranded copper conductors having bunch stranded members Classes I, K and M

ASTM B173

Rope lay stranded copper conductors having concentric stranded members Classes G and H

ASTM B174

Bunch stranded copper conductors

ASTM B496

Compact round concentric lay stranded copper conductors

ASTM B 230

Standard Specification for Aluminum 1350-H19 Wire for Electrical Purposes

ASTM B 230M

Standard Specification for Aluminum 1350-H19 Wire for Electrical Purposes [Metric]

ASTM B 231

Standard Specification for Concentric-Lay-Stranded Aluminum 1350 Conductors

ASTM B 231 M

Standard Specification for Concentric-Lay-Stranded Aluminum 1350 Conductors [Metric]

Class B Conductors

AWG/kcmil	No./Strand Inch	Nominal Area kcmil	Nominal Area mm^2	Nominal Diameter Inch	Nominal Diameter mm	Nominal Weight Lbs/Kft	Nominal Weight kg/km
22	7/.0100	0.64	0.32	0.030	0.76	2.2	3.3
20	7/.0121	1.02	0.52	0.036	0.91	3.2	4.8
18	7/.0152	1.62	0.82	0.045	1.14	5.0	7.4
16	7/.0192	2.58	1.31	0.056	1.42	8.0	12
14	7/.0242	4.11	2.08	0.071	1.80	12.7	18.9
12	7/.0305	6.53	3.31	0.090	2.29	20.2	30.1
10	7/.0385	10.38	5.26	0.113	2.87	32.1	47.8
9	7/.0432	13.09	6.63	0.127	3.23	40.4	60.1
8	7/.0486	16.51	8.37	0.141	3.58	51.0	74.4
7	7/.0545	20.82	10.5	0.158	4.01	64.3	95.7
6	7/.0612	26.24	13.3	0.178	4.52	81.1	121
5	7/.0688	33.09	16.8	0.200	5.08	102	152
4	7/.0772	41.74	21.2	0.225	5.72	129	192
3	7/.0867	52.62	26.7	0.252	6.40	163	243
2	7/.0974	66.36	33.6	0.283	7.19	205	305
1	19/.0664	83.69	42.4	0.322	8.18	258	384
1/0	19/.0745	105.6	53.5	0.362	9.19	326	485
2/0	19/.0837	133.1	67.4	0.406	10.3	411	612
3/0	19/.0940	167.8	85.0	0.458	11.6	518	771
4/0	19/.1055	211.6	107	0.512	13.0	653	972
250	37/.0822	250	127	0.558	14.2	772	1150
262.6	—	—	—	—	—	—	—
300	37/.0900	300	152	0.611	15.5	926	1380
313.1	—	—	—	—	—	—	—
350	37/.0973	350	177	0.661	16.8	1080	1607
373.7	—	—	—	—	—	—	—
400	37/.1040	400	203	0.706	17.9	1235	1838
444.4	—	—	—	—	—	—	—
500	37/.1162	500	253	0.789	20.0	1544	2297
535.3	—	—	—	—	—	—	—
592	—	—	—	—	—	—	—
600	61/.0992	600	304	0.866	22.0	1853	2757
646.4	—	—	—	—	—	—	—
750	61/.1109	750	380	0.968	24.6	2316	3446
777.7	—	—	—	—	—	—	—
1000	61/.1280	1000	507	1.117	28.4	3088	4595
1111	—	—	—	—	—	—	—

Class C Conductors

AWG/kcmil	No./Strand Inch	Nominal Area kcmil	Nominal Area mm^2	Nominal Diameter Inch	Nominal Diameter mm	Nominal Weight Lbs/Kft	Nominal Weight kg/km
22	19/.0063	0.64	0.32	0.031	0.79	2.3	3.4
20	19/.0080	1.02	0.52	0.038	0.97	3.8	5.7
18	19/.0092	1.62	0.82	0.044	1.12	5.0	7.4
16	19/.0117	2.58	1.31	0.056	1.42	8.0	12
14	19/.0147	4.11	2.08	0.071	1.80	12.7	18.9
12	19/.0185	6.53	3.31	0.089	2.26	20.2	30.1
10	19/.0234	10.38	5.26	0.112	2.85	32.1	47.8
9	19/.0262	13.09	6.63	0.123	3.12	40.4	60.1
8	19/.0295	16.51	8.37	0.139	3.53	51.0	74.4
7	19/.0331	20.82	10.5	0.156	3.96	64.3	95.7
6	19/.0372	26.24	13.3	0.175	4.45	81.0	121
5	19/.0417	33.09	16.8	0.203	5.16	102	152
4	19/.0469	41.74	21.2	0.229	5.82	129	192
3	19/.0526	52.62	26.7	0.256	6.50	163	243
2	19/.0591	66.36	33.6	0.288	7.32	205	305
1	37/.0476	83.69	42.4	0.325	8.26	258	384
1/0	37/.0534	105.6	53.5	0.364	9.25	326	485
2/0	37/.0600	133.1	67.4	0.410	10.4	411	612
3/0	37/.0673	167.8	85.0	0.459	11.7	518	771
4/0	37/.0756	211.6	107	0.516	13.1	653	972
250	61/.0640	250	127	0.562	14.3	774	1150
262.6	—	—	—	—	—	—	—
300	61/.0701	300	152	0.615	15.6	927	1380
313.1	—	—	—	—	—	—	—
350	61/.0757	350	177	0.664	16.9	1082	1610
373.7	—	—	—	—	—	—	—
400	61/.0810	400	203	0.711	18.1	1235	1838
444.4	—	—	—	—	—	—	—
500	61/.0905	500	253	0.794	20.2	1545	2299
535.3	—	—	—	—	—	—	—
592	—	—	—	—	—	—	—
600	91/.0812	600	304	0.893	22.7	1853	2757
646.4	—	—	—	—	—	—	—
750	91/.0908	750	380	0.999	25.4	2316	3446
777.7	—	—	—	—	—	—	—
1000	91/.1048	1000	507	1.153	29..3	3088	4595
1111	—	—	—	—	—	—	—

Class I Conductors

AWG/kcmil	No./Strand Inch	Nominal Area kcmil	Nominal Area mm^2	Nominal Diameter Inch	Nominal Diameter mm	Nominal Weight Lbs/Kft	Nominal Weight kg/km
22	—	—	—	—	—	—	—
20	—	—	—	—	—	—	—
18	—	—	—	—	—	—	—
16	—	—	—	—	—	—	—
14	—	—	—	—	—	—	—
12	—	—	—	—	—	—	—
10	27/24	10.91	5.53	0.123	3.12	33.7	50
9	—	—	—	—	—	—	—
8	37/24	14.95	7.57	0.138	3.50	46.0	68
7	—	—	—	—	—	—	—
6	61/24	24.64	12.5	0.190	4.83	77	114
5	91/24	36.76	19	0.240	6.10	113	168
4	105/24	42.42	21	0.260	6.60	132	196
3	125/24	50.5	25	0.285	7.24	155	231
2	150/24	60.6	31	0.320	8.13	189	281
1	225/24	90.9	46	0.385	9.78	280	417
1/0	275/24	111.1	56	0.435	11.0	346	515
2/0	325/24	131.3	66	0.470	11.9	403	600
3/0	450/24	181.8	92	0.545	13.8	567	844
4/0	550/24	222.2	112	0.580	14.7	684	1018
250	—	—	—	—	—	—	—
262.6	650/24	262.6	133	0.652	16	820	1220
300	—	—	—	—	—	—	—
313.1	775/24	313.1	159	0.700	18	960	1428
350	—	—	—	—	—	—	—
373.7	925/24	373.7	189	0.760	19	1105	1644
400	—	—	—	—	—	—	—
444.4	1100/24	444.4	225	0.850	21	1370	2038
500	—	—	—	—	—	—	—
535.3	1325/24	535.3	271	0.940	24	1700	2530
592	1480/24	597.9	303	0.970	25	1835	2730
600	—	—	—	—	—	—	—
646.4	1600/24	646.4	327	1.040	26	1992	2964
750	—	—	—	—	—	—	—
777.7	1925/24	777.7	394	1.120	28	2390	3556
1000	—	—	—	—	—	—	—
1111	2750/24	1111	563	1.340	34	3400	5059

General description of the UL44 products

Type-letter designation	XHHW-2	XHHW	XHH	RHH	RHW-2	RHW
Maximum Temperature	90°C (194°F) wet or dry	75°C (167°F) wet 90°C (194°F) dry	90°C (194°F) dry	90°C (194°F) dry	90°C (194°F) wet or dry	75°C (167°F) wet or dry
Maximum Voltage	600			600 or 2000		
Conductor Size	14 AWG – 2000 kcmil					
Number of Conductors	One, 2 parallel, 2 or more cabled					
Conductor Metal	14 and 13 AWG – soft-annealed copper, 12 AWG – 2000 kcmil – aluminum, copper-clad aluminum, or soft-annealed copper					
Conductor – General	Metal coating Splices Separator					
Insulation Material(s)b	XL EPCV			SBR/IIR/NR CP CPE EPCV EP XL Silicone rubber (RHH only)		

Type-letter designation	SA	SIS
Maximum Temperature	90°C (194°F) dry 200°C (392°F) special dry	90°C (194°F) dry
Maximum Voltage	600	
Conductor Size	14 AWG – 2000 kcmil	14 – 4/0 AWG
Number of Conductors	One, 2 parallel, 2 or more cabled	
Conductor Metal	Soft-annealed copper	14, 13 AWG soft-annealed copper, 12 – 4/0 AWG – aluminum, copper-clad aluminum, or soft-annealed copper
Conductor – General	Metal coating Splices Separator	
Insulation Material(s)b	200°C silicone	CP CPE EPCV XL

General description of the UL83 products

Type-letter designation	**TW**	**THW**	**Insulated conductors for Type ACTH cable**	**THWN**
Maximum temperature	60°C (140°F) dry or wet	75°C (167°F) dry or wet	75°C (167°F) dry	75°C (167°F) dry or wet
Conductor size	14 AWG – 2000 kcmil		14 – 1 AWG	14 AWG – 1000 kcmil
Conductor metal	Soft-annealed copper for Nos. 14 and 13 AWG; aluminum, copper-clad aluminum, or soft-annealed copper for other sizes			
Conductor – general	Metal coating Splices Separator			
Insulation – materialc	PVC	PVC in one or two layers		PVCb,d
Insulation – general	Application Joints Other material Centering			
Physical properties of insulation	PVC			
Nylon jacket	None			yes

Type-letter designation	THW-2	THHW	THWN-2	THHN	Insulated conductors without a nylon jacket for Type ACTHH, NM-B, and NMC-B cables	Insulated conductors without a nylon jacket for Type UF-B cable
Maximum temperature	90°C (194°F) dry or wet	90°C (194°F) dry 75°C (167°F) wet	90°C (194°F) dry or wet	90°C (194°F) dry		90°C (194°F) dry 60°C (140°F) wet
Conductor size	14 AWG – 2000 kcmil	14 AWG – 1000 kcmil			14–1AWG	14 – 6 AWG
Conductor metal	Soft-annealed copper for Nos.14 and 13 AWG; aluminum, copper-clad aluminum, or soft-annealed copper for other sizes					
Conductor – general	Metal coating Splices Separator					
Insulation – materialc	PVC in one or two layers	PVC		PVCb,d	PVCd	PVC
Insulation – general	Application Joints Other material Centering					

Thicknesses of insulation on Type SA wire

Size of conductor	Minimum average thickness Inch/mm		Minimum thickness at any point Inch/mm		Minimum average thickness Inch/mm		Minimum thickness at any point Inch/mm	
AWG								
14 – 10	0.045	1.14	0.040	1.02	0.045	1.14	0.040	1.02
9 – 2	0.060	1.52	0.054	1.37	0.060	1.52	0.054	1.37
1 – 4/0	0.080	2.03	0.072	1.83	0.080	2.03	0.072	1.83
kcmil								
213 – 500	0.095	2.41	0.086	2.18	0.095	2.41	0.086	2.18
501 – 1000	0.110	2.79	0.099	2.51	0.110	2.79	0.099	2.51
1001 – 2000	0.125	3.18	0.112	2.84	0.125	3.18	0.112	2.84

Thicknesses of insulation on Type SIS wire

Size of conductor	Minimum average thickness Inch/mm		Minimum thickness at any point Inch/mm		Minimum average thickness Inch/mm		Minimum thickness at any point Inch/mm	
AWG								
14 – 10	0.030	0.76	0.027	0.69	0.030	0.76	0.027	0.69
9 – 2	0.045	1.14	0.040	1.02	0.045	1.14	0.040	1.02
1 – 4/0	0.055	1.40	0.050	1.27	0.055	1.40	0.050	1.27

Thicknesses of insulation on Type XHHW-2, XHHW, and XHH wires

Size of conductor	Minimum average thickness Inch/mm		Minimum thickness at any point Inch/mm		Minimum average thickness Inch/mm		Minimum thickness at any point Inch/mm	
AWG								
14 – 10	0.030	0.76	0.027	0.69	0.030	0.76	0.027	0.69
9 – 2	0.045	1.14	0.040	1.02	0.045	1.14	0.040	1.02
1 – 4/0	0.055	1.40	0.050	1.27	0.055	1.40	0.050	1.27
kcmil								
213 – 500	0.065	1.65	0.058	1.47	0.065	1.65	0.058	1.47
501 – 1000	0.080	2.03	0.072	1.83	0.080	2.03	0.072	1.83
1001 – 2000	0.095	2.41	0.086	2.18	0.095	2.41	0.086	2.18

Thicknesses of insulation on 600V Type RHW-2, RHH, and RHW wires

Size of conductor	Wire with insulation consisting of Class SBR/IIR/NR under a neoprene, NBR/PVC, CPE or CP jacket or a fibrous covering and wire with insulation consisting of silicone rubber (RHH only) or EP under a neoprene, NBR/PVC, CPE, or CP jacket or a fibrous covering and wire with insulation consisting of Class CP, CPE, or XL or EPCV under no covering				Wire with composite insulation consisting of a layer of CP, CPE, EPCV, or XL over a layer of EP without any outer covering											
					Inner Layer – EP						Outer Layer – CP, CPE, EPCV, or XL					
	Minimum thickness				Minimum thickness						Minimum thickness					
	mils mm				mils mm						mils mm					
	Average At any point		Average At any point		Average At any point			Average At any point			Average At any point			Average At any point		
						A	B		A	B		A	B		A	B
AWG																
14 – 10	45	40	1.14	1.02	30	27	28	0.76	0.69	0.71	15	14	12	0.38	0.36	0.30
9, 8, 7	60	54	1.52	1.37	45	40	42	1.14	1.02	1.07	15	14	12	0.38	0.36	0.30
6 – 2	60	54	1.52	1.37	45	40	44	1.14	1.02	1.12	0	27	24	0.76	0.69	0.61
1 – 4/0	80	72	2.03	1.83	55	50	54	1.40	1.27	1.37	45	40	36	1.14	1.02	0.91
kcmil																
213 – 500	95	86	2.41	2.18	65	8	65	1.65	1.47	1.65	65	58	52	1.65	1.47	1.32
501 – 1000	110	99	2.79	2.51	80	72	78	2.03	1.83	1.98	65	58	52	1.65	1.47	1.32
1001 – 2000	125	112	3.18	2.84	–	–	–	–	–	–	–	–	–	–	–	–

a The minimum thickness at any point shall not be less than indicated in column A or B under Inner Layer with the minimum thickness at any point not less than indicated in the corresponding column A or B under Outer Layer. The thickness in column B under Inner Layer plus the thickness in Column B under Outer Layer equals 90 percent of the sum of the average thicknesses indicated under Inner Layer and Outer Layer.

Thicknesses of insulation on 2000 V Type RHW-2, RHH, and RHW wires

Size of conductor	Wire with insulation consisting of silicone rubber (RHH only) or EP under a neoprene, NBR/PVC, CPE, or CP jacket or a fibrous covering and wire with insulation consisting of Class XL or EPCV under no covering				Wire with insulation consisting of CP or CPE under no covering and wire with insulation consisting of Class SBR/IIR/NR under a neoprene, NBR/PVC, CPE, or CP jacket or a fibrous covering				Wire with composite insulation consisting of a layer of CP, CPE, EPCV, or XL over a layer of EP without any outer covering											
									Inner Layer – EP						Outer Layer – CP, CPE, EPCV, or XL					
	Minimum thickness								Minimum thickness						Minimum thickness					
	mils mm				mils mm				mils mm						mils mm					
	Avg. At any point		Avg. At any point		Avg. At any point		Avg. At any point		Avg. At any point			Avg. At any point			Avg. At any point			Avg. At any point		
										A	B		A	B		A	B		A	B
AWG																				
14 – 10	60	54	1.52	1.37	80	72	2.03	1.83	45	40	42	1.14	1.02	1.07	15	14	12	0.38	0.36	0.30
9	70	63	1.78	1.60	80	72	2.03	1.83	55	50	51	1.40	1.27	1.30	15	14	12	0.38	0.36	0.30
8, 7	70	63	1.78	1.60	80	72	2.03	1.83	55	50	52	1.40	1.27	1.32	30	27	24	0.76	0.69	.61
6 – 2	70	63	1.78	1.60	95	86	2.41	2.18	55	50	52	1.40	1.27	1.32	30	27	24	0.76	0.69	0.61
1 – 4/0	90	81	2.29	2.06	110	99	2.79	2.51	65	58	63	1.65	1.47	1.60	45	40	36	1.14	1.02	0.91
kcmil																				
213 – 500	105	94	2.67	2.39	125	112	3.18	2.84	75	68	74	1.90	1.73	1.88	65	58	52	1.65	1.47	1.32
501 – 1000	120	108	3.05	2.74	140	126	3.56	3.20	90	81	88	2.29	2.06	2.24	65	58	52	1.65	1.47	1.32
1001 – 2000	140	126	3.56	3.20	140	126	3.56	3.20	115	104	113	2.92	2.64	2.87	95	85	76	2.41	2.16	1.93

a The minimum thickness at any point shall not be less than indicated in Column A or B under Inner Layer with the minimum thickness at any point not less than indicated in the corresponding Column A or B under Outer Layer. The thickness in Column B under EP plus the thickness in Column B under Outer Layer equals 90 percent of the sum of the average thicknesses indicated under Inner Layer and Outer Layer.

Thicknesses of jacket on single-conductor wires and cables

Size of conductor	600-V wires and cables				2000–V Wires and Cables			
	mils		mm		mils		mm	
	Minimum average thickness	Minimum thickness at any point	Minimum average thickness	Minimum thickness at any point	Minimum average thickness	Minimum thickness at any point	Minimum average thickness	Minimum thickness at any point
AWG								
14 – 12	15	12	0.38	0.30	15	12	0.38	0.30
11, 10	15	12	0.38	0.30	30	24	0.76	0.61
9 – 3	30	24	0.76	0.61	30	24	0.76	0.61
2	30	24	0.76	0.61	45	36	1.14	0.91
1 – 3/0	45	36	1.14	0.91	45	36	1.14	0.91
4/0	45	36	1.14	0.91	65	52	1.65	1.32
kcmil								
213 – 1000	65	52	1.65	1.32	65	52	1.65	1.32
1001 – 2000	95	76	2.41	1.93	95	76	2.41	1.93

Thicknesses of insulation and jacket on Type THWN-2, THHN, and THWN wires

Conductor size	Minimum thicknesses					
	PVC insulation				At any point of nylon jacket	
	Average		At any point			
	mils	mm	mils	mm	mils	mm
AWG						
14–12	15	0.38	13	0.33	4	0.10
11,10	20	0.51	18	0.46	4	0.10
9–5	30	0.76	27	0.69	5	0.13
4–2	40	1.02	36	0.91	6	0.15
1–4/0	50	1.27	45	1.14	7	0.18
kcmil						
213–500	60	1.52	54	1.37	8	0.20
501–1000	70	1.78	63	1.60	9	0.23