

Appendix A

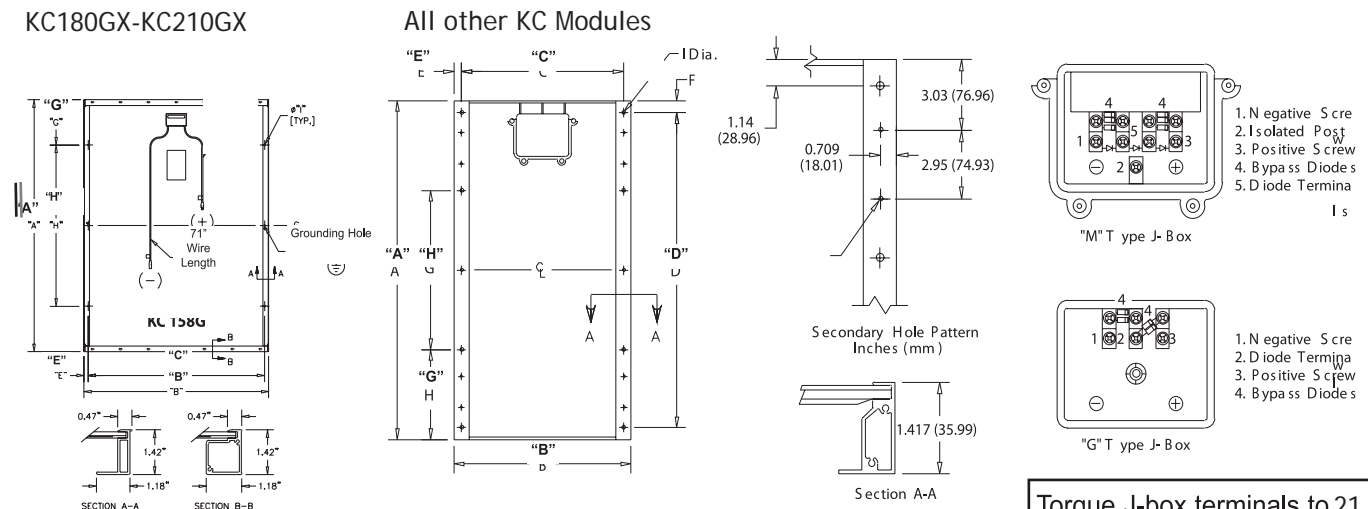
Kyocera Solar Mounting Hole Location

Model	Dim. A	Dim. B	Dim. C	Dim. D	Dim. E
KD210GX-LP	59.1 / 1499.0	39.0 / 990.0	37.24 / 945.9	-	0.87 / 22.1
KD205GX-LP	59.1 / 1499.0	39.0 / 990.0	37.24 / 945.9	-	0.87 / 22.1
KD180GX-LP	52.8 / 1341.0	39.0 / 990.0	37.24 / 945.9	-	0.87 / 22.1
KD135SX-LP KD135GX-LP	59.1 / 1499.0	26.3 / 668.0	24.6 / 624.0	-	0.87 / 22.1
KC130TM	56.0 / 1425.0	25.67 / 652.0	24.13 / 613.0	53.82 / 1367.0	0.77 / 20.0
KC85T/TS	39.65 / 1007.0	25.67 / 652.0	24.13 / 613.0	37.36 / 949.0	0.77 / 20.0
KC65T	29.57 / 751.0	25.67 / 652.0	24.13 / 613.0	27.28 / 693.0	0.77 / 20.0
KC50T	25.16 / 639.0	25.67 / 652.0	24.13 / 613.0	22.87 / 581.0	0.77 / 20.0
KC40T	20.7 / 526.0	25.67 / 652.0	24.13 / 613.0	18.43 / 468.0	0.77 / 20.0

Dimensions shown in inches / millimeters

Model	Dim. F	Dim. G	Dim. H	J-Box/Connection
KD210GX-LP	-	11.0 / 278.5	37.12 / 942.0	MC
KD205GX-LP	-	11.0 / 278.5	37.12 / 942.0	MC
KD180GX-LP	-	10.2 / 259.0	32.48 / 825.0	MC
KD135SX-LP KD135GX-LP	-	11.0 / 278.5	37.12 / 942.0	M/MC
KC130TM	1.14 / 29.0	9.48 / 240.0	37.12 / 942.0	M
KC85T/TS	1.14 / 29.0	9.48 / 240.0	20.67 / 525.0	M
KC65T	1.14 / 29.0	9.48 / 240.0	10.6 / 270.0	G
KC50T	1.14 / 29.0	6.0 / 152.0	13.19 / 335.0	G
KC40T	1.14 / 29.0	6.0 / 152.0	8.74 / 222.0	G

Dimensions shown in inches / millimeters



Torque J-box terminals to 21 inch pounds (25 kg-cm)

Kyocera Solar Modules Standard Packaging Details

Model	KD205/210GX-LP	KC180GX-LP	KD135GX-LP	KC130TM
Module Quantity Per Carton	2	2	2	2
Carton Size (in.) (L x W x D)	64 x 44 x 4	55 x 44 x 4	64 x 29 x 3.5	60 x 28 x 3.5
Carton Size (cm) (L x W x D)	163 x 112 x 10	138 x 110 x 9	163 x 74 x 9	153 x 71 x 9
Carton Gross Weight (lbs./kg)	94.0 / 43.0	80.0 / 36.3	65.5 / 30.0	69.0 / 31.2
Number of Cartons per Pallet	10	10	10	10
Number of Modules per Pallet	20	20	20	20
Maximum Pallet Dimensions (in.) (LxWxD)	64 x 44 x 40	56 x 44 x 40	64 x 29 x 40	60 x 28 x 39
Maximum Pallet Area (ft ³ /m ³)	78.2 / 2.2	68.4 / 1.94	51.5 / 1.46	45.5 / 1.3
Gross Weight of Max. Pallet (lbs. kg)	940 / 426	844 / 385	655 / 297	690 / 312
Number of Modules per 20' Container	240	320	360	400
Number of Modules per 40' Container	560	640	840	880

Model	KC85T	KC65T	KC50T	KC40T
Module Quantity Per Carton	2	2	2	2
Carton Size (in.) (L x W x D)	43 x 28 x 3.5	34 x 28 x 3.5	28 x 30 x 4	25 x 28 x 4
Carton Size (cm) (L x W x D)	109 x 71 x 9	86 x 71 x 9	71 x 76 x 9	64 x 71 x 9
Carton Gross Weight (lbs./kg)	48.0 / 21.7	32.0 / 14.5	25.0 / 11.3	23.0 / 10.5
Number of Cartons per Pallet	20	20	20	20
Number of Modules per Pallet	40	40	40	40
Maximum Pallet Dimensions (in.) (LxWxD)	59 x 43 x 39	55 x 43 x 39	28 x 58 x 39	26 x 50 x 39
Maximum Pallet Area (ft ³ /m ³)	57.0 / 1.62	53.0 / 1.5	33.6 / 1.0	33.6 / 1.0
Gross Weight of Max. Pallet (lbs. kg)	900 / 408	662 / 301	575 / 261	475 / 197
Number of Modules per 20' Container	560	560	960	520
Number of Modules per 40' Container	1280	1280	2000	1080

1 All Kyocera KC series solar modules are supplied with bypass diodes installed inside of the junction box. Bypass diodes are installed across eighteen series cells, accomplished by the diode terminal in the J-Box. This diode terminal is not usable for interconnection wiring between modules. KC85T and KC130TM modules include an isolated post inside the J-Box for parallel splicing wiring from adjacent modules.

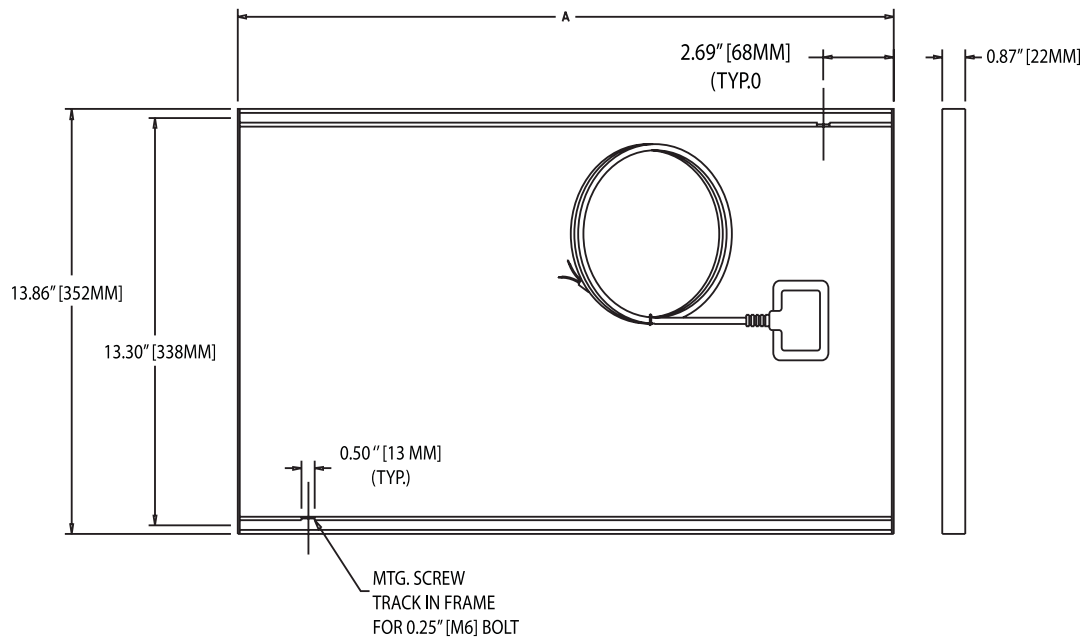
2 'M' style junction box standard with KC85T and KC130TM solar modules. 'G' style junction box standard with KC40T, KC50T and KC65T modules. Multi-contact connectors used on KD135GX-LP, KD180GX-LP & KD205GX-LP. All Kyocera solar modules have one opening in the junction box for wiring purposes. In some cases, wiring multiple solar modules together may result in one module with a remaining opening in the J-Box. A sealing hole plug may be required.

Solartec KS Module

Mounting Hole Location



Dimensions show in Inches / millimeters



Model	Dim. A
KS 40	40.0 / 990.0
KS 20	20.50 / 520.0
KS 10	12.00 / 304.0
KS 5	8.10 / 205.0

Solartec KS Modules Standard Packaging Details

Model	KS 40	KD 20	KS 10	KS 5
Module Quantity Per Carton	2	1	1	1
Carton Size (in.) (L x W x D)	41.7 x 14.6 x 3.3	21.25 x 15 x 1.6	12.2 x 15 x 1.6	8.5 x 15 x 1.6
Carton Size (cm) (L x W x D)	106 x 37 x 8.5	54 x 36.5 x 4	31.0 x 36.5 x 4	21.5 x 36.5 x 4
Carton Gross Weight (lbs./kg)	25.4 / 11.5	6.00 / 2.7	4.30 / 1.95	2.87 / 1.30
Number of Cartons per Pallet		90	150	240
Number of Modules per Pallet		90	150	240
Maximum Pallet Dimensions (in.) (L X W x D)		43.3 x 43.3 x 33.5	39.4 x 39.4 x 35.4	43.3 x 43.3 x 35.4
Maximum Pallet Area (ft ³ /m ³)		36.33 / 1.03	31.78 / 0.90	38.46 / 1.09
Gross Weight of Max. Pallet (lbs./ kg)		1190.0 / 540.0	645.0 / 292.5	688.0 / 312.0
Number of Modules per 20' Container		1800	3000	4800
Number of Modules per 40' Container		2000	6000	9600

Appendix B

Wire Sizing Tables

Use these tables to determine the appropriate wire size for charging circuits in your PV power system. These tables will show you the maximum one way wire distance the conductor will pass current at the rated voltage drop. Resistance in wiring has been calculated for the round trip based on one way distance. Cross-reference by wire gauge and current (amps) to find length. For example, on the 48V table, 30A with #6 wire will run a maximum distance of 81.5 feet. This is based on 5% voltage drop and maximum temperature of 75°C.

R=Resistance in Ohms per 1000 feet of wire.

System Voltage: 48V

Voltage Drop: 5.00%

Temperature (°C): 75

R 3.14 1.98 1.24 0.778 0.491 0.308 0.245 0.194 0.154 0.122 0.0967 0.0766 0.0608 0.0515

Wire Gauge														
Amps	#14	#12	#10	#8	#6	#4	#3	#2	#1	#1/0	#2/0	#3/0	#4/0	250MCM
1.00	382.17	606.06	967.74	1542.42	2443.99	3896.10	4897.96	6185.57	7792.21	9836.07	12409.51	15665.80	19736.84	23300.97
2.00	191.08	303.03	483.87	771.21	1222.00	1948.05	2448.98	3092.78	3896.10	4918.03	6204.76	7832.90	9868.42	11650.49
4.00	95.54	151.52	241.94	385.60	611.00	974.03	1224.49	1546.39	1948.05	2459.02	3102.38	3916.45	4934.21	5825.24
6.00	63.69	101.01	161.29	257.07	407.33	649.35	816.33	1030.93	1298.70	1639.34	2068.25	2610.97	3289.47	3883.50
8.00	47.77	75.76	120.97	192.80	305.50	487.01	612.24	773.20	974.03	1229.51	1551.19	1958.22	2467.11	2912.62
10.00	38.22	60.61	96.77	154.24	244.40	389.61	489.80	618.56	779.22	983.61	1240.95	1566.58	1973.68	2330.10
12.00	31.85	50.51	80.65	128.53	203.67	324.68	408.16	515.46	649.35	819.67	1034.13	1305.48	1644.74	1941.75
14.00	27.30	43.29	69.12	110.17	174.57	278.29	349.85	441.83	556.59	702.58	886.39	1118.99	1409.77	1664.36
16.00	23.89	37.88	60.48	96.40	152.75	243.51	306.12	386.60	487.01	614.75	775.59	979.11	1233.55	1456.31
18.00	21.23	33.67	53.76	85.69	135.78	216.45	272.11	343.64	432.90	546.45	689.42	870.32	1096.49	1294.50
20.00	19.11	30.30	48.39	77.12	122.20	194.81	244.90	309.28	389.61	491.80	620.48	783.29	986.84	1165.0
25.00	15.29	24.24	38.71	61.70	97.76	155.84	195.92	247.42	311.69	393.44	496.38	626.63	789.47	932.04
30.00	12.74	20.20	32.26	51.41	81.47	129.87	163.27	206.19	259.74	327.87	413.65	522.19	657.89	776.70
35.00	10.92	17.32	27.65	44.07	69.83	111.32	139.94	176.73	222.63	281.03	354.56	447.59	563.91	665.74
40.00	9.55	15.15	24.19	38.56	61.10	97.40	122.45	154.64	194.81	245.90	310.24	391.64	493.42	582.52
45.00	8.49	13.47	21.51	34.28	54.31	86.58	108.84	137.46	173.16	218.58	275.77	348.13	438.60	517.80
50.00	7.64	12.12	19.35	30.85	48.88	77.92	97.96	123.71	155.84	196.72	248.19	313.32	394.74	466.02
55.00	6.95	11.02	17.60	28.04	44.44	70.84	89.05	112.46	141.68	178.84	225.63	284.83	358.85	423.65
60.00	6.37	10.10	16.13	25.71	40.73	64.94	81.63	103.09	129.87	163.93	206.83	261.10	328.95	388.35
65.00	5.88	9.32	14.89	23.73	37.60	59.94	75.35	95.16	119.88	151.32	190.92	241.01	303.64	358.48
70.00	5.46	8.66	13.82	22.03	34.91	55.66	69.97	88.37	111.32	140.52	177.28	223.80	281.95	332.87
75.00	5.10	8.08	12.90	20.57	32.59	51.95	65.31	82.47	103.90	131.15	165.46	208.88	263.16	310.68
80.00	4.78	7.58	12.10	19.28	30.55	48.70	61.22	77.32	97.40	122.95	155.12	195.82	246.71	291.26
85.00	4.50	7.13	11.39	18.15	28.75	45.84	57.62	72.77	91.67	115.72	145.99	184.30	232.20	274.13
90.00	4.25	6.73	10.75	17.14	27.16	43.29	54.42	68.73	86.58	109.29	137.88	174.06	219.30	258.90
95.00	4.02	6.38	10.19	16.24	25.73	41.01	51.56	65.11	82.02	103.54	130.63	164.90	207.76	245.27
100.00	3.82	6.06	9.68	15.42	24.44	38.96	48.98	61.86	77.92	98.36	124.10	156.66	197.37	233.01
125.00	3.06	4.85	7.74	12.34	19.55	31.17	39.18	49.48	62.34	78.69	99.28	125.33	157.89	186.41
150.00	2.55	4.04	6.45	10.28	16.29	25.97	32.65	41.24	51.95	65.57	82.73	104.44	131.58	155.34
175.00	2.18	3.46	5.53	8.81	13.97	22.26	27.99	35.35	44.53	56.21	70.91	89.52	112.78	133.15
200.00	1.91	3.03	4.84	7.71	12.22	19.48	24.49	30.93	38.96	49.18	62.05	78.33	98.68	116.50
225.00	1.70	2.69	4.30	6.86	10.86	17.32	21.77	27.49	34.63	43.72	55.15	69.63	87.72	103.56
250.00	1.53	2.42	3.87	6.17	9.78	15.58	19.59	24.74	31.17	39.34	49.64	62.66	78.95	93.20
275.00	1.39	2.20	3.52	5.61	8.89	14.17	17.81	22.49	28.34	35.77	45.13	56.97	71.77	84.73
300.00	1.27	2.02	3.23	5.14	8.15	12.99	16.33	20.62	25.97	32.79	41.37	52.22	65.79	77.67
400.00	0.96	1.52	2.42	3.86	6.11	9.74	12.24	15.46	19.48	24.59	31.02	39.16	49.34	58.25

Appendix B

Wire Sizing Tables

Use these tables to determine the appropriate wire size for charging circuits in your PV power system. These tables will show you the maximum one way wire distance the conductor will pass current at the rated voltage drop. Resistance in wiring has been calculated for the round trip based on one way distance. Cross-reference by wire gauge and current (amps) to find length. For example, on the 24V table, 30A with #6 wire will run a maximum distance of 32.5 feet. This is based on 4% voltage drop and maximum temperature of 75°C. R=Resistance in Ohms per 1000 feet of wire.

System Voltage: 24V

Voltage Drop: 4.00%

Temperature (°C): 75

R 3.14 1.98 1.24 0.778 0.491 0.308 0.245 0.194 0.154 0.122 0.0967 0.0766 0.0608 0.0515

Wire Gauge														
Amps	#14	#12	#10	#8	#6	#4	#3	#2	#1	#1/0	#2/0	#3/0	#4/0	250MCM
1.00	152.87	242.42	387.10	616.97	977.60	1558.44	1959.18	2474.23	3116.88	3934.43	4963.81	6266.32	7894.74	9320.39
2.00	76.43	121.21	193.55	308.48	488.80	779.22	979.59	1237.11	1558.44	1967.21	2481.90	3133.16	3947.37	4660.19
4.00	38.22	60.61	96.77	154.24	244.40	389.61	489.80	618.56	779.22	983.61	1240.95	1566.58	1973.68	2330.10
6.00	25.48	40.40	64.52	102.83	162.93	259.74	326.53	412.37	519.48	655.74	827.30	1044.39	1315.79	1553.40
8.00	19.11	30.30	48.39	77.12	122.20	194.81	244.90	309.28	389.61	491.80	620.48	783.29	986.84	1165.05
10.00	15.29	24.24	38.71	61.70	97.76	155.84	195.92	247.42	311.69	393.44	496.38	626.63	789.47	932.04
12.00	12.74	20.20	32.26	51.41	81.47	129.87	163.27	206.19	259.74	327.87	413.65	522.19	657.89	776.70
14.00	10.92	17.32	27.65	44.07	69.83	111.32	139.94	176.73	222.63	281.03	354.56	447.59	563.91	665.74
16.00	9.55	15.15	24.19	38.56	61.10	97.40	122.45	154.64	194.81	245.90	310.24	391.64	493.42	582.52
18.00	8.49	13.47	21.51	34.28	54.31	86.58	108.84	137.46	173.16	218.58	275.77	348.13	438.60	517.80
20.00	7.64	12.12	19.35	30.85	48.88	77.92	97.96	123.71	155.84	196.72	248.19	313.32	394.74	466.02
25.00	6.11	9.70	15.48	24.68	39.10	62.34	78.37	98.97	124.68	157.38	198.55	250.65	315.79	372.82
30.00	5.10	8.08	12.90	20.57	32.59	51.95	65.31	82.47	103.90	131.15	165.46	208.88	263.16	310.68
35.00	4.37	6.93	11.06	17.63	27.93	44.53	55.98	70.69	89.05	112.41	141.82	179.04	225.56	266.30
40.00	3.82	6.06	9.68	15.42	24.44	38.96	48.98	61.86	77.92	98.36	124.10	156.66	197.37	233.01
45.00	3.40	5.39	8.60	13.71	21.72	34.63	43.54	54.98	69.26	87.43	110.31	139.25	175.44	207.12
50.00	3.06	4.85	7.74	12.34	19.55	31.17	39.18	49.48	62.34	78.69	99.28	125.33	157.89	186.41
55.00	2.78	4.41	7.04	11.22	17.77	28.34	35.62	44.99	56.67	71.54	90.25	113.93	143.54	169.46
60.00	2.55	4.04	6.45	10.28	16.29	25.97	32.65	41.24	51.95	65.57	82.73	104.44	131.58	155.34
65.00	2.35	3.73	5.96	9.49	15.04	23.98	30.14	38.07	47.95	60.53	76.37	96.40	121.46	143.39
70.00	2.18	3.46	5.53	8.81	13.97	22.26	27.99	35.35	44.53	56.21	70.91	89.52	112.78	133.15
75.00	2.04	3.23	5.16	8.23	13.03	20.78	26.12	32.99	41.56	52.46	66.18	83.55	105.26	124.27
80.00	1.91	3.03	4.84	7.71	12.22	19.48	24.49	30.93	38.96	49.18	62.05	78.33	98.68	116.50
85.00	1.80	2.85	4.55	7.26	11.50	18.33	23.05	29.11	36.67	46.29	58.40	73.72	92.88	109.65
90.00	1.70	2.69	4.30	6.86	10.86	17.32	21.77	27.49	34.63	43.72	55.15	69.63	87.72	103.56
95.00	1.61	2.55	4.07	6.49	10.29	16.40	20.62	26.04	32.81	41.42	52.25	65.96	83.10	98.11
100.00	1.53	2.42	3.87	6.17	9.78	15.58	19.59	24.74	31.17	39.34	49.64	62.66	78.95	93.20
125.00	1.22	1.94	3.10	4.94	7.82	12.47	15.67	19.79	24.94	31.48	39.71	50.13	63.16	74.56
150.00	1.02	1.62	2.58	4.11	6.52	10.39	13.06	16.49	20.78	26.23	33.09	41.78	52.63	62.14
175.00	0.87	1.39	2.21	3.53	5.59	8.91	11.20	14.14	17.81	22.48	28.36	35.81	45.11	53.26
200.00	0.76	1.21	1.94	3.08	4.89	7.79	9.80	12.37	15.58	19.67	24.82	31.33	39.47	46.60
225.00	0.68	1.08	1.72	2.74	4.34	6.93	8.71	11.00	13.85	17.49	22.06	27.85	35.09	41.42
250.00	0.61	0.97	1.55	2.47	3.91	6.23	7.84	9.90	12.47	15.74	19.86	25.07	31.58	37.28
275.00	0.56	0.88	1.41	2.24	3.55	5.67	7.12	9.00	11.33	14.31	18.05	22.79	28.71	33.89
300.00	0.51	0.81	1.29	2.06	3.26	5.19	6.53	8.25	10.39	13.11	16.55	20.89	26.32	31.07
400.00	0.38	0.61	0.97	1.54	2.44	3.90	4.90	6.19	7.79	9.84	12.41	15.67	19.74	23.30

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Appendix B

Wire Sizing Tables

Use these tables to determine the appropriate wire size for charging circuits in your PV power system. These tables will show you the maximum one way wire distance the conductor will pass current at the rated voltage drop. Resistance in wiring has been calculated for the round trip based on one way distance. Cross-reference by wire gauge and current (amps) to find length. For example, on the 12V table, 30A with #6 wire will run a maximum distance of 12.2 feet. This is based on 3% voltage drop and maximum temperature of 75°C. R=Resistance in Ohms per 1000 feet of wire.

System Voltage: 24V

Voltage Drop: 4.00%

Temperature (°C): 75

Wire Gauge														
R	3.14	1.98	1.24	0.778	0.491	0.308	0.245	0.194	0.154	0.122	0.0967	0.0766	0.0608	0.0515
Amps	#14	#12	#10	#8	#6	#4	#3	#2	#1	#1/0	#2/0	#3/0	#4/0	250MCM
1.00	57.32	90.91	145.16	231.36	366.60	584.42	734.69	927.84	1168.83	1475.41	1861.43	2349.87	2960.53	3495.15
2.00	28.66	45.45	72.58	115.68	183.30	292.21	367.35	463.92	584.42	737.70	930.71	1174.93	1480.26	1747.57
4.00	14.33	22.73	36.29	57.84	91.65	146.10	183.67	231.96	292.21	368.85	465.36	587.47	740.13	873.79
6.00	9.55	15.15	24.19	38.56	61.10	97.40	122.45	154.64	194.81	245.90	310.24	391.64	493.42	582.52
8.00	7.17	11.36	18.15	28.92	45.82	73.05	91.84	115.98	146.10	184.43	232.68	293.73	370.07	436.89
10.00	5.73	9.09	14.52	23.14	36.66	58.44	73.47	92.78	116.88	147.54	186.14	234.99	296.05	349.51
12.00	4.78	7.58	12.10	19.28	30.55	48.70	61.22	77.32	97.40	122.95	155.12	195.82	246.71	291.26
14.00	4.09	6.49	10.37	16.53	26.19	41.74	52.48	66.27	83.49	105.39	132.96	167.85	211.47	249.65
16.00	3.58	5.68	9.07	14.46	22.91	36.53	45.92	57.99	73.05	92.21	116.34	146.87	185.03	218.45
18.00	3.18	5.05	8.06	12.85	20.37	32.47	40.82	51.55	64.94	81.97	103.41	130.55	164.47	194.17
20.00	2.87	4.55	7.26	11.57	18.33	29.22	36.73	46.39	58.44	73.77	93.07	117.49	148.03	174.76
25.00	2.29	3.64	5.81	9.25	14.66	23.38	29.39	37.11	46.75	59.02	74.46	93.99	118.42	139.81
30.00	1.91	3.03	4.84	7.71	12.22	19.48	24.49	30.93	38.96	49.18	62.05	78.33	98.68	116.50
35.00	1.64	2.60	4.15	6.61	10.47	16.70	20.99	26.51	33.40	42.15	53.18	67.14	84.59	99.86
40.00	1.43	2.27	3.63	5.78	9.16	14.61	18.37	23.20	29.22	36.89	46.54	58.75	74.01	87.38
45.00	1.27	2.02	3.23	5.14	8.15	12.99	16.33	20.62	25.97	32.79	41.37	52.22	65.79	77.67
50.00	1.15	1.82	2.90	4.63	7.33	11.69	14.69	18.56	23.38	29.51	37.23	47.00	59.21	69.90
55.00	1.04	1.65	2.64	4.21	6.67	10.63	13.36	16.87	21.25	26.83	33.84	42.72	53.83	63.55
60.00	0.96	1.52	2.42	3.86	6.11	9.74	12.24	15.46	19.48	24.59	31.02	39.16	49.34	58.25
65.00	0.88	1.40	2.23	3.56	5.64	8.99	11.30	14.27	17.98	22.70	28.64	36.15	45.55	53.77
70.00	0.82	1.30	2.07	3.31	5.24	8.35	10.50	13.25	16.70	21.08	26.59	33.57	42.29	49.93
75.00	0.76	1.21	1.94	3.08	4.89	7.79	9.80	12.37	15.58	19.67	24.82	31.33	39.47	46.60
80.00	0.72	1.14	1.81	2.89	4.58	7.31	9.18	11.60	14.61	18.44	23.27	29.37	37.01	43.69
85.00	0.67	1.07	1.71	2.72	4.31	6.88	8.64	10.92	13.75	17.36	21.90	27.65	34.83	41.12
90.00	0.64	1.01	1.61	2.57	4.07	6.49	8.16	10.31	12.99	16.39	20.68	26.11	32.89	38.83
95.00	0.60	0.96	1.53	2.44	3.86	6.15	7.73	9.77	12.30	15.53	19.59	24.74	31.16	36.79
100.00	0.57	0.91	1.45	2.31	3.67	5.84	7.35	9.28	11.69	14.75	18.61	23.50	29.61	34.95
125.00	0.46	0.73	1.16	1.85	2.93	4.68	5.88	7.42	9.35	11.80	14.89	18.80	23.68	27.96
150.00	0.38	0.61	0.97	1.54	2.44	3.90	4.90	6.19	7.79	9.84	12.41	15.67	19.74	23.30
175.00	0.33	0.52	0.83	1.32	2.09	3.34	4.20	5.30	6.68	8.43	10.64	13.43	16.92	19.97
200.00	0.29	0.45	0.73	1.16	1.83	2.92	3.67	4.64	5.84	7.38	9.31	11.75	14.80	17.48
225.00	0.25	0.40	0.65	1.03	1.63	2.60	3.27	4.12	5.19	6.56	8.27	10.44	13.16	15.53
250.00	0.23	0.36	0.58	0.93	1.47	2.34	2.94	3.71	4.68	5.90	7.45	9.40	11.84	13.98
275.00	0.21	0.33	0.53	0.84	1.33	2.13	2.67	3.37	4.25	5.37	6.77	8.54	10.77	12.71
300.00	0.19	0.30	0.48	0.77	1.22	1.95	2.45	3.09	3.90	4.92	6.20	7.83	9.87	11.65
400.00	0.14	0.23	0.36	0.58	0.92	1.46	1.84	2.32	2.92	3.69	4.65	5.87	7.40	8.74

Appendix C

UniRac Universal Mounts Sizing Guide



THE NEW STANDARD IN PV MODULE RACKS™

SolarMount Rail Sets with Clamp Sets or Clip Sets

Select your PV module and complete a layout of your roof or other installation area before selecting the SolarMount components required for your installation. There are just 4 easy steps to selecting a complete SolarMount system - 3 of which are optional.

1 Select the required SolarMount Rail Sets (below) and Top Mounting Clamp Sets or Bottom Mounting Clip Sets (See page 22).

2 Select SolarMount Tilt Leg Kits, if required. (See page 23.)

3 Select SolarMount Standoffs, if required. (See page 28.)

4 Select SolarMount Splice Kits, if required. (See page 26.)

		Number of Modules						
Module Make and Model		2	3	4	5	6	7	8
SolarMount Rail Sets for use with Top Mounting Clips								
KC40T, 50T, 65T, 85T, 130TM	Rail Set	300202	300204	300207	300209	300211	300213	300215
KD130GX-LP, KD135GX-LP	Rail Set	300202	300204	300207	300209	300211	300214	use ProPak 300116
KD180GX-LP, 205GX-LP, 210GX-LP	Rail Set	300204	300208	300211	300214	300226	300229	300232
SolarMount Rail Sets for use with Bottom Mounting Clips								
KC40T, 50T, 65T, 85T, 130TM	Rail Set	300202	300204	300206	300208	300210	300212	300215
KD135GX-LP	Rail Set	300202	300204	300206	300208	300211	300213	300215
KD180GX-LP, 205GX-LP, 210GX-LP	Rail Set	300204	300207	300210	300214	300225	300228	300231

Pole Top Mounts

(More than one part number indicates multiple wind ratings. Wind ratings are listed on www.UniRac.com)

		Number of Modules							
Module Make and Model		1	2	3	4	6	8	10	12
KC40T, 50T, 65T, 85T (May need to trim cross tubes on smaller modules)		500025	500031	500107	500113	500325/ 501486	500330	501429	501430
KC130TM		500043	500128	500131	500228	500342/501456	501462	-	-
KD135GX-LP		500044	500129	500132	500239	500315	501463		
KD180GX-LP		500039	500132	500243	500313/501432	501440	-	-	-
KD205GX-LP, 210GX-LP		500014	500132	500243	500315/501457	-	-	-	-

Side of Pole Mounts - Adjustable Tilt

		Number of Modules			
Module Make and Model		1	2	3	4
KC40T, 50T, 65T, 85T		400107	400213	400223	400229
KC130TM		400257	400214	400224	400246
KD135GX-LP		400236	400233	400224	400246
KD180GX-LP		400209	400224	-	-
KD205GX-LP, 210GX-LP		400209	400224		

SunFrame Components for KC130TM / KD135GX-LP

16 ft. Length of Rail and Cap Strips per Installation									
	Number of Modules per Row								
Number of Rows	2	3	4	5	6	7	8	9	10
1	1	1	2	2	2	2	3	3	3
2	1	2	2	3	3	3	4	4	5
3	2	2	3	3	4	4	5	5	6
Cap Strip Screws per Installation									
	Number of Modules per Row								
Number of Rows	2	3	4	5	6	7	8	9	10
1	16	16	32	32	32	32	48	48	48
2	16	32	32	48	48	48	64	64	80
3	32	32	48	48	64	64	80	80	96
L-feet per Installation - 4 ft. Spacing									
	Number of Modules per Row								
Number of Rows	2	3	4	5	6	7	8	9	10
1	4	4	6	6	8	8	10	10	12
2	6	6	9	9	12	12	15	15	18
3	8	8	12	12	16	16	20	20	24
Splices per Installation									
	Number of Modules per Row								
Number of Rows	2	3	4	5	6	7	8	9	10
1	0	0	0	0	0	0	2	2	2
2	0	0	1	1	2	0	3	3	4
3	0	0	1	1	3	0	4	4	5
End Caps per Installation									
Number of Rows	Any Number of Modules per Row								
1	4								
2	6								
3	8								

Side of Pole Mounts - Fixed Tilt

Module make and model	UniRac Model
KS 5 - 20 45 degree	401102
KC 40T - 85T 45 degree	401260
KC 40T - 85T 60 degree	401262
KC 85T - 130GT/TM 45 degree	401264
KC 85T - 130GT/TM 60 degree	401266
KD135GX-LP 45 degree	
KD135GX-LP 60 degree	
KD180GX-LP 45 degree	401278
KD180GX-LP 60 degree	401279

SunFrame Components for KC 175GT / 200GT

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APPENDIX D

Inverter Overcurrent Protection and Cable Sizing

Brand	Model	Max. Continuous Power (Watts)	Voltage	Max. Input Amps* DC	Min. Overcurrent Protection (Breaker/Fuse)	Min. Cable Size ** (In conduit)	Min. Cable Size ** (In free air)
Xantrex TR1512	TR1512 ²	1500	12	201	200	#4/0	#4/0
	TR2412 ²	2400	12	321	350	#4/0	#4/0 ¹
	TR1524 ²	1500	24	100	100	#2/0	#2/0
	TR2424 ²	2400	24	160	175	#2/0	#2/0
	TR3624 ²	3600	24	241	250	#4/0	#4/0 ¹
	XW6048-120/240-60	6000	48	130	250	#4/0	#4/0
	XW4548-120/240-60	4500	48	96	175	#2/0	#2/0
	XW4024-120/240-60	4000	24	178	250	#4/0	#4/0
	SW4024 ²	4000	24	267	250	#4/0	#4/0 ¹
	SW4048 ²	4000	48	134	150	#2/0	#2/0
	SW5548 ²	5500	48	184	200	#4/0	#4/0
	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
OutBack	FX 2012T ²	2000	12	202	250/300	#4/0	#4/0
	FX 2524T ²	2500	24	101	175/200	#2/0	#2/0
	FX 3048T ²	2500	48	63	100/110	#2	#2
	VFX 2812 ²	2800	12	282	250/300	#4/0	#4/0
	VFX 3524 ²	3500	24	176	250/300	#4/0	#4/0
	VFX 3648 ²	3600	48	91	175/200	#2/0	#2/0
	GTFX 2524	2500	24	126	175/200	#4/0	#4/0
	GTFX 3048	3000	48	76	100/110	#2/0	#2/0
	GVFX 3524	3500	24	176	250/300	#4/0	#4/0
	GVFX 3648	3600	48	91	175/200	#2/0	#2/0

* The maximum input current is calculated by multiplying the inverter's maximum continuous power output by 1.25 and then dividing by 0.85 and the lowest voltage that the inverter will operate at (11V for a 12V unit, 22V for a 24V unit and 44V for a 48V unit). For example, a SW4024 is a 24V unit with a 4000W continuous output so you would multiply 4000W by 1.25 to get 5000W. You would then divide 5000W by the lowest inverter efficiency of 0.85 to get 5882.4W and then divide that by the lowest inverter voltage of 22 volts to get 267 amps. We downsize the overcurrent protection to 250 amps for the SW4024 so that we can still use #4/0 AWG cables.

* With OutBack inverters, the full power efficiency should be calculated with a lowest expected full power efficiency factor of 0.90 instead of 0.85 as used with the other brands of inverters.

²The cable size is the same for free air as in conduit. This preserves the performance of the inverter (motor starting surge) and maximizes the conversion efficiency of the system.

** Minimum cable sizes are for 90° C rated cable from NEC Tables 310-16 & 310-17. Also refer to NEC articles 240-3b and 240-6a for proper sizing of overcurrent protection devices. Cable sizes are good up to 10' of one way distance. If you use "free air" size cable in conduit, the NEC requires that you use double conductors (two positive and two negative cables). Multiply the rated cable ampacity by 0.8 for parallel conductors.

Smaller cable sizes than those listed here may be used as long as the overcurrent protection is reduced as well. We typically sell #2, #2/0 and #4/0 AWG inverter cables that should be matched with 110A, 175A and 250A overcurrent protection devices respectively. Using larger cables is perfectly acceptable, but you might run into problems fitting them into various disconnects and fuse blocks. MCM stands for "thousands of circular mils" and it represents the cross sectional area of cables larger than #4/0 AWG. See NEC Table 8 "Conductor Properties" for details.

¹Cable is sized for 10 feet total length. From 10 feet to 20 feet total length, double the recommended wire size.

²Cable sizes are recommended by the manufacturer for inverter performance, i.e. surging, ripple and voltage drop. For that reason, cable size given is the same for conduit and free air.

APPENDIX E

Battery Installation and Wiring

Batteries may be wired in either series or parallel configuration. When a battery is wired in series the positive terminal is wired to the next battery's negative terminal. This increases the voltage while maintaining amperage of the two batteries. With parallel wiring the positive terminal is wired to the next battery's positive terminal, and the negative to the next negative. This arrangement increases amperage while maintaining voltage. One common mistake is to believe that both amperage and voltage will increase when wiring batteries together. It will not; only one value will increase with respect to the arrangement. A battery bank may combine both series and parallel wiring configurations. Series strings of batteries are used to achieve the correct voltage, then a number of these series strings are attached in parallel to increase the amp-hours of the total battery bank.

	12 Volt Systems	24 Volt Systems	48 Volt Systems
12 volt Batteries			
6 Volt Batteries			
4 Volt Batteries			
2 Volt Batteries			

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