

PowerXL **Series Drive** Single-Phase Input Applications

Operating the PowerXL Series on a single-phase supply

The PowerXL Series drives are designed for use on normal three-phase supplies. However, it is possible to use it on single-phase supplies but certain limitations apply and are detailed below.

1. The motor must always be a three-phase motor. Single-phase motors cannot be used.
2. The single-phase voltage must be the same magnitude as the three-phase voltage rating on the drive.
3. The drive must be sized per **Table 1** or **Table 3**. Additional capacitance kits may be required and are specified in **Table 3**.
4. The cable and protection sizing (fuse & circuit breakers) will change when using single phase input. Consult **Table 2** or **Table 4** for the appropriate sizing.
5. The single-phase input must be connected to input terminals L1 and L2. The motor should be connected, as normal, to terminals U, V, and W.
6. The drive would normally trip on a missing input phase. In order to avoid this trip, the input phase fault parameter must be disabled. This is done by setting parameter Input Phase Fault to "No Action".



Note:For UL approval of this application the drive package must be done from the Eaton Watertown Factory. Products purchased externally as an open product are not seen by UL as approved installations of this application at this time.

Use of External Capacitor Kits

When using the PowerXL Series drive in single-phase input applications, some horsepower ratings offer an option with and without external capacitors. The decision between these two options should be made by considering size limitations and evaluating cost. Generally, if external capacitors are used, a smaller, more cost-effective drive can be used. If the drive is going to be mounted in an enclosure, it may be best to use external capacitors with the smaller drive option to minimize the enclosure size. However, if the drive is going to be wall-mounted, then it may be more effective to choose the option with no capacitors, thus avoiding the need to add an enclosure. The performance and reliability of the drive is not affected by the decision to use capacitor kits or not.



Powering Business Worldwide

Table 1: Drive Size Specification – Without External Capacitors

Motor Horsepower	230V		480V	
	Drive Catalog Number		Drive Catalog Number	
0.75	DG1-327D8FB-C21C	DH1-32011DN-C21C	DG1-342D2FB-C21C	DH1-343D3DN-C21C
1.0	DG1-327D8FB-C21C	DH1-32011DN-C21C	DG1-343D3FB-C21C	DH1-344D3DN-C21C
2.0	DG1-32017FB-C21C	DH1-32025DN-C21C	DG1-345D6FB-C21C	DH1-347D6DN-C21C
3.0	DG1-32025FB-C21C	DH1-32031DN-C21C	DG1-34012FB-C21C	DH1-34016DN-C21C
5.0	DG1-32031FB-C21C	DH1-32048DN-C21C	DG1-34016FB-C21C	DH1-34023DN-C21C
7.5	DG1-32048FB-C21C	DH1-32061DN-C21C	DG1-34031FB-C21C	DH1-34038DN-C21C
10.0	DG1-32075FN-C21C	DH1-32088DN-C21C	DG1-34038FB-C21C	DH1-34046DN-C21C
15.0	DG1-32088FN-C21C	DH1-32114DN-C21C	DG1-34061FB-C21C	DH1-34072DN-C21C
20.0	DG1-32114FN-C21C	DH1-32143DN-C21C	DG1-34072FN-C21C	DH1-34087DN-C21C
25.0	DG1-32143FN-C21C	DH1-32170DN-C21C	DG1-34105FN-C21C	DH1-34140DN-C21C
30.0	-	-	DG1-34140FN-C21C	DH1-34170DN-C21C
40.0	-	-	DG1-34170FN-C21C	DH1-34205DN-C21C

Note:For UL approval the open drive does not meet UL approval but will work in this applicaiton.

Table 2: Cable and Fuse/Breaker Sizes – Without External Capacitors

Motor Horsepower	Frame Size	Input Current	Fuse Qty	Fuse Amps	Breaker Amps	Input Wire Size		Output NEC Amps	Output Wire Size		Terminal Size	
						Power	Ground		Power	Ground	Power	Ground
230V Ratings												
0.75	FR1	10.2	2	15	15	14	14	3.2	14	14	24-10	18-10
1	FR1	10.2	2	15	15	14	14	4.2	14	14	24-10	18-10
2	FR2	23.2	2	30	30	8	10	6.8	14	12	20-6	12-6
3	FR2	29	2	35	35	8	10	9.6	14	12	20-6	12-6
5	FR3	44.2	2	60	60	6	10	15.2	6	12	6-2	14-4
7.5	FR3	56	2	70	70	4	8	22	6	10	6-2	14-4
10	FR4	78	2	90	90	3	8	28	6	8	6-1/0	10-1/0
15	FR4	94.3	2	110	110	1	6	42	4	8	6-1/0	10-1/0
20	FR5	129	2	150	150	2/0	6	54	1/0	6	1/0-350 kcmil	8-250 kcmil
25	FR5	157	2	200	200	3/0	6	68	1/0	6	1/0-350 kcmil	8-250 kcmil
480V Ratings												
0.75	FR1	2.8	2	10	15	14	14	1.6	14	14	26-10	18-10
1	FR1	3.2	2	10	15	14	14	2.1	14	14	26-10	18-10
2	FR1	7.1	2	10	15	14	14	3.4	14	14	26-10	18-10
3	FR2	13	2	15	15	12	12	4.8	14	12	20-6	12-6
5	FR2	19.6	2	25	25	10	10	7.6	14	12	20-6	12-6
7.5	FR3	31.7	2	40	40	8	10	11	6	12	6-2	14-4
10	FR3	37	2	45	45	6	10	14	6	12	6-2	14-4
15	FR4	59.3	2	70	70	4	8	21	6	10	6-1/0	10-1/0
20	FR4	70.3	2	90	90	3	8	27	6	8	6-1/0	10-1/0
25	FR5	114.4	2	150	150	1/0	6	34	1/0	8	1/0-350 kcmil	8-250 kcmil
30	FR5	144	2	175	175	3/0	6	40	1/0	8	1/0-350 kcmil	8-250 kcmil
40	FR5	166.1	2	200	200	4/0	6	52	1/0	6	1/0-350 kcmil	8-250 kcmil

Table 3: Drive Size Specification – With External Capacitors

Motor Horsepower	230V			480V		
	Drive Catalog Number	Additional Capacitor Kit		Drive Catalog Number	Additional Capacitor Kit	
0.75	DG1-327D8FB-C21C	DH1-32011DN-C21C	None Required	DG1-342D2FB-C21C	DH1-343D3DN-C21C	None Required
1.0	DG1-327D8FB-C21C	DH1-32011DN-C21C	None Required	DG1-343D3FB-C21C	DH1-345D6DN-C21C	None Required
2.0	DG1-32017FB-C21C	DH1-32025DN-C21C	None Required	DG1-345D6FB-C21C	DH1-347D6DN-C21C	None Required
3.0	DG1-32025FB-C21C	DH1-32031DN-C21C	None Required	DG1-347D6FB-C21C	DH1-349D0DN-C21C	SP42-KIT
5.0	DG1-32025FB-C21C	DH1-32031DN-C21C	SP21-KIT	DG1-34016FB-C21C	DH1-34023DN-C21C	None Required
7.5	DG1-32048FB-C21C	DH1-32061DN-C21C	None Required	DG1-34023FB-C21C	DH1-34031DN-C21C	SP42-KIT
10.0	DG1-32048FB-C21C	DH1-32061DN-C21C	SP21-KIT	DG1-34031FB-C21C	DH1-34038DN-C21C	SP42-KIT
15.0	DG1-32088FN-C21C	DH1-32114DN-C21C	None Required	DG1-34038FB-C21C	DH1-34046DN-C21C	SP42-KIT
20.0	DG1-32088FN-C21C	DH1-32114DN-C21C	SP22-KIT	DG1-34061FB-C21C	DH1-34072DN-C21C	SP44-KIT
25.0	DG1-32143FN-C21C	DH1-32170DN-C21C	None Required	DG1-34072FN-C21C	DH1-34087DN-C21C	SP44-KIT
30.0	DG1-32143FN-C21C	DH1-32170DN-C21C	SP23-KIT	DG1-34072FN-C21C	DH1-34087DN-C21C	SP44-KIT
40.0	DG1-32170FN-C21C	DH1-32211DN-C21C	SP23-KIT	DG1-34105FN-C21C	DH1-34140DN-C21C	SP44-KIT
50.0	-	-	-	DG1-34140FN-C21C	DH1-34170DN-C21C	SP44-KIT
60.0	-	-	-	DG1-34140FN-C21C	DH1-34170DN-C21C	SP44-KIT
75.0	-	-	-	DG1-34205FN-C21C	DH1-34261DN-C21C	SP44-KIT

Note: For UL approval for the external cap kit this process must be done from the Eaton Watertown Factory. PowerXL DH1 package will be available in 2019.

Table 4: Cable and Fuse/Breaker Sizes – With External Capacitors

Motor Horsepower	Frame Size	Input Current	Fuse Qty	Fuse Amps	Breaker Amps	Input Wire Size		Output NEC Amps	Output Wire Size		Terminal Size		DC Cap wire size
						Power	Ground		Power	Ground	Power	Ground	
230V Ratings													
0.75	FR1	10.2	2	15	15	14	14	3.2	14	14	24-10	18-10	10AWG
1	FR1	10.2	2	15	15	14	14	4.2	14	14	24-10	18-10	10AWG
2	FR2	23.2	2	30	30	8	10	6.8	14	12	20-6	12-6	10AWG
3	FR2	29	2	35	35	8	10	9.6	14	12	20-6	12-6	10AWG
5	FR2	29	2	35	35	8	10	15.2	12	12	20-6	12-6	10AWG
7.5	FR3	56	2	70	70	4	8	22	6	10	6-2	14-4	10AWG
10	FR3	56	2	70	70	4	8	28	6	8	6-2	14-4	10AWG
15	FR4	94.3	2	110	110	1	6	42	4	8	6-1/0	10-1/0	10AWG
20	FR4	94.3	2	110	110	1	6	54	2	6	6-1/0	10-1/0	10AWG
25	FR5	157	2	200	200	3/0	6	68	1/0	6	1/0-350 kcmil	8-250 kcmil	10AWG
30	FR5	157	2	200	200	3/0	6	80	1/0	6	1/0-350 kcmil	8-250 kcmil	10AWG
40	FR5	189	2	225	225	250 kcmil	4	104	1/0	4	1/0-350 kcmil	8-250 kcmil	10AWG
480V Ratings													
0.75	FR1	2.8	2	10	15	14	14	1.6	14	14	26-10	18-10	10AWG
1	FR1	3.2	2	10	15	14	14	2.1	14	14	26-10	18-10	10AWG
2	FR1	7.1	2	10	15	14	14	3.4	14	14	26-10	18-10	10AWG
3	FR1	8.4	2	10	15	14	14	4.8	14	14	26-10	18-10	10AWG
5	FR2	19.6	2	25	25	10	10	7.6	14	12	20-6	12-6	10AWG
7.5	FR2	25.2	2	30	30	8	10	11	12	12	20-6	12-6	10AWG
10	FR3	31.7	2	40	40	8	10	14	6	12	6-2	14-4	10AWG
15	FR3	37	2	45	45	6	10	21	6	10	6-2	14-4	10AWG
20	FR4	59.3	2	70	70	4	8	27	6	8	6-1/0	10-1/0	10AWG
25	FR4	70.3	2	90	90	3	8	34	6	8	6-1/0	10-1/0	10AWG
30	FR4	70.3	2	90	90	3	8	40	4	8	6-1/0	10-1/0	10AWG
40	FR5	114.4	2	150	150	1/0	6	52	1/0	6	1/0-350 kcmil	8-250 kcmil	10AWG
50	FR5	144	2	175	175	3/0	6	65	1/0	6	1/0-350 kcmil	8-250 kcmil	10AWG
60	FR5	144	2	175	175	3/0	6	77	1/0	6	1/0-350 kcmil	8-250 kcmil	10AWG
75	FR6	221.5	2	300	300	300 kcmil	4	96	1/0	4	①	①	10AWG

Note:

① Frame 6 available in 2019.

Installation of External Capacitor Kits

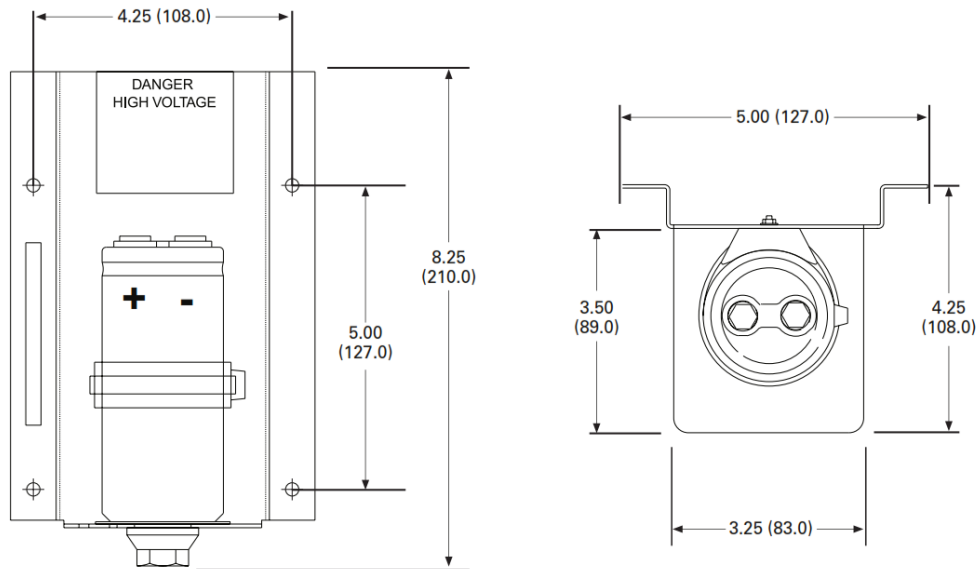
When mounting the single-phase capacitor kits, observe the following guidelines to ensure safe and proper operation.

1. Mounting holes are 0.171 inch diameter. Use 10-32 bit to tap enclosure.
2. Mount the capacitor kit in the existing drive enclosure. Dimensions of the capacitor kits are detailed in **Figures 1-3** below.
3. Mount the capacitor kit within 36 inches of the drive. The lead length should not exceed 36 inches. Longer leads may cause capacitor failure.

Figure 1: Mounting Dimensions for One Capacitor Kit

This configuration applies to SP21-KIT and SP22-KIT.

Approximate dimensions in inches (mm).



Wiring a Single Phase Cap Kit with 1 Capacitor

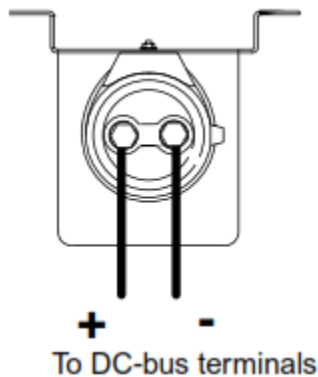
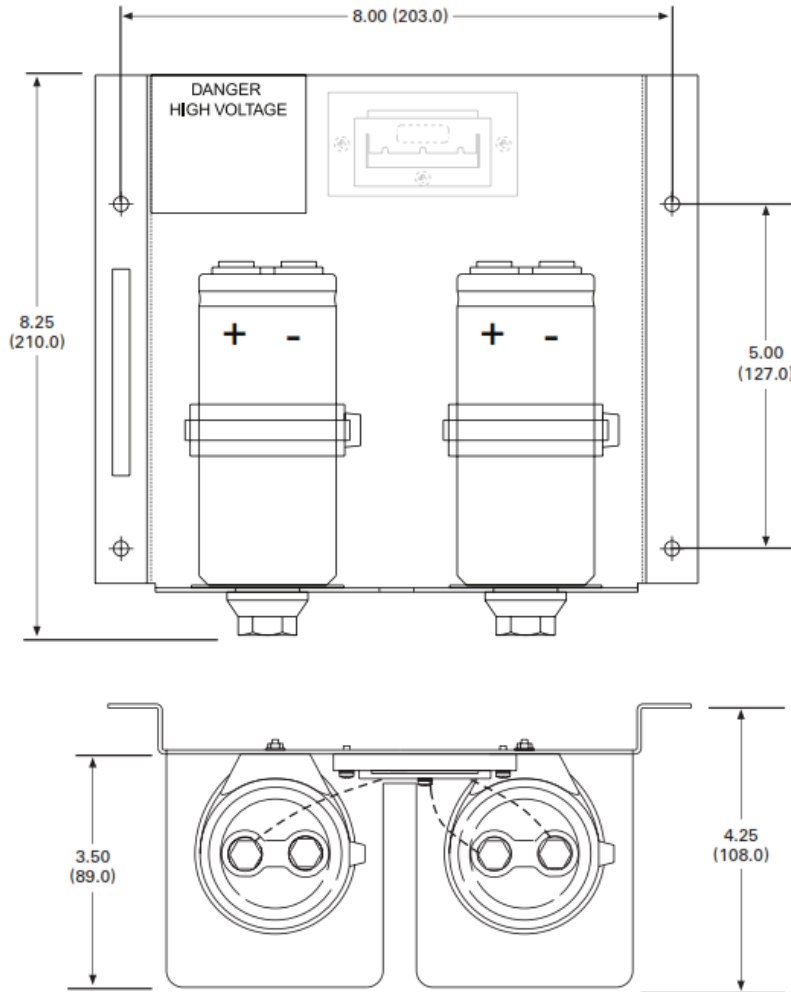


Figure 2: Mounting Dimensions for Two Capacitor Kit

This configuration applies to SP23-KIT, SP41-KIT, SP42-KIT, and SP43-KIT.

Approximate dimensions in inches (mm).

Dotted lines are the wires for the balancing resistor for series capacitor connection. Balancing resistors are used to “balance” the voltage increase/decrease of the capacitors in a healthy manner since every capacitor has a slightly different charge/discharge rate.



Wiring a Single Phase Cap Kit with 2 Capacitors with balancing resistor

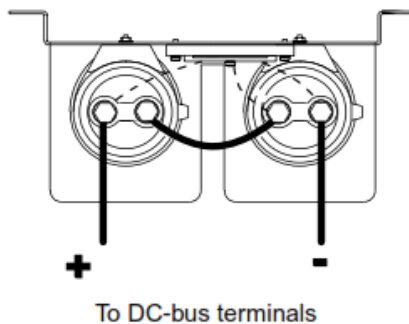
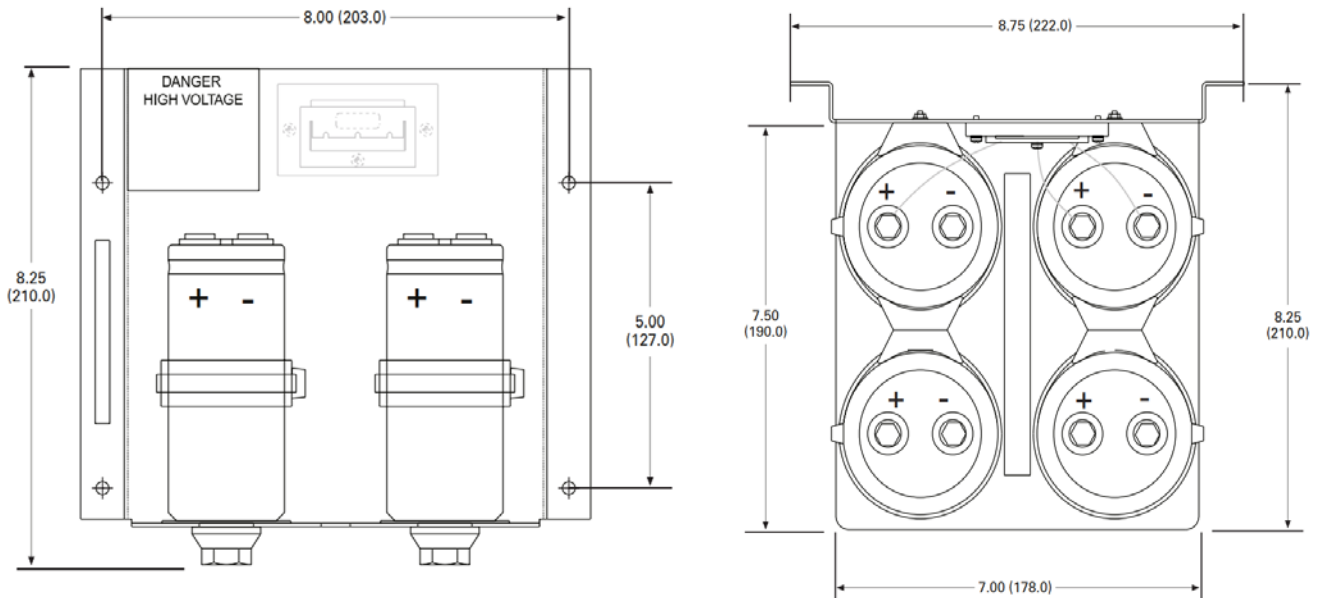


Figure 3: Mounting Dimensions for Four Capacitor Kit

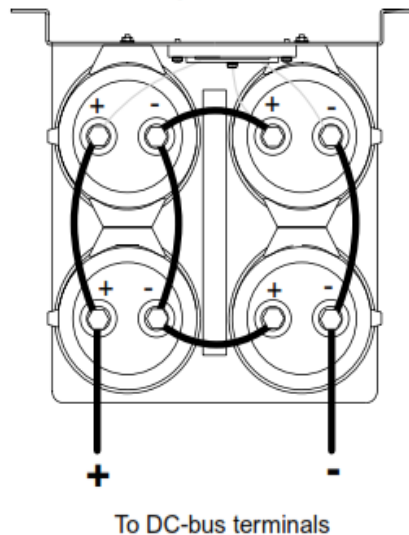
This configuration applies to SP45-KIT.

Approximate dimensions in inches (mm).

Light Gray lines are the wires for the Balancing Resistor for series capacitor connection.



Wiring a Single Phase Cap Kit with 4 Capacitors



Additional Help

In the US or Canada: please contact the Technical Resource Center at 1-877-ETN-CARE or 1-877-386-2273 option 2, option 6.

All other supporting documentation is located on the Eaton web site at www.eaton.com/Drives

