

11.10 DC Reactors (DCRs)

A DCR is mainly used for power supply matching and for input power factor correction (for reducing harmonic components).

■ For power supply matching

- Use a DCR when the capacity of a power supply transformer exceeds 500 kVA and is 10 times or more the rated inverter capacity. In this case, the percent reactance of the power supply decreases, and harmonic components and their peak value increase. These factors may break rectifiers or capacitors in the converter section of inverter, or decrease the capacitance of the capacitor (which can shorten the inverter's service life).
- Also use a DCR when there are thyristor-driven loads or when phase-advancing capacitors are being turned ON/OFF.
- Use a DCR when the interphase voltage unbalance ratio of the inverter power supply exceeds 2%.

$$\text{Interphase voltage unbalance (\%)} = \frac{\text{Max. voltage (V)} - \text{Min. voltage (V)}}{\text{Three - phase average voltage (V)}} \times 67$$

■ For input power factor correction (for suppressing harmonics)

Generally a capacitor is used to improve the power factor of the load, however, it cannot be used in a system that includes an inverter. Using a DCR increases the reactance of inverter's power supply so as to decrease harmonic components on the power supply lines and improve the power factor of inverter. Using a DCR improves the input power factor to approximately 86% to 95%.



Note

- At the time of shipping, a jumper bar is connected across terminals P1 and P (+) on the terminal block. Remove the jumper bar when connecting a DCR.
- If a DCR is not going to be used, do not remove the jumper bar.
- Please select in the capacity of the applicable motor selection of DC reactor.

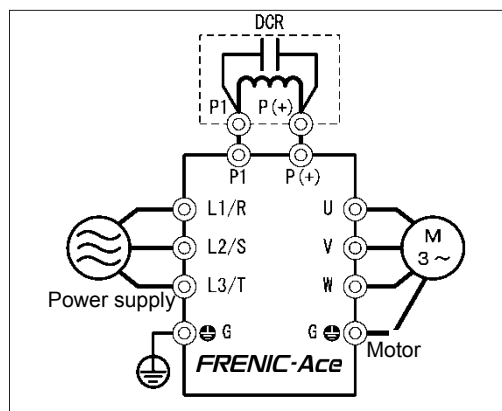
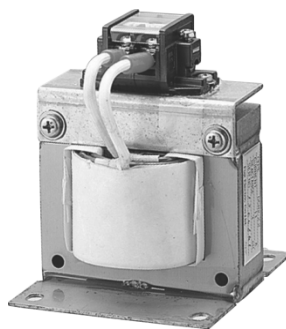


Figure 11.10-1 External View of a DC Reactor (DCR) and Connection Example

Table 11.10-1 DC Reactors (DCRs)

| Power supply voltage | Nominal applied motor (kW) | Nominal applied motor (HP) | DC reactor type | Rated current (A) | Inductance (mH) | Generated loss (W) |
|----------------------|----------------------------|----------------------------|-------------------|-------------------|-----------------|--------------------|
| Three-phase 200V | 0.1 | 1/8 | DCR2-0.2 | 1.5 | 20 | 0.8 |
| | 0.2 | 1/4 | | | | 1.6 |
| | 0.4 | 1/2 | DCR2-0.4 | 3.0 | 12 | 1.9 |
| | 0.75 | 1 | DCR2-0.75 | 5.0 | 7.0 | 2.8 |
| | 1.5 | 2 | DCR2-1.5 | 8.0 | 4.0 | 4.6 |
| | 2.2 | 3 | DCR2-2.2 | 11 | 3.0 | 6.7 |
| | 3.0 | 4 | DCR2-3.7 | 18 | 1.7 | 8.8 |
| | 3.7 | 5 | | | | |
| | 5.5 | 7.5 | DCR2-5.5 | 25 | 1.2 | 14 |
| | 7.5 | 10 | DCR2-7.5 | 34 | 0.8 | 16 |
| | 11 | 15 | DCR2-11 | 50 | 0.6 | 27 |
| | 15 | 20 | DCR2-15 | 67 | 0.4 | 27 |
| | 18.5 | 25 | DCR2-18.5 | 81 | 0.35 | 29 |
| 22 | 30 | DCR2-22A | 98 | 0.3 | 38 | |
| 30 | 40 | DCR2-30B | 136 | 0.23 | 37 | |
| Three-phase 400V | 0.4 | 1/2 | DCR4-0.4 | 1.5 | 50 | 2.0 |
| | 0.75 | 1 | DCR4-0.75 | 2.5 | 30 | 2.5 |
| | 1.1 | 1 1/2 | DCR4-1.5 | 4.0 | 16 | 4.8 |
| | 1.5 | 2 | | | | |
| | 2.2 | 3 | DCR4-2.2 | 5.5 | 12 | 6.8 |
| | 3.0 | 4 | DCR4-3.7 | 9.0 | 7.0 | 8.1 |
| | 3.7 | 5 | | | | |
| | 5.5 | 7.5 | DCR4-5.5 | 13 | 4 | 10 |
| | 7.5 | 10 | DCR4-7.5 | 18 | 3.5 | 15 |
| | 11 | 15 | DCR4-11 | 25 | 2.2 | 21 |
| | 15 | 20 | DCR4-15 | 34 | 1.8 | 28 |
| | 18.5 | 25 | DCR4-18.5 | 41 | 1.4 | 29 |
| | 22 | 30 | DCR4-22A | 49 | 1.2 | 35 |
| | 30 | 40 | DCR4-30B | 71 | 0.86 | 35 |
| | 37 | 50 | DCR4-37B/DCR4-37C | 88/88 | 0.70/0.483 | 40/63 |
| | 45 | 60 | DCR4-45B/DCR4-45C | 107/107 | 0.58/0.4 | 44/69 |
| | 55 | 75 | DCR4-55B/DCR4-55C | 131/131 | 0.47/0.324 | 55/78 |
| | 75 | 100 | DCR4-75C | 178 | 0.23 | 97 |
| | 90 | 125 | DCR4-90C | 214 | 0.2 | 111 |
| | 110 | 150 | DCR4-110C | 261 | 0.166 | 122 |
| 132 | 200 | DCR4-132C | 313 | 0.148 | 159 | |
| 160 | 250 | DCR4-160C | 380 | 0.122 | 185 | |
| 200 | 300 | DCR4-200C | 475 | 0.098 | 218 | |
| 220 | 350 | DCR4-220C | 524 | 0.087 | 231 | |
| 250 | 400 | DCR4-250C | 589 | 0.077 | 249 | |
| 280 | 450 | DCR4-280C | 649 | 0.069 | 270 | |
| 315 | 475 | DCR4-315C | 739 | 0.061 | 285 | |
| 355 | 500 | DCR4-355C | 833 | 0.054 | 308 | |
| Single-phase 200V | 0.1 | 1/8 | DCR2-0.2 | 1.5 | 20 | 1.6 |
| | 0.2 | 1/4 | DCR2-0.4 | 3.0 | 12 | 1.9 |
| | 0.4 | 1/2 | DCR2-0.75 | 5.0 | 7.0 | 2.8 |
| | 0.75 | 1 | DCR2-1.5 | 8.0 | 4.0 | 4.6 |
| | 1.5 | 2 | DCR2-3.7 | 18 | 1.7 | 8.8 |
| | 2.2 | 3 | | | | |
| | 3.0 | 4 | DCR2-5.5 | 25 | 1.2 | 14 |

Note: Generated losses listed in the above tables are approximate values that are calculated according to the following conditions:

- The power supply is three-phase 200V/400 V 50 Hz with 0% interphase voltage unbalance ratio.
- The capacity of the power supply used is the larger of either 500 kVA or 10 times the rated capacity of the inverter.
- The motor is a 4-pole standard model at full load (100%).
- An AC reactor (ACR) is not connected.

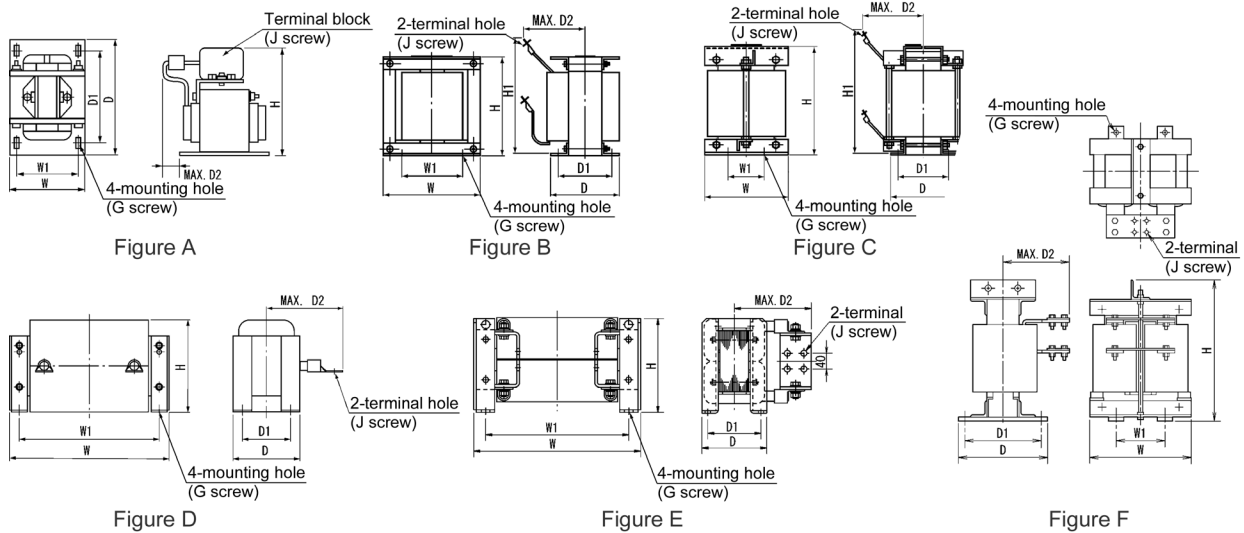


Table 11.10-2 DC Reactors (DCRs) External Dimensions

| Power supply voltage | DC reactor type | Figure | Dimensions mm (inch) | | | | | | | | Mounting hole | Terminal hole | Mass kg (lb) |
|----------------------|-----------------|--------|----------------------|--------------|--------------|-------------|--------------|--------------|----|--------------------------|---------------|---------------|--------------|
| | | | W | W1 | D | D1 | D2 | H | H1 | | | | |
| Three-phase 200V | DCR2-0.2 | A | 66 (2.6) | 56 (2.2) | 90 (3.5) | 72 (2.8) | 5 (0.2) | 94 (3.7) | — | M4 (5.2×8 (0.2×0.31)) | M4 | 0.8 (1.8) | |
| | DCR2-0.4 | A | 66 (2.6) | 56 (2.2) | 90 (3.5) | 72 (2.8) | 15 (0.59) | 94 (3.7) | — | M4 (5.2×8 (0.2×0.31)) | M4 | 1.0 (2.2) | |
| | DCR2-0.75 | A | 66 (2.6) | 56 (2.2) | 90 (3.5) | 72 (2.8) | 20 (0.79) | 94 (3.7) | — | M4 (5.2×8 (0.2×0.31)) | M4 | 1.4 (3.1) | |
| | DCR2-1.5 | A | 66 (2.6) | 56 (2.2) | 90 (3.5) | 72 (2.8) | 20 (0.79) | 94 (3.7) | — | M4 (5.2×8 (0.2×0.31)) | M4 | 1.6 (3.5) | |
| | DCR2-2.2 | A | 86 (3.4) | 71 (2.8) | 100 (3.9) | 80 (3.1) | 10 (0.79) | 110 (4.3) | — | M5 (6×9 (0.24×0.35)) | M4 | 1.8 (4.0) | |
| | DCR2-3.7 | A | 86 (3.4) | 71 (2.8) | 100 (3.9) | 80 (3.1) | 20 (0.79) | 110 (4.3) | — | M5 (6×9 (0.24×0.35)) | M4 | 2.6 (5.7) | |
| | DCR2-5.5 | A | 111 (4.4) | 95 (3.7) | 100 (3.9) | 80 (3.1) | 20 (0.79) | 130 (5.1) | — | M6 (7×11 (0.28×0.43)) | M5 | 3.6 (7.9) | |
| | DCR2-7.5 | A | 111 (4.4) | 95 (3.7) | 100 (3.9) | 80 (3.1) | 23 (0.91) | 130 (5.1) | — | M6 (7×11 (0.28×0.43)) | M5 | 3.8 (8.4) | |
| | DCR2-11 | A | 111 (4.4) | 95 (3.7) | 100 (3.9) | 80 (3.1) | 24 (0.94) | 137 (5.4) | — | M6 (7×11 (0.28×0.43)) | M6 | 4.3 (9.5) | |
| | DCR2-15 | A | 146 (5.7) | 124 (4.9) | 120 (4.7) | 96 (3.8) | 15 (0.59) | 180 (7.1) | — | M6 (7×11 (0.28×0.43)) | M8 | 5.9 (13) | |
| | DCR2-18.5 | A | 146 (5.7) | 124 (4.9) | 120 (4.7) | 96 (3.8) | 25 (0.98) | 180 (7.1) | — | M6 (7×11 (0.28×0.43)) | M8 | 7.4 (16) | |
| | DCR2-22A | A | 146 (5.7) | 124 (4.9) | 120 (4.7) | 96 (3.8) | 25 (0.98) | 180 (7.1) | — | M6 (7×11 (0.28×0.43)) | M8 | 7.5 (17) | |

Table 11.10-3 DC Reactors (DCRs) External Dimensions (continue)

| Power supply voltage | DC reactor type | Figure | Dimensions mm (inch) | | | | | | | | | Mass kg (lb) |
|----------------------|-----------------|---------------|----------------------|---------------|--------------|--------------|--------------|--------------|----------------------------|----------------------------|---------------|--------------|
| | | | W | W1 | D | D1 | D2 | H | H1 | Mounting hole | Terminal hole | |
| Three-phase 400V | DCR4-0.4 | A | 66 (2.6) | 56 (2.2) | 90 (3.5) | 72 (2.8) | 15 (0.59) | 94 (3.7) | — | M4 (5.2×8 (0.2×0.31)) | M4 | 1.0 (2.2) |
| | DCR4-0.75 | A | 66 (2.6) | 56 (2.2) | 90 (3.5) | 72 (2.8) | 20 (0.79) | 94 (3.7) | — | M4 (5.2×8 (0.2×0.31)) | M4 | 1.4 (3.1) |
| | DCR4-1.5 | A | 66 (2.6) | 56 (2.2) | 90 (3.5) | 72 (2.8) | 20 (0.79) | 94 (3.7) | — | M4 (5.2×8 (0.2×0.31)) | M4 | 1.6 (3.5) |
| | DCR4-2.2 | A | 86 (3.4) | 71 (2.8) | 100 (3.9) | 80 (3.1) | 15 (0.59) | 110 (4.3) | — | M5 (6×9 (0.24×0.35)) | M4 | 2.0 (4.4) |
| | DCR4-3.7 | A | 86 (3.4) | 71 (2.8) | 100 (3.9) | 80 (3.1) | 20 (0.79) | 110 (4.3) | — | M5 (6×9 (0.24×0.35)) | M4 | 2.6 (5.7) |
| | DCR4-5.5 | A | 86 (3.4) | 71 (2.8) | 100 (3.9) | 80 (3.1) | 20 (0.79) | 110 (4.3) | — | M5 (6×9 (0.24×0.35)) | M4 | 2.6 (5.7) |
| | DCR4-7.5 | A | 111 (4.4) | 95 (3.7) | 100 (3.9) | 80 (3.1) | 24 (0.94) | 130 (5.1) | — | M6 (7×11 (0.28×0.43)) | M5 | 4.2 (9.3) |
| | DCR4-11 | A | 111 (4.4) | 95 (3.7) | 100 (3.9) | 80 (3.1) | 24 (0.94) | 130 (5.1) | — | M6 (7×11 (0.28×0.43)) | M5 | 4.3 (9.5) |
| | DCR4-15 | A | 146 (5.7) | 124 (4.9) | 120 (4.7) | 96 (3.8) | 15 (0.59) | 168 (6.6) | — | M6 (7×11 (0.28×0.43)) | M5 | 5.9 (13) |
| | DCR4-18.5 | A | 146 (5.7) | 124 (4.9) | 120 (4.7) | 96 (3.8) | 25 (0.98) | 171 (6.7) | — | M6 (7×11 (0.28×0.43)) | M6 | 7.2 (16) |
| | DCR4-22A | A | 146 (5.7) | 124 (4.9) | 120 (4.7) | 96 (3.8) | 25 (0.98) | 171 (6.7) | — | M6 (7×11 (0.28×0.43)) | M6 | 7.2 (16) |
| | DCR4-30B | B | 152 (6.0) | 90 (3.5) | 157 (6.2) | 115 (4.5) | 100 (3.9) | 130 (5.1) | 190 (7.5) | M6 (ø8 (ø 0.31)) | M8 | 13 (29) |
| | DCR4-37B | B | 171 (6.7) | 110 (4.3) | 150 (5.9) | 110 (4.3) | 100 (3.9) | 150 (5.9) | 200 (7.9) | M6 (ø8 (ø 0.31)) | M8 | 15 (33) |
| | DCR4-37C | D | 210 (8.3) | 185 (7.3) | 101 (4.0) | 81 (3.2) | 105 (4.1) | 125 (4.9) | — | M6 (7×13 (0.28×0.51)) | M8 | 7.4 (16) |
| | DCR4-45B | B | 171 (6.7) | 110 (4.3) | 165 (6.5) | 125 (4.9) | 110 (4.3) | 150 (5.9) | 210 (8.3) | M6 (ø8 (ø 0.31)) | M8 | 18 (40) |
| | DCR4-45C | D | 210 (8.3) | 185 (7.3) | 106 (4.2) | 86 (3.4) | 120 (4.7) | 125 (4.9) | — | M6 (7×13 (0.28×0.51)) | M8 | 8.4 (19) |
| | DCR4-55B | B | 171 (6.7) | 110 (4.3) | 170 (6.7) | 130 (5.1) | 110 (4.3) | 150 (5.9) | 210 (8.3) | M6 (ø8 (ø 0.31)) | M8 | 20 (44) |
| | DCR4-55C | D | 255 (10.0) | 225 (8.9) | 96 (3.8) | 76 (3.0) | 120 (4.7) | 145 (5.7) | — | M6 (7×13 (0.28×0.51)) | M10 | 11 (24) |
| | DCR4-75C | D | 255 (10.0) | 225 (8.9) | 106 (4.2) | 86 (3.4) | 125 (4.9) | 145 (5.7) | — | M6 (7×13 (0.28×0.51)) | M10 | 13 (29) |
| | DCR4-90C | D | 255 (10.0) | 225 (8.9) | 116 (4.6) | 96 (3.8) | 140 (5.5) | 145 (5.7) | — | M6 (7×13 (0.28×0.51)) | M12 | 15 (33) |
| | DCR4-110C | D | 300 (11.8) | 265 (10.4) | 116 (4.6) | 90 (3.5) | 175 (6.9) | 155 (6.1) | — | M8 (10×18 (0.39×0.71)) | M12 | 19 (42) |
| | DCR4-132C | D | 300 (11.8) | 265 (10.4) | 126 (5.0) | 100 (3.9) | 180 (7.1) | 160 (6.3) | — | M8 (10×18 (0.39×0.71)) | M12 | 22 (49) |
| | DCR4-160C | D | 350 (13.8) | 310 (12) | 131 (5.2) | 103 (4.1) | 180 (7.1) | 190 (7.5) | — | M10 (12×22 (0.47×0.87)) | M12 | 26 (57) |
| | DCR4-200C | D | 350 (13.8) | 310 (12.2) | 141 (5.6) | 113 (4.4) | 185 (7.3) | 190 (7.5) | — | M10 (12×22 (0.47×0.87)) | M12 | 30 (66) |
| | DCR4-220C | D | 350 (13.8) | 310 (12.2) | 146 (5.7) | 118 (4.6) | 200 (7.9) | 190 (7.5) | — | M10 (12×22 (0.47×0.87)) | M12 | 33 (73) |
| | DCR4-250C | D | 350 (13.8) | 310 (12.2) | 161 (6.3) | 133 (5.2) | 210 (8.3) | 190 (7.5) | — | M10 (12×22 (0.47×0.87)) | M12 | 35 (77) |
| | DCR4-280C | D | 350 (13.8) | 310 (12.2) | 161 (6.3) | 133 (5.2) | 210 (8.3) | 190 (7.5) | — | M10 (12×22 (0.47×0.87)) | M16 | 37 (82) |
| | DCR4-315C | D | 400 (15.7) | 345 (13.6) | 146 (5.7) | 118 (4.6) | 200 (7.9) | 225 (8.9) | — | M10 (12×22 (0.47×0.87)) | M16 | 40 (88) |
| DCR4-355C | E | 400 (15.7) | 345 (13.6) | 156 (6.1) | 128 (5.0) | 200 (7.9) | 225 (8.9) | — | M10 (12×22 (0.47×0.87)) | 4×M12 | 49 (108) | |