

Delta High Performance Vector Control Drive

C2000 Plus Series

User Manual

www.deltaww.com

Smarter. Greener. Together.

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(Original instructions)

Before Use

READ PRIOR TO INSTALLATION FOR SAFETY.

DANGER

- ☑ Disconnect AC input power before connecting any wiring to the AC motor drive.
- ☑ Turn OFF the AC motor drive power before doing any wiring. A charge with hazardous voltages may remain in the DC bus capacitors even after the power has been turned off for a short time. Do not touch the internal circuits and components before the POWER LED (behind the digital keypad) is OFF.
- ☑ For your safety, measure the remaining voltage with a DC voltmeter on +1/DC+ and DC- and do not start wiring before the voltage drops to a safe level (less than 25 V_{DC}). Installing wiring with a residual voltage may cause personal injury, sparks and short circuit.
- ☑ There are highly sensitive MOS components on the printed circuit boards. These components are especially sensitive to static electricity. Please do not touch these components or the circuit boards before taking anti-static measures.
- ☑ Never reassemble internal components or wiring.
- ☑ Ground the AC motor drive using the ground terminal. The grounding method must comply with the laws of the country where the AC motor drive is to be installed.
- ☑ Do NOT install the AC motor drive in a place subjected to high temperature, direct sunlight and inflammables.

CAUTION

- ☑ Never connect the AC motor drive output terminals U/T1, V/T2 and W/T3 directly to the AC mains circuit power supply.
- ☑ After finishing the wiring of the AC motor drive, check if R/L1, S/L2 and T/L3 are short-circuited to ground with a multimeter. Do NOT power the drive if short circuits occur. Eliminate the short circuits before the drive is powered.
- ☑ Rated voltage of power system to install motor drives is as below, make sure that the installation voltage is within the ranges mentioned below while installing the motor drives:
  1. For 230V models, the range is between 170–264V.
  2. For 460V models, the range is between 323–528V.
  3. For 575V models, the range is between 446–660V.
  4. For 690V models, the range is between 446–759V.
- ☑ Refer to the table below for short circuit rating:

Model (Power)	Short circuit rating
230V / 460V	100 kA
575V (2–20HP)	5 kA
690V (25–50HP)	5 kA
690V (60–175HP)	10 kA
690V (215–335HP)	18 kA
690V (425–600HP)	30 kA
690V (745–850HP)	42 kA

- ☑ Only qualified persons are allowed to install, wire and maintain the AC motor drives.
- ☑ Even if the three-phase AC motor is stopped, a charge may still remain in the main circuit terminals of the AC motor drive with hazardous voltages.

☑ The performance of electrolytic capacitor will degrade if it is not charged for a long time. It is recommended to charge the drive which is stored in no charge condition every 2 years for 3–4 hours to restore the performance of electrolytic capacitor in the motor drive.

NOTE: When power up the motor drive, use adjustable AC power source (ex. AC auto-transformer) to charge the drive at 70%–80% of rated voltage for 30 minutes (do not run the motor drive). Then charge the drive at 100% of rated voltage for an hour (do not run the motor drive). By doing these, restore the performance of electrolytic capacitor before starting to run the motor drive. Do NOT run the motor drive at 100% rated voltage right away.

☑ Pay attention to the following precautions when transporting and installing this package (including wooden crate and wood stave).

1. If you need to deworm the wooden crate, do not use fumigation or you will damage the drive. Any damage to the drive caused by using fumigation voids the warranty.
2. Use other methods, such as heat treatment or any other non-fumigation treatment, to deworm the wood packaging material.
3. If you use heat treatment to deworm, leave the packaging materials in an environment of over 56°C for a minimum of thirty minutes.

☑ Connect the drive to a three-phase three-wire or three-phase four-wire Wye system to comply with UL standards.

☑ If the motor drive produces a leakage current of over 3.5mA AC or over 10mA DC on the Protective Earthing conductor, the minimum specifications required of the Protective Earthing conductor to be installed have to comply with the national, local laws and regulations or follow IEC 61800-5-1 to do grounding.

☑ The C2000 Plus series drives are designed for Industrial application. The non-linear load generates harmonic current, when you use a C2000 Plus series drive in a public low-voltage distribution network (such as power supply in a residential building), install suppression devices (for example, one-to-one transformer or input AC reactor) to suppress the possible interferences caused by the harmonic current. Contact Delta for more information.

NOTE:

1. In the figures in this manual, the cover or safety shield is disassembled only when explaining the details of the product. During operation, install the top cover and wiring correctly according to the provisions. Refer to the operation descriptions in the manual to ensure safety.
2. The figures in this instruction are only for reference and may be slightly different depending on your model, but it will not affect your customer rights.
3. The content of this manual may be revised without prior notice. Consult our distributors or download the latest version at http://www.deltaww.com/iadownload_acmotordrive

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Issued Edition: 00
Firmware Version: V3.09 (Refer to Pr.00-06 on the product for the firmware version.)
Issued Date: 2025/05

Chapter 1 Introduction

1-1 Nameplate Information

1-2 Model Name

1-3 Serial Number

1-4 Apply After-Sales Service by Mobile Device

1-5 RFI Jumper

1-6 Dimensions

After receiving the AC motor drive, please check for the following:

1. Inspect the unit after unpacking to ensure that it was not damaged during shipment. Make sure that the part number printed on the package matches the part number indicated on the nameplate.
2. Make sure that the mains voltage is within the range indicated on the nameplate. Install the AC motor drive according to the instructions in this manual.
3. Before applying power, make sure that all devices, including mains power, motor, control board and digital keypad, are connected correctly.
4. When wiring the AC motor drive, make sure that the wiring of input terminals “R/L1, S/L2, T/L3” and output terminals “U/T1, V/T2, W/T3” are correct to prevent damage to the drive.
5. When power is applied, use the digital keypad (KPC-CC01) to select the language and set parameters. When executing a trial run, begin with a low speed and then gradually increases the speed to the desired speed.

1-1 Nameplate Information

230V / 460V Model

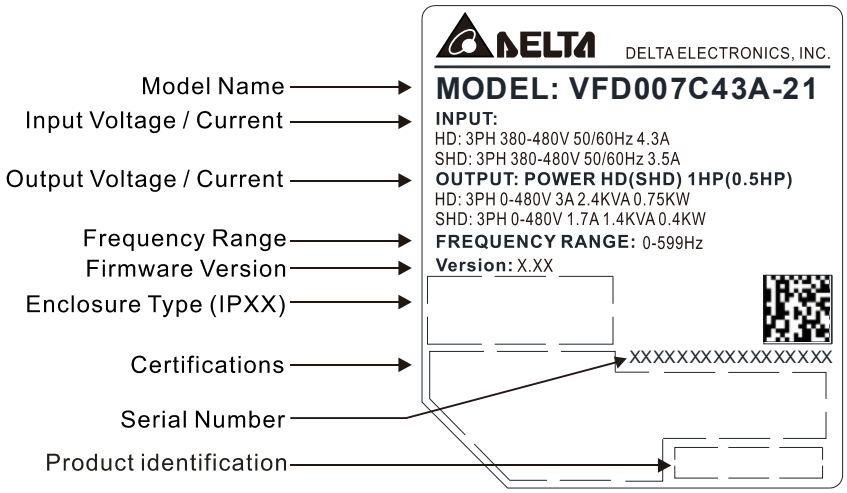


Figure 1-1

575V / 690V Model

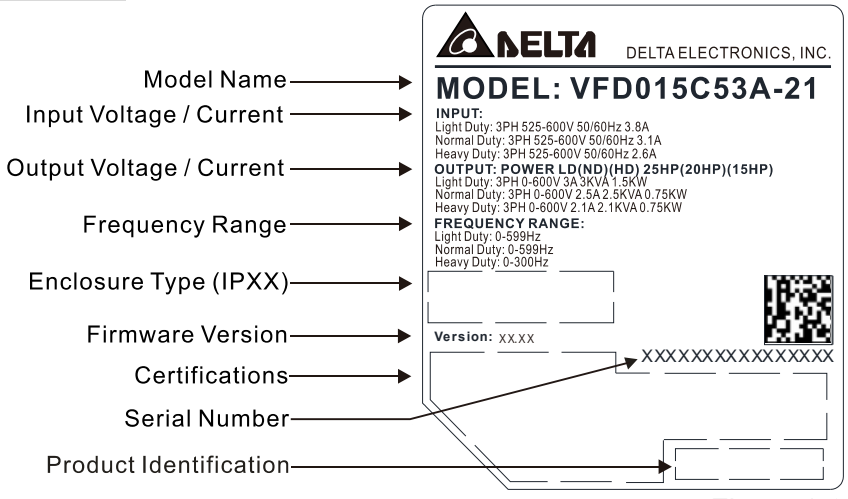
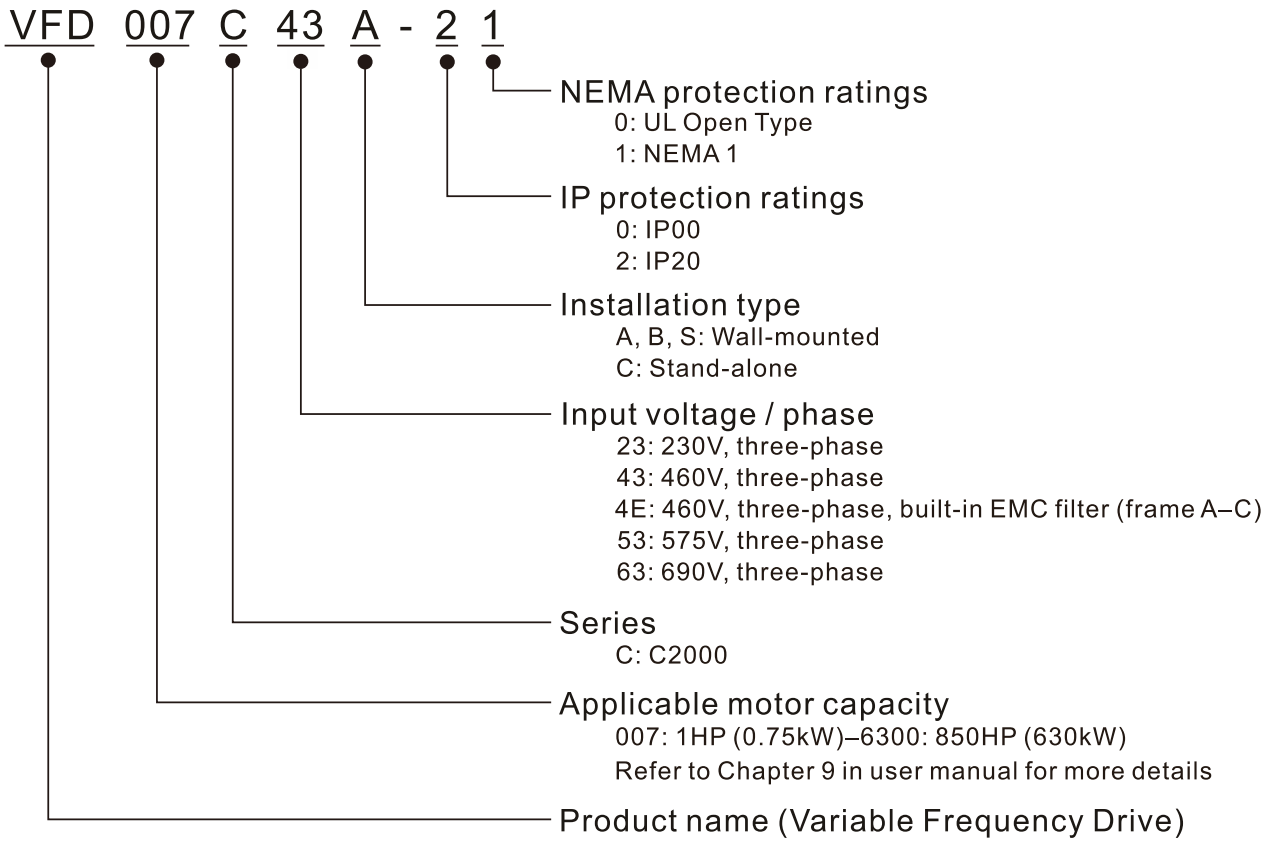
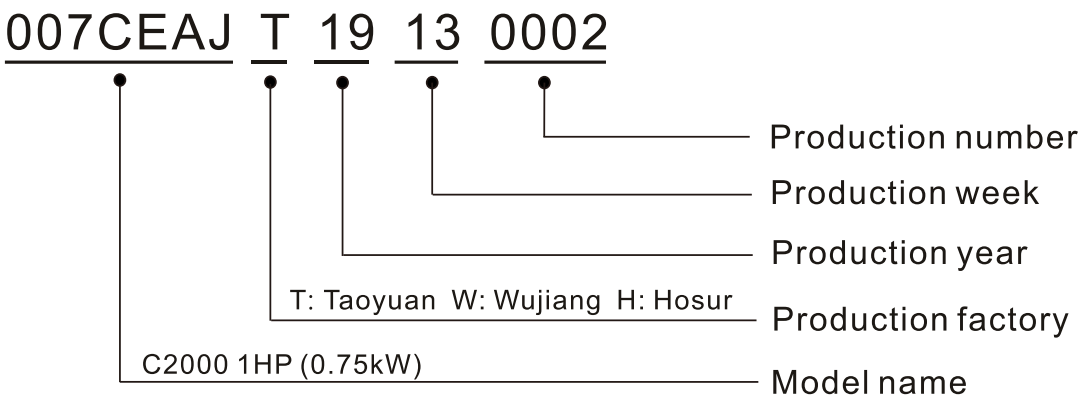


Figure 1-2

1-2 Model Name



1-3 Serial Number



1-4 Apply After-Sales Service by Mobile Device

1-4-1 Location of Service Link Label

Frame A–H

Service link label (Service Label) will be pasted on the upper-right corner of the side where keypad is installed on the case body, as below drawing shown:

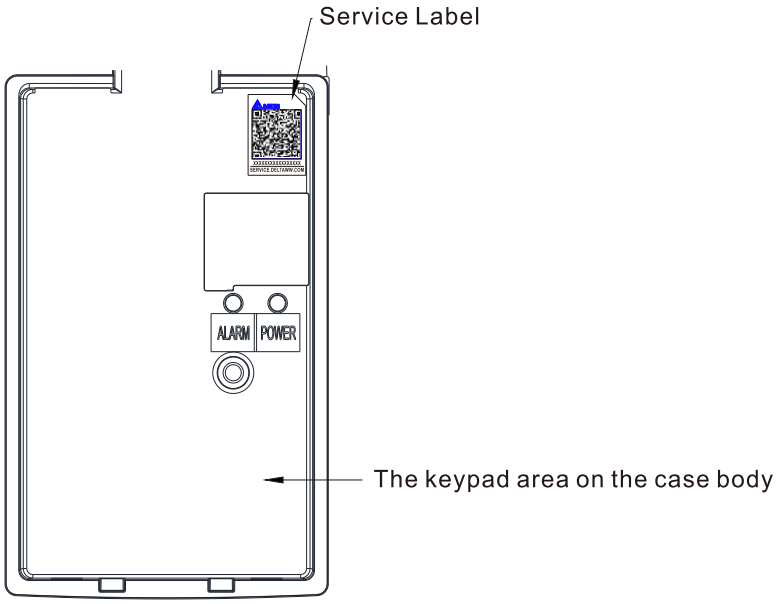


Figure 1-3

1-4-2 Service Link Label



QR code
https://service.deltaww.com/ia/repair?sn=product-serial-number

Serial number

Web address of product service
https://service.deltaww.com

Figure 1-4

Scan QR Code to apply

1. Find out the QR code sticker (as above shown).
2. Using a Smartphone to run a QR Code reader APP.
3. Point your camera to the QR Code. Hold your camera steady so that the QR code comes into focus.
4. Access the Delta After-Sales Service website.
5. Fill your information into the column marked with an orange star.
6. Enter the CAPTCHA and click “Submit” to complete the application.

Cannot find out the QR Code?

1. Open a web browser on your computer or smart phone.
2. In the browser address bar, enter https://service.deltaww.com/us/Repair/Request?type=IA and press **Enter**.
3. Fill your information into the columns marked with an orange star.
4. Enter the CAPTCHA and click “Submit” to complete the application.

1-5 RFI Jumper

(1) The drive contains Varistors / MOVs that are connected from phase to phase and from phase to ground to prevent the drive from unexpected stop or damage caused by mains surges or voltage spikes. Because the Varistors / MOVs from phase to ground are connected to ground with the RFI jumper, removing the RFI jumper disables the protection.

(2) In models with a built-in EMC filter, the RFI jumper connects the filer capacitors to ground to form a return path for high frequency noise in order to isolate the noise from contaminating the mains power. Removing the RFI jumper strongly reduces the effect of the built-in EMC filter. Although a single drive complies with the international standards for leakage current, an installation with several drives with built-in EMC filters can trigger the RCD. Removing the RFI jumper helps, but the EMC performance of each drive is no longer guaranteed.

Frame A–C Screw Torque: 8–10 kg-cm / (6.9–8.7 lb-in.) / (0.8–1.0 Nm)

Loosen the screws and remove the RFI jumper (as shown below).

Tighten the screws again after you remove the RFI jumper.

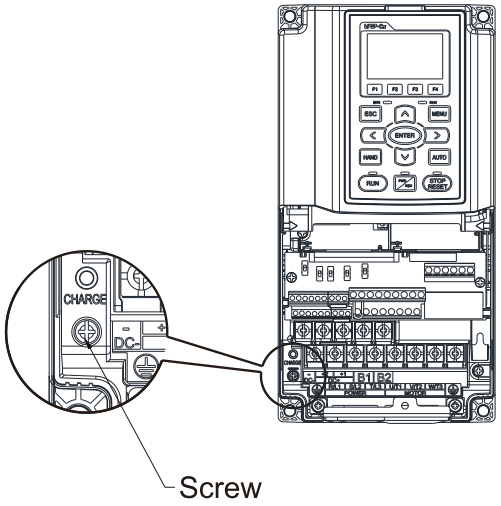


Figure 1-5

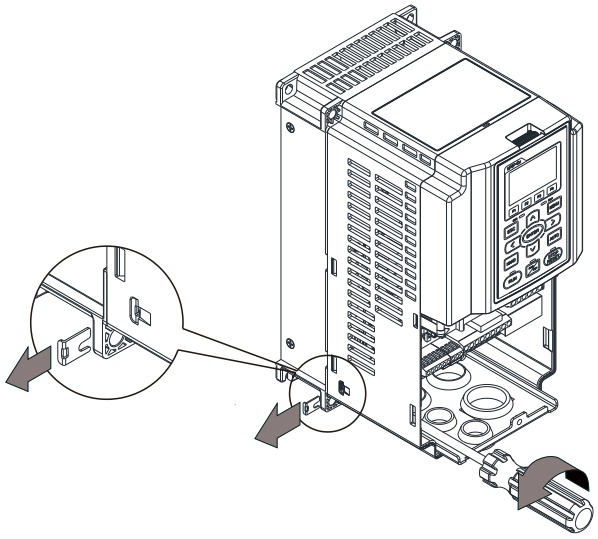


Figure 1-6

Frame D0–H

Remove the RFI jumper by hands (as shown below).

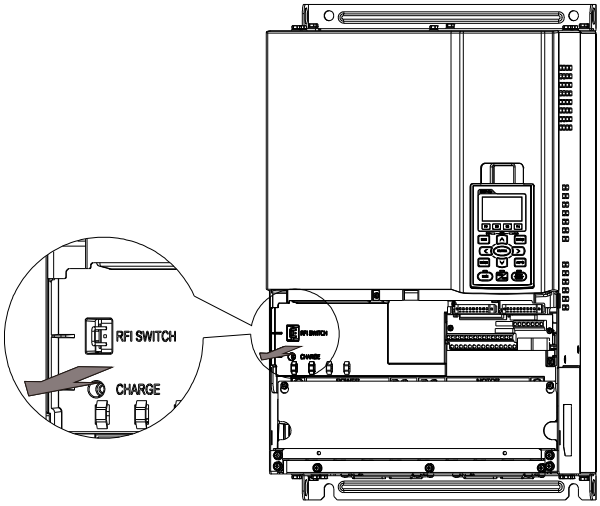


Figure 1-7

Isolating main power from ground:

When the power distribution system of the drive is a floating ground system (IT Systems) or an asymmetric ground system (Corner Grounded TN Systems), you must remove the RFI jumper. Voltage of any phase to the ground for either system may be larger than the voltage specifications of the drive's built-in surge absorber and common-mode capacitance. In this case, connecting RFI jumper to the ground may cause damage to the drive.

Important points regarding ground connection

- ☑ To ensure the safety of personnel, proper operation, and to reduce electromagnetic radiation, you must properly ground the motor and drive during installation.
- ☑ The diameter of the grounding cables must comply with the local safety regulations.
- ☑ You must connect the shielded cable to the motor drive's ground to meet safety regulations.
- ☑ Only use the shielded cable as the ground for equipment when the aforementioned points are met.
- ☑ When installing multiple drives, do not connect the grounds of the drives in series but connect each drive to ground. The following pictures show the correct and wrong ways to connect the grounds.

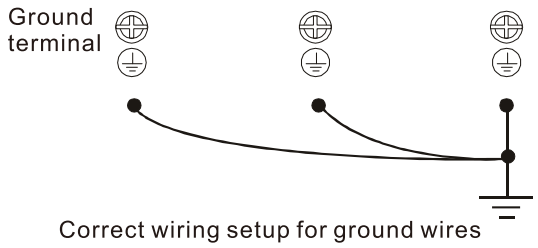


Figure 1-8

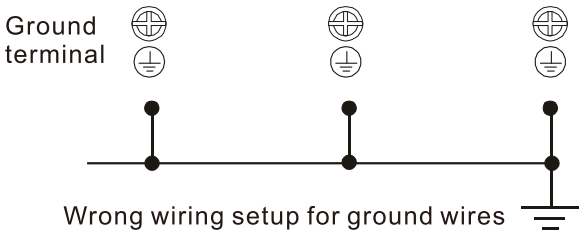


Figure 1-9

Pay particular attention to the following points:

- ☑ Do not remove the RFI jumper while the power is ON.
- ☑ Removing the RFI jumper also cuts the capacitor conductivity of the surge absorber to ground and the built-in EMC filter capacitors. Compliance with the EMC specifications is no longer guaranteed.
- ☑ Do not remove the RFI jumper if the mains power is a symmetrical grounded power system in order to maintain the efficiency for EMC circuit.
- ☑ Remove the RFI jumper when conducting high voltage tests. When conducting a high voltage test to the entire facility, disconnect the mains power and the motor if the leakage current is too high.

Floating Ground System (IT Systems)

A floating ground system is also called IT system, ungrounded system, or high impedance / resistance (greater than 30Ω) grounding system.

- ☑ Remove the RFI jumper to disconnect the ground cable from the internal filter capacitor and surge absorber.
- ☑ In situations where EMC is required, check for excess electromagnetic radiation affecting nearby low-voltage circuits. In some situations, the adapter and cable naturally provide enough suppression. If in doubt, install an extra electrostatic shielded cable on the power supply side between the main circuit and the control terminals to increase shielding.
- ☑ Do not install an external RFI / EMC filter. The external EMC filter passes through a filter capacitor and connects power input to the ground. This is very dangerous and damages the motor drive.

Asymmetric Ground System (Corner Grounded TN Systems)

Caution: Do not remove the RFI jumper while power to the input terminal of the drive is ON.

In the following four situations, the RFI jumper must be removed. This is to prevent the system from grounding through the RFI and filter capacitor and damaging the drive.

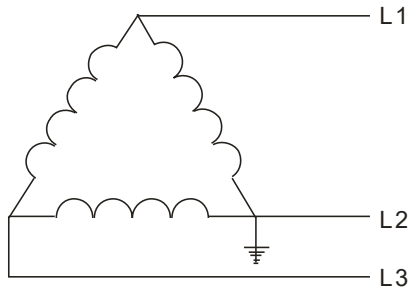
<table>
<tr><th colspan="2">You must remove the RFI jumper for an asymmetric ground system</th></tr>
<tr><td>1. Grounding at a corner in a triangle configuration
 

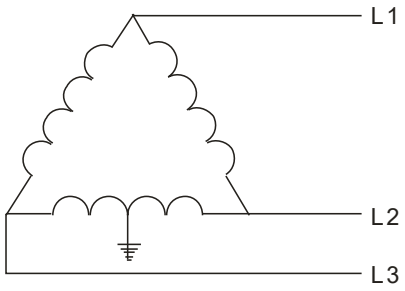
Figure 1-10</td><td>2. Grounding at a midpoint in a polygonal configuration
 

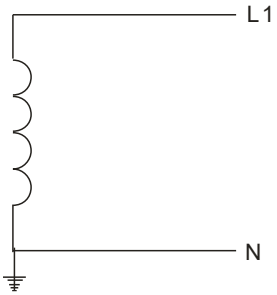
Figure 1-11</td></tr>
<tr><td>3. Grounding at one end in a single-phase configuration
 

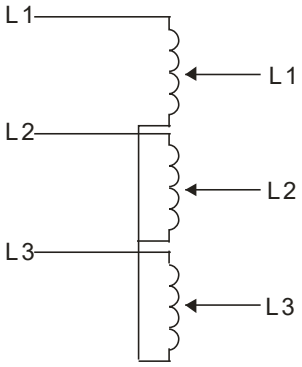
Figure 1-12</td><td>4. No stable neutral grounding in a three-phase autotransformer configuration
 

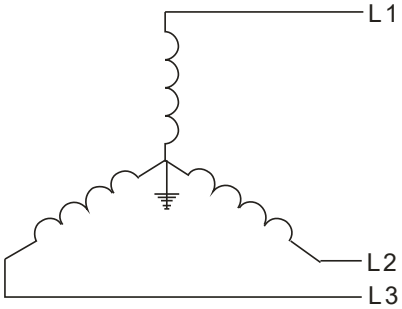
Figure 1-13</td></tr>
<tr><th colspan="2">You can use the RFI jumper for a symmetrical grounding power system</th></tr>
<tr><td>In a situation with a symmetrical grounding power system, you can use the RFI jumper to maintain the effect of the built-in EMC filter and surge absorber. For example, the diagram on the right is a symmetrical grounding power system.</td><td> 

Figure 1-14</td></tr>
</table>

1-6 Dimensions

Frame A

VFD007C23A-21; VFD007C43A-21; VFD007C4EA-21; VFD015C23A-21; VFD015C43A-21; VFD015C4EA-21; VFD015C53A-21; VFD022C23A-21; VFD022C43A-21; VFD022C4EA-21; VFD022C53A-21; VFD037C23A-21; VFD037C43A-21; VFD037C4EA-21; VFD037C53A-21; VFD040C43A-21; VFD040C4EA-21; VFD055C43A-21; VFD055C4EA-21

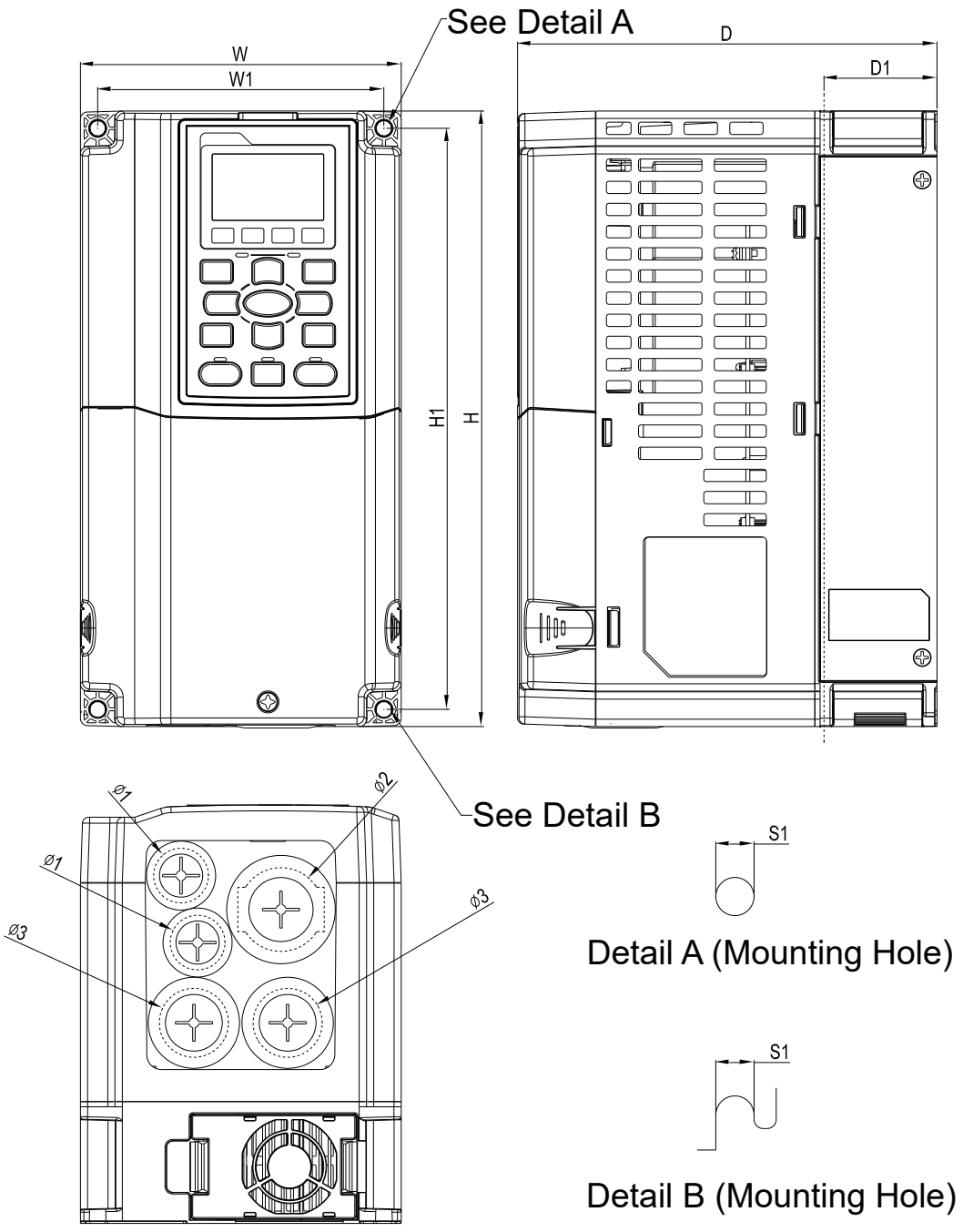


Figure 1-15

Unit: mm [inch]

Frame	W	H	D	W1	H1	D1*	S1	Φ1	Φ2	Φ3
A	130.0 [5.12]	250.0 [9.84]	170.0 [6.69]	116.0 [4.57]	236.0 [9.29]	45.8 [1.80]	6.2 [0.24]	22.2 [0.87]	34.0 [1.34]	28.0 [1.10]

D1*: Flange mounting

Frame B

VFD055C23A-21; VFD055C53A-21; VFD075C23A-21; VFD075C43A-21; VFD075C4EA-21; VFD075C53A-21; VFD110C23A-21; VFD110C43A-21; VFD110C4EA-21; VFD110C53A-21; VFD150C43A-21; VFD150C4EA-21; VFD150C53A-21

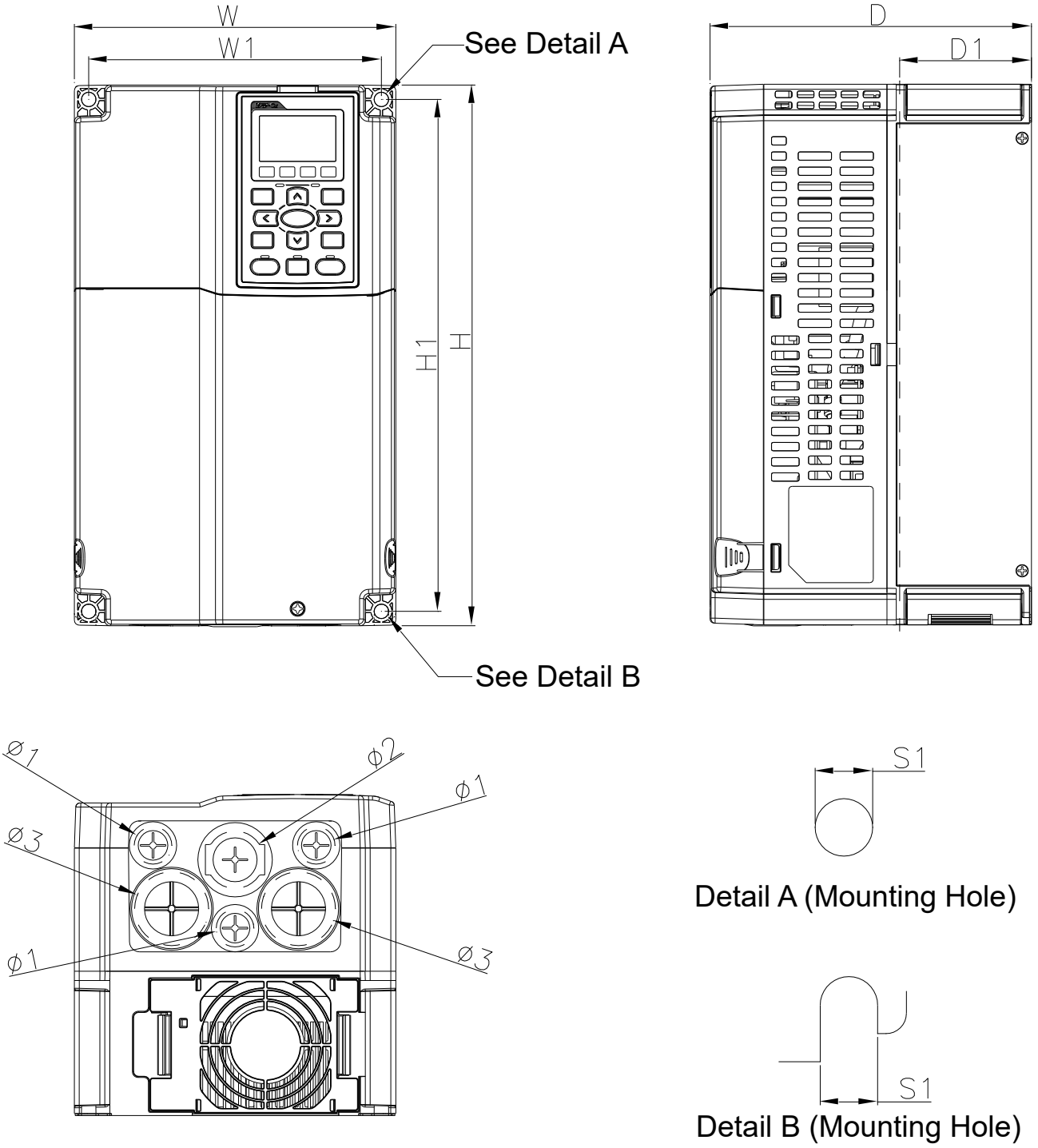


Figure 1-16

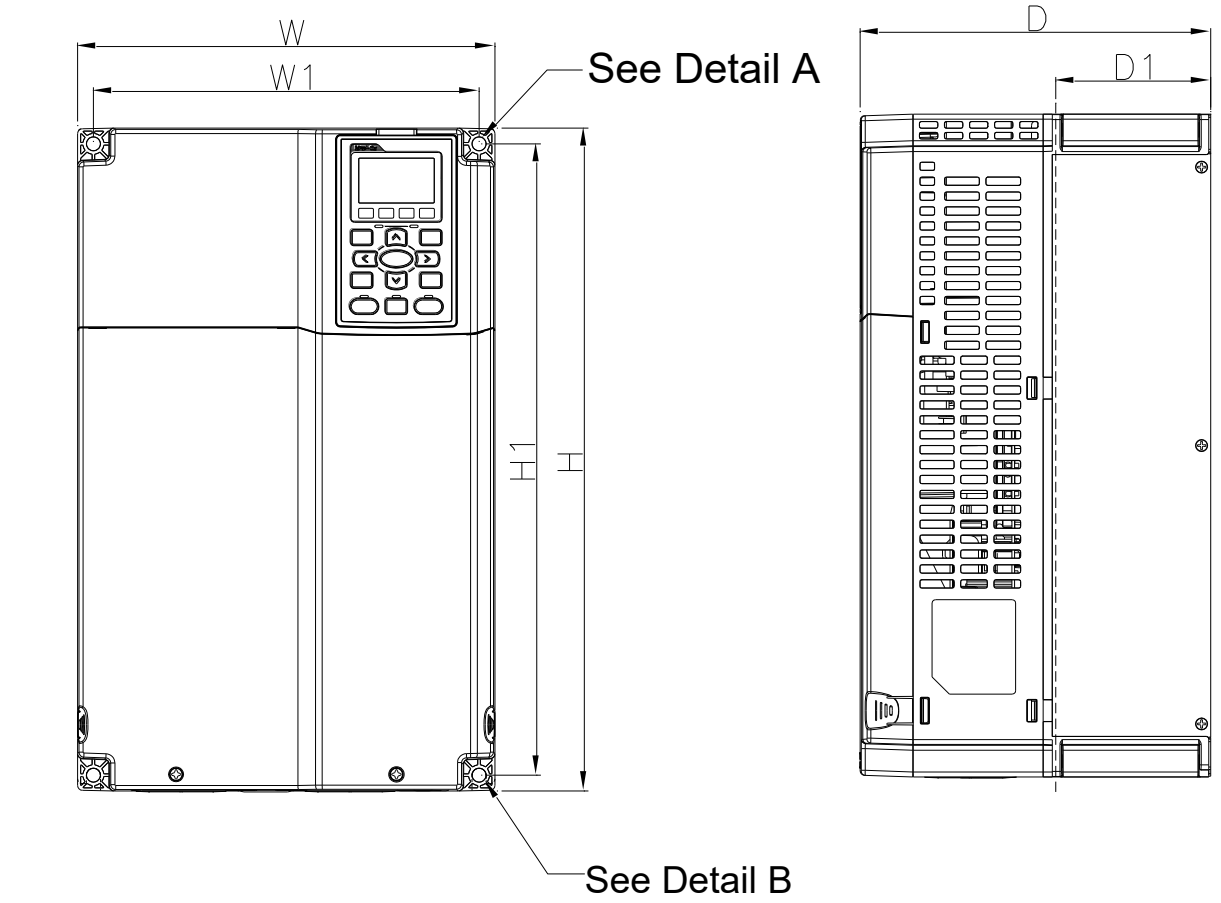
Unit: mm [inch]

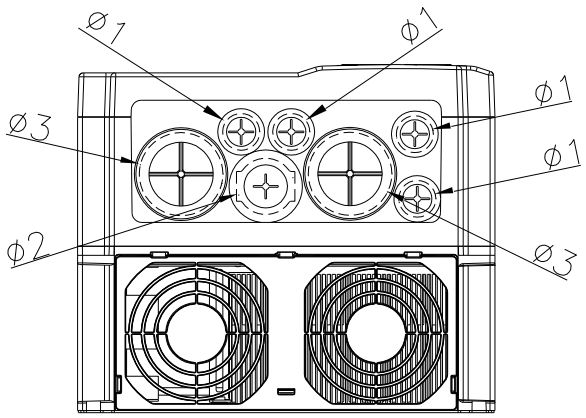
Frame	W	H	D	W1	H1	D1*	S1	Φ1	Φ2	Φ3
B	190.0 [7.48]	320.0 [12.60]	190.0 [7.48]	173.0 [6.81]	303.0 [11.93]	77.9 [3.07]	8.5 [0.33]	22.2 [0.87]	34.0 [1.34]	43.8 [1.72]

D1*: Flange mounting

Frame C

VFD150C23A-21; VFD185C23A-21; VFD185C43A-21; VFD185C4EA-21; VFD185C63B-21; VFD220C23A-21; VFD220C43A-21; VFD220C4EA-21; VFD220C63B-21; VFD300C43A-21; VFD300C4EA-21; VFD300C63B-21; VFD370C63B-21





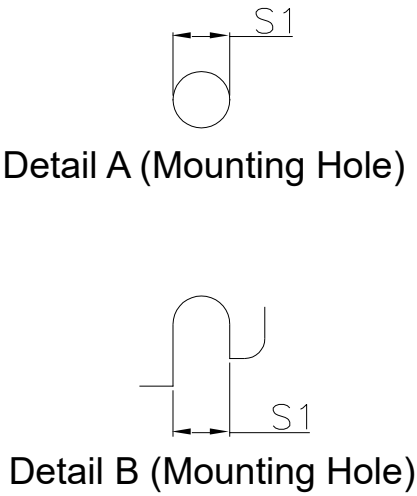


Figure 1-17

Unit: mm [inch]

Frame	W	H	D	W1	H1	D1*	S1	Φ1	Φ2	Φ3
C	250.0 [9.84]	400.0 [15.75]	210.0 [8.27]	231.0 [9.09]	381.0 [15.00]	92.9 [3.66]	8.5 [0.33]	22.2 [0.87]	34.0 [1.34]	50.0 [1.97]

D1*: Flange mounting

Frame D0

D0-1: VFD370C43S-00; VFD450C43S-00

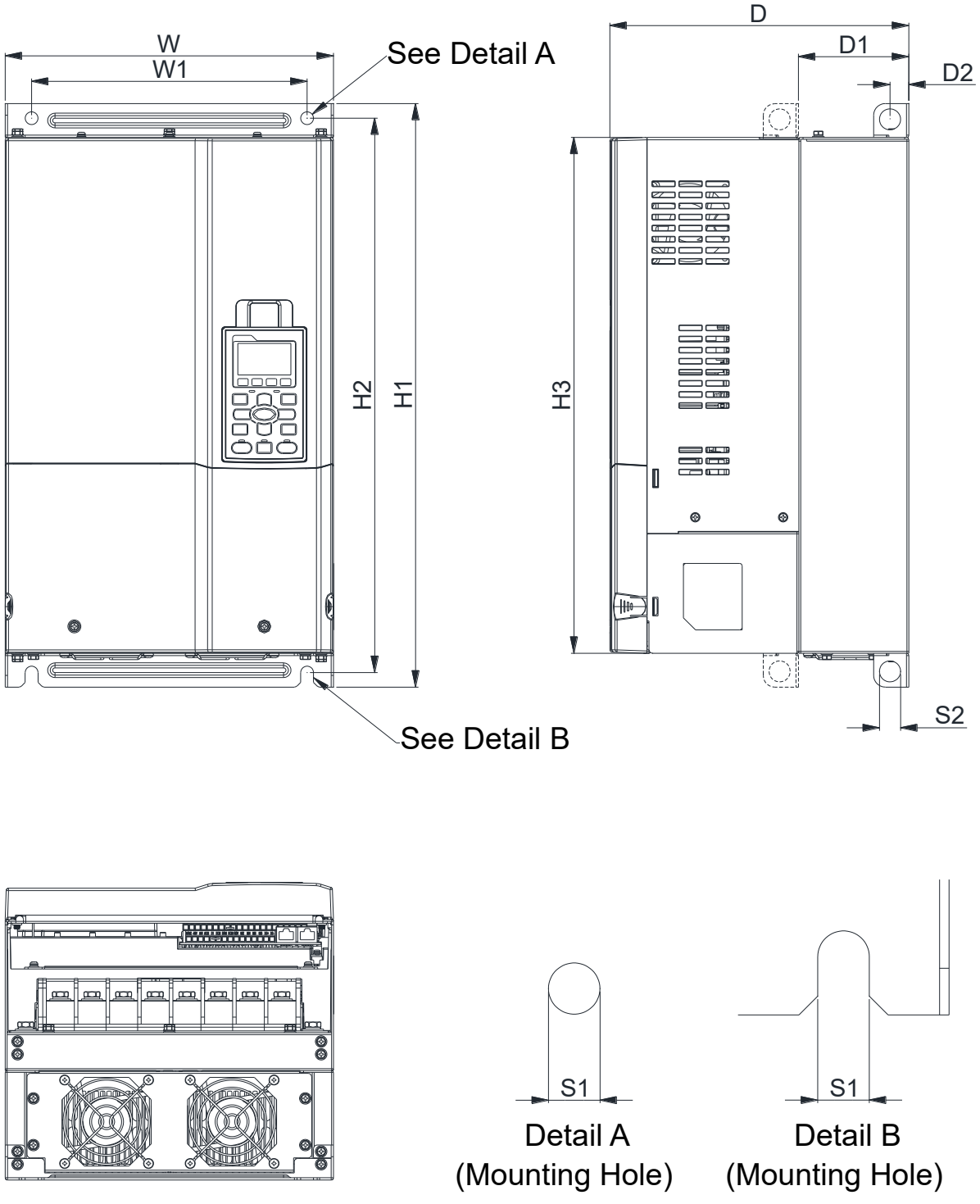


Figure 1-18

Unit: mm [inch]

Frame	W	H1	D	W1	H2	H3	D1*	D2	S1	S2
D0-1	280.0 [11.02]	500.0 [19.69]	255.0 [10.04]	235.0 [9.25]	475.0 [18.70]	442.0 [17.40]	94.2 [3.71]	16.0 [0.63]	11.0 [0.43]	18.0 [0.71]

D1*: Flange mounting

Frame D0

D0-2: VFD370C43S-21; VFD450C43S-21

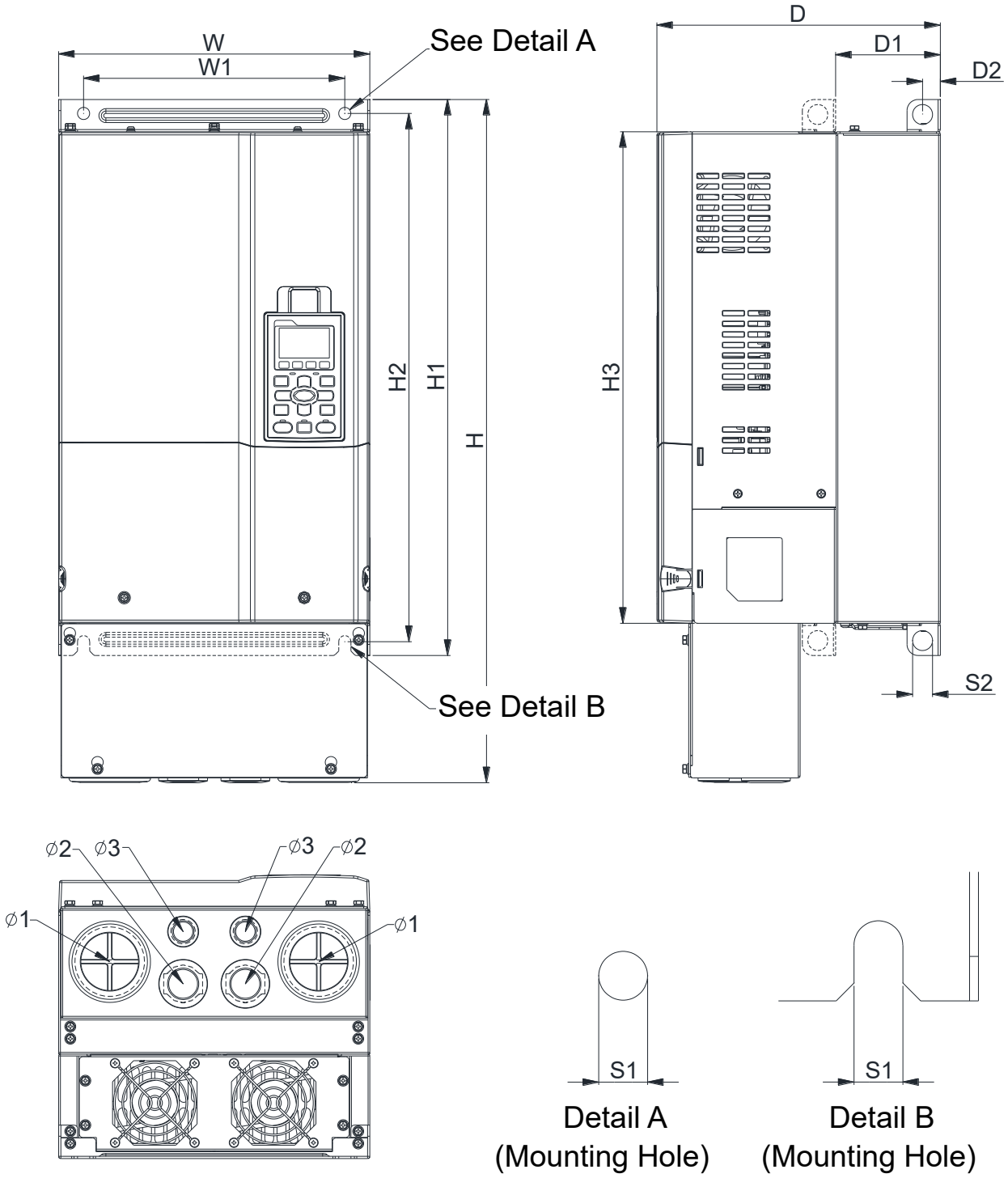


Figure 1-19

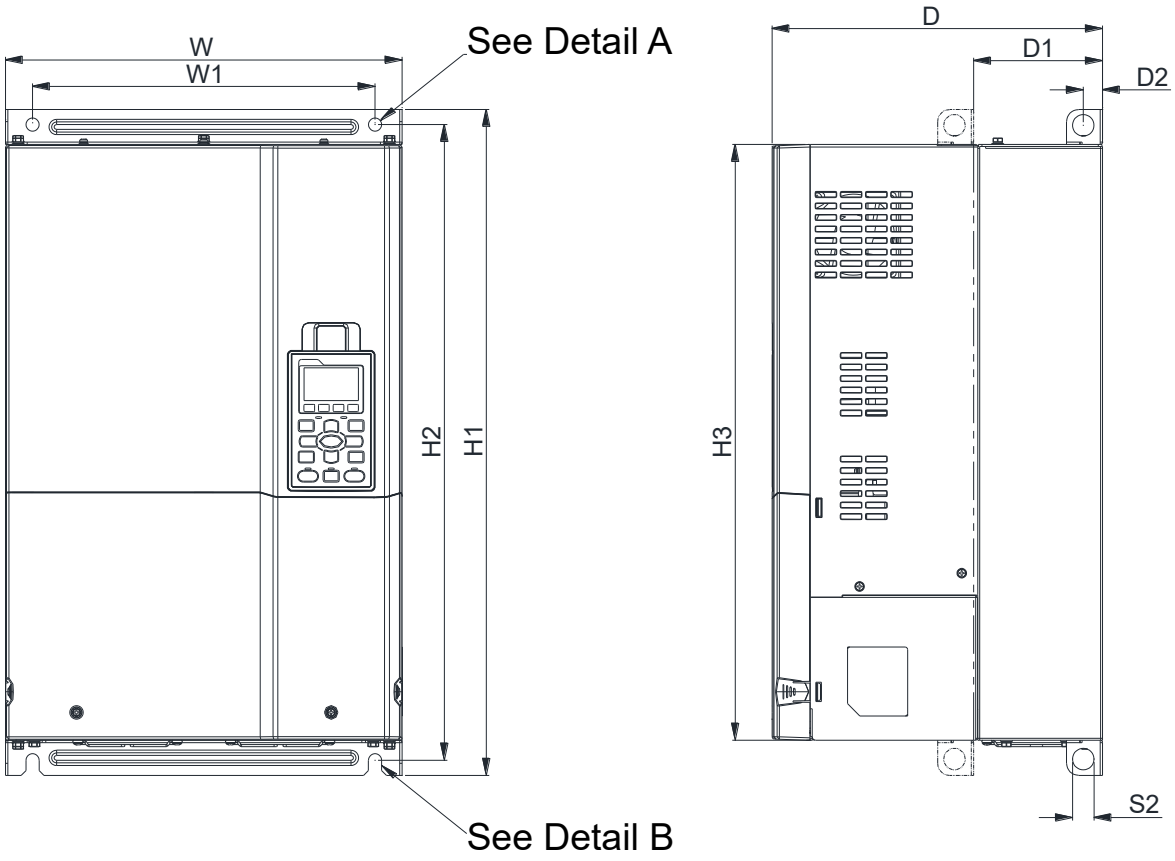
Unit: mm [inch]

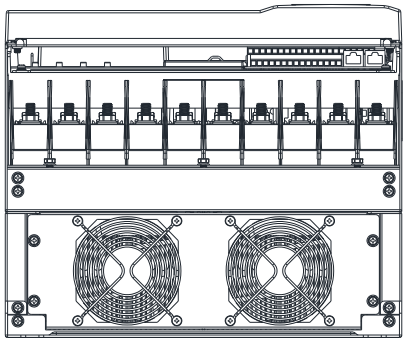
Frame	W	H	D	W1	H1	H2	H3	D1*	D2	S1	S2	Φ1	Φ2	Φ3
D0-2	280.0 [11.02]	614.4 [24.19]	255.0 [10.04]	235.0 [9.25]	500.0 [19.69]	475.0 [18.70]	442.0 [17.40]	94.2 [3.71]	16.0 [0.63]	11.0 [0.43]	18.0 [0.71]	62.7 [2.47]	34.0 [1.34]	22.0 [0.87]

D1*: Flange mounting

Frame D

D1: VFD300C23A-00; VFD370C23A-00; VFD450C63B-00; VFD550C43A-00; VFD550C63B-00; VFD750C43A-00





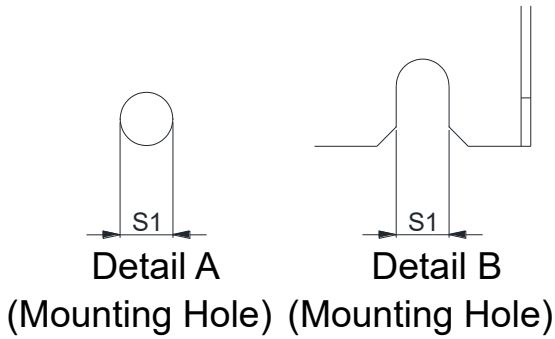


Figure 1-20

Unit: mm [inch]

Frame	W	H	D	W1	H1	H2	H3	D1*	D2	S1	S2	Φ1	Φ2	Φ3
D1	330.0 [12.99]	-	275.0 [10.83]	285.0 [11.22]	550.0 [21.65]	525.0 [20.67]	492.0 [19.37]	107.2 [4.22]	16.0 [0.63]	11.0 [0.43]	18.0 [0.71]	-	-	-

D1*: Flange mounting

Frame D

D2: VFD300C23A-21; VFD370C23A-21; VFD450C63B-21; VFD550C43A-21; VFD550C63B-21; VFD750C43A-21

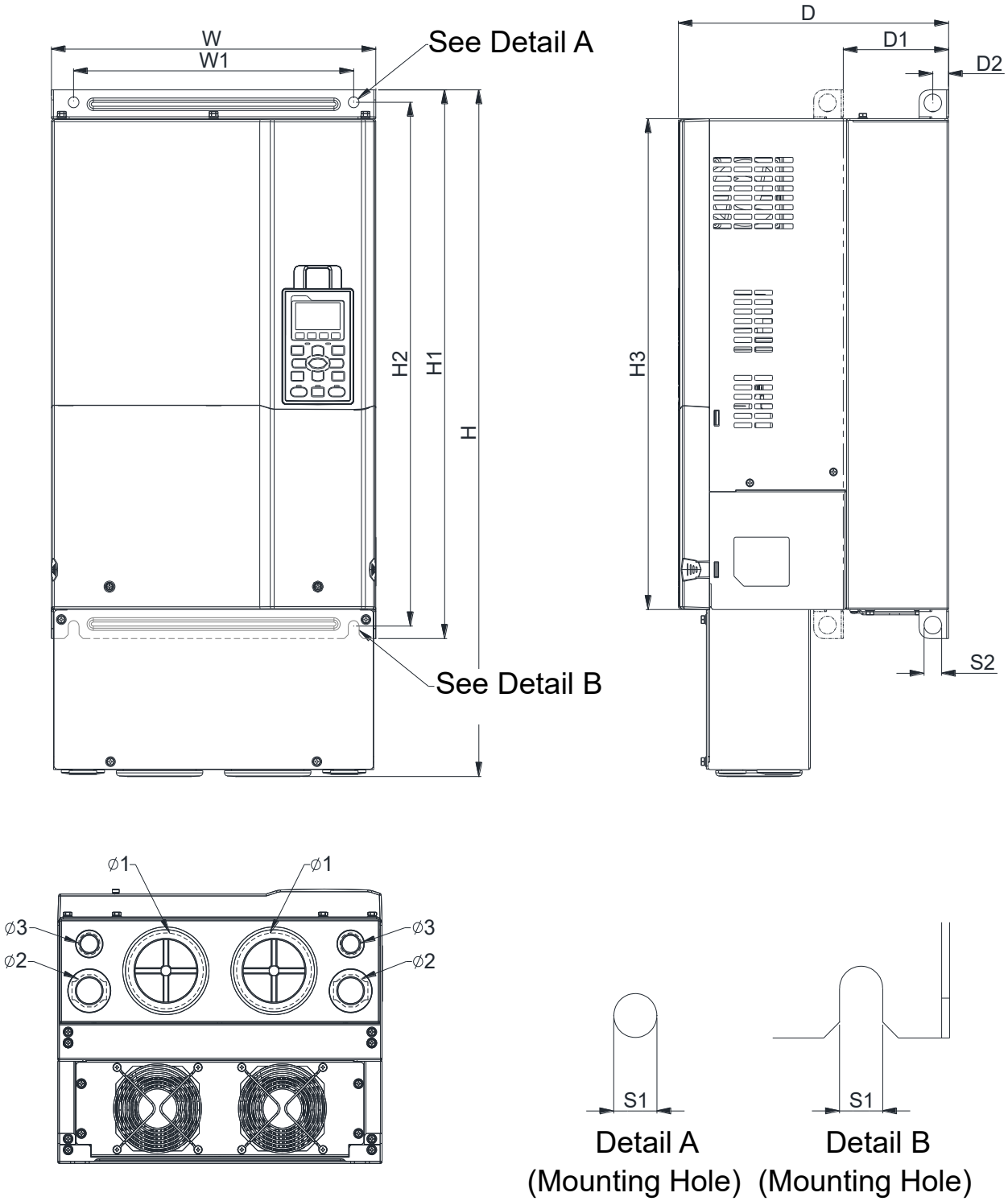


Figure 1-21

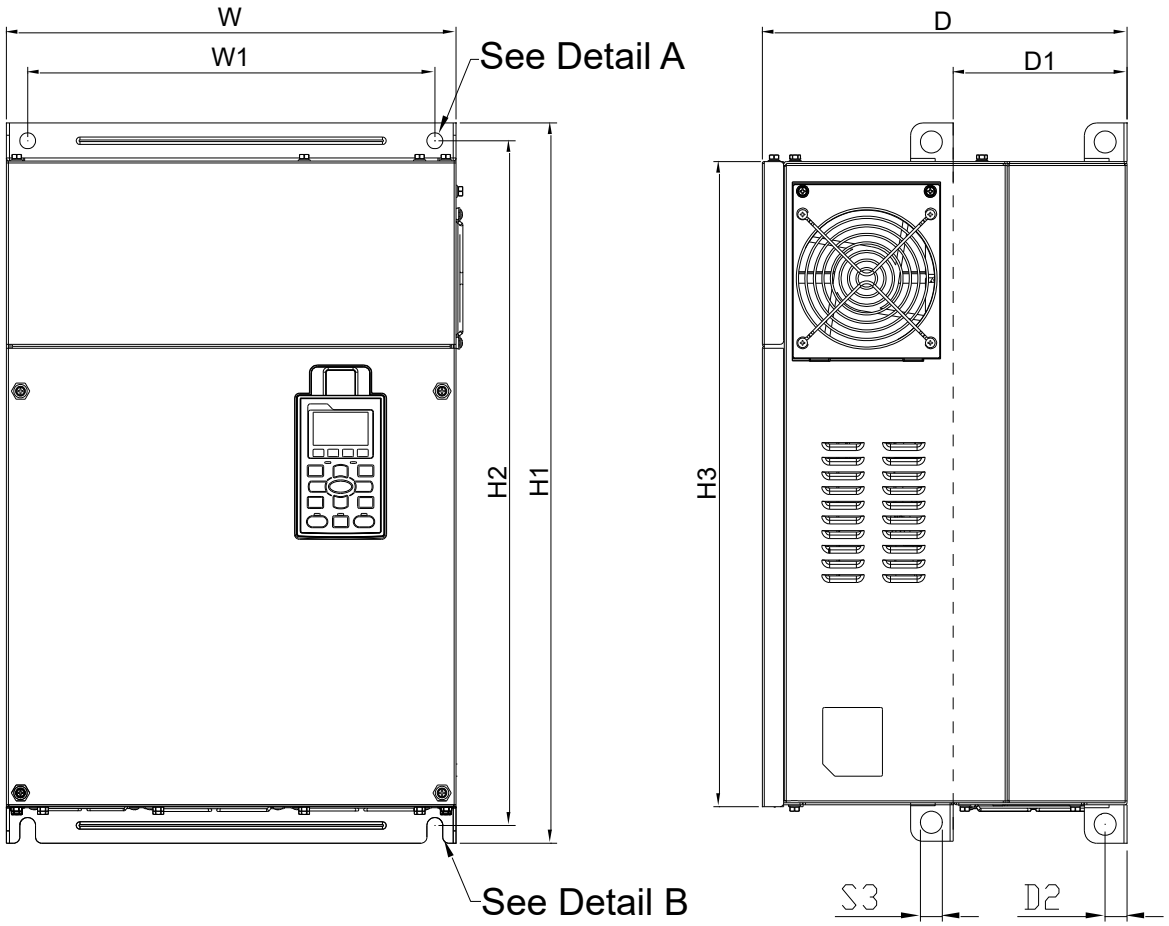
Unit: mm [inch]

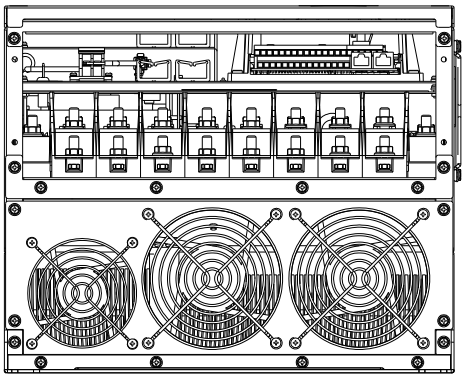
Frame	W	H	D	W1	H1	H2	H3	D1*	D2	S1	S2	Φ1	Φ2	Φ3
D2	330.0 [12.99]	688.3 [27.10]	275.0 [10.83]	285.0 [11.22]	550.0 [21.65]	525.0 [20.67]	492.0 [19.37]	107.2 [4.22]	16.0 [0.63]	11.0 [0.43]	18.0 [0.71]	76.2 [3.00]	34.0 [1.34]	22.0 [0.87]

D1*: Flange mounting

Frame E

E1: VFD450C23A-00; VFD550C23A-00; VFD750C23A-00; VFD750C63B-00; VFD900C43A-00; VFD900C63B-00; VFD1100C43A-00; VFD1100C63B-00; VFD1320C63B-00





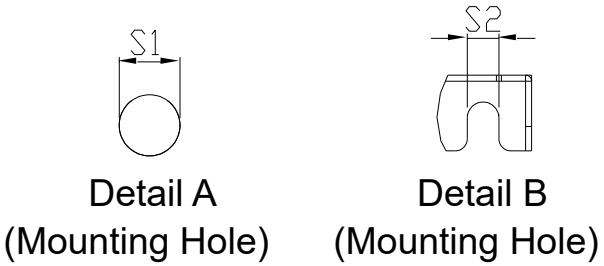


Figure 1-22

Unit: mm [inch]

Frame	W	H	D	W1	H1	H2	H3	D1*	D2	S1, S2	S3	Φ1	Φ2	Φ3
E1	370.0 [14.57]	-	300.0 [11.81]	335.0 [13.19	589 [23.19]	560.0 [22.05]	528.0 [20.80]	143.0 [5.63]	18.0 [0.71]	13.0 [0.51]	18.0 [0.71]	-	-	-

D1*: Flange mounting

Frame E

E2: VFD450C23A-21; VFD550C23A-21; VFD750C23A-21; VFD750C63B-21; VFD900C43A-21; VFD900C63B-21; VFD1100C43A-21; VFD1100C63B-21; VFD1320C63B-21

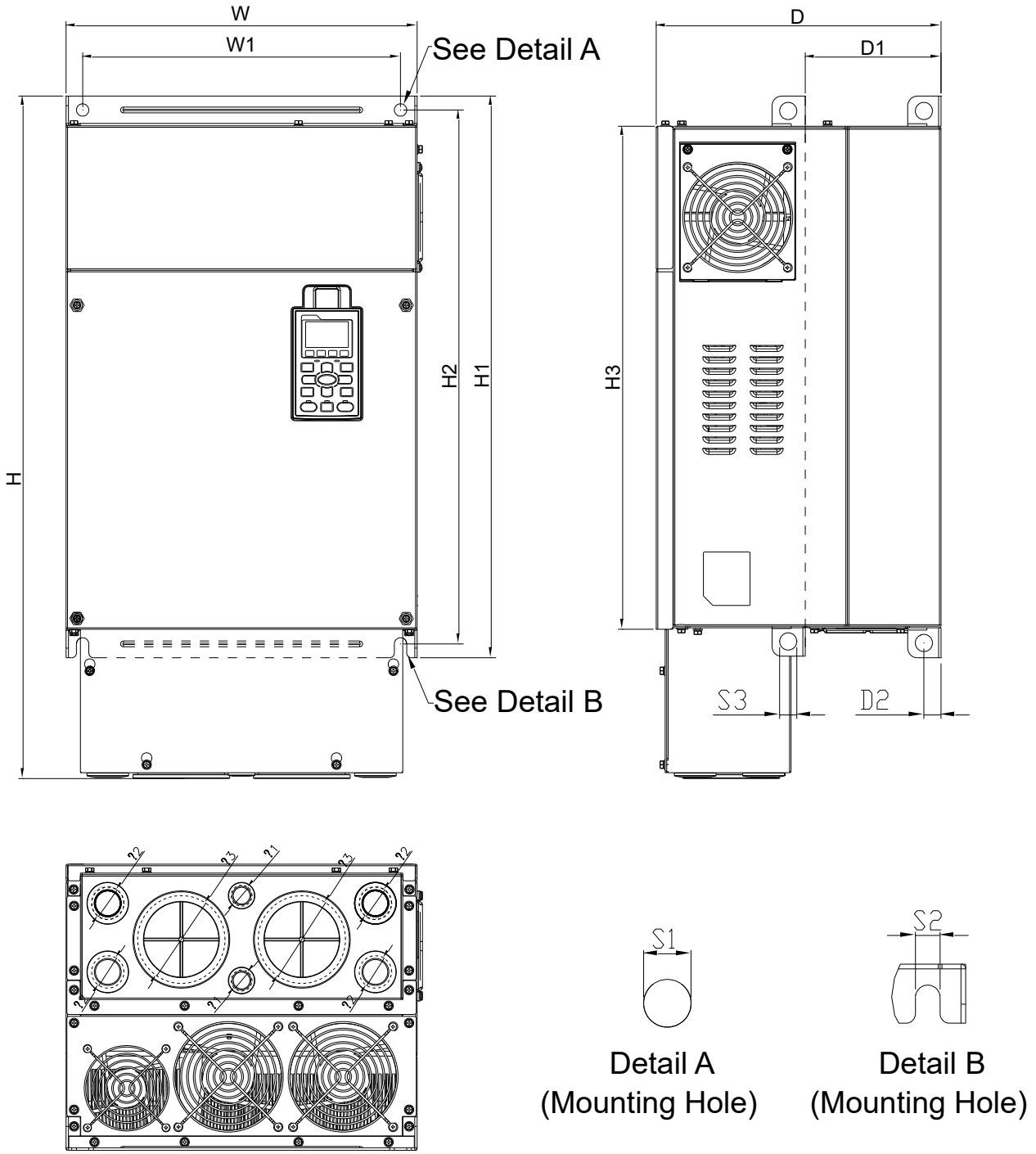


Figure 1-23

Unit: mm [inch]

Frame	W	H	D	W1	H1	H2	H3	D1*	D2	S1, S2	S3	Φ1	Φ2	Φ3
E2	370.0 [14.57]	715.8 [28.18]	300.0 [11.81]	335.0 [13.19	589 [23.19]	560.0 [22.05]	528.0 [20.80]	143.0 [5.63]	18.0 [0.71]	13.0 [0.51]	18.0 [0.71]	22.0 [0.87]	34.0 [1.34]	92.0 [3.62]

D1*: Flange mounting

Frame F

F1: VFD900C23A-00; VFD1320C43A-00; VFD1600C43A-00; VFD1600C63B-00; VFD2000C63B-00

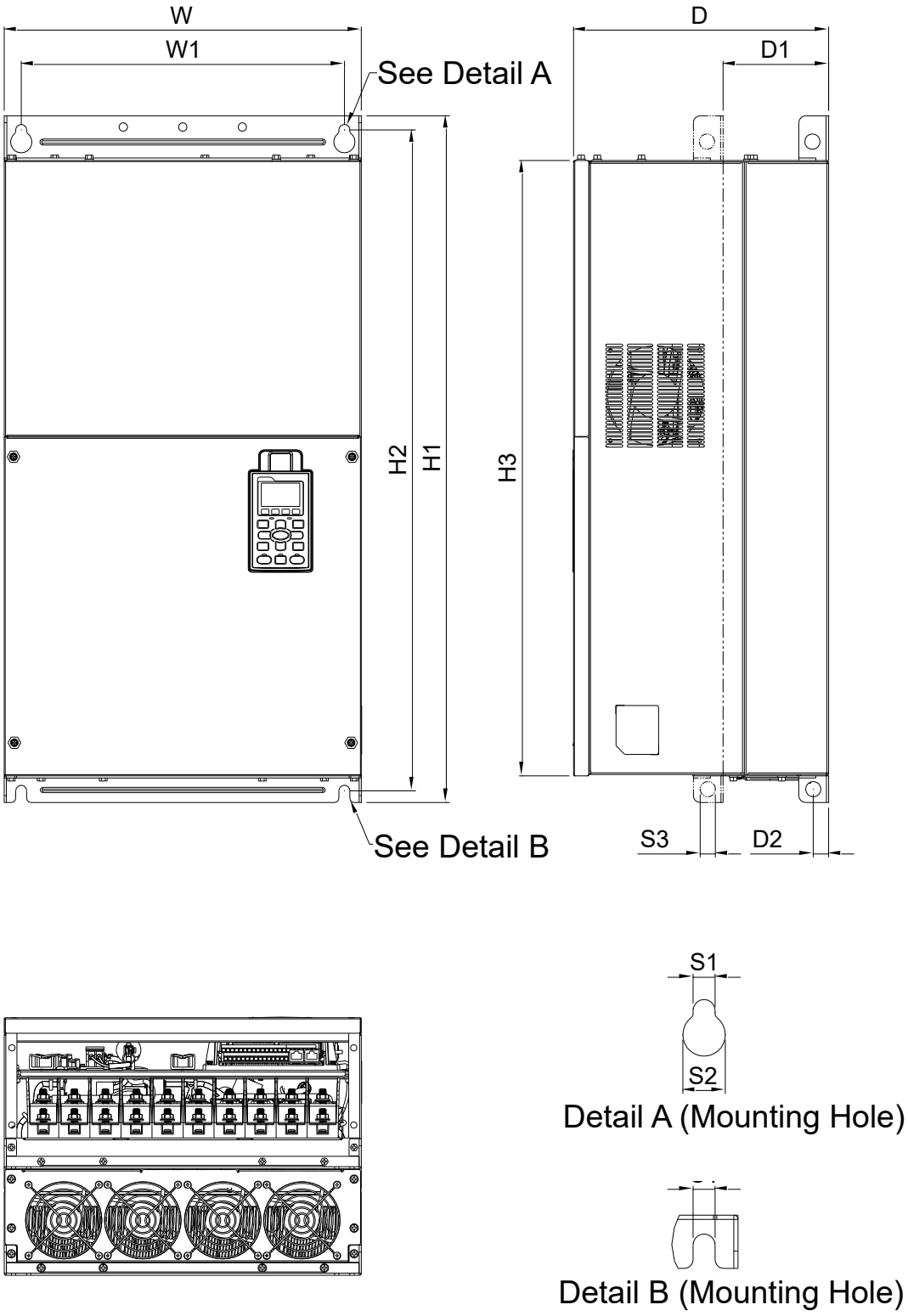


Figure 1-24

Unit: mm [inch]

Frame	W	H	D	W1	H1	H2	H3	D1*	D2	S1	S2	S3
F1	420.0 [16.54]	-	300.0 [11.81]	380.0 [14.96]	800.0 [31.50]	770.0 [30.32]	717.0 [28.23]	124.0 [4.88]	18.0 [0.71]	13.0 [0.51]	25.0 [0.98]	18.0 [0.71]

D1*: Flange mounting

Frame F

F2: VFD900C23A-21; VFD1320C43A-21; VFD1600C43A-21; VFD1600C63B-21; VFD2000C63B-21

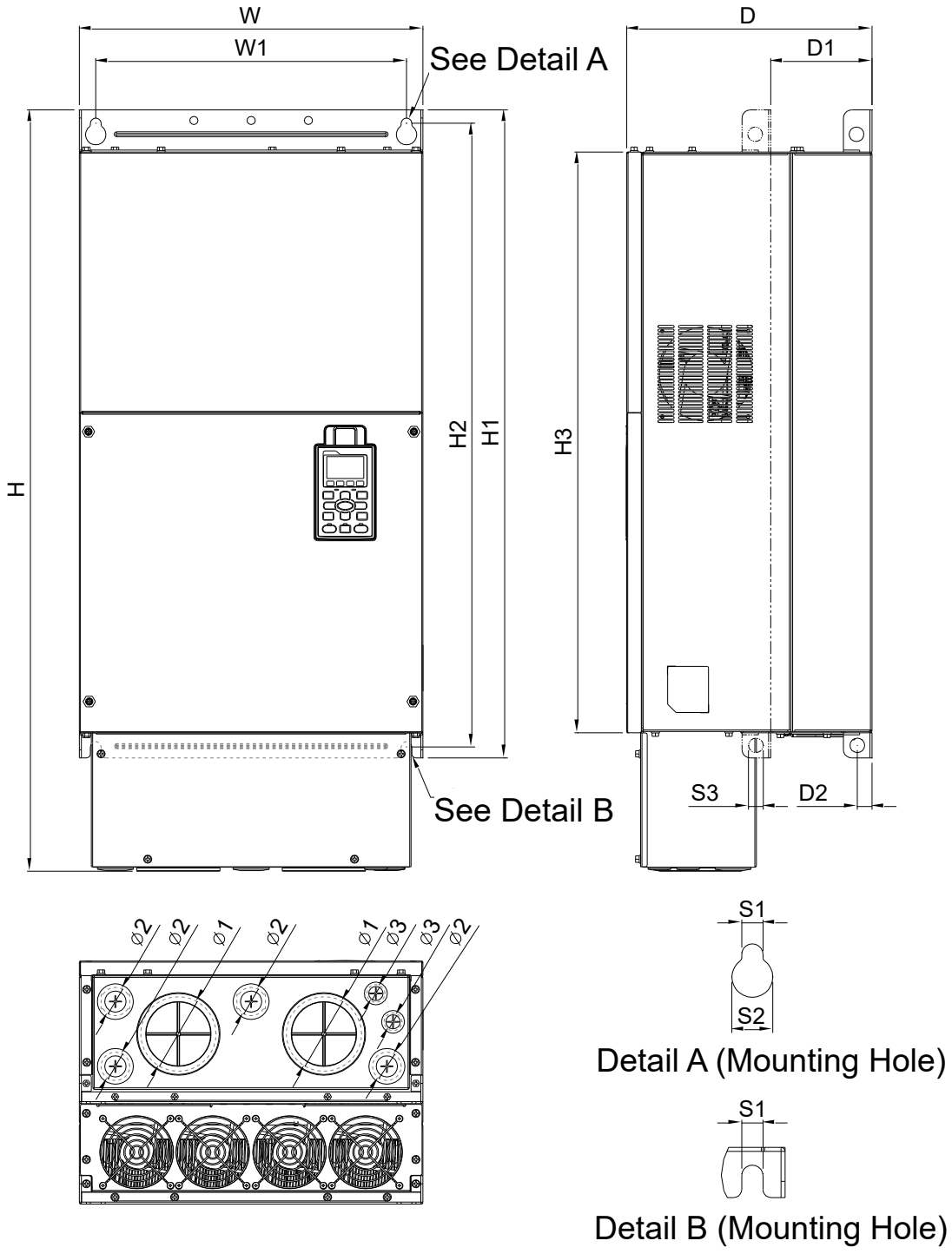


Figure 1-25

Unit: mm [inch]

Frame	W	H	D	W1	H1	H2	H3	D1*	D2	S1	S2	S3
F2	420.0 [16.54]	940.0 [37.00]	300.0 [11.81]	380.0 [14.96]	800.0 [31.50]	770.0 [30.32]	717.0 [28.23]	124.0 [4.88]	18.0 [0.71]	13.0 [0.51]	25.0 [0.98]	18.0 [0.71]

Frame	Φ1	Φ2	Φ3
F2	92.0 [3.62]	35.0 [1.38]	22.0 [0.87]

D1*: Flange mounting

Frame G

G1: VFD1850C43A-00; VFD2000C43A-00; VFD2200C43A-00; VFD2500C43A-00; VFD2500C63B-00; VFD3150C63B-00

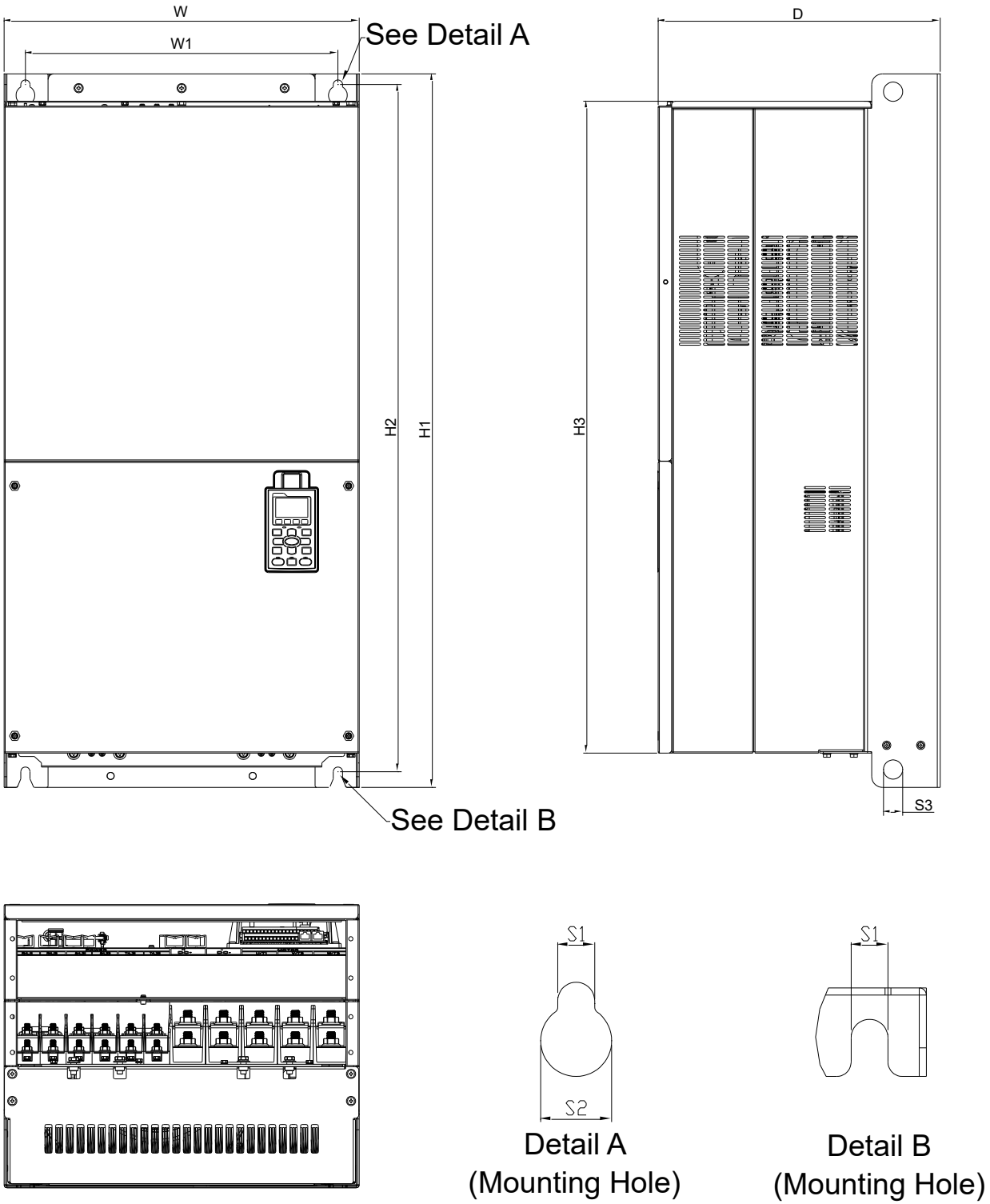


Figure 1-26

Unit: mm [inch]

Frame	W	H	D	W1	H1	H2	H3	S1	S2	S3	Φ1	Φ2	Φ3
G1	500.0 [19.69]	-	397.0 [15.63]	440.0 [217.32]	1000.0 [39.37]	963.0 [37.91]	913.6 [35.97]	13.0 [0.51]	26.5 [1.04]	27.0 [1.06]	-	-	-

Frame G

G2: VFD1850C43A-21; VFD2000C43A-21; VFD2200C43A-21; VFD2500C43A-21; VFD2500C63B-21; VFD3150C63B-21

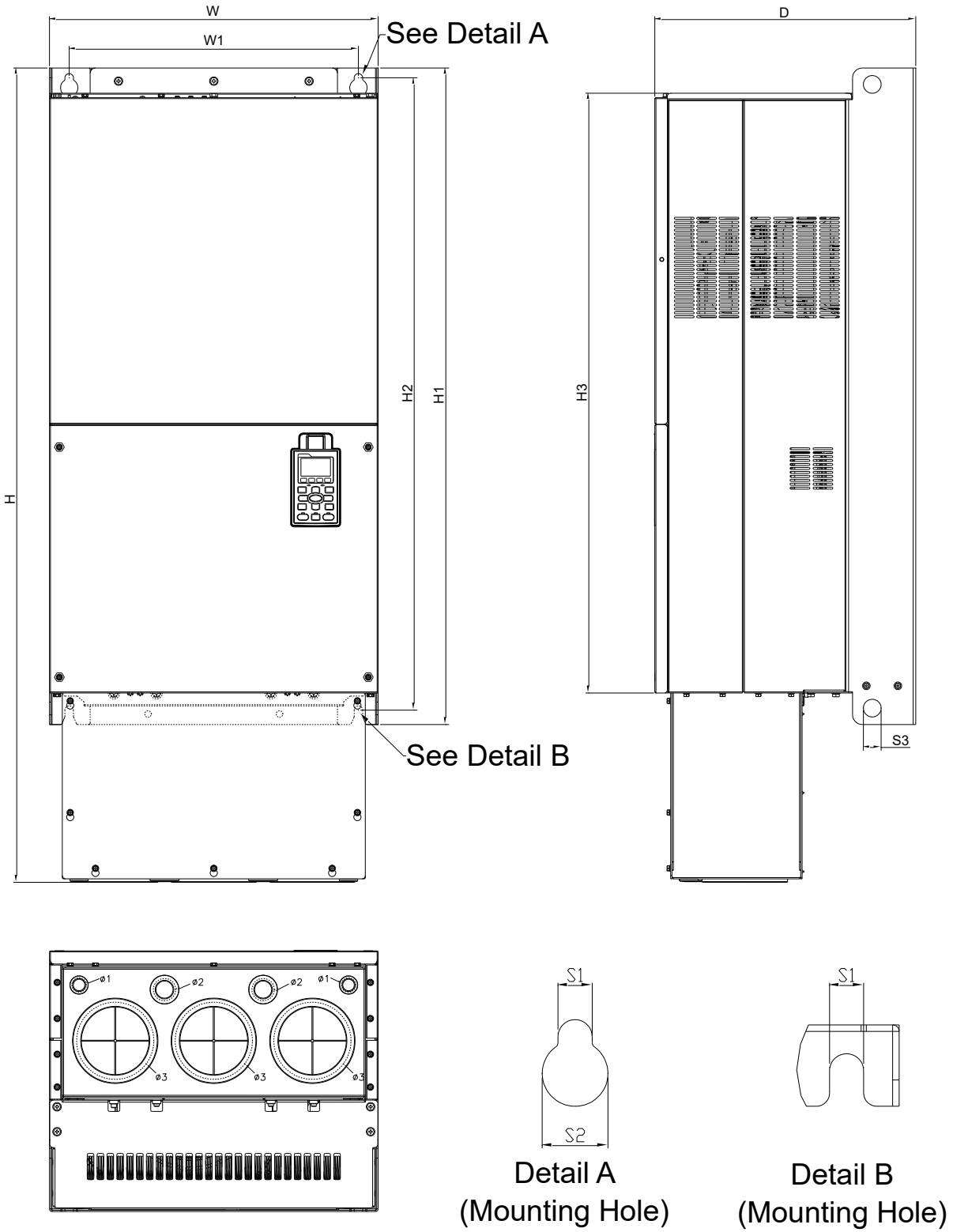


Figure 1-27

Unit: mm [inch]

Frame	W	H	D	W1	H1	H2	H3	S1	S2	S3	Φ1	Φ2	Φ3
G2	500.0 [19.69]	1240.2 [48.83]	397.0 [15.63]	440.0 [217.32]	1000.0 [39.37]	963.0 [37.91]	913.6 [35.97]	13.0 [0.51]	26.5 [1.04]	27.0 [1.06]	22.0 [0.87]	34.0 [1.34]	117.5 [4.63]

Frame H

H1: VFD2800C43A-00; VFD3150C43A-00; VFD3550C43A-00; VFD4000C43A-00; VFD4000C63B-00; VFD4500C43A-00; VFD4500C63B-00; VFD5000C43A-00; VFD5600C43A-00; VFD5600C63B-00; VFD6300C63B-00

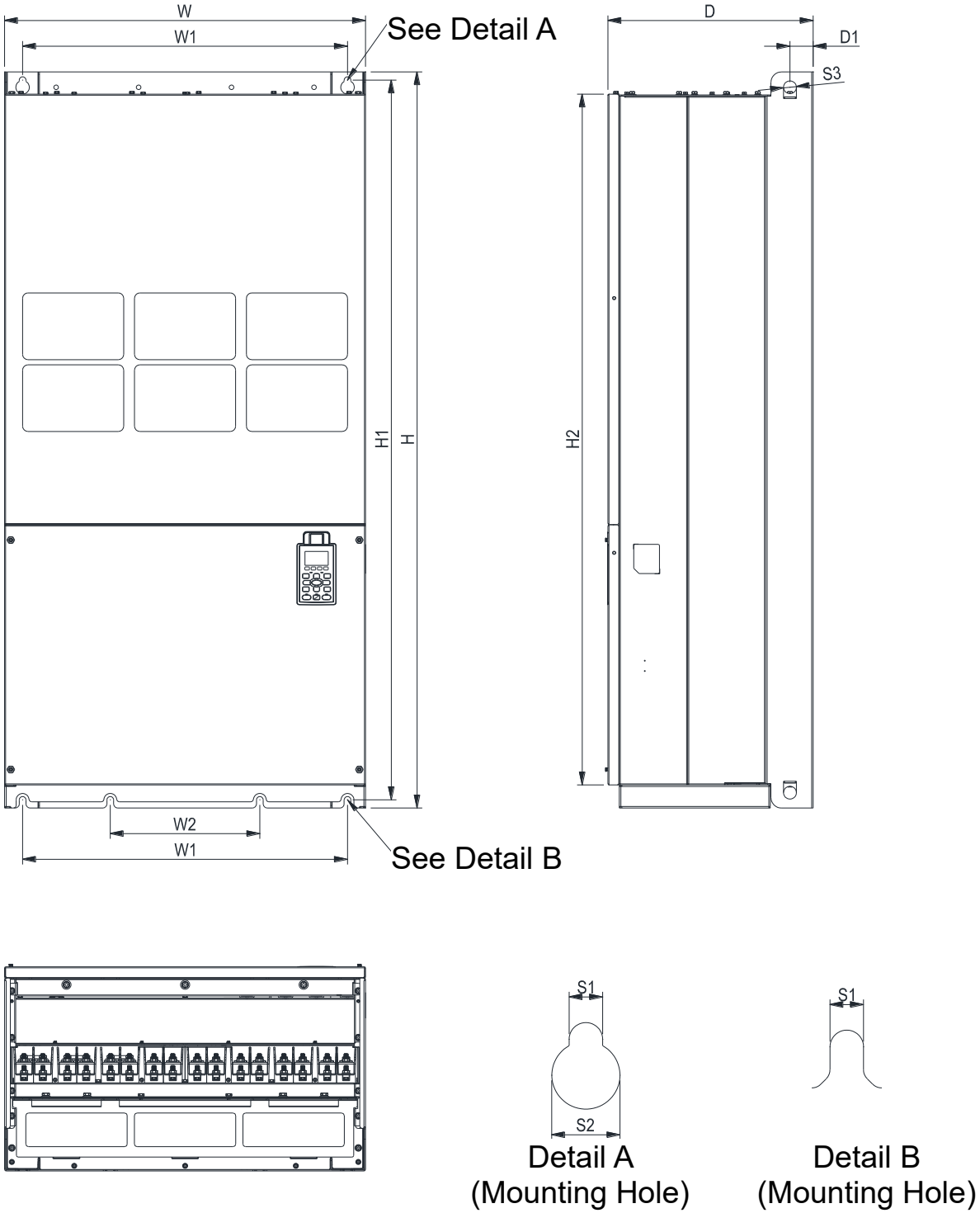


Figure 1-28

Unit: mm [inch]

Frame	W	H	D	W1	W2	W3	W4	W5	W6	H1	H2	H3	H4
H1	700.0 [27.56]	1435.0 [56.5]	398.0 [15.67]	630.0 [24.8]	290.0 [11.42]	-	-	-	-	1403.0 [55.24]	1346.6 [53.02]	-	-

Frame	H5	D1	D2	D3	D4	D5	D6	S1	S2	S3	Φ1	Φ2	Φ3
H1	-	45.0 [1.77]	-	-	-	-	-	13.0 [0.51]	26.5 [1.04]	25.0 [0.98]	-	-	-

Frame H

H3: VFD2800C43C-21; VFD3150C43C-21; VFD3550C43C-21; VFD4000C43C-21; VFD4500C43C-21; VFD5000C43C-21; VFD5600C43C-21

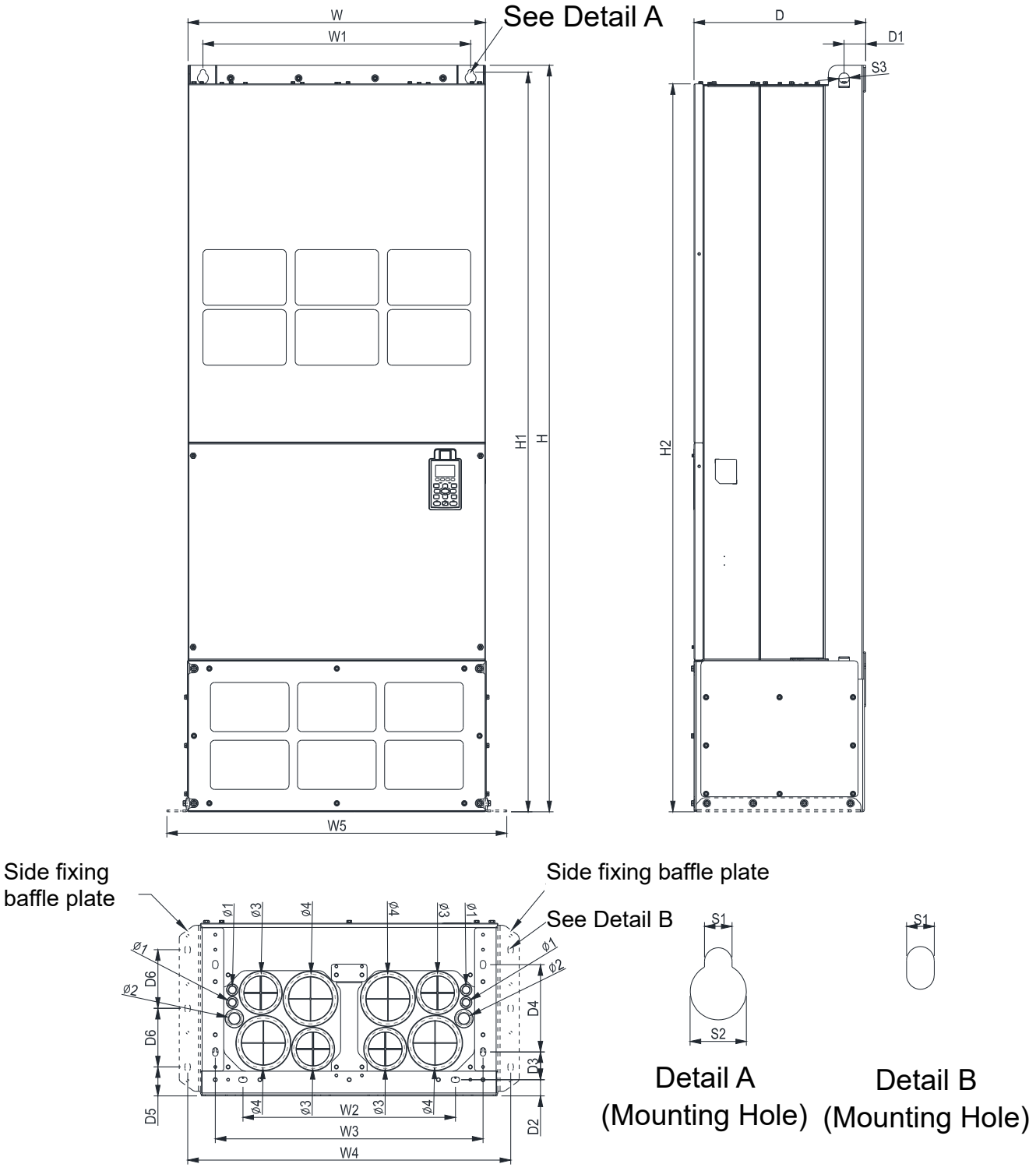


Figure 1-29

Unit: mm [inch]

Frame	W	H	D	W1	W2	W3	W4	W5	W6	H1	H2	H3	H4
H3	700.0 [27.56]	1745.0 [68.70]	404.0 [15.9]	630.0 [24.8]	500.0 [19.69]	630.0 [24.8]	760.0 [29.92]	800.0 [31.5]	-	1729.0 [68.07]	1701.6 [66.99]	-	-

Frame	D1	D2	D3	D4	D5	D6	S1	S2	S3	Φ1	Φ2	Φ3	Φ4
H3	51.0 [2.0]	38.0 [1.5]	65.0 [2.56]	204.0 [8.03]	68.0 [2.68]	137.0 [5.4]	13.0 [0.51]	26.5 [1.04]	25.0 [0.98]	22.0 [0.87]	34.0 [1.34]	91.5 [3.60]	117.5 [4.63]

690V Frame H

H2: VFD4000C63B-21; VFD4500C63B-21; VFD5600C63B-21; VFD6300C63B-21

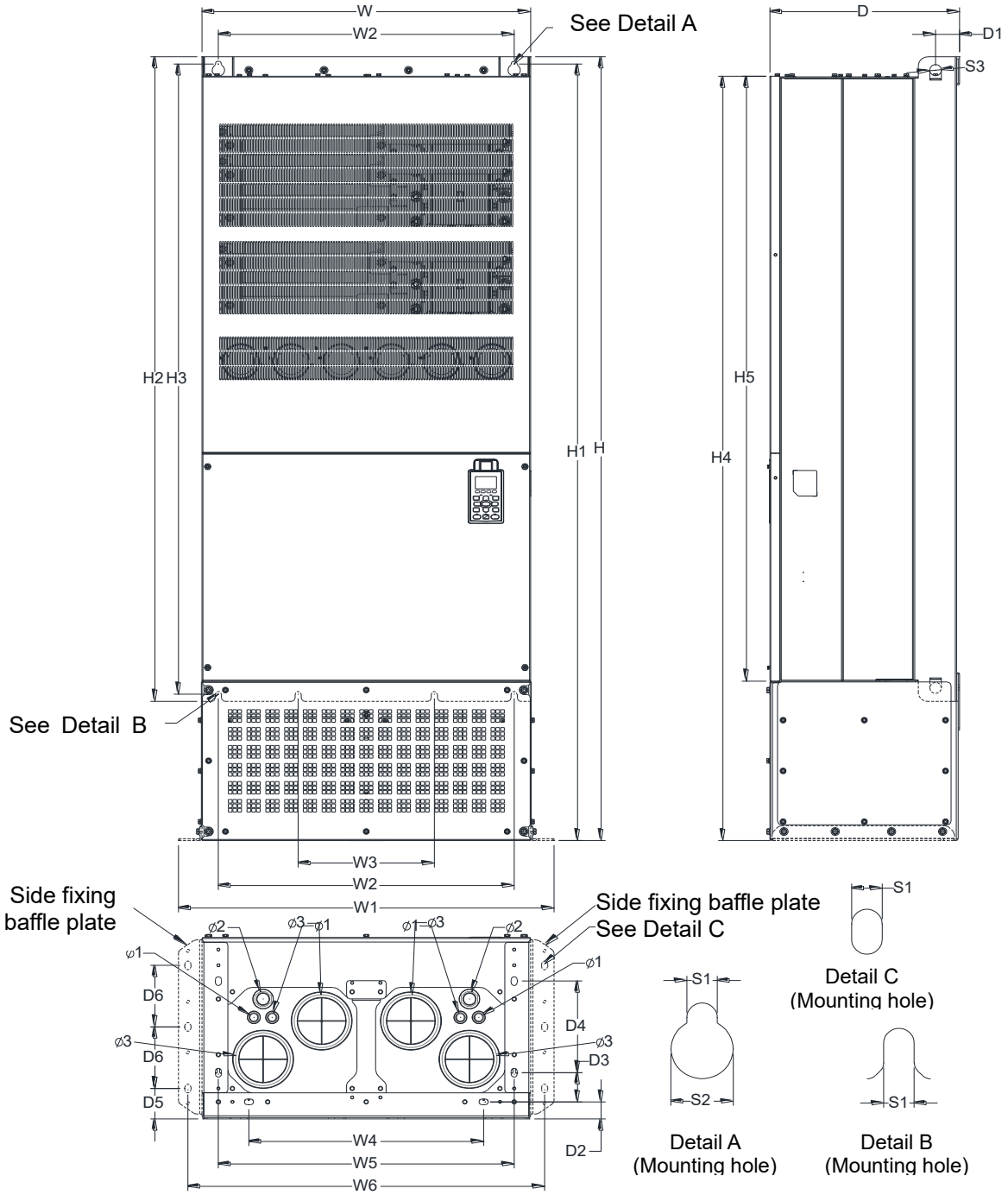


Figure 1-30

Unit: mm [inch]

Frame	W	H	D	W1	W2	W3	W4	W5	W6	H1	H2	H3	H4
H2	700.0 [27.56]	1745.0 [68.70]	404.0 [15.91]	630.0 [24.8]	500.0 [19.69]	630.0 [24.8]	760.0 [29.92]	800.0 [31.5]	-	1729.0 [68.07]	1701.6 [66.99]	-	-

Frame	H5	D1	D2	D3	D4	D5	D6	S1	S2	S3	Φ1	Φ2	Φ3
H2	-	51.0 [2.01]	38.0 [1.50]	65.0 [2.56]	204.0 [8.03]	68.0 [2.68]	137.0 [5.39]	13.0 [0.51]	26.5 [1.04]	25.0 [0.98]	22.0 [0.87]	34.0 [1.34]	117.5 [4.63]

Digital Keypad

KPC-CC01

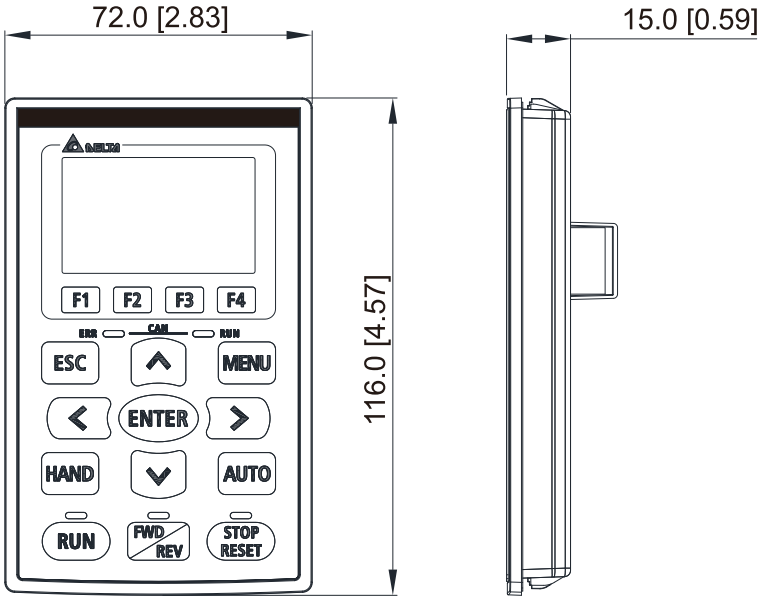


Figure 1-31

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Chapter 2 Installation

2-1 Mounting Clearance

2-2 Airflow and Power Dissipation

2-1 Mounting Clearance

☑ Prevent fiber particles, scraps of paper, shredded wood, sawdust, metal particles, etc. from adhering to the heat sink.

☑ Install the AC motor drive in a metal cabinet. When installing one drive below another one, use a metal separator between the AC motor drives to prevent mutual heating and to prevent the risk of fire accident.

☑ Install the AC motor drive in Pollution Degree 2 environments with clean and circulating air. A clean and circulating environment means airs without polluting substances and dust.

The appearances shown in the following figures are for reference only. The actual motor drives may look different.

Airflow direction: Inflow Outflow Distance

Single drive installation (Frame A–H)

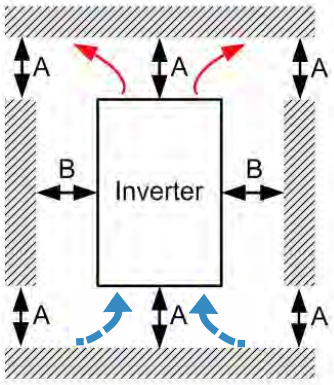


Figure 2-1

Side-by-side horizontal installation (Frame A–C)

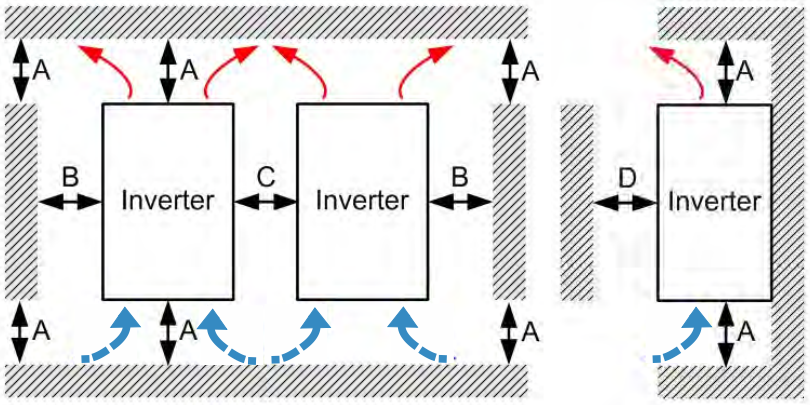


Figure 2-2

Multiple drives, single side-by-side horizontal installation (Frame G, H)

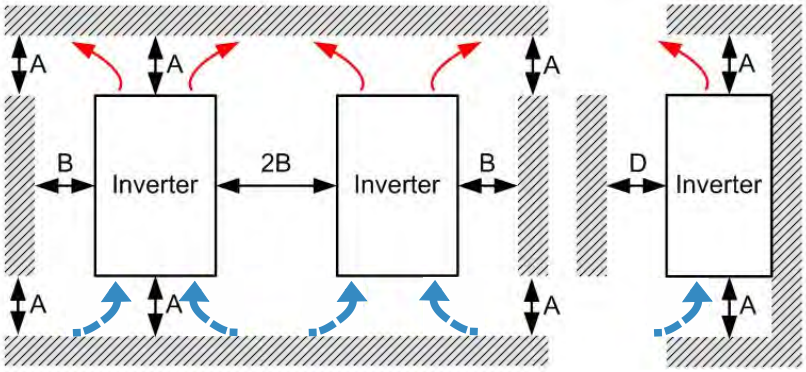


Figure 2-3

Multiple drives, side-by-side installation (Frame D0, D, E, F) Install metal separator between the drives.

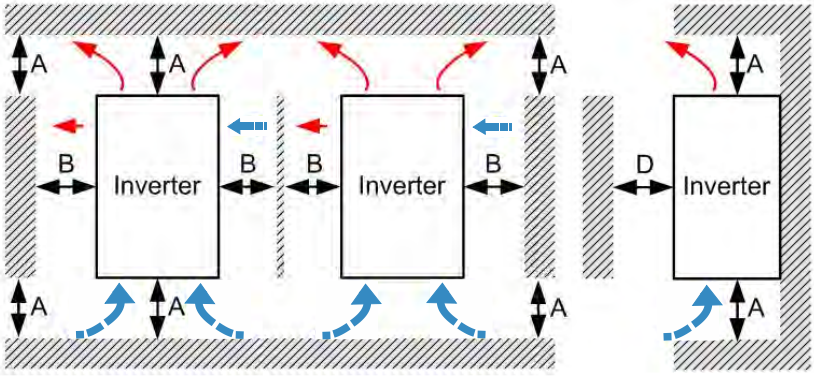


Figure 2-4

Multiple drives side-by-side vertical installation

Ta: Frame A–G Ta*: Frame H

When installing one AC motor drive below another one (top-bottom installation), use a metal separator between the drives to prevent mutual heating. The temperature measured at the fan's inflow side must be lower than the temperature measured at the operation side. If the fan's inflow temperature is higher, use a thicker or larger size of metal separator. Operation temperature is the temperature measured at 50 mm away from the fan's inflow side (as shown in the figure below).

(Frame A–C)

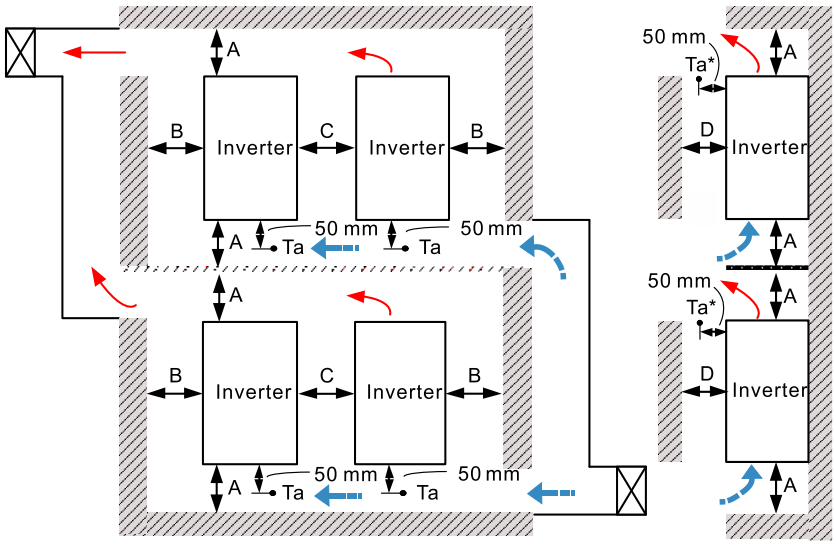


Figure 2-5

(Frame D0–G) Install metal separator between the drives

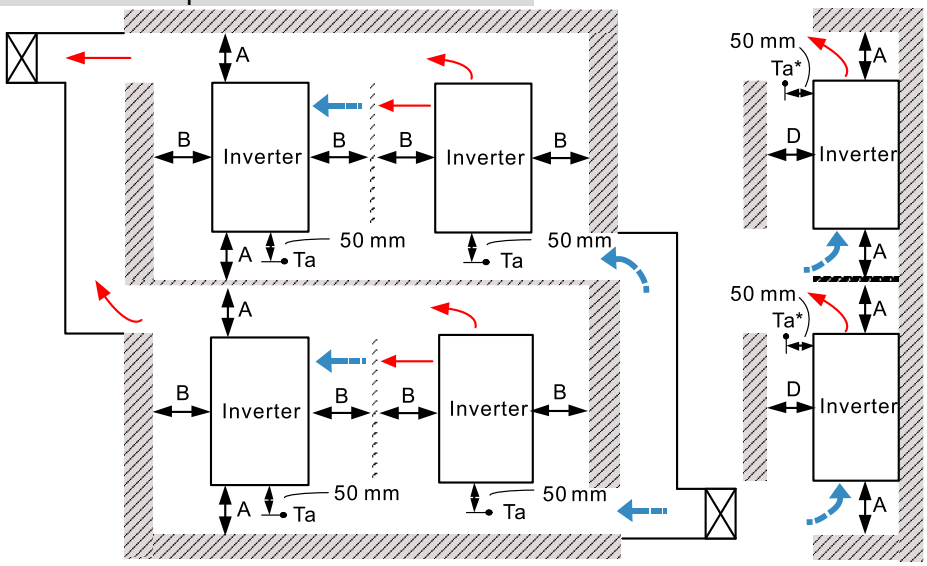


Figure 2-6

Minimum mounting clearance

Frame	A (mm)	B (mm)	C (mm)	D (mm)
A–C	60	30	10	0
D0–F	100	50	-	0
G	200	100	-	0
H*1	350	0	0	200 (Ta=Ta*=50°C)
H*1	350	0	0	100 (Ta=Ta*=40°C)

Table 2-1

NOTE:

1. The minimum mounting clearances A–D stated in the table above apply to AC motor drives installation. Failing to follow the minimum mounting clearances may cause the fan to malfunction and heat dissipation problems.
2. Mark *1 means Frame H does not have side installing holes or fans; there is no request for mounting clearance B and C.

Frame A	VFD007C23A-21; VFD007C43A-21; VFD007C4EA-21; VFD015C23A-21; VFD015C43A-21; VFD015C4EA-21; VFD015C53A-21; VFD022C23A-21; VFD022C43A-21; VFD022C4EA-21; VFD022C53A-21; VFD037C23A-21; VFD037C43A-21; VFD037C4EA-21; VFD037C53A-21; VFD040C43A-21; VFD040C4EA-21; VFD055C43A-21; VFD055C4EA-21
Frame B	VFD055C23A-21; VFD055C53A-21; VFD075C23A-21; VFD075C43A-21; VFD075C4EA-21; VFD075C53A-21; VFD110C23A-21; VFD110C43A-21; VFD110C4EA-21; VFD110C53A-21; VFD150C43A-21; VFD150C4EA-21; VFD150C53A-21
Frame C	VFD150C23A-21; VFD185C23A-21; VFD185C43A-21; VFD185C4EA-21; VFD185C63B-21; VFD220C23A-21; VFD220C43A-21; VFD220C4EA-21; VFD220C63B-21; VFD300C43A-21; VFD300C4EA-21; VFD300C63B-21; VFD370C63B-21
Frame D0	VFD370C43S-00; VFD370C43S-21; VFD450C43S-00; VFD450C43S-21
Frame D	VFD300C23A-00; VFD300C23A-21; VFD370C23A-00; VFD370C23A-21; VFD450C63B-00; VFD450C63B-21; VFD550C43A-00; VFD550C43A-21; VFD550C63B-00; VFD550C63B-21; VFD750C43A-00; VFD750C43A-21
Frame E	VFD450C23A-00; VFD450C23A-21; VFD550C23A-00; VFD550C23A-21; VFD750C23A-00; VFD750C23A-21; VFD750C63B-00; VFD750C63B-21; VFD900C43A-00; VFD900C43A-21; VFD900C63B-00; VFD900C63B-21; VFD1100C43A-00; VFD1100C43A-21; VFD1100C63B-00; VFD1100C63B-21; VFD1320C63B-00; VFD1320C63B-21
Frame F	VFD900C23A-00; VFD900C23A-21; VFD1320C43A-00; VFD1320C43A-21; VFD1600C43A-00; VFD1600C43A-21; VFD1600C63B-00; VFD1600C63B-21; VFD2000C63B-00; VFD2000C63B-21
Frame G	VFD1850C43A-00; VFD1850C43A-21; VFD2000C43A-00; VFD2000C43A-21; VFD2200C43A-00; VFD2200C43A-21; VFD2500C43A-00; VFD2500C43A-21; VFD2500C63B-00; VFD2500C63B-21; VFD3150C63B-00; VFD3150C63B-21
Frame H	VFD2800C43A-00; VFD2800C43C-21; VFD3150C43A-00; VFD3150C43C-21; VFD3550C43A-00; VFD3550C43C-21; VFD4000C43A-00; VFD4000C43C-21; VFD4000C63B-00; VFD4000C63B-21; VFD4500C43A-00; VFD4500C43C-21; VFD4500C63B-00; VFD4500C63B-21; VFD5000C43A-00; VFD5000C43C-21; VFD5600C43A-00; VFD5600C43C-21; VFD5600C63B-00; VFD5600C63B-21; VFD6300C63B-00; VFD6300C63B-21

Table 2-2

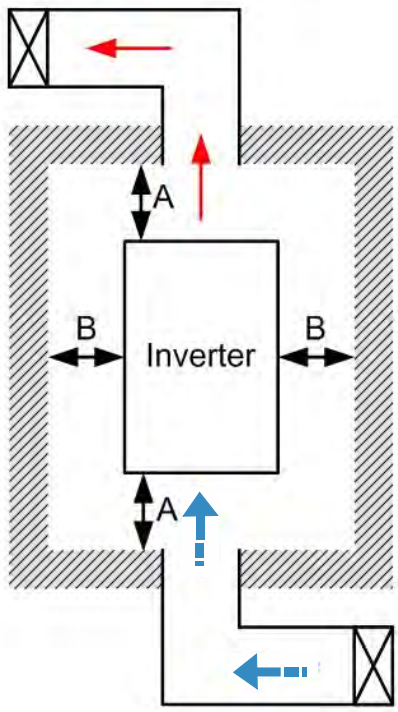


Figure 2-7

NOTE:

※ The mounting clearance stated in the figure is for installing the drive in an open area. To install the drive in a confined space (such as cabinet or electric box), follow the following rules: (1) Keep the minimum mounting clearances. (2) Install a ventilation equipment or an air conditioner to keep surrounding temperature lower than operation temperature. (3) Refer to parameter setting and set up Pr.00-16, Pr.00-17, and Pr.06-55.

※ The table below shows the heat dissipation and the required air volume when installing a single drive in a confined space. When installing multiple drives, the required air volume shall be multiplied by the number of the drives.

※ Refer to the table below (Airflow Rate for Cooling) for ventilation equipment design and selection.

※ Refer to the table below (Power Dissipation for AC Motor Drive) for air conditioner design and selection.

※ Different control mode affects the derating. See Pr.06-55 for more information.

※ Ambient temperature derating curve shows the derating status in different temperature in relation to different protection level.

※ Refer to Section 9-7 for ambient temperature derating curve and derating curves under different control modes.

※ If UL Type 1 models need side-by-side installation, remove the top cover for Frame A–C. Do NOT install the conduit box for Frame D and above.

2-2 Airflow and Power Dissipation

Model No.	Airflow Rate for Cooling						Power Dissipation for AC Motor Drive		
	Flow Rate (Unit: cfm)			Flow Rate (Unit: m^3 / hr)			Power Dissipation (Unit: watt)		
	External	Internal	Total	External	Internal	Total	Loss External (Heat sink)	Internal	Total
VFD007C23A-21	-	-	-	-	-	-	33	27	61
VFD015C23A-21	14	-	14	24	-	24	56	31	88
VFD022C23A-21	14	-	14	24	-	24	79	36	115
VFD037C23A-21	10	-	10	17	-	17	113	46	159
VFD055C23A-21	40	14	54	68	24	92	197	67	264
VFD075C23A-21	66	14	80	112	24	136	249	86	335
VFD110C23A-21	58	14	73	99	24	124	409	121	529
VFD150C23A-21	166	12	178	282	20	302	455	161	616
VFD185C23A-21	166	12	178	282	20	302	549	184	733
VFD220C23A-21	166	12	178	282	20	302	649	216	865
VFD300C23A-00 VFD300C23A-21	179	30	209	304	51	355	913	186	1099
VFD370C23A-00 VFD370C23A-21	179	30	209	304	51	355	1091	220	1311
VFD450C23A-00 VFD450C23A-21	228	73	301	387	124	511	1251	267	1518
VFD550C23A-00 VFD550C23A-21	228	73	301	387	124	511	1401	308	1709
VFD750C23A-00 VFD750C23A-21	246	73	319	418	124	542	1770	369	2139
VFD900C23A-00 VFD900C23A-21	224	112	336	381	190	571	2304	484	2788
VFD007C43A-21 VFD007C4EA-21	-	-	-	-	-	-	33	25	59
VFD015C43A-21 VFD015C4EA-21	-	-	-	-	-	-	45	29	74
VFD022C43A-21 VFD022C4EA-21	14	-	14	24	-	24	71	33	104
VFD037C43A-21 VFD037C4EA-21	10	-	10	17	-	17	103	38	141
VFD040C43A-21 VFD040C4EA-21	10	-	10	17	-	17	116	42	158
VFD055C43A-21 VFD055C4EA-21	10	-	10	17	-	17	134	46	180
VFD075C43A-21 VFD075C4EA-21	40	14	54	68	24	92	216	76	292
VFD110C43A-21 VFD110C4EA-21	66	14	80	112	24	136	287	93	380
VFD150C43A-21 VFD150C4EA-21	58	14	73	99	24	124	396	122	518
VFD185C43A-21 VFD185C4EA-21	99	21	120	168	36	204	369	138	507
VFD220C43A-21 VFD220C4EA-21	99	21	120	168	36	204	476	158	635
VFD300C43A-21 VFD300C4EA-21	126	21	147	214	36	250	655	211	866
VFD370C43S-00 VFD370C43S-21	179	30	209	304	51	355	809	184	993
VFD450C43S-00 VFD450C43S-21	179	30	209	304	51	355	929	218	1147
VFD550C43A-00 VFD550C43A-21	179	30	209	304	51	355	1156	257	1413
VFD750C43A-00 VFD750C43A-21	186	30	216	316	51	367	1408	334	1742

Model No.	Airflow Rate for Cooling						Power Dissipation for AC Motor Drive		
	Flow Rate (Unit: cfm)			Flow Rate (Unit: m^3 / hr)			Power Dissipation (Unit: watt)		
	External	Internal	Total	External	Internal	Total	Loss External (Heat sink)	Internal	Total
VFD900C43A-00 VFD900C43A-21	257	73	330	437	124	561	1693	399	2092
VFD1100C43A-00 VFD1100C43A-21	223	73	296	379	124	503	2107	491	2599
VFD1320C43A-00 VFD1320C43A-21	224	112	336	381	190	571	2502	579	3081
VFD1600C43A-00 VFD1600C43A-21	289	112	401	491	190	681	3096	687	3783
VFD1850C43A-00 VFD1850C43A-21			454			771			4589
VFD2000C43A-00 VFD2000C43A-21			454			771			5050
VFD2200C43A-00 VFD2200C43A-21			454			771			5772
VFD2500C43A-00 VFD2500C43A-21			454			771			6063
VFD2800C43A-00 VFD2800C43C-21			769			1307			6381
VFD3150C43A-00 VFD3150C43C-21			769			1307			7156
VFD3550C43A-00 VFD3550C43C-21			769			1307			8007
VFD4000C43A-00 VFD4000C43C-21			769			1307			9025
VFD4500C43A-00 VFD4500C43C-21			769			1307			11894
VFD5000C43A-00 VFD5000C43C-21			952.9			1618.9			12500
VFD5600C43A-00 VFD5600C43C-21			952.9			1618.9			14350
VFD015C53A-21	-	-	-	-	-	-	39.5	13.0	53
VFD022C53A-21	-	-	-	-	-	-	55.0	22.0	77
VFD037C53A-21	0.006	-	0.006	13.6	-	13.6	86.8	42.7	130
VFD055C53A-21	0.019	0.007	0.026	40.0	14.5	54.5	124.6	67.9	193
VFD075C53A-21	0.019	0.007	0.026	40.0	14.5	54.5	143.5	119.0	263
VFD110C53A-21	0.019	0.007	0.026	40.0	14.5	54.5	222.2	162.8	385
VFD150C53A-21	0.019	0.007	0.026	40.0	14.5	54.5	308.5	216.5	525
VFD185C63B-21	90.0	21.3	111.4	153.0	36.2	189.2	317.5	145.0	462.5
VFD220C63B-21	90.0	21.3	111.4	153.0	36.2	189.2	408.2	141.8	550.0
VFD300C63B-21	90.0	21.3	111.4	153.0	36.2	189.2	492.7	257.3	750.0
VFD370C63B-21	89.0	21.3	110.3	151.2	36.2	187.5	641.6	283.4	925.0
VFD450C63B-00 VFD450C63B-21	175.9	36.4	212.3	298.8	61.8	360.6	718.2	406.8	1125.0
VFD550C63B-00 VFD550C63B-21	175.9	36.4	212.3	298.8	61.8	360.6	890.1	484.9	1375.0
VFD750C63B-00 VFD750C63B-21	264.6	90.6	355.2	449.6	153.9	603.5	1356.0	519.0	1875.0
VFD900C63B-00 VFD900C63B-21	264.6	90.6	355.2	449.6	153.9	603.5	1652.8	597.2	2250.0
VFD1100C63B-00 VFD1100C63B-21	264.6	90.6	355.2	449.6	153.9	603.5	1960.3	789.7	2750.0
VFD1320C63B-00 VFD1320C63B-21	264.6	90.6	355.2	449.6	153.9	603.5	2230.8	1069.2	3300.0
VFD1600C63B-00 VFD1600C63B-21	248.1	135.3	383.4	421.6	229.9	651.4	2627.3	1372.7	4000.0

Model No.	Airflow Rate for Cooling						Power Dissipation for AC Motor Drive		
	Flow Rate (Unit: cfm)			Flow Rate (Unit: m^3 / hr)			Power Dissipation (Unit: watt)		
	External	Internal	Total	External	Internal	Total	Loss External (Heat sink)	Internal	Total
VFD2000C63B-00 VFD2000C63B-21	248.1	135.3	383.4	421.6	229.9	651.4	3415.0	1585.0	5000.0
VFD2500C63B-00 VFD2500C63B-21			409.7			696.0	4751.7	1498.3	6250.0
VFD3150C63B-00 VFD3150C63B-21			409.7			696.0	5695.4	2179.6	7875.0
VFD4000C63B-00 VFD4000C63B-21			563.0			956.4	6796.2	3203.8	10000.0
VFD4500C63B-00 VFD4500C63B-21			952.9			1618.9	7313.6	3936.4	11250.0
VFD5600C63B-00 VFD5600C63B-21			952.9			1618.9	9553.4	4446.6	14000.0
VFD6300C63B-00 VFD6300C63B-21			952.9			1618.9	11042.4	4707.6	15750.0
	● The required airflow shown in the table is for installing single drive in a confined space. ● When installing multiple drives, the required air volume should be the required air volume for single drive X the number of the drives.						● The heat dissipation shown in the table is for installing single drive in a confined space. ● When installing multiple drives, volume of heat dissipation should be the heat dissipated for single drive X the number of the drives. ● Heat dissipation for each model is calculated by rated voltage, current and default carrier.		

Table 2-3

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Chapter 3 Unpacking

3-1 Unpacking

3-2 The Lifting Hook

The AC motor drive should be kept in the shipping carton or crate before installation. In order to retain the warranty coverage, the AC motor drive should be stored properly when it is not to be used for an extended period of time.

3-1 Unpacking

Follow these steps to unpack the AC motor drive:

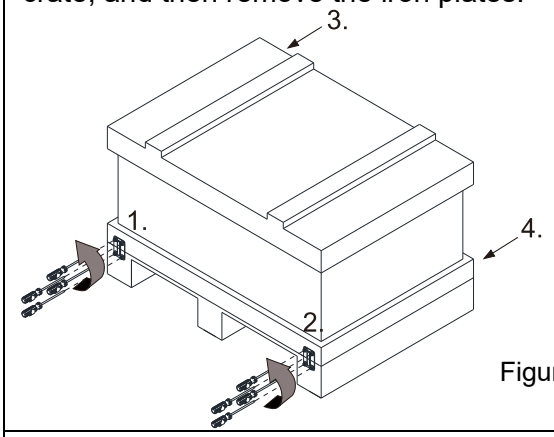
<table>
<tr><th colspan="2">Frame E</th></tr>
<tr><td>Unpacking 1
(VFDXXXCXXA-00, VFDXXXC63B-00)</td><td>Unpacking 2
(VFDXXXCXXA-21, VFDXXXC63B-21)</td></tr>
<tr><td>Loosen the 16 screws at the four corners of the crate, and then remove the iron plates.
 

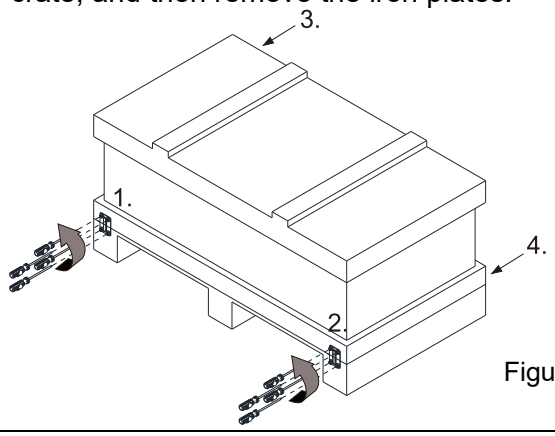
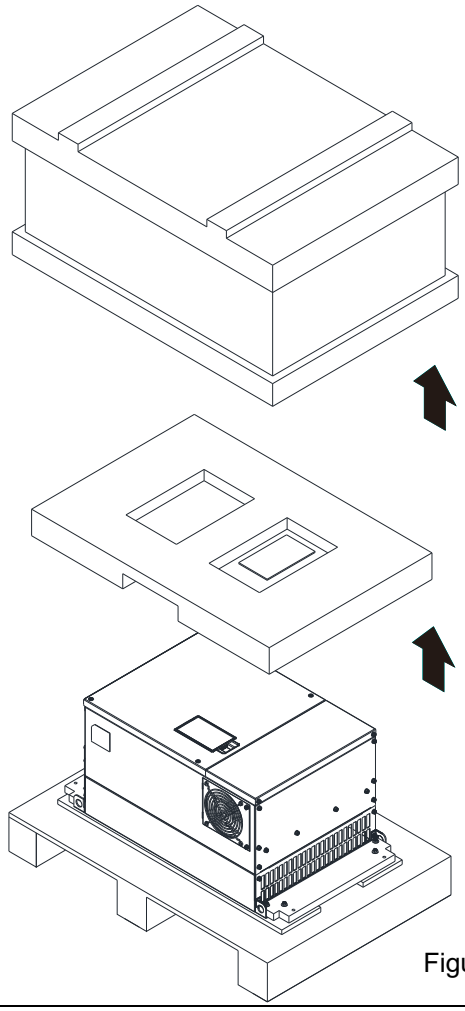
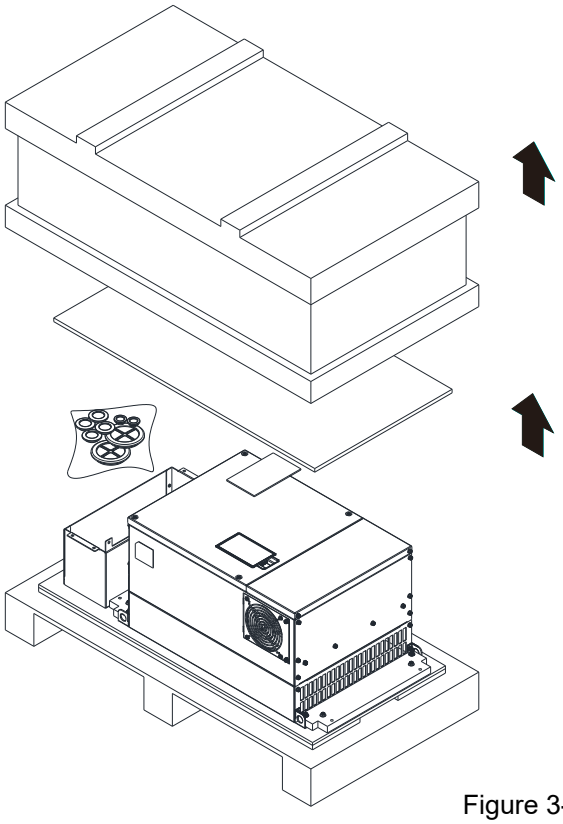
Figure 3-1</td><td>Loosen the 16 screws at the four corners of the crate, and then remove the iron plates.
 

Figure 3-5</td></tr>
<tr><td>Remove the top cover, take out the EPEs and the manual.
 
Figure 3-2</td><td>Remove the top cover, take out the EPEs, rubber and the manual.
 
Figure 3-6</td></tr>
</table>

Loosen the eight screws fasten the drive on the pallet, and then remove the wood plate.

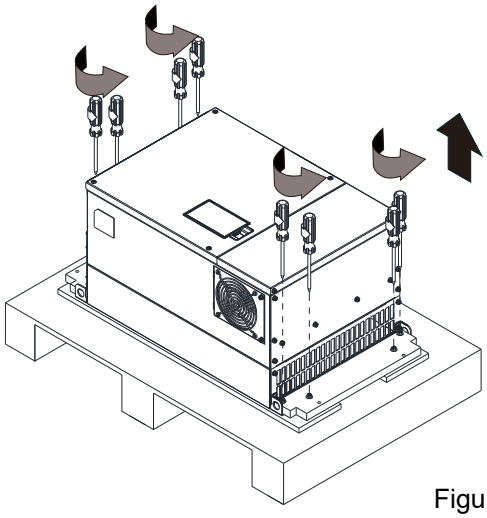


Figure 3-3

Loosen the ten screws fasten the drive on the pallet, and then remove the wood plates and the conduit box.

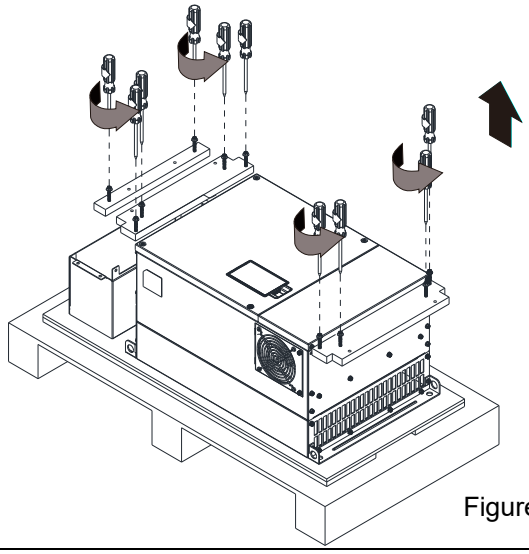


Figure 3-7

Lift the drive by hooking the lifting hole. It is now ready for installation.

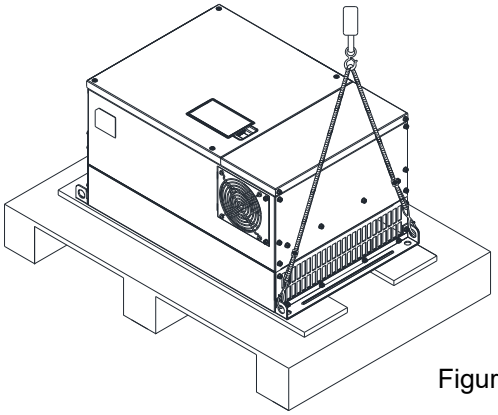


Figure 3-4

Lift the drive by hooking the lifting hole. It is now ready for installation.

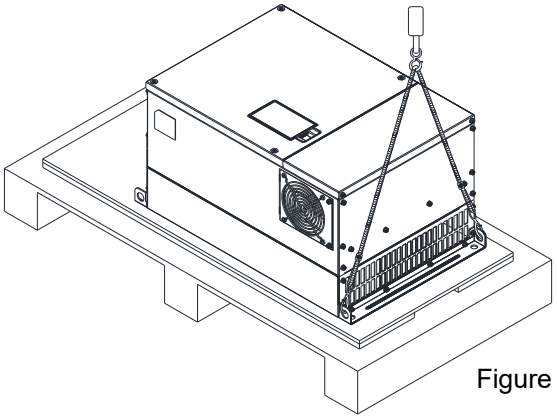


Figure 3-8

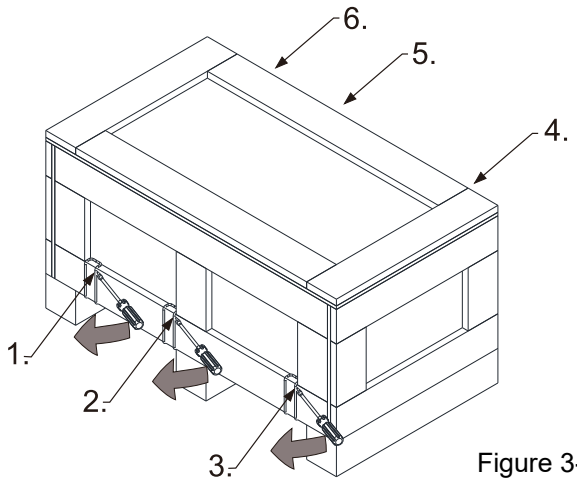
<table>
<tr><th colspan="2">Frame F</th></tr>
<tr><td>Unpacking 1
(VFDXXXCXXA-00, VFDXXXC63B-00)</td><td>Unpacking 2
(VFDXXXCXXA-21, VFDXXXC63B-21)</td></tr>
<tr><td>Remove the six buckles fixed on the crate with a flat-head screwdriver, see the figure below.
 

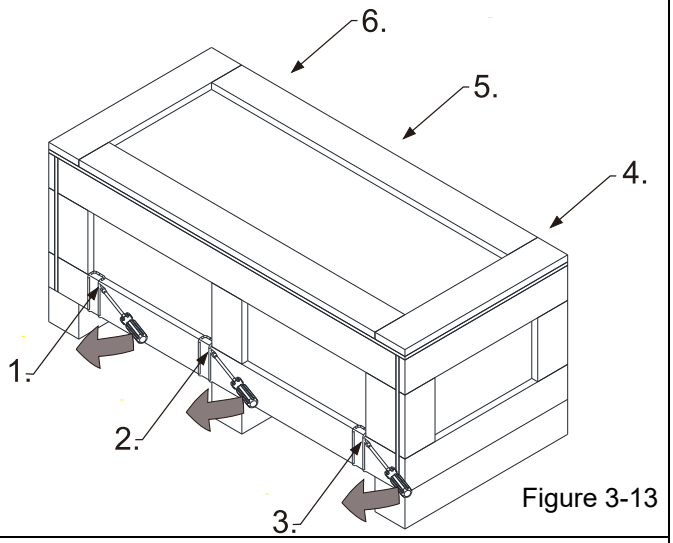
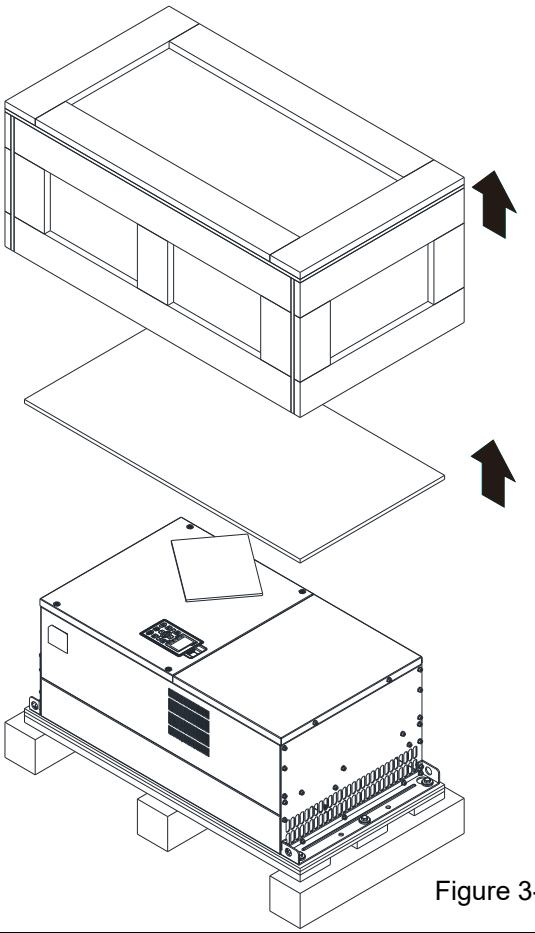
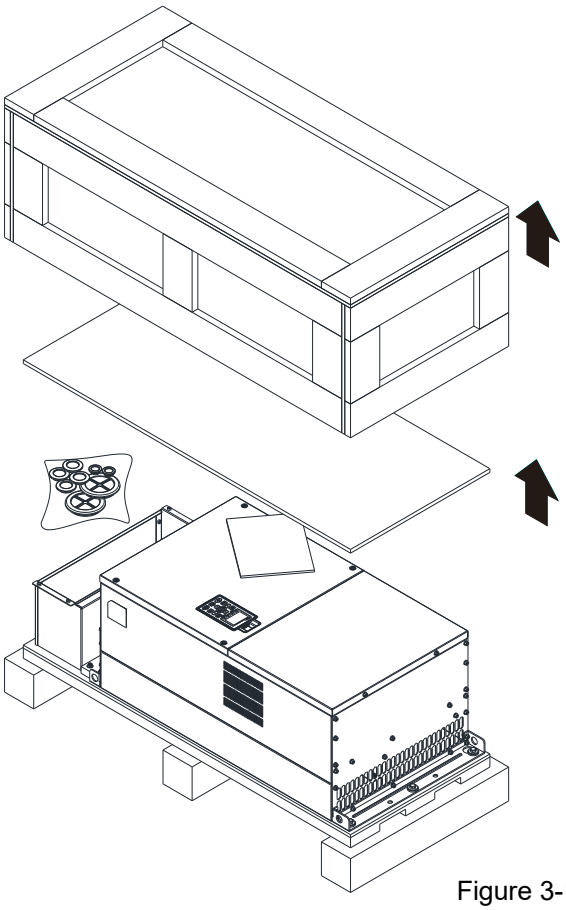
Figure 3-9</td><td>Remove the six buckles fixed on the crate with a flat-head screwdriver, see the figure below.
 

Figure 3-13</td></tr>
<tr><td>Remove the top cover, take out the EPEs and the manual.
 
Figure 3-10</td><td>Remove the top cover, take out the EPEs, rubber and the manual.
 
Figure 3-14</td></tr>
</table>

Loosen the five screws fasten the drive on the pallet, see the figure below.

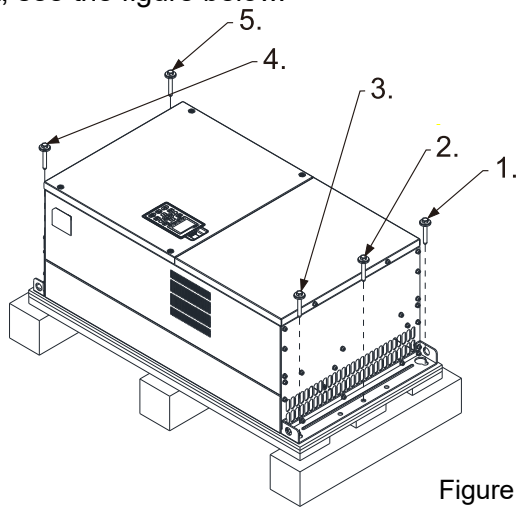


Figure 3-11

Loosen the five screws fasten the drive on the pallet, and then remove the wood plates and conduit box.

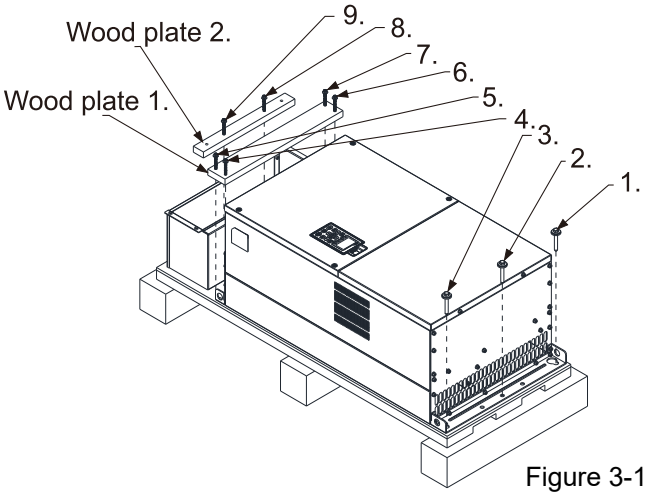


Figure 3-15

Lift the drive by hooking the lifting hole. It is now ready for installation.

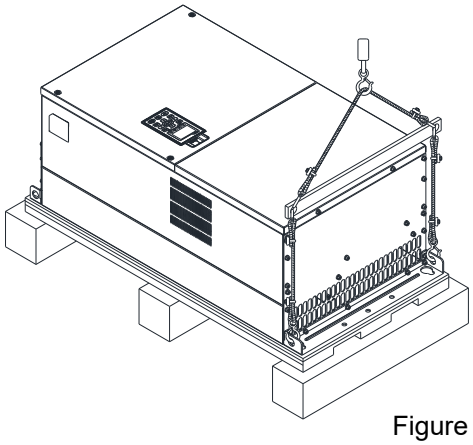


Figure 3-12

Lift the drive by hooking the lifting hole. It is now ready for installation.

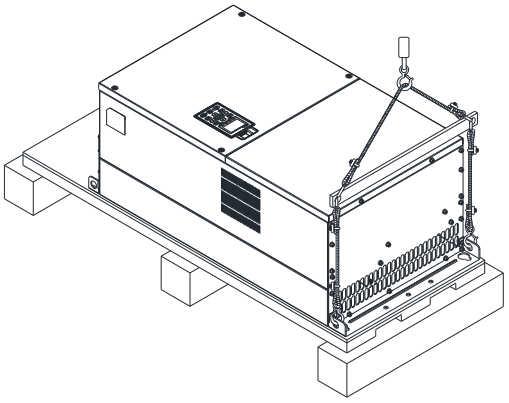
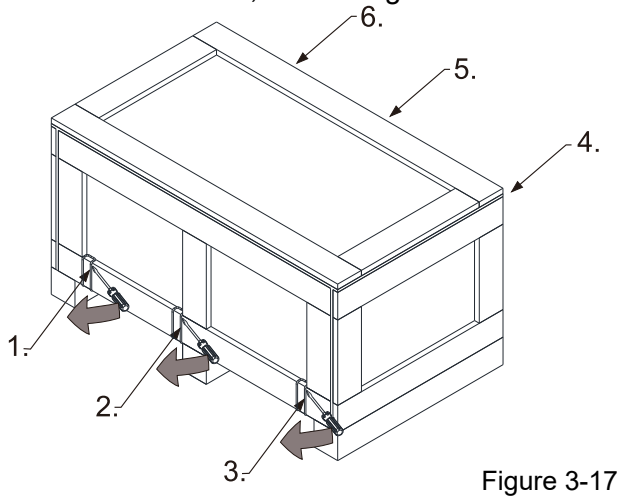
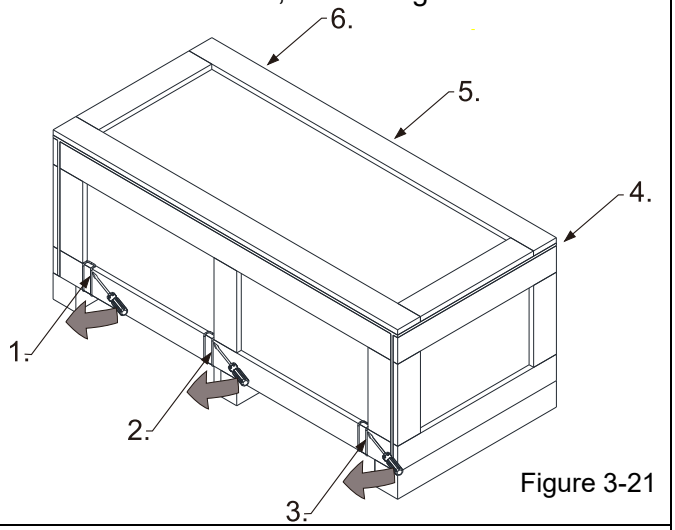
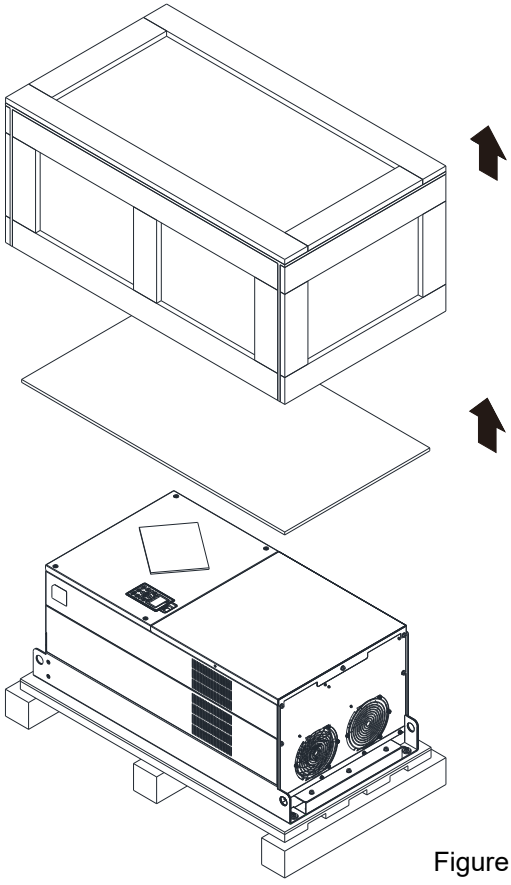
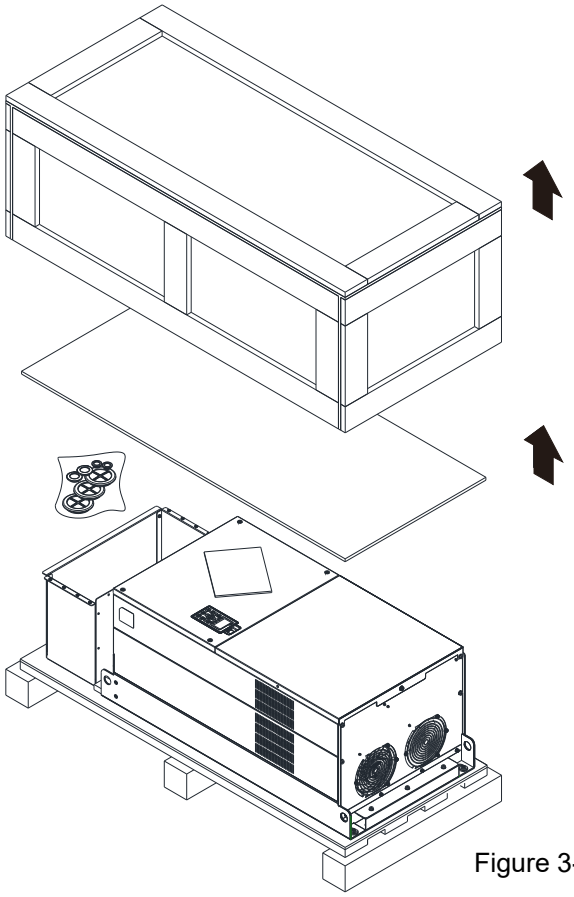


Figure 3-16

Frame G	
Unpacking 1 (VFDXXXCXXA-00, VFDXXXC63B-00)	Unpacking 2 (VFDXXXCXXA-21, VFDXXXC63B-21)
Remove the six buckles fixed on the crate with a flat-head screwdriver, see the figure below.  Figure 3-17	Remove the six buckles fixed on the crate with a flat-head screwdriver, see the figure below.  Figure 3-21
Remove the top cover, take out the EPEs and the manual.  Figure 3-18	Remove the top cover, take out the EPEs, rubber and the manual.  Figure 3-22

Loosen the five screws fasten the drive on the pallet, see the figure below.

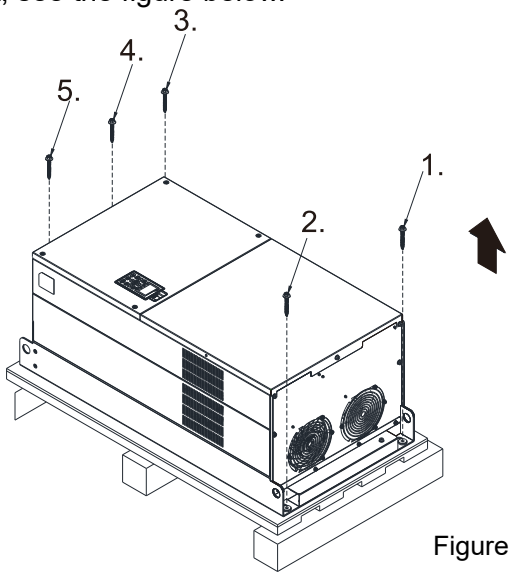


Figure 3-19

Loosen the 12 screws fasten the drive on the pallet, and then remove the wood plates and conduit box.

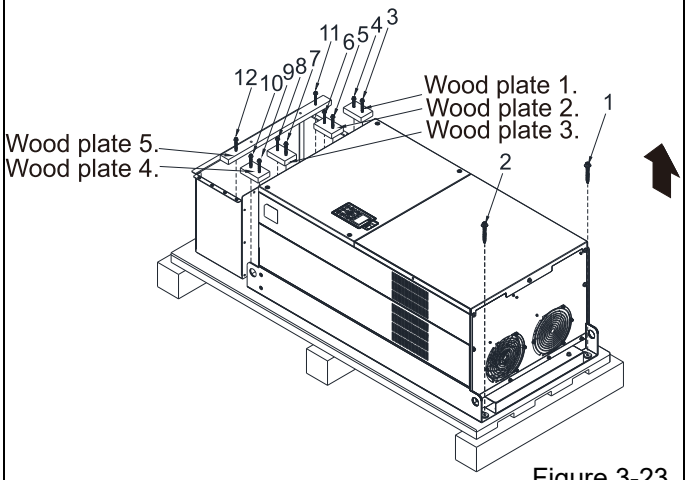


Figure 3-23

Lift the drive by hooking the lifting hole. It is now ready for installation.

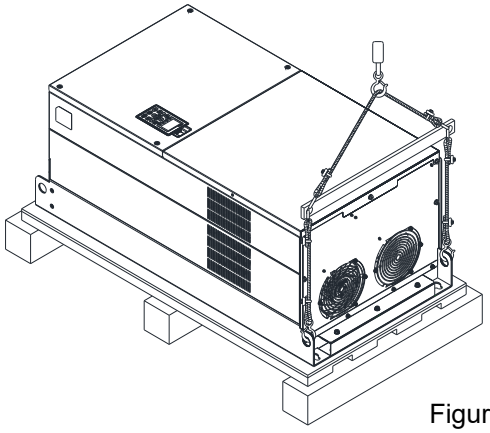


Figure 3-20

Lift the drive by hooking the lifting hole. It is now ready for installation.

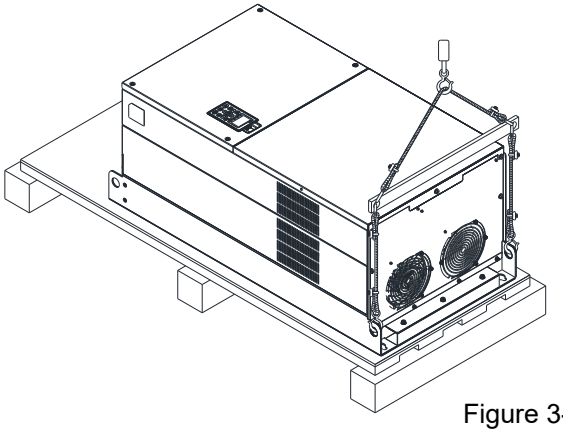


Figure 3-24

Frame H

Unpacking 1 (VFDXXXC43A-00)

Remove the eight buckles fixed on the crate with a flat-head screwdriver, see the figure below.

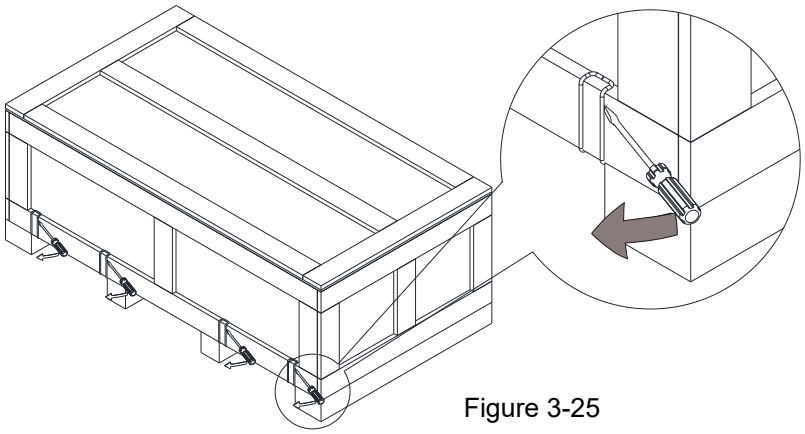


Figure 3-25

Remove the top cover, take out the EPEs and the manual.

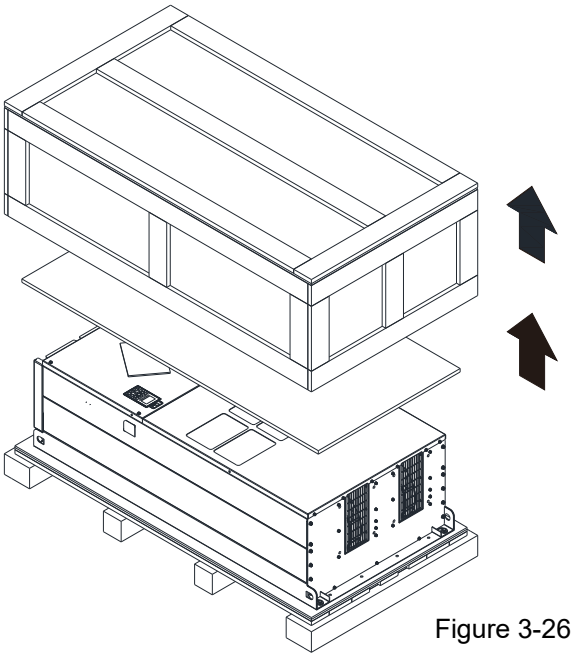


Figure 3-26

Loosen the six screws fasten the drive on the pallet, and then remove six metal washers and six plastic washers. See the figure below.

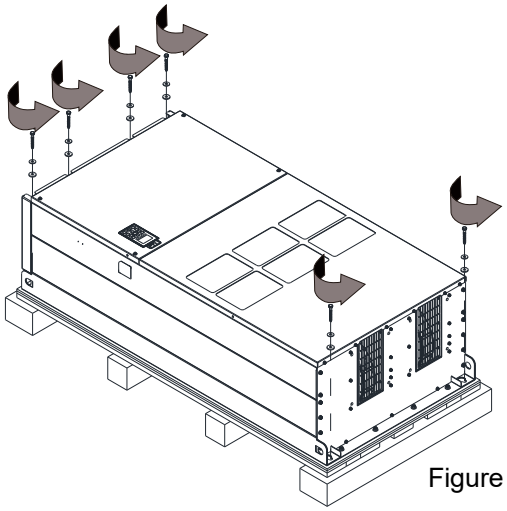


Figure 3-27

Lift the drive by hooking the lifting hole. It is now ready for installation.

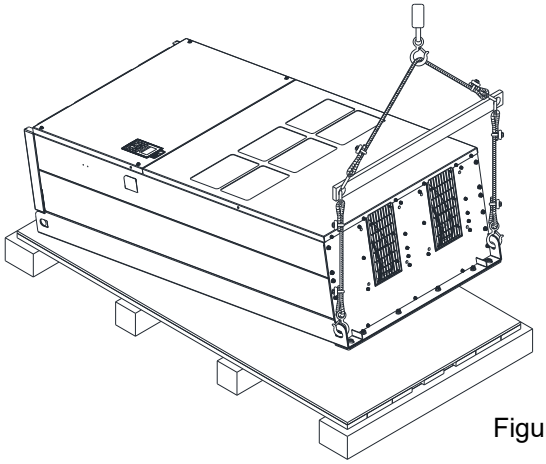


Figure 3-28

Unpacking 2 (VFDXXXC43C-21)

Remove the eight buckles fixed on the crate with a flat-head screwdriver, see the figure below.

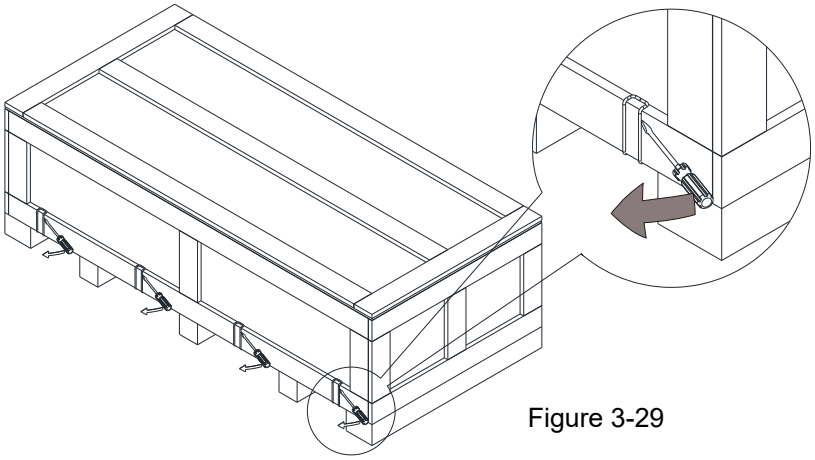


Figure 3-29

Remove the cover, take out the EPEs and the manual.

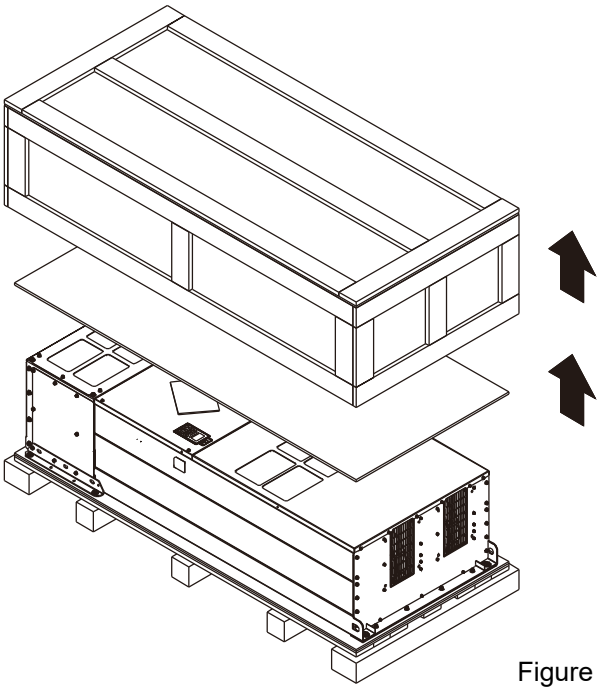


Figure 3-30

Loosen the six screws fasten the drive on the pallet, and then remove six metal washers and six plastic washers. See the figure below.

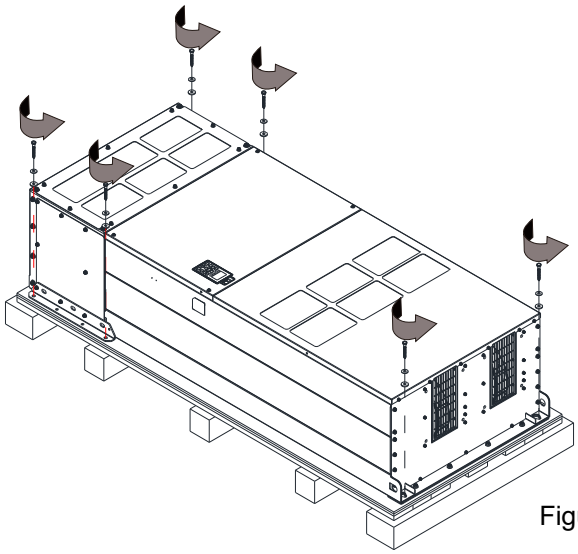


Figure 3-31

Loosen the six M6 screws and the iron plates (see the figure below). You can use the removed screws and iron plates to fix the drive from outside.

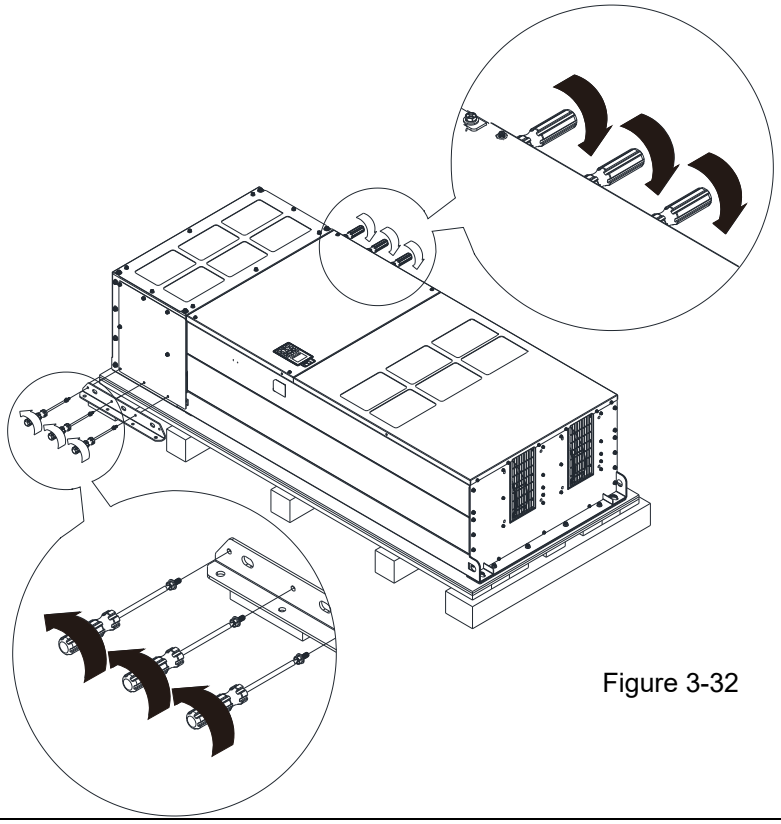


Figure 3-32

Fix the drive from the inside

Loosen the 18 M6 screws and remove the covers (see the figure 3-34). After fixing the drive and the cover for cables (see the figure 3-33), fasten the other covers back (see the figure 3-34).
Torque: 35–45 kg-cm / (30.38–39.06 lb-in.) / (3.4–4.4 Nm)

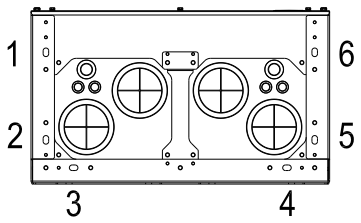


Figure 3-33

Cover for cables (use M12 screws)

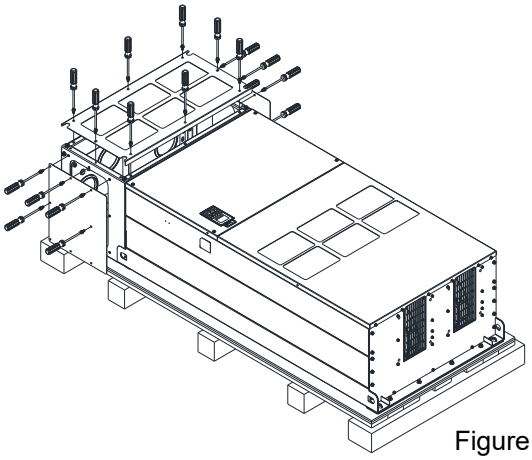


Figure 3-34

Fix the drive from the outside

Loosen the eight M8 screws, and then use these eight M8 screws to fix the iron plates (removed at the last step) to the drive, see the figure below.
Torque: 150–180 kg-cm / (130.20–156.24 lb-in.) / (14.7–17.6 Nm)

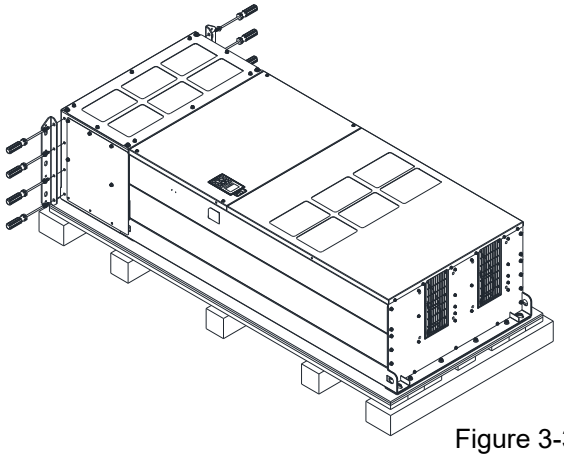


Figure 3-36

Tighten the six M6 screws back, see the figure below. Torque: 35–45 kg-cm / (30.38–39.06 lb-in) / (3.4–4.4 Nm)

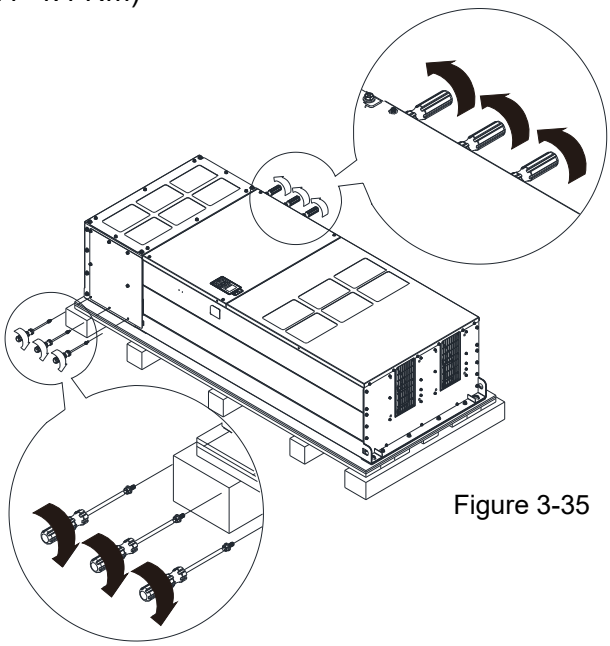


Figure 3-35

Tighten the six M6 screws that removed in the figure 3-32 back, see the figure below.
Torque: 35–45 kg-cm / (30.38–39.06 lb-in) / (3.4–4.4 Nm)

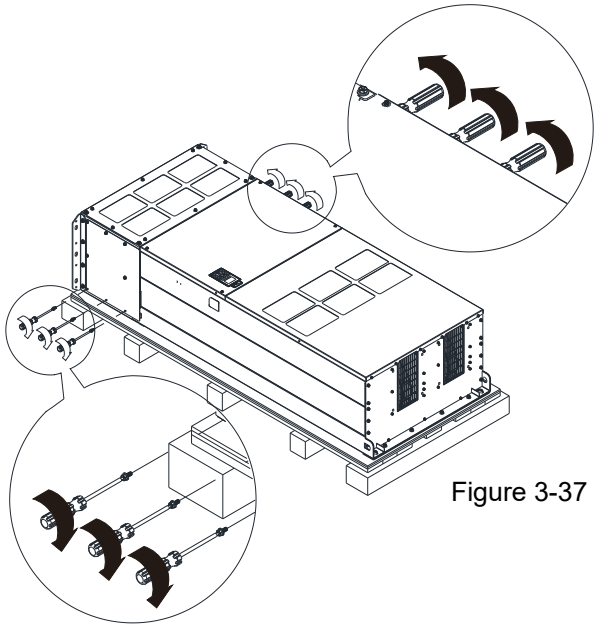


Figure 3-37

Lift the drive by hooking the lifting hole. It is now ready for installation.

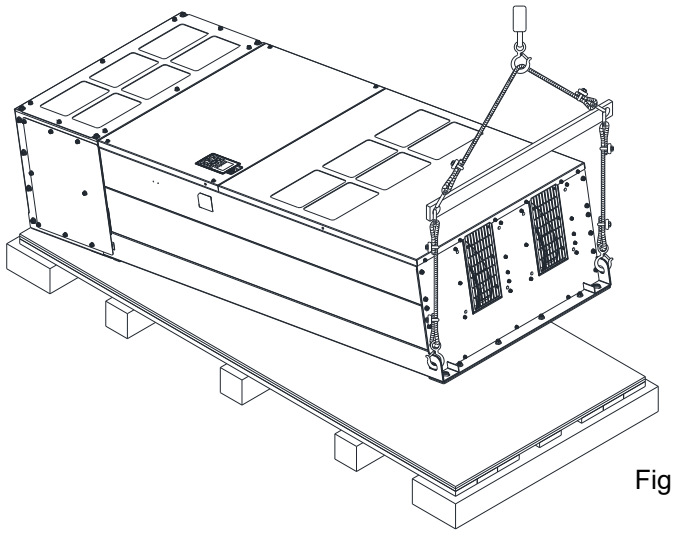


Figure 3-38

690V Frame H

Unpacking 1 (VFDXXXC63B-00)

Remove the eight buckles fixed on the crate with a flat-head screwdriver, see the figure below.

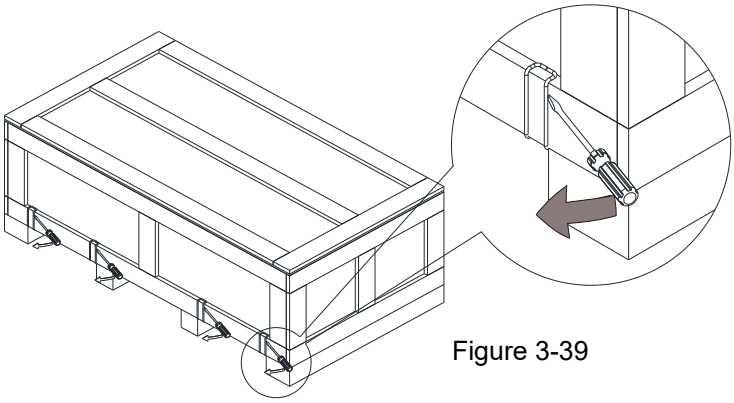


Figure 3-39

Remove the top cover, take out the EPEs and the manual.

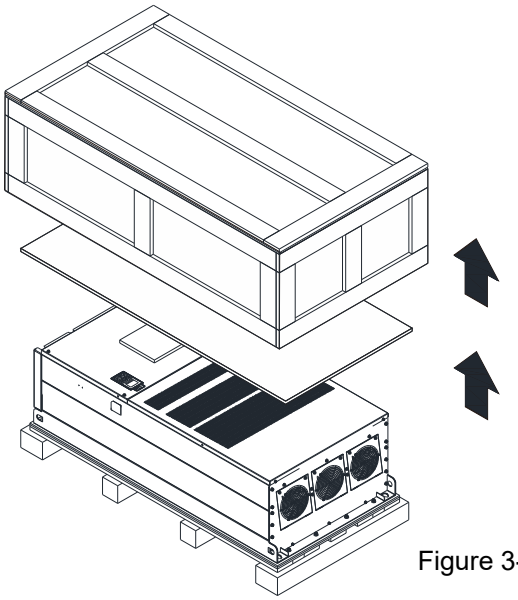


Figure 3-40

Loosen the six screws fasten the drive on the pallet, and then remove six metal washers and six plastic washers. See the figure below.

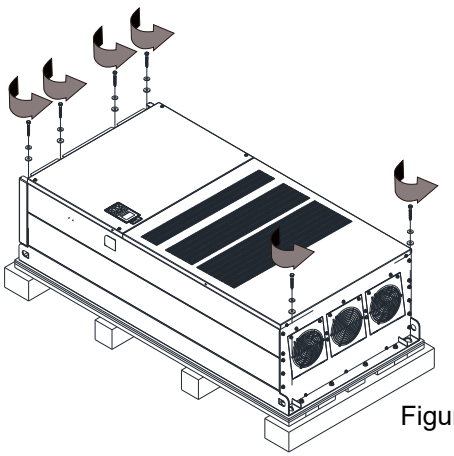


Figure 3-41

Lift the drive by hooking the lifting hole. It is now ready for installation.

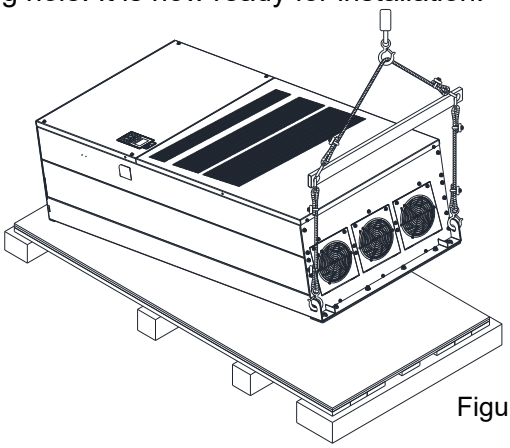


Figure 3-42

Unpacking 2 (VFDXXXC63B-21)

Remove the eight buckles fixed on the crate with a flat-head screwdriver, see the figure below.

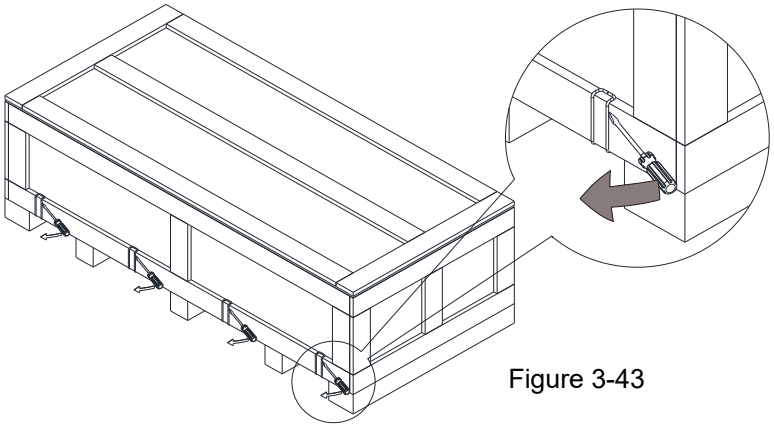


Figure 3-43

Remove the top cover, take out the EPEs, rubber and the manual.

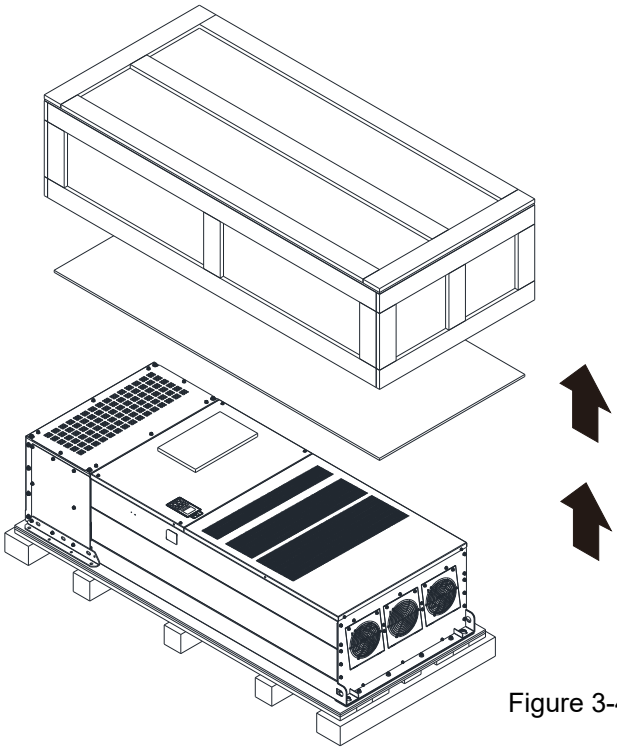


Figure 3-44

Loosen the six screws fasten the drive on the pallet, and then remove six metal washers and six plastic washers. See the figure below.

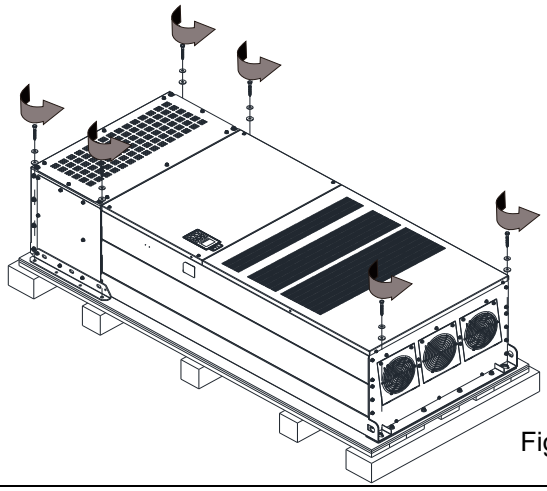


Figure 3-45

Loosen the six M6 screws and the iron plates (see the figure below). You can use the removed screws and iron plates to fix the drive from the outside.

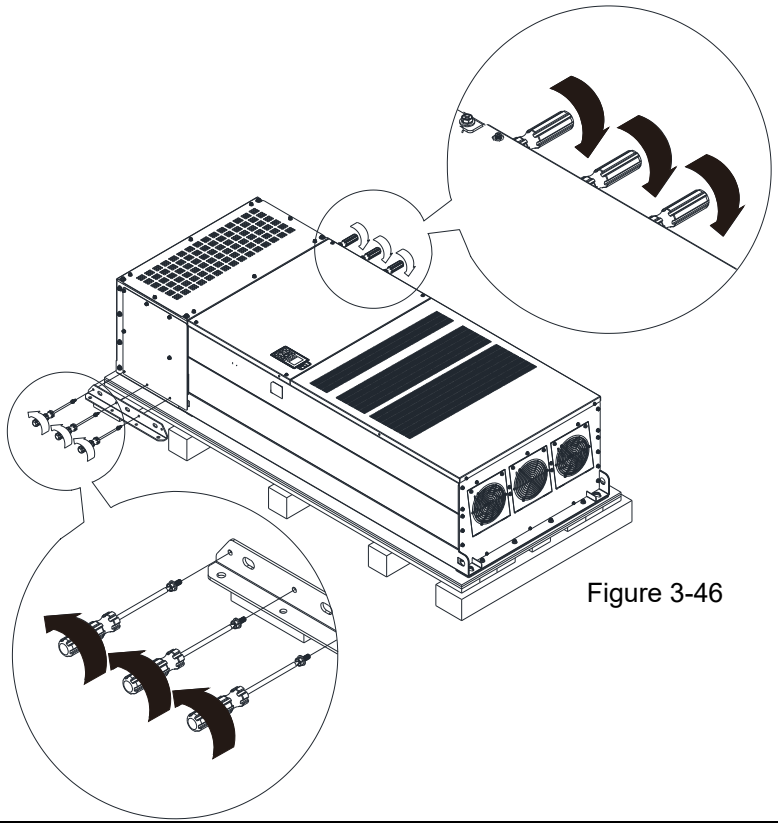


Figure 3-46

Fix the drive from the inside

Loosen the 18 M6 screws and remove the covers (see the figure 3-48). After fixing the drive and the cover for cables (see figure 3-47), fasten the other covers back (see the figure 3-48).
Torque: 35–45 kg-cm / (30.38–39.06 lb-in.)
(3.43–3.92 Nm)

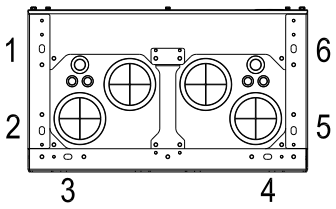


Figure 3-47

Cover for cables (use M12 screws)

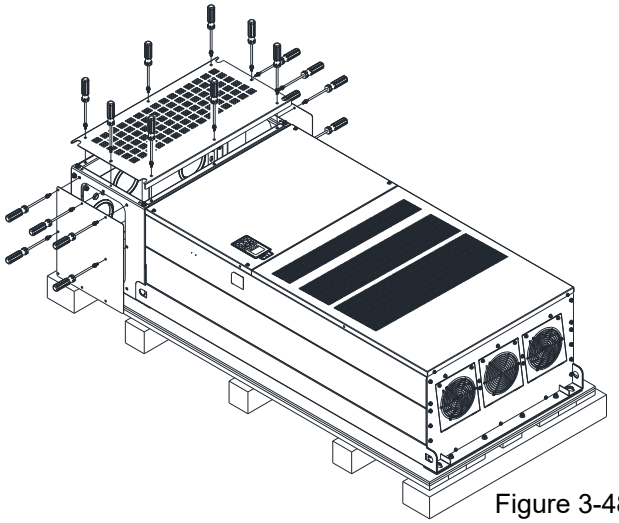


Figure 3-48

Fix the drive from the outside

Loosen the eight M8 screws, and then use these eight M8 screws to fix the iron plates (removed at the last step) to the drive, see the figure below.
Torque: 150–180 kg-cm / (130.20–156.24 lb-in.)
(14.7–17.64 Nm)

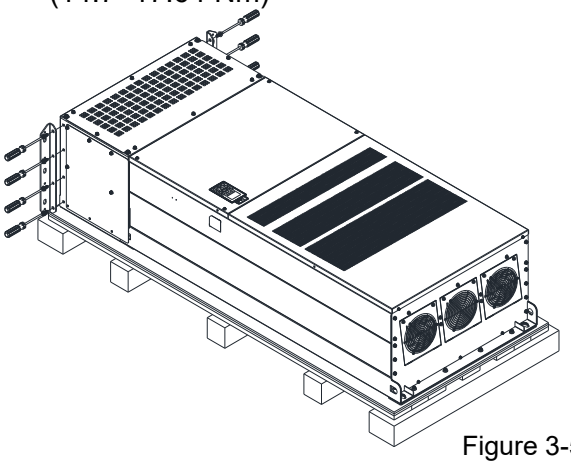


Figure 3-50

Tighten the six M6 screws back, see the figure below.

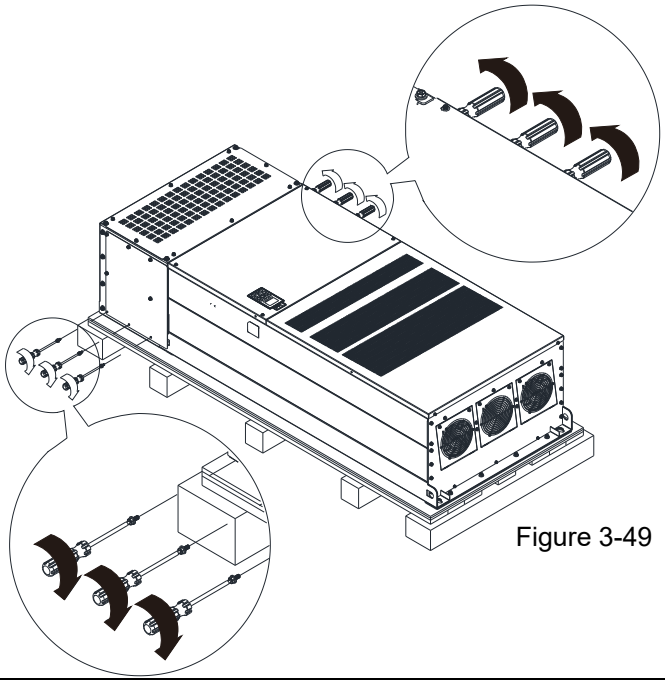


Figure 3-49

Tighten the six M6 screws back, see the figure below.

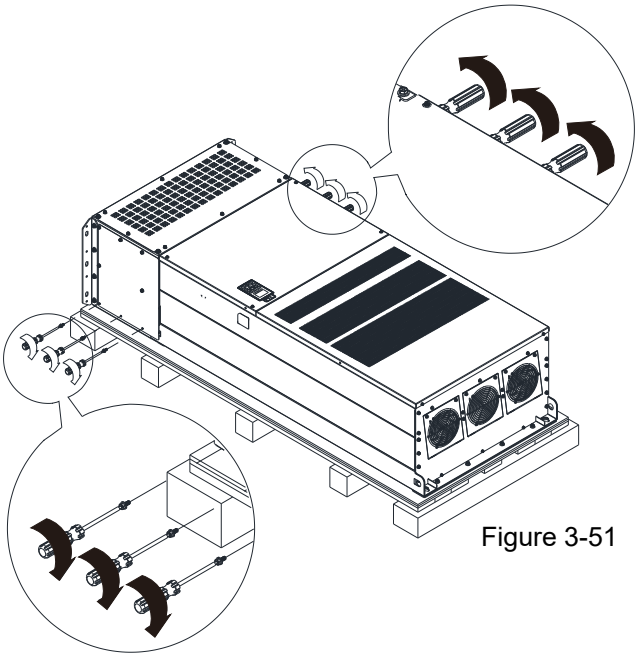


Figure 3-51

Lift the drive by hooking the lifting hole. It is now ready for installation.

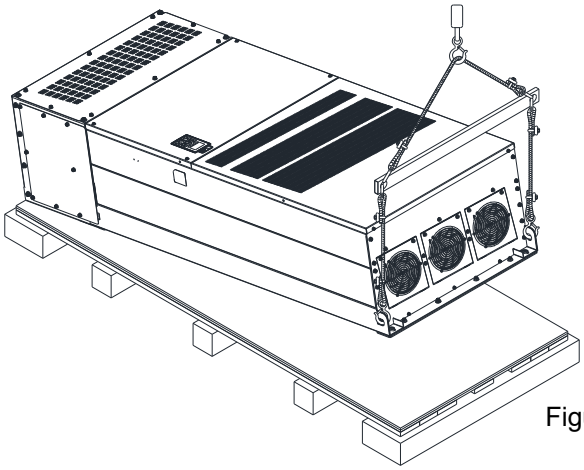


Figure 3-52

Frame H: Fix the drive

VFDXXXC43A-00

Screw: M12*6

Torque: 340–420 kg-cm / (295.1–364.6 lb-in.) / (33.3–41.2 Nm)

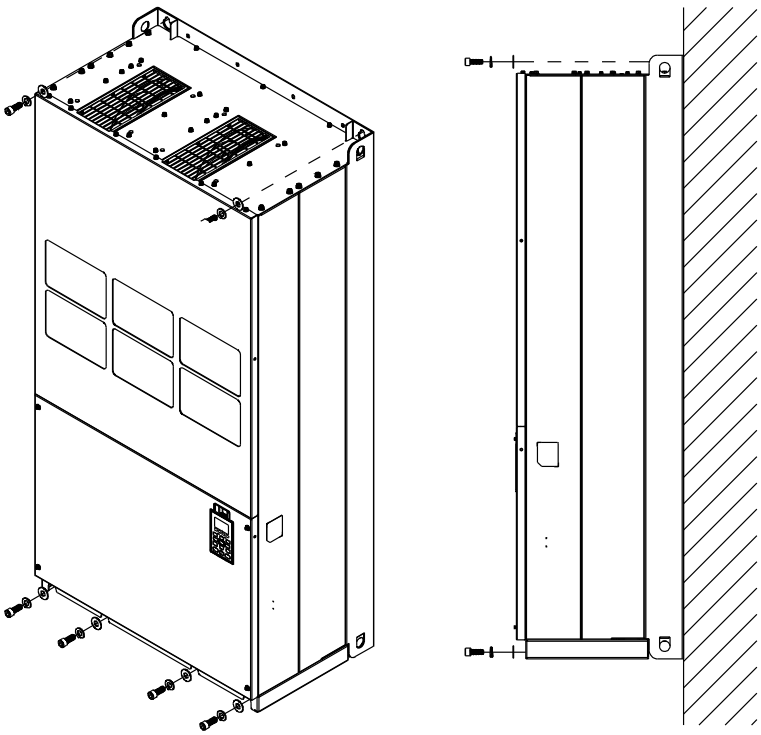


Figure 3-53

VFDXXXC43C-21

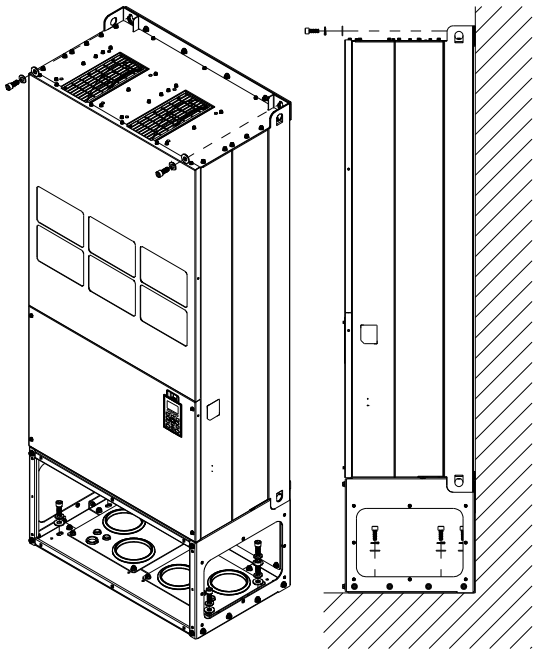


Figure 3-54

Fix the drive from the inside.

Screw: M12*8

Torque: 340–420 kg-cm / (295.1–364.6 lb-in.) / (33.3–41.2 Nm)

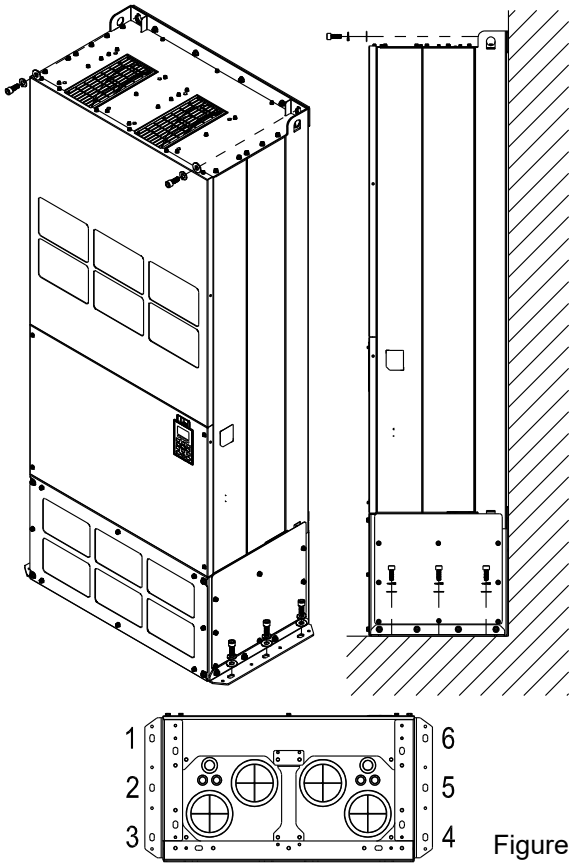


Figure 3-55

Fix the drive from the outside.

Screw: M12*8

Torque: 340–420 kg-cm / (295.1–364.6 lb-in.) / (33.3–41.2 Nm)

VFDXXXC63B

Screw M 12*6

Torque: 340–420 kg-cm / (295.1–364.6 lb-in.) / (33.32–41.16 Nm)

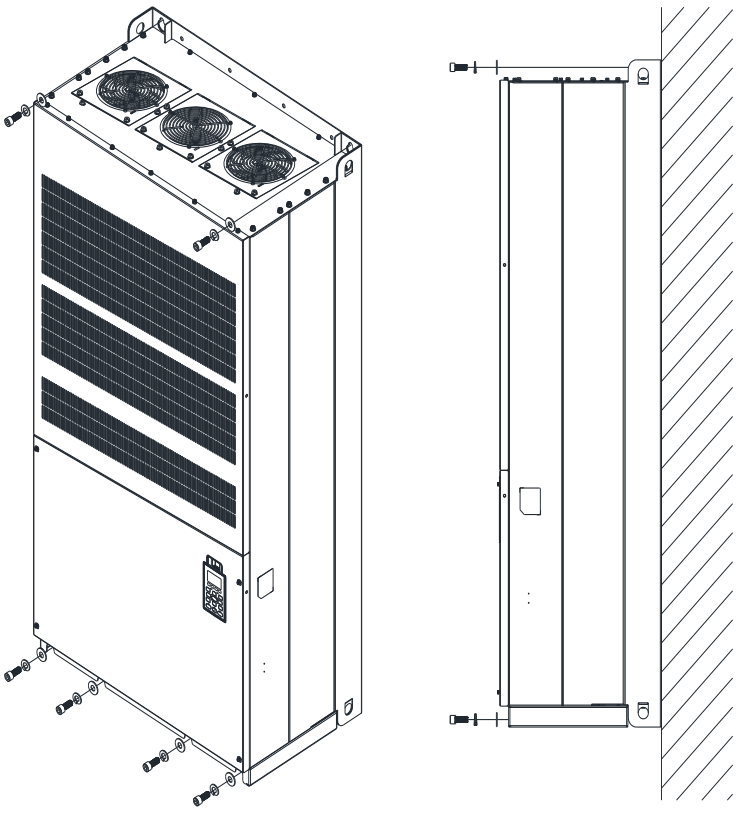
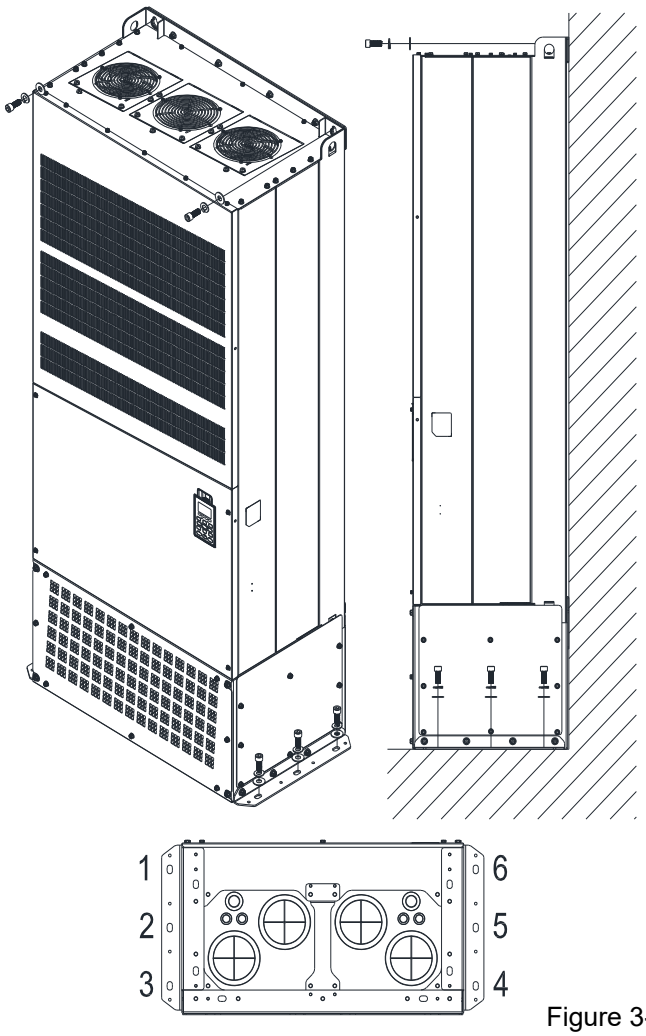


Figure 3-56

VFDXXXC63B-21



Fix the drive from the outside.
Screw: M12*8
Torque: 340–420 kg-cm / (295.1–364.6 lb-in.) / (33.32–41.16 Nm)

Figure 3-57

3-2 The Lifting Hook

The arrows indicate the location of the lifting holes of frame D to H, as shown in figure below:

Frame D0

Applicable models:

VFD370C43S-00; VFD370C43S-21; VFD450C43S-00; VFD450C43S-21

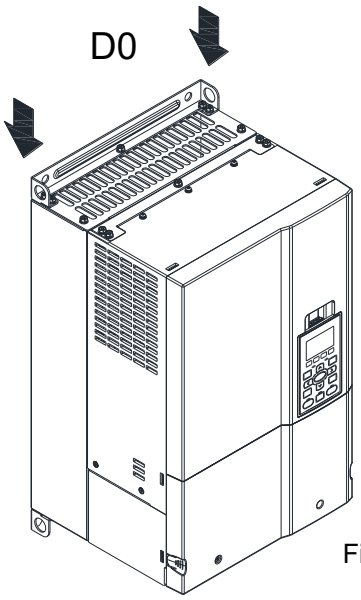


Figure 3-58

Frame D

Applicable models:

VFD300C23A-00; VFD300C23A-21; VFD370C23A-00; VFD370C23A-21; VFD450C63B-00; VFD450C63B-21; VFD550C43A-00; VFD550C43A-21; VFD550C63B-00; VFD550C63B-21; VFD750C43A-00; VFD750C43A-21

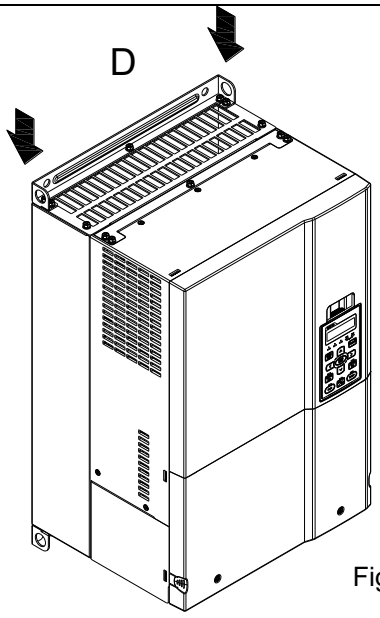


Figure 3-59

Frame E

Applicable models:

VFD450C23A-00; VFD450C23A-21; VFD550C23A-00; VFD550C23A-21; VFD750C23A-00; VFD750C23A-21; VFD750C63B-00; VFD750C63B-21; VFD900C43A-00; VFD900C43A-21; VFD900C63B-00; VFD900C63B-21; VFD1100C43A-00; VFD1100C43A-21; VFD1100C63B-00; VFD1100C63B-21; VFD1320C63B-00; VFD1320C63B-21

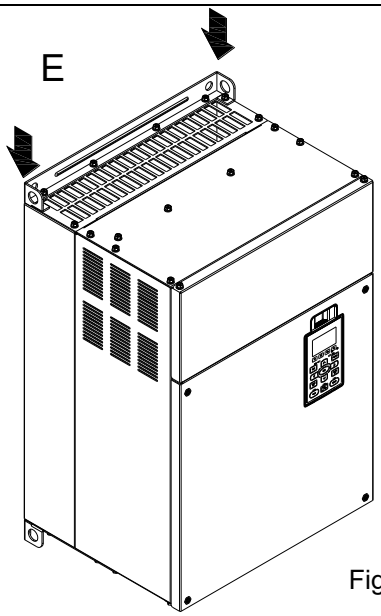


Figure 3-60

Frame F

Applicable models:

VFD900C23A-00; VFD900C23A-21; VFD1320C43A-00; VFD1320C43A-21; VFD1600C43A-00; VFD1600C43A-21; VFD1600C63B-00; VFD1600C63B-21; VFD2000C63B-00; VFD2000C63B-21

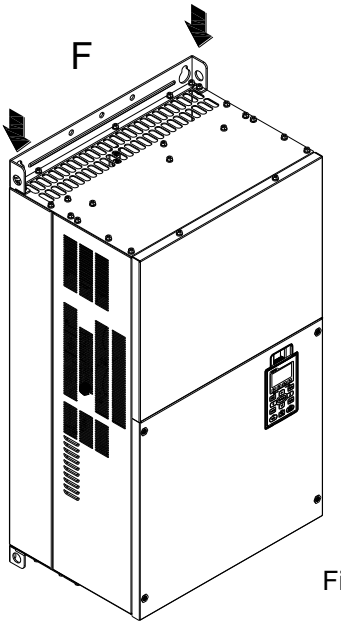


Figure 3-61

Frame G

Applicable models:

VFD1850C43A-00; VFD1850C43A-21; VFD2000C43A-00; VFD2000C43A-21; VFD2200C43A-00; VFD2200C43A-21; VFD2500C43A-00; VFD2500C43A-21; VFD2500C63B-00; VFD2500C63B-21; VFD3150C63B-00; VFD3150C63B-21

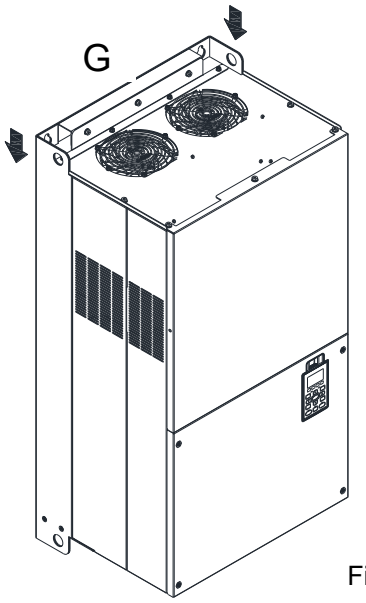


Figure 3-62

Frame H

Applicable models:

VFD2800C43A-00; VFD2800C43C-21; VFD3150C43A-00; VFD3150C43C-21; VFD3550C43A-00; VFD3550C43C-21; VFD4000C43A-00; VFD4000C43A-21; VFD4000C63B-00; VFD4500C43A-00; VFD4500C43C-21; VFD4500C63B-00; VFD5000C43A-00; VFD5000C43C-21; VFD5600C43A-00; VFD5600C43C-21; VFD5600C63B-00; VFD6300C63B-00

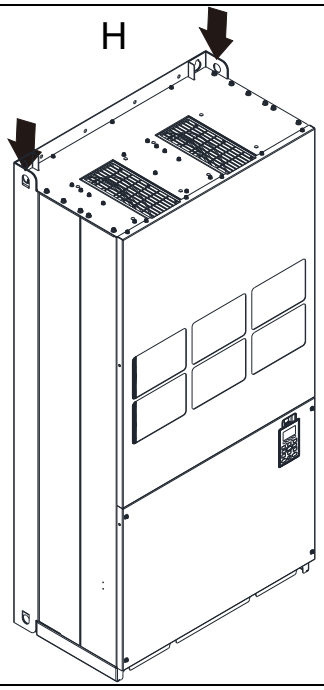


Figure 3-63

690V Frame H3

Applicable models:

VFD4000C63B-21; VFD4500C63B-21; VFD5600C63B-21; VFD6300C63B-21

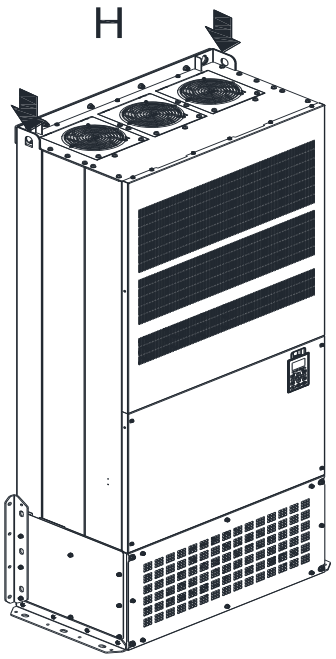


Figure 3-64

Ensure the lifting hook properly goes through the lifting hole, as shown in the following diagram.

Applicable to Frame D0–E

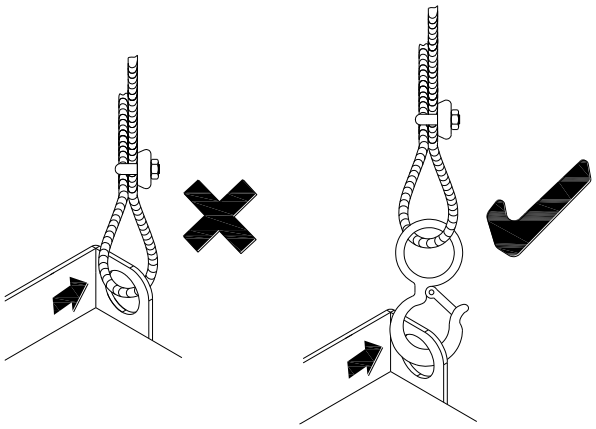


Figure 3-65

Applicable to Frame F–H

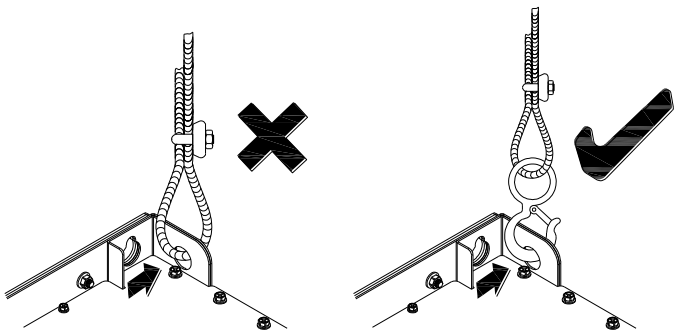


Figure 3-66

Ensure the angle between the lifting holes and the lifting device is within the specification, as shown in the following figure.

Applicable to Frame D0–E

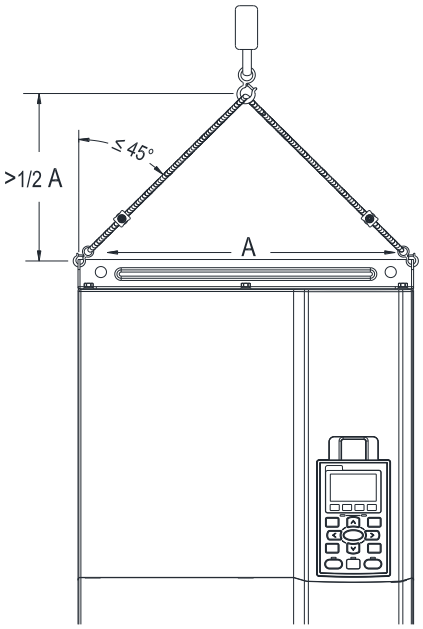


Figure 3-67

Applicable to Frame F–H, 690V Frame H3

Following drawing is only for demonstration, it may be slightly different with the machine you have.

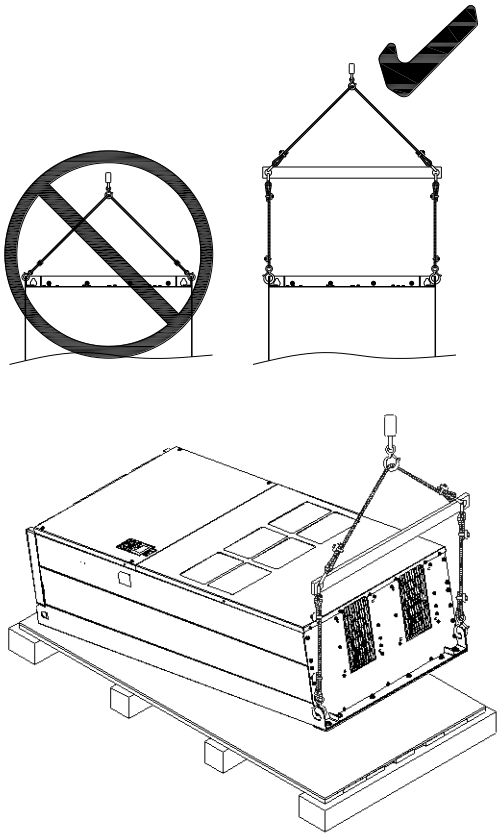
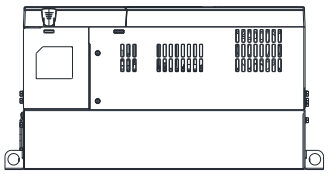
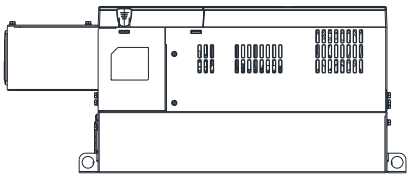
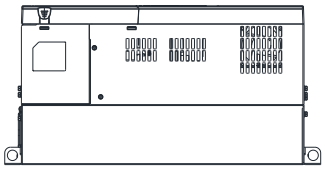
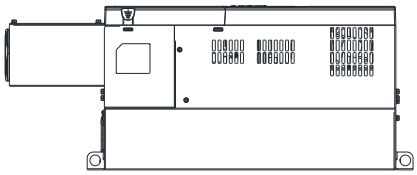
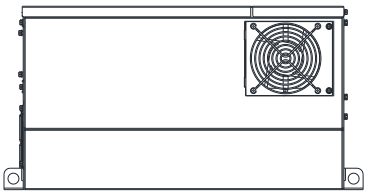
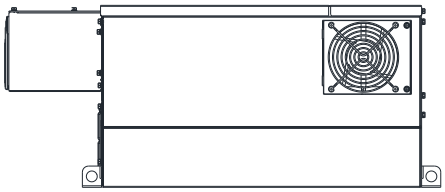
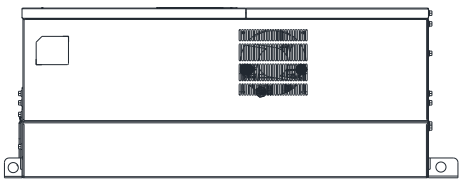
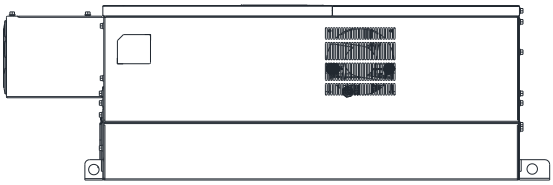
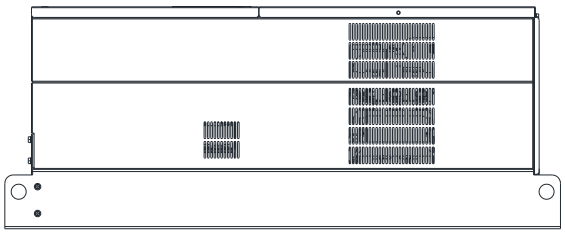
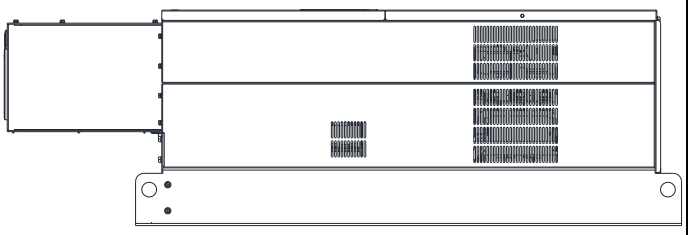
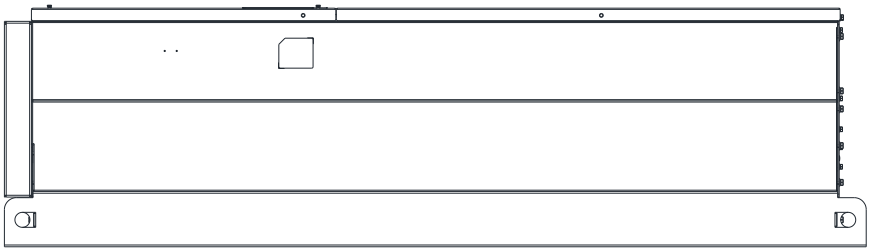
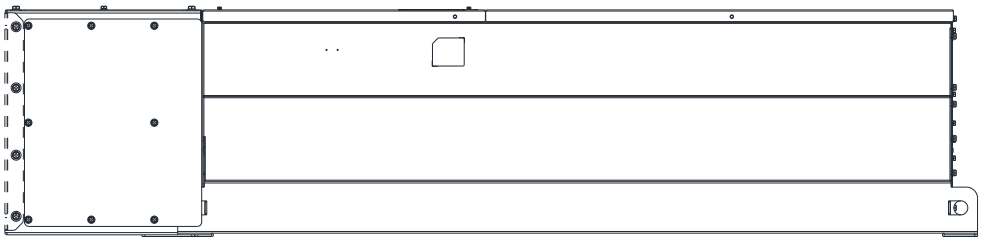
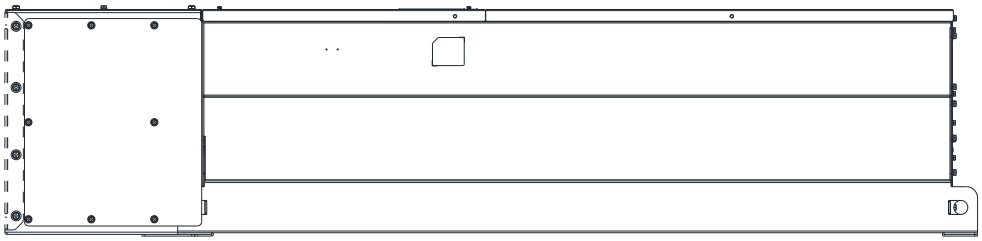


Figure 3-68

Weight

D0	VFDXXXXCXXS-00: 27 kg / (59.5 lbs)  Figure 3-69	VFDXXXXCXXS-21: 29 kg / (63.9 lbs)  Figure 3-70
D	VFDXXXXCXXA-00: 37.6 kg / (82.9 lbs) VFDXXXC63B-00: 39.0 kg / (86.0 lbs)  Figure 3-71	VFDXXXXCXXA-21: 40 kg / (88.2 lbs) VFDXXXC63B-21: 41.1 kg / (91.3 lbs)  Figure 3-72
E	VFDXXXXCXXA-00: 63.6 kg / (140.2 lbs) VFDXXXC63B-00: 61.0 kg / (134.5 lbs)  Figure 3-73	VFDXXXXCXXA-21: 66 kg / (145.5 lbs) VFDXXXC63B-21: 63.4 kg / (139.8 lbs)  Figure 3-74
F	VFDXXXXCXXA-00: 85 kg / (187.2 lbs) VFDXXXC63B-00: 88.0 kg / (194.0 lbs)  Figure 3-75	VFDXXXXCXXA-21: 88 kg / (193.8 lbs) VFDXXXC63B-21: 91.0 kg / (200.7 lbs)  Figure 3-76
G	VFDXXXXCXXA-00: 130 kg / (286.5 lbs) VFDXXXC63B-00: 135.0 kg / (297.6 lbs)  Figure 3-77	VFDXXXXCXXA-21: 138 kg / (303.9 lbs) VFDXXXC63B-21: 143.0 kg / (315.3 lbs)  Figure 3-78

H1	VFD2800C43A-00; VFD3150C43A-00; VFD3550C43A-00; VFD4000C43A-00; VFD4500C43A-00: 244 kg / (537.9 lbs) VFD5000C43A-00; VFD5600C43A-00: 270 kg / (595.2 lbs) VFDXXXC63B-00: 243.0 kg / (535.7 lbs)  Figure 3-79
H2	VFDXXXC63B-21: 251.0 kg / (553.5 lbs)  Figure 3-80
H3	VFD2800C43C-21; VFD3150C43C-21; VFD3550C43C-21; VFD4000C43C-21; VFD4500C43C-21: 269 kg / (593.0 lbs) VFD5000C43C-21; VFD5600C43C-21: 295kg / (650.4 lbs)  Figure 3-81

Chapter 4 Wiring

4-1 System Wiring Diagram

4-2 Wiring

After removing the front cover, verify that the power and control terminals are clearly noted. Read the following precautions before wiring.



- ☑ **Turn off the AC motor drive power** before doing any wiring. A charge with hazardous voltages may remain in the DC bus capacitors even after the power has been turned off for a short time. Measure the remaining voltage with a DC voltmeter on +1/DC+ and DC- before doing any wiring. For your safety, do not start wiring before the voltage drops to a safe level (less than 25 V_{DC}). Installing wiring with a residual voltage may cause personal injury, sparks and short circuit.
- ☑ Only qualified personnel familiar with AC motor drives are allowed to perform installation, wiring and commissioning. Make sure the power is turned off before wiring to prevent electric shock.
- ☑ Make sure that power is only applied to the R/L1, S/L2 and T/L3 terminals. Failure to comply may result in damage to the equipment. The voltage and current must be in the range indicated on the nameplate (refer to Section 1-1 Nameplate Information for details).
- ☑ All units must be grounded directly to a common ground terminal to prevent damage from a lightning strike or electric shock and reduce noise interference.
- ☑ Tighten the screws of the main circuit terminals to prevent sparks caused by screws loosened due to vibration.



- ☑ For your safety, choose wires that comply with local regulations when wiring.
- ☑ Check the following items after finishing the wiring:
  1. Are all connections correct?
  2. Are there any loose wires?
  3. Are there any short circuits between the terminals or to ground?

4-1 System Wiring Diagram

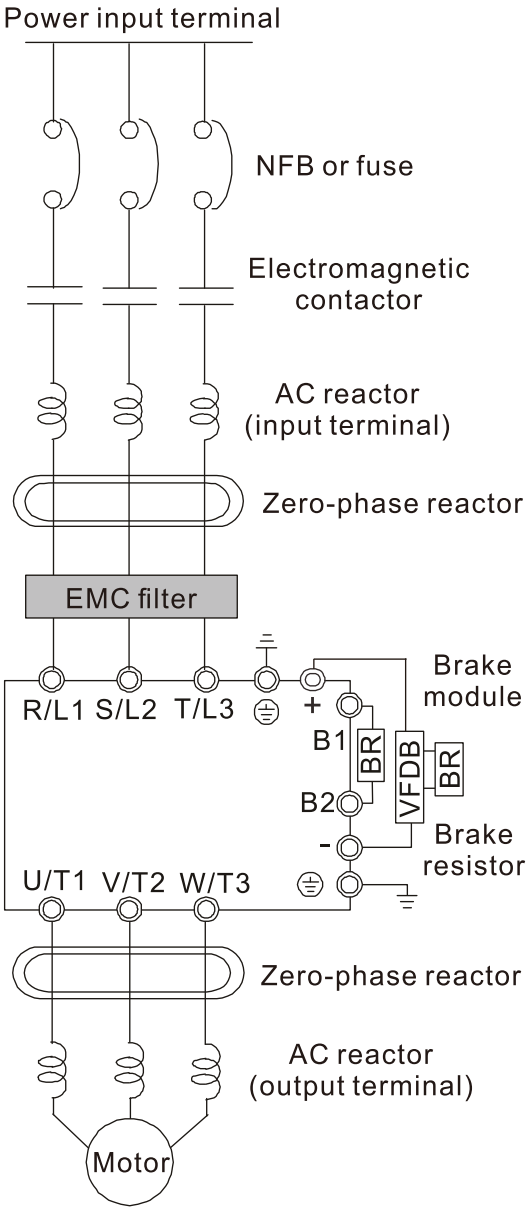


Figure 4-1

NOTE:
Refer to Section 4-2 Wiring Diagram for detailed wiring information.

Power input terminal	Supply power according to the rated power specifications indicated in the manual (refer to Chapter 9 Specification).
NFB or fuse	There may be a large inrush current during power on. Refer to Section 7-2 NFB to select a suitable NFB or Section 7-3 Fuse Specification Chart.
Electromagnetic contactor	Switching the power ON/OFF on the primary side of the electromagnetic contactor can turn the drive ON/OFF, but frequent switching can cause machine failure. Do not switch ON/OFF more than once an hour. Do not use the electromagnetic contactor as the power switch for the drive; doing so shortens the life of the drive. Refer to Section 7-2 Magnetic Contactor / Air Circuit Breaker to select the electromagnetic contactor that meets your requirement.
AC reactor (input terminal)	When the mains power supply capacity is greater than 500 kVA, or when it switches into the phase capacitor, the instantaneous peak voltage and current generated may destroy the internal circuit of the drive. It is recommended that you install an input side AC reactor in the drive. This also improves the power factor and reduces power harmonics. The wiring distance should be within 10 m. Refer to Section 7-4 AC / DC Reactor for details. Refer to Chapter 7-4.
Zero phase reactor	Used to reduce radiated interference, especially in environments with audio devices, and reduce input and output side interference. The effective range is AM band to 10 MHz. Refer to Section 7-5 Zero Phase Reactors for details.
EMC filter	Can be used to reduce electromagnetic interference. Refer to Section 7-6 EMC Filter for details.
Brake module & Brake resistor (BR)	Used to shorten the deceleration time of the motor. Refer to Section 7-1 Brake Resistors and Brake Units Used in AC Motor Drives for details.
AC reactor (output terminal)	The motor cable length affects the size of the reflected wave on the motor end. It is recommended that you install an AC output reactor when the motor wiring length exceeds the value listed in Section 7-4.

Table 4-1

4-2 Wiring

4-2-1 Wiring

Wiring Diagram for Frame A–C

Input: 3-phase power

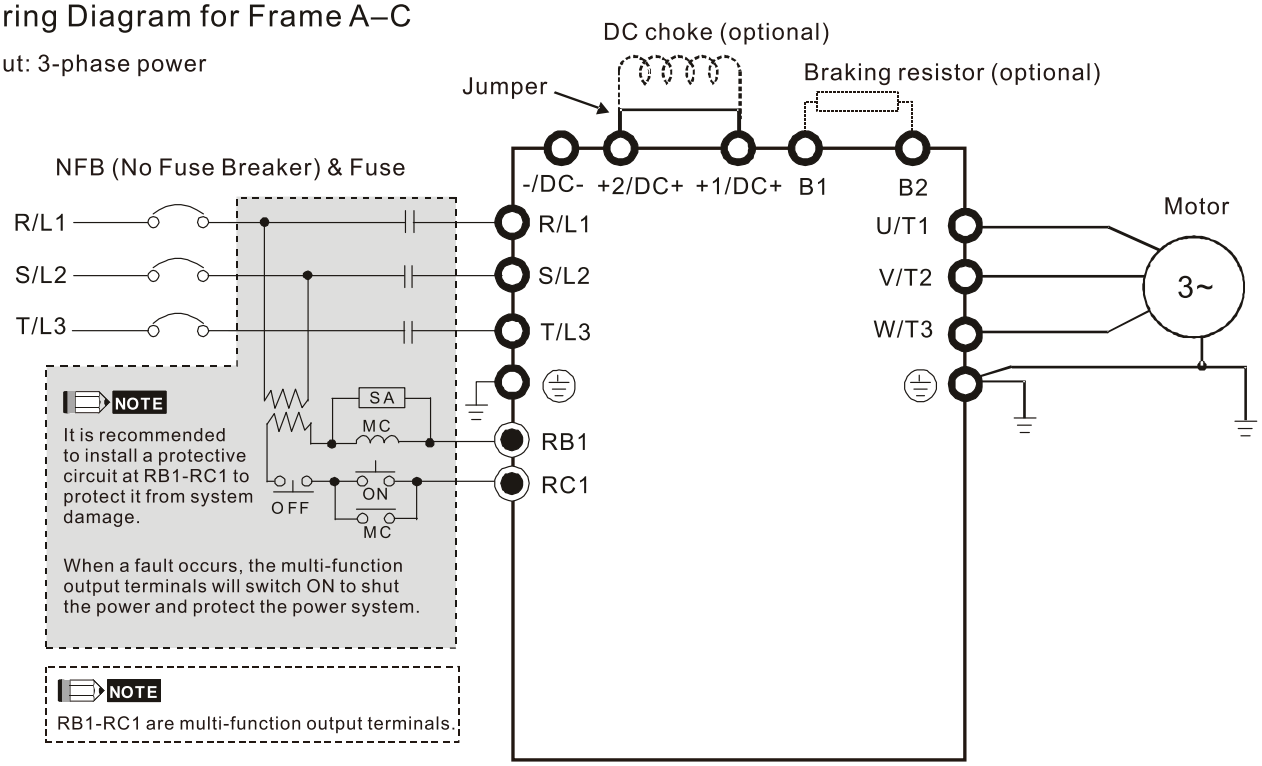


Figure 4-2

Wiring Diagram for Frame D–F

Input: 3-phase power

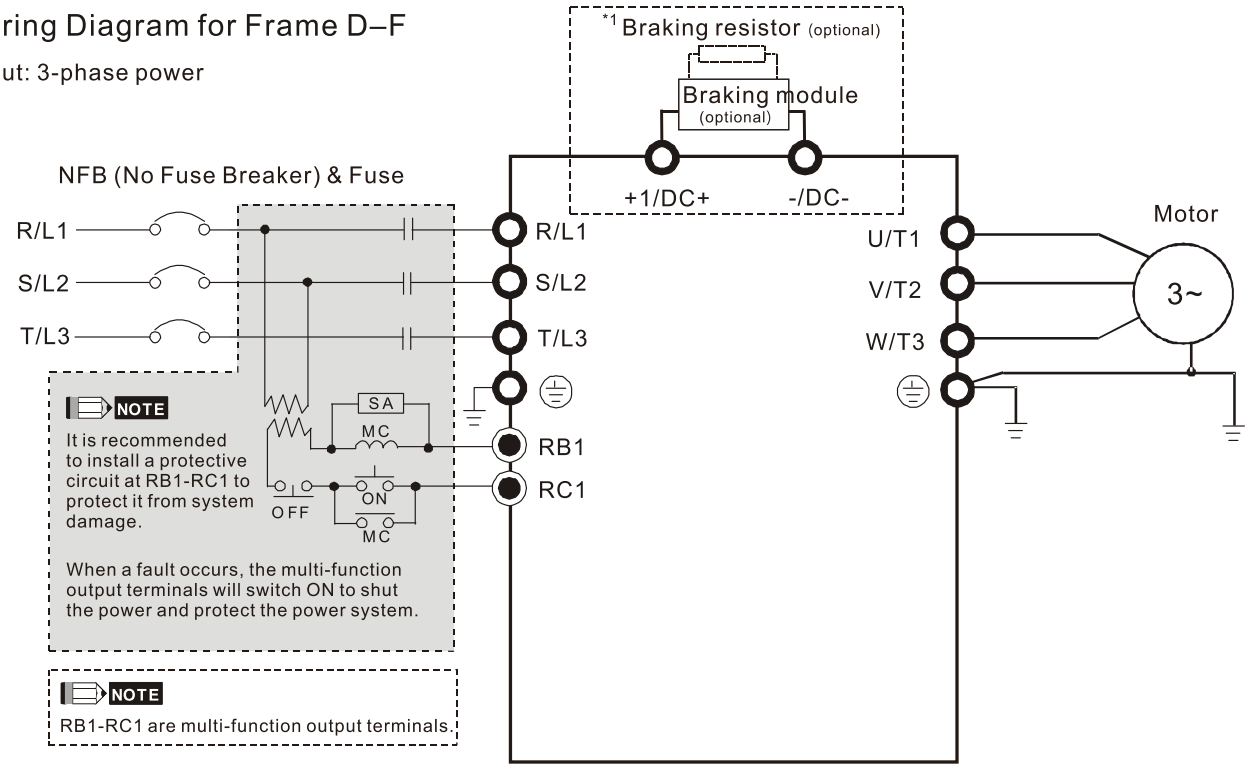


Figure 4-3

NOTE: *1 means that refer to Section 7-1 for brake units and resistors selection.

Wiring Diagram for Frame G–H

Input: 3-phase power

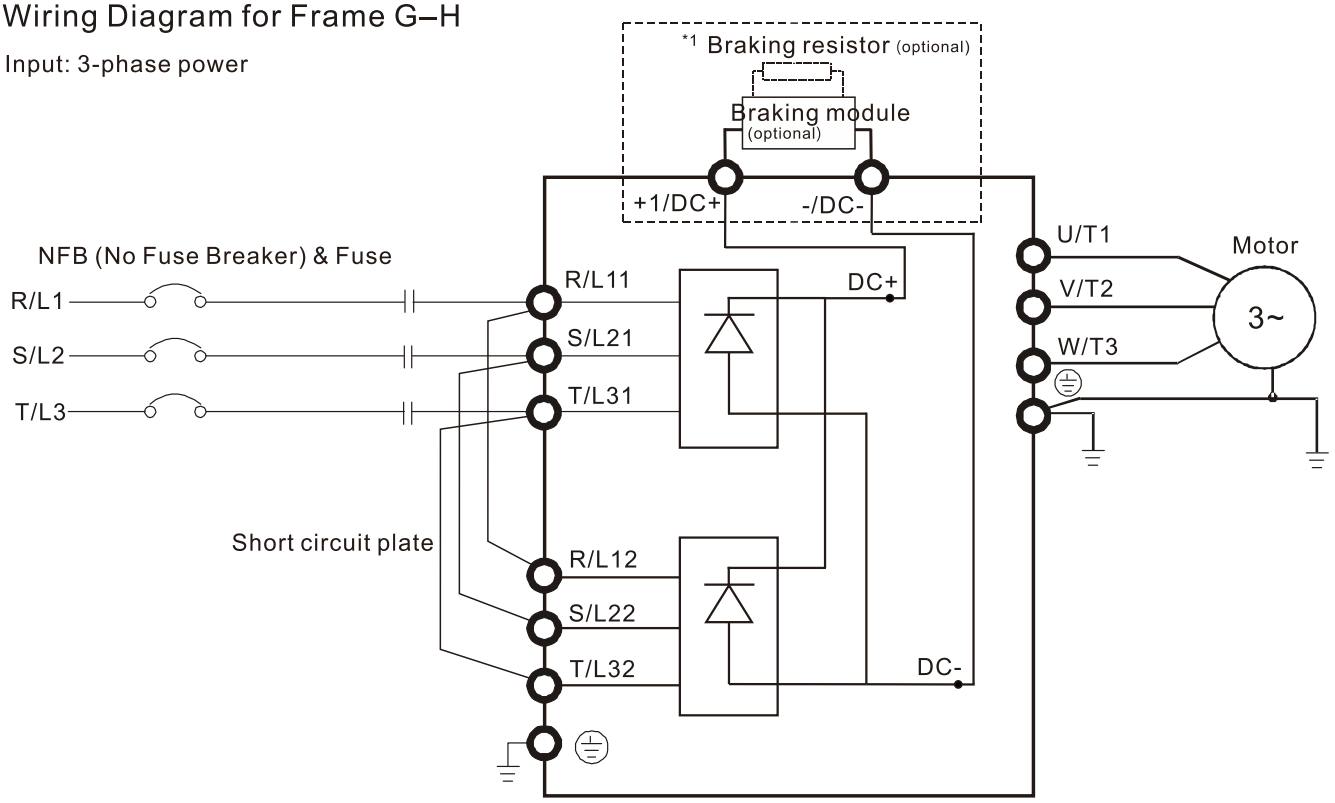


Figure 4-4

Wiring Diagram for Frame G–H

Input: 12 pulse

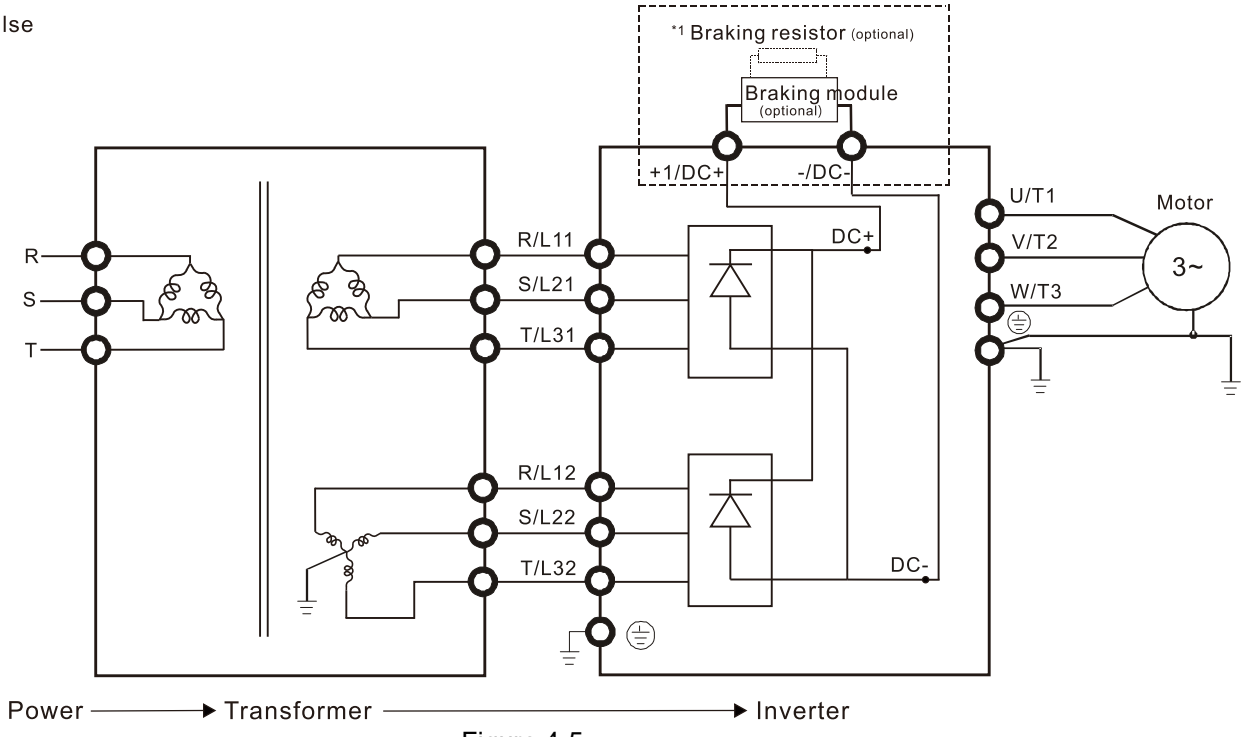


Figure 4-5

NOTE:

1. *1 means that refer to Section 7-1 for brake units and resistors selection.
2. When wiring for 12 Pulse Input, strictly follow above wiring diagram.

Wiring Diagram for Frame A–H

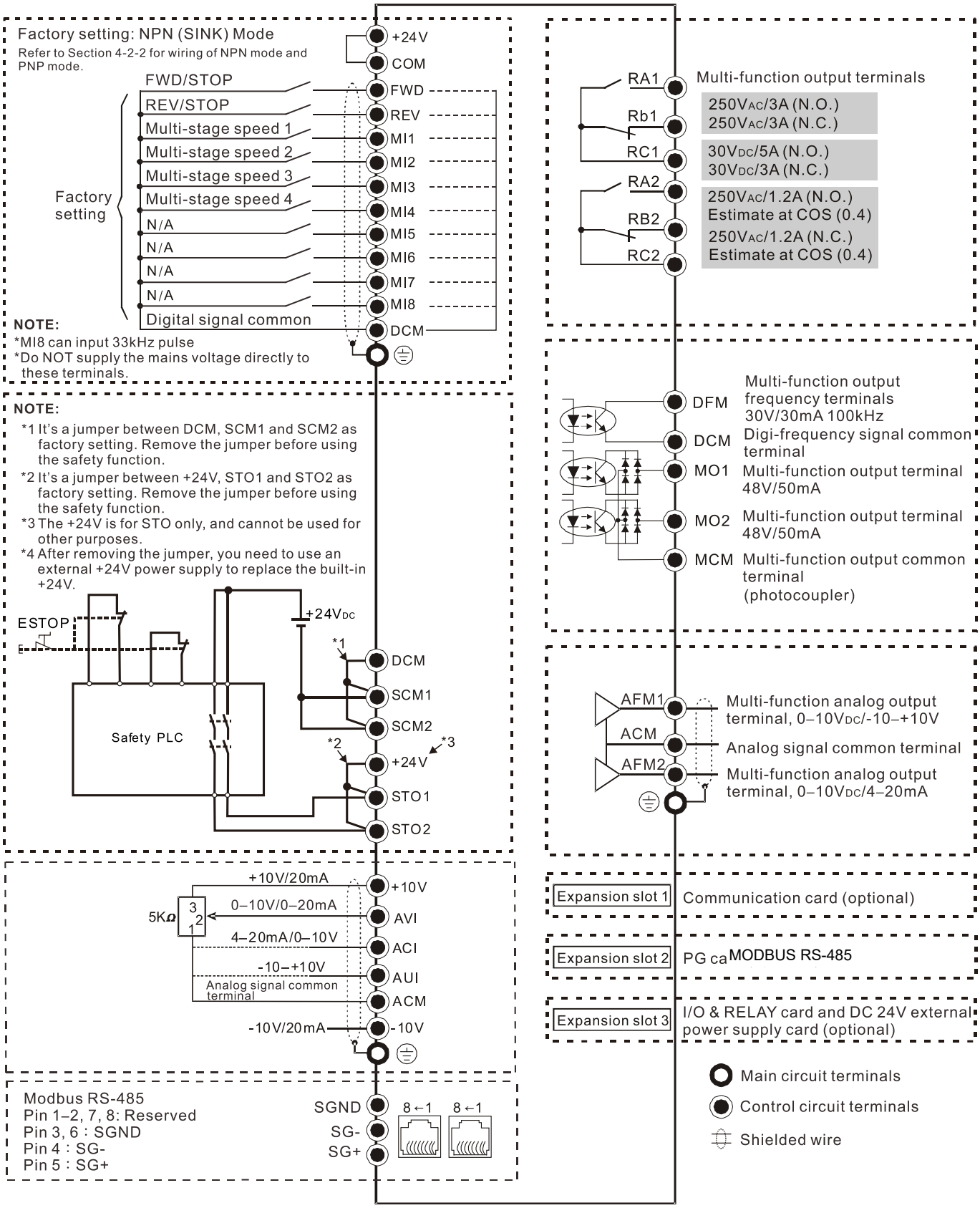


Figure 4-6

4-2-2 SINK (NPN) / SOURCE (PNP) Mode

① Sink Mode
with internal power (+24VDC)

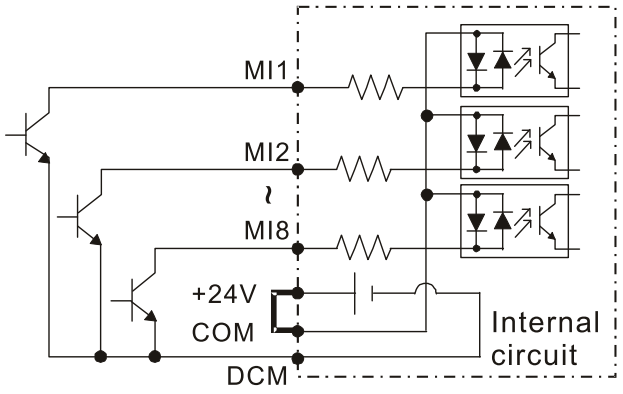


Figure 4-7

② Source Mode
with internal power (+24VDC)

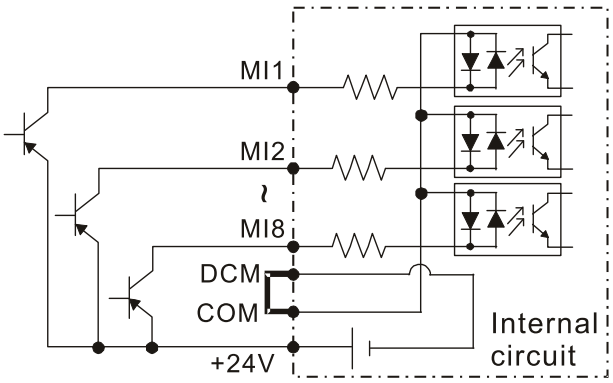


Figure 4-8

③ Sink Mode
with external power

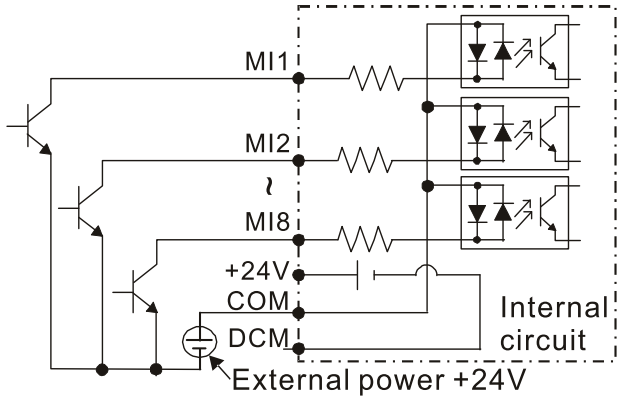


Figure 4-9

④ Source Mode
with external power

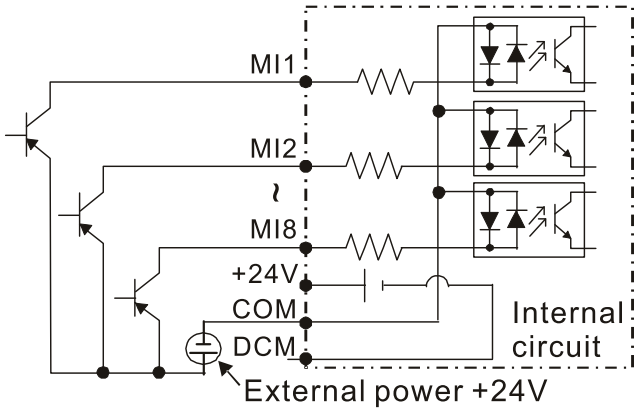


Figure 4-10

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Chapter 5 Main Circuit Terminals

5-1 Main Circuit Diagram

5-2 Main Circuit Terminal Specifications

DANGER

- ☑ Tighten the screws in the main circuit terminal to prevent sparks caused by screws loosened due to vibration.
- ☑ If necessary, use an inductive filter only at the motor output terminals U/T1, V/T2, W/T3 of the AC motor drive. DO NOT use phase-compensation capacitors or L-C (Inductance-Capacitance) or R-C (Resistance-Capacitance), unless approved by Delta.
- ☑ DO NOT connect phase-compensation capacitors or surge absorbers at the output terminals of AC motor drives.
- ☑ DO NOT short circuit [+1, -], [+2, -], [+1/DC+, -/DC-] or connect brake resistors directly to any of them to prevent damage to the drive or to the brake resistors.
- ☑ Ensure proper insulation of the main circuit wiring in accordance with the relevant safety regulations.

CAUTION

Main input power terminals

- ☑ Do not connect three-phase model to single-phase power. R/L1, S/L2 and T/L3 have no phase-sequence requirement; they can be connected in any sequence.
- ☑ Add a magnetic contactor (MC) to the power input wiring to cut off power quickly and reduce malfunctions when the AC motor drive protection function activates. Both ends of the MC should have an R-C surge absorber.
- ☑ Use voltage and current within the specifications in Chapter 9. Refer to Chapter 9 Specifications for details.
- ☑ When using a general GFCI (Ground Fault Circuit Interrupter), select a current sensor with sensitivity of 200 mA or above and not less than 0.1-second operation time to avoid nuisance tripping.
- ☑ Use shielded wire or conduit for the power wiring and ground the two ends of the shield wire or conduit.
- ☑ DO NOT run and stop the AC motor drives by turning the power ON and OFF. Run and stop the AC motor drives by sending RUN and STOP commands through the control terminals or the keypad. If you still need to run and stop the AC motor drives by turning the power ON and OFF, do so no more often than ONCE per hour.
- ☑ To comply with UL standards, connect the drive to a three-phase three-wire or three-phase four-wire Wye system type of mains power system.

Output terminals of the main circuit

- ☑ Use well-insulated motor, suitable for inverter operation.
- ☑ When the AC drive output terminals U/T1, V/T2, and W/T3 are connected to the motor terminals U/T1, V/T2, and W/T3 respectively, the motor will rotate counterclockwise (as viewed on the shaft end of the motor, refer to the pointed direction in the figure below) upon a forward operation command is received. To permanently reverse the direction of motor rotation, switch over any of the two motor leads.

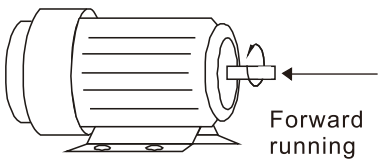


Figure 5-1

Terminals for connecting DC reactor, external brake resistor and DC circuit

☑ Use the terminals, as shown in Figure 5-2, to connect a DC reactor to improve the power factor and reduce harmonics. A jumper is connected to these terminals at the factory. Remove that jumper before connecting to a DC reactor.

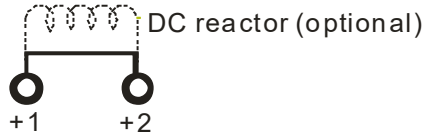


Figure 5-2

☑ Install an external brake resistor for applications in frequent deceleration to stop, short deceleration time (such as high frequency operation and heavy load operation), too low braking torque, or increased braking torque.

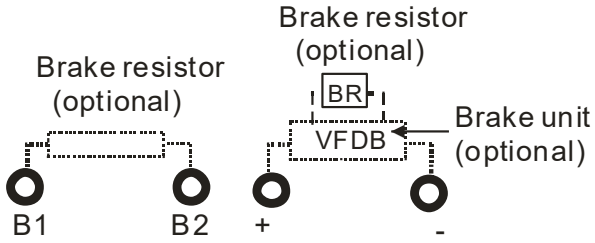


Figure 5-3

☑ The external brake resistor of Frame A, B and C should connect to the terminals (B1, B2) of AC motor drives.

☑ For those models without built-in brake resistor, please connect external brake unit and brake resistor (both of them are optional) to increase brake torque.

☑ When the terminals +1, +2 and - are not used, leave the terminals open.

☑ DC+ and DC- are connected by common DC bus, refer to Section 5-1 (Main Circuit Terminal) for the wiring terminal specification and the wire gauge information.

☑ Refer to the VFDB manual for more information on wire gauge when installing the brake unit.

5-1 Main Circuit Diagram

Wiring Diagram for Frame A~C

Input: 3-phase power

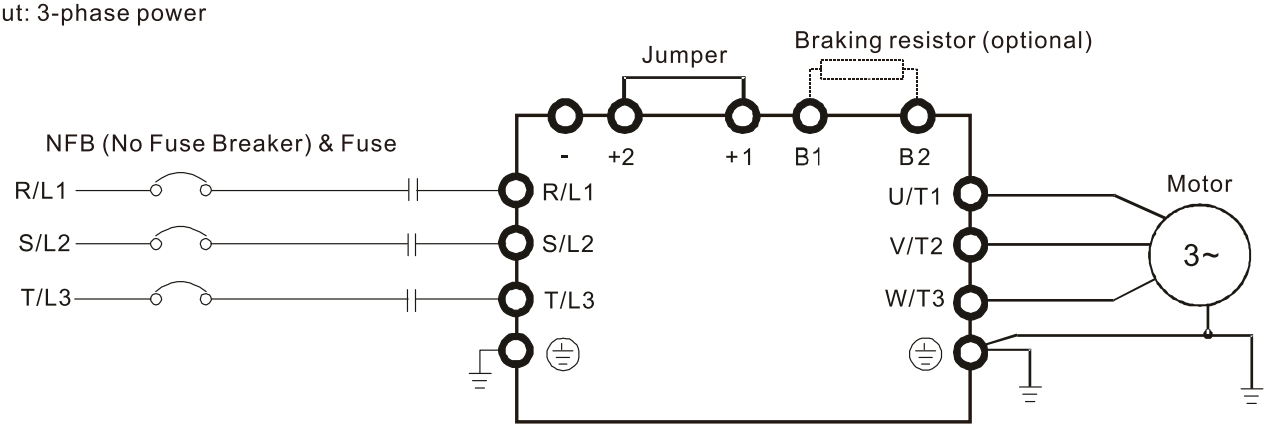


Figure 5-4

Wiring Diagram for Frame A~C

Input: 3-phase power

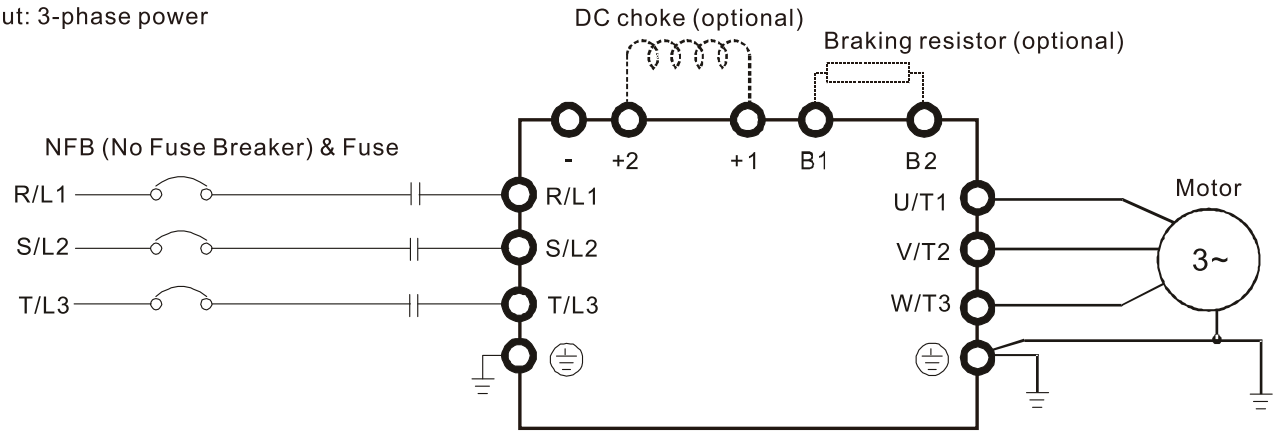


Figure 5-5

Wiring Diagram for Frame D~F

Input: 3-phase power

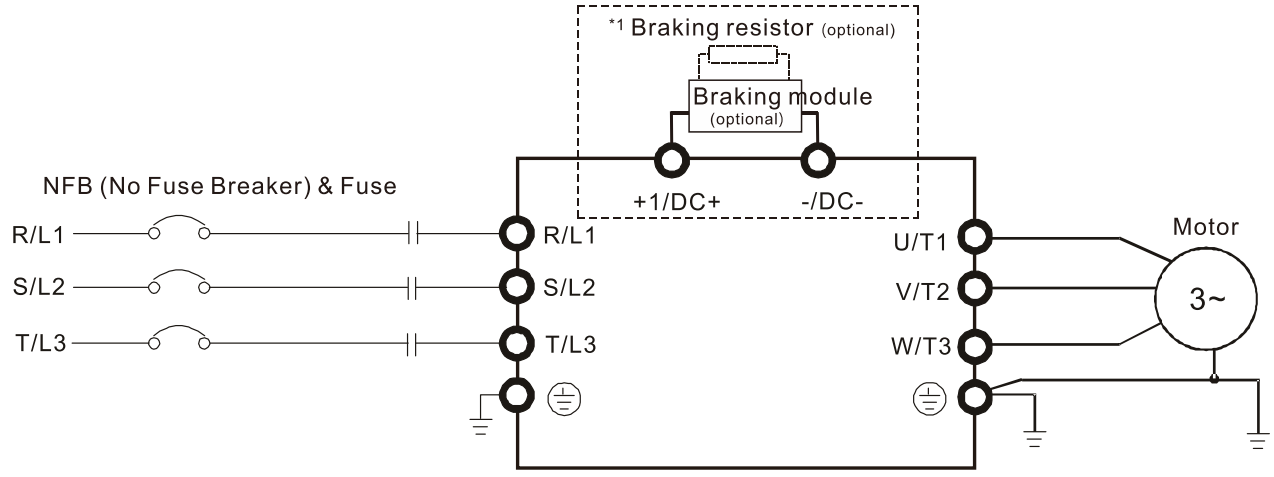


Figure 5-6

Wiring Diagram for Frame G–H

Input: 3-phase power

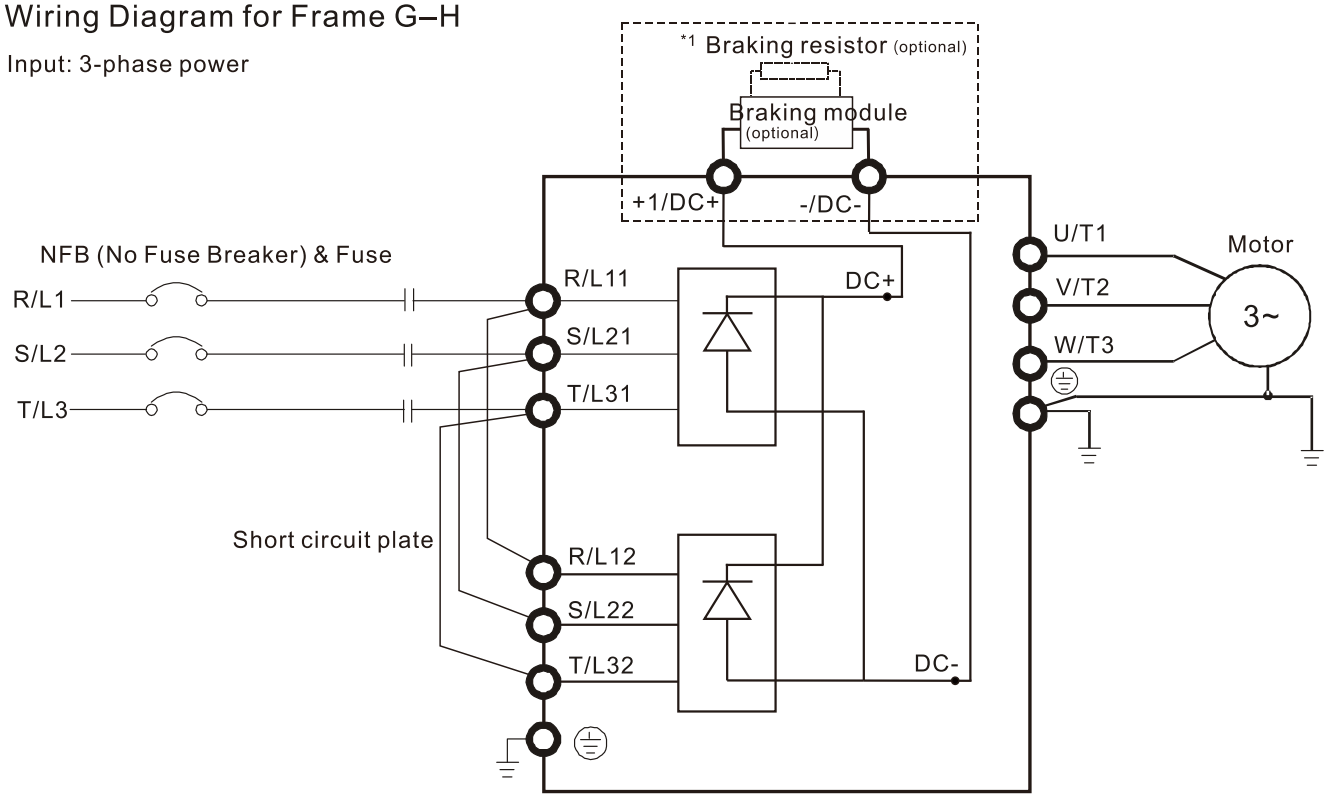


Figure 5-7

Wiring Diagram for Frame G–H

Input: 12 pulse

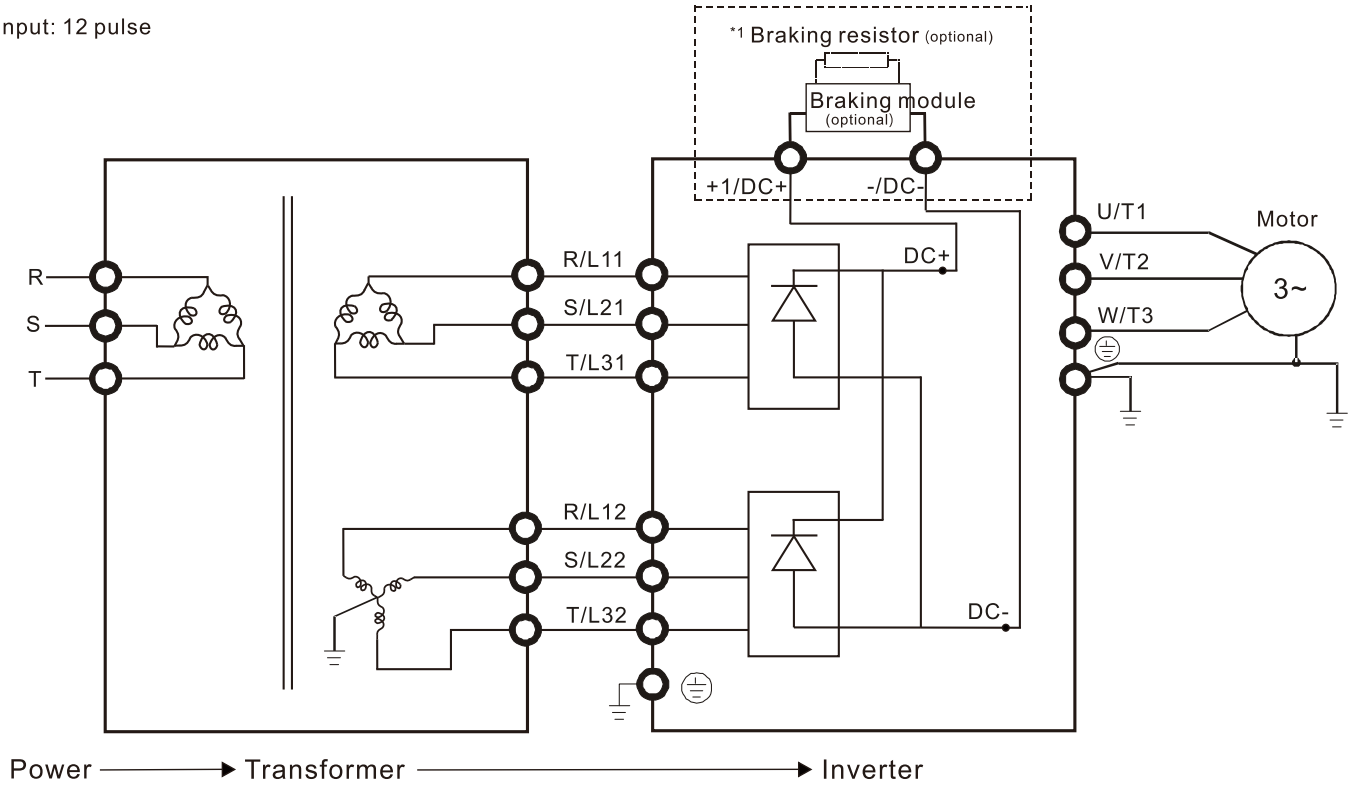


Figure 5-8

NOTE:

1. Mark *1 means that refer to Section 7-1 for brake units and resistors selection.
2. If the wiring between motor drive and motor is over 75 meters, refer to Section 7-4 Specifications of limits for motor cable length.
3. Frame G and H models use 12 pulse input, you should remove the short circuit plate (see the figure below). Consult with Delta before using 12 pulse input.
4. When wiring for 12 pulse input, strictly follow above wiring diagram.

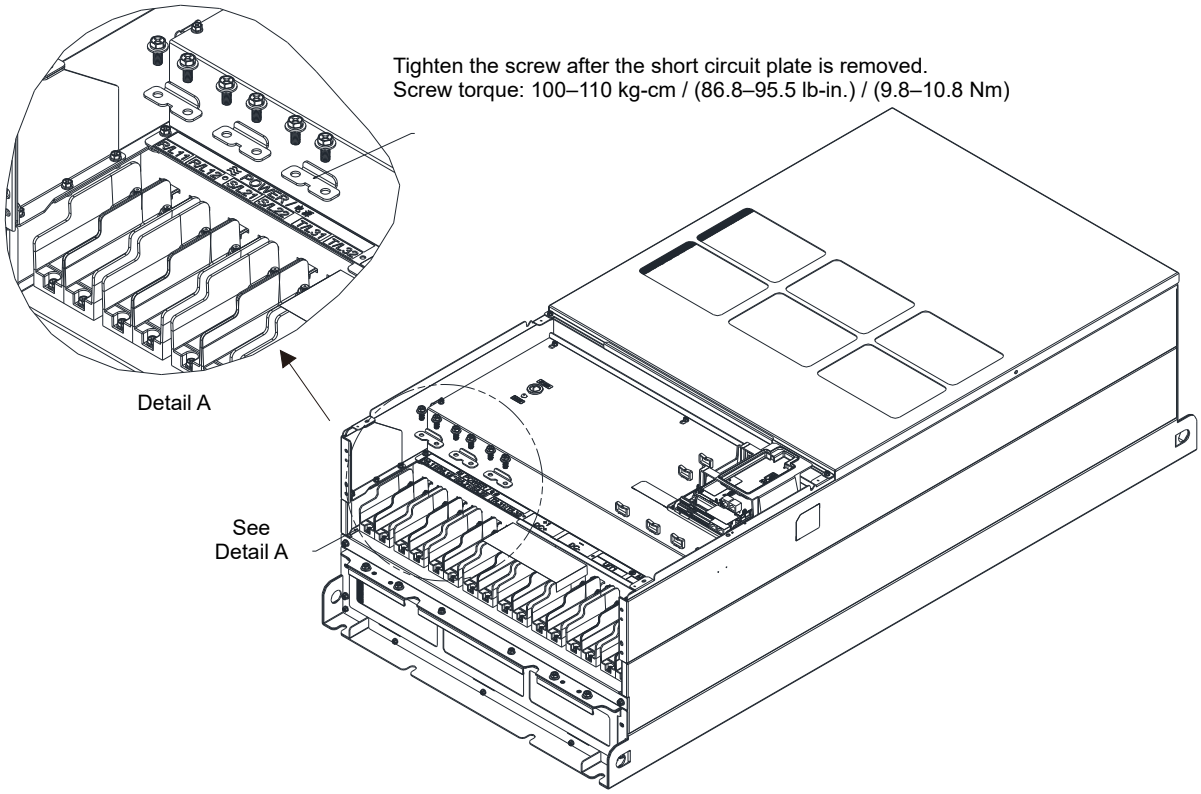


Figure 5-9

Terminals	Descriptions
R/L1, S/L2, T/L3	Mains input terminals (three-phase)
U/T1, V/T2, W/T3	AC motor drive output terminals for connecting three-phase induction motor
+1/DC+, +2/DC+	Applicable to frame A–C Connections for DC reactor to improve the power factor. Remove the jumper before installing a DC reactor.
+1/DC+, -/DC-	Connections for brake module (VFDB series) (for 230V models: ≤ 22 kW, built-in brake module) (for 460V models: ≤ 30 kW, built-in brake module) (for 690V models: ≤ 37 kW, built-in brake module) Common DC bus
B1, B2	Connections for brake resistor (optional). Refer to Section 7-1 for details.
⏚	Ground connection; comply with local regulations.

Table 5-1

5-2 Main Circuit Terminal Specifications

- Use the specified ring lug for main circuit terminal wiring. See figure 5-10 and figure 5-11 for ring lug specifications. For other types of wiring, use the wires that comply with the local regulations.
- After crimping the wire to the ring lug (must be UL approved), UL and CSA approved recognized component (YDPU2/8), install heat shrink tube rated at a minimum of 600V_{AC} insulation over the live part. Refer to figure 5-11 below.

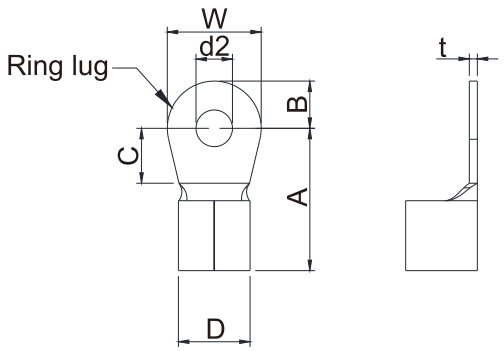


Figure 5-10

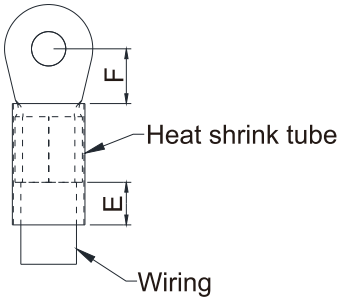


Figure 5-11

Terminal specification

The part number of the ring lugs (produced by K.S. Terminals Inc.) in the table below are for reference only. You can buy the ring lugs of your choice to match with different frame sizes.

Unit: mm

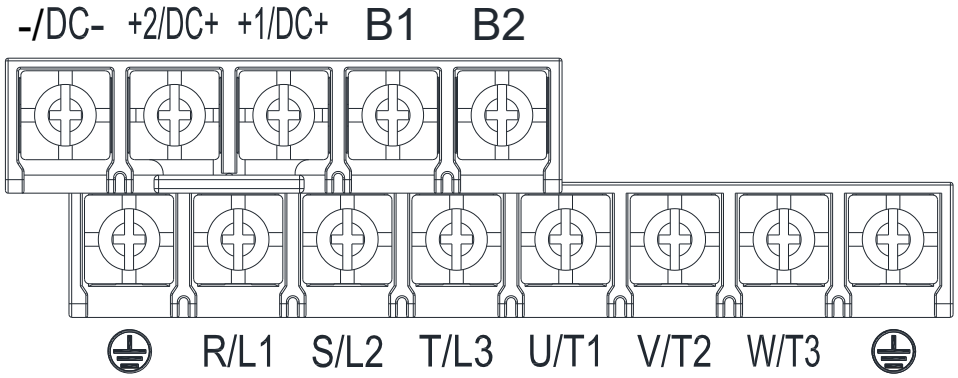
Frame	AWG[*1]	Kit P/N	A (MAX)	B (MAX)	C (MIN)	D (MAX)	d2 (MIN)	E (MIN)	F (MIN)	W (MAX)	t (MAX)
A	16	RNBL2-4	20.0	5.0	5.5	9.0	4.3	8.0	5.5	10.0	1.5
	14	RNBL2-4									
	12	RNBL5-4									
	10	RNBL5-4									
	8	RNBS8-4									
B	8	RNBM8-5	28.0	7.0	7.5	14.0	5.2	13.0	12.0	14.0	1.5
	6	RNB14-5									
	4	RNBS22-5									
C	6	RNB14-8	40.0	12.0	12.5	22.0	8.3	13.0	12.5	24.0	2.5
	4	RNB22-8									
	2	RNBS38-8									
	1/0	RNB60-8									
D0	4	RNB22-8	44.0	13.0	10.0	15.0	8.3	13.0	17.0	26.0	3.0
	2	RNBS38-8									
	1/0	SQNBS60-8	40.0	11.0	10.0	23.0	8.3	13.0	14.0[*2]	24.0	4.5
	2/0	SQNBS80-8									
D	4	RNB22-8	50.0	16.0	10.0	27.0	8.3	13.0	14.0	28.0	6.0
	2	RNBS38-8									
	1/0	RNB60-8									
	2/0	RNB70-8									
	3/0	RNB80-8									
	4/0	SQNBS100-8									
	250MCM	SQNBS150-8									
	300MCM	SQNBS150-8									

Frame	AWG*1	Kit P/N	A (MAX)	B (MAX)	C (MIN)	D (MAX)	d2 (MIN)	E (MIN)	F (MIN)	W (MAX)	t (MAX)
E	1/0	RNB60-8	53.0	16.0	17.0	26.5	8.4	13.0	17.0	31.0	5.0
	2/0	RNB70-8									
	3/0	RNB80-8									
	4/0	RNB100-8									
F	3/0	RNB80-8	55.0	15.0	10.0	27.0	8.3	13.0	17.5	31.0	6.0
	4/0	SQNBS100-8									
	300MCM	SQNBS150-8									
G	1/0	SQNBS60-8	54.0	15.5	18.0	26.5	8.2	13.0	18.0	31.0	3.5
	2/0	SQNBS80-8									
	3/0	SQNBS80-8									
	4/0	SQNBS100-8									
	250MCM	SQNBS150-8									
	300MCM	SQNBS180-12	70.0	21.0	27.0	32.7	12.2	13.0	27.0	42.0	4.0
	350MCM	SQNBS180-12									
	400MCM	SQNBS200-12									
	500MCM	SQNBS200-12									
H	3/0	SQNBS80-8	54.0	15.5	18.0	26.5	8.2	13.0	18.0	31.0	3.5
	4/0	SQNBS100-8									
	250MCM	SQNBS150-8									
	300MCM	SQNBS150-8									
	350MCM	SQNBS150-8									
	400MCM	SQNBS200-12	70.0	21.0	27.0	32.7	12.2	13.0	27.0	42.0	4.0
	500MCM	SQNBS200-12									

Table 5-2

*1. AWG: Refer to the following tables for the wire size specification for models in each frame.
*2: F(MAX)=16.5

Frame A

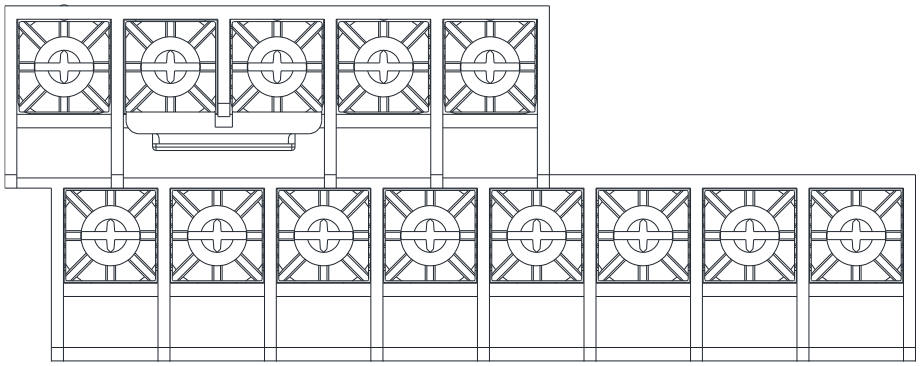


- If the installation is in an environment where the ambient temperature is 50°C, use copper wire with a rated voltage of 600V and a temperature resistance of 75°C or 90°C for wiring.
- If the installation is in an environment where the ambient temperature is above 50°C, use copper wire with a rated voltage of 600V and a temperature resistance of 90°C or above for wiring.
- To be UL installation compliant, you must use copper wires when installing. The wire gauge is based on a temperature resistance of 75°C, in accordance with UL requirements and recommendations. Do not reduce the wire gauge when using high-temperature resistant wires.

Model Name	Main Circuit Terminals R/L1、S/L2、T/L3、U/T1、V/T2、W/T3、-/DC-、+1/DC+、+2/DC+、B1、B2			Terminal ⏚		
	Max. Wire Gauge	Min. Wire Gauge	Screw Spec. and Torque (±10%)	Max. Wire Gauge	Min. Wire Gauge	Screw Spec. and Torque (±10%)
VFD007C23A-21	10 mm² (8 AWG)	2.5 mm² (14 AWG)	M4 20 kg-cm (17.4 lb-in.) (1.96 Nm)	2.5 mm² (14 AWG)	2.5 mm² (14 AWG)	M4 20 kg-cm (17.4 lb-in.) (1.96 Nm)
VFD015C23A-21		4.0 mm² (12 AWG)		4.0 mm² (12 AWG)	4.0 mm² (12 AWG)	
VFD022C23A-21		6.0 mm² (10 AWG)		6.0 mm² (10 AWG)	6.0 mm² (10 AWG)	
VFD037C23A-21		10.0 mm² (8 AWG)		10.0 mm² (8 AWG)	10.0 mm² (8 AWG)	
VFD007C43A-21		1.5 mm² (16 AWG)		2.5 mm² (14 AWG)	2.5 mm² (14 AWG)	
VFD015C43A-21		1.5 mm² (16 AWG)		2.5 mm² (14 AWG)	2.5 mm² (14 AWG)	
VFD022C43A-21		2.5 mm² (14 AWG)		2.5 mm² (14 AWG)	2.5 mm² (14 AWG)	
VFD037C43A-21		6.0 mm² (10 AWG)		6.0 mm² (10 AWG)	6.0 mm² (10 AWG)	
VFD040C43A-21		6.0 mm² (10 AWG)		6.0 mm² (10 AWG)	6.0 mm² (10 AWG)	
VFD055C43A-21		6.0 mm² (10 AWG)		6.0 mm² (10 AWG)	6.0 mm² (10 AWG)	
VFD007C4EA-21		1.5 mm² (16 AWG)		2.5 mm² (14 AWG)	2.5 mm² (14 AWG)	
VFD015C4 EA-21		1.5 mm² (16 AWG)		2.5 mm² (14 AWG)	2.5 mm² (14 AWG)	
VFD022C4 EA-21		2.5 mm² (14 AWG)		2.5 mm² (14 AWG)	2.5 mm² (14 AWG)	
VFD037C4 EA-21		6.0 mm² (10 AWG)		6.0 mm² (10 AWG)	6.0 mm² (10 AWG)	
VFD040C4 EA-21		6.0 mm² (10 AWG)		6.0 mm² (10 AWG)	6.0 mm² (10 AWG)	
VFD055C4 EA-21		6.0 mm² (10 AWG)		6.0 mm² (10 AWG)	6.0 mm² (10 AWG)	
VFD015C53A-21		2.5 mm² (14 AWG)		2.5 mm² (14 AWG)	2.5 mm² (14 AWG)	
VFD022C53A-21		2.5 mm² (14 AWG)		2.5 mm² (14 AWG)	2.5 mm² (14 AWG)	
VFD037C53A-21		4.0 mm² (12 AWG)		4.0 mm² (12 AWG)	4.0 mm² (12 AWG)	

Frame B

-/DC- +2/DC+ +1/DC+ B1 B2

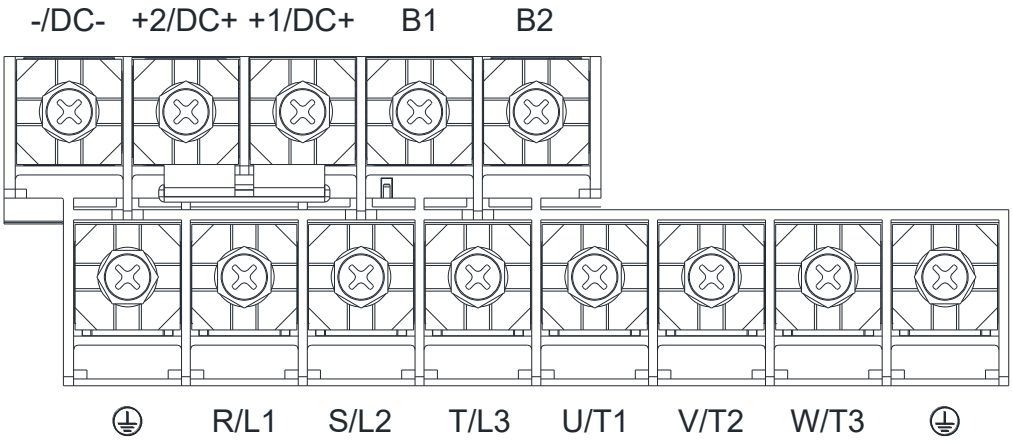


⏚ R/L1 S/L2 T/L3 U/T1 V/T2 W/T3 ⏚

- If the installation is in an environment where the ambient temperature is 50°C, use copper wire with a rated voltage of 600V and a temperature resistance of 75°C or 90°C for wiring.
- If the installation is in an environment where the ambient temperature is above 50°C, use copper wire with a rated voltage of 600V and a temperature resistance of 90°C or above for wiring.
- For VFD110C23A-21 model: If the installation is in an environment where the ambient temperature is above 40°C, use copper wire with a rated voltage of 600V and a temperature resistance of 90°C or above for wiring.
- To be UL installation compliant, you must use copper wires when installing. The wire gauge is based on a temperature resistance of 75°C, in accordance with UL requirements and recommendations. Do not reduce the wire gauge when using high-temperature resistant wires.
- +2/DC+ and +1/DC+: with 45 kg-cm / (39.0 lb-in) / (4.42 Nm) (±10%) torque

Model Name	Main Circuit Terminals R/L1、S/L2、T/L3、U/T1、V/T2、W/T3、-/DC-、+1/DC+、+2/DC+、B1、B2			Terminal ⏚		
	Max. Wire Gauge	Min. Wire Gauge	Screw Spec. and Torque (±10%)	Max. Wire Gauge	Min. Wire Gauge	Screw Spec. and Torque (±10%)
VFD055C23A-21	25 mm² (4 AWG)	10 mm² (8 AWG)	M5 35 kg-cm (30.4 lb-in.) (3.43 Nm)	10 mm² (8 AWG)	10 mm² (8 AWG)	M5 35 kg-cm (30.4 lb-in.) (3.43 Nm)
VFD075C23A-21		16 mm² (6 AWG)		16 mm² (6 AWG)	16 mm² (6 AWG)	
VFD110C23A-21		25 mm² (4 AWG)		25 mm² (4 AWG)	16 mm² (6 AWG)	
VFD075C43A-21		10 mm² (8 AWG)		10 mm² (8 AWG)	10 mm² (8 AWG)	
VFD075C4EA-21		10 mm² (8 AWG)		10 mm² (8 AWG)	10 mm² (8 AWG)	
VFD110C43A-21		10 mm² (8 AWG)		10 mm² (8 AWG)	10 mm² (8 AWG)	
VFD110C4EA-21		10 mm² (8 AWG)		10 mm² (8 AWG)	10 mm² (8 AWG)	
VFD150C43A-21		16 mm² (6 AWG)		16 mm² (6 AWG)	16 mm² (6 AWG)	
VFD150C4EA-21		16 mm² (6 AWG)		16 mm² (6 AWG)	16 mm² (6 AWG)	
VFD055C53A-21		6 mm² (10 AWG)		6 mm² (10 AWG)	6 mm² (10 AWG)	
VFD075C53A-21		6 mm² (10 AWG)		6 mm² (10 AWG)	6 mm² (10 AWG)	
VFD110C53A-21		10 mm² (8 AWG)		10 mm² (8 AWG)	10 mm² (8 AWG)	
VFD150C53A-21		10 mm² (8 AWG)		10 mm² (8 AWG)	10 mm² (8 AWG)	

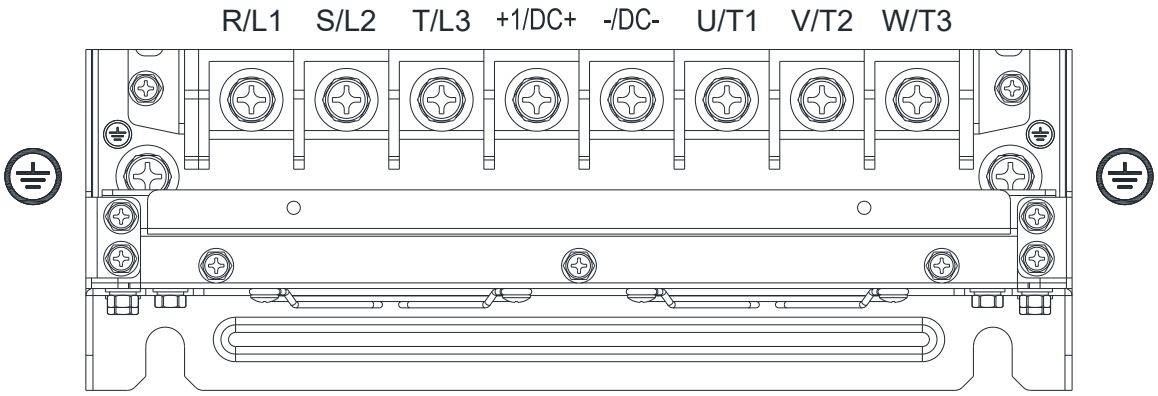
Frame C



- If the installation is in an environment where the ambient temperature is 50°C, use copper wire with a rated voltage of 600V and a temperature resistance of 75°C or 90°C for wiring.
- If the installation is in an environment where the ambient temperature is above 50°C, use copper wire with a rated voltage of 600V and a temperature resistance of 90°C or above for wiring.
- For VFD220C23A-21 model: If the installation is in an environment where the ambient temperature is above 40°C, use copper wire with a rated voltage of 600V and a temperature resistance of 90°C or above for wiring.
- To be UL installation compliant, you must use copper wires when installing. The wire gauge is based on a temperature resistance of 75°C, in accordance with UL requirements and recommendations. Do not reduce the wire gauge when using high-temperature resistant wires.
- +2/DC+ and +1/DC+: with 90 kg-cm / (78.2 lb-in) / (8.83 Nm) (±10%) torque

Model Name	Main Circuit Terminals R/L1、S/L2、T/L3、U/T1、V/T2、W/T3、-/DC-、+1/DC+、+2/DC+、B1、B2			Terminal ⏚		
	Max. Wire Gauge	Min. Wire Gauge	Screw Spec. and Torque (±10%)	Max. Wire Gauge	Min. Wire Gauge	Screw Spec. and Torque (±10%)
VFD150C23A-21	50 mm² (1/0 AWG)	50 mm² (1 AWG)	M8 80 kg-cm (69.4 lb-in.) (7.84 Nm)	50 mm² (1 AWG)	25 mm² (4 AWG)	M8 80 kg-cm (69.4 lb-in.) (7.84 Nm)
VFD185C23A-21		50 mm² (1/0 AWG)		50 mm² (1/0 AWG)	25 mm² (4 AWG)	
VFD220C23A-21		50 mm² (1/0 AWG)		50 mm² (1/0 AWG)	25 mm² (4 AWG)	
VFD185C43A-21		25 mm² (4 AWG)		25 mm² (4 AWG)	16 mm² (6 AWG)	
VFD220C43A-21		25 mm² (4 AWG)		25 mm² (4 AWG)	16 mm² (6 AWG)	
VFD300C43A-21		35 mm² (2 AWG)		35 mm² (2 AWG)	16 mm² (6 AWG)	
VFD185C4EA-21		25 mm² (4 AWG)		25 mm² (4 AWG)	16 mm² (6 AWG)	
VFD220C4EA-21		25 mm² (4 AWG)		25 mm² (4 AWG)	16 mm² (6 AWG)	
VFD300C4EA-21		35 mm² (2 AWG)		35 mm² (2 AWG)	16 mm² (6 AWG)	
VFD185C63B-21		10 mm² (8 AWG)		10 mm² (8 AWG)	10 mm² (8 AWG)	
VFD220C63B-21		16 mm² (6 AWG)		16 mm² (6 AWG)	16 mm² (6 AWG)	
VFD300C63B-21		25 mm² (4 AWG)		25 mm² (4 AWG)	16 mm² (6 AWG)	
VFD370C63B-21		35 mm² (2 AWG)		35 mm² (2 AWG)	16 mm² (6 AWG)	

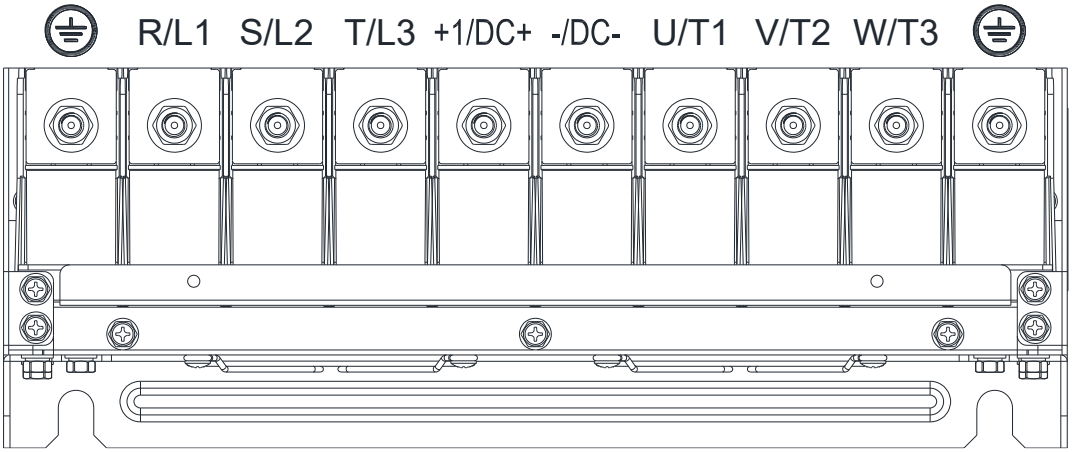
Frame D0



- If the installation is in an environment where the ambient temperature is 40°C (for model names with last digit -21) / 50°C (for model names with last digit -00), use copper wire with a rated voltage of 600V and a temperature resistance of 75°C or 90°C for wiring.
- If the installation is in an environment where the ambient temperature is above 40°C (for model names with last digit -21) / above 50°C (for model names with last digit -00), use copper wire with a rated voltage of 600V and a temperature resistance of 90°C or above for wiring.
- To be UL installation compliant, you must use copper wires when installing. The wire gauge is based on a temperature resistance of 75°C, in accordance with UL requirements and recommendations. Do not reduce the wire gauge when using high-temperature resistant wires.

Model Name	Main Circuit Terminals R/L1、S/L2、T/L3、U/T1、V/T2、W/T3、-/DC-、+1/DC+			Terminal ⏚		
	Max. Wire Gauge	Min. Wire Gauge	Screw Spec. and Torque (±10%)	Max. Wire Gauge	Min. Wire Gauge	Screw Spec. and Torque (±10%)
VFD370C43S-00	70 mm^2 (2/0 AWG)	50 mm^2 (1/0 AWG)	M8 80 kg-cm (69.4 lb-in.) (7.84 Nm)	35 mm^2 (2 AWG)	25 mm^2 (4 AWG)	M8 80 kg-cm (69.4 lb-in.) (7.84 Nm)
VFD450C43S-00		70mm^2 (2/0 AWG)				
VFD370C43S-21		50 mm^2 (1/0 AWG)				
VFD450C43S-21		70mm^2 (2/0 AWG)				

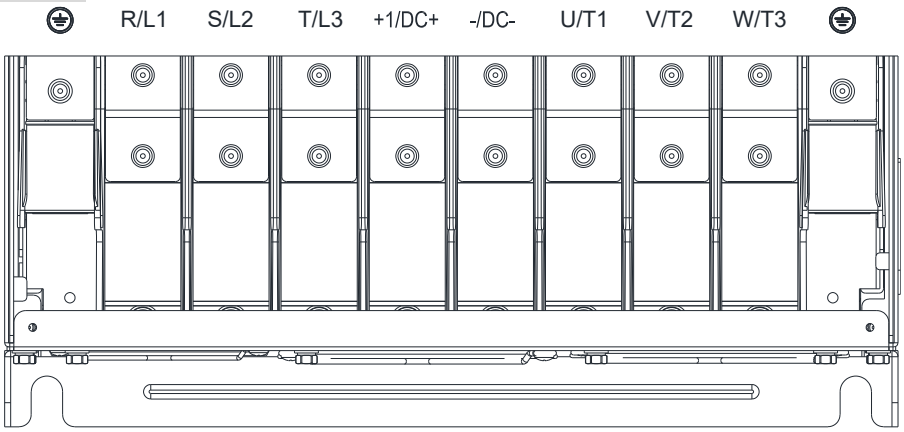
Frame D



- If the installation is in an environment where the ambient temperature is 40°C (for 230V / 460V model names with last digit -21; for 690V model names end with 63B-21) / 50°C (for 230V / 460V model names with last digit -00; for 690V model names end with 63B-00), use copper wire with a rated voltage of 600V and a temperature resistance of 75°C or 90°C for wiring.
- If the installation is in an environment where the ambient temperature is above 40°C (for 230V / 460V model names with last digit -21; for 690V model names end with 63B-21) / above 50°C (for 230V / 460V model names with last digit -00; for 690V model names end with 63B-00), use copper wire with a rated voltage of 600V and a temperature resistance of 90°C or above for wiring.
- To be UL installation compliant, you must use copper wires when installing. The wire gauge is based on a temperature resistance of 75°C, in accordance with UL requirements and recommendations. Do not reduce the wire gauge when using high-temperature resistant wires.

Model Name	Main Circuit Terminals R/L1、S/L2、T/L3、U/T1、V/T2、W/T3、-/DC-、+1/DC+			Terminal ⏚		
	Max. Wire Gauge	Min. Wire Gauge	Screw Spec. and Torque (±10%)	Max. Wire Gauge	Min. Wire Gauge	Screw Spec. and Torque (±10%)
VFD300C23A-00	150 mm² (300 MCM)	120 mm² (4/0 AWG)	M8 180 kg-cm (156.2 lb-in.) (17.65 Nm)	120 mm² (4/0 AWG)	70 mm² (2/0 AWG)	M8 180 kg-cm (156.2 lb-in.) (17.65 Nm)
VFD370C23A-00		120 mm² (250MCM)		120 mm² (250MCM)	70 mm² (2/0 AWG)	
VFD550C43A-00		95 mm² (3/0 AWG)		95 mm² (3/0 AWG)	50 mm² (1/0 AWG)	
VFD750C43A-00		150 mm² (300MCM)		150 mm² (300MCM)	95 mm² (3/0 AWG)	
VFD300C23A-21	120 mm² (4/0 AWG)	95 mm² (3/0 AWG)		95 mm² (3/0 AWG)	50 mm² (1/0 AWG)	
VFD370C23A-21		120 mm² (4/0 AWG)		120 mm² (4/0 AWG)	70 mm² (2/0 AWG)	
VFD550C43A-21		70 mm² (2/0 AWG)		70 mm² (2/0 AWG)	35 mm² (2 AWG)	
VFD750C43A-21		120 mm² (4/0 AWG)		120 mm² (4/0 AWG)	70 mm² (2/0 AWG)	
VFD450C63B-00	150 mm² (300 MCM)	35 mm² (2 AWG)		35 mm² (2 AWG)	16 mm² (6 AWG)	
VFD550C63B-00		35 mm² (2 AWG)		35 mm² (2 AWG)	16 mm² (6 AWG)	
VFD450C63B-21		35 mm² (2 AWG)		35 mm² (2 AWG)	16 mm² (6 AWG)	
VFD550C63B-21		35 mm² (2 AWG)		35 mm² (2 AWG)	16 mm² (6 AWG)	

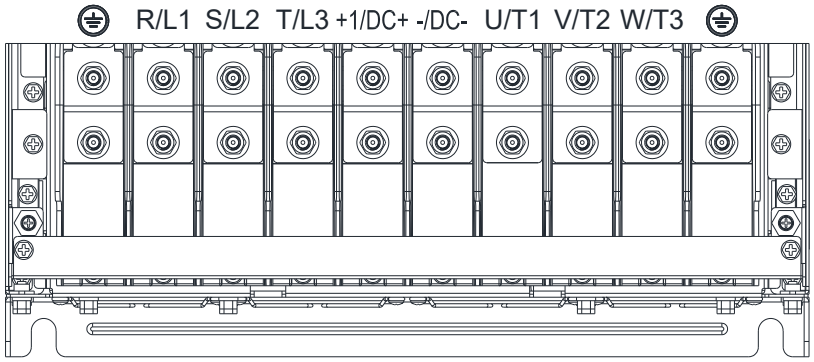
Frame E



- If the installation is in an environment where the ambient temperature is 40°C (for 230V / 460V model names with last digit -21; for 690V model names end with 63B-21) / 50°C (for 230V / 460V model names with last digit -00; for 690V model names end with 63B-00), use copper wire with a rated voltage of 600V and a temperature resistance of 75°C or 90°C for wiring.
- If the installation is in an environment where the ambient temperature is above 40°C (for 230V / 460V model names with last digit -21; for 690V model names end with 63B-21) / above 50°C (for 230V / 460V model names with last digit -00; for 690V model names end with 63B-00), use copper wire with a rated voltage of 600V and a temperature resistance of 90°C or above for wiring.
- To be UL installation compliant, you must use copper wires when installing. The wire gauge is based on a temperature resistance of 75°C, in accordance with UL requirements and recommendations. Do not reduce the wire gauge when using high-temperature resistant wires.

Model Name	Main Circuit Terminals R/L1、S/L2、T/L3、U/T1、V/T2、W/T3、-/DC-、+1/DC+			Terminal ⏚		
	Max. Wire Gauge	Min. Wire Gauge	Screw Spec. and Torque (±10%)	Max. Wire Gauge	Min. Wire Gauge	Screw Spec. and Torque (±10%)
VFD450C23A-00	120 mm²*2 (4/0 AWG*2)	50 mm²*2 (1/0 AWG*2)	M8 180 kg-cm (156.2 lb-in.) (17.65 Nm)	50mm²*2 (1/0 AWG*2)	50 mm²*1 (1/0 AWG*1)	M8 180 kg-cm (156.2 lb-in.) (17.65 Nm)
VFD550C23A-00		95 mm²*2 (3/0 AWG*2)		95mm²*2 (3/0 AWG*2)	95 mm²*1 (3/0 AWG*1)	
VFD750C23A-00		120 mm²*2 (4/0 AWG*2)		120mm²*2 (4/0 AWG*2)	120 mm²*1 (4/0 AWG*1)	
VFD900C43A-00		50 mm²*2 (1/0 AWG*2)		50mm²*2 (1/0 AWG*2)	50 mm²*1 (1/0 AWG*1)	
VFD1100C43A-00		95 mm²*2 (3/0 AWG*2)		95mm²*2 (3/0 AWG*2)	95 mm²*1 (3/0 AWG*1)	
VFD450C23A-21		50 mm²*2 (1/0 AWG*2)		50mm²*2 (1/0 AWG*2)	50 mm²*1 (1/0 AWG*1)	
VFD550C23A-21		70 mm²*2 (2/0 AWG*2)		70mm²*2 (2/0 AWG*2)	70 mm²*1 (2/0 AWG*1)	
VFD750C23A-21		95 mm²*2 (3/0 AWG*2)		95mm²*2 (3/0 AWG*2)	95 mm²*1 (3/0 AWG*1)	
VFD900C43A-21		50 mm²*2 (1/0 AWG*2)		50mm²*2 (1/0 AWG*2)	50 mm²*1 (1/0 AWG*1)	
VFD1100C43A-21		70 mm²*2 (2/0 AWG*2)		70mm²*2 (2/0 AWG*2)	70 mm²*1 (2/0 AWG*1)	
VFD750C63B-00		25 mm²*2 (4 AWG*2)		25 mm²*2(4 AWG*2)	25 mm²*1 (4 AWG*1)	
VFD900C63B-00		35 mm²*2 (2 AWG*2)		35 mm²*2 (2 AWG*2)	35 mm²*1 (2 AWG*1)	
VFD1100C63B-00		35 mm²*2 (2 AWG*2)		35 mm²*2 (2 AWG*2)	35 mm²*1 (2 AWG*1)	
VFD1320C63B-00		50 mm²*2 (1/0 AWG*2)		50 mm²*2 (1/0 AWG*2)	50 mm²*1 (1/0 AWG*1)	
VFD750C63B-21		25 mm²*2 (4 AWG*2)		25 mm²*2 (4 AWG*2)	25 mm²*1 (4 AWG*1)	
VFD900C63B-21		35 mm²*2 (2 AWG*2)		35 mm²*2 (2 AWG*2)	35 mm²*1 (2 AWG*1)	
VFD1100C63B-21		35 mm²*2 (2 AWG*2)		35 mm²*2 (2 AWG*2)	35 mm²*1 (2 AWG*1)	
VFD1320C63B-21		50 mm²*2 (1/0 AWG*2)		50 mm²*2 (1/0 AWG*2)	50 mm²*1 (1/0 AWG*1)	

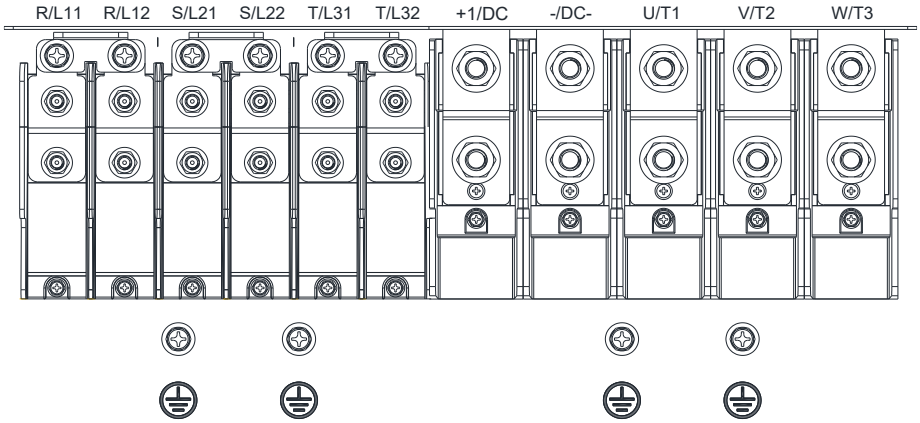
Frame F



- If the installation is in an environment where the ambient temperature is 40°C (for 230V / 460V model names with last digit -21; for 690V model names end with 63B-21) / 50°C (for 230V / 460V model names with last digit -00; for 690V model names end with 63B-00), use copper wire with a rated voltage of 600V and a temperature resistance of 75°C or 90°C for wiring.
- If the installation is in an environment where the ambient temperature is above 40°C (for 230V / 460V model names with last digit -21; for 690V model names end with 63B-21) / above 50°C (for 230V / 460V model names with last digit -00; for 690V model names end with 63B-00), use copper wire with a rated voltage of 600V and a temperature resistance of 90°C or above for wiring.
- For VFD900C23A-00 model: If the installation is in an environment where the ambient temperature is above 45°C, use copper wire with a rated voltage of 600V and a temperature resistance of 90°C or above for wiring.
- For VFD900C23E-21 model: If the installation is in an environment where the ambient temperature is above 30°C, use copper wire with a rated voltage of 600V and a temperature resistance of 90°C or above for wiring.
- To be UL installation compliant, you must use copper wires when installing. The wire gauge is based on a temperature resistance of 75°C, in accordance with UL requirements and recommendations. Do not reduce the wire gauge when using high-temperature resistant wires.

Model Name	Main Circuit Terminals R/L1、S/L2、T/L3、U/T1、V/T2、W/T3、-/DC-、+1/DC+			Terminal ⏚		
	Max. Wire Gauge	Min. Wire Gauge	Screw Spec. and Torque (±10%)	Max. Wire Gauge	Min. Wire Gauge	Screw Spec. and Torque (±10%)
VFD900C23A-00	150 mm²*2 (300 MCM*2)	150 mm²*2 (300MCM*2)	M8 180 kg-cm (156.2 lb-in.) (17.65 Nm)	150 mm²*2 (300 MCM*2)	150 mm²*1 (300 MCM*1)	M8 180 kg-cm (156.2 lb-in.) (17.65 Nm)
VFD1320C43A-00		120 mm²*2 (4/0 AWG*2)		120 mm²*2 (4/0 AWG*2)	120 mm²*1 (4/0 AWG*1)	
VFD1600C43A-00		150 mm²*2 (300MCM*2)		150 mm²*2 (300 MCM*2)	150 mm²*1 (300 MCM*1)	
VFD900C23A-21	120 mm²*2 (4/0 AWG*2)	120 mm²*2 (4/0 AWG*2)		120 mm²*2 (4/0 AWG*2)	120 mm²*1 (4/0 AWG*1)	
VFD1320C43A-21		95 mm²*2 (3/0 AWG*2)		95 mm²*2 (3/0 AWG*2)	95 mm²*1 (3/0 AWG*1)	
VFD1600C43A-21		120 mm²*2 (4/0 AWG*2)		120 mm²*2 (4/0AWG*2)	120 mm²*1 (4/0 AWG*1)	
VFD1600C63B-00	150 mm²*2 (300 MCM*2)	70 mm²*2 (2/0 AWG*2)		70 mm²*2 (2/0 AWG*2)	70 mm²*1 (2/0 AWG*1)	
VFD2000C63B-00		95 mm²*2 (3/0 AWG*2)		95 mm²*2 (3/0 AWG*2)	95 mm²*1 (3/0 AWG*1)	
VFD1600C63B-21		70 mm²*2 (2/0 AWG*2)		70 mm²*2 (2/0 AWG*2)	70 mm²*1 (2/0 AWG*1)	
VFD2000C63B-21		95 mm²*2 (3/0 AWG*2)		95 mm²*2 (3/0 AWG*2)	95 mm²*1 (3/0 AWG*1)	

Frame G

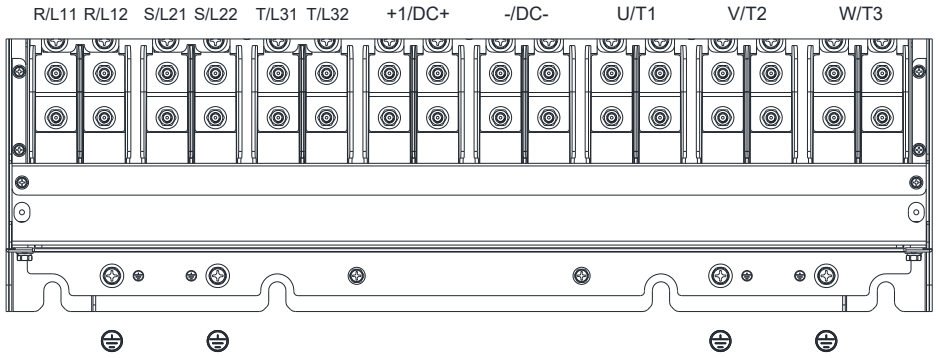


- If the installation is in an environment where the ambient temperature is 40°C (for 460V model names with last digit -21; for 690V model names end with 63B-21) / 50°C (for 460V model names with last digit -00; for 690V model names end with 63B-00), use copper wire with a rated voltage of 600V and a temperature resistance of 75°C or 90°C for wiring.
- If the installation is in an environment where the ambient temperature is above 40°C (for 460V model names with last digit -21; for 690V model names end with 63B-21) / above 50°C (for 460V model names with last digit -00; for 690V model names end with 63B-00), use copper wire with a rated voltage of 600V and a temperature resistance of 90°C or above for wiring.
- For VFD2200C43A-00, VFD2500C43A-00 (main circuit terminals U/T1, V/T2, W/T3, －/DC-, ＋/DC+) models: If the installation is in an environment where the ambient temperature is above 45°C, use copper wire with a rated voltage of 600V and a temperature resistance of 90°C or above for wiring.
- To be UL installation compliant, you must use copper wires when installing. The wire gauge is based on a temperature resistance of 75°C, in accordance with UL requirements and recommendations. Do not reduce the wire gauge when using high-temperature resistant wires.

Model Name	Main Circuit Terminals R/L11、R/L12、S/L21、S/L22、T/L31、T/L32			Terminal ⏚		
	Max. Wire Gauge	Min. Wire Gauge	Screw Spec. and Torque (±10%)	Max. Wire Gauge	Min. Wire Gauge	Screw Spec. and Torque (±10%)
VFD1850C43A-00	120 mm²*4 (250MCM*4)	70 mm²*4 (2/0 AWG*4)	M8 180 kg-cm (156.2 lb-in.) (17.65 Nm)	70 mm²*4 (2/0AWG*4)	70 mm²*2 (2/0 AWG*2)	M8 180 kg-cm (156.2 lb-in.) (17.65 Nm)
VFD2000C43A-00		70 mm²*4 (2/0 AWG*4)		70 mm²*4 (2/0AWG*4)	70 mm²*2 (2/0 AWG*2)	
VFD2200C43A-00		70 mm²*4 (2/0 AWG*4)		70 mm²*4 (2/0AWG*4)	70 mm²*2 (2/0 AWG*2)	
VFD2500C43A-00		95 mm²*4 (3/0 AWG*4)		95 mm²*4 (3/0AWG*4)	95 mm²*2 (3/0 AWG*2)	
VFD1850C43A-21		50 mm²*4 (1/0 AWG*4)		50 mm²*4 (1/0AWG*4)	50 mm²*2 (1/0 AWG*2)	
VFD2000C43A-21		50 mm²*4 (1/0 AWG*4)		50 mm²*4 (1/0AWG*4)	50 mm²*2 (1/0 AWG*2)	
VFD2200C43A-21		50 mm²*4 (1/0 AWG*4)		50 mm²*4 (1/0AWG*4)	50 mm²*2 (1/0 AWG*2)	
VFD2500C43A-21		70 mm²*4 (2/0 AWG*4)		70 mm²*4 (2/0AWG*4)	70 mm²*2 (2/0 AWG*2)	
VFD2500C63B-00	150mm²*4 (300MCM*4)	50 mm²*4 (1/0 AWG*4)		50 mm²*4 (1/0 AWG*4)	50 mm²*2 (1/0 AWG*2)	
VFD3150C63B-00		50 mm²*4 (1/0 AWG*4)		50 mm²*4 (1/0 AWG*4)	50 mm²*2 (1/0 AWG*2)	
VFD2500C63B-21		50 mm²*4 (1/0 AWG*4)		50 mm²*4 (1/0 AWG*4)	50 mm²*2 (1/0 AWG*2)	
VFD3150C63B-21		50 mm²*4 (1/0 AWG*4)		50 mm²*4 (1/0 AWG*4)	50 mm²*2 (1/0 AWG*2)	

Model Name	Main Circuit Terminals U/T1、V/T2、W/T3、-/DC-、+1/DC+			Terminal ⏚		
	Max. Wire Gauge	Min. Wire Gauge	Screw Spec. and Torque (±10%)	Max. Wire Gauge	Min. Wire Gauge	Screw Spec. and Torque (±10%)
VFD1850C43A-00	240 mm²*2 (500MCM*2)	185 mm²*2 (350MCM*2)	M12 408 kg-cm (354.1 lb-in.) (39.98 Nm)	185 mm²*2 (350MCM*2)	185 mm²*1 (350MCM*1)	M8 180 kg-cm (156.2 lb-in.) (17.65 Nm)
VFD2000C43A-00		240 mm²*2 (400MCM*2)		240 mm²*2 (400MCM*2)	240 mm²*1 (400MCM*1)	
VFD2200C43A-00		240 mm²*2 (500MCM*2)		240 mm²*2 (500MCM*2)	240 mm²*1 (500MCM*1)	
VFD2500C43A-00		240 mm²*2 (500MCM*2)		240 mm²*2 (500MCM*2)	240 mm²*1 (500MCM*1)	
VFD1850C43A-21		150 mm²*2 (300MCM*2)		150 mm²*2 (300MCM*2)	150 mm²*1 (300MCM*1)	
VFD2000C43A-21		150 mm²*2 (300MCM*2)		150 mm²*2 (300MCM*2)	150 mm²*1 (300MCM*1)	
VFD2200C43A-21		240 mm²*2 (400MCM*2)		240 mm²*2 (400MCM*2)	240 mm²*1 (400MCM*1)	
VFD2500C43A-21		240 mm²*2 (500MCM*2)		240 mm²*2 (500MCM*2)	240 mm²*1 (500MCM*1)	
VFD2500C63B-00		120 mm²*2 (250MCM*2)		120 mm²*2 (250MCM*2)	120 mm²*1 (250MCM*1)	
VFD3150C63B-00		150 mm²*2 (350MCM*2)		150 mm²*2 (350MCM*2)	150 mm²*1 (350MCM*1)	
VFD2500C63B-21		120 mm²*2 (250MCM*2)		120 mm²*2 (250MCM*2)	120 mm²*1 (250MCM*1)	
VFD3150C63B-21		150 mm²*2 (350MCM*2)		150 mm²*2 (350MCM*2)	150 mm²*1 (350MCM*1)	

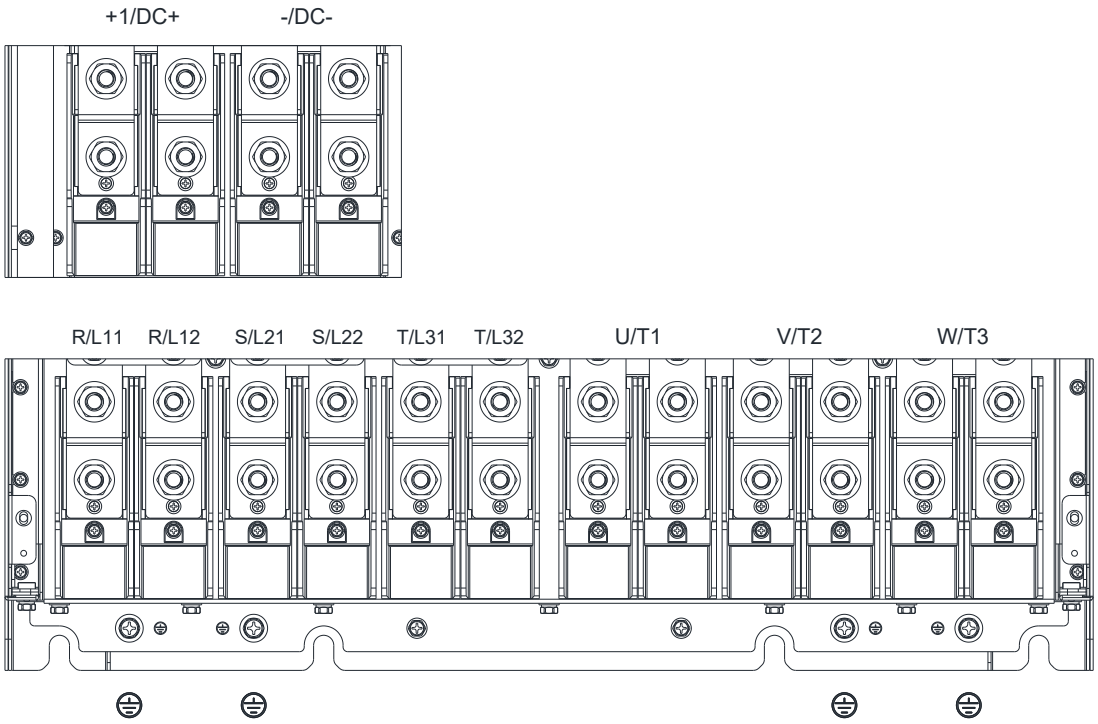
Frame H



- If the installation is in an environment where the ambient temperature is 40°C (for 460V model names with last digit -21; for 690V model names end with 63B-21) / 50°C (for 460V model names with last digit -00; for 690V model names end with 63B-00), use copper wire with a rated voltage of 600V and a temperature resistance of 75°C or 90°C for wiring.
- If the installation is in an environment where the ambient temperature is above 40°C (for 460V model names with last digit -21; for 690V model names end with 63B-21) / above 50°C (for 460V model names with last digit -00; for 690V model names end with 63B-00), use copper wire with a rated voltage of 600V and a temperature resistance of 90°C or above for wiring.
- For VFD4000C43A-00, VFD4500C43A-00 models: If the installation is in an environment where the ambient temperature is above 40°C, use copper wire with a rated voltage of 600V and a temperature resistance of 90°C or above for wiring.
- To be UL installation compliant, you must use copper wires when installing. The wire gauge is based on a temperature resistance of 75°C, in accordance with UL requirements and recommendations. Do not reduce the wire gauge when using high-temperature resistant wires.

Model Name	Main Circuit Terminals R/L11、R/L12、S/L21、S/L22、T/L31、T/L32、U/T1、V/T2、W/T3、-/DC-、+1/DC+			Terminal ⏚		
	Max. Wire Gauge	Min. Wire Gauge	Screw Spec. and Torque (±10%)	Max. Wire Gauge	Min. Wire Gauge	Screw Spec. and Torque (±10%)
VFD2800C43A-00	185 mm²*4 (350 MCM*4)	120 mm²*4 (4/0 AWG*4)	M8 180 kg-cm (156.2 lb-in.) (17.65 Nm)	120 mm²*4 (4/0AWG*4)	120 mm²*2 (4/0 AWG*2)	M8 180 kg-cm (156.2 lb-in.) (17.65 Nm)
VFD3150C43A-00		150 mm²*4 (300 MCM*4)		150 mm²*4 (300 MCM*4)	150 mm²*2 (300 MCM*2)	
VFD3550C43A-00		150 mm²*4 (300 MCM*4)		150 mm²*4 (300 MCM*4)	150 mm²*2 (300 MCM*2)	
VFD4000C43A-00		150 mm²*4 (300 MCM*4)		150 mm²*4 (300 MCM*4)	150 mm²*2 (300 MCM*2)	
VFD4500C43A-00		185 mm²*4 (350 MCM*4)		185 mm²*4 (350 MCM*4)	185 mm²*2 (350 MCM*2)	
VFD2800C43C-21		95 mm²*4 (3/0 AWG*4)		95 mm²*4 (3/0 AWG*4)	95 mm²*2 (3/0 AWG*2)	
VFD3150C43C-21		120 mm²*4 (4/0 AWG*4)		120 mm²*4 (4/0 AWG*4)	120 mm²*2 (4/0 AWG*2)	
VFD3550C43C-21		120 mm²*4 (250 MCM*4)		120 mm²*4 (250 MCM*4)	120 mm²*2 (250 MCM*2)	
VFD4000C43A-21		150 mm²*4 (300 MCM*4)		150 mm²*4 (300 MCM*4)	150 mm²*2 (300 MCM*2)	
VFD4500C43C-21		185 mm²*4 (350 MCM*4)		185 mm²*4 (350 MCM*4)	185 mm²*2 (350 MCM*2)	
VFD4000C63B-00		95 mm²*4 (3/0 AWG*4)		95 mm²*4 (3/0AWG*4)	95 mm²*2 (3/0 AWG*2)	
VFD4500C63B-00		95 mm²*4 (3/0 AWG*4)		95 mm²*4 (3/0AWG*4)	95 mm²*2 (3/0 AWG*2)	
VFD5600C63B-00		120 mm²*4 (250 MCM*4)		120 mm²*4 (250 MCM*4)	120 mm²*2 (250 MCM*2)	
VFD6300C63B-00		150 mm²*4 (300 MCM*4)		150 mm²*4 (300 MCM*4)	150 mm²*2 (300 MCM*2)	
VFD4000C63B-21		95 mm²*4 (3/0 AWG*4)		95 mm²*4 (3/0 AWG*4)	95 mm²*2 (3/0 AWG*2)	
VFD4500C63B-21		95 mm²*4 (3/0 AWG*4)		95 mm²*4 (3/0 AWG*4)	95 mm²*2 (3/0 AWG*2)	
VFD5600C63B-21		120 mm²*4 (250 MCM*4)		120 mm²*4 (250 MCM*4)	120 mm²*2 (250 MCM*2)	
VFD6300C63B-21		150 mm²*4 (300 MCM*4)		150 mm²*4 (300 MCM*4)	150 mm²*2 (300 MCM*2)	

Frame H



- If the installation is in an environment where the ambient temperature is 40°C (model names with last digit C-21) / 50°C (model names with last digit A-00), use copper wire with a rated voltage of 600V and a temperature resistance of 75°C or 90°C for wiring.
- If the installation is in an environment where the ambient temperature is above 40°C (model names with last digit C-21) / above 50°C (model names with last digit A-00), use copper wire with a rated voltage of 600V and a temperature resistance of 90°C or above for wiring.
- For VFD5000C43A-00 model: If the installation is in an environment where the ambient temperature is above 40°C, use copper wire with a rated voltage of 600V and a temperature resistance of 90°C or above for wiring.
- For VFD5600C43A-00, VFD5600C43C-21 models: If the installation is in an environment where the ambient temperature is above 30°C, use copper wire with a rated voltage of 600V and a temperature resistance of 90°C or above for wiring.

  To be UL installation compliant, you must use copper wires when installing. The wire gauge is based on a temperature resistance of 75°C, in accordance with UL requirements and recommendations. Do not reduce the wire gauge when using high-temperature resistant wires.

Model Name	Main Circuit Terminals R/L11、R/L12、S/L21、S/L22、T/L31、T/L32、U/T1、V/T2、W/T3、-/DC-、+1/DC+			Terminal ⏚		
	Max. Wire Gauge	Min. Wire Gauge	Screw Spec. and Torque (±10%)	Max. Wire Gauge	Min. Wire Gauge	Screw Spec. and Torque (±10%)
VFD5000C43A-00	240 mm²*4 (500 MCM*4)	240 mm²*4 (400 MCM*4)	M12 408 kg-cm (354.1 lb-in.) (39.98 Nm)	240 mm²*4 (400 MCM*4)	240 mm²*2 (400 MCM*2)	M8 180 kg-cm (156.2 lb-in.) (17.65 Nm)
VFD5600C43A-00		240 mm²*4 (500 MCM*4)		240 mm²*4 (500 MCM*4)	240 mm²*2 (500 MCM*2)	
VFD5000C43C-21		240 mm²*4 (400 MCM*4)		240 mm²*4 (400 MCM*4)	240 mm²*2 (400 MCM*2)	
VFD5600C43C-21		240 mm²*4 (500 MCM*4)		240 mm²*4 (500 MCM*4)	240 mm²*2 (500 MCM*2)	

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Chapter 6 Control Terminals

6-1 Remove the Cover for Wiring

6-2 Control Terminal Specifications

6-3 Remove the Terminal Block

CAUTION

Analog input terminals (AVI, ACI, AUI, ACM)

☑ Analog input signals are easily affected by external noise. Use shielded wiring and keep it as short as possible (< 20 m) with proper grounding. If the noise is inductive, connecting the shield to the ACM terminal can reduce interference.

☑ Use twisted-pair wire for weak analog signals.

☑ If the analog input signals are affected by noise from the AC motor drive, connect a capacitor and a ferrite core as shown in Figure 6-1.

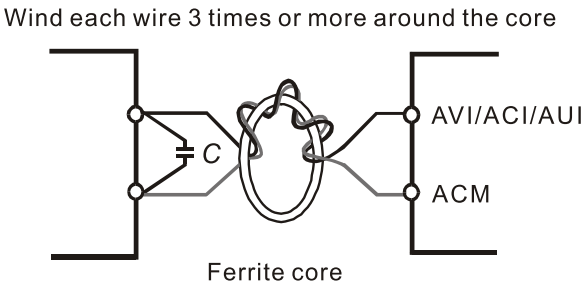


Figure 6-1

Contact input terminals (FWD, REV, MI1–MI8, COM)

☑ The "COM" terminal is the common side of the photo-coupler. Any of wiring method, the "common point" of all photo-coupler must be the "COM".

① Sink Mode
with internal power (+24V$_{DC}$)

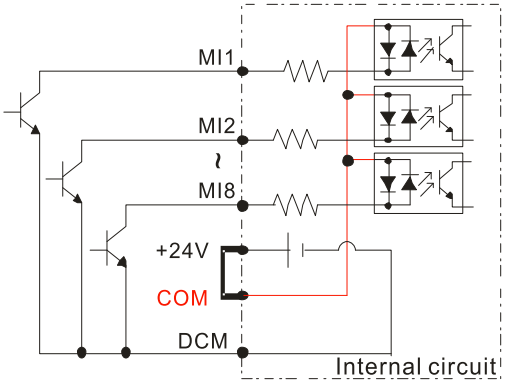


Figure 6-2

② Source Mode
with internal power (+24V$_{DC}$)

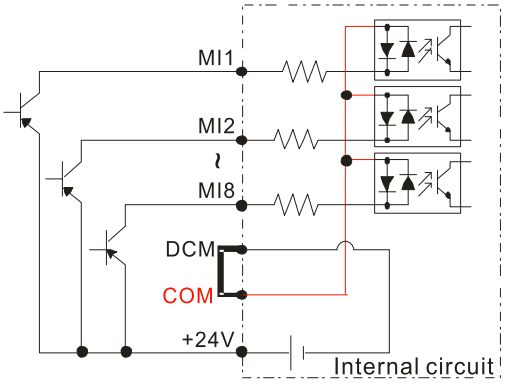


Figure 6-3

③ Sink Mode
with external power

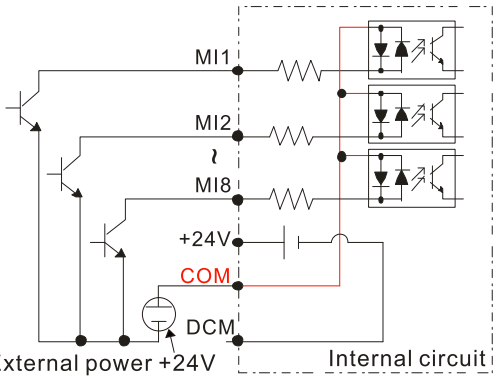


Figure 6-4

④ Source Mode
with external power

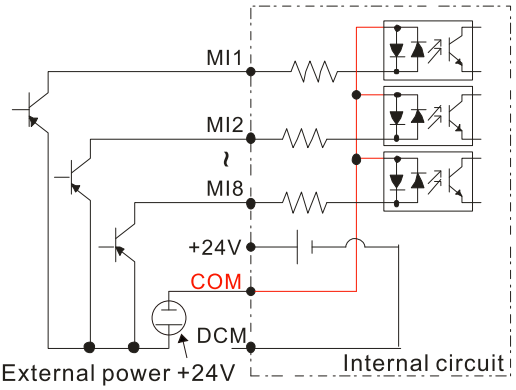


Figure 6-5

	☑ When the photo-coupler uses internal power supply, the switch connection for Sink and Source modes shows as Figure 6-2 and Figure 6-3: MI-DCM: Sink mode, MI-+24V: Source mode. ☑ When the photo-coupler uses external power supply, remove the short circuit cable between the +24V and COM terminals. The connection mode is Sink mode or Source mode according to the below: The “+” of 24V connects to “COM: Sink mode The “-” of 24V connects to COM: Source mode **Transistor outputs (MO1, MO2, MCM)** ☑ Connect the digital outputs to the correct polarity. ☑ When connecting a relay to the digital outputs, connect a surge absorber across the coil and check the polarity.

6-1 Remove the Cover for Wiring

Remove the top cover before wiring the multi-function input and output terminals.

NOTE: The drive appearances shown in the figures are for reference only, a real drive may look different.

Frame A & B

Applicable models: VFD007C23A-21; VFD007C43A-21; VFD007C4EA-21; VFD015C23A-21; VFD015C43A-21; VFD015C4EA-21; VFD015C53A-21; VFD022C23A-21; VFD022C43A-21; VFD022C4EA-21; VFD022C53A-21; VFD037C23A-21; VFD037C43A-21; VFD037C4EA-21; VFD037C53A-21; VFD040C43A-21; VFD040C4EA-21; VFD055C23A-21; VFD055C43A-21; VFD055C4EA-21; VFD055C53A-21; VFD075C23A-21; VFD075C43A-21; VFD075C4EA-21; VFD075C53A-21; VFD110C23A-21; VFD110C43A-21; VFD110C4EA-21; VFD110C53A-21; VFD150C43A-21; VFD150C4EA-21; VFD150C53A-21

Screw torque: 12–15 kg-cm / (10.4–13 lb-in.) / (1.2–1.5 Nm)

Loosen the screws and press the tabs on both sides to remove the cover.

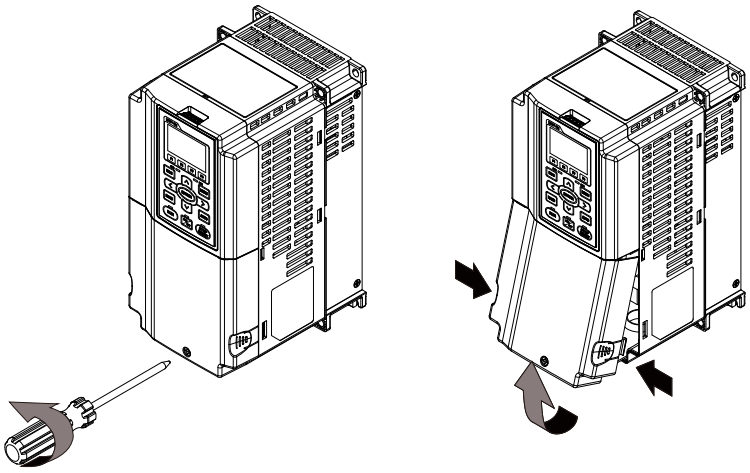


Figure 6-6

Frame C

Applicable models: VFD150C23A-21; VFD185C23A-21; VFD185C43A-21; VFD185C4EA-21; VFD185C63B-21; VFD220C23A-21; VFD220C43A-21; VFD220C4EA-21; VFD220C63B-21; VFD300C43A-21; VFD300C4EA-21; VFD300C63B-21; VFD370C63B-21

Screw torque: 12–15 kg-cm / (10.4–13 lb-in.) / (1.2–1.5 Nm)

Loosen the screws and press the tabs on both sides to remove the cover.

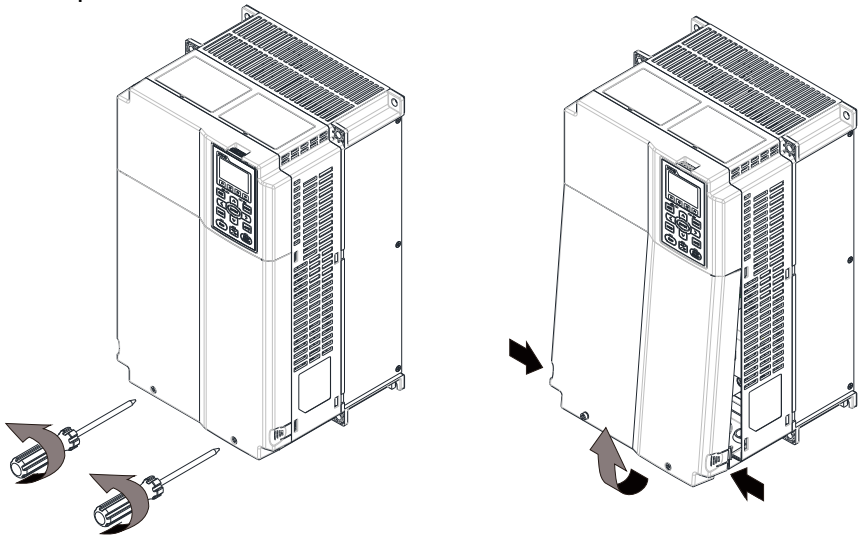


Figure 6-7

Frame D0 & D

Applicable models: VFD300C23A-00; VFD300C23A-21; VFD370C23A-00; VFD370C23A-21;
VFD370C43S-00; VFD370C43S-21; VFD450C43S-00; VFD450C43S-21;
VFD450C63B-00; VFD450C63B-21; VFD550C43A-00; VFD550C43A-21;
VFD750C43A-00; VFD750C43A-21; VFD550C63B-00; VFD550C63B-21

Screw torque: 12–15 kg-cm / (10.4–13 lb-in.) / (1.2–1.5 Nm)

To remove the cover, lift it slightly and pull outward.

Loosen the screws and press the tabs on both sides to remove the cover.

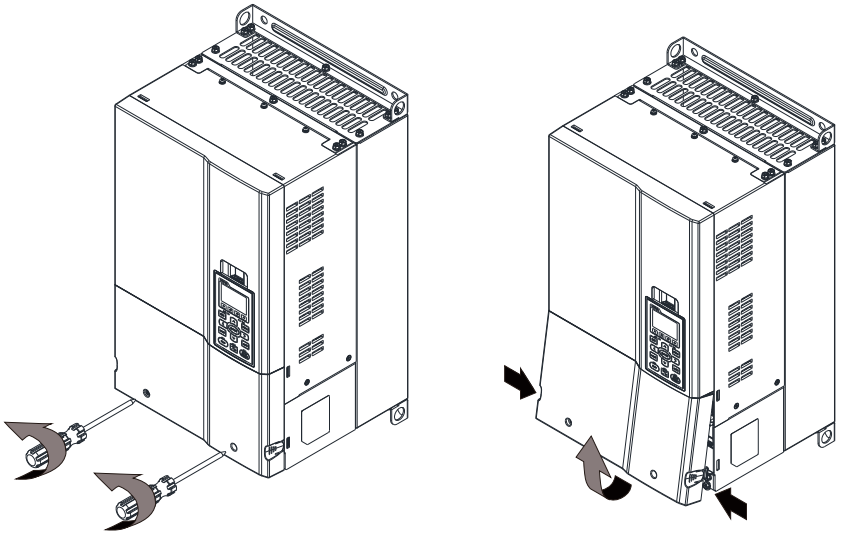


Figure 6-8

Frame E

Applicable models: VFD450C23A-00; VFD450C23A-21; VFD550C23A-00; VFD550C23A-21;
VFD750C23A-00; VFD750C23A-21; VFD750C63B-00; VFD750C63B-21;
VFD900C43A-00; VFD900C43A-21; VFD900C63B-00; VFD900C63B-21;
VFD1100C43A-00; VFD1100C43A-21; VFD1100C63B-00; VFD1100C63B-21;
VFD1320C63B-00; VFD1320C63B-21

Screw torque: 12–15 kg-cm / (10.4–13 lb-in.) / (1.2–1.5 Nm)

To remove the cover, lift it slightly and pull outward.

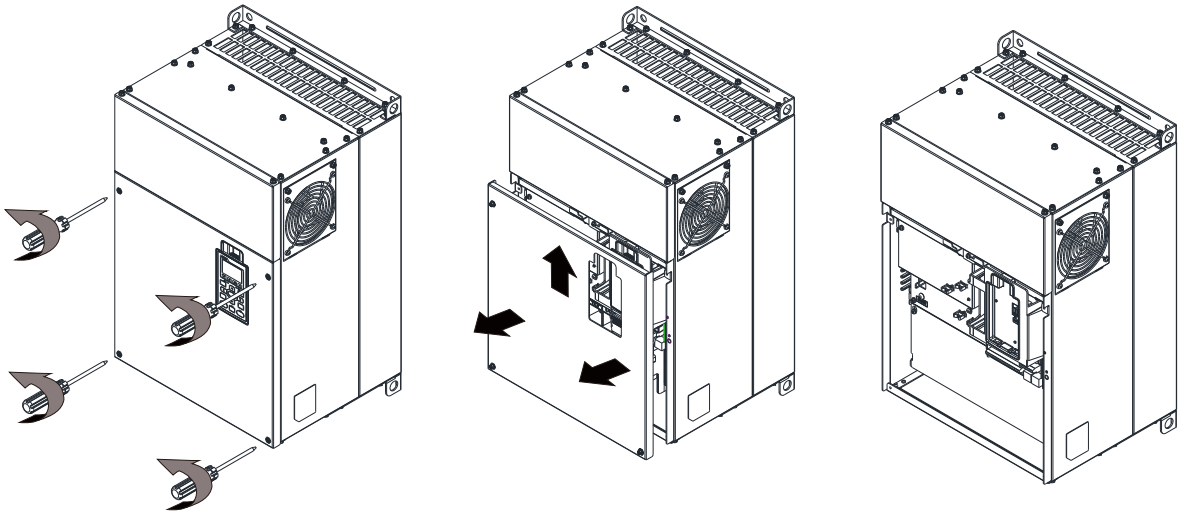


Figure 6-9

Frame F

Applicable models: VFD900C23A-00; VFD900C23A-21; VFD1320C43A-00; VFD1320C43A-21; VFD1600C43A-00; VFD1600C43A-21; VFD1600C63B-00; VFD1600C63B-21; VFD2000C63B-00; VFD2000C63B-21

Screw torque: 12–15 kg-cm / (10.4–13 lb-in.) / (1.2–1.5 Nm)

To remove the cover, lift it slightly and pull outward.

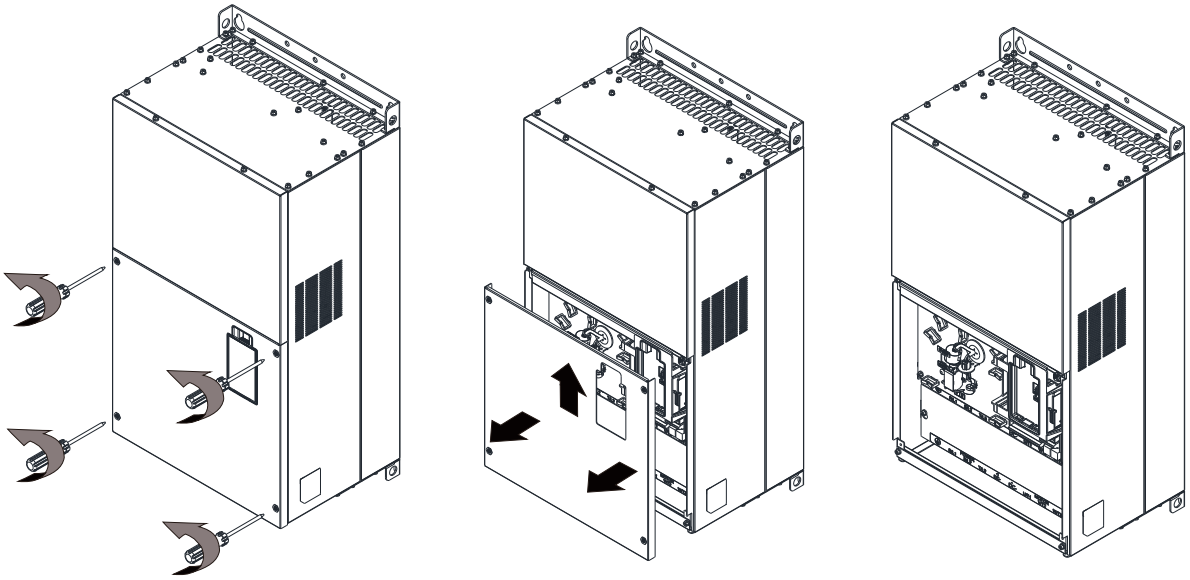


Figure 6-10

Frame G

Applicable models: VFD1850C43A-00; VFD1850C43A-21; VFD2000C43A-00; VFD2000C43A-21; VFD2200C43A-00; VFD2200C43A-21; VFD2500C43A-00; VFD2500C43A-21; VFD2500C63B-00; VFD2500C63B-21; VFD3150C63B-00; VFD3150C63B-21

Screw torque: 12–15 kg-cm / (10.4–13 lb-in.) / (1.2–1.5 Nm)

To remove the cover, lift it slightly and pull outward.

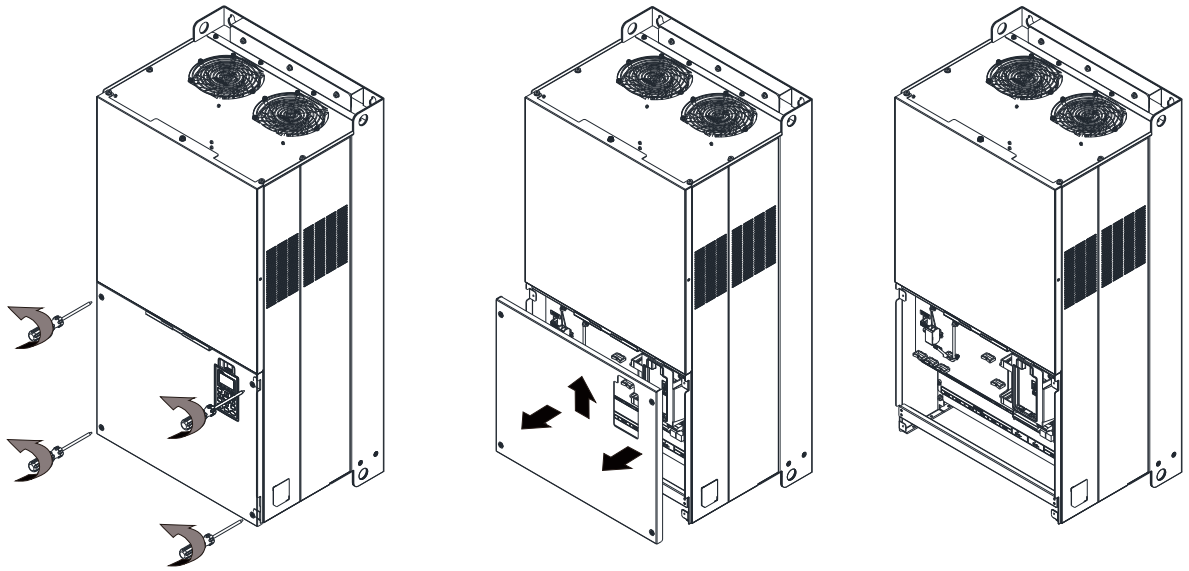


Figure 6-11

Frame H

Applicable models: VFD2800C43A-00; VFD2800C43C-21; VFD3150C43A-00; VFD3150C43C-21; VFD3550C43A-00; VFD3550C43C-21; VFD4000C43A-00; VFD4000C43C-21; VFD4000C63B-00; VFD4500C43A-00; VFD4500C43C-21; VFD4500C63B-00; VFD5000C43A-00; VFD5000C43C-21; VFD5600C43A-00; VFD5600C43C-21; VFD5600C63B-00; VFD6300C63B-00

Screw torque: 14–16 kg-cm / (12.15–13.89 lb-in.) / (1.4–1.6 Nm)

To remove the cover, lift it slightly and pull outward.

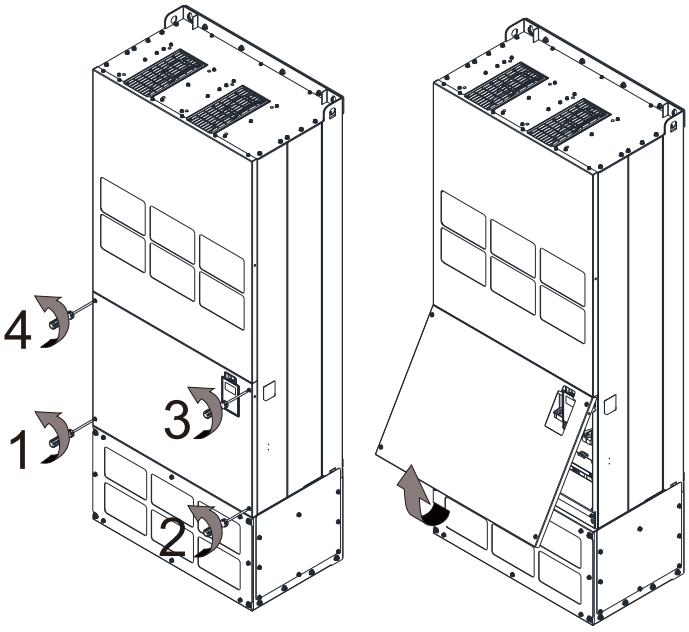


Figure 6-12

690V Frame H3

Applicable models: VFD4000C63B-21; VFD4500C63B-21; VFD5600C63B-21; VFD6300C63B-21

Screw torque: 14–16 kg-cm (12.15–13.89 lb-in.) (1.37–1.57 Nm)

To remove the cover, lift it slightly and pull outward.

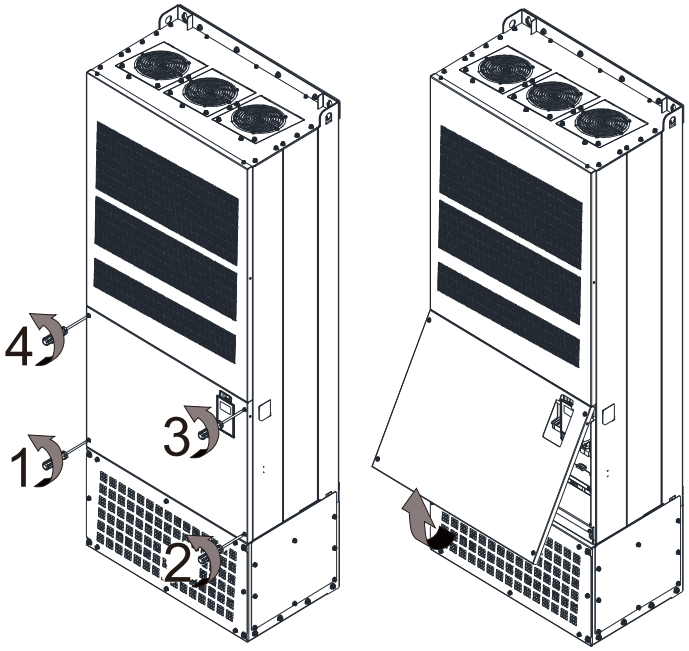


Figure 6-13

6-2 Control Terminal Specifications

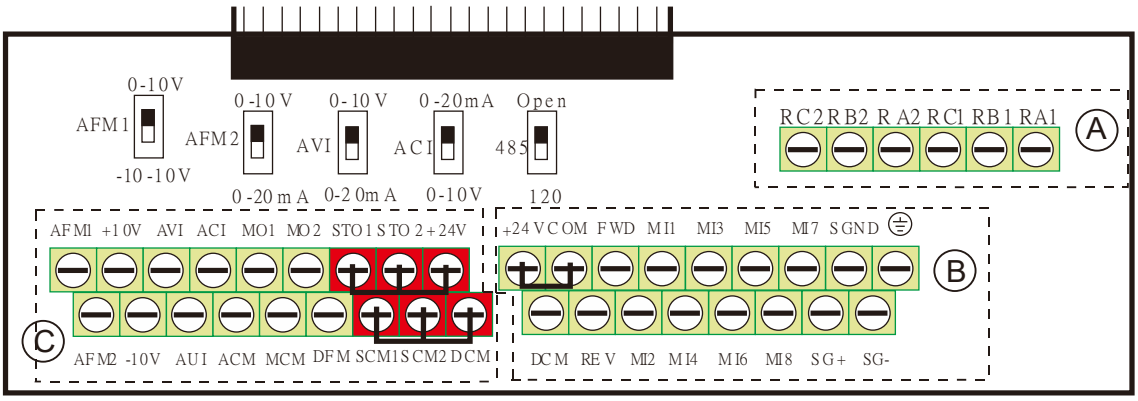


Figure 6-14. Removable Terminal Block

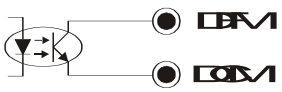
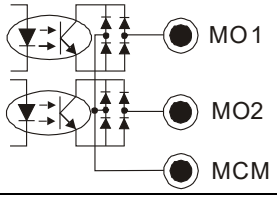
Function name	Area	Conductor	Stripping Length (mm)	Maximum Wire Gauge	Minimum Wire Gauge	Tightening Torque (±10 %)
RELAY Terminals	Ⓐ	Conductor cross section solid wire Conductor cross section stranded wire	4–5	1.5 mm² (16 AWG)	0.2 mm² (26 AWG)	5 kg-cm (4.3 lb-in.) (0.49 Nm)
Control Terminals	Ⓑ	Conductor cross section solid wire Conductor cross section stranded wire	6–7			8 kg-cm (6.9 lb-in.) (0.78 Nm)
Control Terminals	Ⓒ	Conductor cross section solid wire Conductor cross section stranded wire				2 kg-cm (1.7 lb-in.) (0.20 Nm)

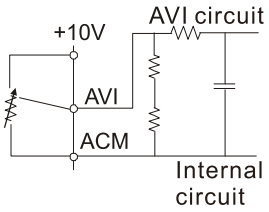
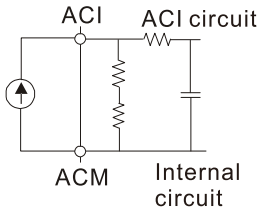
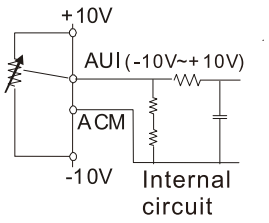
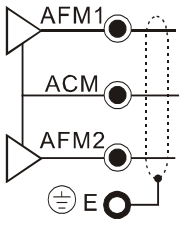
Table 6-1

Wiring precautions:

- In the figure above, the factory default for STO1, STO2, +24V and SCM1, SCM2, DCM are short-circuited. Use the +24V power supply of the safety function (as shown in section Ⓒ of above figure) for STO only. Do NOT use it for other purposes. The factory setting for +24V-COM is short-circuited and SINK mode (NPN); please refer to Chapter 4 Wiring for detail.
- Tighten the wiring with slotted screwdriver:
  Ⓐ Ⓑ is 3.5 mm (wide) x 0.6 mm (thick); Ⓒ is 2.5 mm (wide) x 0.4 mm (thick)
- When wiring bare wires, ensure that they are perfectly arranged to go through the wiring holes.

Terminals	Terminal Function	Factory Setting (NPN mode)
+24V	Digital control signal common (Source)	+24V ± 5% 200 mA
COM	Digital control signal common (Sink)	Common for multi-function input terminals
FWD	Forward-Stop command	FWD-DCM: ON➔ forward running OFF➔ deceleration to stop

Terminals	Terminal Function	Factory Setting (NPN mode)
REV	Reverse-Stop command	REV-DCM: ON➔ reverse running OFF➔ deceleration to stop
MI1 – MI8	Multi-function input 1–8	Refer to Pr.02-01–02-08 to program the multi-function inputs MI1–MI8. Source mode ON: activation current 3.3 mA ≥ 11 V_{DC} OFF: cut-off voltage ≤ 5 V_{DC} Sink Mode ON: activation current 3.3 mA ≤ 13 V_{DC} OFF: cut-off voltage ≥ 19 V_{DC}
DFM	Digital frequency signal output  Figure 6-15	DFM uses pulse voltage as an output monitoring signal; Duty-cycle: 50 % Min. load impedance: 1 kΩ / 100 pF Max. current endurance: 30 mA Max. voltage: 30 V_{DC}
DCM	Digital control / Frequency signal common	
MO1	Multi-function output 1 (photocoupler)	The AC motor drive outputs various monitoring signals, such as drive in operation, frequency reached, and overload indication through a transistor (open collector).  Figure 6-16
MO2	Multi-function output 2 (photocoupler)	
MCM	Multi-function output common	Max 48 V_{DC} 50 mA
RA1	Multi-function relay output 1 (N.O.) a	Resistive Load 3A (N.O.) / 3A (N.C.) 250 V_{AC} 5A (N.O.) / 3A (N.C.) 30 V_{DC} Inductive Load (COS 0.4) 1.2A (N.O.) / 1.2A (N.C.) 250 V_{AC} 2.0A (N.O.) / 1.2A (N.C.) 30 V_{DC} To output different kinds of monitoring signals such as motor drive in operation, frequency reached, and overload indication.
RB1	Multi-function relay output 1 (N.C.) b	
RC1	Multi-function relay common	
RA2	Multi-function relay output 2 (N.O.) a	
RB2	Multi-function relay output 2 (N.C.) b	
RC2	Multi-function relay common	
+10V	Potentiometer power supply	Power supply for analog frequency setting: +10V_{DC} 20 mA
-10V	Potentiometer power supply	Power supply for analog frequency setting: -10V_{DC} 20 mA

Terminals	Terminal Function	Factory Setting (NPN mode)
AVI	Analog voltage frequency command  Figure 6-17	Impedance: 20 kΩ Range: 0–20 mA / 4–20 mA / 0–10 V = 0–Max. Operation Frequency (Pr.01-00) AVI switch, factory setting is 0–10 V
ACI	Analog current input  Figure 6-18	Impedance: 250 Ω Range: 0–20mA / 4–20mA / 0–10V = 0–Max. Operation Frequency (Pr.01-00) ACI Switch, factory setting is 4–20 mA
AUI	Auxiliary analog voltage input  Figure 6-19	Impedance: 20 kΩ Range: -10– +10 V_{DC} = 0–Max. Operation Frequency (Pr. 01-00)
AFM1	Multi-function analog voltage output  Figure 6-20	0–10V Max. output current 2mA, Max. load 5 kΩ -10–10V maximum output current 2 mA, maximum load 5 kΩ Output current: 2 mA max Resolution: 0–10V corresponds to Max. operation frequency Range: 0–10V → -10– +10V AFM1 Switch, factory setting is 0–10V
AFM2		0–10V Max. output current 2 mA, Max. load 5 kΩ 0–20 mA Max. load 500 Ω Output current: 20 mA max Resolution: 0–10V corresponds to Max. operation frequency Range: 0–10V → 4–20 mA AFM2 Switch, factory setting is 0–10V
ACM	Analog signal common	Analog signal common terminal
STO1 SCM1 STO2 SCM2	Default setting is shorted Power removal safety function for EN954-1 and IEC/EN61508 When STO1–SCM1; STO2–SCM2 is activated, the activation current is 3.3 mA ≥ 11V_{DC} **NOTE:** Refer to Chapter 17 SAFE TORQUE OFF FUNCTION for details.	
SG+ SG-	Modbus RS-485 **NOTE:** Refer to Chapter 12 Descriptions Of Parameter Settings parameter group 09	

Terminals	Terminal Function	Factory Setting (NPN mode)
SGND	Communication Parameters for details.	
RJ45	PIN 1, 2, 7, 8: Reserved PIN 4: SG-	PIN 3, 6: SGND PIN 5: SG+

NOTE: Wire size of analog control signals: 0.75 mm^2 (18 AWG) with shielded wire Table 6-2

6-3 Remove the Terminal Block

1. Loosen the screws by screwdriver. (As shown in figure below).

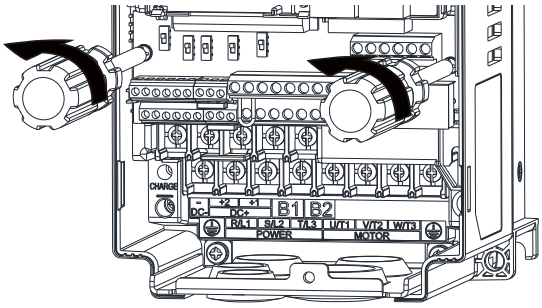


Figure 6-21

2. Remove the control board by pulling it out for a distance 6–8 cm (as 1 in the figure) then lift the control board upward (as 2 in the figure).

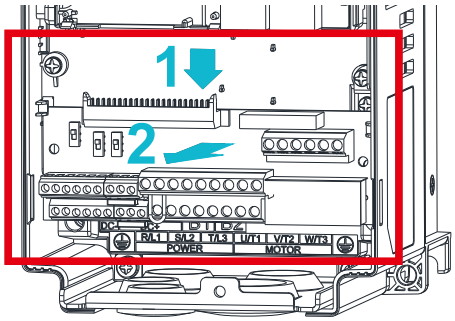


Figure 6-22

Chapter 7 Optional Accessories

7-1 Brake Resistors and Brake Units Used in AC Motor Drives

7-2 Magnetic Contactor / Air Circuit Breaker and Non-fuse Circuit Breaker

7-3 Fuse Specification Chart

7-4 AC / DC Reactor

7-5 Zero Phase Reactors

7-6 EMC Filter

7-7 Panel Mounting (MKC-KPPK)

7-8 Conduit Box Kit

7-9 Fan Kit

7-10 Flange Mounting Kit

7-11 Power Terminal Kit

7-12 USB/RS-485 Communication Interface IFD6530

The optional accessories listed in this chapter are available upon request. Installing additional accessories to your drive can substantially improve the drive's performance. Select accessories according to your needs or contact your local distributor for suggestions.

7-1 Brake Resistors and Brake Units Used in AC Motor Drives

230V models

Model	Applicable Motor		125% Braking Torque / 10% ED*1						Max. Braking Torque*2		
	HP	kW	Braking Torque (kg-m)	Brake Unit	Brake Resistor for Each Brake Unit*3			Resistor Value Spec. for Each AC Motor Drive	Total Braking Current (A)	Min. Resistor Value (Ω)	Max. Total Braking Current (A)	Peak Power (kW)
				VFDB*4	P/N	Q'ty	Usage					
VFD007C23A-21	1	0.7	0.5	-	BR080W200	1	-	80W 200Ω	1.9	63.3	6	2.3
VFD015C23A-21	2	1.5	1.0	-	BR200W091	1	-	200W 91Ω	4.2	47.5	8	3.0
VFD022C23A-21	3	2.2	1.5	-	BR300W070	1	-	300W 70Ω	5.4	38.0	10	3.8
VFD037C23A-21	5	3.7	2.5	-	BR400W040	1	-	400W 40Ω	9.5	19.0	20	7.6
VFD055C23A-21	7.5	5.5	3.7	-	BR1K0W020	1	-	1000W 20Ω	19	14.6	26	9.9
VFD075C23A-21	10	7.5	5.1	-	BR1K0W020	1	-	1000W 20Ω	19	14.6	26	9.9
VFD110C23A-21	15	11	7.5	-	BR1K5W013	1	-	1500W 13Ω	29	12.6	29	10.6
VFD150C23A-21	20	15	10.2	-	BR1K0W4P3	2	2 in series	2000W 8.6Ω	44	8.3	46	17.5
VFD185C23A-21	25	18	12.2	-	BR1K0W4P3	2	2 in series	2000W 8.6Ω	44	8.3	46	17.5
VFD220C23A-21	30	22	14.9	-	BR1K5W3P3	2	2 in series	3000W 6.6Ω	58	5.8	66	25.1
VFD300C23A-00 VFD300C23A-21	40	30	20.3	2015*2	BR1K0W5P1	2	2 in series	4000W 5.1Ω	75	4.8	80	30.4
VFD370C23A-00 VFD370C23A-21	50	37	25.1	2022*2	BR1K2W3P9	2	2 in series	4800W 3.9Ω	97	3.2	120	45.6
VFD450C23A-00 VFD450C23A-21	60	45	30.5	2022*2	BR1K5W3P3	2	2 in series	6000W 3.3Ω	118	3.2	120	45.6
VFD550C23A-00 VFD550C23A-21	75	55	37.2	2022*3	BR1K2W3P9	2	2 in series	7200W 2.6Ω	145	2.1	180	68.4
VFD750C23A-00 VFD750C23A-21	100	75	50.8	2022*4	BR1K2W3P9	2	2 in series	9600W 2Ω	190	1.6	240	91.2
VFD900C23A-00 VFD900C23A-21	125	90	60.9	2022*4	BR1K5W3P3	2	2 in series	12000W 1.65Ω	230	1.6	240	91.2

Table 7-1

460V models

Model	Applicable Motor		125% Braking Torque / 10% ED*1						Max. Braking Torque*2		
	HP	kW	Braking Torque (kg-m)	Brake Unit	Brake Resistor for Each Brake Unit*3			Resistor Value Spec. for Each AC Motor Drive	Total Braking Current (A)	Min. Resistor Value (Ω)	Max. Total Braking Current (A)	Peak Power (kW)
				VFDB*4	P/N	Q'ty	Usage					
VFD007C43A-21 VFD007C4EA-21	1	0.7	0.5	-	BR080W750	1	-	80W 750Ω	1	190.0	4	3.0
VFD015C43A-21 VFD015C4EA-21	2	1.5	1.0	-	BR200W360	1	-	200W 360Ω	2.1	126.7	6	4.6
VFD022C43A-21 VFD022C4EA-21	3	2.2	1.5	-	BR300W250	1	-	300W 250Ω	3	108.6	7	5.3
VFD037C43A-21 VFD037C4EA-21	5	3.7	2.5	-	BR400W150	1	-	400W 150Ω	5.1	84.4	9	6.8
VFD040C43A-21 VFD040C4EA-21	5.5	4.0	2.7	-	BR1K0W075	1	-	1000W 75Ω	10.2	54.3	14	10.6
VFD055C43A-21 VFD055C4EA-21	7.5	5.5	3.7									

Model	Applicable Motor		125% Braking Torque / 10% ED*1							Max. Braking Torque*2		
	HP	kW	Braking Torque (kg-m)	Brake Unit	Brake Resistor for Each Brake Unit*3			Resistor Value Spec. for Each AC Motor Drive	Total Braking Current (A)	Min. Resistor Value (Ω)	Max. Total Braking Current (A)	Peak Power (kW)
				VFDB*4	P/N	Q'ty	Usage					
VFD075C43A-21 VFD075C4EA-21	10	7.5	5.1	-	BR1K0W075	1	-	1000W 75Ω	10.2	47.5	16	12.2
VFD110C43A-21 VFD110C4EA-21	15	11	7.5	-	BR1K5W043	1	-	1500W 43Ω	17.6	42.2	18	13.7
VFD150C43A-21 VFD150C4EA-21	20	15	10.2	-	BR1K0W016	2	2 in series	2000W 32Ω	24	26.2	29	22.0
VFD185C43A-21 VFD185C4EA-21	25	18	12.2	-	BR1K0W016	2	2 in series	2000W 32Ω	24	23.0	33	25.1
VFD220C43A-21 VFD220C4EA-21	30	22	14.9	-	BR1K5W013	2	2 in series	3000W 26Ω	29	23.0	33	25.1
VFD300C43A-21 VFD300C4EA-21	40	30	20.3	-	BR1K0W016	4	2 parallel, 2 in series	4000W 16Ω	47.5	14.1	54	41.0
VFD370C43S-00 VFD370C43S-21	50	37	25.1	4045*1	BR1K2W015	4	2 parallel, 2 in series	4800W 15Ω	50	12.7	60	45.6
VFD450C43S-00 VFD450C43S-21	60	45	30.5	4045*1	BR1K5W013	4	2 parallel, 2 in series	6000W 13Ω	59	12.7	60	45.6
VFD550C43A-00 VFD550C43A-21	75	55	37.2	4030*2	BR1K0W5P1	4	4 in series	8000W 10.2Ω	76	9.5	80	60.8
VFD750C43A-00 VFD750C43A-21	100	75	50.8	4045*2	BR1K2W015	4	2 parallel, 2 in series	9600W 7.5Ω	100	6.3	120	91.2
VFD900C43A-00 VFD900C43A-21	125	90	60.9	4045*2	BR1K5W013	4	2 parallel, 2 in series	12000W 6.5Ω	117	6.3	120	91.2
VFD1100C43A-00 VFD1100C43A-21	150	110	74.5	4110*1	BR1K2W015	10	5 parallel, 2 in series	12000W 6Ω	126	6.0	126	95.8
VFD1320C43A-00 VFD1320C43A-21	175	132	89.4	4160*1	BR1K5W012	12	6 parallel, 2 in series	18000W 4Ω	190	4.0	190	144.4
VFD1600C43A-00 VFD1600C43A-21	215	160	108.3	4160*1	BR1K5W012	12	6 parallel, 2 series	18000W 4Ω	190	4.0	190	144.4
VFD1850C43A-00 VFD1850C43A-21	250	185	125.3	4185*1	BR1K5W012	14	7 parallel, 2 in series	21000W 3.4Ω	225	3.4	225	171.0
VFD2000C43A-00 VFD2000C43A-21	270	200	135.4	4110*2	BR1K2W015	10	5 parallel, 2 in series	24000W 3Ω	252	3	252	191.5
VFD2200C43A-00 VFD2200C43A-21	300	220	148.9	4110*2	BR1K2W015	10	5 parallel, 2 in series	24000W 3Ω	252	3.0	252	190.5
VFD2500C43A-00 VFD2500C43A-21	340	250	169.3	4160*2	BR1K5W012	12	6 parallel, 2 in series	36000W 2Ω	380	2	380	288.8

Model	Applicable Motor		125% Braking Torque / 10% ED*1							Max. Braking Torque*2		
	HP	kW	Braking Torque (kg-m)	Brake Unit	Brake Resistor for Each Brake Unit*3			Resistor Value Spec. for Each AC Motor Drive	Total Braking Current (A)	Min. Resistor Value (Ω)	Max. Total Braking Current (A)	Peak Power (kW)
				VFDB*4	P/N	Q'ty	Usage					
VFD2800C43A-00 VFD2800C43C-21	375	280	189.6	4160*2	BR1K5W012	12	6 parallel, 2 in series	36000W 2Ω	380	2.0	380	288.8
VFD3150C43A-00 VFD3150C43C-21	425	315	213.3	4160*2	BR1K5W012	12	6 parallel, 2 in series	36000W 2Ω	380	2.0	380	288.8
VFD3550C43A-00 VFD3550C43C-21	475	355	240.3	4185*2	BR1K5W012	14	7 parallel, 2 in series	42000W 1.7Ω	450	1.7	450	342.0
VFD4000C43A-00 VFD4000C43C-21	530	400	270.8	4160*3	BR1K5W012	12	6 parallel, 2 in series	54000W 1.3Ω	540	1.3	540	410.4
VFD4500C43A-00 VFD4500C43C-21	600	450	304.7	4185*3	BR1K5W012	12	6 parallel, 2 in series	54000W 1.3Ω	600	1.1	675	513.0
VFD5000C43A-00 VFD5000C43C-21	675	500	338.5	4185*3	BR1K5W012	14	7 parallel, 2 in series	63000W 1.1Ω	675	1.1	675	513.0
VFD5600C43A-00 VFD5600C43C-21	750	560	379.1	4160*4	BR1K5W012	12	6 parallel, 2 in series	72000W 1.0Ω	760	1.0	760	577.6

Table 7-2

575V models

Model	Applicable Motor (kW)			125% Braking Torque / 10%ED*1						Max. Braking Torque*2		
	LD	ND	HD	Braking Torque (kg-m)	Brake Unit	Brake Resistor for Each Brake Unit*3			Resistor Value Spec. for Each AC Motor Drive	Total Braking Current (A)	Min. Resistor Value (Ω)	Max. Total Braking Current (A)	Peak Power (kW)
					VFDB*4	P/N	Q'ty	Usage					
VFD015C53A-21	1.5	0.75	0.75	0.5	-	BR080W750	1	-	80W 750Ω	1.2	280.0	4	4.5
VFD022C53A-21	2.2	1.5	1.5	1	-	BR200W360	1	-	200W 360Ω	2.6	186.7	6	6.7
VFD037C53A-21	3.7	2.2	2.2	1.5	-	BR300W400	1	-	300W 400Ω	2.3	160.0	7	7.8
VFD055C53A-21	5.5	3.7	3.7	2.5	-	BR500W100	1	-	500W 100Ω	9.2	93.3	12	13.4
VFD075C53A-21	7.5	5.5	3.7	3.7	-	BR750W140	1	-	750W 140Ω	6.6	80.0	14	15.7
VFD110C53A-21	11	7.5	7.5	5.1	-	BR1K0W075	1	-	1000W 75Ω	12.3	70.0	16	17.9
VFD150C53A-21	15	11	7.5	7.4	-	BR1K1W091	1	-	1100W 91Ω	10.1	62.2	18	20.2

Table 7-3

690V models

Model	Applicable Motor (kW)			125% Braking Torque / 10%ED*1							Max. Braking Torque*2		
	LD	ND	HD	Braking Torque (kg-m)	Brake Unit	Brake Resistor for Each Brake Unit*3			Resistor Value Spec. for Each AC Motor Drive	Total Braking Current (A)	Min. Resistor Value (Ω)	Max. Total Braking Current (A)	Peak Power (kW)
					VFDB*4	P/N	Q'ty	Usage					
VFD185C63B-21	18.5	15	11	10.2	-	BR1K0W039	2	2 in series	2000W 78Ω	14.4	58.9	19	21.3
VFD220C63B-21	22	18.5	15	12.5	-	BR1K2W033	2	2 in series	2400W 66Ω	17.0	58.9	19	21.3
VFD300C63B-21	30	22	18.5	14.9	-	BR1K5W027	2	2 in series	3000W 54Ω	20.7	43.1	26	29.1
VFD370C63B-21	37	30	22	20.3	-	BR1K2W015	3	3 in series	3600W 45Ω	24.9	43.1	26	29.1
VFD450C63B-00 VFD450C63B-21	45	37	30	25	6055*1	BR1K2W033	4	2 in series, 2 parallel	4800W 33Ω	33.9	24.3	46	51.5
VFD550C63B-00 VFD550C63B-21	55	45	37	30.5	6055*1	BR1K5W027	4	2 in series, 2 parallel	6000W 27Ω	41.5	24.3	46	51.5
VFD750C63B-00 VFD750C63B-21	75	55	45	37.2	6110*1	BR1K2W033	6	2 in series, 3 parallel	7200W 22Ω	50.9	12.2	92	103.0
VFD900C63B-00 VFD900C63B-21	90	75	55	50.8	6110*1	BR1K5W027	6	2 in series, 3 parallel	9000W 18Ω	62.2	12.2	92	103.0
VFD1100C63B-00 VFD1100C63B-21	110	90	75	60.9	6110*1	BR1K5W027	8	2 in series, 4 parallel	12000W 13.5Ω	83.0	12.2	92	103.0
VFD1320C63B-00 VFD1320C63B-21	132	110	90	74.5	6160*1	BR1K2W015	12	3 in series, 4 parallel	14400W 11.3Ω	99.6	8.2	136	152.3
VFD1600C63B-00 VFD1600C63B-21	160	132	110	89.4	6160*1	BR1K5W027	10	2 in series, 5 parallel	15000W 10.8Ω	103.7	8.2	136	152.3
VFD2000C63B-00 VFD2000C63B-21	200	160	132	108.3	6200*1	BR1K5W027	12	2 in series, 6 parallel	18000W 9.0Ω	124.4	6.9	162	181.4
VFD2500C63B-00 VFD2500C63B-21	250	200	160	135.4	6110*2	BR1K5W027	8	2 in series, 4 parallel	24000W 6.8Ω	165.9	6.1	184	206.1
VFD3150C63B-00 VFD3150C63B-21	315	250	200	169.3	6160*2	BR1K5W027	10	2 in series, 5 parallel	30000W 5.4Ω	207.4	4.1	272	304.6
VFD4000C63B-00 VFD4000C63B-21	400	315	250	213.3	6200*2	BR1K5W027	12	2 in series, 6 parallel	36000W 4.5Ω	248.9	3.5	324	362.9
VFD4500C63B-00 VFD4500C63B-21	450	355	315	240.3	6200*2	BR1K5W027	14	2 in series, 7 parallel	42000W 3.9Ω	290.4	3.5	324	362.9
VFD5600C63B-00 VFD5600C63B-21	560	450	355	304.7	6200*3	BR1K5W027	12	2 in series, 6 parallel	54000W 3.0Ω	373.3	2.3	486	544.3

Model	Applicable Motor (kW)			125% Braking Torque / 10%ED*1							Max. Braking Torque*2		
	LD	ND	HD	Braking Torque (kg-m)	Brake Unit	Brake Resistor for Each Brake Unit*3			Resistor Value Spec. for Each AC Motor Drive	Total Braking Current (A)	Min. Resistor Value (Ω)	Max. Total Braking Current (A)	Peak Power (kW)
					VFDB*4	P/N	Q'ty	Usage					
VFD6300C63B-00 VFD6300C63B-21	630	630	630	426.5	6200*4	BR1K5W027	12	2 in series, 6 parallel	72000W 2.3Ω	497.8	1.7	648	725.8

Table 7-4

*1. Calculation of 125% brake toque: (kW) * 125% * 0.8; where 0.8 is the motor efficiency.
Since there is a resistor power consumption limit, the longest operation time for 10% ED is 10 seconds (ON: 10 seconds / OFF: 90 seconds).

*2. Refer to Chapter 7 "Brake Module and Brake Resistors" in the application manual for "Operation Duration & ED" vs. "Braking Current".

*3. To dissipate heat, mount a resistor of 400 W or lower to a frame to keep the surface temperature below 250°C. Fix a resistor of 1000 W or higher to a surface to keep the surface temperature below 350°C. (If the surface temperature is higher than the temperature limit, install extra cooling or increase the size of the resistor.)

*4. The calculation of the brake resistor is based on a four-pole motor (1800 rpm). Refer to VFDB series Braking Module Instruction for more details on brake resistor.

NOTE:

1. Specification and Appearance of Brake Resistors

   甲、 Wire wound resistors: For 1000 W and above, refer to the following appearance of wire wound resistor (Figure7-1) and its model and specification comparison table (Table 7-5) for details.

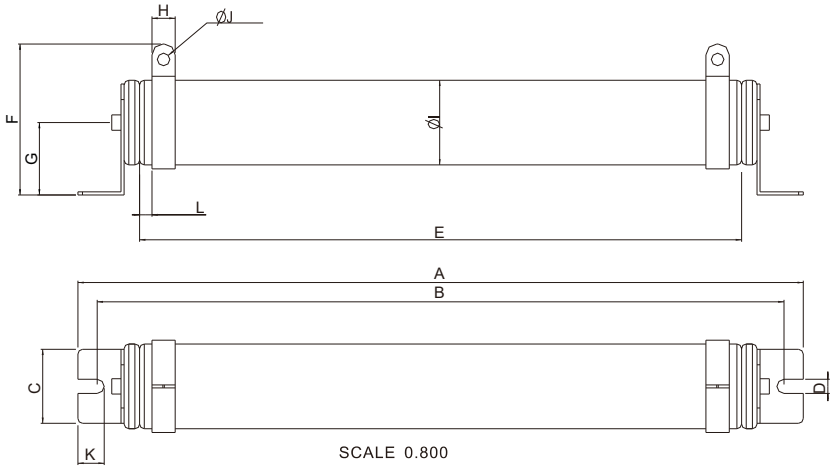


Figure 7-1

Models and Specifications Comparison Table of Wire Wound Resistors: Unit: mm

Models	A	B	C	D	E	F	G	H	Ø	ØJ	K	L
BR1K0W4P3	470±10	445±5	48±0.2	9.1±0.1	390±3	98±5	47±5	15±1	55±5	8.1±0.1	21±0.2	8±1
BR1K0W5P1												
BR1K0W016												
BR1K0W020												
BR1K0W075												
BR1K2W3P9												
BR1K2W015												
BR1K5W3P3												
BR1K5W012												
BR1K5W013												
BR1K5W043												

Table 7-5

   乙、 Aluminum housed resistors: For below 1000 W, refer to the following appearance of aluminum-housed resistor (Figure 7-2) and its model and specification comparison table (Table 7-6) for details

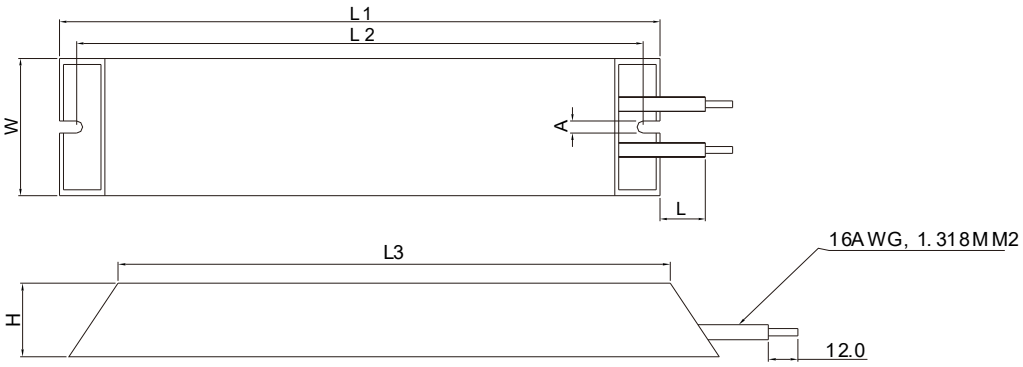


Figure 7-2

Unit: mm

Models	L1	L2	L3	W	H	A	L
BR080W200	140±2	125±2	100±1	40±0.5	20±0.5	5.3±0.5	200±20
BR080W750							
BR200W091	165±2	150±2	125±1	60±0.5	30±0.5		
BR200W360							
BR300W070	215±2	200±2	175±1				
BR300W250							
BR400W040	265±2	250±2	225±1				
BR400W150							

Table 7-6

2. Select the resistance value, power and brake usage (ED %) according to Delta rules.

Definition for Brake Usage ED%

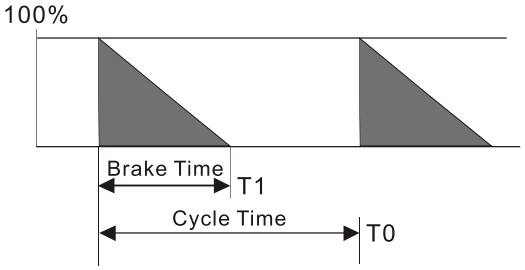
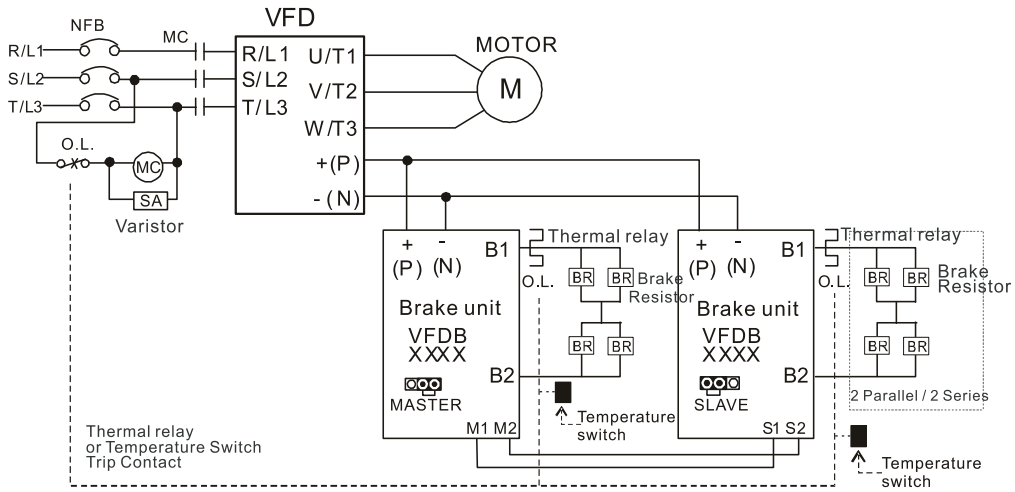


Figure 7-3

ED% = T1/T0 x 100 (%)

Explanation: Brake usage ED (%) is the amount of time needed for the brake unit and brake resistor to dissipate heat generated by braking. When the brake resistor heats up, the resistance increases with temperature, and braking torque decreases accordingly.

For safety, install a thermal overload relay (O.L) between the brake unit and the brake resistor in conjunction with the magnetic contactor (MC) before the drive for additional protection. The thermal overload relay protects the brake resistor from damage due to frequent or continuous braking. Under such circumstances, turn off the power to prevent damage to the brake resistor, brake unit and drive. NOTE: Never use it to disconnect the brake resistor.



- When AC Drive is equipped with a DC reactor, please read user manual for the correct wiring for the brake unit input circuit +(P).
- DO NOT connect input circuit -(N) to the neutral point of the power system.

Figure 7-4

3. Any damage to the drive or other equipment caused by using brake resistors and brake modules that are not provided by Delta voids the warranty.
4. Consider environmental safety factors when installing the brake resistors. If you use the minimum resistance value, consult local dealers for the power calculation.
5. When using more than two brake units, the equivalent resistor value of the parallel brake unit cannot be less than the value in the column “Min. Resistor Value (Ω)”. Install the brake unit vertically and leaves appropriate heat dissipation space on the top and the bottom of the brake unit. Visit the following links to get the instruction sheets for the wiring in the brake unit:

- VFDB2015 / 2022 / 4030 / 4045 / 5055
  https://downloadcenter.deltaww.com/downloadCenterCounter.aspx?DID=47611&DocPath=1&hl=en-US
- VFDB4110 / 4160 / 4185
  https://downloadcenter.deltaww.com/downloadCenterCounter.aspx?DID=47614&DocPath=1&hl=en-US
- VFDB6055 / 6110 / 6160 / 6200
  https://downloadcenter.deltaww.com/downloadCenterCounter.aspx?DID=8592&DocPath=1&hl=en-US

6. The selection tables are for normal usage. If the AC motor drive requires frequent braking, increase the Watts by two to three times.
7. Thermal Overload Relay (TOR):

   Thermal overload relay selection is based on its overload capacity. A standard braking capacity of the C2000 Plus is 10% ED (Tripping time=10 s). As shown in the graph below, a 460V, 110 kW C2000 Plus requires the thermal relay to take 260% overload capacity for 10 seconds (hot starting) and the braking current is 126 A. In this case, select a thermal overload relay rated at 50 A (50 × 260% = 130 A > 126 A). The property of each thermal relay may vary among different manufacturers. Carefully read the specification before using it.

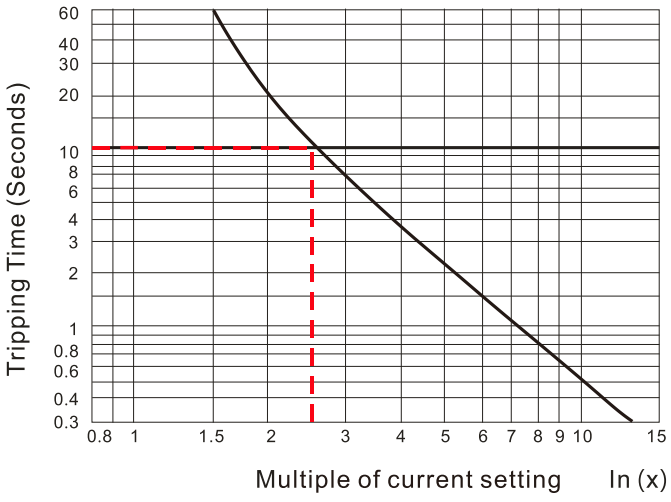


Figure 7-5

7-2 Magnetic Contactor / Air Circuit Breaker and Non-fuse Circuit Breaker

Magnetic Contactor (MC) and Air Circuit Breaker (ACB)

It is recommended the surrounding temperature for MC should be ≥ 60°C and that for ACB should be ≥ 50°C. In the meanwhile, consider temperature derating for components with ON/OFF switch in accordance with the ambient temperature of the on-site distribution panel.

230V models

Frame	Model	Heavy Duty Output Current (A)	Heavy Duty Input Current (A)	MC/ACB Selection (A)
A	VFD007C23A-21	5	6.4	11
	VFD015C23A-21	8	12	22
	VFD022C23A-21	11	16	32
	VFD037C23A-21	17	20	32
B	VFD055C23A-21	25	28	55
	VFD075C23A-21	33	36	65
	VFD110C23A-21	49	52	85
C	VFD150C23A-21	65	72	130
	VFD185C23A-21	75	83	150
	VFD220C23A-21	90	99	150
D	VFD300C23A-00 VFD300C23A-21	120	124	185
	VFD370C23A-00 VFD370C23A-21	146	143	225
E	VFD450C23A-00 VFD450C23A-21	180	171	265
	VFD550C23A-00 VFD550C23A-21	215	206	330
	VFD750C23A-00 VFD750C23A-21	255	245	400
F	VFD900C23A-00 VFD900C23A-21	346	331	500

Table 7-7

460V models

Frame	Model	Heavy Duty Output Current (A)	Heavy Duty Input Current (A)	MC/ACB Selection (A)
A	VFD007C43A-21	3	4.3	7
	VFD015C43A-21	4	5.9	9
	VFD022C43A-21	6	8.7	18
	VFD037C43A-21	9	14	22
	VFD040C43A-21	10.5	15.5	32
	VFD055C43A-21	12	17	32
B	VFD075C43A-21	18	20	32
	VFD110C43A-21	24	26	40
	VFD150C43A-21	32	35	55
C	VFD185C43A-21	38	40	65
	VFD220C43A-21	45	47	75
	VFD300C43A-21	60	63	105
D0	VFD370C43S-00 VFD370C43S-21	73	74	130
	VFD450C43S-00 VFD450C43S-21	91	101	185

Frame	Model	Heavy Duty Output Current (A)	Heavy Duty Input Current (A)	MC/ACB Selection (A)
D	VFD550C43A-00 VFD550C43A-21	110	114	185
	VFD750C43A-00 VFD750C43A-21	150	157	265
E	VFD900C43A-00 VFD900C43A-21	180	167	265
	VFD1100C43A-00 VFD1100C43A-21	220	207	330
F	VFD1320C43A-00 VFD1320C43A-21	260	240	400
	VFD1600C43A-00 VFD1600C43A-21	310	300	500
G	VFD1850C43A-00 VFD1850C43A-21	370	380	630
	VFD2000C43A-00 VFD2000C43A-21	395	395	630
	VFD2200C43A-00 VFD2200C43A-21	460	400	630
	VFD2500C43A-00 VFD2500C43A-21	481	447	800
H	VFD2800C43A-00 VFD2800C43C-21	550	494	800
	VFD3150C43A-00 VFD3150C43C-21	616	555	800
	VFD3550C43A-00 VFD3550C43C-21	683	625	1000
	VFD4000C43A-00 VFD4000C43C-21	770	770	1250
	VFD4500C43A-00 VFD4500C43C-21	866	866	1600
	VFD5000C43A-00 VFD5000C43C-21	930	930	1600
	VFD5600C43A-00 VFD5600C43C-21	1094	1094	2000

Table 7-8

575V models

Frame	Model	Light Duty Output Current (A)	Light Duty Input Current (A)	MC/ACB Selection (A)
A	VFD015C53A-21	3	3.8	9
	VFD022C53A-21	4.3	5.4	12
	VFD037C53A-21	6.7	10.4	18
B	VFD055C53A-21	9.9	14.9	32
	VFD075C53A-21	12.1	16.9	32
	VFD110C53A-21	18.7	21.3	40
	VFD150C53A-21	24.2	26.3	50

Table 7-9

690V models

Frame	Model	Light Duty Output Current (A)	Light Duty Input Current (A)	MC/ACB Selection (A)
C	VFD185C63B-21	24	29	50
	VFD220C63B-21	30	36	65
	VFD300C63B-21	36	43	75
	VFD370C63B-21	45	54	100
D	VFD450C63B-00 VFD450C63B-21	54	65	130
	VFD550C63B-00 VFD550C63B-21	67	81	150
E	VFD750C63B-00 VFD750C63B-21	86	84	150
	VFD900C63B-00 VFD900C63B-21	104	102	185
	VFD1100C63B-00 VFD1100C63B-21	125	122	225
	VFD1320C63B-00 VFD1320C63B-21	150	147	265
F	VFD1600C63B-00 VFD1600C63B-21	180	178	330
	VFD2000C63B-00 VFD2000C63B-21	220	217	400
G	VFD2500C63B-00 VFD2500C63B-21	290	292	630
	VFD3150C63B-00 VFD3150C63B-21	350	353	630
H	VFD4000C63B-00 VFD4000C63B-21	430	454	800
	VFD4500C63B-00 VFD4500C63B-21	465	469	800
	VFD5600C63B-00 VFD5600C63B-21	590	595	1000
	VFD6300C63B-00 VFD6300C63B-21	675	681	1250

Table 7-10

Non-fuse Circuit Breaker

Comply with the UL standard: Per UL 508, paragraph 45.8.4, part a.

The rated current of the non-fuse circuit breaker should be 1.6–2.6 times (575V / 690V models: 2–4 times) the drive's rated input current.

230V / Three-phase	
Model	Breaker Rated Input Recommended Current (A)
VFD007C23A-21	15
VFD015C23A-21	20
VFD022C23A-21	30
VFD037C23A-21	40
VFD055C23A-21	50
VFD075C23A-21	70
VFD110C23A-21	110
VFD150C23A-21	125
VFD185C23A-21	150
VFD220C23A-21	200
VFD300C23A-00 / VFD300C23A-21	250
VFD370C23A-00 / VFD370C23A-21	300
VFD450C23A-00 / VFD450C23A-21	350
VFD550C23A-00 / VFD550C23A-21	400
VFD750C23A-00 / VFD750C23A-21	500
VFD900C23A-00 / VFD900C23A-21	600

Table 7-11

460V / Three-phase	
Model	Breaker Rated Input Recommended Current (A)
VFD007C43A-21 / VFD007C4EA-21	10
VFD015C43A-21 / VFD015C4EA-21	10
VFD022C43A-21 / VFD022C4EA-21	15
VFD037C43A-21 / VFD037C4EA-21	20
VFD040C43A-21 / VFD040C4EA-21	20
VFD055C43A-21 / VFD055C4EA-21	40
VFD075C43A-21 / VFD075C4EA-21	40
VFD110C43A-21 / VFD110C4EA-21	50
VFD150C43A-21 / VFD150C4EA-21	70
VFD185C43A-21 / VFD185C4EA-21	80
VFD220C43A-21 / VFD220C4EA-21	100
VFD300C43A-21 / VFD300C4EA-21	125
VFD370C43S-00 / VFD370C43S-21	150
VFD450C43S-00 / VFD450C43S-21	175
VFD550C43A-00 / VFD550C43A-21	250
VFD750C43A-00 / VFD750C43A-21	300
VFD900C43A-00 / VFD900C43A-21	350
VFD1100C43A-00 / VFD1100C43A-21	400
VFD1320C43A-00 / VFD1320C43A-21	500
VFD1600C43A-00 / VFD1600C43A-21	600
VFD1850C43A-00 / VFD1850C43A-21	600
VFD2000C43A-00 / VFD2000C43A-21	800
VFD2200C43A-00 / VFD2200C43A-21	800
VFD2500C43A-00 / VFD2500C43A-21	1000
VFD2800C43A-00 / VFD2800C43C-21	1000
VFD3150C43A-00 / VFD3150C43C-21	1200
VFD3550C43A-00 / VFD3550C43C-21	1350
VFD4000C43A-00 / VFD4000C43C-21	1500
VFD4500C43A-00 / VFD4500C43C-21	1600
VFD5000C43A-00 / VFD5000C43C-21	2000
VFD5600C43A-00 / VFD5600C43C-21	2000

Table 7-12

575V / Three-phase	
Model	Breaker Rated Input Recommended Current (A)
VFD015C53A-21	5
VFD022C53A-21	10
VFD037C53A-21	15
VFD055C53A-21	20
VFD075C53A-21	25
VFD110C53A-21	40
VFD150C53A-21	50

Table 7-13

690V / Three-phase	
Model	Breaker Rated Input Recommended Current (A)
VFD185C63B-21	50
VFD220C63B-21	60
VFD300C63B-21	60
VFD370C63B-21	80
VFD450C63B-00 / VFD450C63B-21	100
VFD550C63B-00 / VFD550C63B-21	125
VFD750C63B-00 / VFD750C63B-21	150
VFD900C63B-00 / VFD900C63B-21	200
VFD1100C63B-00 / FD1100C63B-21	225
VFD1320C63B-00 / FD1320C63B-21	300
VFD1600C63B-00 / FD1600C63B-21	350
VFD2000C63B-00 / FD2000C63B-21	400
VFD2500C63B-00 / FD2500C63B-21	500
VFD3150C63B-00 / FD3150C63B-21	650
VFD4000C63B-00 / FD4000C63B-21	800
VFD4500C63B-00 / FD4500C63B-21	850
VFD5600C63B-00 / FD5600C63B-21	1200
VFD6300C63B-00 / FD6300C63B-21	1400

Table 7-14

7-3 Fuse Specification Chart

☑ Fuse specifications lower than the table below are allowed.

☑ UL certified fuses apply to the short-circuit protection at the input side. For installation in the United States, branch circuit protection must be provided in accordance with the National Electrical Code (NEC) and any applicable local codes. Use UL classified fuses to fulfill this requirement.

☑ For installation in Canada, branch circuit protection must be provided in accordance with Canadian Electrical Code and any applicable provincial codes. Use UL classified fuses to fulfill this requirement.

230V Models	Input Current I (A)		Line Fuse	
	Super Heavy Duty	Heavy Duty	I (A)	Bussmann P/N
VFD007C23A-21	3.9	6.4	15	JJN-15 / JJS-15
VFD015C23A-21	6.4	12	25	JJN-25 / JJS-25
VFD022C23A-21	12	16	35	JJN-35 / JJS-35
VFD037C23A-21	16	20	45	JJN-45 / JJS-45
VFD055C23A-21	20	28	60	JJN-60 / JJS-60
VFD075C23A-21	28	36	80	JJN-80 / JJS-80
VFD110C23A-21	36	52	110	JJN-110 / JJS-110
VFD150C23A-21	52	72	150	JJN-150 / JJS-150
VFD185C23A-21	72	83	175	JJN-175 / JJS-175
VFD220C23A-21	83	99	225	JJN-225 / JJS-225
VFD300C23A-00 VFD300C23A-21	99	124	250	JJN-250 / JJS-250
VFD370C23A-00 VFD370C23A-21	124	143	300	JJN-300 / JJS-300
VFD450C23A-00 VFD450C23A-21	143	171	400	JJN-400 / JJS-400
VFD550C23A-00 VFD550C23A-21	171	206	450	JJN-450 / JJS-450
VFD750C23A-00 VFD750C23A-21	206	245	500	JJN-500 / JJS-500
VFD900C23A-00 VFD900C23A-21	245	331	700	JJN-700 / JJS-700

Table 7-15

460V Models	Input Current I (A)		Line Fuse	
	Super Heavy Duty	Heavy Duty	I (A)	Bussmann P/N
VFD007C43A-21 VFD007C4EA-21	3.5	4.3	10	JJS-10
VFD015C43A-21 VFD015C4EA -21	4.3	5.9	15	JJS-15
VFD022C43A-21 VFD022C4EA-21	5.9	8.7	20	JJS-20
VFD037C43A-21 VFD037C4EA-21	8.7	14	30	JJS-30
VFD040C43A-21 VFD040C4EA-21	14	15.5	35	JJS-35
VFD055C43A-21 VFD055C4EA-21	15.5	17	40	JJS-40
VFD075C43A-21 VFD075C4EA-21	17	20	45	JJS-45
VFD110C43A-21 VFD110C4EA-21	20	26	60	JJS-60

460V Models	Input Current I (A)		Line Fuse	
	Super Heavy Duty	Heavy Duty	I (A)	Bussmann P/N
VFD150C43A-21 VFD150C4EA-21	26	35	80	JJS-80
VFD185C43A-21 VFD185C4EA-21	35	40	90	JJS-90
VFD220C43A-21 VFD220C4EA-21	40	47	110	JJS-110
VFD300C43A-21 VFD300C4EA-21	47	63	150	JJS-150
VFD370C43S-00 VFD370C43S-21	63	74	175	JJS-175
VFD450C43S-00 VFD450C43S-21	74	101	225	JJS-225
VFD550C43A-00 VFD550C43A-21	101	114	250	JJS-250
VFD750C43A-00 VFD750C43A-21	114	157	350	JJS-350
VFD900C43A-00 VFD900C43A-21	157	167	350	JJN-350
VFD1100C43A-00 VFD1100C43A-21	167	207	450	JJS-450
VFD1320C43A-00 VFD1320C43A-21	207	240	500	JJS-500
VFD1600C43A-00 VFD1600C43A-21	240	300	700	KTU-700
VFD1850C43A-00 VFD1850C43A-21	300	380	800	KTU-800
VFD2000C43A-00 VFD2000C43A-21	300	395	800	KTU-800
VFD2200C43A-00 VFD2200C43A-21	380	400	800	KTU-800
VFD2500C43A-00 VFD2500C43A-21	390	447	1000	KTU-1000
VFD2800C43A-00 VFD2800C43C-21	400	494	1000	KTU-1000
VFD3150C43A-00 VFD3150C43C-21	494	555	1200	KTU-1200
VFD3550C43A-00 VFD3550C43C-21	555	625	1400	KTU-1400
VFD4000C43A-00 VFD4000C43C-21	590	770	1400	KTU-1400
VFD4500C43A-00 VFD4500C43C-21	625	866	1600	170M6019
VFD5000C43A-00 VFD5000C43C-21	866	930	1800	170M6020
VFD5600C43A-00 VFD5600C43C-21	930	1094	2000	170M6021

Table 7-16

575V Models	Input Current I (A)			Line Fuse		
	Light Duty	Normal Duty	Heavy Duty	I (A)	Model No.	Supplier
VFD015C53A-21	3.8	3.1	2.6	7	KLKD007.T	Littelfuse
VFD022C53A-21	5.4	4.5	3.8	10	KLKD010.T	Littelfuse
VFD037C53A-21	10.4	7.2	5.8	15	KLKD015.T	Littelfuse
VFD055C53A-21	14.9	12.3	10.7	25	25ET	Bussmann
VFD075C53A-21	16.9	15	12.5	32	32ET	Bussmann
VFD110C53A-21	21.3	18	16.9	50	50FE	Bussmann
VFD150C53A-21	26.3	22.8	19.7	63	63FE	Bussmann

Table 7-17

690V Models	Input Current I (A)			Line Fuse	
	Light Duty	Normal Duty	Heavy Duty	I (A)	Bussmann P/N
VFD185C63B-21	29	24	20	60	JJS-60
VFD220C63B-21	36	29	24	70	JJS-70
VFD300C63B-21	43	36	29	80	JJS-80
VFD370C63B-21	54	43	36	100	JJS-100
VFD450C63B-00 VFD450C63B-21	54	45	36	100	JJS-100
VFD550C63B-00 VFD550C63B-21	67	54	45	125	JJS-125
VFD750C63B-00 VFD750C63B-21	84	66	53	175	JJS-175
VFD900C63B-00 VFD900C63B-21	102	84	66	200	JJS-200
VFD1100C63B-00 VFD1100C63B-21	122	102	84	250	JJS-250
VFD1320C63B-00 VFD1320C63B-21	147	122	102	300	JJS-300
VFD1600C63B-00 VFD1600C63B-21	178	148	123	350	JJS-350
VFD2000C63B-00 VFD2000C63B-21	217	178	148	400	JJS-400
VFD2500C63B-00 VFD2500C63B-21	292	222	181	450	170M4063
VFD3150C63B-00 VFD3150C63B-21	353	292	222	500	170M6058
VFD4000C63B-00 VFD4000C63B-21	454	353	292	700	170M6061
VFD4500C63B-00 VFD4500C63B-21	469	388	313	800	170M6062
VFD5600C63B-00 VFD5600C63B-21	595	504	423	1250	170M6066
VFD6300C63B-00 VFD6300C63B-21	681	681	681	1400	170M6067

Table 7-18

7-4 AC / DC Reactor

AC Input Reactor

Installing an AC reactor on the input side of an AC motor drive can increase line impedance, improve the power factor, reduce input current, increase system capacity, and reduce interference generated from the motor drive. It also reduces momentary voltage surges or abnormal current spikes from the mains power, further protecting the drive. For example, when the main power capacity is higher than 500 kVA, or when using a phase-compensation capacitor, momentary voltage and current spikes may damage the AC motor drive's internal circuit. An AC reactor on the input side of the AC motor drive protects it by suppressing surges.

Installation

Install an AC input reactor in series between the main power and the three input phases R S T, as shown in the figure below:

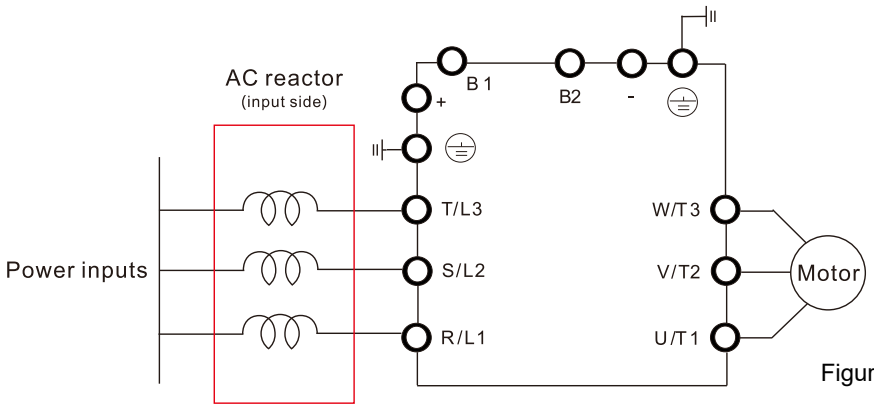


Figure 7-6 Wiring of AC input reactor

Applicable Reactors

200V–230V, 50/60 Hz / Heavy Duty

Model	HP	Rated Current (Arms)	Saturation current (Arms)	3% impedance (mH)	5% impedance (mH)	Built-in DC reactor	Input AC reactor Delta part #	Weight (kg)	Heat Dissipation (W)
VFD007C23A-21	1	5	9	2.536	4.227	No	DR005A0254	1.2	21
VFD015C23A-21	2	8	14.4	1.585	2.642	No	DR008A0159	1.7	37
VFD022C23A-21	3	11	19.8	1.152	1.922	No	DR011A0115	2.5	38
VFD037C23A-21	5	17	30.6	0.746	1.243	No	DR017AP746	3.2	40
VFD055C23A-21	7.5	25	45	0.507	0.845	No	DR025AP507	3.8	61
VFD075C23A-21	10	33	59.4	0.32	0.534	No	DR033AP320	4.5	60
VFD110C23A-21	15	49	88.2	0.216	0.359	No	DR049AP215	6.5	70
VFD150C23A-21	20	65	117	0.163	0.271	No	DR065AP162	8.5	83
VFD185C23A-21	25	75	135	0.169	0.282	No	DR075AP170	10	150
VFD220C23A-21	30	90	162	0.141	0.235	No	DR090AP141	11.5	120
VFD300C23A-00 VFD300C23A-21	40	120	216	0.106	0.176	Yes	DR146AP087	22	110
VFD370C23A-00 VFD370C23A-21	50	146	262.8	0.087	0.145	Yes	DR146AP087	22	110
VFD450C23A-00 VFD450C23A-21	60	180	324	0.070	0.117	Yes	DR180AP070	26	120
VFD550C23A-00 VFD550C23A-21	75	215	387	0.059	0.098	Yes	DR215AP059	30	150

Model	HP	Rated Current (Arms)	Saturation current (Arms)	3% impedance (mH)	5% impedance (mH)	Built-in DC reactor	Input AC reactor Delta part #	Weight (kg)	Heat Dissipation (W)
VFD750C23A-00 VFD750C23A-21	100	255	459	0.049	0.083	Yes	DR276AP049	37	200
VFD900C23A-00 VFD900C23A-21	125	346	622.8	0.037	0.061	Yes	DR346AP037	40	240

Table 7-19

200V–230V, 50/60 Hz / Super Heavy Duty

Model	HP	Rated Current (Arms)	Saturation current (Arms)	3% impedance (mH)	5% impedance (mH)	Built-in DC reactor	Input AC reactor Delta part #	Weight (kg)	Heat Dissipation (W)
VFD007C23A-21	1	3	6	4.227	7.045	No	N/A	N/A	N/A
VFD015C23A-21	2	5	10	2.536	4.227	No	DR005A0254	1.2	21
VFD022C23A-21	3	8	16	1.585	2.642	No	DR008A0159	1.7	37
VFD037C23A-21	5	11	22	1.152	1.922	No	DR011A0115	2.5	38
VFD055C23A-21	7.5	17	34	0.746	1.243	No	DR017AP746	3.2	40
VFD075C23A-21	10	25	50	0.507	0.845	No	DR025AP507	3.8	61
VFD110C23A-21	15	33	66	0.32	0.534	No	DR033AP320	4.5	60
VFD150C23A-21	20	49	98	0.216	0.359	No	DR049AP215	6.5	70
VFD185C23A-21	25	65	130	0.163	0.271	No	DR065AP162	8.5	83
VFD220C23A-21	30	75	150	0.169	0.282	No	DR075AP170	10	150
VFD300C23A-00 VFD300C23A-21	40	90	180	0.141	0.235	Yes	DR090AP141	11.5	120
VFD370C23A-00 VFD370C23A-21	50	120	240	0.106	0.176	Yes	DR146AP087	22	110
VFD450C23A-00 VFD450C23A-21	60	146	292	0.087	0.145	Yes	DR146AP087	22	110
VFD550C23A-00 VFD550C23A-21	75	180	360	0.07	0.117	Yes	DR180AP070	26	120
VFD750C23A-00 VFD750C23A-21	100	215	430	0.059	0.098	Yes	DR215AP059	30	150
VFD900C23A-00 VFD900C23A-21	125	255	510	0.049	0.083	Yes	DR276AP049	37	200

Table 7-20

380V–460V, 50/60 Hz / Heavy Duty

Model	HP	Rated Current (Arms)	Saturation current (Arms)	3% impedance (mH)	5% impedance (mH)	Built-in DC reactor	Input AC reactor Delta part #	Weight (kg)	Heat Dissipation (W)
VFD007C43A-21	1	3	5.4	8.102	13.502	No	DR003A0810	1.5	20
VFD015C43A-21	2	4	7.2	6.077	10.127	No	DR004A0607	1.8	21
VFD022C43A-21	3	6	10.8	4.050	6.752	No	DR006A0405	2.8	31
VFD037C43A-21	5	9	16.2	2.700	4.501	No	DR009A0270	3.5	40
VFD040C43A-21	5	10.5	18.9	2.315	3.858	No	DR010A0231	4.5	50
VFD055C43A-21	7.5	12	21.6	2.025	3.375	No	DR012A0202	4.8	50
VFD075C43A-21	10	18	32.4	1.174	1.957	No	DR018A0117	5.3	54
VFD110C43A-21	15	24	43.2	0.881	1.468	No	DR024AP881	5.8	60
VFD150C43A-21	20	32	57.6	0.66	1.101	No	DR032AP660	9	80
VFD185C43A-21	25	38	68.4	0.639	1.066	No	DR038AP639	9.5	85
VFD220C43A-21	30	45	81	0.541	0.900	No	DR045AP541	10.5	95
VFD300C43A-21	40	60	108	0.405	0.675	No	DR060AP405	11.5	100
VFD370C43S-00 VFD370C43S-21	50	73	131.4	0.334	0.555	Yes	DR073AP334	25	115

Model	HP	Rated Current (Arms)	Saturation current (Arms)	3% impedance (mH)	5% impedance (mH)	Built-in DC reactor	Input AC reactor Delta part #	Weight (kg)	Heat Dissipation (W)
VFD450C43S-00 VFD450C43S-21	60	91	163.8	0.267	0.445	Yes	DR091AP267	25	130
VFD550C43A-00 VFD550C43A-21	75	110	198	0.221	0.368	Yes	DR110AP221	28	150
VFD750C43A-00 VFD750C43A-21	100	150	270	0.162	0.270	Yes	DR150AP162	35	170
VFD900C43A-00 VFD900C43A-21	125	180	324	0.135	0.225	Yes	DR180AP135	42	190
VFD1100C43A-00 VFD1100C43A-21	150	220	396	0.110	0.184	Yes	DR220AP110	45	230
VFD1320C43A-00 VFD1320C43A-21	175	260	468	0.098	0.162	Yes	DR260AP098	55	280
VFD1600C43A-00 VFD1600C43A-21	215	310	558	0.078	0.131	Yes	DR310AP078	60	300
VFD1850C43A-00 VFD1850C43A-21	250	370	666	0.066	0.109	Yes	DR370AP066	75	340
VFD2000C43A-00 VFD2000C43A-21	270	395	474	0.061	0.1	Yes	DR460AP054*1	85	400
VFD2200C43A-00 VFD2200C43A-21	300	460	828	0.054	0.090	Yes	DR460AP054	85	400
VFD2500C43A-00 VFD2500C43A-21	340	481	578	0.052	0.086	Yes	DR550AP044*1	95	430
VFD2800C43A-00 VFD2800C43C-21	375	550	990	0.044	0.074	Yes	DR550AP044	95	430
VFD3150C43A-00 VFD3150C43C-21	420	616	1108.8	0.039	0.066	Yes	DR616AP039	110	450
VFD3550C43A-00 VFD3550C43C-21	475	683	1229.4	0.036	0.060	Yes	DR683AP036	130	480
VFD4000C43A-00 VFD4000C43A-21	530	770	924	0.028	0.047	Yes	DR866AP028	170	610
VFD4500C43A-00 VFD4500C43C-21	600	866	1558.8	0.028	0.047	Yes	DR866AP028	170	610
VFD5000C43A-00 VFD5000C43C-21	650	930	1674	0.026	0.044	Yes	N/A	N/A	N/A
VFD5600C43A-00 VFD5600C43C-21	750	1094	1969.2	0.022	0.037	Yes	N/A	N/A	N/A

. Table 7-21

NOTE: *1: The inductance value for the above applications of Delta's reactors will be close to, but less than 3%

380V–460V, 50/60 Hz / Super Heavy Duty

Model	HP	Rated Current (Arms)	Saturation current (Arms)	3% impedance (mH)	5% impedance (mH)	Built-in DC reactor	Input AC reactor Delta part #	Weight (kg)	Heat Dissipation (W)
VFD007C43A-21	1	1.7	3.4	14.298	23.827	No	N/A	N/A	N/A
VFD015C43A-21	2	3	6	8.102	13.502	No	DR003A0810	1.5	20
VFD022C43A-21	3	4	8	6.077	10.127	No	DR004A0607	1.8	21
VFD037C43A-21	5	6	12	4.05	6.752	No	DR006A0405	2.8	31
VFD040C43A-21	5	9	18	2.7	4.501	No	DR009A0270	3.5	40
VFD055C43A-21	7.5	10.5	21	2.315	3.858	No	DR010A0231	4.5	50
VFD075C43A-21	10	12	24	2.025	3.375	No	DR012A0202	4.8	50
VFD110C43A-21	15	18	36	1.174	1.957	No	DR018A0117	5.3	54
VFD150C43A-21	20	24	48	0.881	1.468	No	DR024AP881	5.8	60
VFD185C43A-21	25	32	64	0.66	1.101	No	DR032AP660	9	80
VFD220C43A-21	30	38	76	0.639	1.066	No	DR038AP639	9.5	85
VFD300C43A-21	40	45	90	0.541	0.9	No	DR045AP541	10.5	95
VFD370C43S-00 VFD370C43S-21	50	60	120	0.405	0.675	Yes	DR060AP405	11.5	100
VFD450C43S-00 VFD450C43S-21	60	73	146	0.334	0.555	Yes	DR073AP334	25	115

Model	HP	Rated Current (Arms)	Saturation current (Arms)	3% impedance (mH)	5% impedance (mH)	Built-in DC reactor	Input AC reactor Delta part #	Weight (kg)	Heat Dissipation (W)
VFD550C43A-00 VFD550C43A-21	75	91	182	0.267	0.445	Yes	DR091AP267	25	130
VFD750C43A-00 VFD750C43A-21	100	110	220	0.221	0.368	Yes	DR110AP221	28	150
VFD900C43A-00 VFD900C43A-21	125	150	300	0.162	0.27	Yes	DR150AP162	35	170
VFD1100C43A-00 VFD1100C43A-21	150	180	360	0.135	0.225	Yes	DR180AP135	42	190
VFD1320C43A-00 VFD1320C43A-21	175	220	440	0.11	0.184	Yes	DR220AP110	45	230
VFD1600C43A-00 VFD1600C43A-21	215	260	520	0.098	0.162	Yes	DR260AP098	55	280
VFD1850C43A-00 VFD1850C43A-21	250	310	620	0.078	0.131	Yes	DR310AP078	60	300
VFD2000C43A-00 VFD2000C43A-21	270	335	536	0.072	0.12	Yes	DR370AP066*1	75	340
VFD2200C43A-00 VFD2200C43A-21	300	370	740	0.066	0.109	Yes	DR370AP066	75	340
VFD2500C43A-00 VFD2500C43A-21	340	415	664	0.058	0.10	Yes	DR460AP054*1	85	400
VFD2800C43A-00 VFD2800C43C-21	375	460	920	0.054	0.09	Yes	DR460AP054	85	400
VFD3150C43A-00 VFD3150C43C-21	420	550	1100	0.044	0.074	Yes	DR550AP044	95	430
VFD3550C43A-00 VFD3550C43C-21	475	616	1232	0.039	0.066	Yes	DR616AP039	110	450
VFD4000C43A-00 VFD4000C43A-21	530	683	1092.8	0.036	0.06	Yes	DR683AP036	130	480
VFD4500C43A-00 VFD4500C43C-21	600	683	1366	0.036	0.06	Yes	DR683AP036	130	480
VFD5000C43A-00 VFD5000C43C-21	650	866	1732	0.028	0.047	Yes	DR866AP028	170	610
VFD5600C43A-00 VFD5600C43C-21	750	930	1860	0.026	0.044	Yes	N/A	N/A	N/A

Table 7-22

NOTE: *1: The inductance value for the above applications of Delta's reactors will be close to, but less than 3%.

575V, 50/60 Hz, Three-phase

kW	HP	Rated current (Arms)			Saturation Current (Arms)	3% impedance (mH)			5% impedance (mH)		
		Light Duty	Normal Duty	Heavy Duty		Light Duty	Normal Duty	Heavy Duty	Light Duty	Normal Duty	Heavy Duty
VFD015C53A-21	2	3	2.5	2.1	4.2	8.806	10.567	12.580	14.677	17.612	20.967
VFD022C53A-21	3	4.3	3.6	3	5.9	6.144	7.338	8.806	10.239	12.230	14.677
VFD037C53A-21	5	6.7	5.5	4.6	9.1	3.943	4.803	5.743	6.572	8.005	9.572
VFD055C53A-21	7.5	9.9	8.2	6.9	13.7	2.668	3.222	3.829	4.447	5.369	6.381
VFD075C53A-21	10	12.1	10	8.3	16.5	2.183	2.642	3.183	3.639	4.403	5.305
VFD110C53A-21	15	18.7	15.5	13	25.7	1.413	1.704	2.032	2.355	2.841	3.387
VFD150C53A-21	20	24.2	20	16.8	33.3	1.092	1.321	1.572	1.819	2.201	2.621

Table 7-23

690V, 50/60 Hz, Three-phase

kW	HP	Rated current (Arms)			Saturation Current (Arms)			3% Impedance (mH)			5% Impedance (mH)		
		Light Duty	Normal Duty	Heavy Duty	Light Duty	Normal Duty	Heavy Duty	Light Duty	Normal Duty	Heavy Duty	Light Duty	Normal Duty	Heavy Duty
VFD185C63B-21	25	24	20	14	28.8	30.0	25.2	1.585	1.902	2.717	2.642	3.170	4.529
VFD220C63B-21	30	30	24	20	36.0	36.0	36.0	1.268	1.585	1.902	2.113	2.642	3.170

kW	HP	Rated current (Arms)			Saturation Current (Arms)			3% Impedance (mH)			5% Impedance (mH)		
		Light Duty	Normal Duty	Heavy Duty	Light Duty	Normal Duty	Heavy Duty	Light Duty	Normal Duty	Heavy Duty	Light Duty	Normal Duty	Heavy Duty
VFD300C63B-21	40	36	30	24	43.2	45.0	43.2	1.057	1.268	1.585	1.761	2.113	2.642
VFD370C63B-21	50	45	36	30	54.0	54.0	54.0	0.845	1.057	1.268	1.409	1.761	2.113
VFD450C63B-00 VFD450C63B-21	60	54	45	36	64.8	67.5	64.8	0.704	0.845	1.057	1.174	1.409	1.761
VFD550C63B-00 VFD550C63B-21	75	67	54	45	80.4	81.0	81.0	0.568	0.704	0.845	0.946	1.174	1.409
VFD750C63B-00 VFD750C63B-21	100	86	67	54	103.2	100.5	97.2	0.442	0.568	0.704	0.737	0.946	1.174
VFD900C63B-00 VFD900C63B-21	125	104	86	67	124.8	129.0	120.6	0.366	0.442	0.568	0.610	0.737	0.946
VFD1100C63B-00 VFD1100C63B-21	150	125	104	86	150.0	156.0	154.8	0.304	0.366	0.442	0.507	0.610	0.737
VFD1320C63B-00 VFD1320C63B-21	175	150	125	104	180.0	187.5	187.2	0.254	0.304	0.366	0.423	0.507	0.610
VFD1600C63B-00 VFD1600C63B-21	215	180	150	125	216.0	225.0	225.0	0.211	0.254	0.304	0.352	0.423	0.507
VFD2000C63B-00 VFD2000C63B-21	270	220	180	150	264.0	270.0	270.0	0.173	0.211	0.254	0.288	0.352	0.423
VFD2500C63B-00 VFD2500C63B-21	335	290	220	180	348.0	330.0	324.0	0.131	0.173	0.211	0.219	0.288	0.352
VFD3150C63B-00 VFD3150C63B-21	425	350	290	220	420.0	435.0	396.0	0.109	0.131	0.173	0.181	0.219	0.288
VFD4000C63B-00 VFD4000C63B-21	530	430	350	290	516.0	525.0	522.0	0.088	0.109	0.131	0.147	0.181	0.219
VFD4500C63B-00 VFD4500C63B-21	600	465	385	310	558.0	577.5	558.0	0.082	0.099	0.123	0.136	0.165	0.205
VFD5600C63B-00 VFD5600C63B-21	745	590	465	420	708.0	697.5	756.0	0.064	0.082	0.091	0.107	0.136	0.151
VFD6300C63B-00 VFD6300C63B-21	850	675	675	675	810.0	1012.5	1215.0	0.056	0.056	0.056	0.094	0.094	0.094

Table 7-24

AC input reactor dimension and specifications:

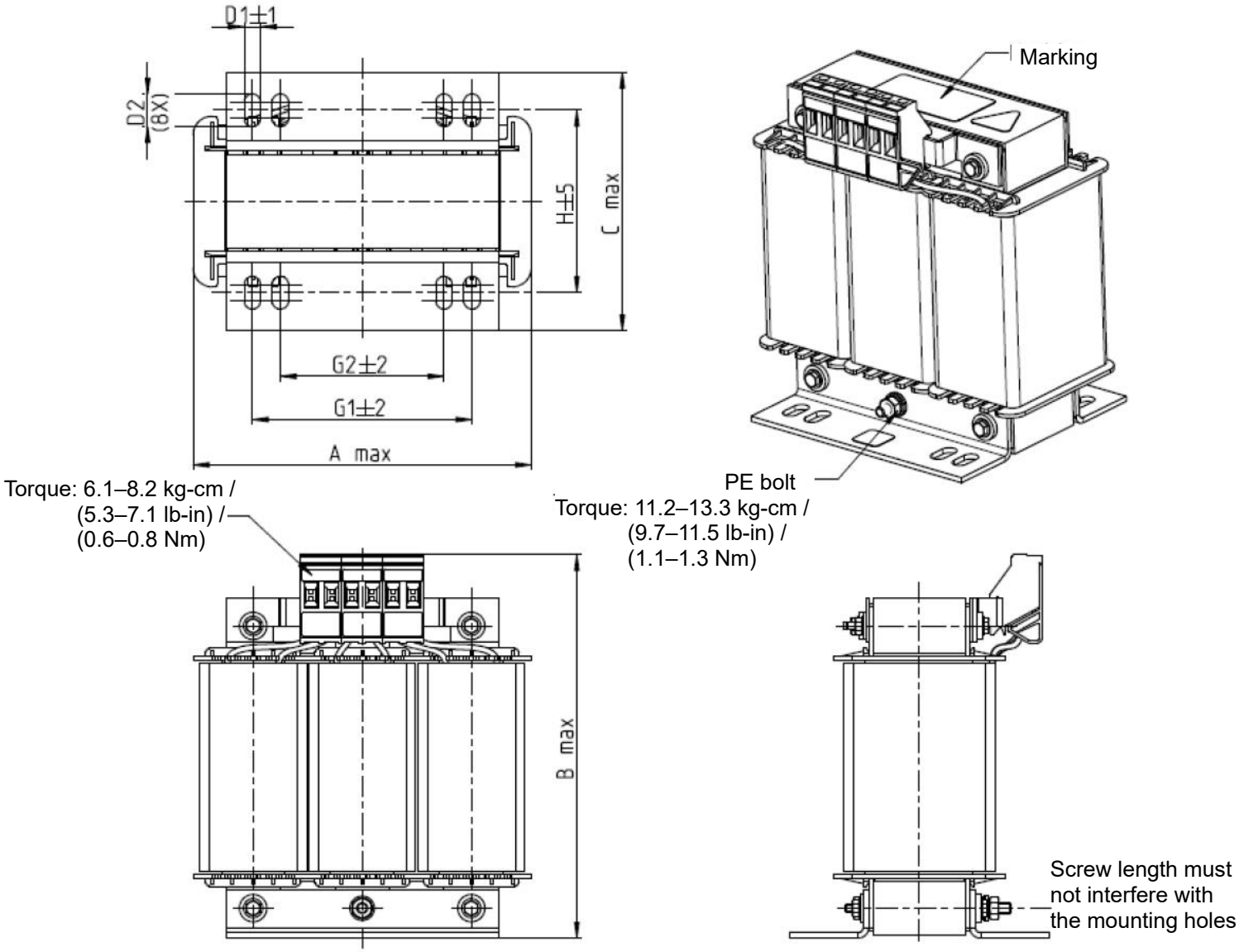


Figure 7-7

Unit: mm

AC Input Reactors Delta part #	A	B	C	D1*D2	H	G1	G2	PE D
DR005A0254	100	115	65	6*9	45	60	40	M4
DR008A0159	100	115	65	6*9	45	60	40	M4
DR011A0115	130	135	95	6*12	60	80.5	60	M4
DR017AP746	130	135	100	6*12	65	80.5	60	M4

Table 7-25

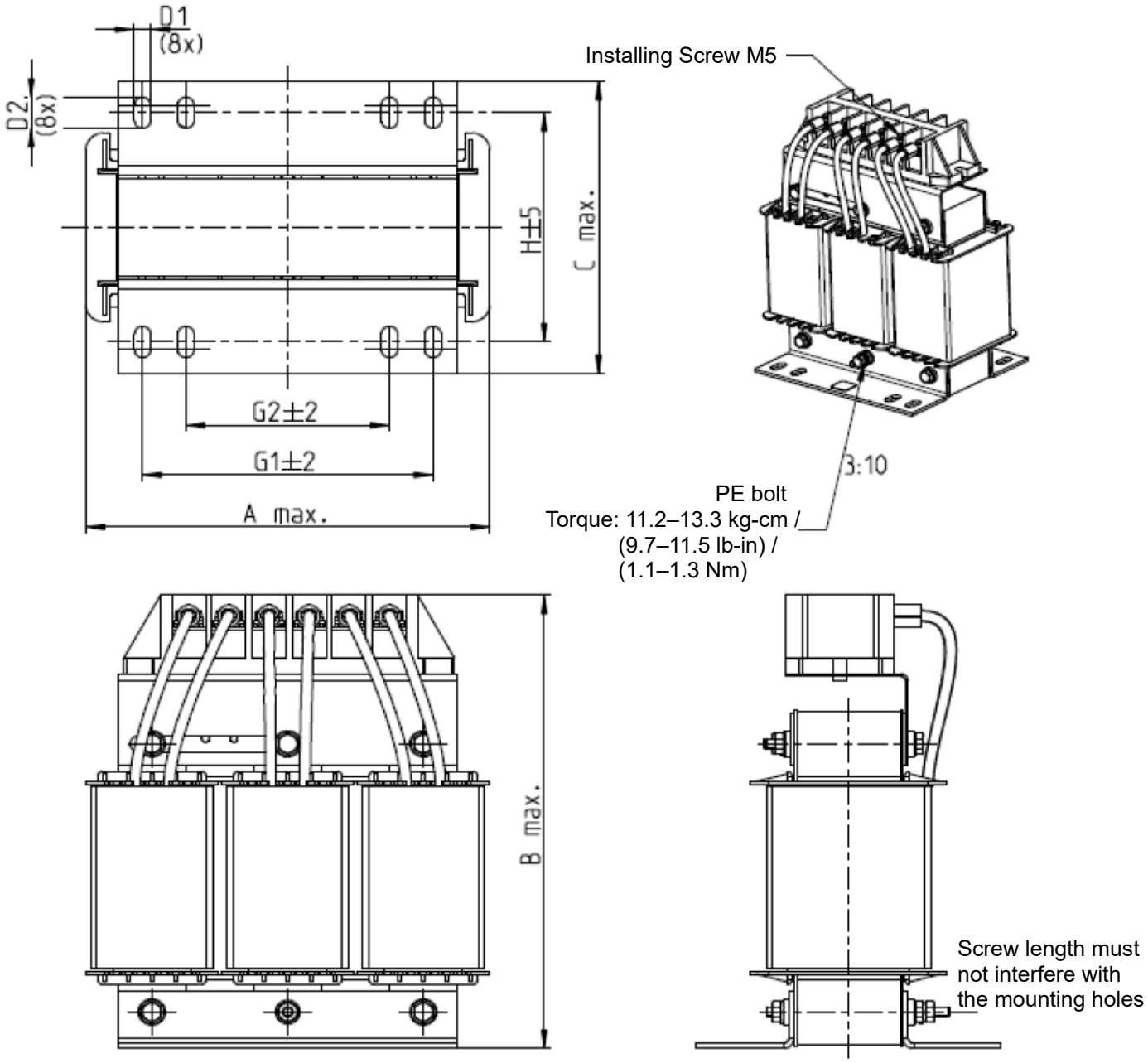


Figure 7-8

Unit: mm

AC Input Reactors Delta part #	A	B	C	D1*D2	H	G1	G2	PE D
DR025AP507	130	195	100	6*12	65	80.5	60	M4
DR033AP320	130	195	100	6*12	65	80.5	60	M4
DR049AP215	160	200	125	6*12	90	107	75	M4

Table 7-26

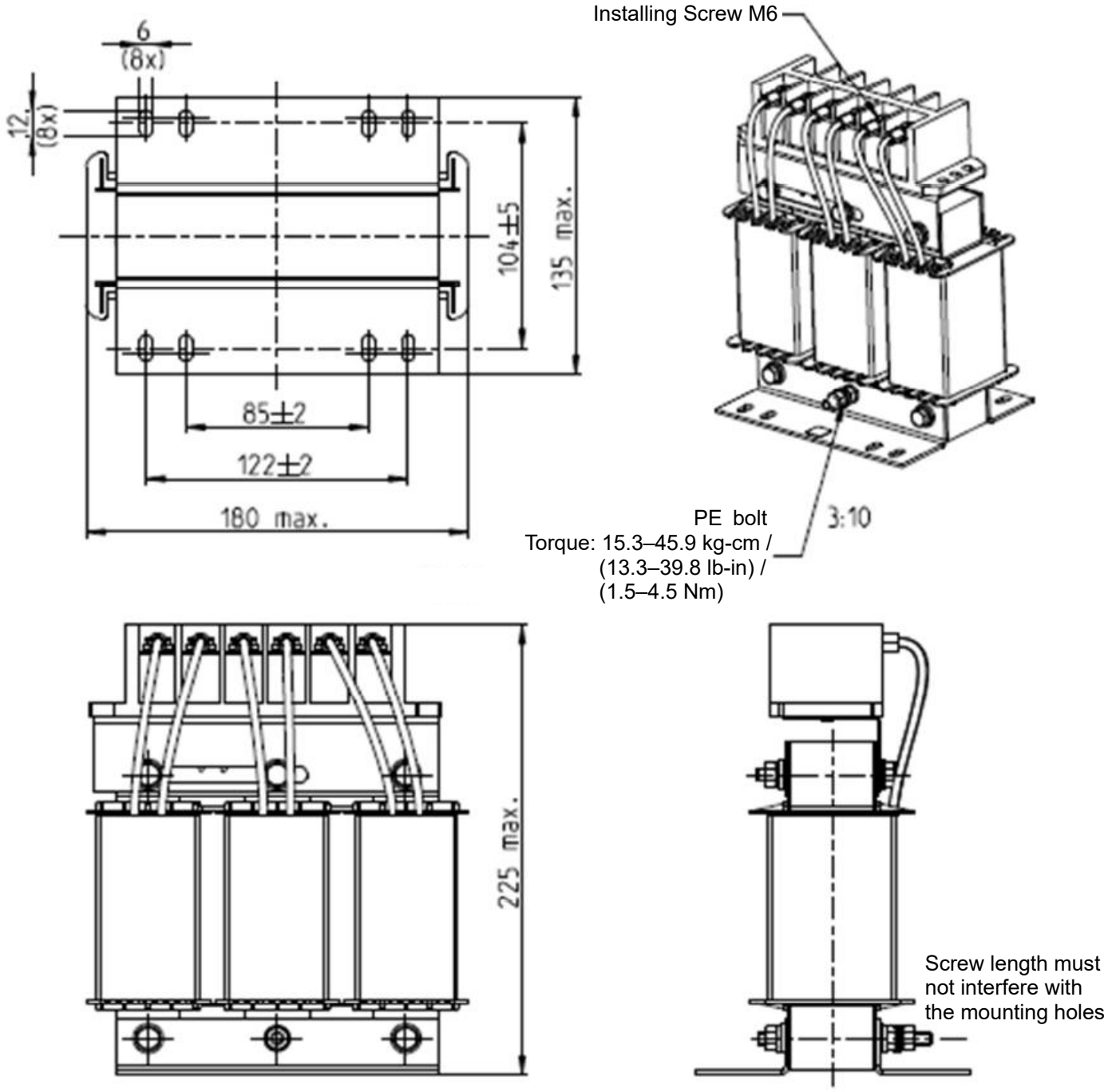


Figure 7-9

Unit: mm

AC Input Reactors Delta part #	A	B	C	D1*D2	H	G1	G2	PE D
DR065AP162	180	225	135	6*12	104	122	85	M6

Table 7-27

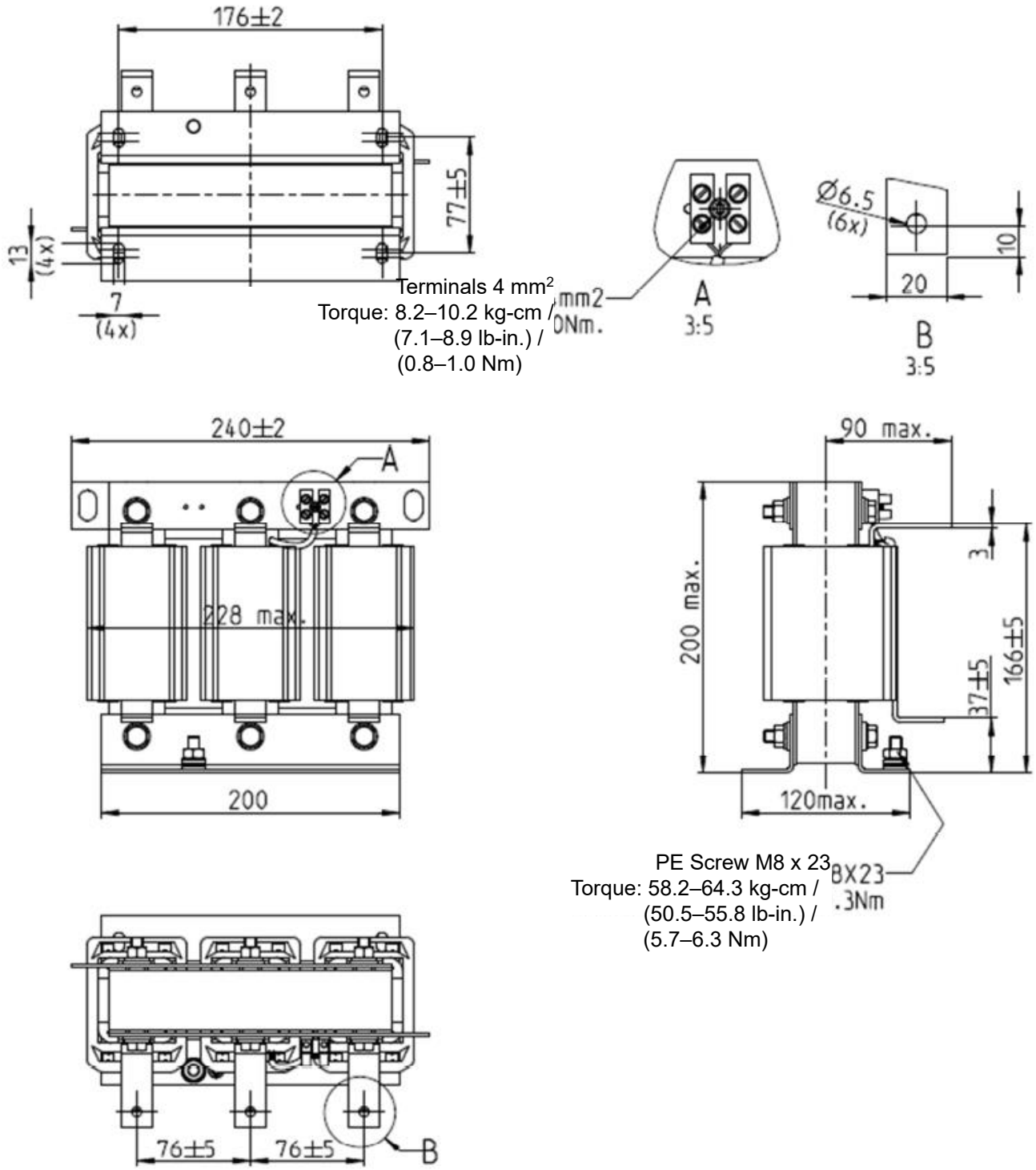


Figure 7-10

Unit: mm

AC Input Reactors Delta part #	Dimensions
DR075AP170	Dimensions are as shown in the figures above.

Table7-28

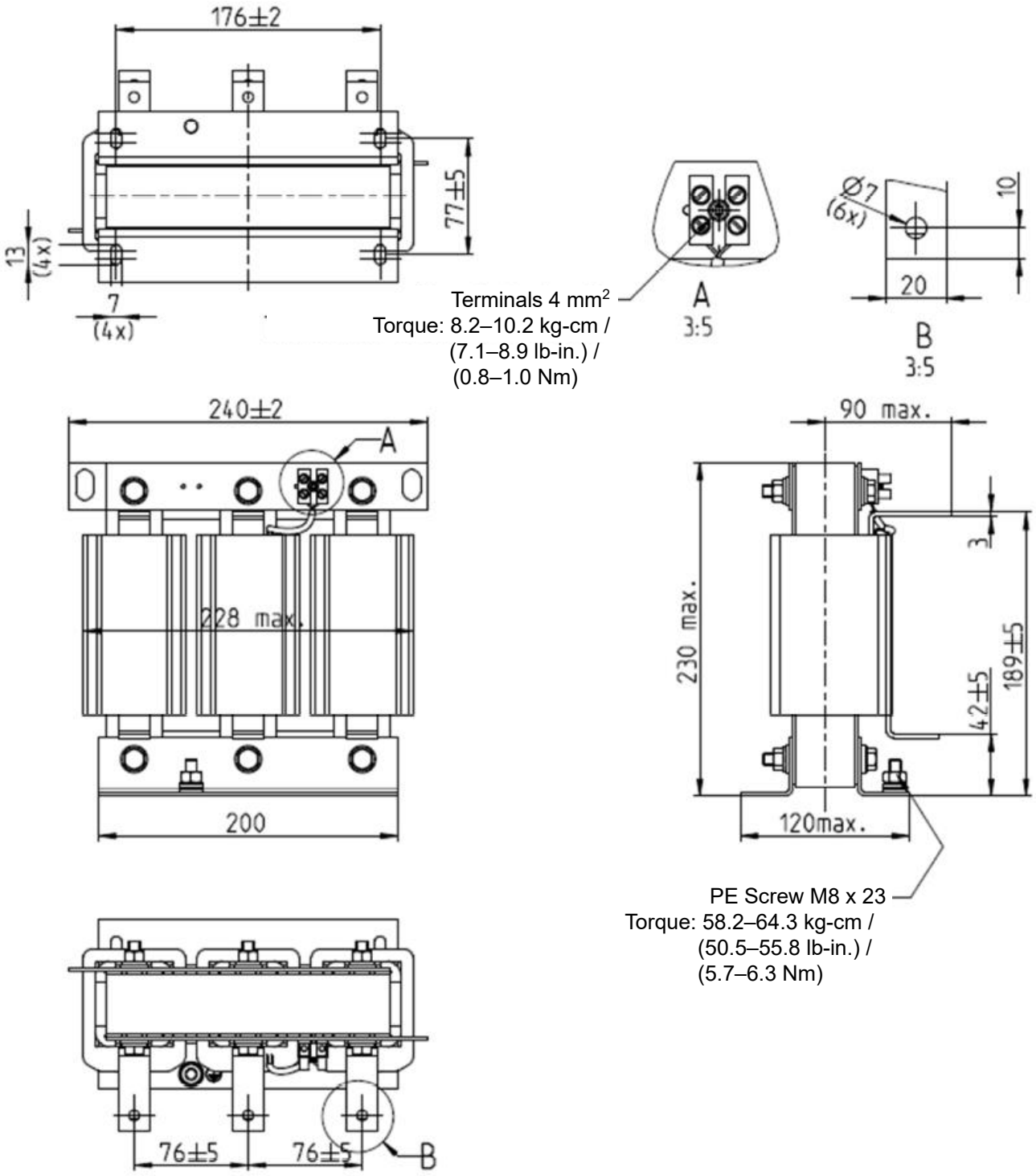


Figure 7-11

Unit: mm

AC Input Reactors Delta part #	Dimensions
DR090AP141	Dimensions are as shown in the figures above.

Table 7-29

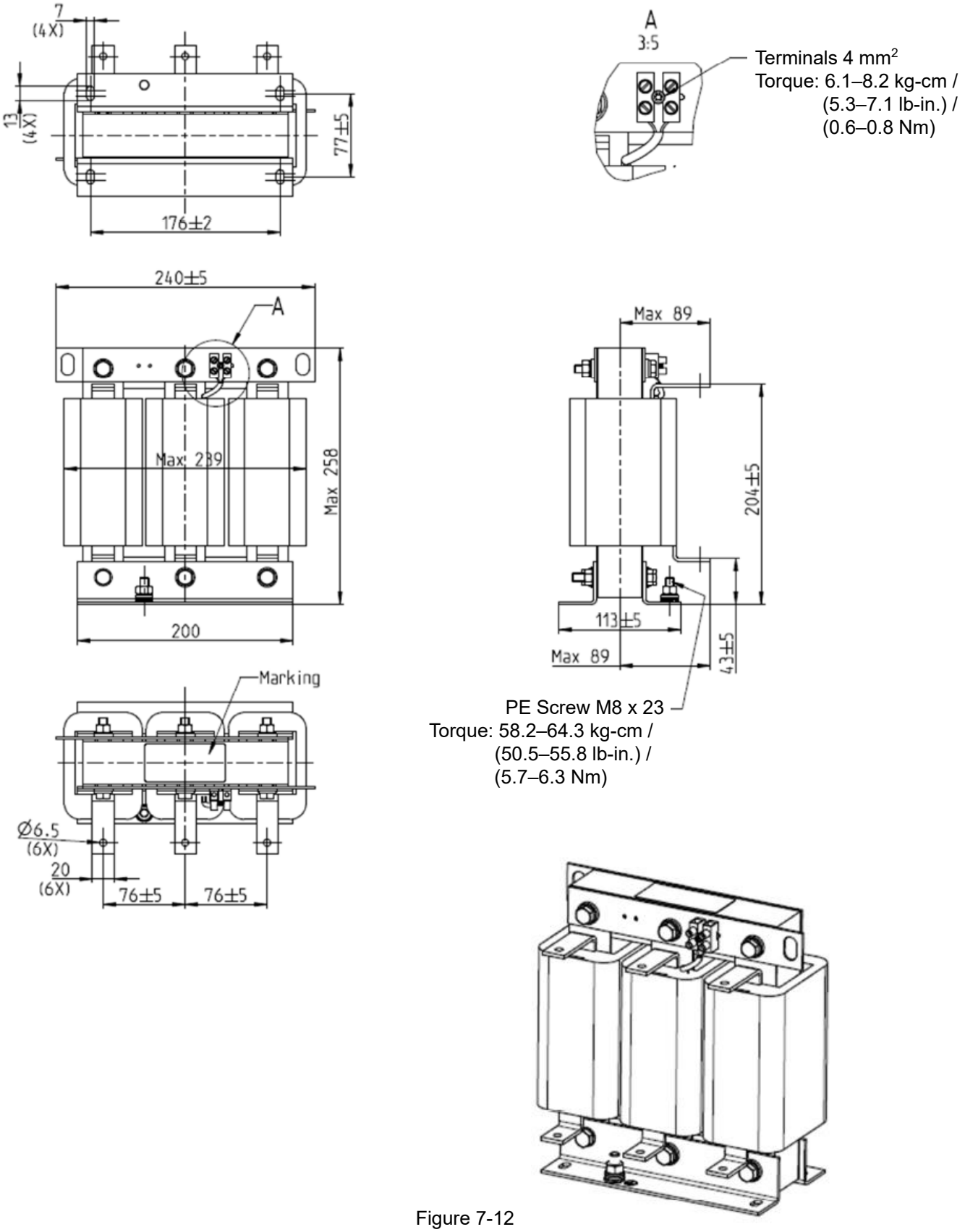


Figure 7-12

Unit: mm

AC Input Reactors Delta part #	Dimensions
DR146AP087	Dimensions are as shown in the figures above.

Table 7-30

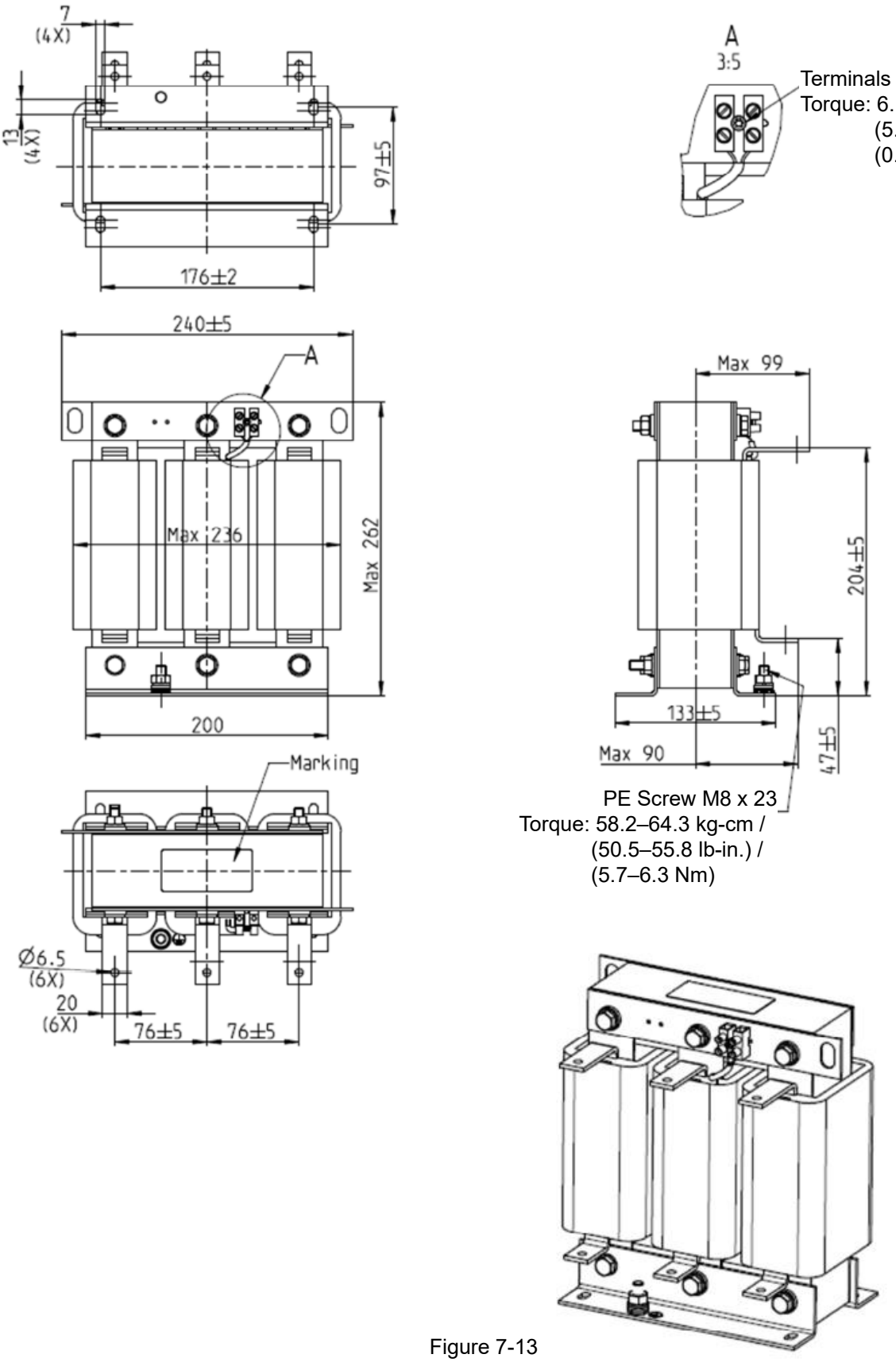


Figure 7-13

Unit: mm

AC Input Reactors Delta part #	Dimensions
DR180AP070	Dimensions are as shown in the figures above.

Table 7-31

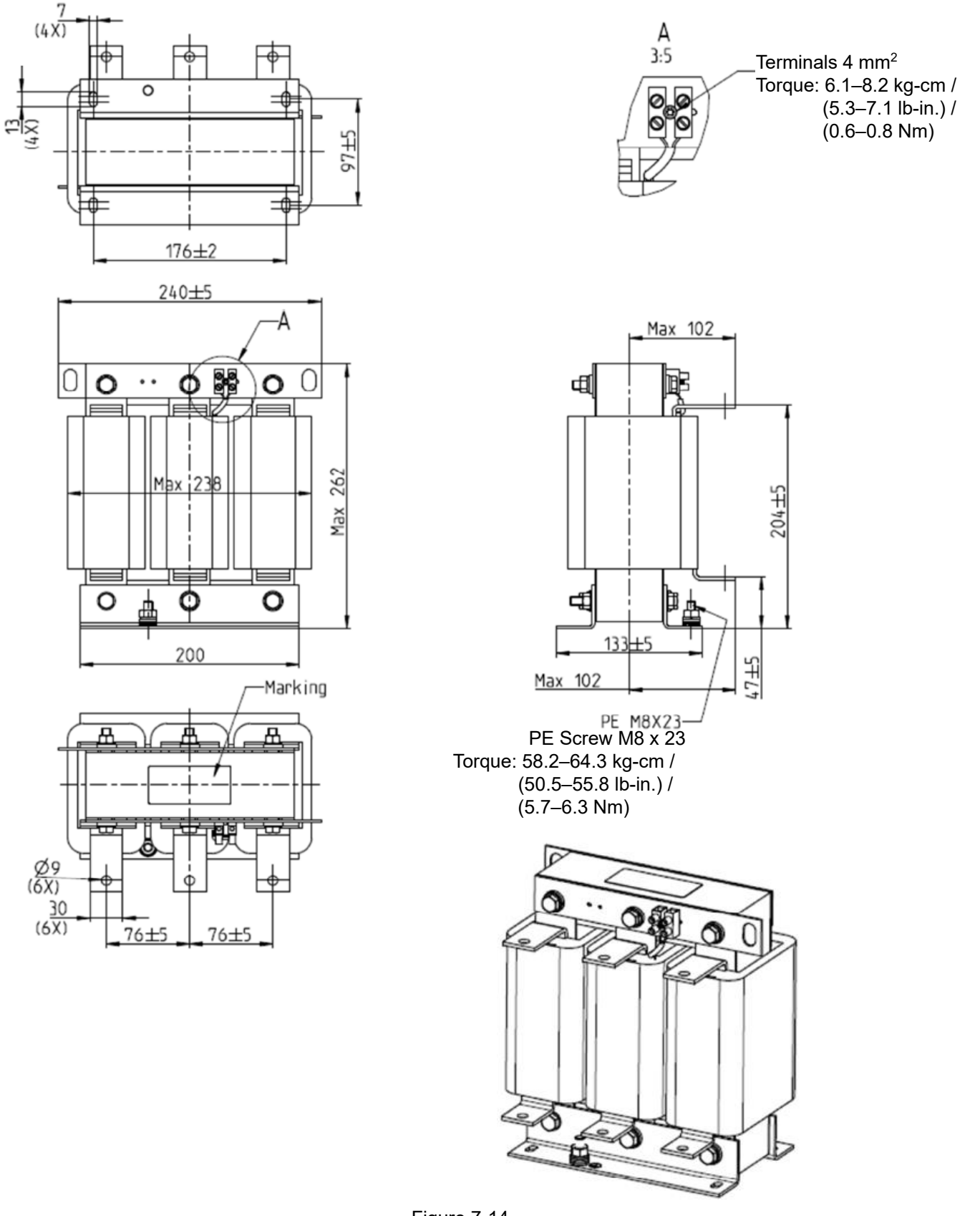


Figure 7-14

Unit: mm

AC Input Reactors Delta part #	Dimensions
DR215AP059	Dimensions are as shown in the figures above.

Table 7-32

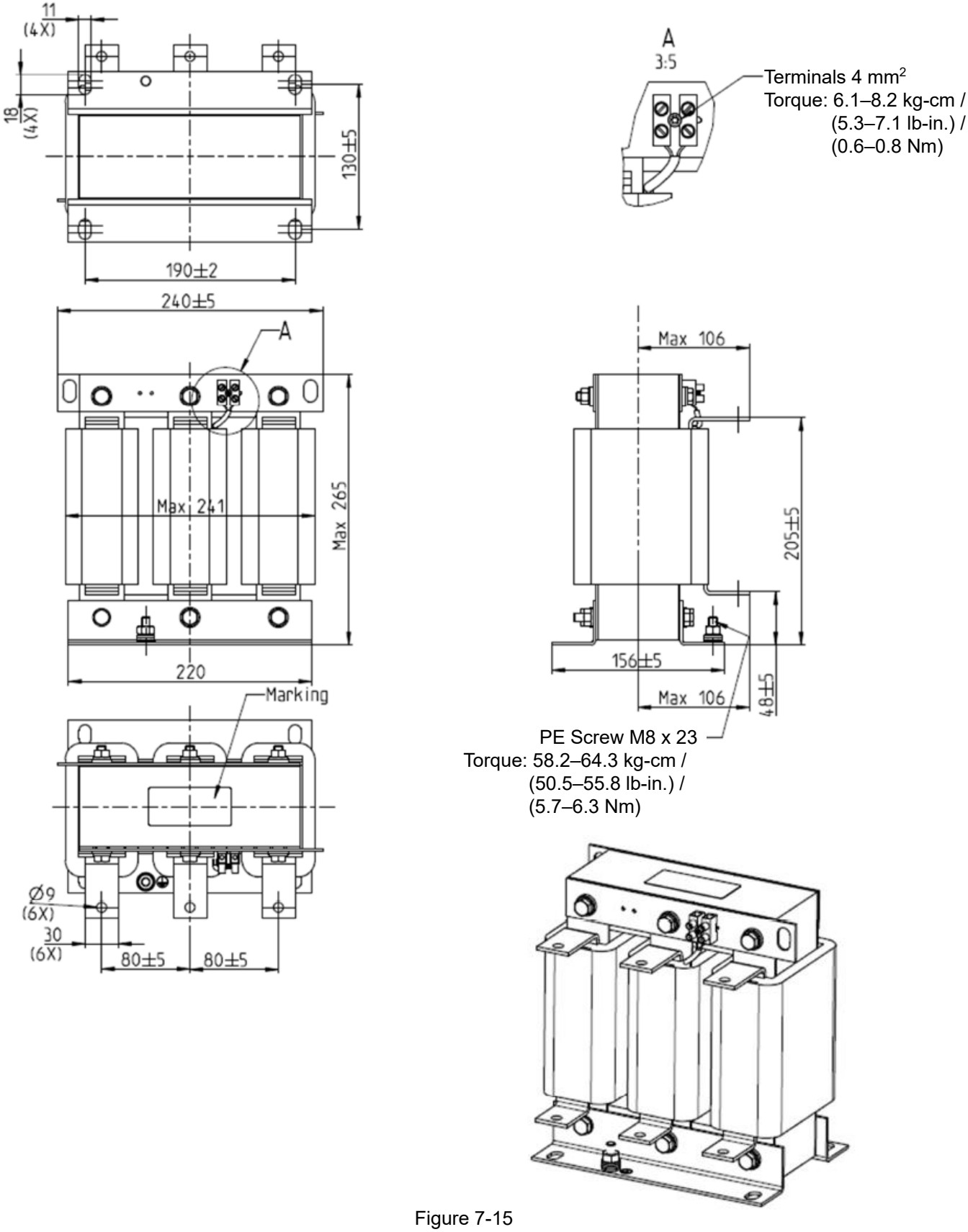


Figure 7-15

Unit: mm

AC Input Reactors Delta part #	Dimensions
DR276AP049	Dimensions are as shown in the figures above.

Table 7-33

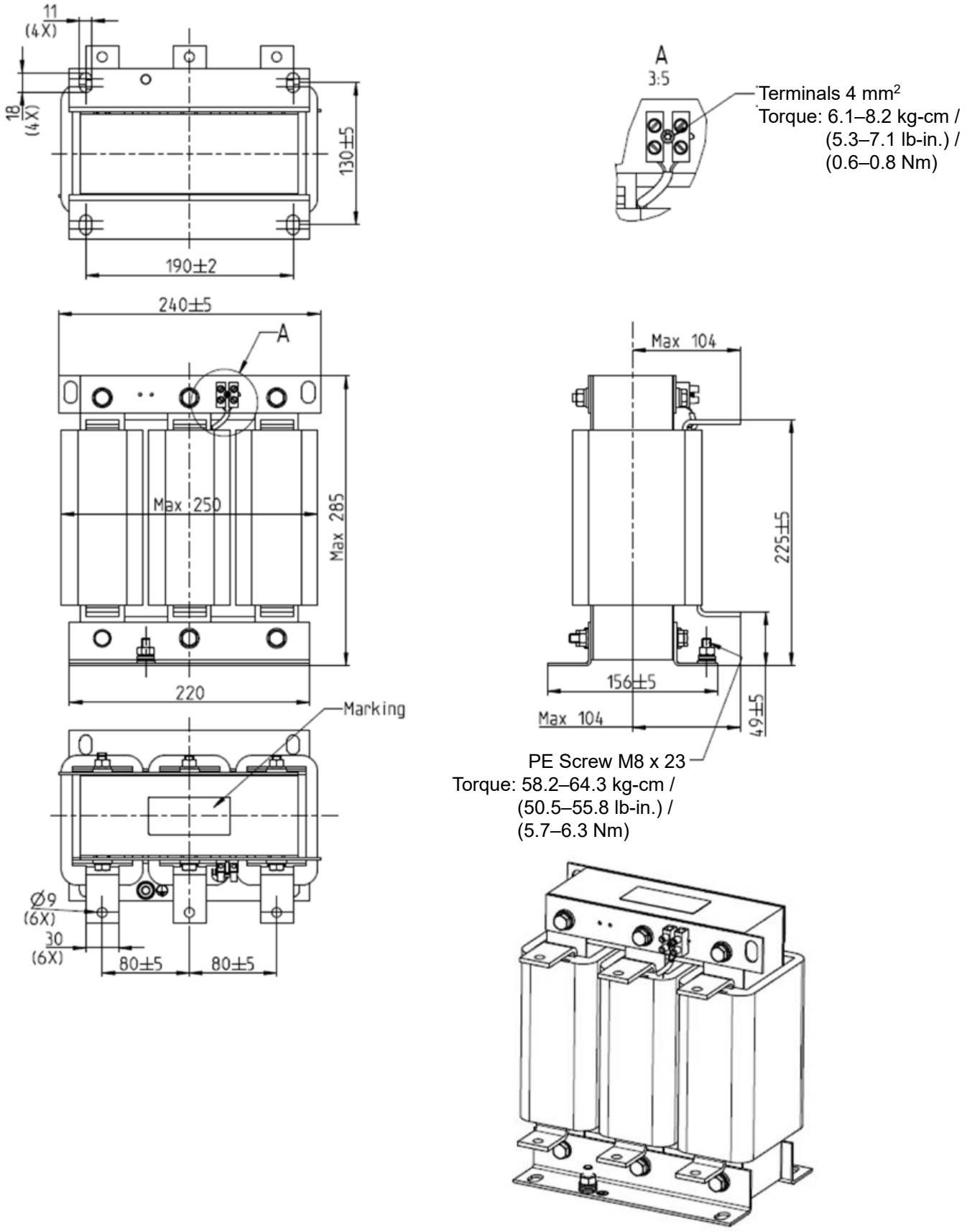


Figure 7-16

Unit: mm

AC Input Reactors Delta part #	Dimensions
DR346AP037	Dimensions are as shown in the figures above.

Table 7-34

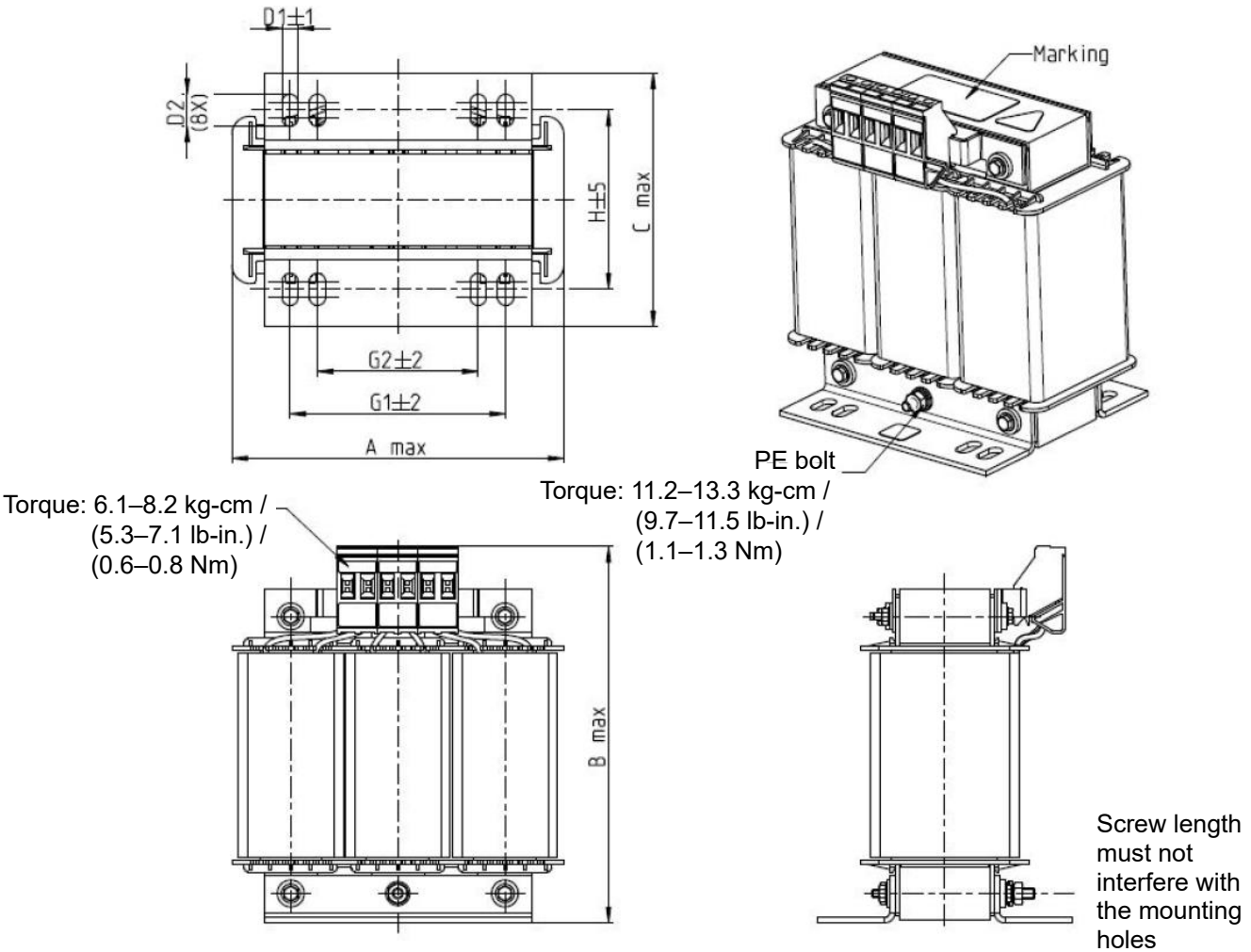


Figure 7-17

Unit: mm

AC Input Reactors Delta part #	A	B	C	D1*D2	H	G1	G2	PE D
DR003A0810	100	125	65	6*9	43	60	40	M4
DR004A0607	100	125	65	6*9	43	60	40	M4
DR006A0405	130	135	95	6*12	60	80.5	60	M4
DR009A0270	160	160	105	6*12	75	107	75	M4
DR010A0231	160	160	115	6*12	90	107	75	M4
DR012A0202	160	160	115	6*12	90	107	75	M4
DR018A0117	160	160	115	6*12	90	107	75	M4

Table 7-35

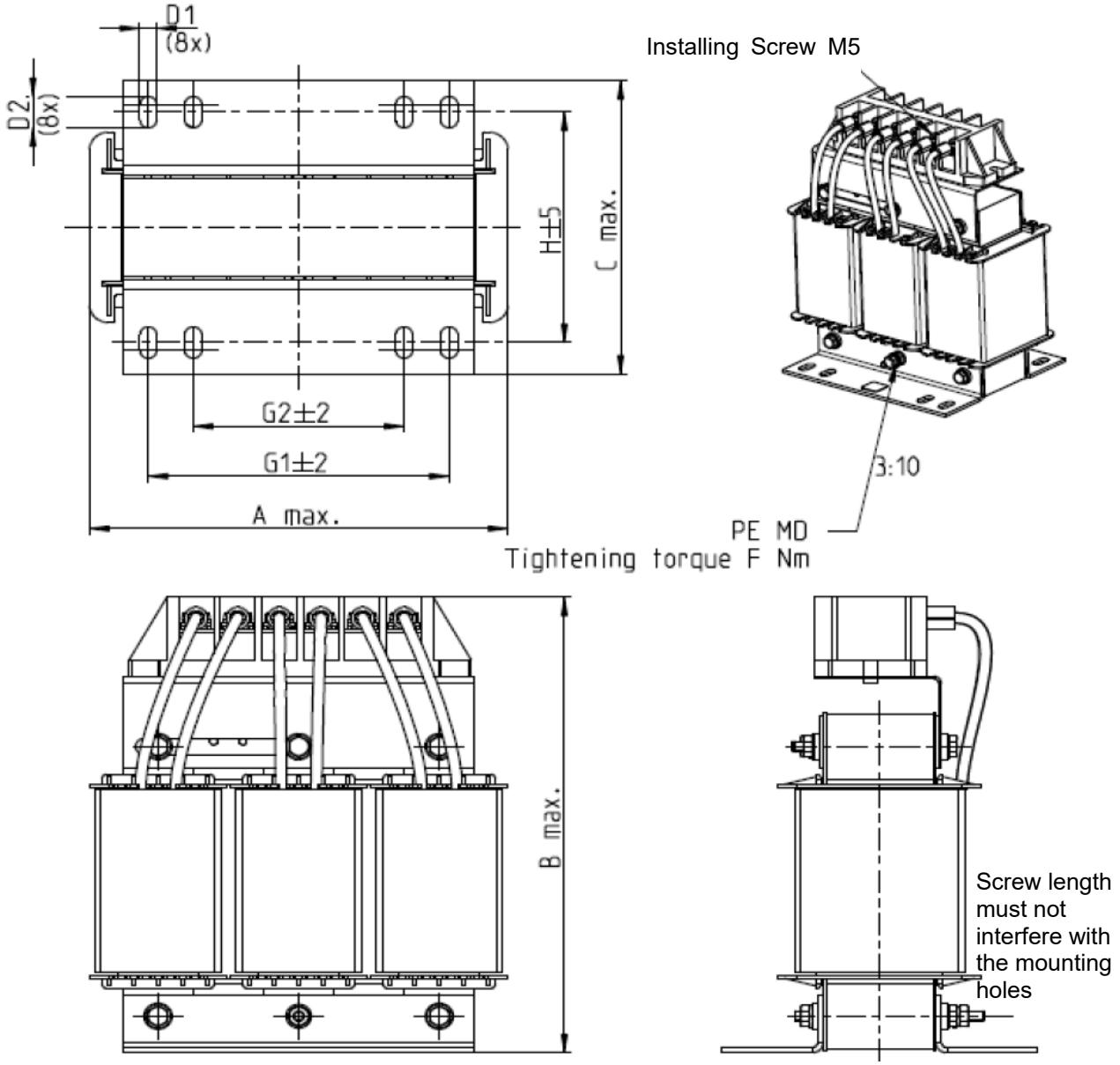


Figure 7-18

Unit: mm

AC Input Reactors Delta part #	A	B	C	D1*D2	H	G1	G2	PE D	F
DR024AP881	160	175	115	6*12	90	107	75	M4	11.2–13.3 kg-cm / (9.7–11.5 lb-in.) / (1.1–1.3 Nm)
DR032AP660	195	200	145	6*12	115	122	85	M6	29.1–32.1 kg-cm / (25.3–27.9 lb-in.) / (2.85–3.15 Nm)
DR038AP639	190	200	145	6*12	115	122	85	M6	
DR045AP541	190	200	145	6*12	115	122	85	M6	

Table 7-36

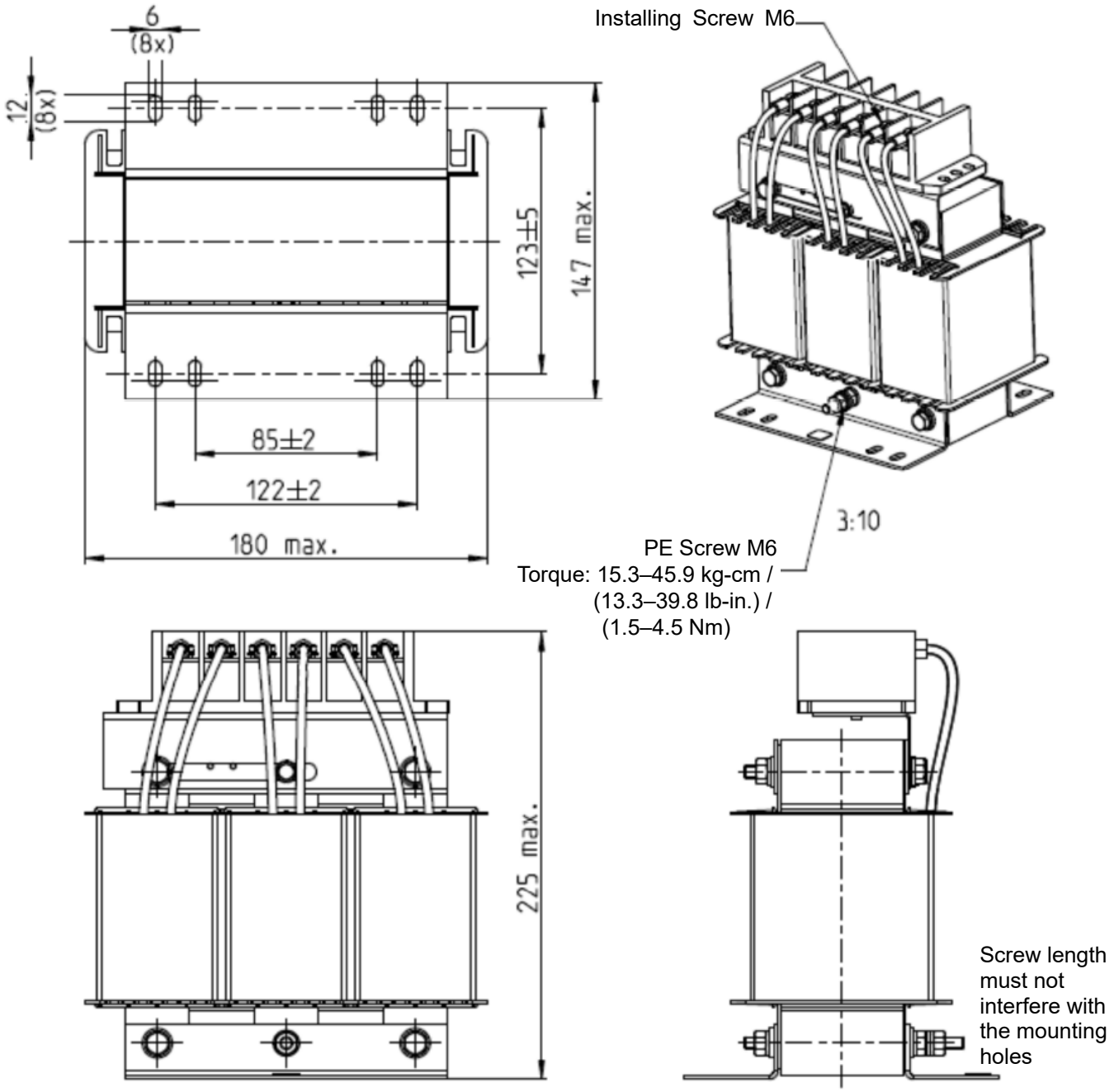


Figure 7-19

Unit: mm

AC Input Reactors Delta part #	Dimensions
DR060AP405	Dimensions are as shown in the figures above.

Table 7-37

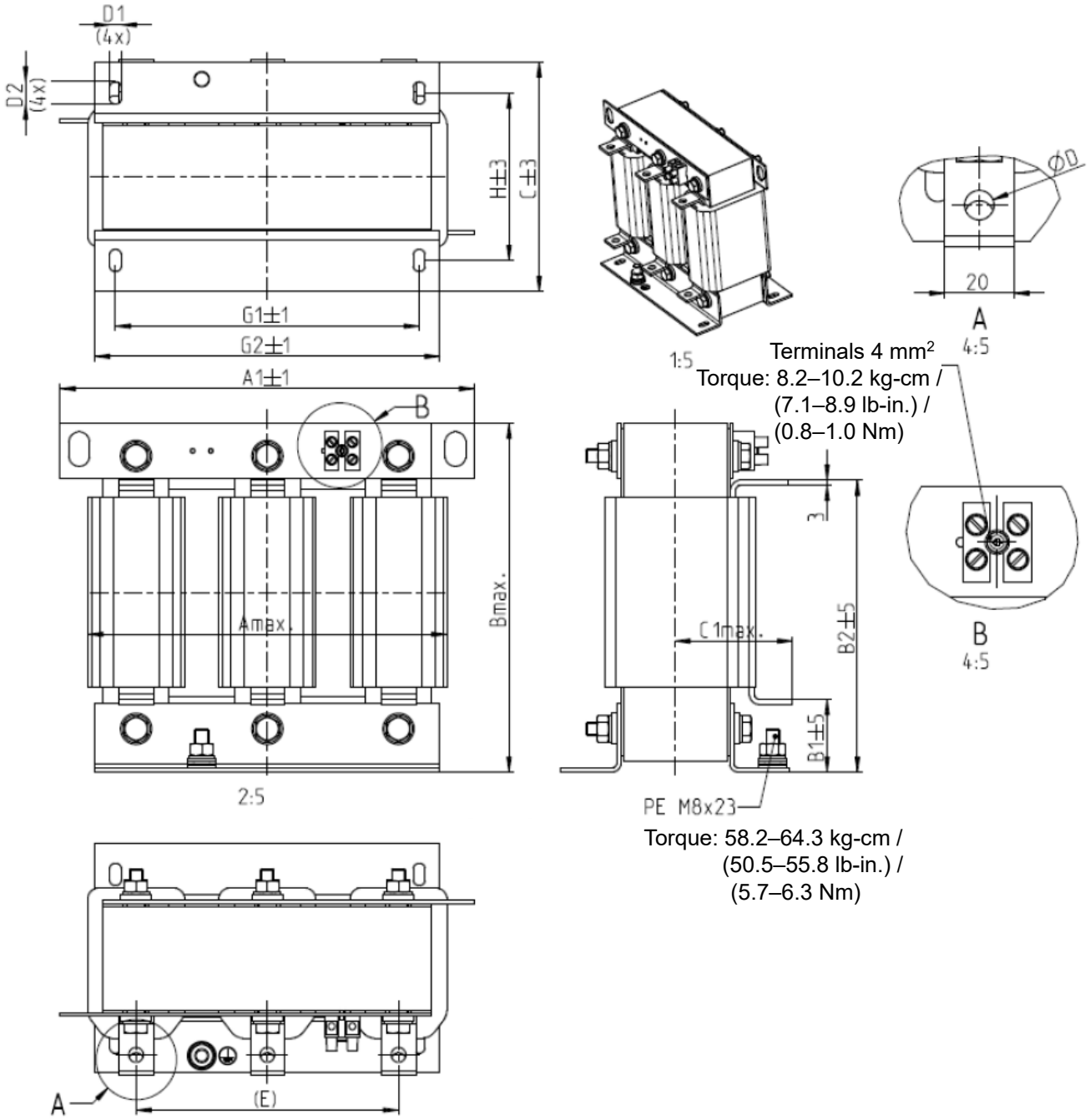


Figure 7-20

Unit: mm

AC Input Reactors Delta part #	A	A1	B	B1	B2	C	C1	D	D1*D2	E	G1	G2	H
DR073AP334	228	240	215	40	170	133	75	8.5	7*13	152	176	200	97
DR091AP267	228	240	245	40	195	133	90	8.8	7*13	152	176	200	97
DR110AP221	228	240	245	40	195	138	95	8.5	7*13	152	176	200	102

Table 7-38

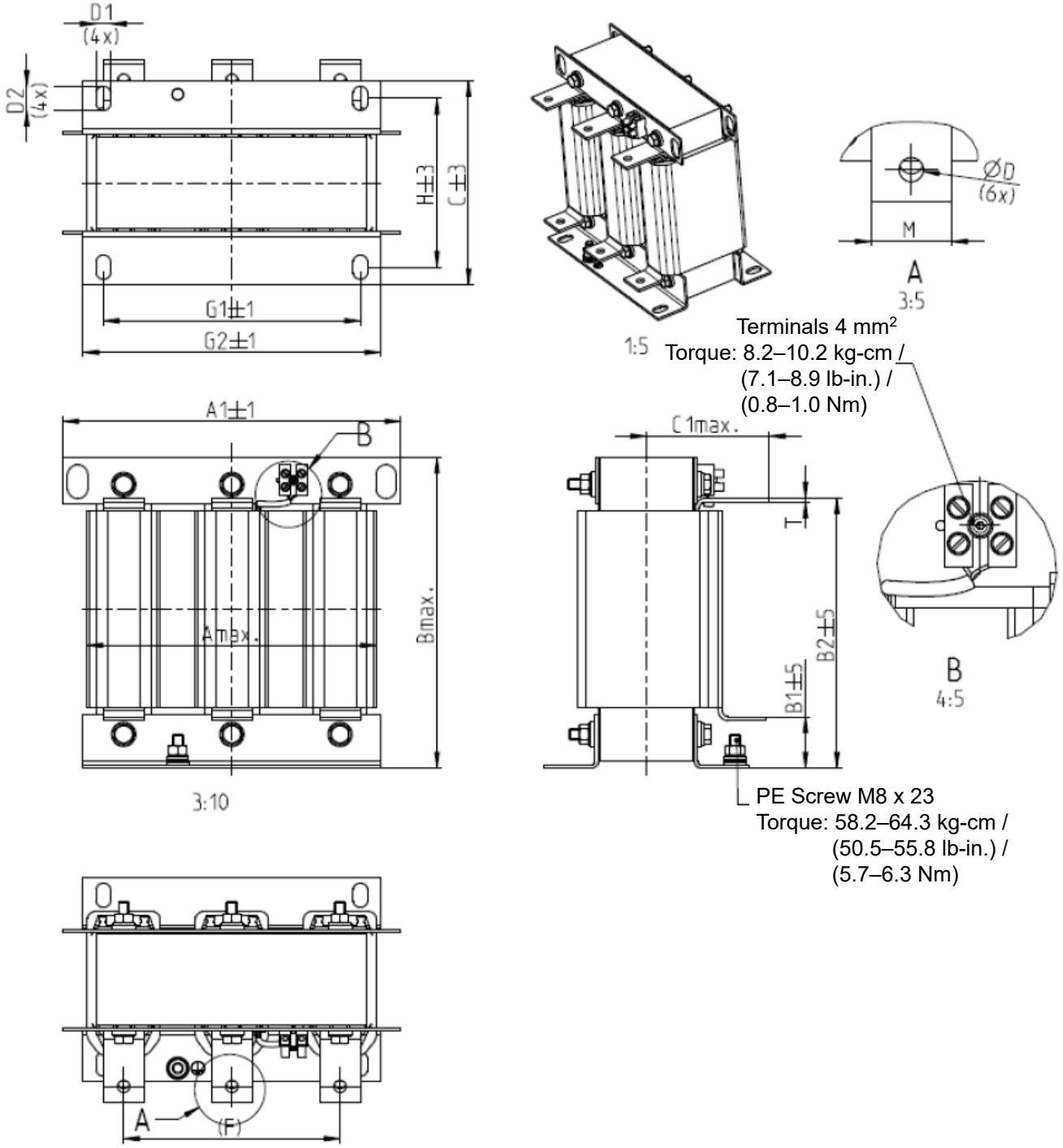


Figure 7-21

Unit: mm

AC Input Reactors Delta part #	A	A1	B	B1	B2	C	C1	D	D1*D2	F	G1	G2	H	M*T
DR150AP162	240	250	245	40	200	151	105	9	11*18	160	190	220	125	20*3
DR180AP135	240	250	245	40	200	151	105	9	11*18	160	190	220	125	20*3
DR220AP110	264	270	275	50	230	151	105	9	10*18	176	200	230	106	30*3
DR260AP098	264	270	285	50	240	151	105	9	10*18	176	200	230	106	30*3
DR310AP078	300	300	345	55	295	153	105	9	10*18	200	224	260	113	30*3
DR370AP066	300	300	345	55	295	158	120	9	10*18	200	224	260	118	50*4

Table 7-39

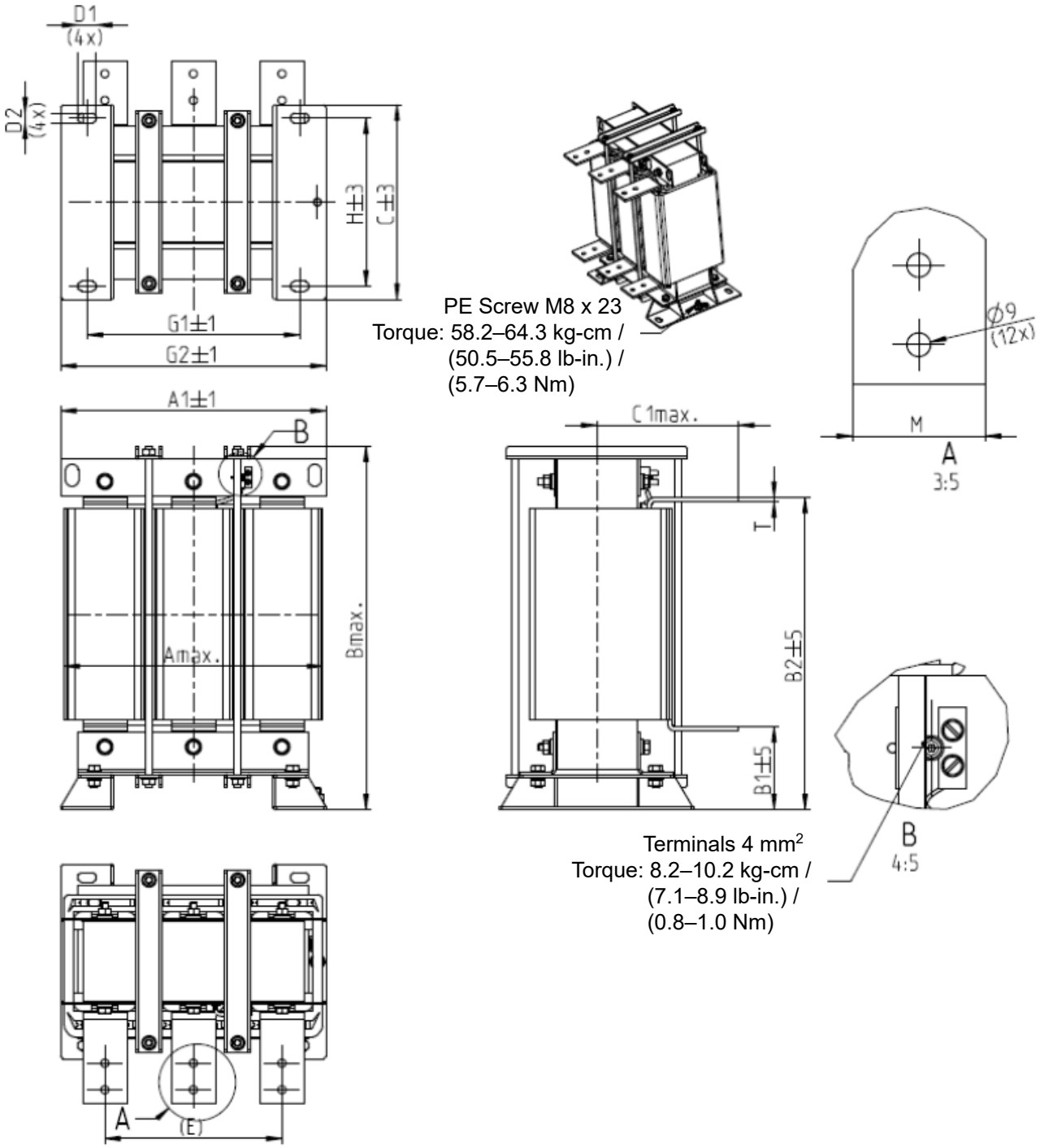


Figure 7-22

Unit: mm

AC Input Reactors Delta part #	A	A1	B	B1	B2	C	C1	D1*D2	E	G1	G2	H	M*T
DR460AP054	300	300	425	95	355	220	170	11*21	200	240	300	190	50*4
DR550AP044	300	300	445	95	375	220	170	11*21	200	240	300	190	50*4
DR616AP039	360	360	465	105	385	252	190	11*21	240	246	316	220	50*5
DR683AP036	360	360	465	105	385	252	195	11*21	240	246	316	220	50*5
DR866AP028	360	360	520	105	435	272	200	11*21	240	246	316	240	60*6

Table 7-40

DC Reactor

A DC reactor can also increase line impedance, improve the power factor, reduce input current, increase system power, and reduce interference generated from the motor drive. A DC reactor stabilizes the DC bus voltage. Compared with an AC input reactor, a DC reactor is in smaller size, lower price, and lower voltage drop (lower power dissipation).

Installation

Install a DC reactor between terminals +2/DC+ and +1/DC+. Remove the jumper, as shown in the figure below, before installing a DC reactor.

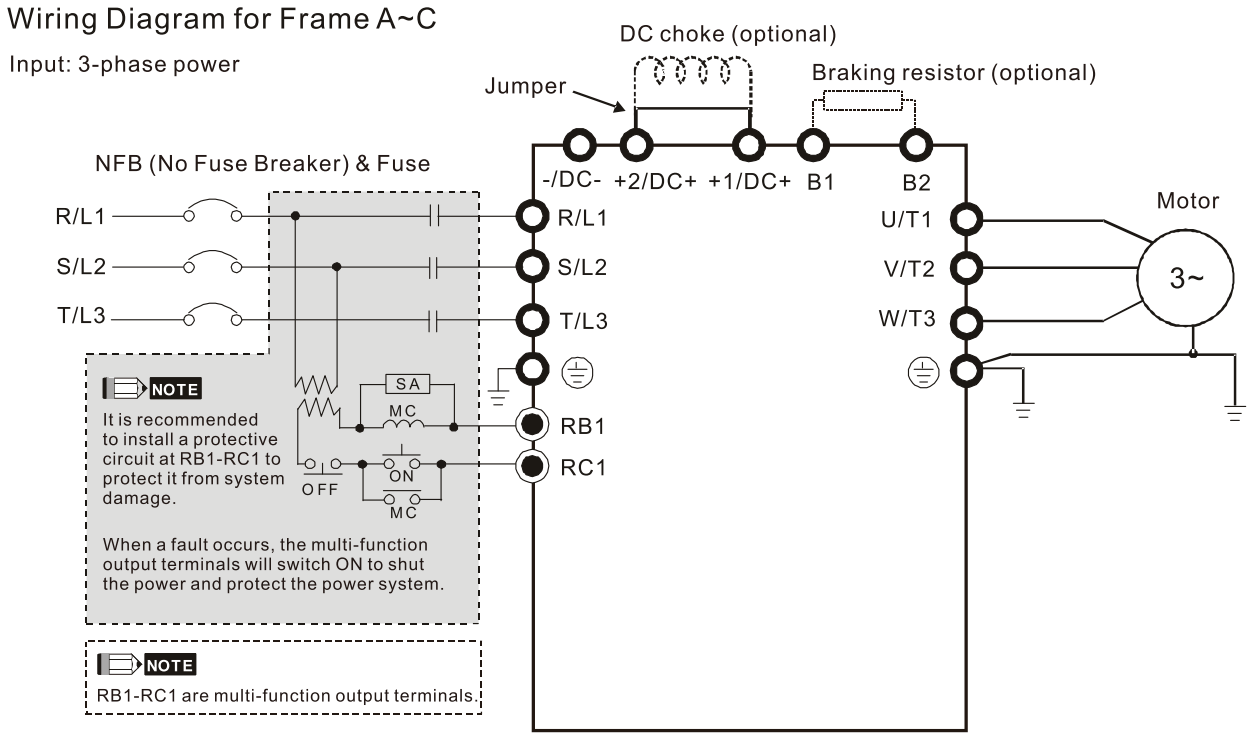


Figure 7-23 Wiring of DC reactor

Applicable Reactors

200V–230V, 50/60 Hz

Model	HP	Heavy Duty				Super Heavy Duty			
		Rated current (Arms)	Saturation current (Arms)	DC reactor (mH)	DC reactor Delta Part #	Rated current (Arms)	Saturation current (Arms)	DC reactor (mH)	DC reactor Delta Part #
VFD007C23A-21	1	5	9	8.64	DR005D0585	3	6	9.762	N/A
VFD015C23A-21	2	8	14.4	12.78	DR008D0366	5	10	5.857	DR005D0585
VFD022C23A-21	3	11	19.8	18	DR011D0266	8	16	3.66	DR008D0366
VFD037C23A-21	5	17	30.6	28.8	DR017D0172	11	22	2.662	DR011D0266
VFD055C23A-21	7.5	25	45	43.2	DR025D0117	17	34	1.722	DR017D0172
VFD075C23A-21	10	33	59.4	55.8	DR033DP851	25	50	1.172	DR025D0117
VFD110C23A-21	15	49	88.2	84.6	DR049DP574	33	66	0.851	DR033DP851
VFD150C23A-21	20	65	117	111.6	DR065DP432	49	98	0.574	DR049DP574
VFD185C23A-21	25	75	135	127.8	DR075DP391	65	130	0.432	DR065DP432
VFD220C23A-21	30	90	162	154.8	DR090DP325	75	150	0.391	DR075DP391

Table7-41

380V–460V, 50/60 Hz

Model	HP	Heavy Duty				Super Heavy Duty			
		Rated current (Arms)	Saturation current (Arms)	DC reactor (mH)	DC reactor Delta Part #	Rated current (Arms)	Saturation current (Arms)	DC reactor (mH)	DC reactor Delta Part #
VFD007C43A-21	1	3	5.4	18.709	DR003D1870	1.7	3.4	33.016	N/A
VFD015C43A-21	2	4	7.2	14.031	DR004D1403	3	6	18.709	DR003D1870
VFD022C43A-21	3	6	10.8	9.355	DR006D0935	4	8	14.031	DR004D1403
VFD037C43A-21	5	9	16.2	6.236	DR009D0623	6	12	9.355	DR006D0935
VFD040C43A-21	5	10.5	18.9	5.345	DR010D0534	9	18	6.236	DR009D0623
VFD055C43A-21	7.5	12	21.6	4.677	DR012D0467	10.5	21	5.345	DR010D0534
VFD075C43A-21	10	18	32.4	3.119	DR018D0311	12	24	4.677	DR012D0467
VFD110C43A-21	15	24	43.2	2.338	DR024D0233	18	36	3.119	DR018D0311
VFD150C43A-21	20	32	57.6	1.754	DR032D0175	24	48	2.338	DR024D0233
VFD185C43A-21	25	38	68.4	1.477	DR038D0147	32	64	1.754	DR032D0175
VFD220C43A-21	30	45	81	1.247	DR045D0124	38	76	1.477	DR038D0147
VFD300C43A-21	40	60	108	0.935	DR060DP935	45	90	1.247	DR045D0124

Table 7-42

575V

Model	HP	Rated current (Arms)			Saturation current (Arms)	4% DC reactor (mH)		
		Light duty	Normal duty	Heavy duty		Light duty	Normal duty	Heavy duty
VFD015C53A-21	2	3	2.5	2.1	4.2	20.336	24.404	29.052
VFD022C531-21	3	4.3	3.6	3	5.9	14.188	16.947	20.336
VFD037C53A-21	5	6.7	5.5	4.6	9.1	9.106	11.093	13.263
VFD055C53A-21	7.5	9.9	8.2	6.9	13.7	6.163	7.440	8.842
VFD075C53A-21	10	12.1	10	8.3	16.5	5.042	6.101	7.351
VFD110C53A-21	15	18.7	15.5	13	25.7	3.263	3.936	4.693
VFD150C53A-21	20	24.2	20	16.8	33.3	2.521	3.050	3.632

Table 7-43

690V

Model	HP	Rated current (Arms)			Saturation current (Arms)			4% DC reactor (mH)		
		Light duty	Normal duty	Heavy duty	Light duty	Normal duty	Heavy duty	Light duty	Normal duty	Heavy duty
VFD185C63B-21	25	24	20	14	28.8	30.0	25.2	3.661	4.393	6.275
VFD220C63B-21	30	30	24	20	36.0	36.0	36.0	2.928	3.661	4.393
VFD300C63B-21	40	36	30	24	43.2	45.0	43.2	2.440	2.928	3.661
VFD370C63B-21	50	45	36	30	54.0	54.0	54.0	1.952	2.440	2.928

Table 7-44

The table below shows the models with built-in DC reactors:

Frame D	VFD450C63B-00; VFD550C63B-00; VFD450C63B-21; VFD550C63B-21
Frame E	VFD750C63B-00; VFD900C63B-00; VFD1100C63B-00; VFD1320C63B-00 VFD750C63B-21; VFD900C63B-21; VFD1100C63B-21; VFD1320C63B-21
Frame F	VFD1600C63B-00; VFD2000C63B-00; VFD1600C63B-21; VFD2000C63B-21
Frame G	VFD2500C63B-00; VFD3150C63B-00; VFD2500C63B-21; VFD3150C63B-21
Frame H	VFD4000C63B-00; VFD4500C63B-00; VFD5600C63B-00; VFD6300C63B-00 VFD4000C63B-21; VFD4500C63B-21; VFD5600C63B-21; VFD6300C63B-21

Table 7-45

DC reactor dimension and specifications:

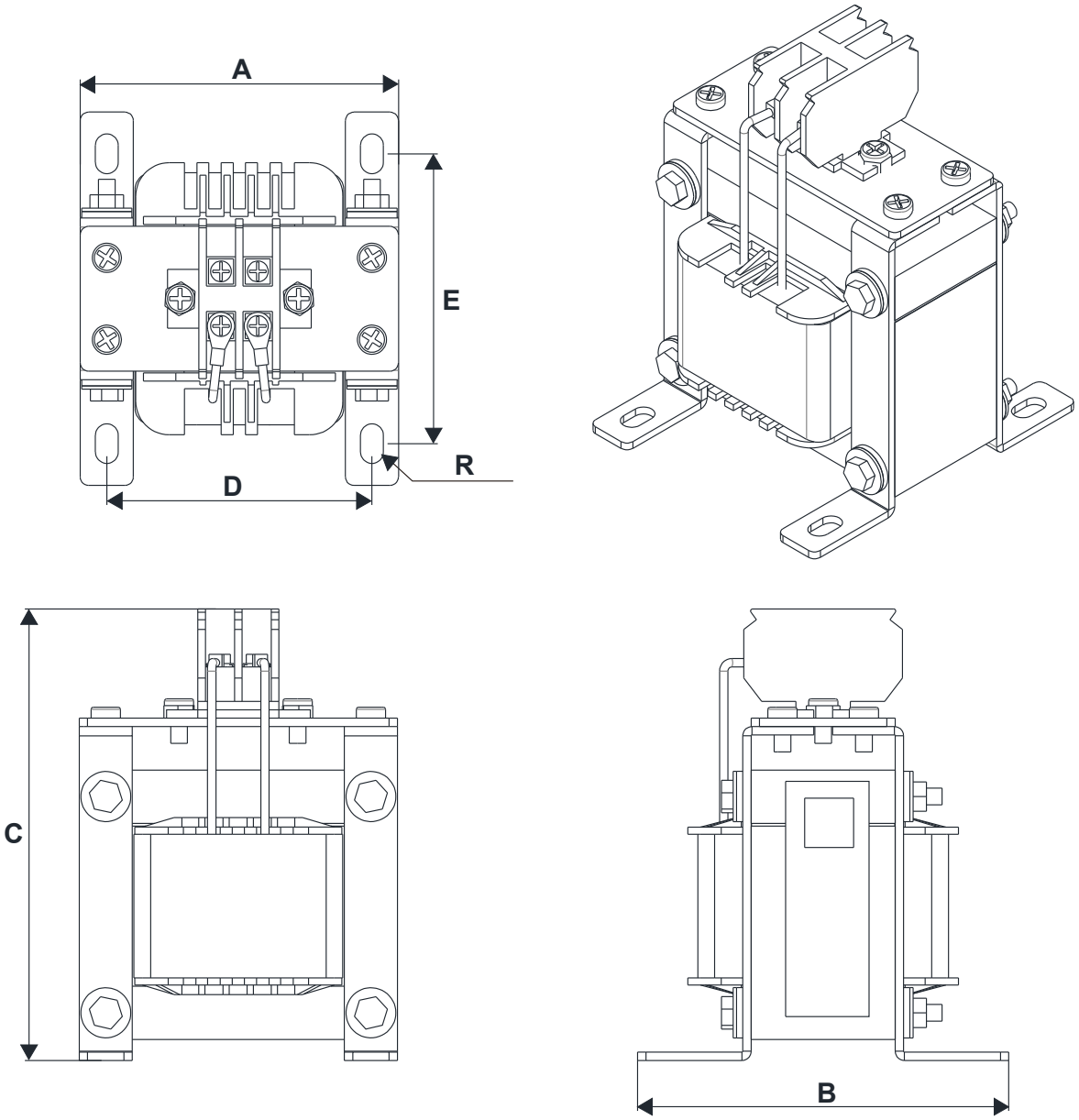


Figure 7-24

200V–230V / 50–60 Hz

DC reactor Delta Part #	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)	R (mm)
DR005D0585	79	78	112	64±2	56±2	9.5*5.5
DR008D0366	79	78	112	64±2	56±2	9.5*5.5
DR011D0266	79	92	112	64±2	69.5±2	9.5*5.5
DR017D0172	79	112	112	64±2	89.5±2	9.5*5.5
DR025D0117	99	105	128	79±2	82.5±2	9.5*5.5
DR033DP851	117	110	156	95±2	87±2	10*6.5
DR049DP574	117	120	157	95±2	97±2	10*6.5
DR065DP432	117	140	157	95±2	116.5±2	10*6.5
DR075DP391	136	135	178	111±2	112±2	10*6.5
DR090DP325	136	135	179	111±2	112±2	10*6.5

DC reactor Delta Part #	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)	R (mm)
DR003D1870	79	78	112	64±2	56±2	9.5*5.5
DR004D1403	79	92	112	64±2	69.5±2	9.5*5.5
DR006D0935	79	92	112	64±2	69.5±2	9.5*5.5
DR009D0623	79	112	112	64±2	89.5±2	9.5*5.5
DR010D0534	99	93	128	79±2	70±2	9.5*5.5
DR012D0467	99	105	128	79±2	82.5±2	9.5*5.5
DR018D0311	117	110	144	95±2	87±2	10*6.5
DR024D0233	117	120	144	95±2	97±2	10*6.5
DR032D0175	117	140	157	95±2	116.5±2	10*6.5
DR038D0147	136	135	172	111±2	112±2	10*6.5
DR045D0124	136	135	173	111±2	112±2	10*6.5
DR060DP935	136	150	173	111±2	127±2	10*6.5

Table 7-46

The table below shows the THDi specification when using Delta's drives to work with AC/DC reactors:

Current Harmonics	Models without built-in DC reactor				Models with built-in DC reactor		
	No AC/DC reactor	3% input AC reactor	5% input AC reactor	4% DC reactor	No AC/DC reactor	3% input AC reactor	5% input AC reactor
5th	73.3%	38.5%	30.8%	34.4%	31.16%	27.01%	25.5%
7th	52.74%	15.3%	9.4%	18.6%	23.18%	9.54%	8.75%
11th	7.28%	7.1%	6.13%	3.41%	8.6%	4.5%	4.2%
13th	0.4%	3.75%	3.15%	0.48%	7.9%	0.22%	0.17%
THDi	91%	43.6%	34.33%	38.2%	42.28%	30.5%	28.4%

Table 7-47

NOTE: The THDi specification listed here may be slightly different from the actual THDi, depending on the installation and environmental conditions (wires, motors).

AC Output Reactor

When using drives in long wiring output application, ground fault (GFF), over-current (OC) and motor over-voltage (OV) often occur. GFF and OC cause errors due to the drive's self-protective mechanism; over-voltage damages motor insulation.

The excessive length of the output wires makes the grounded stray capacitance too large, increase the three-phase output common mode current, and the reflected wave of the long wires makes the motor dv / dt and the motor terminal voltage too high. Thus, installing a reactor on the drive's output side can increase the high-frequency impedance to reduce the dv / dt and terminal voltage to protect the motor.

Installation

Installing an AC output reactor in series between the three output phases U V W and the motor, as shown in the figure below:

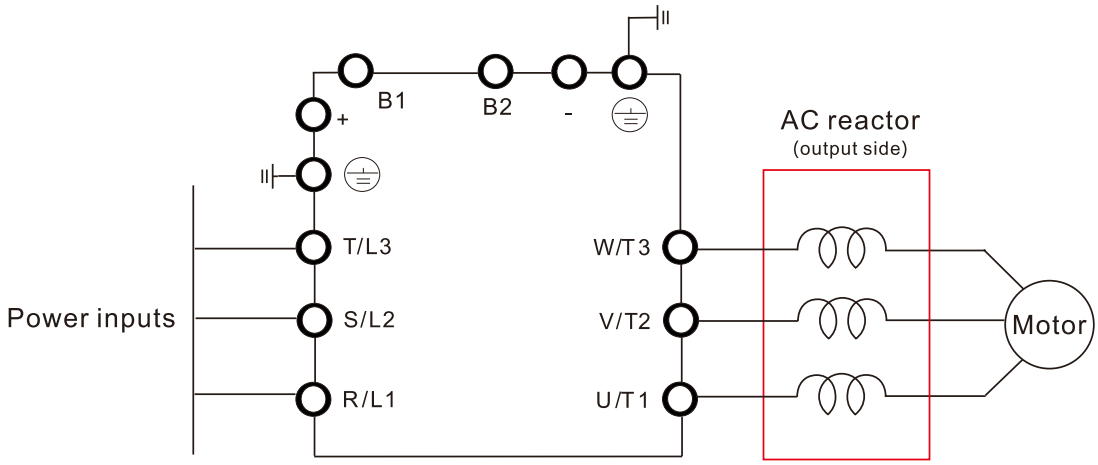


Figure 7-25 Wiring of AC output reactor

Applicable Reactors:

200V–230V, 50/60 Hz / Heavy Duty

Model	HP	Rated current (Arms)	Saturation current (Arms)	3% impedance (mH)	5% impedance (mH)	Built-in DC reactor	Output AC reactor Delta part #	Weight (kg)	Heat Dissipation (W)
VFD007C23A-21	1	5	9	2.536	4.227	No	DR005L0254	1.5	15
VFD015C23A-21	2	8	14.4	1.585	2.642	No	DR008L0159	2.5	30
VFD022C23A-21	3	11	19.8	1.152	1.922	No	DR011L0115	3.0	33
VFD037C23A-21	5	17	30.6	0.746	1.243	No	DR017LP746	3.6	34
VFD055C23A-21	7.5	25	45	0.507	0.845	No	DR025LP507	5.5	50
VFD075C23A-21	10	33	59.4	0.32	0.534	No	DR033LP320	6.5	50
VFD110C23A-21	15	49	88.2	0.216	0.359	No	DR049LP215	8.6	62
VFD150C23A-21	20	65	117	0.163	0.271	No	DR065LP162	12	70
VFD185C23A-21	25	75	135	0.169	0.282	No	DR075LP170	14.5	80
VFD220C23A-21	30	90	162	0.141	0.235	No	DR090LP141	15	80
VFD300C23A-00 VFD300C23A-21	40	120	216	0.106	0.176	Yes	DR146LP087	22	110
VFD370C23A-00 VFD370C23A-21	50	146	262.8	0.087	0.145	Yes	DR146LP087	22	110

Model	HP	Rated current (Arms)	Saturation current (Arms)	3% impedance (mH)	5% impedance (mH)	Built-in DC reactor	Output AC reactor Delta part #	Weight (kg)	Heat Dissipation (W)
VFD450C23A-00 VFD450C23A-21	60	180	324	0.070	0.117	Yes	DR180LP070	26	125
VFD550C23A-00 VFD550C23A-21	75	215	387	0.059	0.098	Yes	DR215LP059	30	150
VFD750C23A-00 VFD750C23A-21	100	255	459	0.049	0.083	Yes	DR276LP049	37	210
VFD900C23A-00 VFD900C23A-21	125	346	622.8	0.037	0.061	Yes	DR346LP037	40	220

Table 7-48

200V–230V, 50/60 Hz / Super Heavy Duty

Model	HP	Rated current (Arms)	Saturation current (Arms)	3% impedance (mH)	5% impedance (mH)	Built-in DC reactor	Output AC reactor Delta part #	Weight (kg)	Heat Dissipation (W)
VFD007C23A-21	1	3	6	4.227	7.045	No	N/A	N/A	N/A
VFD015C23A-21	2	5	10	2.536	4.227	No	DR005L0254	1.5	15
VFD022C23A-21	3	8	16	1.585	2.642	No	DR008L0159	2.5	30
VFD037C23A-21	5	11	22	1.152	1.922	No	DR011L0115	3.0	33
VFD055C23A-21	7.5	17	34	0.746	1.243	No	DR017LP746	3.6	34
VFD075C23A-21	10	25	50	0.507	0.845	No	DR025LP507	5.5	50
VFD110C23A-21	15	33	66	0.32	0.534	No	DR033LP320	6.5	50
VFD150C23A-21	20	49	98	0.216	0.359	No	DR049LP215	8.6	62
VFD185C23A-21	25	65	130	0.163	0.271	No	DR065LP162	12	70
VFD220C23A-21	30	75	150	0.169	0.282	No	DR075LP170	14.5	80
VFD300C23A-00 VFD300C23A-21	40	90	180	0.141	0.235	Yes	DR090LP141	15	80
VFD370C23A-00 VFD370C23A-21	50	120	240	0.106	0.176	Yes	DR146LP087	22	110
VFD450C23A-00 VFD450C23A-21	60	146	292	0.087	0.145	Yes	DR146LP087	22	110
VFD550C23A-00 VFD550C23A-21	75	180	360	0.07	0.117	Yes	DR180LP070	26	125
VFD750C23A-00 VFD750C23A-21	100	215	430	0.059	0.098	Yes	DR215LP059	30	150
VFD900C23A-00 VFD900C23A-21	125	255	510	0.049	0.083	Yes	DR276LP049	37	210

Table 7-49

380V–460V, 50/60 Hz / Heavy Duty

Model	HP	Rated current (Arms)	Saturation current (Arms)	3% impedance (mH)	5% impedance (mH)	Built-in DC reactor	Output AC reactor Delta part #	Weight (kg)	Heat Dissipation (W)
VFD007C43A-21	1	3	5.4	8.102	13.502	No	DR003L0810	1.5	13
VFD015C43A-21	2	4	7.2	6.077	10.127	No	DR004L0607	2.5	18
VFD022C43A-21	3	6	10.8	4.050	6.752	No	DR006L0405	3.0	22
VFD037C43A-21	5	9	16.2	2.700	4.501	No	DR009L0270	3.6	35
VFD040C43A-21	5	10.5	18.9	2.315	3.858	No	DR010L0231	5.5	40
VFD055C43A-21	7.5	12	21.6	2.025	3.375	No	DR012L0202	6.0	45

Model	HP	Rated current (Arms)	Saturation current (Arms)	3% impedance (mH)	5% impedance (mH)	Built-in DC reactor	Output AC reactor Delta part #	Weight (kg)	Heat Dissipation (W)
VFD075C43A-21	10	18	32.4	1.174	1.957	No	DR018L0117	6.4	48
VFD110C43A-21	15	24	43.2	0.881	1.468	No	DR024LP881	7.2	52
VFD150C43A-21	20	32	57.6	0.66	1.101	No	DR032LP660	11	66
VFD185C43A-21	25	38	68.4	0.639	1.066	No	DR038LP639	12	70
VFD220C43A-21	30	45	81	0.541	0.900	No	DR045LP541	16	85
VFD300C43A-21	40	60	108	0.405	0.675	No	DR060LP405	18	85
VFD370C43S-00 VFD370C43S-21	50	73	131.4	0.334	0.555	Yes	DR073LP334	25	110
VFD450C43S-00 VFD450C43S-21	60	91	163.8	0.267	0.445	Yes	DR091LP267	25	130
VFD550C43A-00 VFD550C43A-21	75	110	198	0.221	0.368	Yes	DR110LP221	28	150
VFD750C43A-00 VFD750C43A-21	100	150	270	0.162	0.270	Yes	DR150LP162	35	175
VFD900C43A-00 VFD900C43A-21	125	180	324	0.135	0.225	Yes	DR180LP135	42	195
VFD1100C43A-00 VFD1100C43A-21	150	220	396	0.110	0.184	Yes	DR220LP110	45	235
VFD1320C43A-00 VFD1320C43A-21	175	260	468	0.098	0.162	Yes	DR260LP098	55	285
VFD1600C43A-00 VFD1600C43A-21	215	310	558	0.078	0.131	Yes	DR310LP078	60	300
VFD1850C43A-00 VFD1850C43A-21	250	370	666	0.066	0.109	Yes	DR370LP066	75	345
VFD2000C43A-00 VFD2000C43A-21	270	395	474	0.061	0.1	Yes	DR370LP066 *1	75	410
VFD2200C43A-00 VFD2200C43A-21	300	460	828	0.054	0.090	Yes	DR460LP054	85	410
VFD2500C43A-00 VFD2500C43A-21	340	481	578	0.052	0.086	Yes	DR460LP054 *1	85	440
VFD2800C43A-00 VFD2800C43C-21	375	550	990	0.044	0.074	Yes	DR550LP044	95	440
VFD3150C43A-00 VFD3150C43C-21	420	616	1108.8	0.039	0.066	Yes	DR616LP039	110	465
VFD3550C43A-00 VFD3550C43C-21	475	683	1229.4	0.036	0.060	Yes	DR683LP036	130	495
VFD4000C43A-00 VFD4000C43A-21	536	770	924	0.028	0.047	Yes	DR866LP028	170	600
VFD4500C43A-00 VFD4500C43C-21	600	866	1558.8	0.028	0.047	Yes	DR866LP028	170	600
VFD5000C43A-00 VFD5000C43C-21	650	930	1674	0.026	0.044	Yes	N/A	N/A	N/A
VFD5600C43A-00 VFD5600C43C-21	750	1094	1969.2	0.022	0.037	Yes	N/A	N/A	N/A

Table 7-50

NOTE: *1: The inductance value for the above applications of Delta's reactors will be close to, but less than 3%.

380V–460V, 50/60 Hz / Super Heavy Duty

Model	HP	Rated current (Arms)	Saturation current (Arms)	3% impedance (mH)	5% impedance (mH)	Built-in DC reactor	Output AC reactor Delta part #	Weight (kg)	Heat Dissipation (W)
VFD007C43A-21	1	1.7	3.4	14.298	23.827	No	N/A	N/A	N/A
VFD015C43A-21	2	3	6	8.102	13.502	No	DR003L0810	1.5	13
VFD022C43A-21	3	4	8	6.077	10.127	No	DR004L0607	2.5	18
VFD037C43A-21	5	6	12	4.05	6.752	No	DR006L0405	3.0	22
VFD040C43A-21	5	9	18	2.7	4.501	No	DR009L0270	3.6	35
VFD055C43A-21	7.5	10.5	21	2.315	3.858	No	DR010L0231	5.5	40
VFD075C43A-21	10	12	24	2.025	3.375	No	DR012L0202	6.0	45
VFD110C43A-21	15	18	36	1.174	1.957	No	DR018L0117	6.4	48
VFD150C43A-21	20	24	48	0.881	1.468	No	DR024LP881	7.2	52
VFD185C43A-21	25	32	64	0.66	1.101	No	DR032LP660	11	66
VFD220C43A-21	30	38	76	0.639	1.066	No	DR038LP639	12	70
VFD300C43A-21	40	45	90	0.541	0.9	No	DR045LP541	16	85
VFD370C43S-00 VFD370C43S-21	50	60	120	0.405	0.675	Yes	DR060LP405	18	85
VFD450C43S-00 VFD450C43S-21	60	73	146	0.334	0.555	Yes	DR073LP334	25	110
VFD550C43A-00 VFD550C43A-21	75	91	182	0.267	0.445	Yes	DR091LP267	25	130
VFD750C43A-00 VFD750C43A-21	100	110	220	0.221	0.368	Yes	DR110LP221	28	150
VFD900C43A-00 VFD900C43A-21	125	150	300	0.162	0.27	Yes	DR150LP162	35	175
VFD1100C43A-00 VFD1100C43A-21	150	180	360	0.135	0.225	Yes	DR180LP135	42	195
VFD1320C43A-00 VFD1320C43A-21	175	220	440	0.11	0.184	Yes	DR220LP110	45	235
VFD1600C43A-00 VFD1600C43A-21	215	260	520	0.098	0.162	Yes	DR260LP098	55	285
VFD1850C43A-00 VFD1850C43A-21	250	310	620	0.078	0.131	Yes	DR310LP078	60	300
VFD2000C43A-00 VFD2000C43A-21	270	335	536	0.072	0.12	Yes	DR370LP066 *1	75	345
VFD2200C43A-00 VFD2200C43A-21	300	370	740	0.066	0.109	Yes	DR370LP066	75	345
VFD2500C43A-00 VFD2500C43A-21	340	415	664	0.058	0.10	Yes	DR460LP054 *1	85	410
VFD2800C43A-00 VFD2800C43C-21	375	460	920	0.054	0.09	Yes	DR460LP054	85	410
VFD3150C43A-00 VFD3150C43C-21	420	550	1100	0.044	0.074	Yes	DR550LP044	95	440
VFD3550C43A-00 VFD3550C43C-21	475	616	1232	0.039	0.066	Yes	DR616LP039	110	465
VFD4000C43A-00 VFD4000C43A-21	530	683	1092.8	0.036	0.06	Yes	DR683LP036	130	495

Model	HP	Rated current (Arms)	Saturation current (Arms)	3% impedance (mH)	5% impedance (mH)	Built-in DC reactor	Output AC reactor Delta part #	Weight (kg)	Heat Dissipation (W)
VFD4500C43A-00 VFD4500C43C-21	600	683	1366	0.036	0.06	Yes	DR683LP036	170	495
VFD5000C43A-00 VFD5000C43C-21	650	866	1732	0.028	0.047	Yes	DR866LP028	95	600
VFD5600C43A-00 VFD5600C43C-21	750	930	1860	0.026	0.044	Yes	N/A	N/A	N/A

Table 7-51

NOTE: *1: The inductance value for the above applications of Delta's reactors will be close to, but less than 3%.

575V, 50/60 Hz, Three-phase

Model	HP	Rated current (Arms)			Saturation current (Arms)	3% impedance (mH)			5% impedance (mH)		
		Light load	Normal load	Heavy load		Light load	Normal load	Heavy load	Light load	Normal load	Heavy load
VFD015C53A-21	2	3	2.5	2.1	4.2	8.806	10.567	12.580	14.677	17.612	20.967
VFD022C531-21	3	4.3	3.6	3	5.9	6.144	7.338	8.806	10.239	12.230	14.677
VFD037C53A-21	5	6.7	5.5	4.6	9.1	3.943	4.803	5.743	6.572	8.005	9.572
VFD055C53A-21	7.5	9.9	8.2	6.9	13.7	2.668	3.222	3.829	4.447	5.369	6.381
VFD075C53A-21	10	12.1	10	8.3	16.5	2.183	2.642	3.183	3.639	4.403	5.305
VFD110C53A-21	15	18.7	15.5	13	25.7	1.413	1.704	2.032	2.355	2.841	3.387
VFD150C53A-21	20	24.2	20	16.8	33.3	1.092	1.321	1.572	1.819	2.201	2.621

Table 7-52

690V, 50/60 Hz, Three-phase

Model	HP	Rated current (Arms)			Saturation current (Arms)			3% impedance (mH)			5% impedance (mH)		
		Light load	Normal load	Heavy load	Light load	Normal load	Heavy load	Light load	Normal load	Heavy load	Light load	Normal load	Heavy load
VFD185C63B-21	25	24	20	14	28.8	30.0	25.2	1.585	1.902	2.717	2.642	3.170	4.529
VFD220C63B-21	30	30	24	20	36.0	36.0	36.0	1.268	1.585	1.902	2.113	2.642	3.170
VFD300C63B-21	40	36	30	24	43.2	45.0	43.2	1.057	1.268	1.585	1.761	2.113	2.642
VFD370C63B-21	50	45	36	30	54.0	54.0	54.0	0.845	1.057	1.268	1.409	1.761	2.113
VFD450C63B-00 VFD450C63B-21	60	54	45	36	64.8	67.5	64.8	0.704	0.845	1.057	1.174	1.409	1.761
VFD550C63B-00 VFD550C63B-21	75	67	54	45	80.4	81.0	81.0	0.568	0.704	0.845	0.946	1.174	1.409
VFD750C63B-00 VFD750C63B-21	100	86	67	54	103.2	100.5	97.2	0.442	0.568	0.704	0.737	0.946	1.174
VFD900C63B-00 VFD900C63B-21	125	104	86	67	124.8	129.0	120.6	0.366	0.442	0.568	0.610	0.737	0.946
VFD1100C63B-00 VFD1100C63B-21	150	125	104	86	150.0	156.0	154.8	0.304	0.366	0.442	0.507	0.610	0.737
VFD1320C63B-00 VFD1320C63B-21	175	150	125	104	180.0	187.5	187.2	0.254	0.304	0.366	0.423	0.507	0.610
VFD1600C63B-00 VFD1600C63B-21	215	180	150	125	216.0	225.0	225.0	0.211	0.254	0.304	0.352	0.423	0.507
VFD2000C63B-00 VFD2000C63B-21	270	220	180	150	264.0	270.0	270.0	0.173	0.211	0.254	0.288	0.352	0.423

Model	HP	Rated current (Arms)			Saturation current (Arms)			3% impedance (mH)			5% impedance (mH)		
		Light load	Normal load	Heavy load	Light load	Normal load	Heavy load	Light load	Normal load	Heavy load	Light load	Normal load	Heavy load
VFD2500C63B-00 VFD2500C63B-21	335	290	220	180	348.0	330.0	324.0	0.131	0.173	0.211	0.219	0.288	0.352
VFD3150C63B-00 VFD3150C63B-21	425	350	290	220	420.0	435.0	396.0	0.109	0.131	0.173	0.181	0.219	0.288
VFD4000C63B-00 VFD4000C63B-21	530	430	350	290	516.0	525.0	522.0	0.088	0.109	0.131	0.147	0.181	0.219
VFD4500C63B-00 VFD4500C63B-21	600	465	385	310	558.0	577.5	558.0	0.082	0.099	0.123	0.136	0.165	0.205
VFD5600C63B-00 VFD5600C63B-21	745	590	465	420	708.0	697.5	756.0	0.064	0.082	0.091	0.107	0.136	0.151
VFD6300C63B-00 VFD6300C63B-21	850	675	675	675	810.0	1012.5	1215.0	0.056	0.056	0.056	0.094	0.094	0.094

Table 7-53

AC output reactor dimensions and specification:

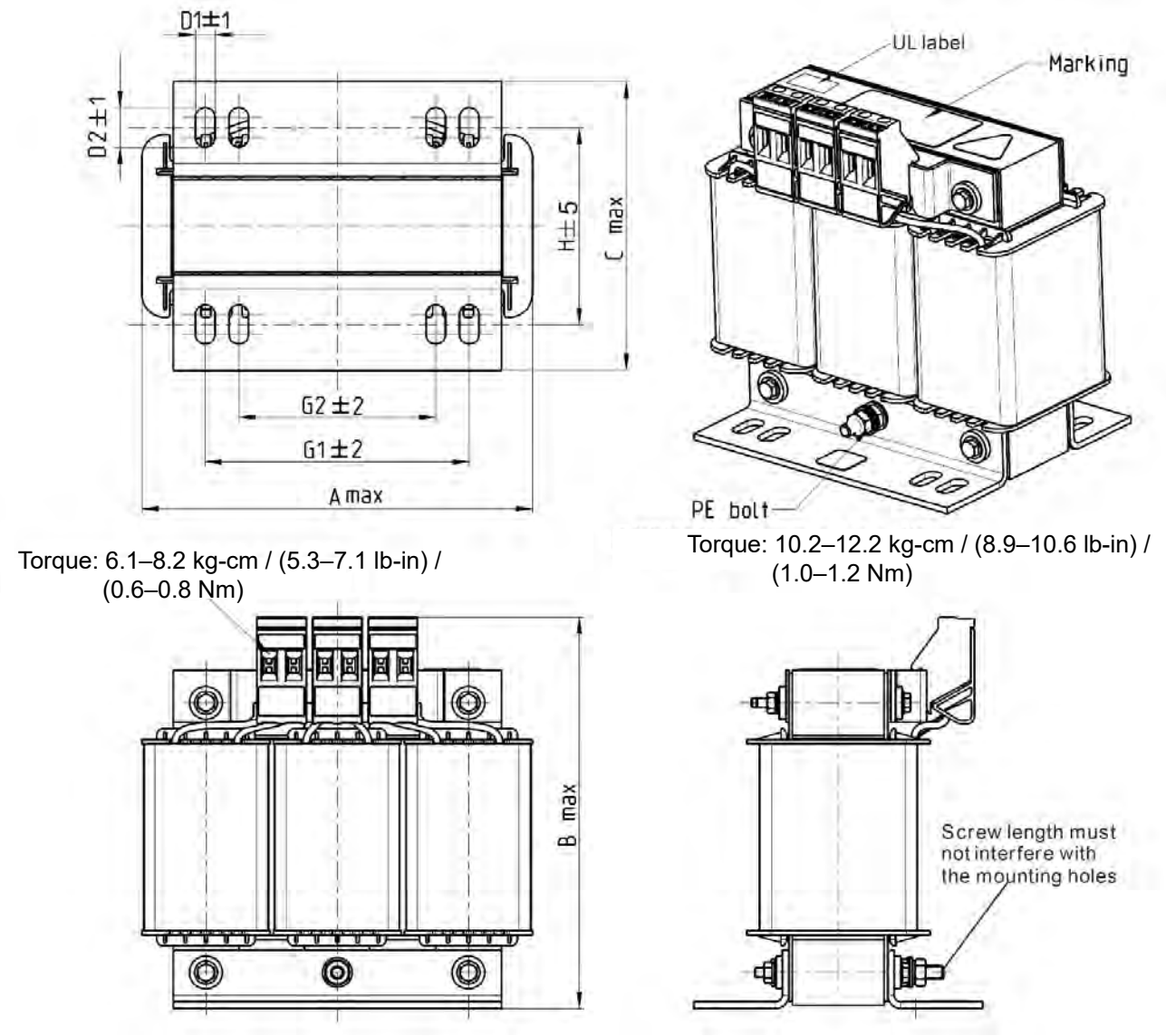


Figure 7-26

Unit: mm

Output AC reactor Delta part #	A	B	C	D1*D2	H	H1	H2	PE
DR005L0254	96	110	70	6*9	42	60	40	M4
DR008L0159	120	135	96	6*12	60	80.5	60	M4
DR011L0115	120	135	96	6*12	60	80.5	60	M4
DR017LP746	120	135	105	6*12	65	80.5	60	M4
DR025LP507	150	160	120	6*12	88	107	75	M4
DR033LP320	150	160	120	6*12	88	107	75	M4

Table 7-54

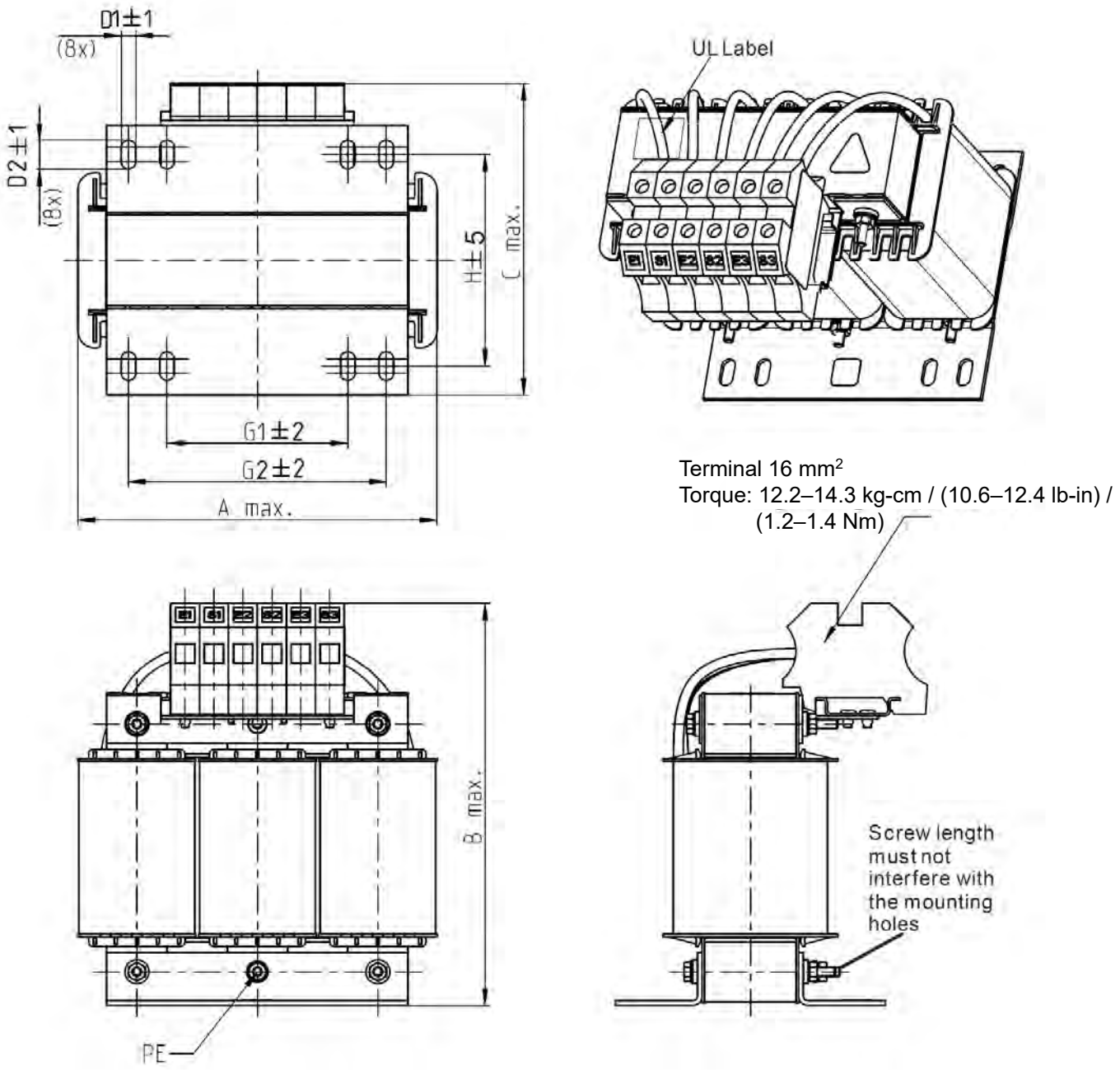


Figure 7-27

Unit: mm

Output AC reactor Delta part #	A	B	C	D1*D2	H	G	G1	Q	M	PE
DR049LP215	180	205	175	6*12	115	85	122	16	1.2–1.4	M4
DR065LP162	180	215	185	6*12	115	85	122	35	2.5–3.0	M4

Table 7-55

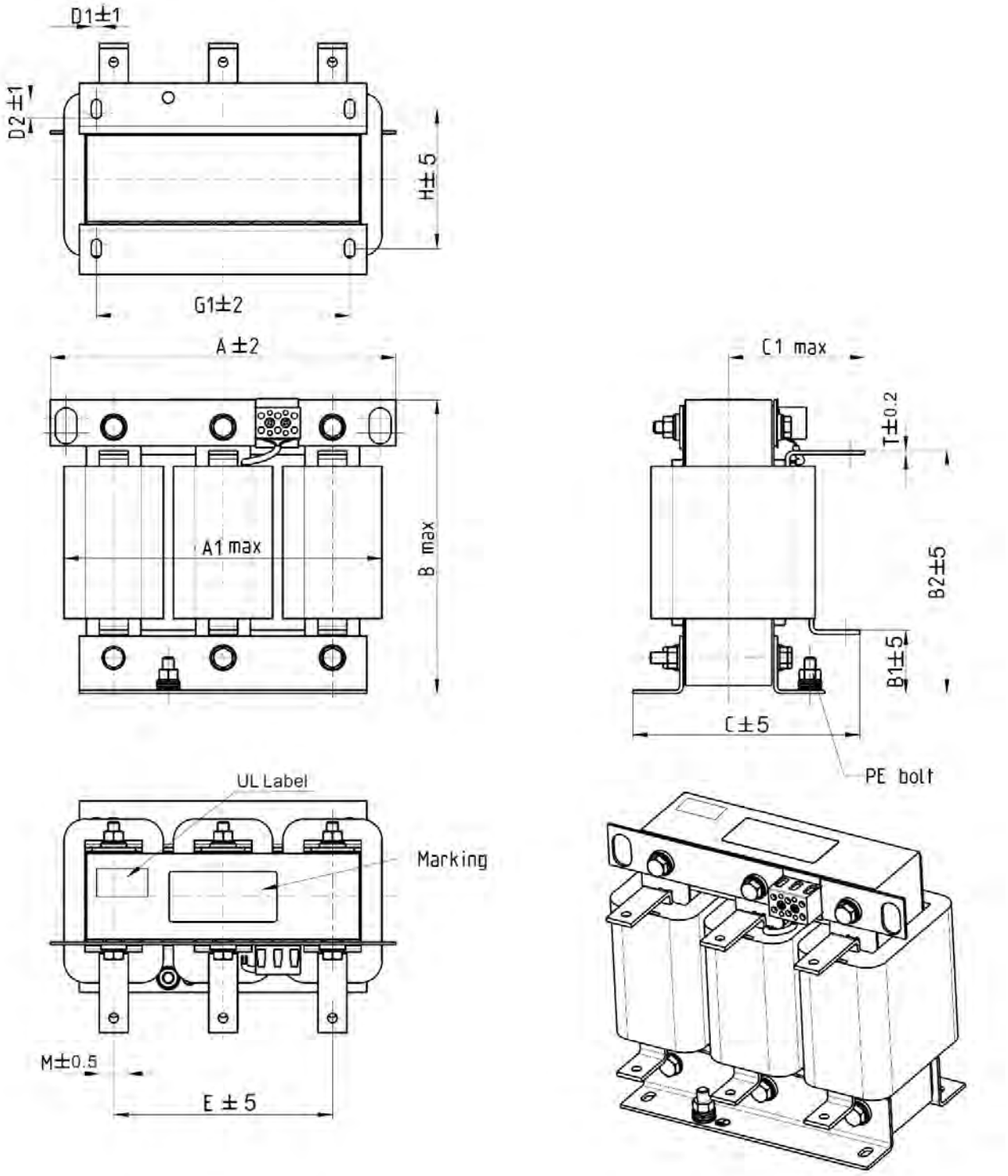


Figure 7-28

Unit: mm

Output AC reactor Delta part #	A	A1	B	B1	B2	C	C1	D1*D2	E	G1	H	M*T
DR075LP170	240	228	215	44	170	151	100	7*13	152	176	85	20*3
DR090LP141	240	228	215	44	170	151	100	7*13	152	176	85	20*3
DR146LP087	240	228	240	45	202	165	110	7*13	152	176	97	30*3
DR180LP070	250	240	250	46	205	175	110	11*18	160	190	124	30*5
DR215LP059	250	240	275	51	226	180	120	11*18	160	190	124	30*5

Table 7-56

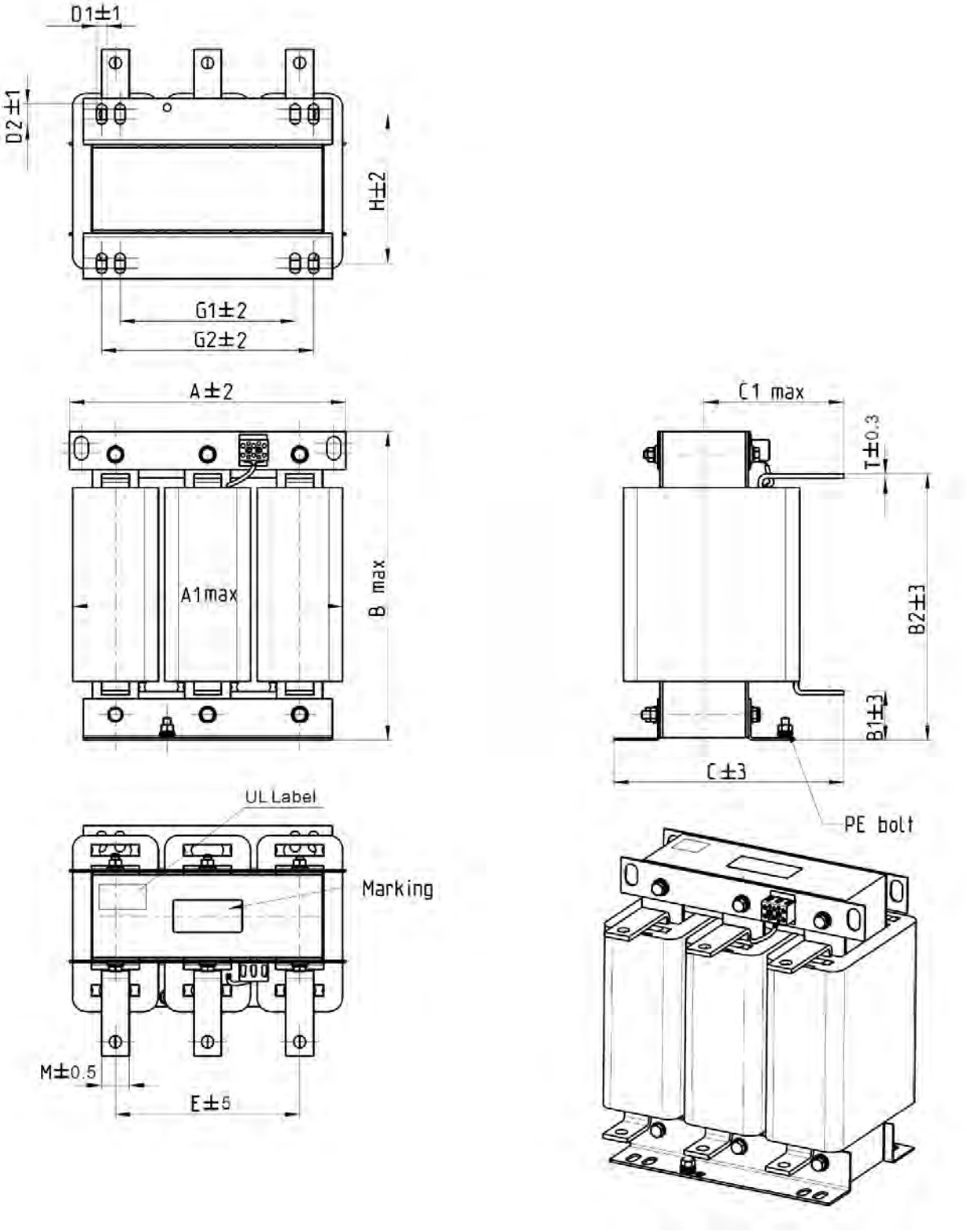


Figure 7-29

Unit: mm

Output AC reactor Delta part #	A	A1	B	B1	B2	C	C1	D1*D2	E	H	M*T
DR276AP049	270	260	320	50	265	200	140	10*18	176	106	30*5
DR346LP037	270	265	340	50	285	200	140	10*18	176	106	30*5

Table 7-57

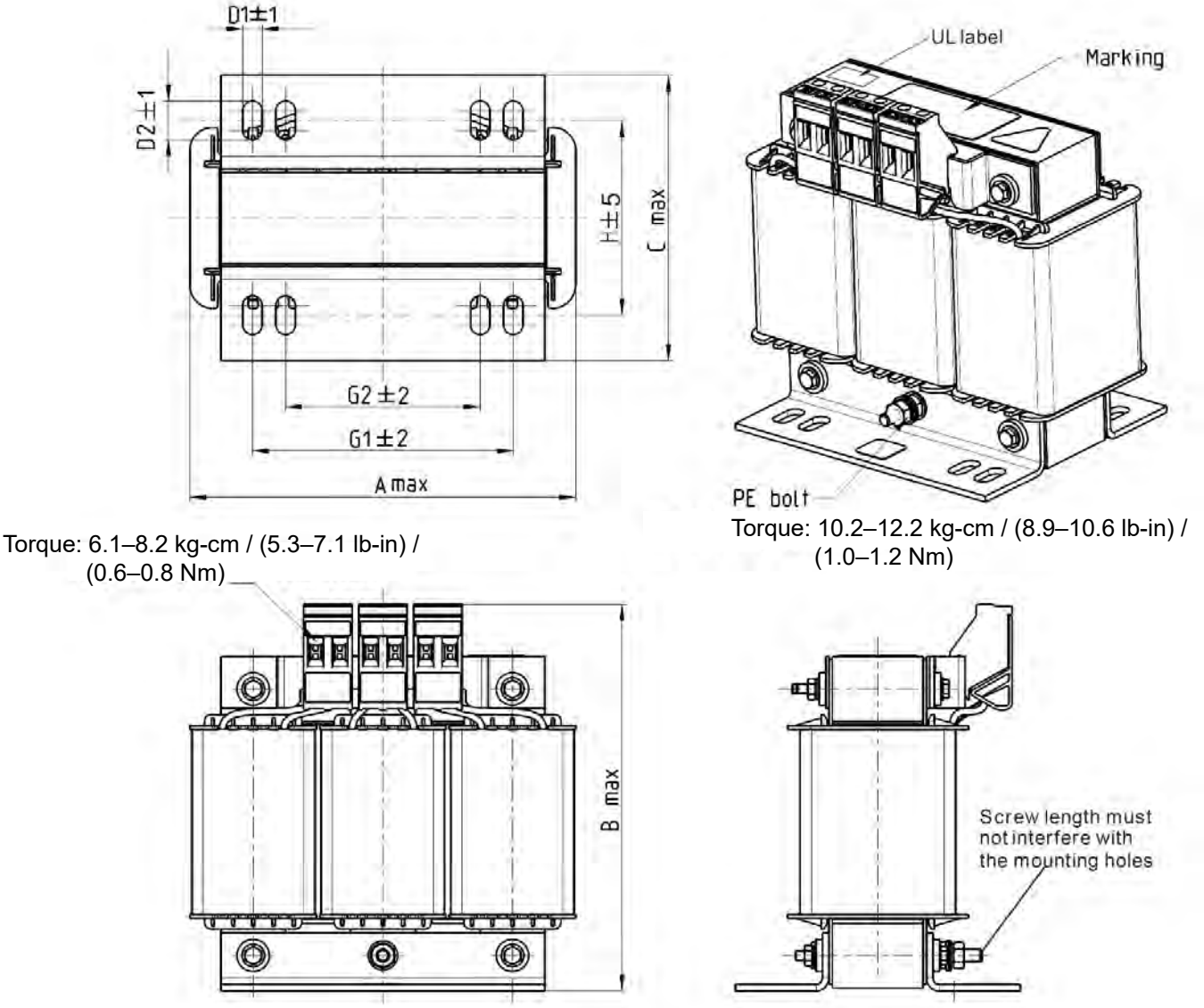


Figure 7-30

Unit: mm

Output AC reactor Delta part #	A	B	C	D1*D2	H	G1	G2	PE
DR003L0810	96	115	65	6*9	42	60	40	M4
DR004L0607	120	135	95	6*12	60	80.5	60	M4
DR006L0405	120	135	95	6*12	60	80.5	60	M4
DR009L0270	150	160	100	6*12	74	107	75	M4
DR010L0231	150	160	115	6*12	88	107	75	M4
DR012L0202	150	160	115	6*12	88	107	75	M4
DR018L0117	150	160	115	6*12	88	107	75	M4
DR024LP881	150	160	115	6*12	88	107	75	M4
DR032LP660	180	190	145	6*12	114	122	85	M6

Table 7-58

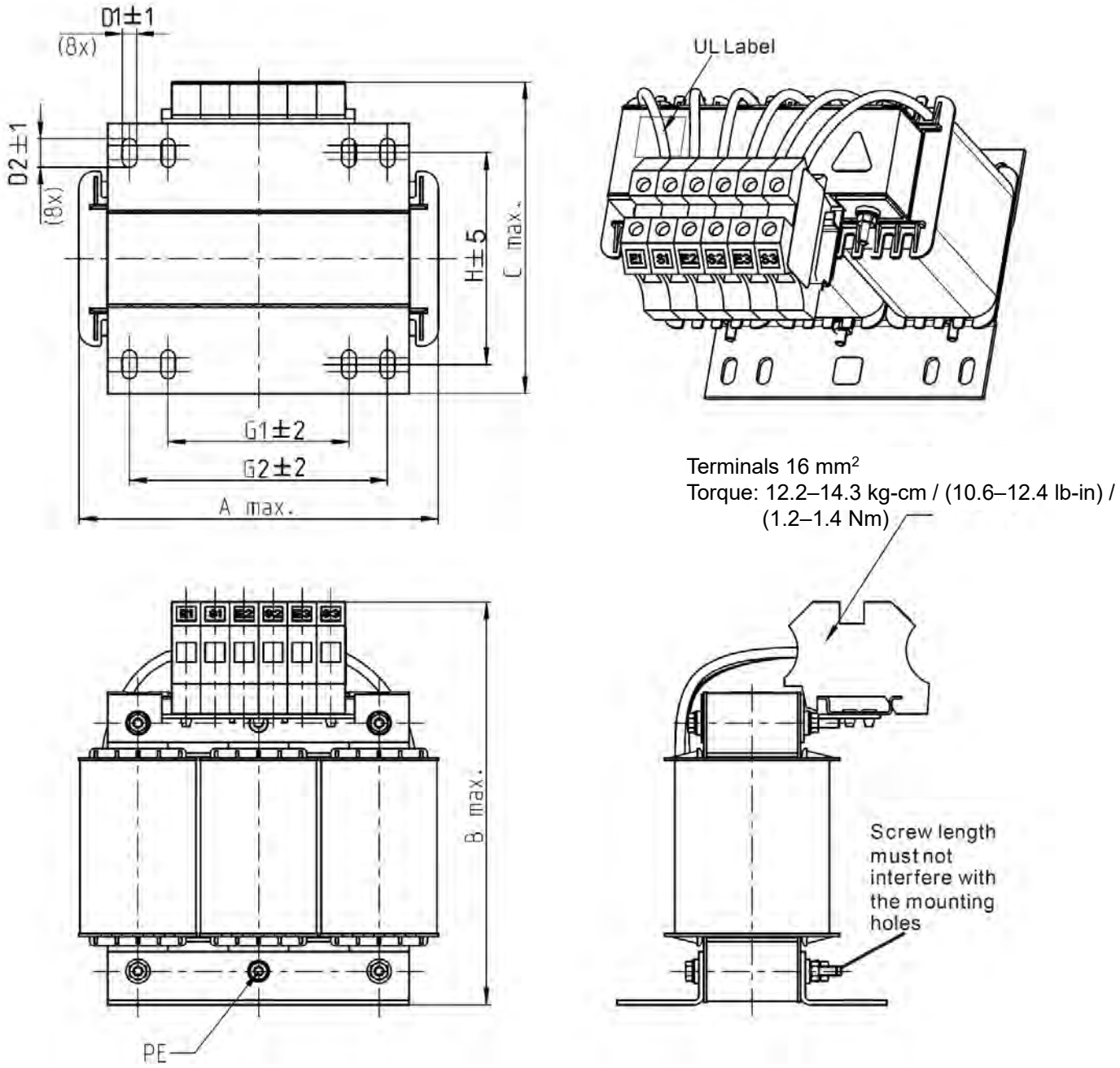


Figure 7-31

Unit: mm

Output AC reactor Delta part #	A	B	C	D1*D2	H	G1	G2	PE
DR038LP639	180	205	170	6*12	115	85	122	M4
DR045LP541	235	245	150	7*13	85	/	176	M6

Table 7-59

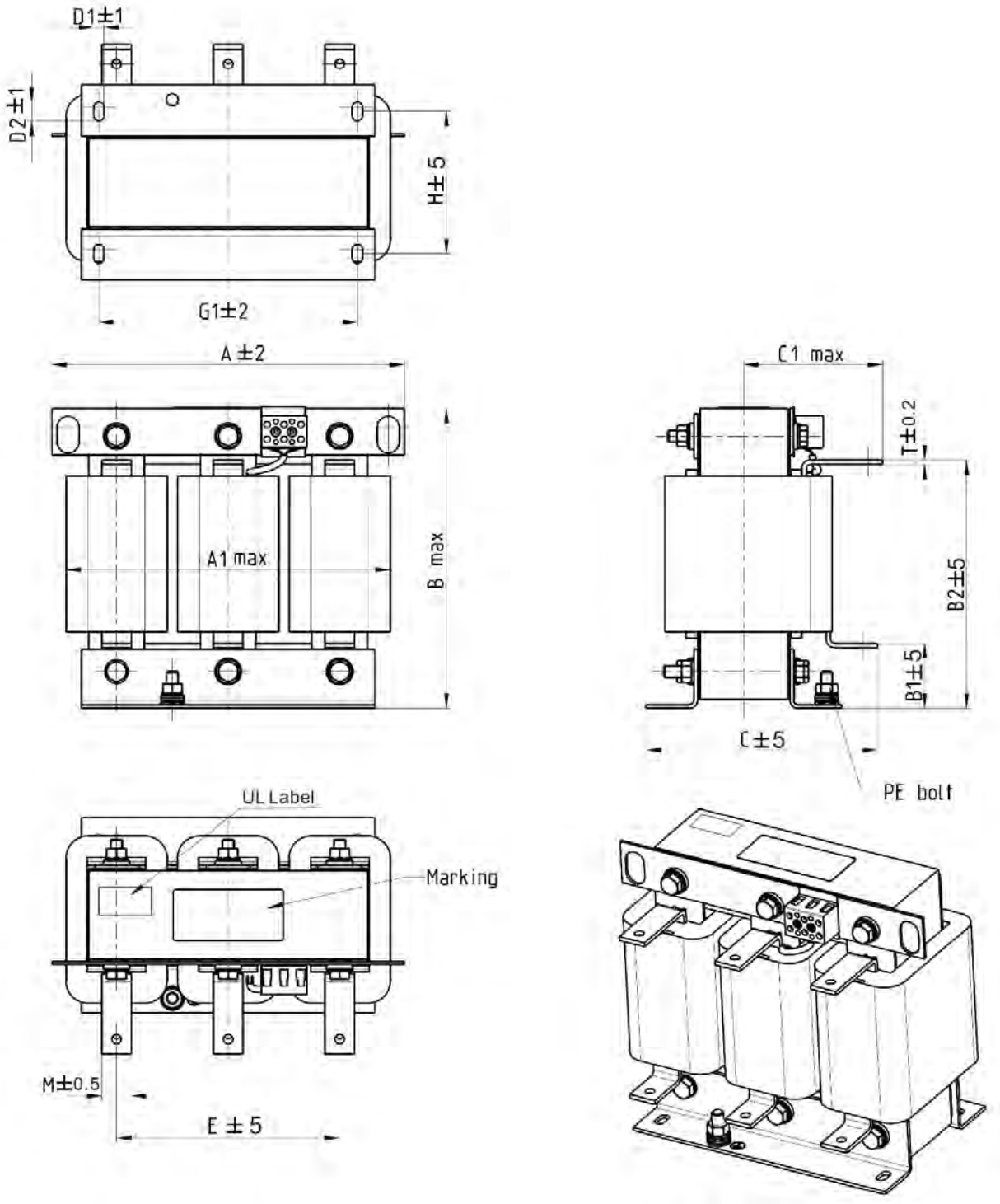


Figure 7-32

Unit: mm

Output AC reactor Delta part #	A	A1	B	B1	B2	C	C1	D1*D2	E	G1	H	M*T
DR060LP405	240	228	215	44	170	163	110	7*13	152	176	97	20*3
DR073LP334	250	235	235	44	186	174	115	11*18	160	190	124	20*3
DR091LP267	250	240	235	44	186	174	115	11*18	160	190	124	20*3
DR110LP221	270	260	245	50	192	175	115	10*18	176	200	106	20*3

Table 7-60

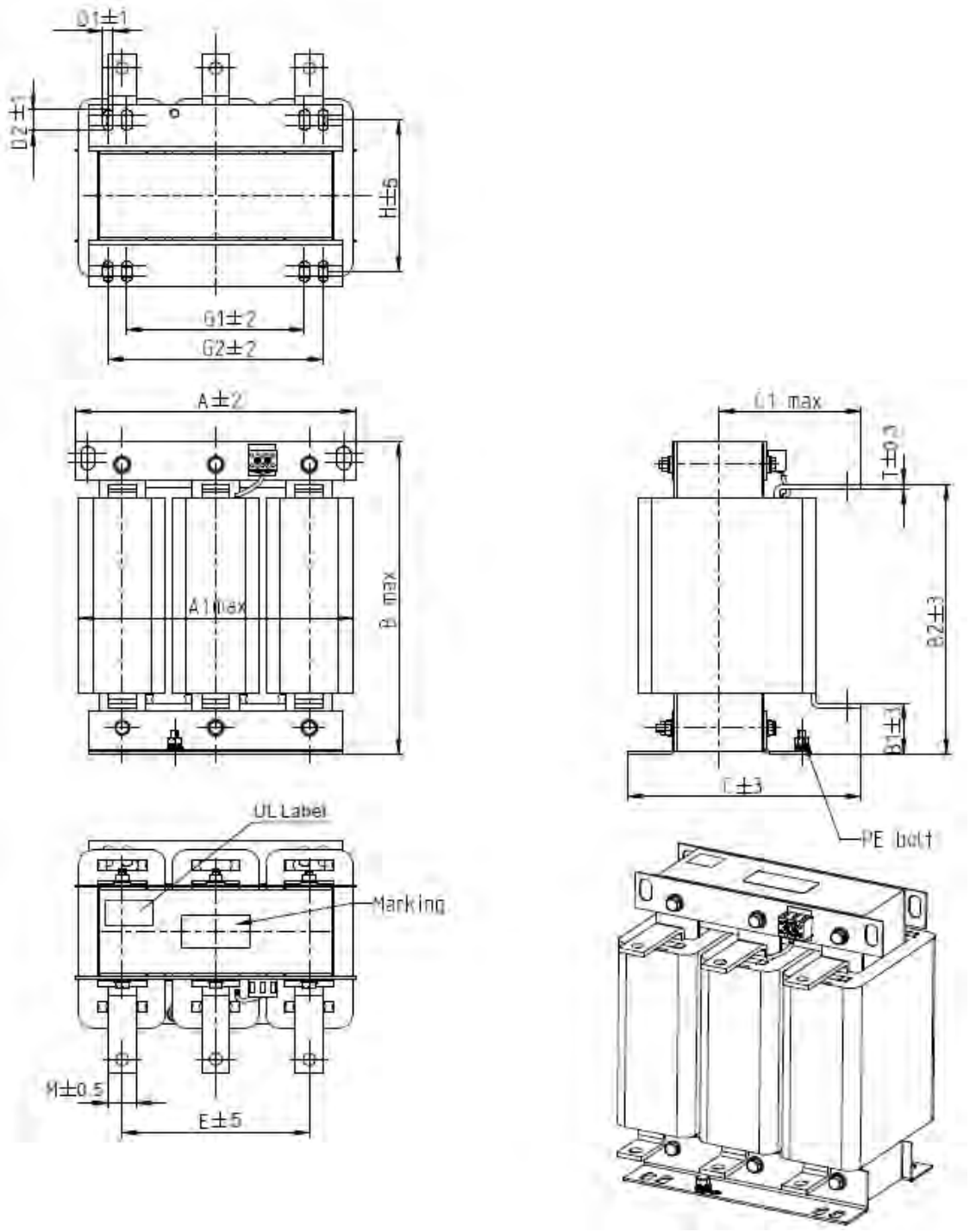


Figure 7-33

Unit: mm

Output AC reactor Delta part #	A	A1	B	B1	B2	C	C1	D1*D2	E	G1	G2	H	M*T
DR150LP162	270	264	265	51	208	192	125	10*18	176	200	/	118	30*3
DR180LP135	300	295	310	55	246	195	125	11*22	200	230	190	142	30*3
DR220LP110	300	298	310	57	248	210	140	11*22	200	230	190	142	30*5
DR260LP098	300	295	330	56	270	227	140	11*22	200	230	190	160	30*5
DR310LP078	300	298	350	54	288	233	145	11*22	200	230	190	160	30*5
DR370LP066	300	298	350	54	289	268	170	11*22	200	230	190	185	40*5

Table 7-61

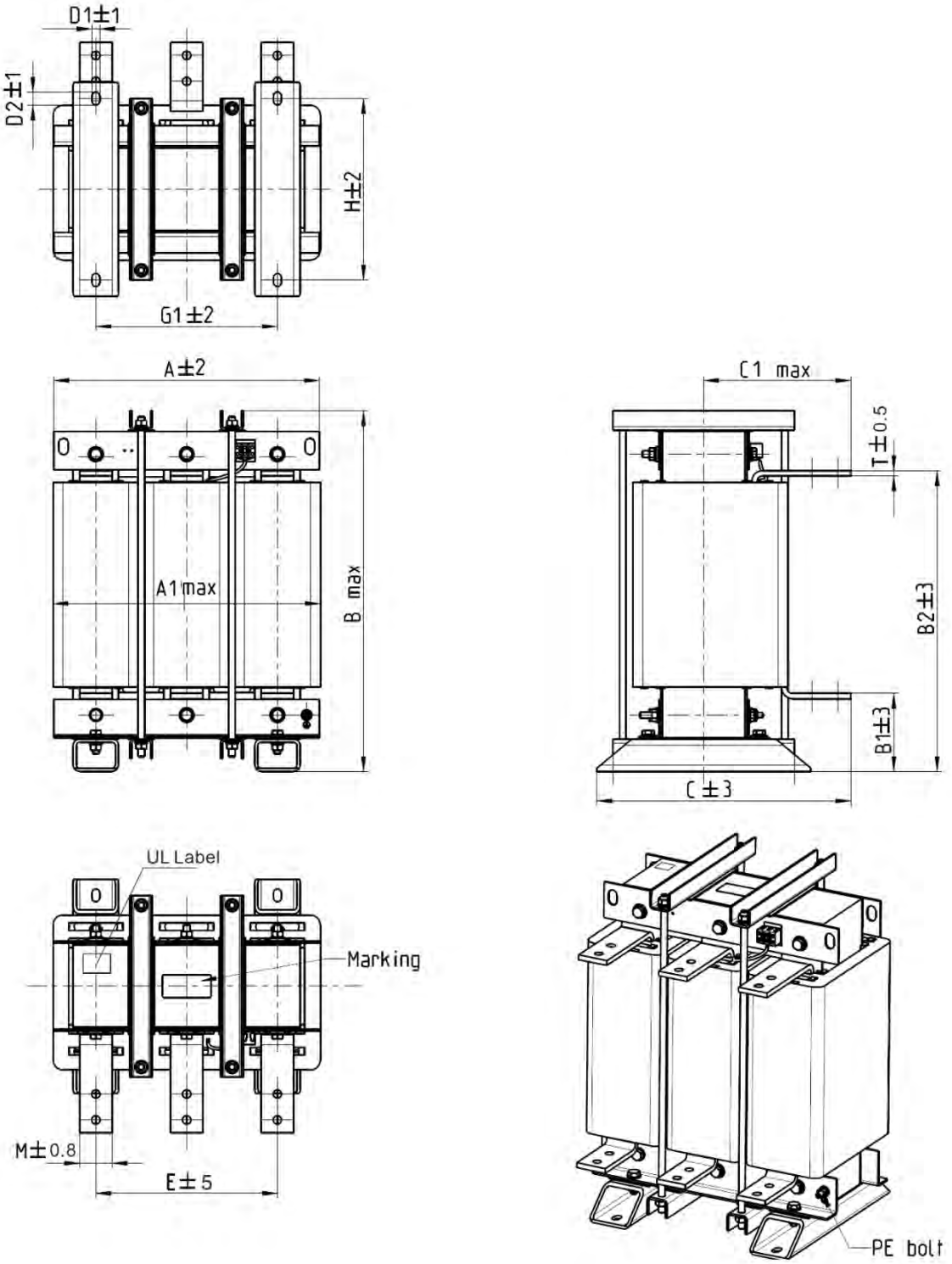


Figure 7-34

Unit: mm

Output AC reactor Delta part #	A	A1	B	B1	B2	C	C1	D1*D2	E	G1	H	M*T
DR460LP054	360	355	510	106	401	346	215	12*20	240	240	240	50*5
DR550LP044	360	355	510	106	401	358	220	12*20	240	240	250	50*5
DR616LP039	360	355	510	110	401	376	230	12*20	240	240	270	50*8
DR683LP036	360	355	510	110	401	396	240	12*20	240	240	290	50*8
DR866LP028	410	418	570	120	464	402	245	12*20	280	280	290	50*8

Table 7-62

Motor Cable Length

1. Consequence of leakage current on the motor

If the cable length is too long, the stray capacitance between cables increase and may cause leakage current. In this case, It activates the over-current protection, increases leakage current, or may affect the current display. The worst case is that it may damage the AC motor drive. If more than one motor is connected to one AC motor drive, the total wiring length should be the sum of the wiring length from AC motor drive to each motor.

For the 460V series AC motor drive, when you install an overload thermal relay between the drive and the motor to protect the motor from overheating, the connecting cable must be shorter than 50 m; however, an overload thermal relay malfunction may still occur. To prevent the malfunction, install an output reactor (optional) to the drive or lower the carrier frequency setting (see Pr.00-17 Carrier Frequency).

2. Consequence of the surge voltage on the motor

When a motor is driven by a PWM-type AC motor drive, the motor terminals experience surge voltages (dv/dt) due to power transistor conversion of AC motor drive. When the motor cable is very long (especially for the 460V series), surge voltages (dv/dt) may damage the motor insulation and bearing. To prevent this, follow these rules:

a. Use a motor with enhanced insulation.
b. Reduce the cable length between the AC motor drive and motor to suggested values.
c. Connect an output reactor (optional) to the output terminals of the AC motor drive

Refer to the following tables for the suggested motor shielded cable length. Use a motor with a rated voltage ≤ 500 V_{AC} and insulation level ≥ 1.35 kV in accordance with IEC 60034-17.

230V Models	Rated current (HD, Arms)	Without an AC output reactor		With an AC output reactor	
		Shielded Cable (meter)	Non-shielded cable (meter)	Shielded Cable (meter)	Non-shielded cable (meter)
VFD007C23A-21	5	50	75	75	115
VFD015C23A-21	8	50	75	75	115
VFD022C23A-21	11	50	75	75	115
VFD037C23A-21	17	50	75	75	115
VFD055C23A-21	25	50	75	75	115
VFD075C23A-21	33	100	150	150	225
VFD110C23A-21	49	100	150	150	225
VFD150C23A-21	65	100	150	150	225
VFD185C23A-21	75	100	150	150	225
VFD220C23A-21	90	100	150	150	225
VFD300C23A-00 VFD300C23A-21	120	100	150	150	225
VFD370C23A-00 VFD370C23A-21	146	100	150	150	225
VFD450C23A-00 VFD450C23A-21	180	150	225	225	325
VFD550C23A-00 VFD550C23A-21	215	150	225	225	325
VFD750C23A-00 VFD750C23A-21	255	150	225	225	325
VFD900C23A-00 VFD900C23A-21	346	150	225	225	325

Table 7-63

460V Models	Rated current (HD, Arms)	Without an AC output reactor		With an AC output reactor	
		Shielded Cable (meter)	Non-shielded cable (meter)	Shielded Cable (meter)	Non-shielded cable (meter)
VFD007C43A-21	3	50	75	75	115
VFD015C43A-21	4	50	75	75	115
VFD022C43A-21	6	50	75	75	115
VFD037C43A-21	9	50	75	75	115
VFD040C43A-21	10.5	50	75	75	115
VFD055C43A-21	12	50	75	75	115
VFD075C43A-21	18	100	150	150	225
VFD110C43A-21	24	100	150	150	225
VFD150C43A-21	32	100	150	150	225
VFD185C43A-21	38	100	150	150	225
VFD220C43A-21	45	100	150	150	225
VFD300C43A-21	60	100	150	150	225
VFD370C43S-00 VFD370C43S-21	73	100	150	150	225
VFD450C43S-00 VFD450C43S-21	91	150	225	225	325
VFD550C43A-00 VFD550C43A-21	110	150	225	225	325
VFD750C43A-00 VFD750C43A-21	150	150	225	225	325
VFD900C43A-00 VFD900C43A-21	180	150	225	225	325
VFD1100C43A-00 VFD1100C43A-21	220	150	225	225	325
VFD1320C43A-00 VFD1320C43A-21	260	150	225	225	325
VFD1600C43A-00 VFD1600C43A-21	310	150	225	225	325
VFD1850C43A-00 VFD1850C43A-21	370	150	225	225	325
VFD2000C43A-00 VFD2000C43A-21	395	150	225	225	325
VFD2200C43A-00 VFD2200C43A-21	460	150	225	225	325
VFD2500C43A-00 VFD2500C43A-21	481	150	225	225	325
VFD2800C43A-00 VFD2700C43C-21	550	150	225	225	325
VFD3150C43A-00 VFD3150C43C-21	616	150	225	225	325
VFD3550C43A-00 VFD3550C43C-21	683	150	225	225	325
VFD4000C43A-00 VFD4000C43A-21	770	150	225	225	325
VFD4500C43A-00 VFD4500C43C-21	866	150	225	225	325
VFD5000C43A-00 VFD5000C43C-21	930	150	225	225	325
VFD5600C43A-00 VFD5600C43C-21	1094	150	225	225	325

Table 7-64

460V	Rated current (HD, Arms)	Without an AC output reactor		With an AC output reactor	
Built-in EMC Filter drive model		Shielded Cable (meter)	Non-shielded cable (meter)	Shielded Cable (meter)	Non-shielded cable (meter)
VFD007C4EA-21	3	30	75	75	115
VFD015C4EA-21	4	30	75	75	115
VFD022C4EA-21	6	30	75	75	115
VFD037C4EA-21	9	30	75	75	115
VFD040C4EA-21	10.5	30	75	75	115
VFD055C4EA-21	12	30	75	75	115
VFD075C4EA-21	18	50	150	150	225
VFD110C4EA-21	24	50	150	150	225
VFD150C4EA-21	32	50	150	150	225
VFD185C4EA-21	38	50	150	150	225
VFD220C4EA-21	45	50	150	150	225
VFD300C4EA-21	60	50	150	150	225

Table 7-65

575V	kW	HP	Rated Current	Without an AC output reactor		With an AC output reactor	
Model			Normal Duty (Arms)	Shielded Cable (meter)	Non-shielded Cable (meter)	Shielded Cable (meter)	Non-shielded Cable (meter)
VFD015C53A-21	1.5	2	2.5	30	35	20	45
VFD022C53A-21	2.2	3	3.6	30	35	20	45
VFD037C53A-21	3.7	5	5.5	30	35	20	45
VFD055C53A-21	5.5	7.5	8.2	30	35	20	45
VFD075C53A-21	7.5	10	10	30	35	20	45
VFD110C53A-21	11	15	15.5	30	35	20	45
VFD150C53A-21	15	20	20	30	35	20	45

Table 7-66

690V	kW	HP	Rated Current	Without AC reactor		With AC reactor	
Model			Normal Duty (Arms)	Shielded Cable (meter)	Non-shielded Cable (meter)	Shielded Cable (meter)	Non-shielded Cable (meter)
VFD185C63B-21	18.5	25	20	20	35	30	45
VFD220C63B-21	22	30	24	20	35	30	45
VFD300C63B-21	30	40	30	20	35	45	60
VFD370C63B-21	37	50	36	20	45	60	75
VFD450C63B-00/21	45	60	45	20	45	60	75
VFD550C63B-00/21	55	75	54	20	45	60	100
VFD750C63B-00/21	75	100	67	20	45	60	100
VFD900C63B-00/21	90	125	86	20	45	75	100
VFD1100C63B-00/21	110	150	104	20	45	75	100
VFD1320C63B-00/21	132	175	125	20	45	75	100
VFD1600C63B-00/21	160	215	150	20	45	90	100
VFD2000C63B-00/21	200	270	180	20	45	90	100
VFD2500C63B-00/21	250	335	220	20	45	90	100
VFD3150C63B-00/21	315	425	290	20	45	90	100
VFD4000C63B-00/21	400	530	350	20	45	90	100

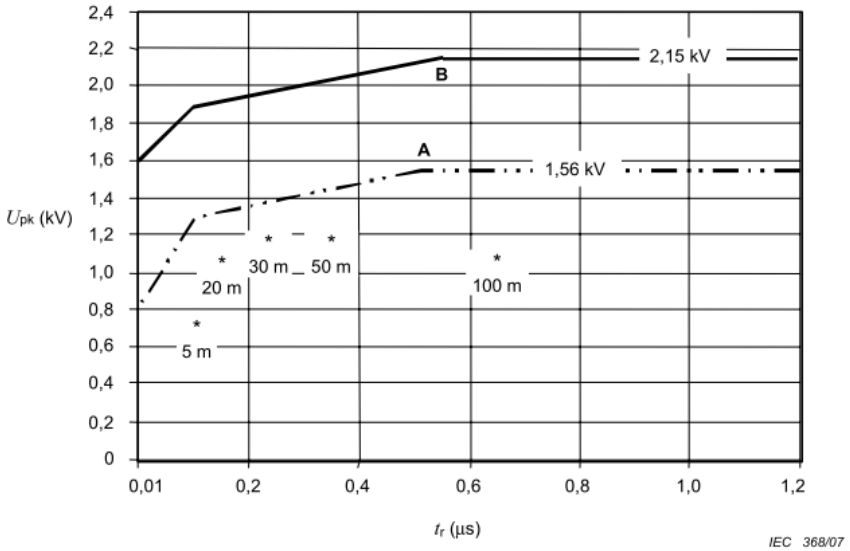
690V	kW	HP	Rated Current	Without AC reactor		With AC reactor	
Model			Normal Duty (Arms)	Shielded Cable (meter)	Non-shielded Cable (meter)	Shielded Cable (meter)	Non-shielded Cable (meter)
VFD4500C63B-00/21	450	600	385	20	45	90	100
VFD5600C63B-00/21	560	745	465	20	45	75	90
VFD6300C63B-00/21	630	850	675	20	45	75	90

Table 7-67

NOTE:

1. The table above is the suggested cable length of EMC built-in models operating under surge voltage influencing. To pass the noise emission and Electromagnetic interference certification, the cable length should follow chapter 7-7 instruction.
2. 690V output motor cable length needs to comply with IEC 60034-25

Requirements on insulation level of Curve B motor



Key

A Without filters for motors up to 500 V a.c.

B Without filters for motors up to 690 V a.c.

* Examples of measured results at 415 V supply, for different lengths of steel armoured cable

Figure 7-35 - **Limiting curves of impulse voltage U_{pk}, measured between two motor phase terminals, as a function of the *peak rise time* t_r**

The t_r is defined as:

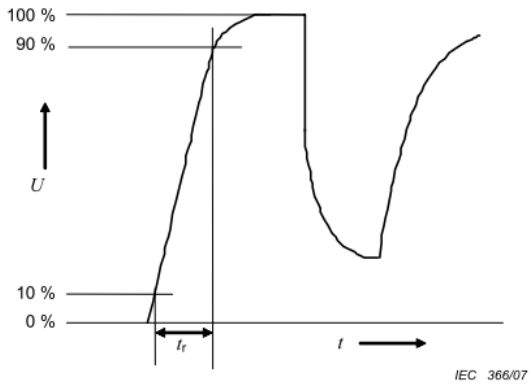


Figure 7-36

Sine-wave Filter

When there is longer cable length connected between the motor drive and the motor, the damping leads to high frequency resonator, and makes impedance matching poor to enlarge the voltage reflection. This phenomenon will generate twice-input voltage in the motor side, which will easily make motor voltage overshoot to damage insulation.

To prevent this, installing sine-wave filter can transform PWM output voltage to smooth and low-ripple sine-wave, and motor cable length can be longer than 1000 meters.

Installation

Install a Sine-wave filter in series between the three output phases U V W and the motor, as shown in the figure below:

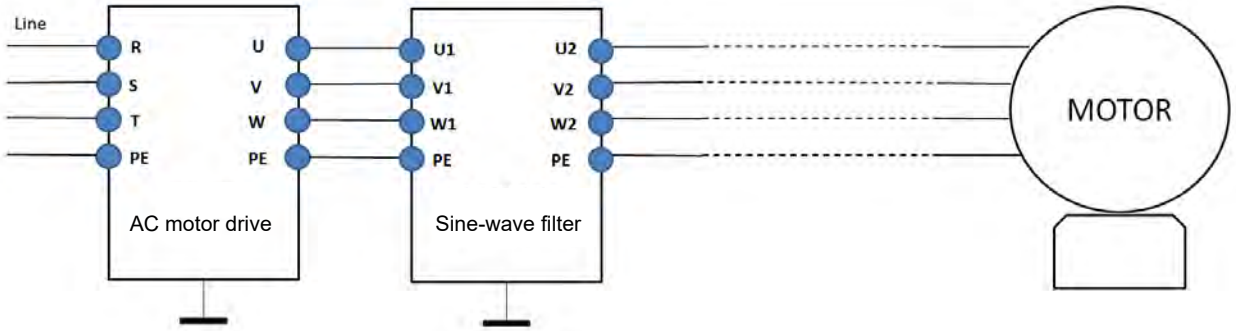


Figure 7-37 Wiring of non-shielded cable

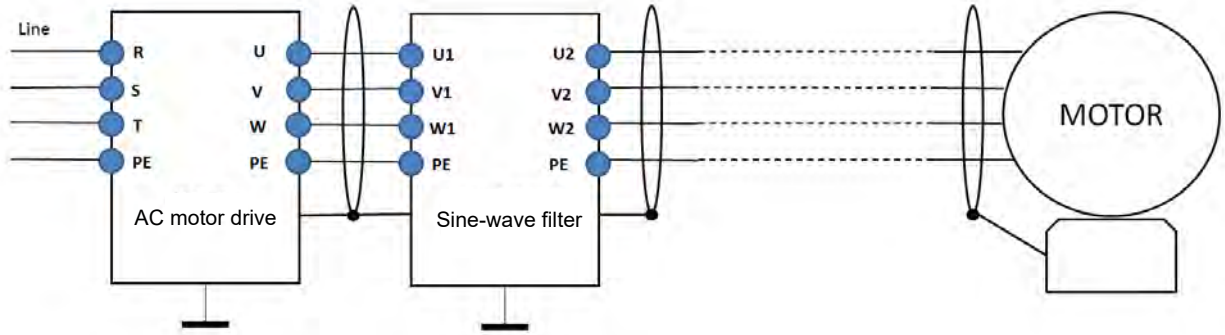


Figure 7-38 Wiring of shielded cable

NOTE:

1. Sinusoidal filters must only be used in V/F operation mode (Pr.00-11=0). If the application requires FOC control then Sinusoidal filters cannot be installed on the output.
2. Sinusoidal filters have strict limits on the output frequency (Pr.01-00), carrier frequency (Pr.00-17) and sometimes also on modulation type. Check the datasheet of the sine-wave filter and contact Delta for more information on how to set the drive to make sure that those limits never get exceeded.

Applicable Sine-wave Filters:

200V–230V, 50/60 Hz

kW	HP	Rated current (Arms)	Suggested sine-wave filter part #	Output cable length (m) (Shielded or non-shielded)
0.75	1	5	B84143V0006R227	1000
1.5	2	8	B84143V0011R227	
2.2	3	11		
3.7	5	17	B84143V0025R227	
5.5	7.5	25		
7.5	10	33	B84143V0033R227	
11	15	49	B84143V0050R227	
15	20	65	B84143V0066R227	
18.5	25	75	B84143V0075R227	
22	30	90	B84143V0095R227	
30	40	120	B84143V0132R227	
37	50	146	B84143V0180R227	
45	60	180		
55	75	215	B84143V0250R227	
75	100	255	B84143V0320R227	
90	125	346	Contact supplier EPCOS	

Table 7-68

380V–460V, 50/60 Hz

kW	HP	Rated current (Arms)	Suggested sine-wave filter part #	Output cable length (m) (Shielded or non-shielded)
0.75	1	3	B84143V0004R227	1000
1.5	2	4		
2.2	3	6	B84143V0006R227	
3.7	5	9	B84143V0011R227	
4	5	10.5		
5.5	7.5	12	B84143V0016R227	
7.5	10	18	B84143V0025R227	
11	15	24		
15	20	32	B84143V0033R227	
18.5	25	38	B84143V0050R227	
22	30	45		
30	40	60	B84143V0066R227	
37	50	73	B84143V0075R227	
45	60	91	B84143V0095R227	
55	75	110	B84143V0132R227	
75	100	150	B84143V0180R227	
90	125	180		
110	150	220	B84143V0250R227	

kW	HP	Rated current (Arms)	Suggested sine-wave filter part #	Output cable length (m) (Shielded or non-shielded)
132	175	260	B84143V0320R227	1000
160	215	310		
185	250	370	Contact supplier EPCOS	
200	270	395		
220	300	460		
250	340	481		
280	375	550		
315	420	616		
355	475	683		
400	536	770		
450	600	866		
500	650	930		
560	750	1094		

Table 7-69

Sine wave filter part #	Please refer to website: http://en.tdk.eu/inf/30/db/emc_2014/B84143V_R227.pdf
B84143V0004R227	I_R:4A, Sine-wave output filters for 3-phase systems
B84143V0006R227	I_R:6A, Sine-wave output filters for 3-phase systems
B84143V0011R227	I_R:11A, Sine-wave output filters for 3-phase systems
B84143V0016R227	I_R:16A, Sine-wave output filters for 3-phase systems
B84143V0025R227	I_R:25A, Sine-wave output filters for 3-phase systems
B84143V0033R227	I_R:33A, Sine-wave output filters for 3-phase systems
B84143V0050R227	I_R:50A, Sine-wave output filters for 3-phase systems
B84143V0066R227	I_R:66A, Sine-wave output filters for 3-phase systems
B84143V0075R227	I_R:75A, Sine-wave output filters for 3-phase systems
B84143V0095R227	I_R:95A, Sine-wave output filters for 3-phase systems
B84143V0132R227	I_R:132A, Sine-wave output filters for 3-phase systems
B84143V0180R227	I_R:180A, Sine-wave output filters for 3-phase systems
B84143V0250R227	I_R:250A, Sine-wave output filters for 3-phase systems
B84143V0320R227	I_R:320A, Sine-wave output filters for 3-phase systems

Table 7-70

7-5 Zero-Phase Reactors

Reactor Model*	Recommended Wire Size		Wiring Method	Max. Wiring Q'ty
RF008X00A	≤ 8 AWG	≤ 8.37 mm^2	Diagram A	1C*3 or 4C*1
T60006L2040W453	≤ 8 AWG	≤ 8.37 mm^2	Diagram B	
RF004X00A	≤ 1 AWG	≤ 42.41 mm^2	Diagram A	1C*3 or 4C*1
T60006L2050W565	≤ 1 AWG	≤ 42.41mm^2	Diagram B	
RF002X00A	≤ 600 MCM	≤ 304 mm^2	Diagram A	1C*3 or 4C*1
T60006L2160V066	≤ 600 MCM	≤ 304 mm^2	Diagram B	
RF300X00A	≤ 350 MCM	≤ 185 mm^2	Diagram A	1C*12 or 4C*3

Table 7-71

NOTE:

1. Mark * means that motor cable is a 600V insulated power cable.
2. The table above only considers the motor cable size
3. For the max. wiring quantity, refer to Chapter 5 Main Circuit Terminal.
4. The table above gives approximate wire size for the zero phase reactors, but the selection is ultimately governed by the type and diameter of cable fitted, i.e. the cable must fit through the center hole of zero phase reactors.
5. Only the phase conductors should pass through, not the earth core or screen.
6. For the zero-phase reactor used for signal cables, it is recommended to install near to the driver and well fixed, as to prevent vibration and pulling of the cable.

Diagram A

Put all wires through at least one core without winding.

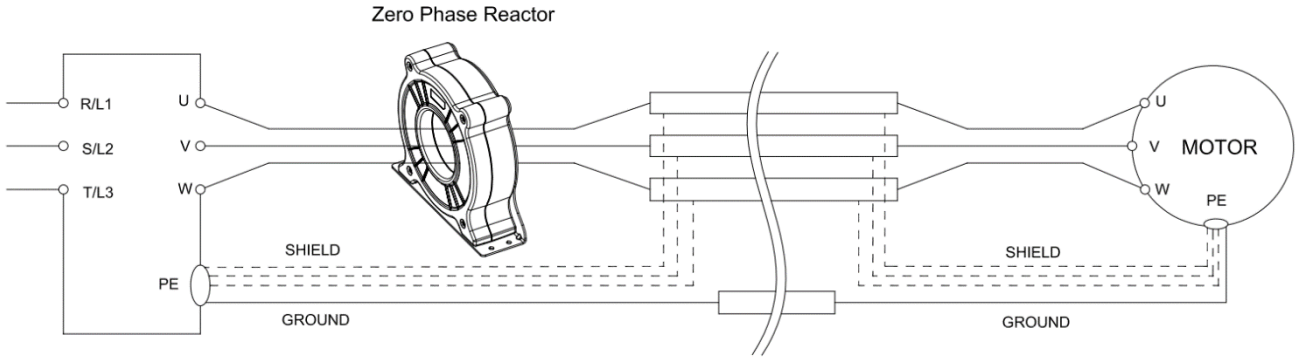


Figure 7-39

Diagram B

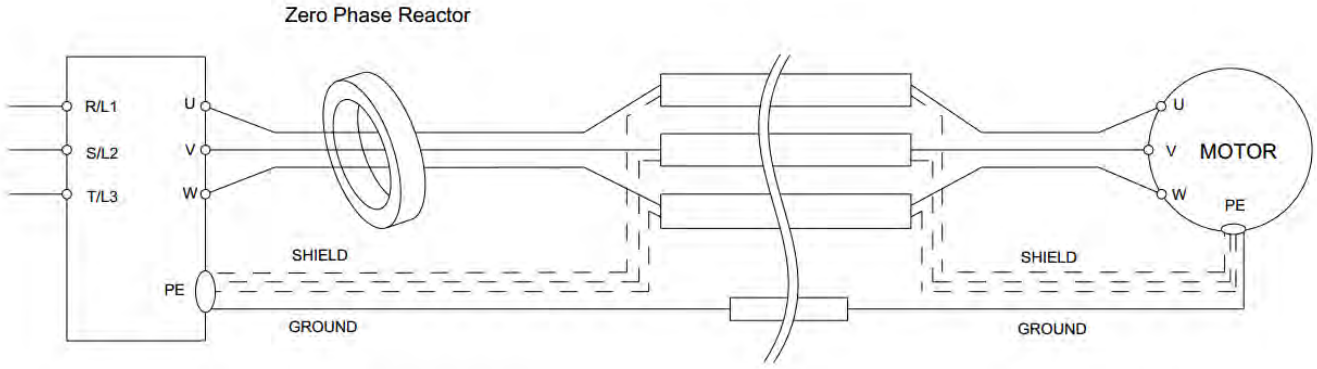


Figure 7-40

Diagram C

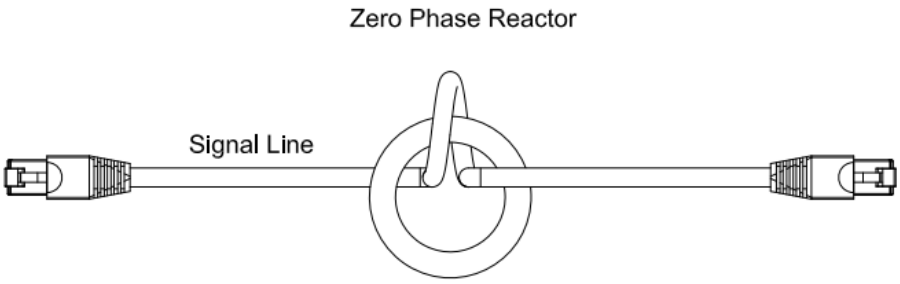


Figure 7-41

Diagram D

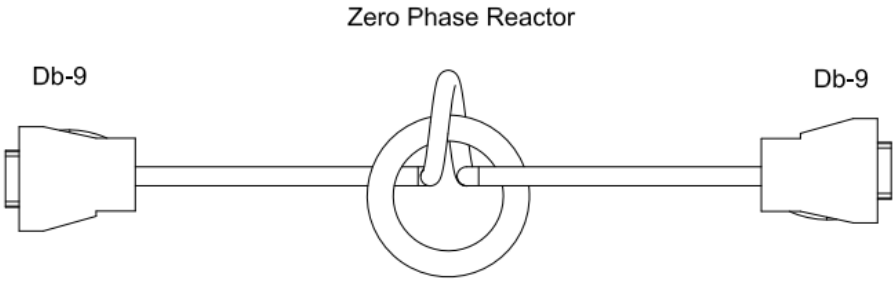


Figure 7-42

Diagram E

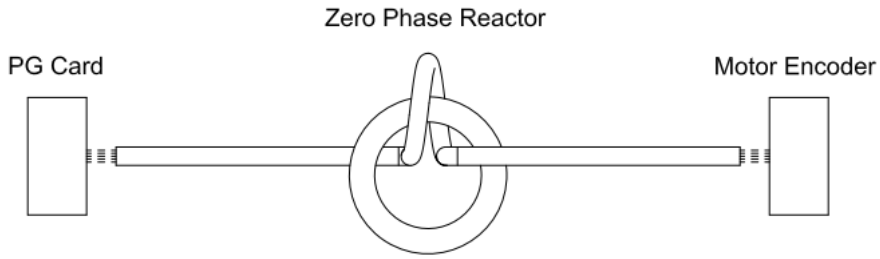


Figure 7-43

Model*	Recommended wire size	Wiring method	Q'ty	Applicable cables
T60006L2050W565	≤ 1 AWG	Diagram D	1	D-sub
T60006L2040W453	≤ 8 AWG	Diagram C	1	Category 5e shielding、Shielded twisted pair cable、CAN standard cable (TAP-CB05, TAP-CB10)
T60004L2025W622	≤ 10AWG	Diagram E	1	PG card signal cable
T60004L2016W620	≤ 12AWG	Diagram E	1	PG card signal cable

Table 7-72

NOTE:

1. Mark * means that the table above is for reference only, select the zero-phase reactor based on the actual wire size that you are using.
2. Some of the cables are recommended to choose bigger zero phase reactor due to its corresponded mechanical size.

Recommended max. motor cable size of zero phase reactor (included LUG width and temperature tolerance of motor cable)

Zero phase reactor	Available max. wire size/ LUG width	Available max. AGW (1C*3)		Available max. AWG (4C*1)	
		75℃	90℃	75℃	90℃
RF008X00A	13 mm	3 AWG	1 AWG	3 AWG	1 AWG
RF004X00A	16 mm	1 AWG	2/0 AWG	1 AWG	1/0 AWG
RF002X00A	36 mm	600 MCM	600 MCM	1 AWG	1/0 AWG
RF300X00A	73 mm	650 MCM	650 MCM	300 MCM	300 MCM
T60006L2040W453	11 mm	9 AWG	4 AWG	6 AWG	6 AWG
T60006L2050W565	16 mm	1 AWG	2/0 AWG	1 AWG	1/0 AWG
T60006L2160V066	57 mm	600 MCM	600 MCM	300 MCM	300 MCM

Table 7-73

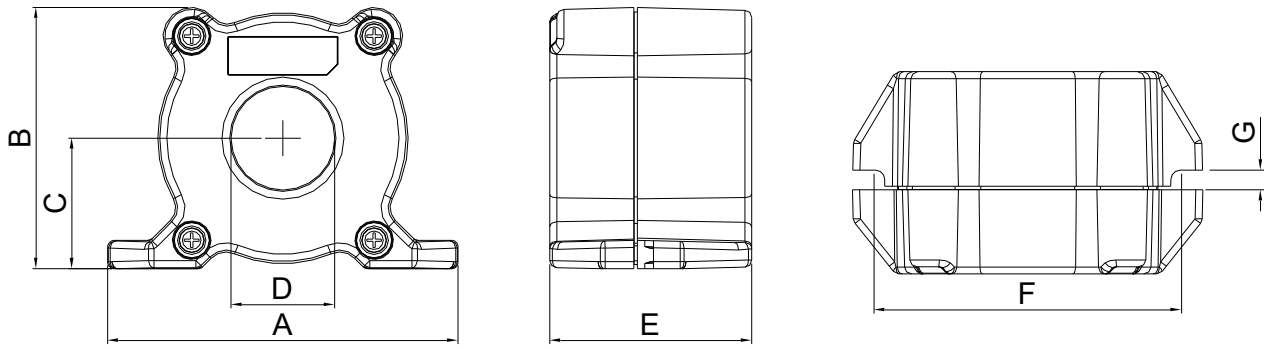


Figure 7-44

Unit: mm (inch)

Model	A	B	C	D	E	F	G(Ø)	Torque
RF008X00A	98 (3.858)	73 (2.874)	36.5 (1.437)	29 (1.142)	56.5 (2.224)	86 (3.386)	5.5 (0.217)	< 10 kgf/cm^2
RF004X00A	110 (4.331)	87.5 (3.445)	43.5 (1.713)	36 (1.417)	53 (2.087)	96 (3.780)	5.5 (0.217)	< 10 kgf/cm^2

Table 7-74

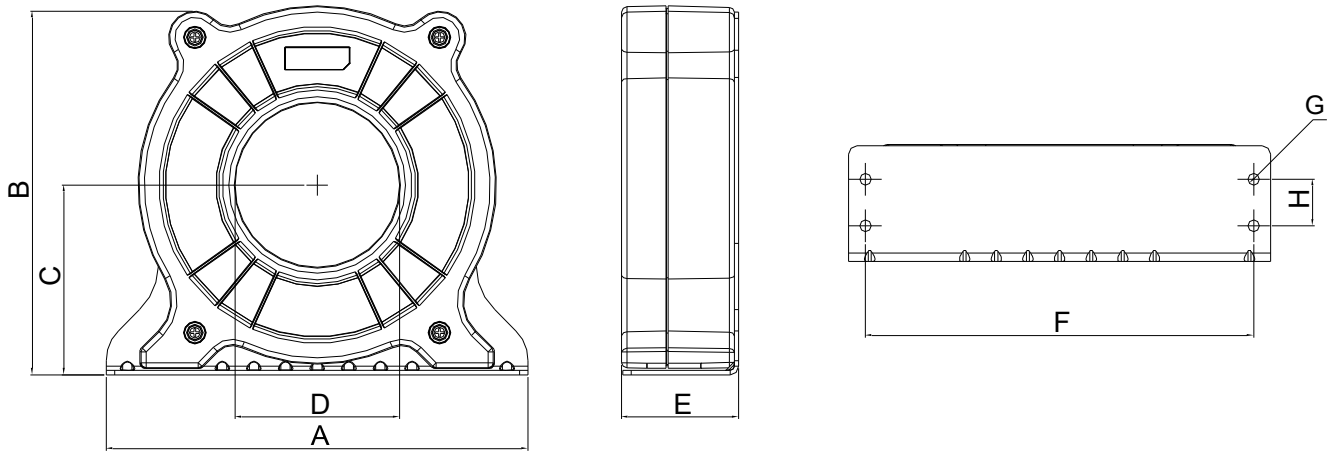


Figure 7-45

Unit: mm (inch)

Model	A	B	C	D	E	F	G(Ø)	H	Torque
RF002X00A	200 (7.874)	172.5 (6.791)	90 (3.543)	78 (3.071)	55.5 (2.185)	184 (7.244)	5.5 (0.217)	22 (0.866)	<45 kgf/cm^2

Table 7-75

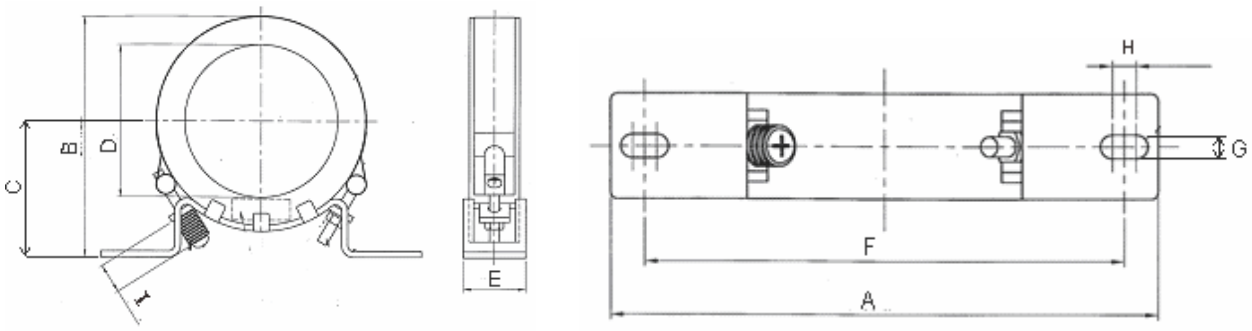


Figure 7-46

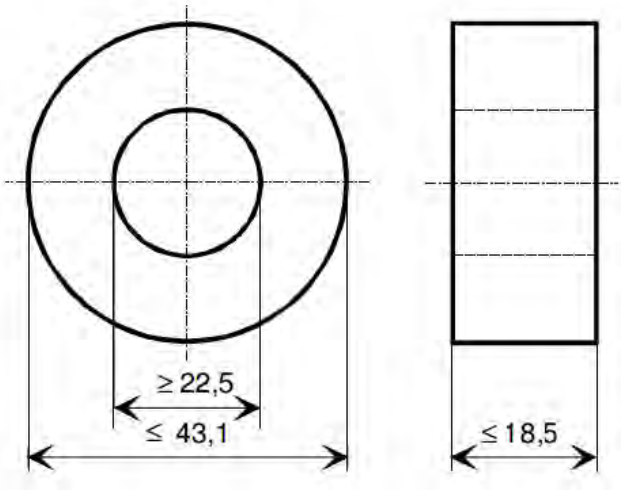
Unit: mm (inch)

Model	A	B	C	D	E	F	G(Ø)	H	I
RF300X00A	241 (9.488)	217 (8.543)	114 (4.488)	155 (6.102)	42 (1.654)	220 (8.661)	6.5 (0.256)	7.0 (0.276)	20 (0.787)

Table 7-76

Magnetic Ring

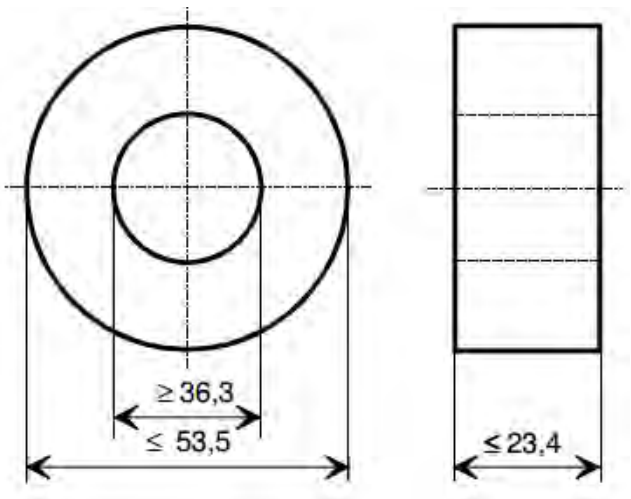
Model number: T60006-L2040-W453



Unit: mm

Figure 7-47

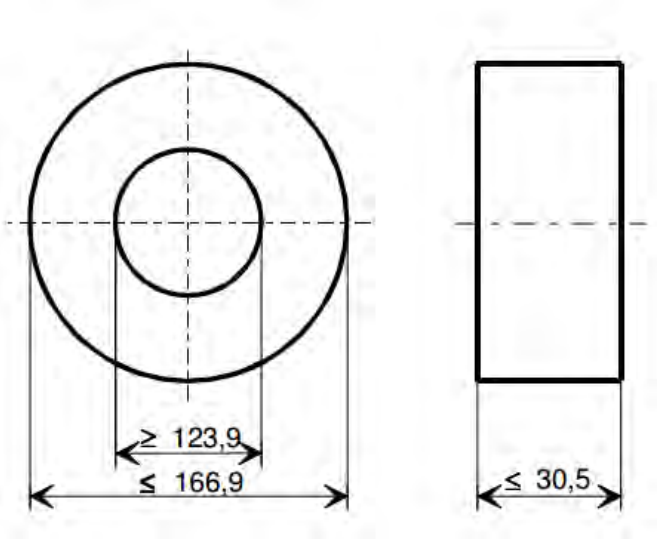
Model number: T60006-L2050-W565



Unit: mm

Figure 7-48

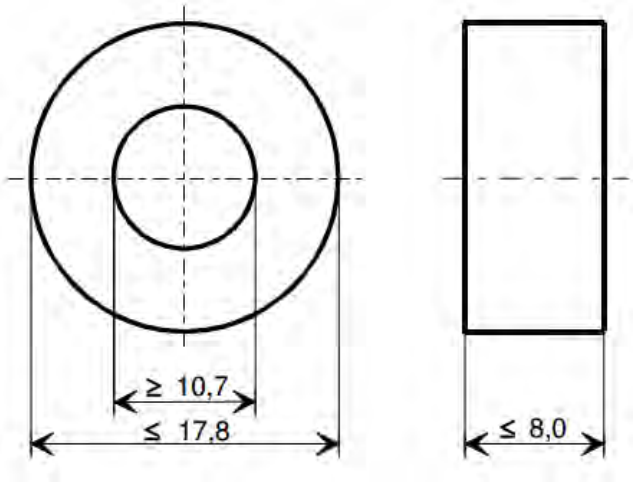
Model number: T60006-L2160-V066



Unit: mm

Figure 7-49

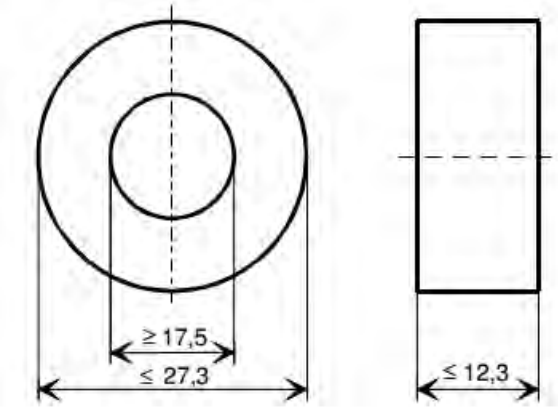
Model number: T60004-L2016-W620



Unit: mm

Figure 7-50

Model number: T60004-L2025-W622



Unit: mm

Figure 7-51

7-6 EMC Filter

Following table is the external EMC filter of C2000 Plus series, user can choose corresponding zero phase reactor and suitable shielded cable length in accord to required noise emission and electromagnetic interference level to have the best configuration to suppress the electromagnetic interference. When the application does not consider RE and only needs CE to comply with C2 or C1, there is no need to install zero phase reactor in input side.

230V models

C2000 Plus			Filter model name	Zero phase reactor		Fc	Conducted Emission (CE)		Radiation Emission (RE)
Frame	Model	Rated input current (A)		Input side (R / S / T)	Output side (U / V / W)		Output shielded cable length		EN61800-3
							C2	C1	
A	VFD007C23A-21	6.4	EMF021A23A	RF008X00A or T60006L2040W453	RF008X00A or T60006L2040W453	≤ 8 kHz	100 m	50 m	C2
	VFD015C23A-21	12							
	VFD022C23A-21	16							
	VFD037C23A-21	20							
B	VFD055C23A-21	28	EMF056A23A	RF004X00A or T60006L2050W565	RF004X00A or T60006L2050W565				
	VFD075C23A-21	36							
	VFD110C23A-21	52							
C	VFD150C23A-21	72	KMF3100A	RF002X00A or T60006L2160V066	RF002X00A or T60006L2160V066	≤ 6 kHz			
	VFD185C23A-21	83							
	VFD220C23A-21	99							
D	VFD300C23A-00 VFD300C23A-21	124	B84143D0150R127	N/A					
	VFD370C23A-00 VFD370C23A-21	143							
E	VFD450C23A-00 VFD450C23A-21	171	B84143B0250S020	N/A	RF300X00A or T60006L2160V066	≤ 4 kHz			
	VFD550C23A-00 VFD550C23A-21	206							
	VFD750C23A-00 VFD750C23A-21	245							
F	VFD900C23A-00 VFD900C23A-21	331	B84143B0400S020						

Table 7-77

460V models

C2000 Plus			Filter model name	Zero phase reactor		Fc	Conducted Emission (CE)		Radiation Emission (RE)
Frame	Model	Rated input current (A)		Input side (R / S / T)	Output side (U / V / W)		Output shielded cable length		EN61800-3
							C2	C1	
A	VFD007C43A-21	4.3	EMF014A43A	RF008X00A or T60006L2040W453	RF008X00A or T60006L2040W453	≤ 8 kHz	100 m	50 m	C2
	VFD015C43A-21	5.9							
	VFD022C43A-21	8.7							
	VFD037C43A-21	14	EMF018A43A						
	VFD040C43A-21	15.5							
	VFD055C43A-21	17							
B	VFD075C43A-21	20	EMF039A43A	RF004X00A or T60006L2050W565	RF004X00A or T60006L2050W565				
	VFD110C43A-21	26							
	VFD150C43A-21	35							
C	VFD185C43A-21	40	KMF370A	RF002X00A or T60006L2160V066	RF002X00A or T60006L2160V066	≤ 6 kHz			
	VFD220C43A-21	47							
	VFD300C43A-21	63							
D0	VFD370C43S-00 VFD370C43S-21	74	B84143D0150R127	N/A					
	VFD450C43S-00 VFD450C43S-21	101							
D	VFD550C43A-00 VFD550C43A-21	114							
	VFD750C43A-00 VFD750C43A-21	157				≤ 4 kHz			
E	VFD900C43A-00 VFD900C43A-21	167	B84143D0200R127	N/A	RF300X00A or T60006L2160V066				
	VFD1100C43A-00 VFD1100C43A-21	207							
F	VFD1320C43A-00 VFD1320C43A-21	240	MIF3400B						
	VFD1600C43A-00 VFD1600C43A-21	300							
G	VFD1850C43A-00 VFD1850C43A-21	380							
	VFD2000C43A-00 VFD2000C43A-21	395							
	VFD2200C43A-00 VFD2200C43A-21	400							
	VFD2500C43A-00 VFD2500C43A-21	447	MIF3800						
H	VFD2800C43A-00 VFD2800C43C-21	494							
	VFD3150C43A-00 VFD3150C43C-21	555							
	VFD3550C43A-00 VFD3550C43C-21	625							
	VFD4500C43A-00 VFD4500C43C-21	866	B84143B1000S020				75 m		
	VFD5000C43A-00 VFD5000C43C-21	930	Contact Delta						
	VFD5600C43A-00 VFD5600C43C-21	1094							

Table 7-78

C2000 Plus			Filter model name	Zero phase reactor		Carrier Frequency	Conducted Emission (CE)	Radiation Emission (RE)
Frame	Model	Rated Input Current (A)		Input side (R / S / T)	Output side (U / V / W)		Output shielded cable length EN618000-3 C3	EN61800-3
D0	VFD370C43S-00 VFD370C43S-21	74	B84143B0120R110	N/A	N/A	≤6 kHz	25 m	*C2
	VFD450C43S-00 VFD450C43S-21	101						
D	VFD550C43A-00 VFD550C43A-21	114	B84143B0180S020	N/A	RF300X00A or T60006L2160V066	≤4 kHz	13 m	*C3
	VFD750C43A-00 VFD750C43A-21	157						
E	VFD900C43A-00 VFD900C43A-21	167	B84143B0250S020					C2
	VFD1100C43A-00 VFD1100C43A-21	207						
F	VFD1320C43A-00 VFD1320C43A-21	240	B84143B0400S020					
	VFD1600C43A-00 VFD1600C43A-21	300						
G	VFD1850C43A-00 VFD1850C43A-21	380	B84143B0600S020			≤2 kHz		
	VFD2000C43A-00 VFD2000C43A-21	395						
	VFD2200C43A-00 VFD2200C43A-21	400						
	VFD2500C43A-00 VFD2500C43A-21	447						
H	VFD2800C43A-00 VFD2800C43C-21	494	B84143B1000S020					*C3
	VFD3150C43A-00 VFD3150C43C-21	555						
	VFD3550C43A-00 VFD3550C43C-21	625						
	VFD4500C43A-00 VFD4500C43C-21	866						
	VFD5000C43A-00 VFD5000C43C-21	930	B84143B1600S020	T60006L2160V066	T60006L2160V066	≤4 kHz	75 m	C2
	VFD5600C43A-00 VFD5600C43C-21	1094						

Table 7-79

NOTE: Mark * means that for Radiated Emission, the drive needs to be placed inside a cabinet.

C2000 Plus			Filter model name	Zero phase reactor		Carrier Frequency	Conducted Emission (CE)	Radiation Emission (RE)
Frame	Model	Rated Input Current (A)		Input side (R / S / T)	Output side (U / V / W)		Output shielded cable length EN618000-3 C3	EN61800-3
D0	VFD370C43S-00 VFD370C43S-21	74	B84143A0120R105	N/A	N/A	≤6 kHz	150 m	C3
	VFD450C43S-00 VFD450C43S-21	101						
D	VFD550C43A-00 VFD550C43A-21	114	B84143B0180S080					*C3
	VFD750C43A-00 VFD750C43A-21	157						
E	VFD900C43A-00 VFD900C43A-21	167	B84143B0250S080			≤4 kHz		C3
	VFD1100C43A-00 VFD1100C43A-21	207						
F	VFD1320C43A-00 VFD1320C43A-21	240	B84143B0400S080					
	VFD1600C43A-00 VFD1600C43A-21	300						
G	VFD1850C43A-00 VFD1850C43A-21	380	B84143B0600S080					
	VFD2000C43A-00 VFD2000C43A-21	395						
	VFD2200C43A-00 VFD2200C43A-21	400						
	VFD2500C43A-00 VFD2500C43A-21	447						
H	VFD2800C43A-00 VFD2800C43C-21	494	B84143B1000S080				100 m	
	VFD3150C43A-00 VFD3150C43C-21	555						
	VFD3550C43A-00 VFD3550C43C-21	625						
	VFD4000C43A-00 VFD4000C43C-21	770						
	VFD4500C43A-00 VFD4500C43C-21	866						
	VFD5000C43A-00 VFD5000C43C-21	930	B84143B1600S080	Contact Delta				
	VFD5600C43A-00 VFD5600C43C-21	1094						

Table 7-80

NOTE: Mark * means that for Radiated Emission, the drive needs to be placed inside a cabinet.

690V models

Frame	Model	Filter model name	Zero phase reactor	Conducted and radiated emission (CE, RE)					
				C2-motor cable length-50m			C3-motor cable length-100m		
				Location of zero phase reactor (See figure below)					
				1*	2*	3*	1*	2*	3*
A	VFD015C53A-21	EMF014A63A	T60006L2040W453			1			1
	VFD022C53A-21					1			1
	VFD037C53A-21					1			1
B	VFD055C53A-21	EMF027A63A			1	1		1	1
	VFD075C53A-21				1	1		1	1
	VFD110C53A-21				1	1		1	1
	VFD150C53A-21				1	1		1	1
C	VFD185C63B-21	B84143A0050R021	T60006L2050W565						
	VFD220C63B-21								
	VFD300C63B-21								
	VFD370C63B-21								
D	VFD450C63B-00	B84143A0080R021						1	2
	VFD550C63B-00							1	2
	VFD450C63B-21							1	2
	VFD550C63B-21							1	2
E	VFD750C63B-00	B84143B0150S021	T60006L2160V066						
	VFD900C63B-00								
	VFD1100C63B-00								
	VFD1320C63B-00								
	VFD750C63B-21								
	VFD900C63B-21								
	VFD1100C63B-21								
	VFD1320C63B-21								
F	VFD1600C63B-00	B84143B0250S021							
	VFD2000C63B-00								
	VFD1600C63B-21								
	VFD2000C63B-21								
G	VFD2500C63B-00	B84143B0400S021							
	VFD3150C63B-00								
	VFD2500C63B-21								
	VFD3150C63B-21								
H	VFD4000C63B-00	B84143B1000S021						1	1
	VFD4500C63B-00							1	1
	VFD5600C63B-00							1	1
	VFD6300C63B-00							1	1
	VFD4000C63B-21							1	1
	VFD4500C63B-21							1	1
	VFD5600C63B-21							1	1
	VFD6300C63B-21							1	1

Table 7-81

NOTE: The number represents quantity of zero phase reactor, all the motor cable are shielded cables.

Zero phase reactor installation position diagram:

1* Install at the cable between the power supply and the EMC filter

2* Install at the cable between the EMC filter and the drive

3* Install at the cable between the drive and the motor

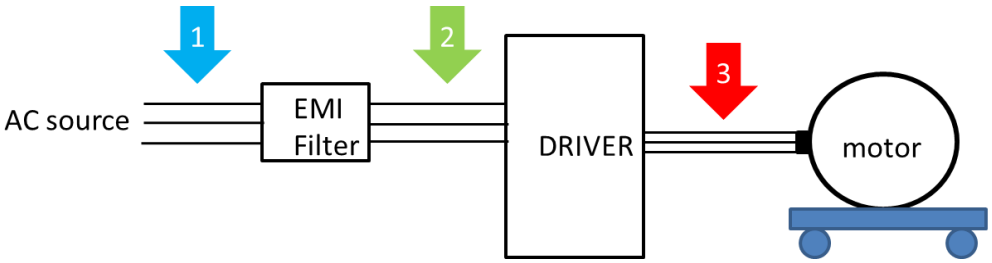


Figure 7-52

EMC Filter Dimension

Model name: EMF021A23A, EMF014A43A

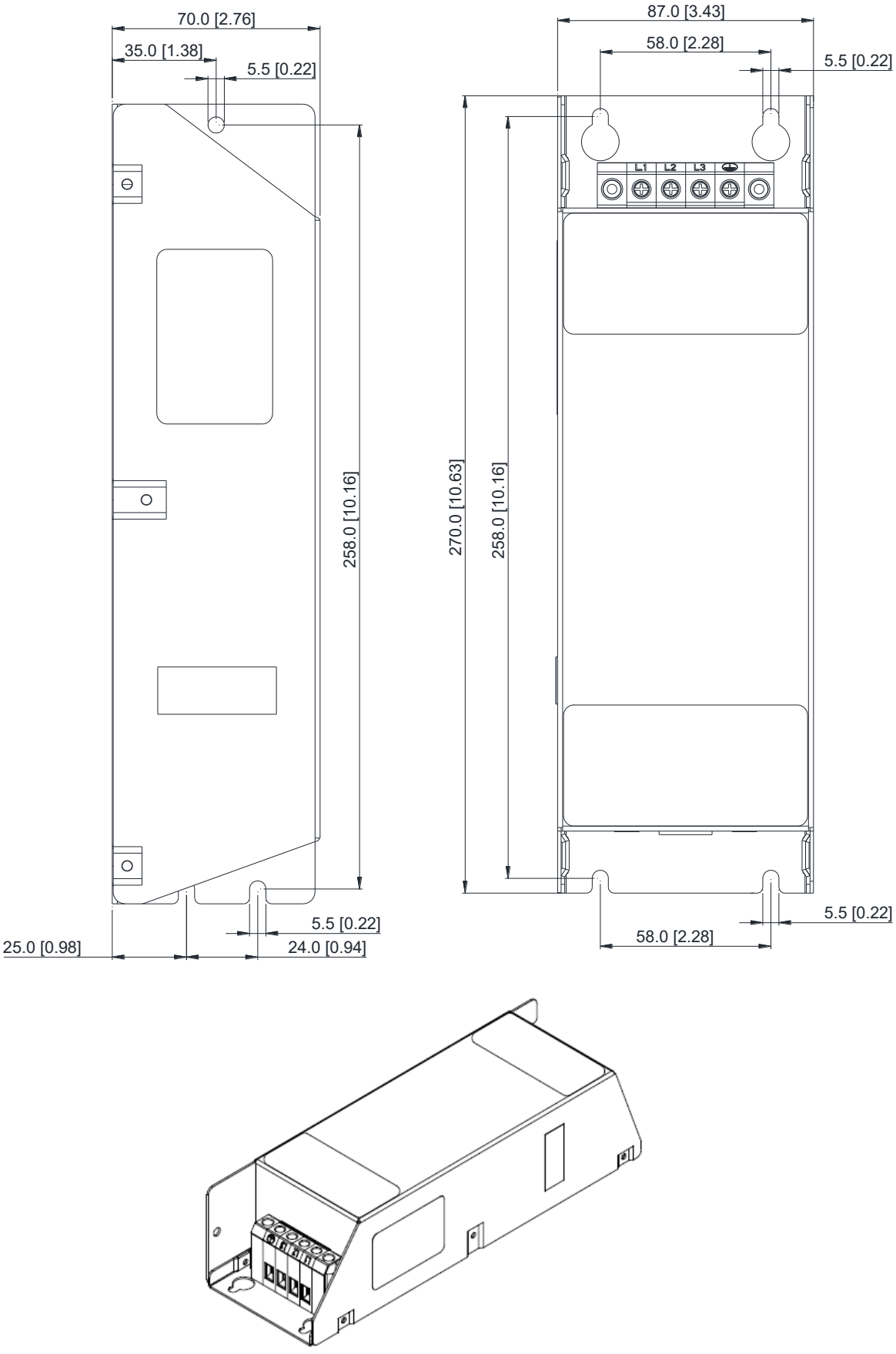


Figure 7-53

Model name: EMF018A43A, EMF014A63A, EMF027A63A

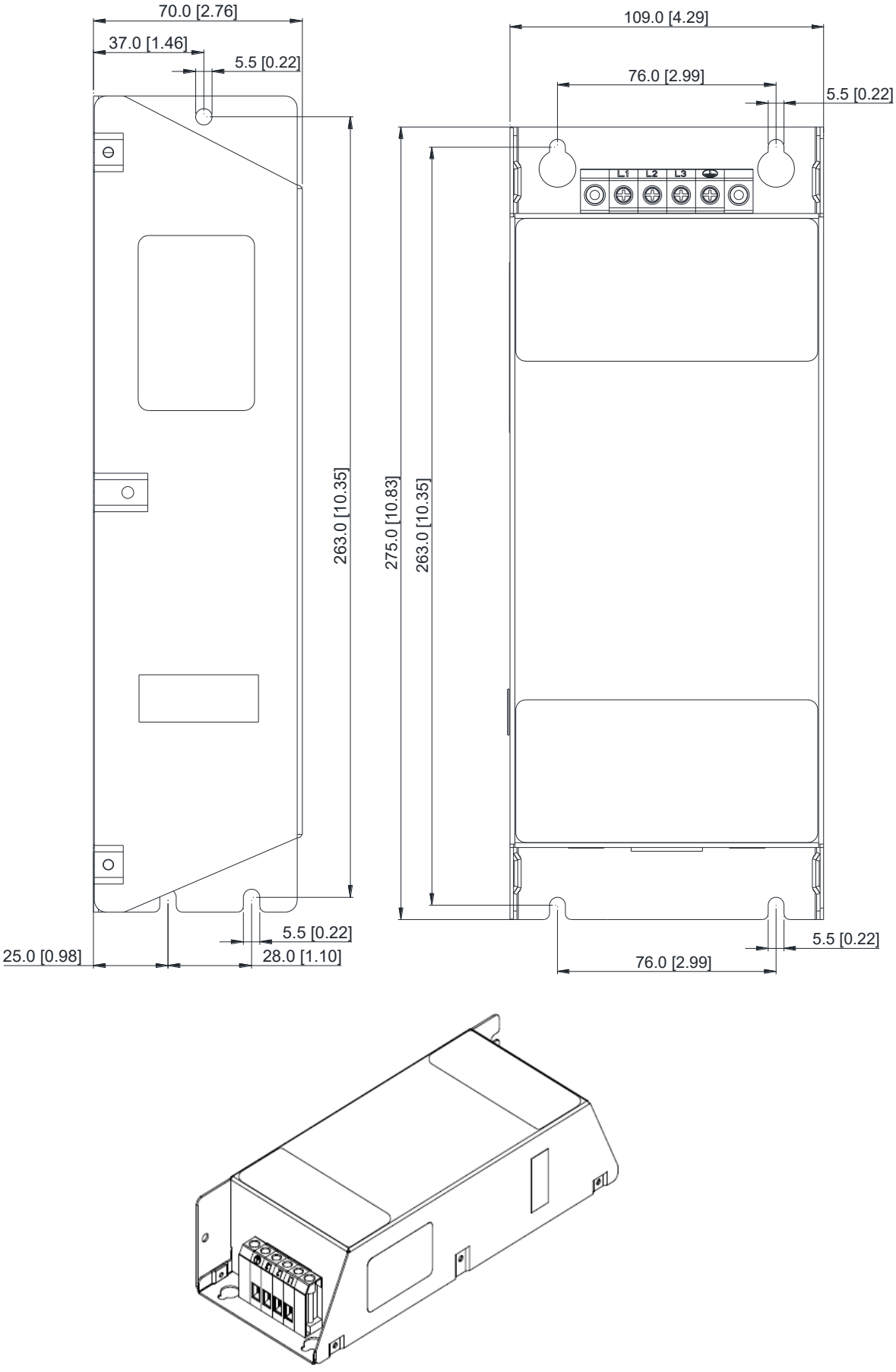


Figure 7-54

Model name: EMF056A23A, EMF039A43A

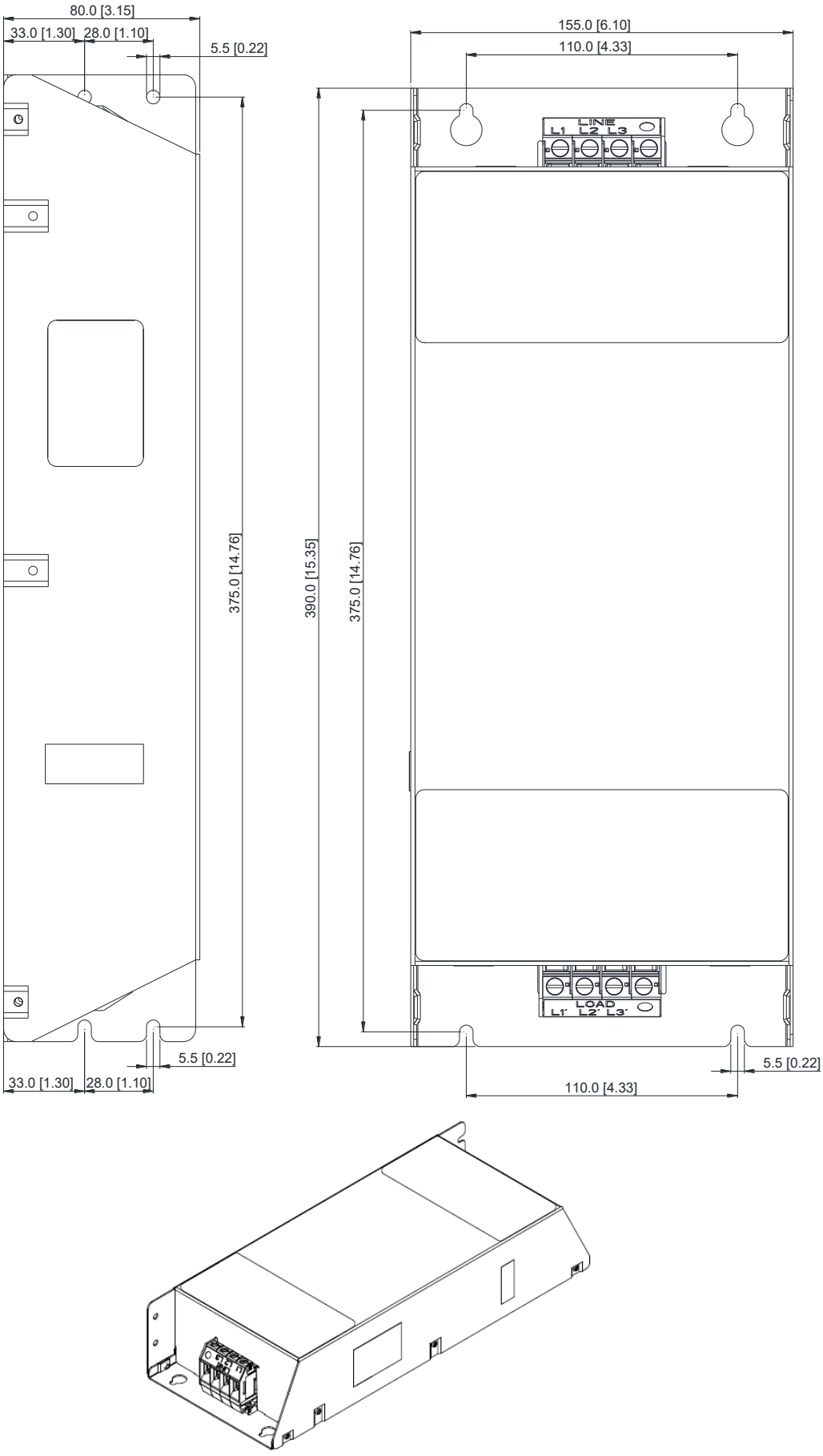


Figure 7-55

Model name: B84143A0050R021

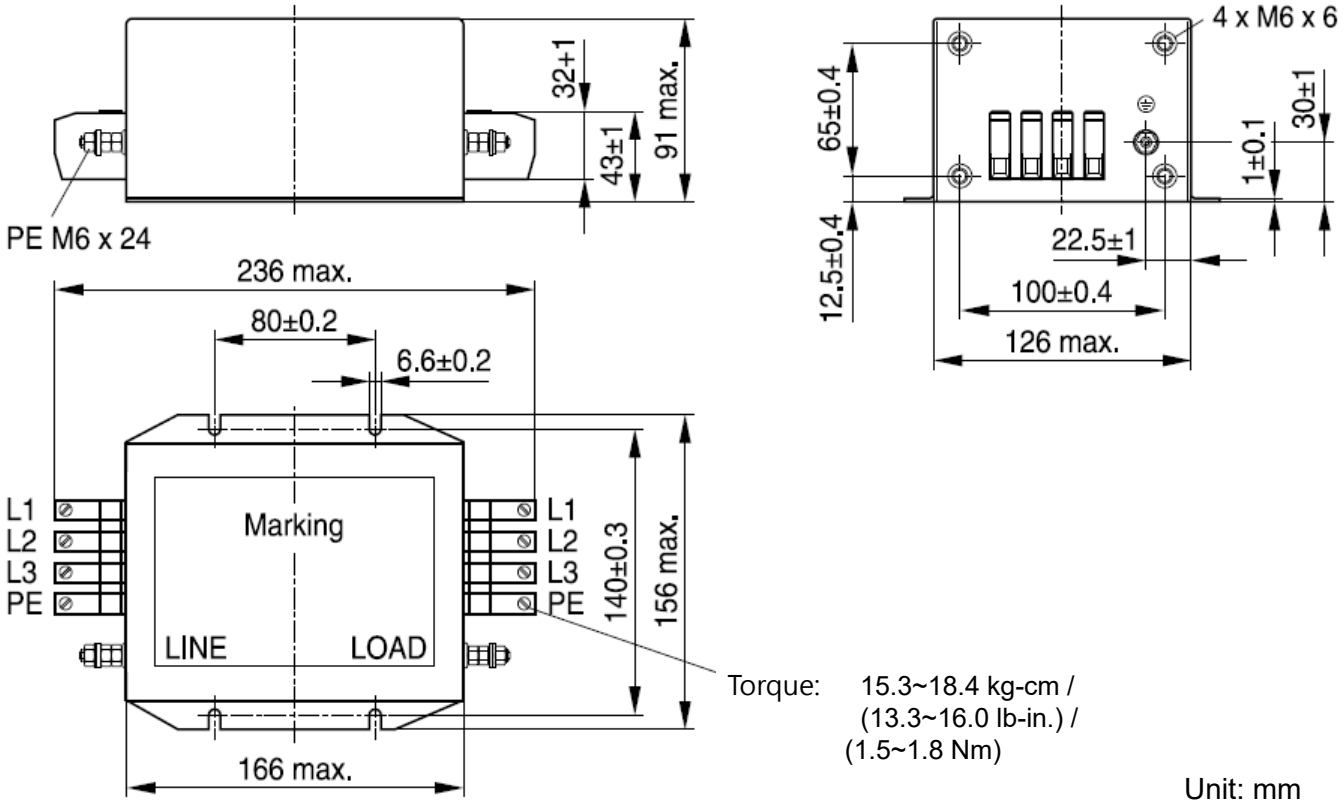


Figure 7-56

Model name: B84143A0080R021

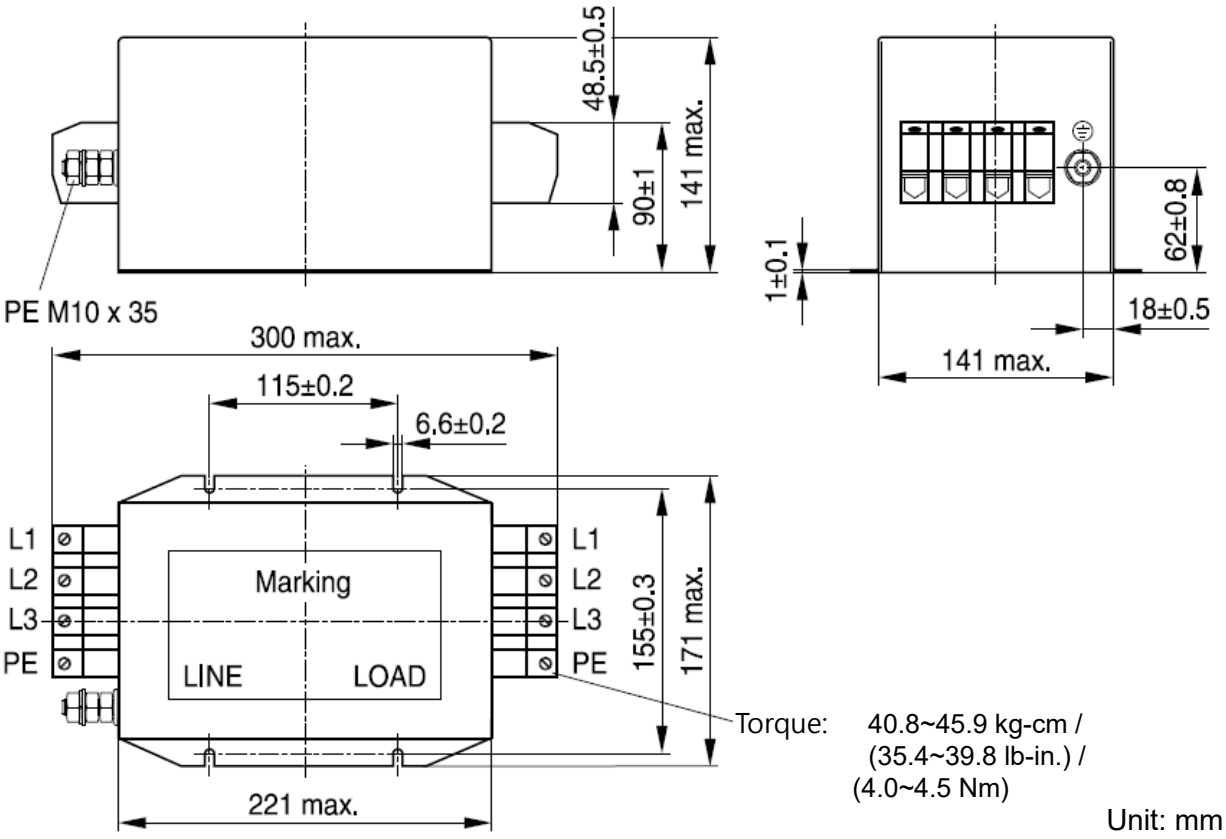
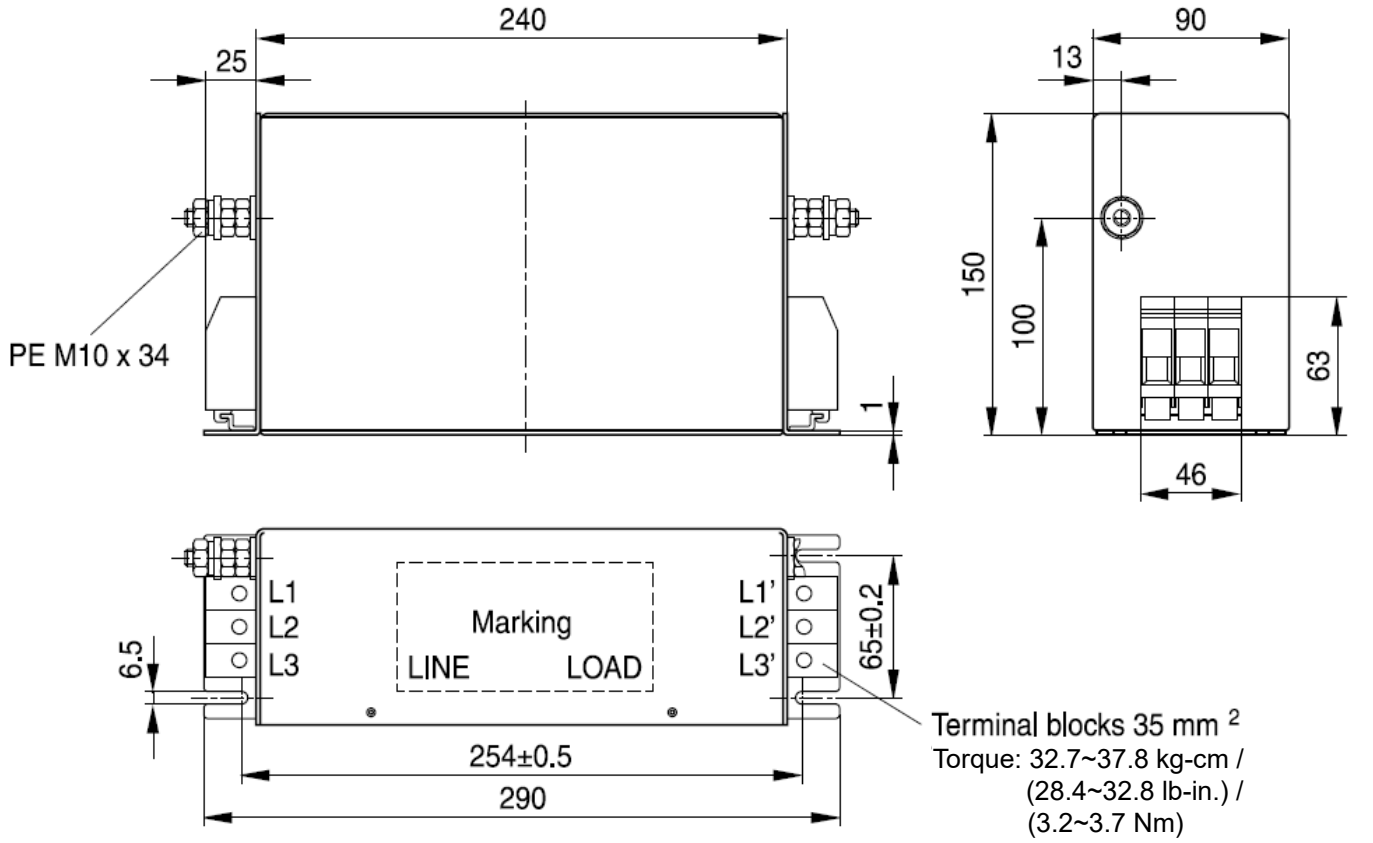


Figure 7-57

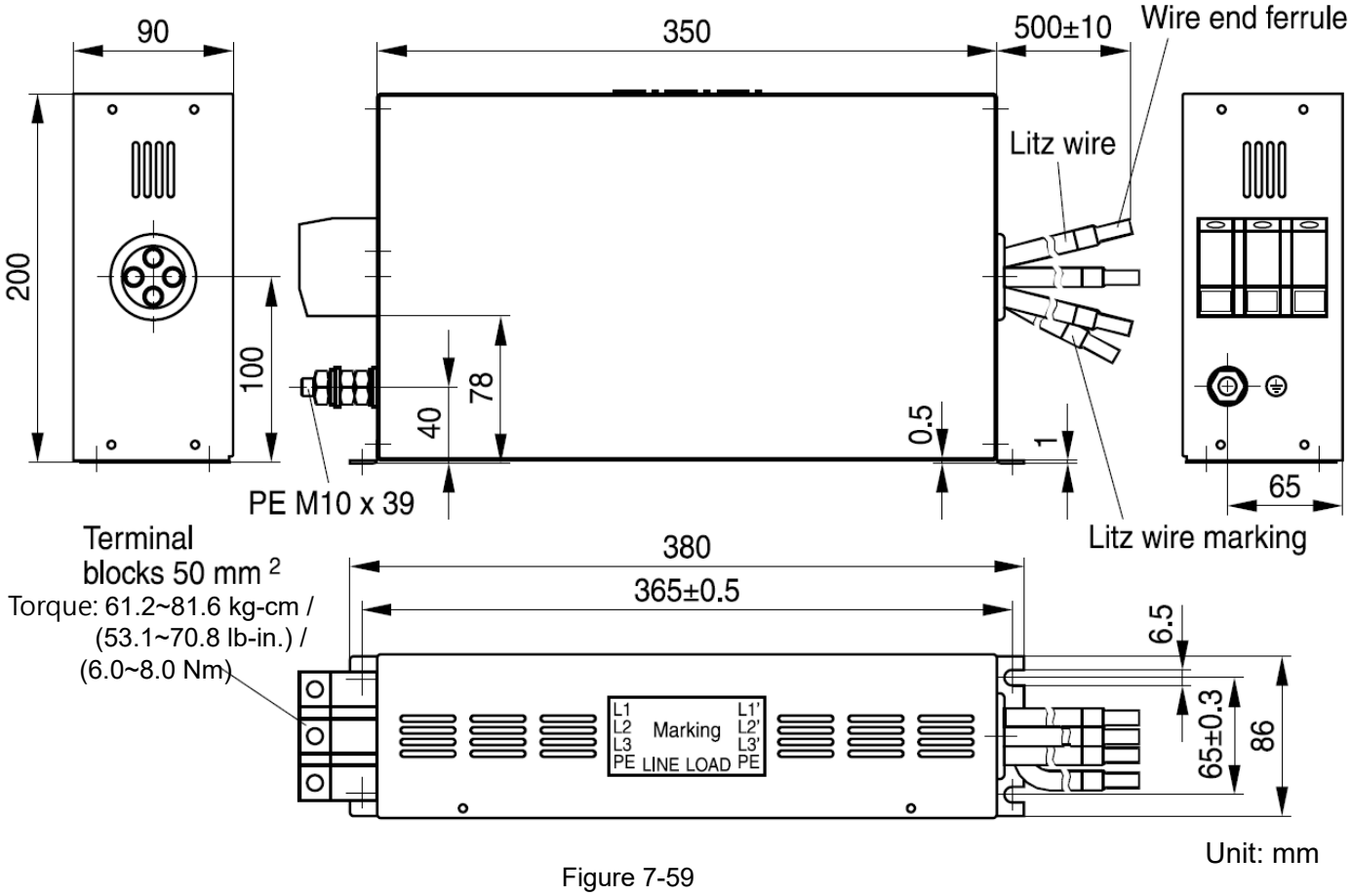
Model name: B84143A0120R105



Unit: mm

Figure 7-58

Model name: B84143B0120R110



Unit: mm

Figure 7-59

Model name: B84143B0150S021, B8414B0180S020

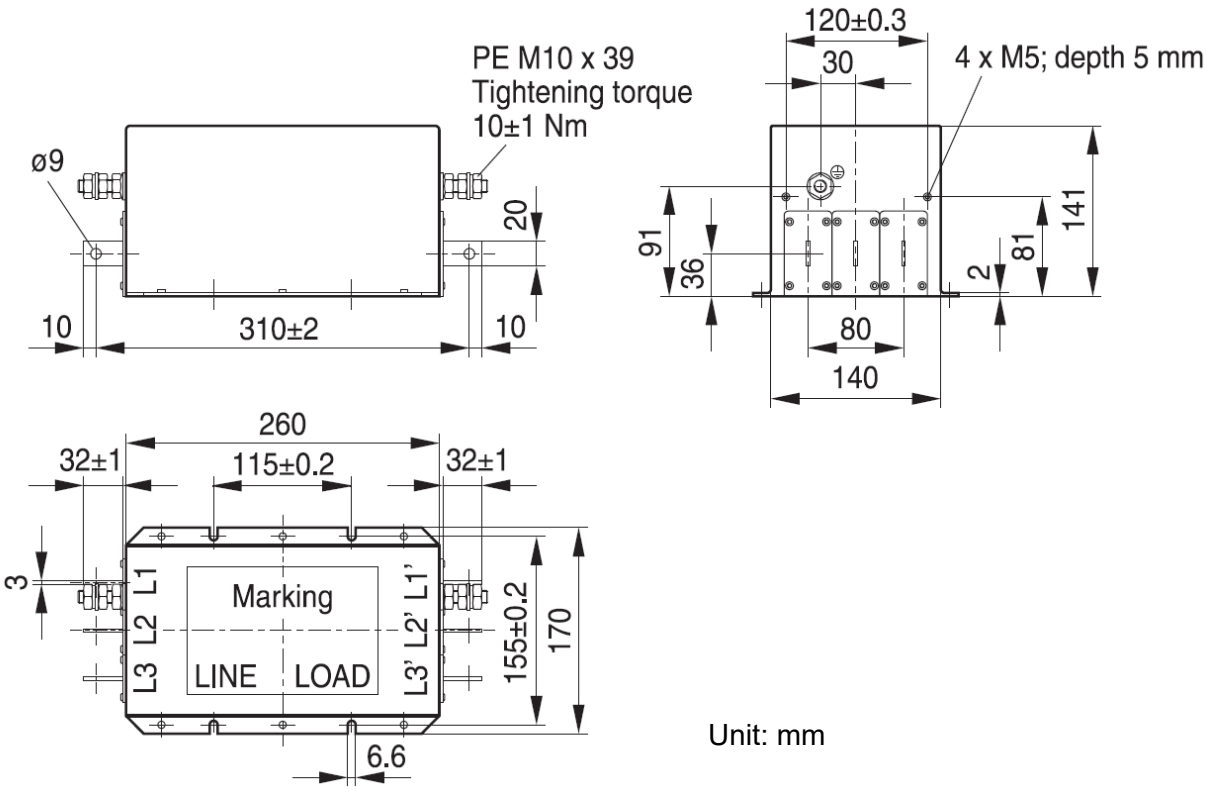


Figure 7-60

Model name: B84143B0180S080, B84143B0250S080

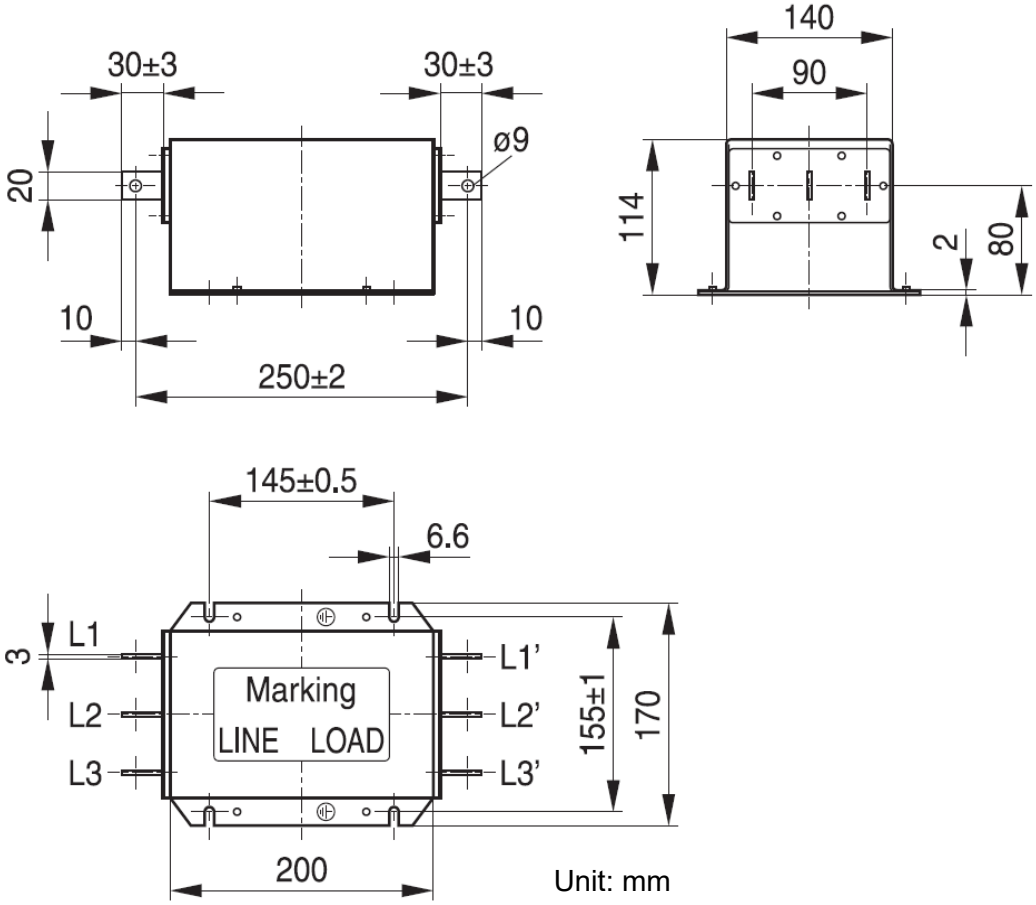


Figure 7-61

Model name: B84143B0250S020, B84143B0250S021

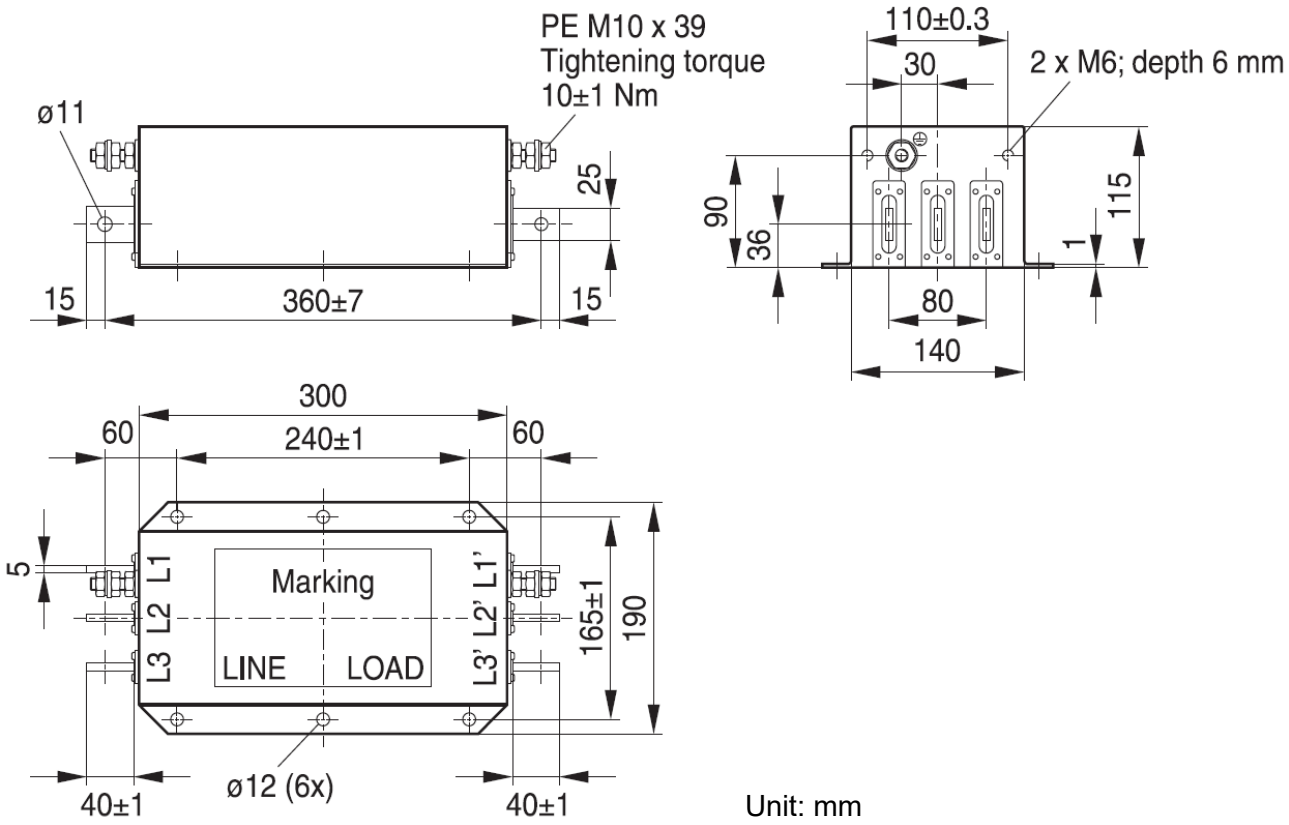


Figure 7-62

Model name: B84143B0400S020、B84143B0400S021

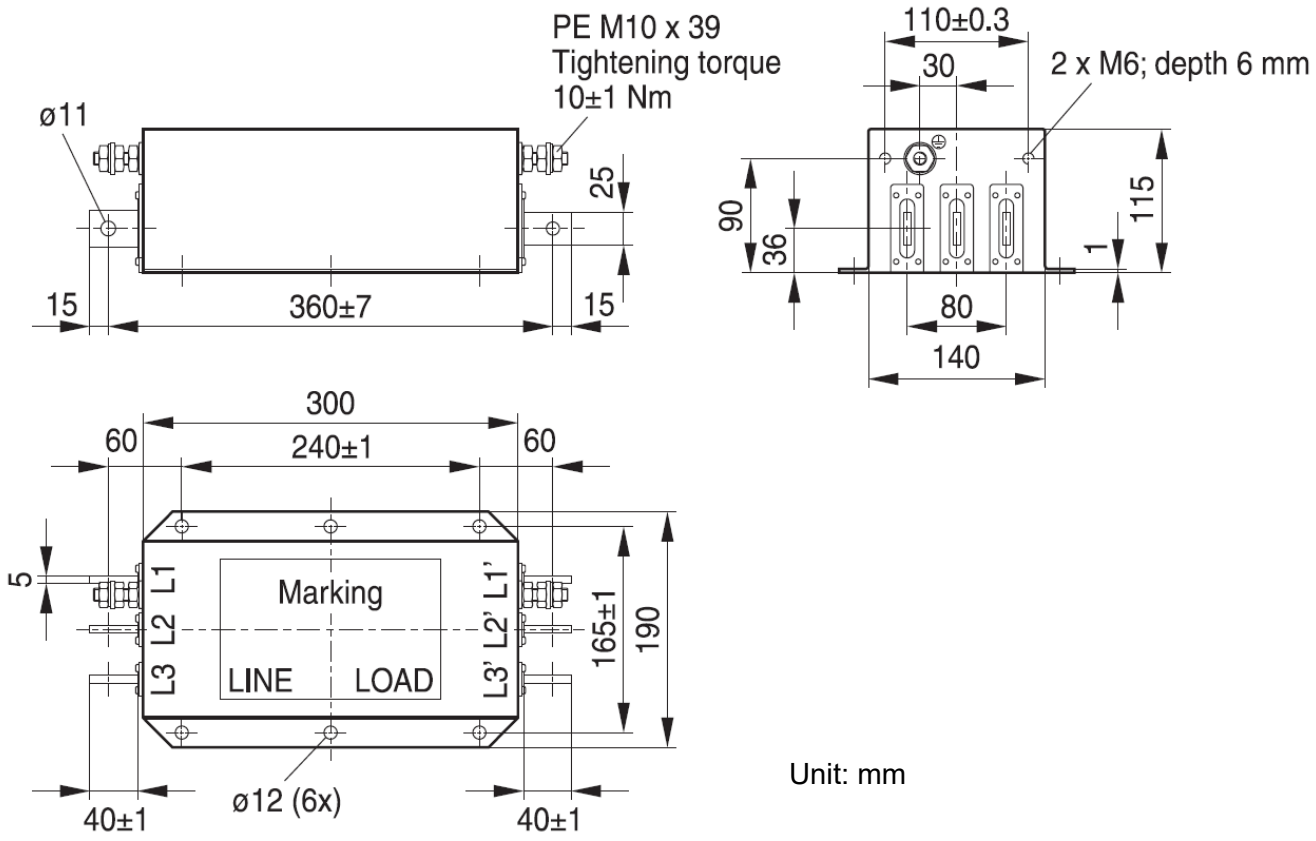


Figure 7-63

Model name: B84143B0400S080

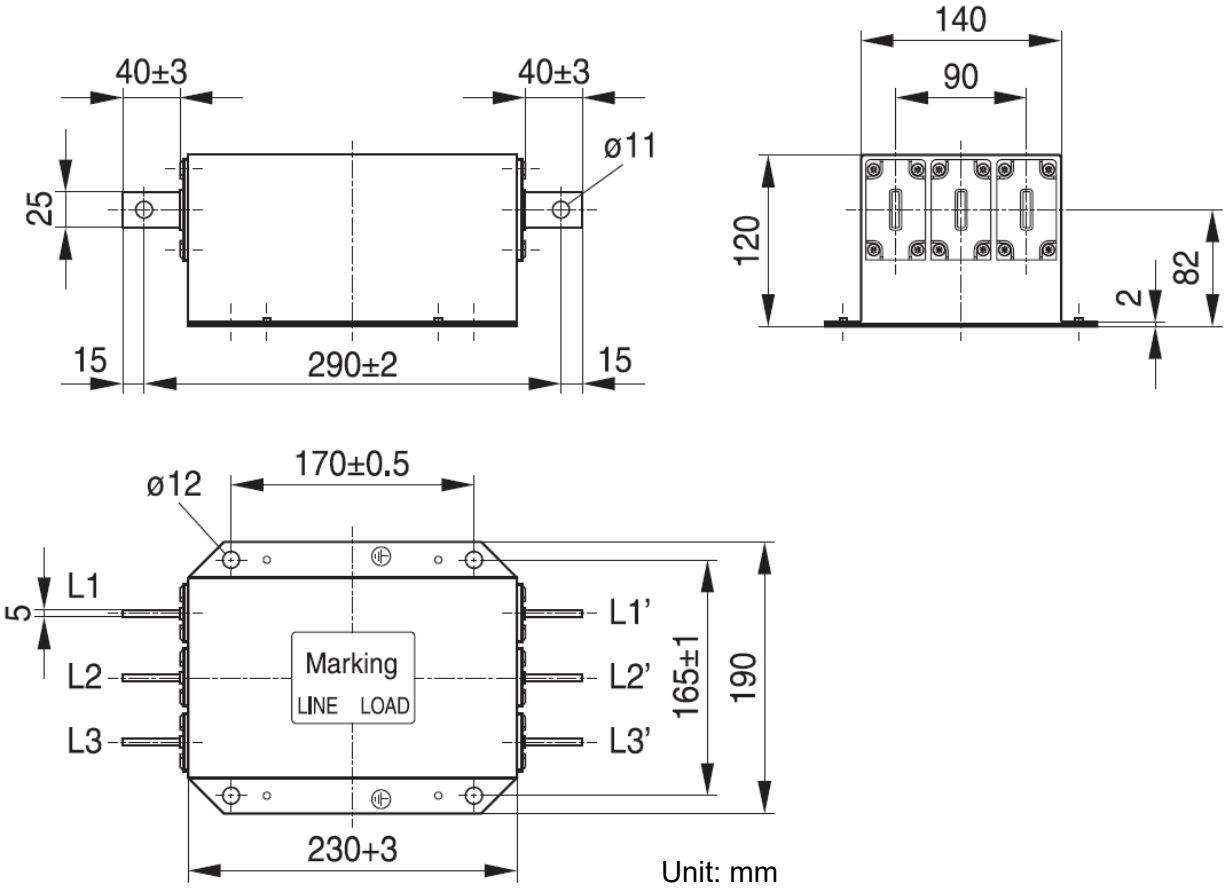


Figure 7-64

Model name: B84143B0600S020

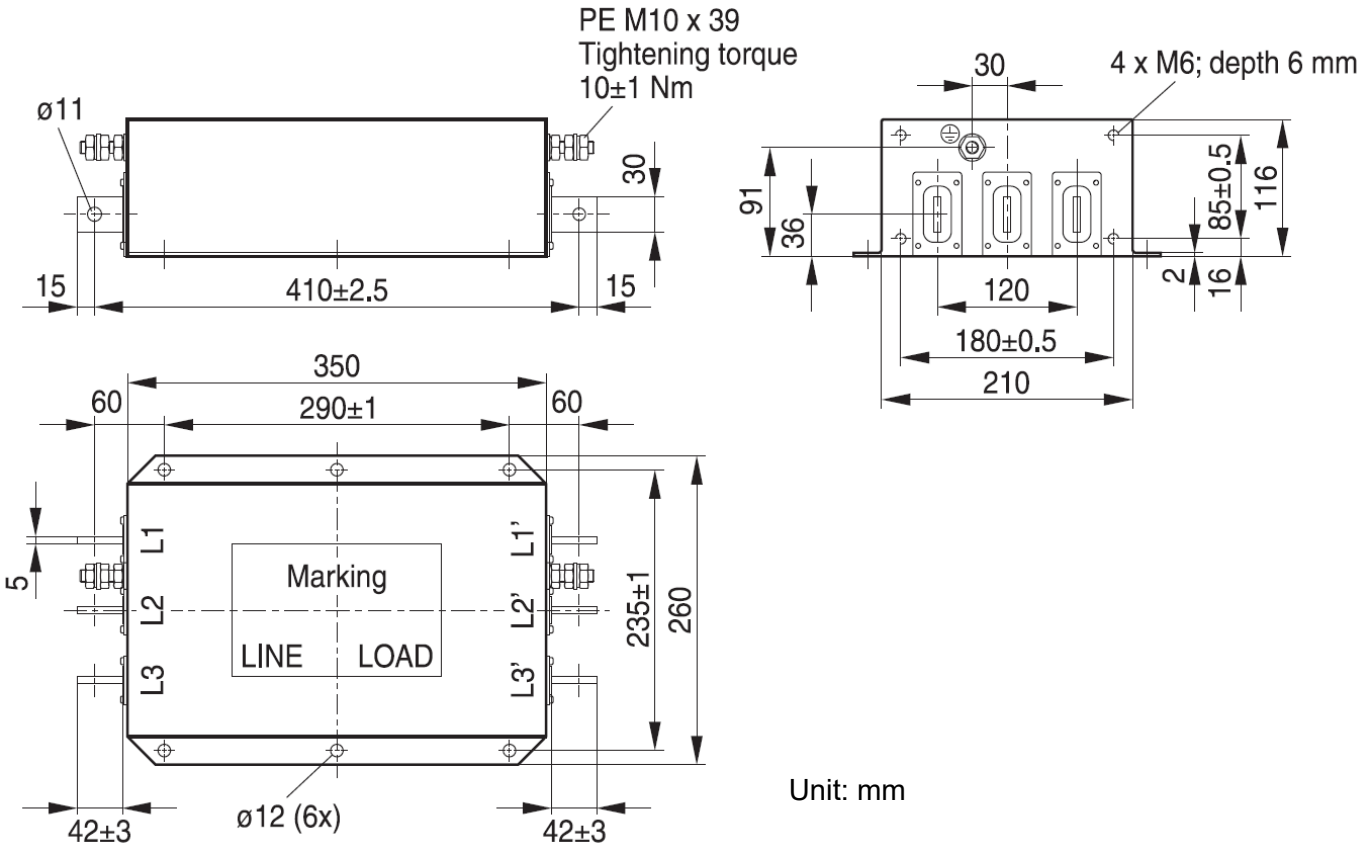


Figure 7-65

Model name: B84143B0600S080

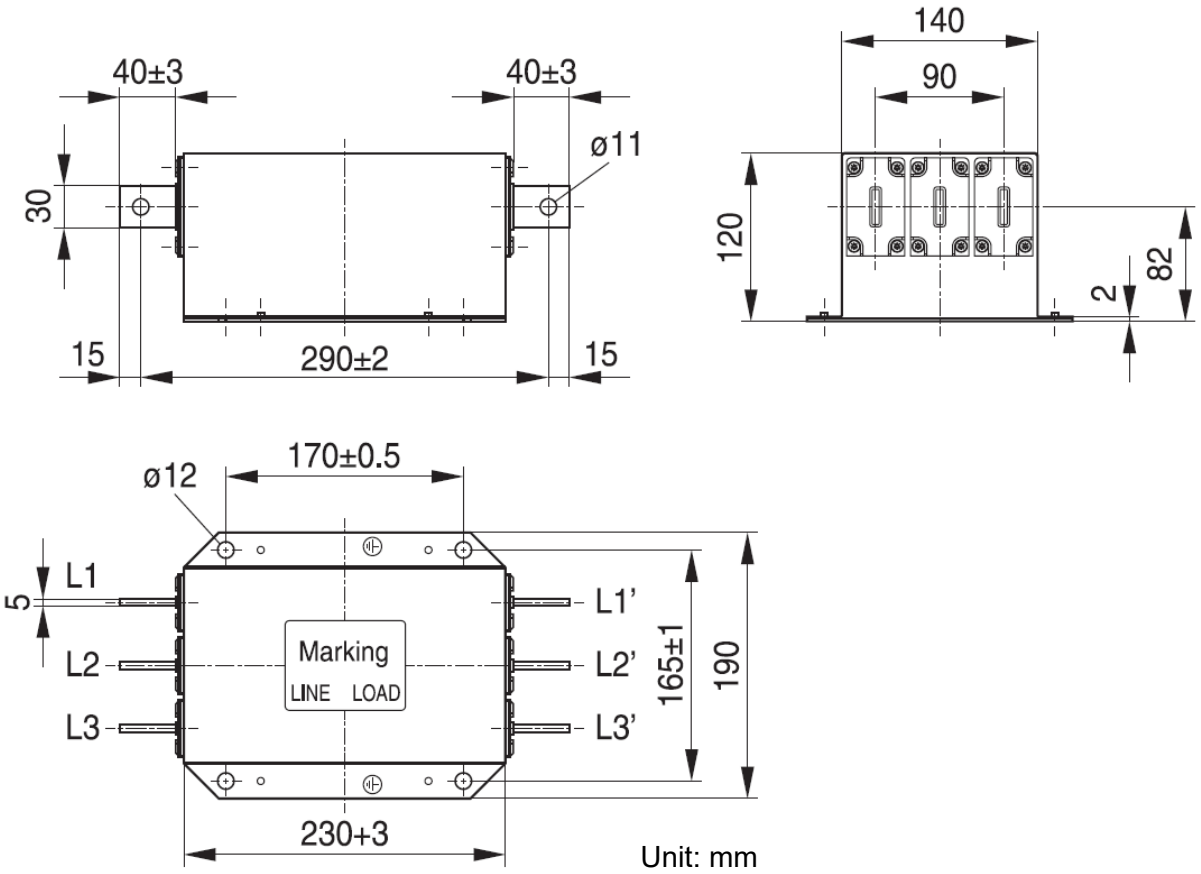


Figure 7-66

Model name:B84143B1000S020, B84143B1000S021

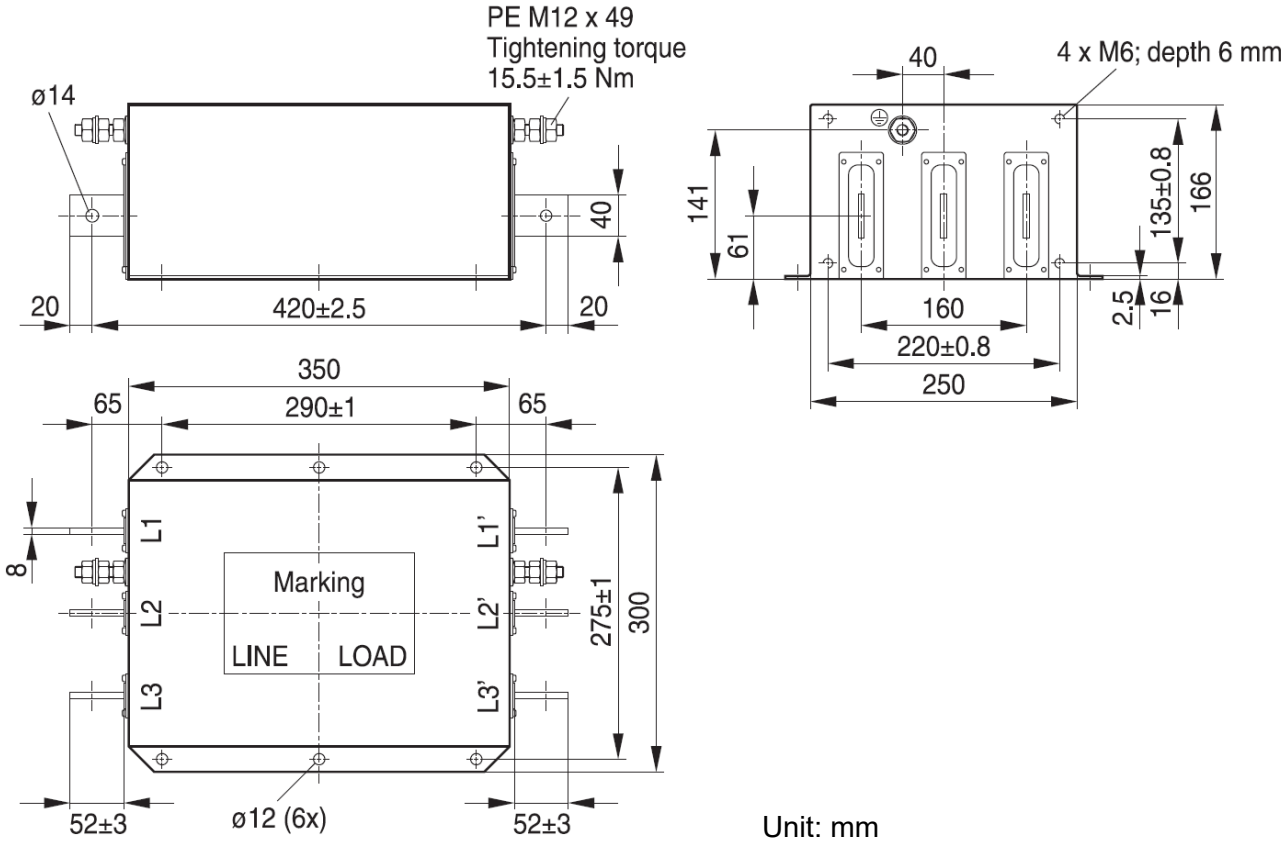
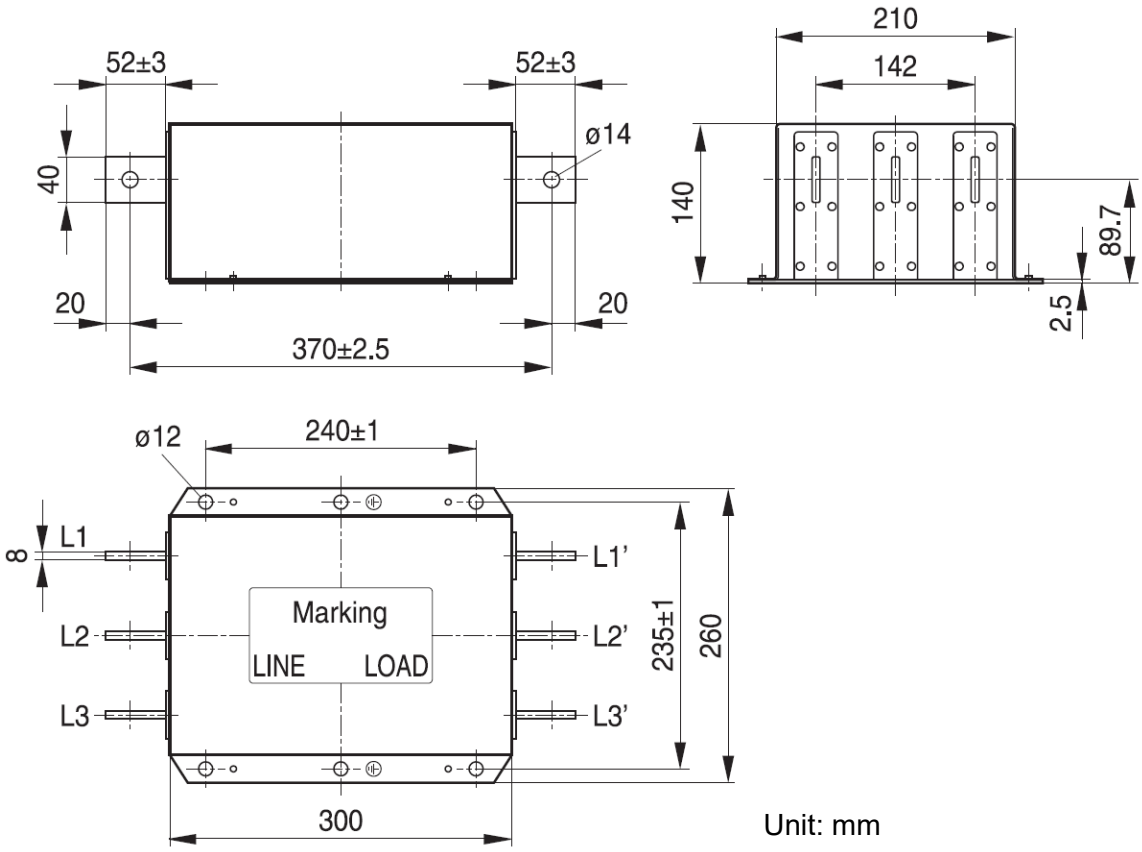


Figure 7-67

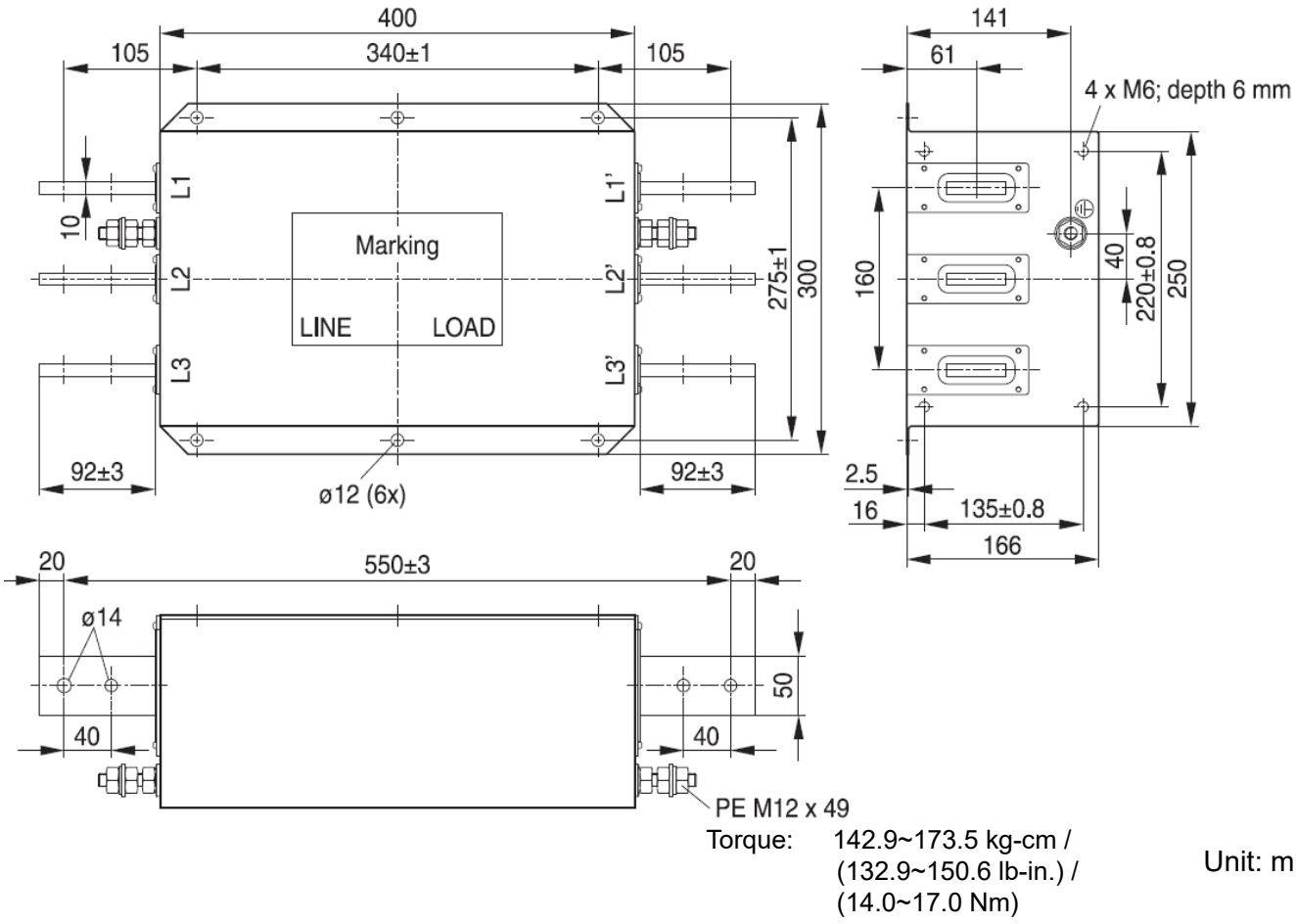
Model name: B84143B1000S080



Unit: mm

Figure 7-68

Model name: B84143B1600S020



Torque: 142.9~173.5 kg-cm / (132.9~150.6 lb-in.) / (14.0~17.0 Nm)

Unit: mm

Figure 7-69

Model name: B84143B1600S080

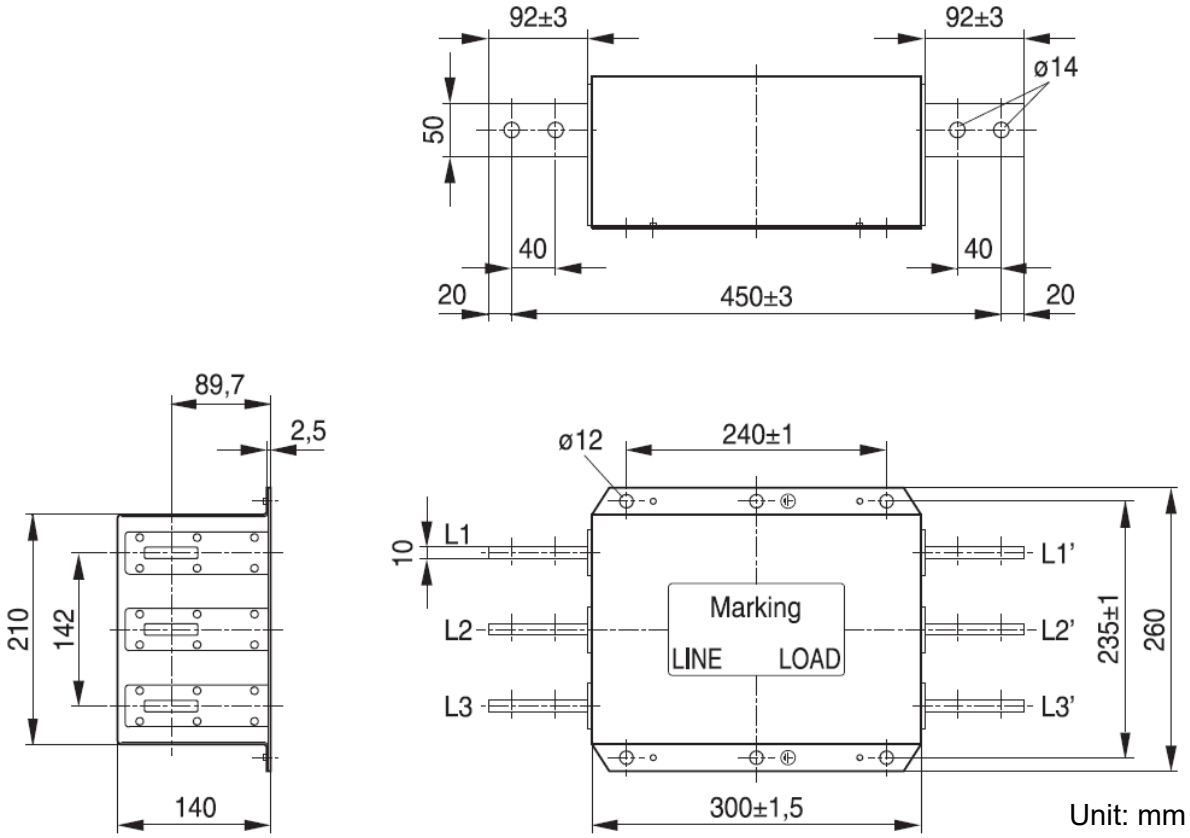


Figure 7-70

Model name: B84143D0150R127

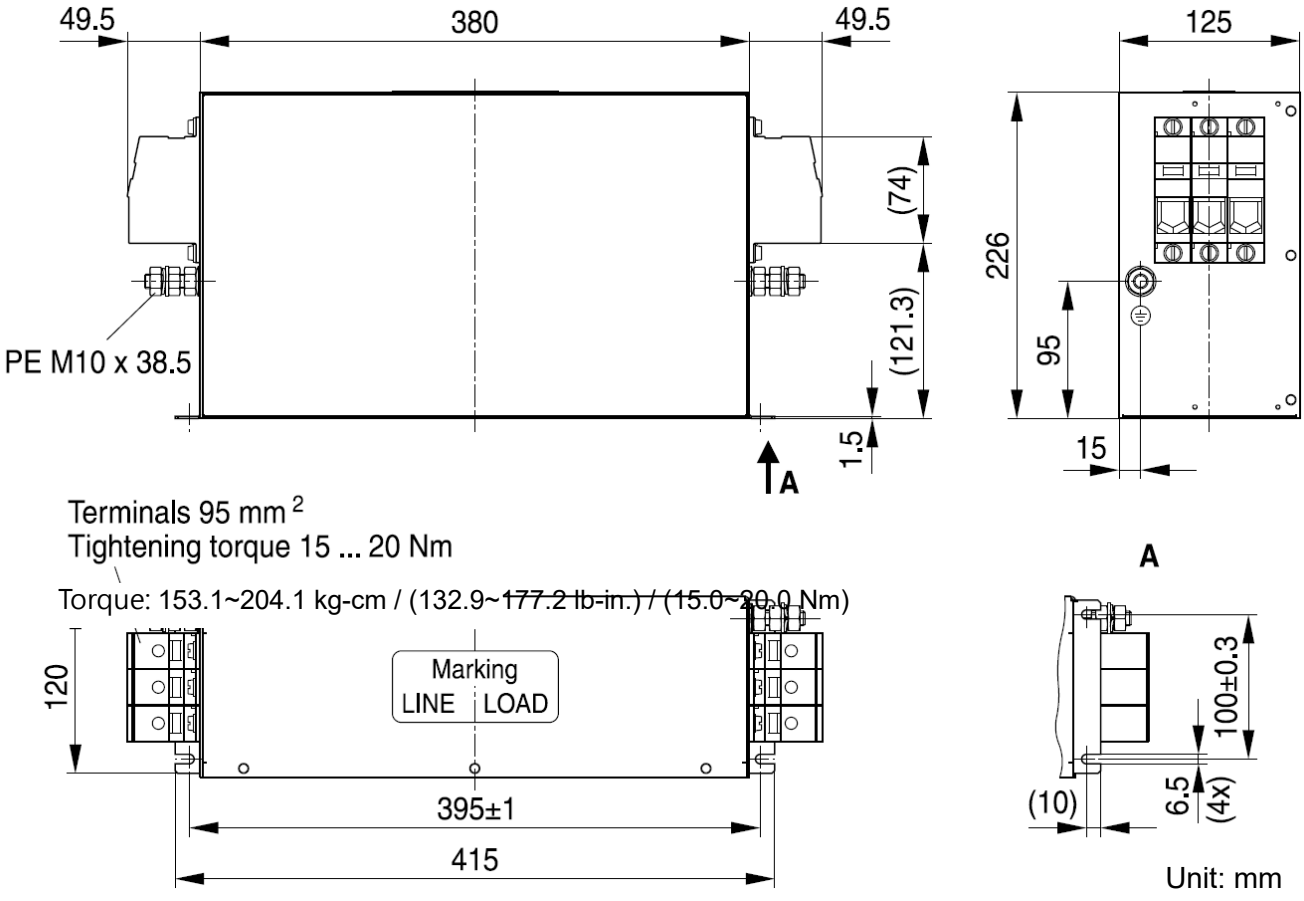


Figure 7-71

Model name: B84143D0200R127

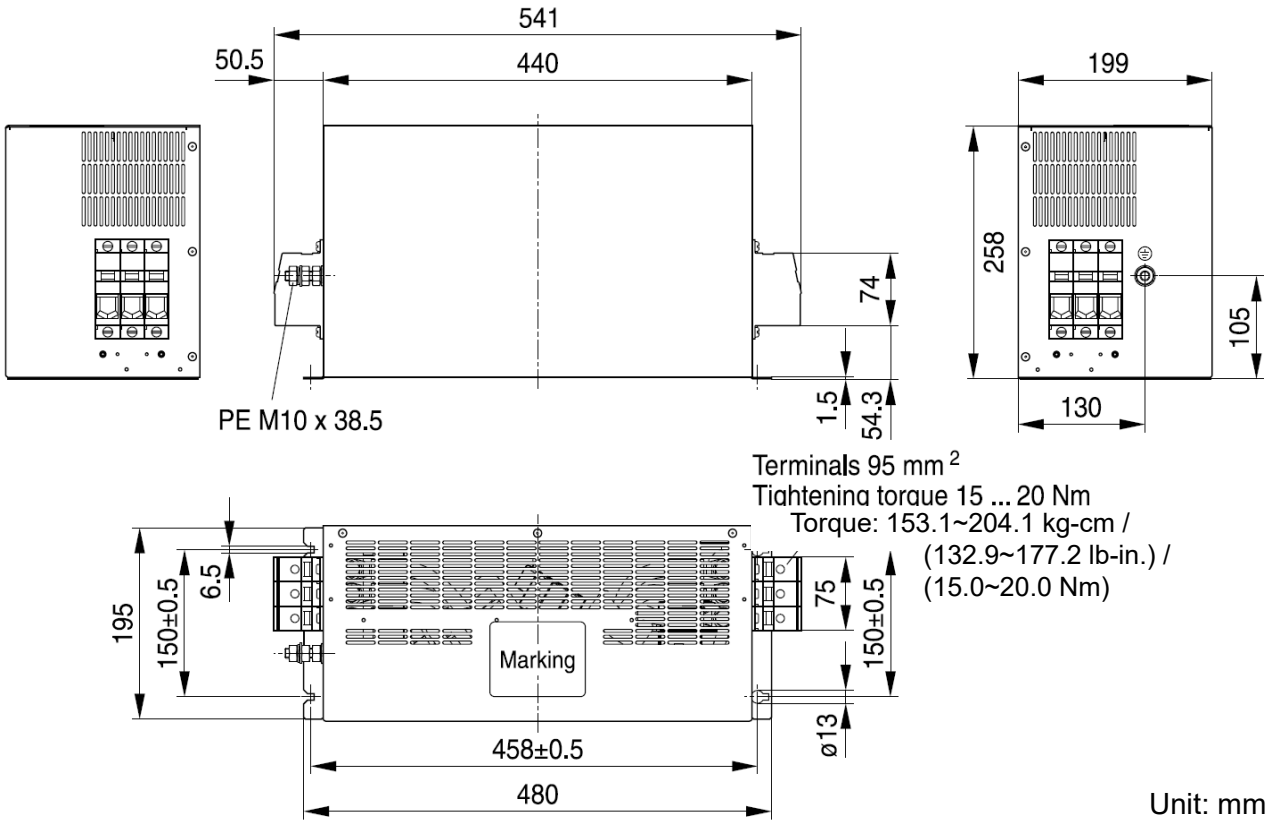


Figure 7-72

Model name: B84143B1600S021

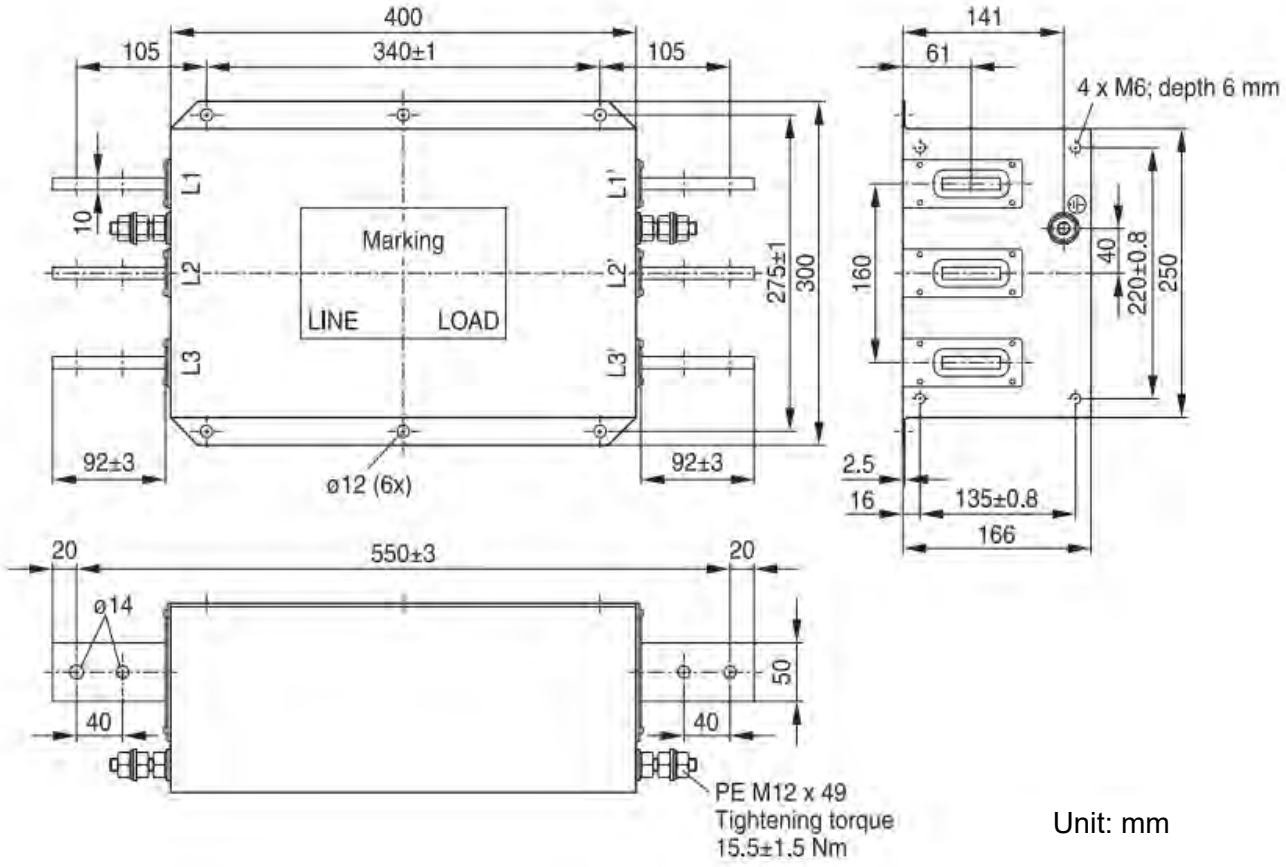


Figure 7-73

Model name: KMF370A

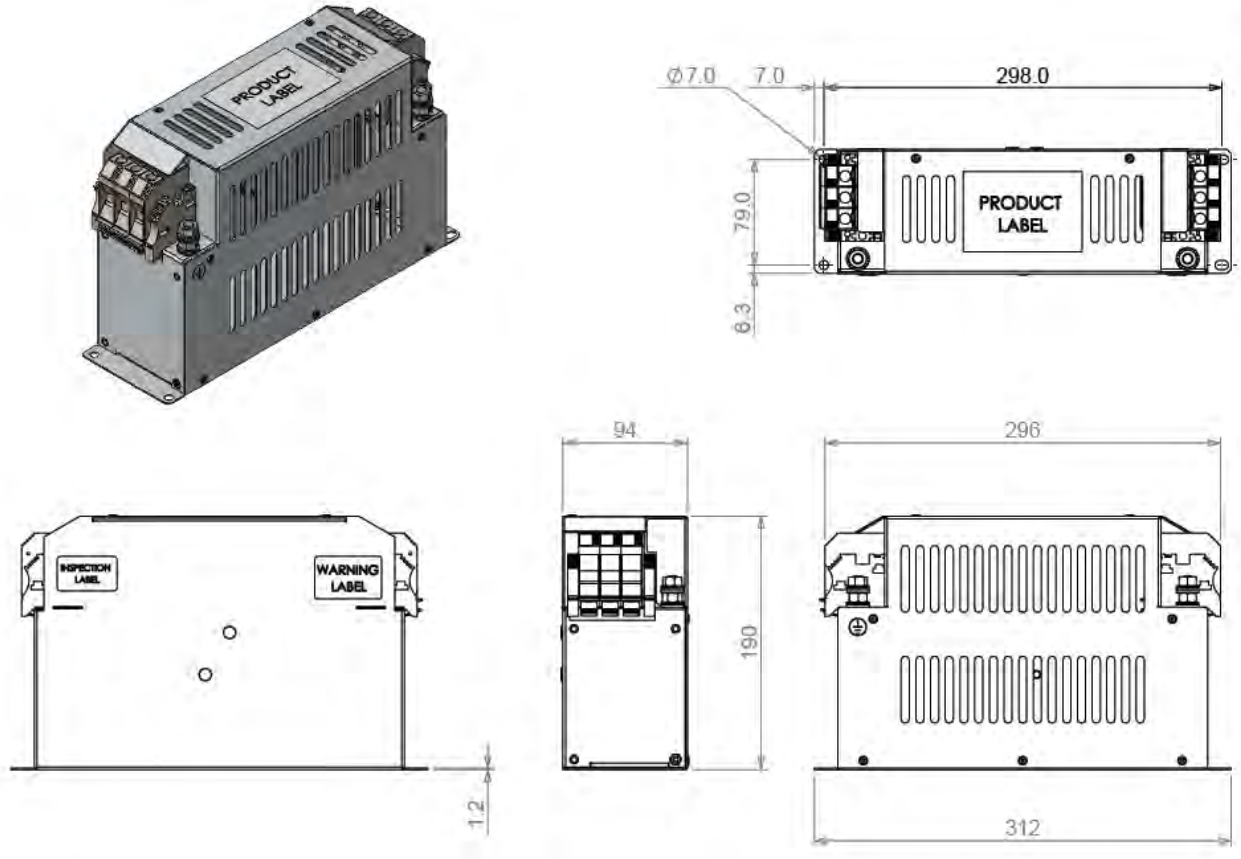
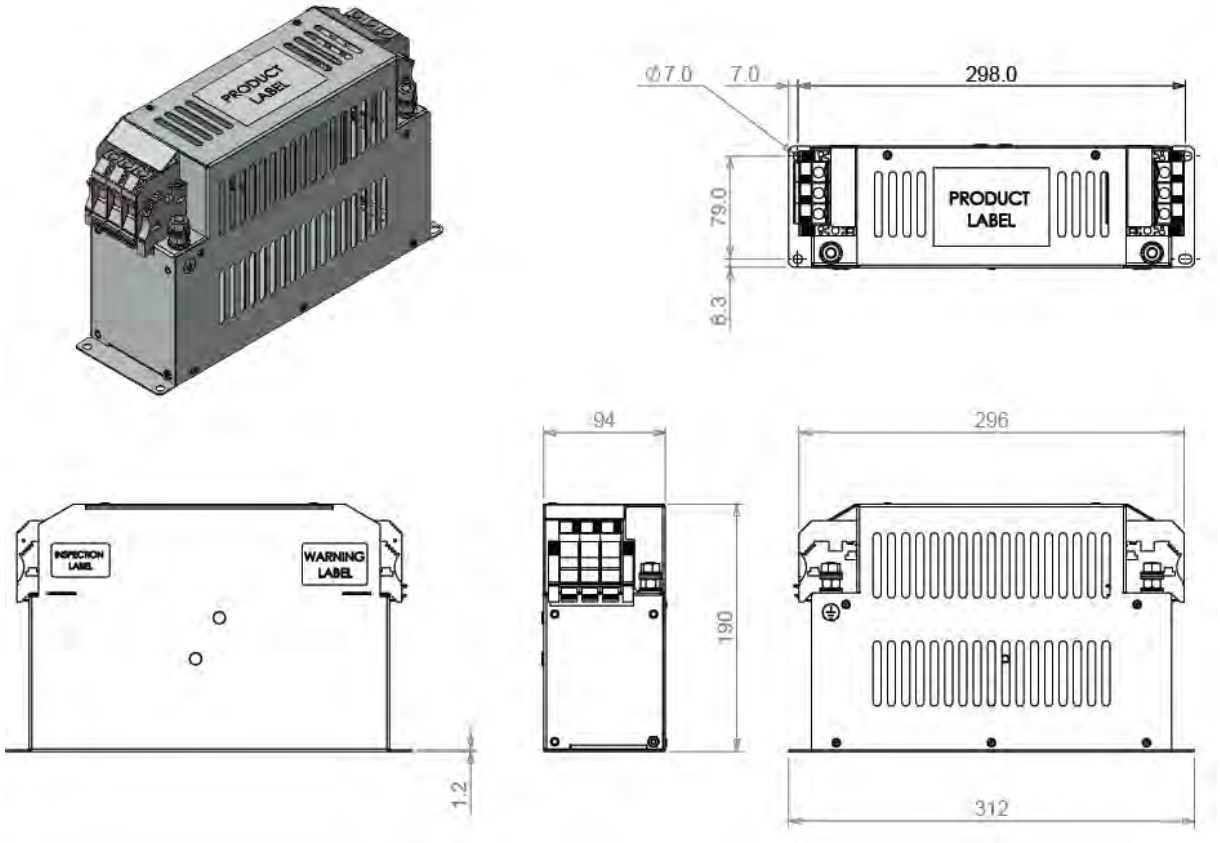


Figure 7-74

Unit: mm

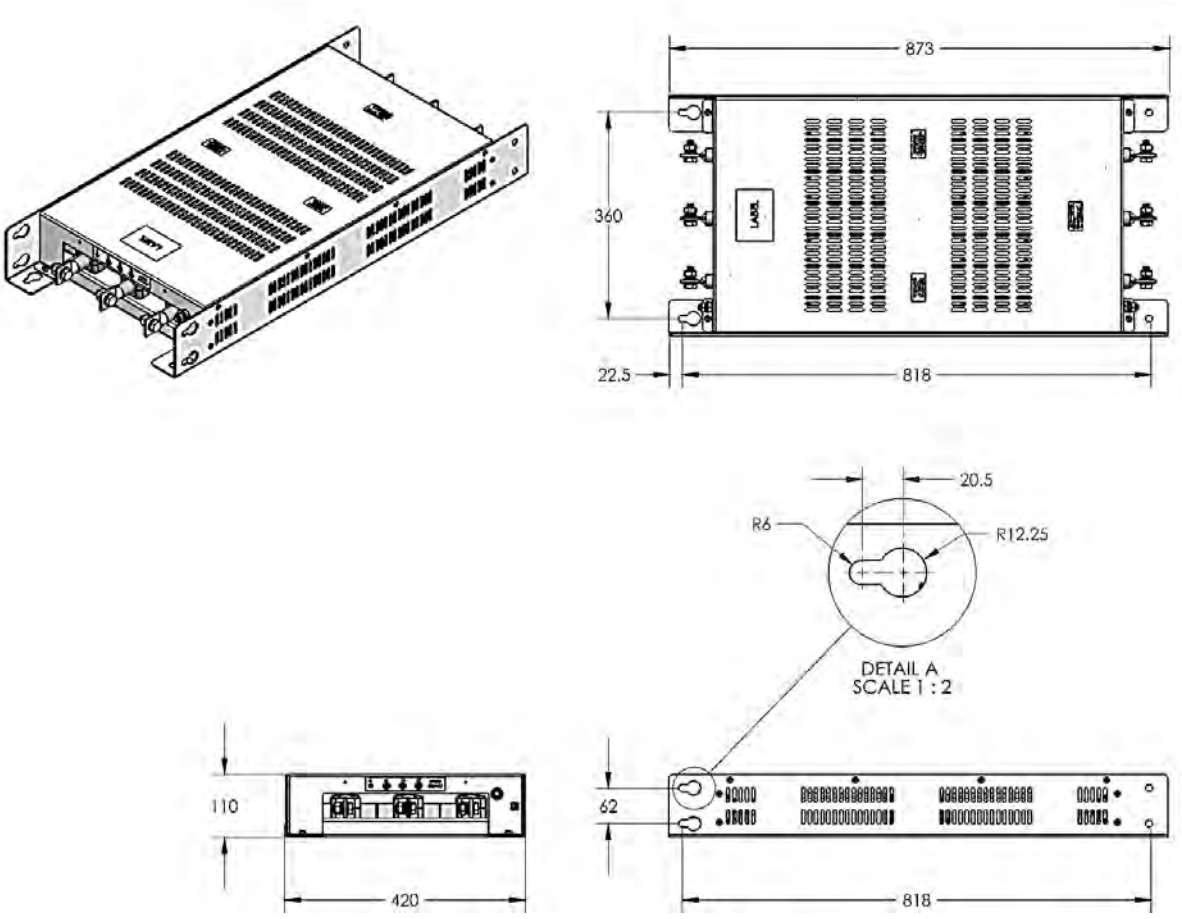
Model name: KMF3100A



Unit: mm

Figure 7-75

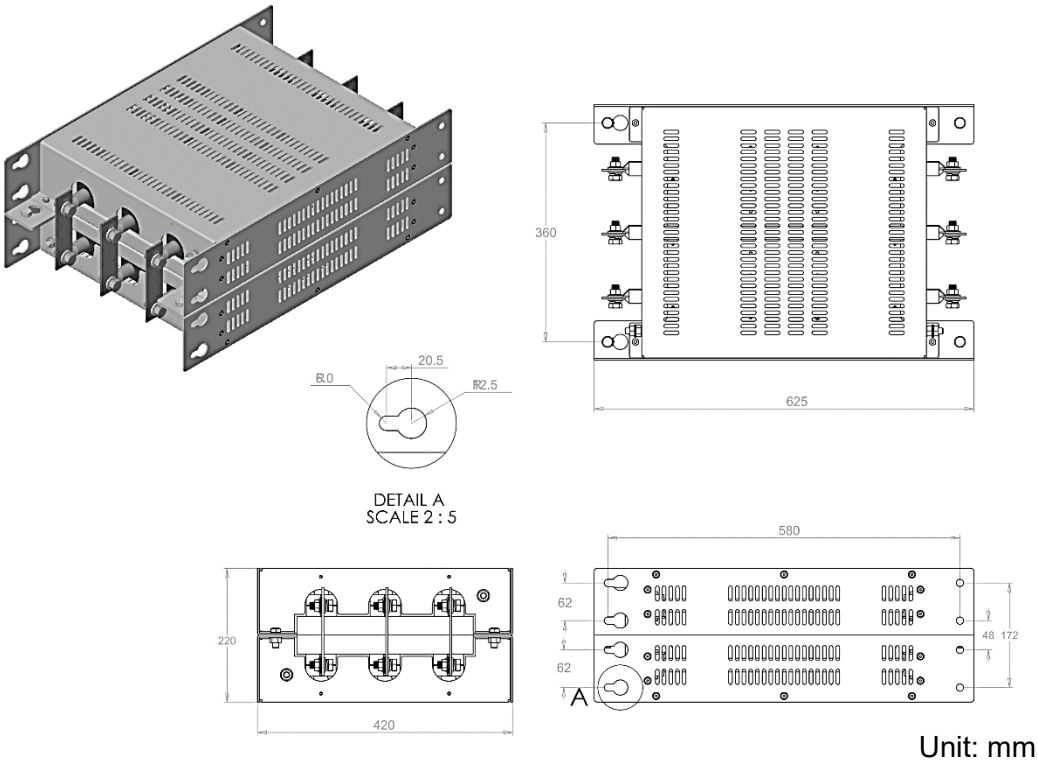
Model name: MIF3400B



Unit: mm

Figure 7-76

Model name: MIF3800



Unit: mm

Figure 7-77

The table below is the maximum shielded cable length for drive models with built-in EMC filters. You can choose the corresponding shielded cable length according to the required noise emission and electromagnetic interference class.

EMC built-in model		Rated current (HD)	Comply with EMC (IEC 61800-3) Class C3		Comply with EMC (IEC 61800-3) Class C2	
Frame	Model		Shielded cable length	Fc	Shielded cable length	Fc
A	VFD007C43EA-21	4.3	30 m	≤ 8 kHz	10 m	≤ 8 kHz
	VFD015C43EA-21	5.9				
	VFD022C43EA-21	8.7				
	VFD037C43EA-21	14				
	VFD040C43EA-21	15.5				
	VFD055C43EA-21	17				
B	VFD075C43EA-21	20				
	VFD110C43EA-21	26				
	VFD150C43EA-21	35				
C	VFD185C43EA-21	40		≤ 6 kHz		≤ 6 kHz
	VFD220C43EA-21	47				
	VFD300C43EA-21	63				

Table 7-82

NOTE: Shielded cable length of Frame A should be no longer than 30m and Frame B, C no longer than 50m to prevent cable length from being too long, which may cause built-in EMC filter malfunction due to overheat resulting from leakage current and larger wires parasitic capacitance.

EMC Filter Installation

All electrical equipment, including AC motor drives, will generate high frequency/ low frequency noise and will interfere with peripheral equipment by radiation or conduction when in operation. By using an EMC filter with correct installation, much interference can be eliminated. It is recommended to use DELTA EMC filter to have the best interference elimination performance.

We assure that it can comply with following rules when AC motor drive and EMC filter are installed and wired according to user manual:

1. EN61000-6-4
2. EN61800-3: 1996
3. EN55011 (1991) Class A Group 1

General precaution

To ensure EMC filter can maximize the effect of suppressing the interference of AC motor drive, the installation and wiring of AC motor drive should follow the user manual. In addition, be sure to observe the following precautions:

EMC filter and AC motor drive should be installed on the same metal plate.

Please install AC motor drive on footprint EMC filter or install EMC filter as close as possible to the AC motor drive.

Please wire as short as possible.

Metal plate should be grounded.

The cover of EMC filter and AC motor drive or grounding should be fixed on the metal plate and the contact area should be as large as possible.

Choose suitable motor cable and precautions

Improper installation and choice of motor cable will affect the performance of EMC filter. Be sure to observe the following precautions when selecting motor cable.

Use the motor cable with copper braid shielded wire (double shielded is better). The copper braid shielded

wire on both ends of the motor cable must ground with the shortest distance and the maximum contact area.

Remove the protective painting where the metal plate fixes with the two-hole straps. This is for ensuring a good contact. See Figure 7-76.

Correctly connect the copper braid shielded wire of the motor cable with the metal plate. Use two-hole straps to fix both ends of copper braid shielded wire of the motor cable on the metal plate. See Figure 7-77.

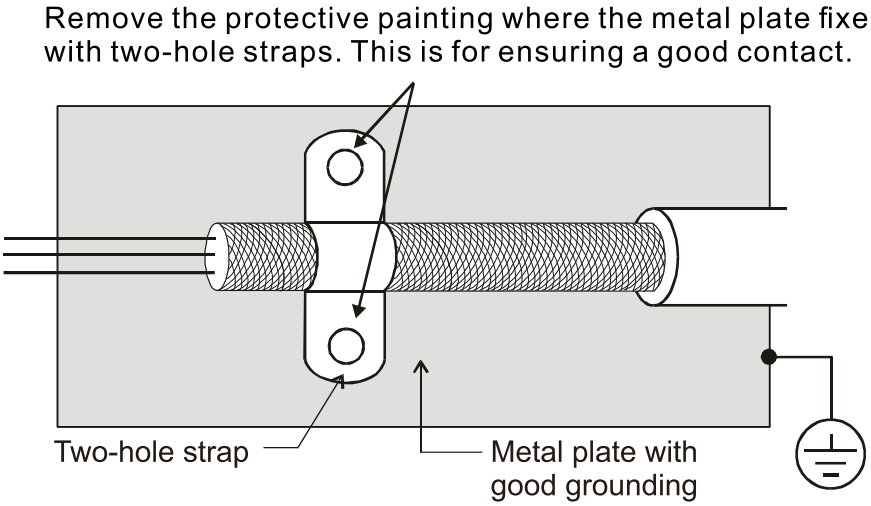


Figure 7-78

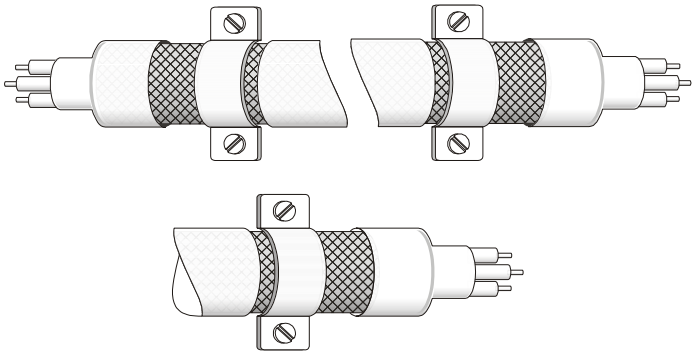


Figure 7-79

Capacitor Filter (Applicable to 230V/ 460V models)

Capacitor Filter is a simple filter accessory, installed to provide simple filtering and eliminating interference.

Installation

Installed on the input side, connect each cable on terminal R, S, T and PE. As shown in the figure below. (Please do NOT install the capacitor filter on the output side.)

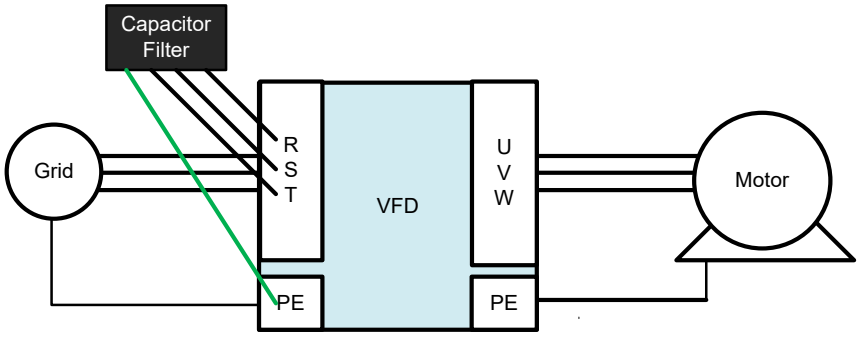


Figure 7-80

Model / Specification

Model	Capacitance of the capacitor	Temperature
CXY101-43A	Cx: 1uF±20% Cy: 1uF±20%	-40 – +85°C

Table 7-83

Unit: mm (inch)

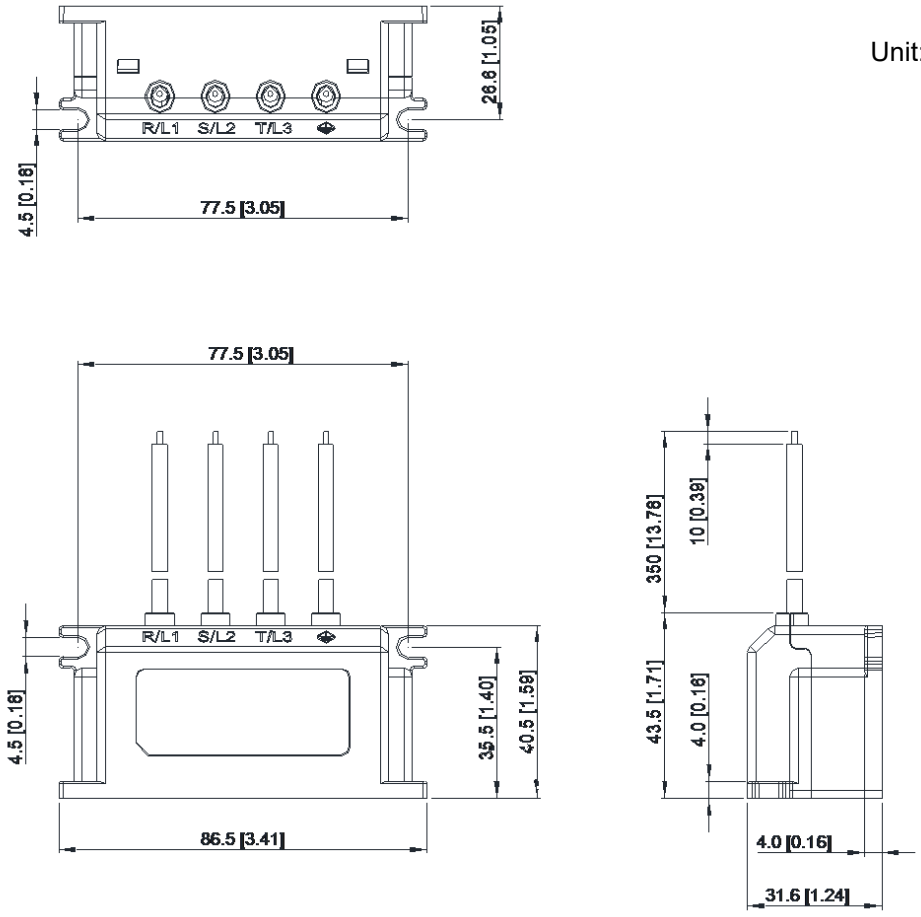


Figure 7-81

7-7 Panel Mounting (MKC-KPPK)

For MKC-KPPK model, user can choose wall mounting or embedded mounting, protection level is IP66.

Applicable to the digital keypads (KPC-CC01)

Wall Mounting

Accessories*1

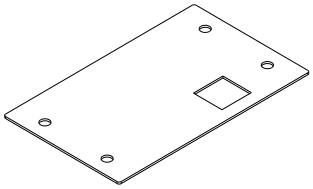


Figure 7-82

Screw *4 –M4*p 0.7 *L8mm

Torque: 10–12 kg-cm / (8.7–10.4 lb-in.) / (1.0–1.2 Nm)

Panel cutout dimension

Unit: mm (inch)

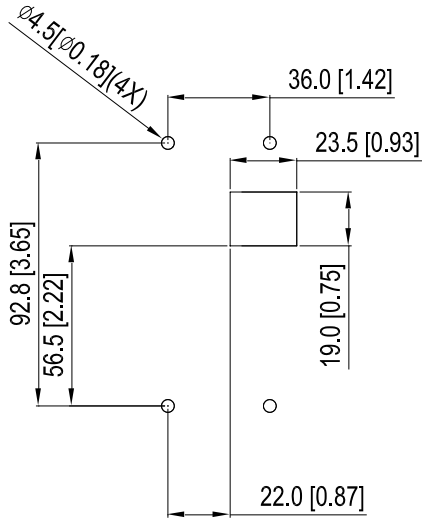


Figure 7-81

Embedded Mounting

Accessories*2

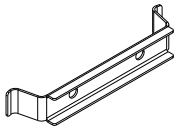


Figure 7-83

Screw *4 –M4*p 0.7 *L8mm

Torque: 10–12 kg-cm / (8.7–10.4 lb-in.) / (1.0–1.2 Nm)

Panel cutout dimension Unit: mm (inch)

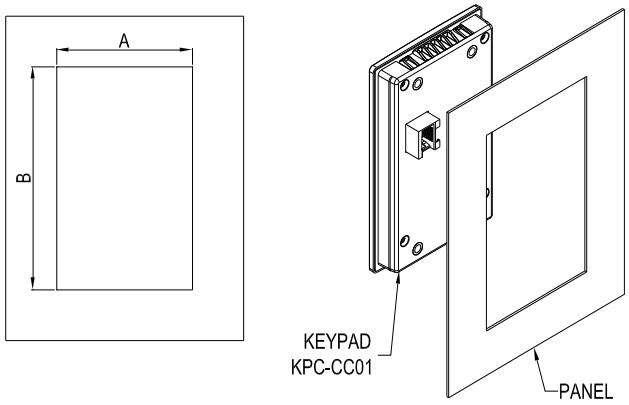


Figure 7-84

Normal cutout dimension

Panel thickness	1.2 mm	1.6 mm	2.0 mm
A	66.4 (2.614)		
B	110.2 (4.339)	111.3 (4.382)	112.5 (4.429)

*Deviation: ±0.15mm /±0.0059inch

Table 7-85

Cutout dimension (Waterproof level: IP66)

Panel thickness	1.2 mm	1.6 mm	2.0 mm
A	66.4 (2.614)		
B	110.8 (4.362)		

*Deviation: ±0.15mm / ±0.0059inch

Table 7-86

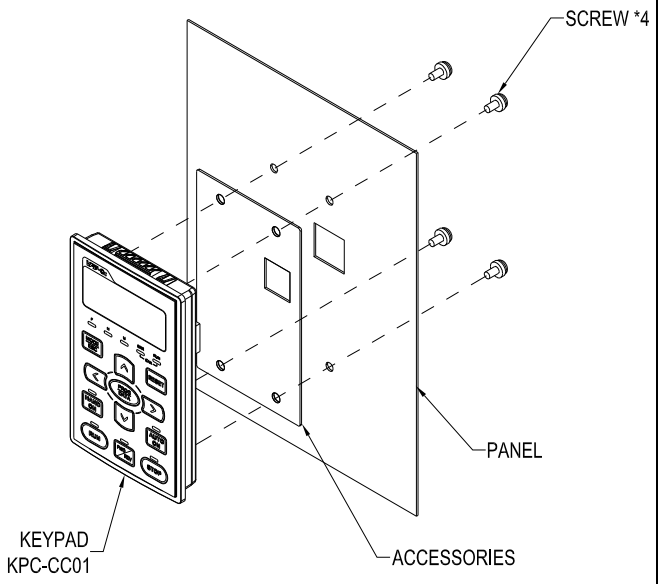
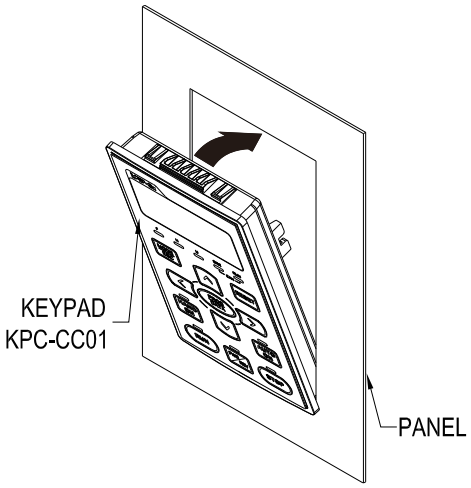
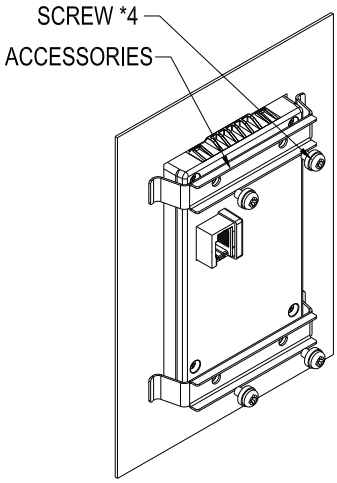
Wall Mounting	Embedded Mounting
 Figure 7-82	 Figure 7-85  Figure 7-86

Table 7-84

7-8 Conduit Box Kit

- Appearance

  Conduit box kit is optional for VFDXXXCXXA-00 (Frame D and above) and VFDXXXC43S-00, the protection will be IP20 / NEMA1 / UL TYPE1 after installation.

Frame D0

Applicable models: VFD370C43S-00; VFD450SC43S-00

Model『MKC-D0N1CB』

ITEM	Description	Qty.
1	Screw M5*0.8*10L	4
2	Bushing Rubber 28	2
3	Bushing Rubber 44	2
4	Bushing Rubber 73	2
5	Conduit box cover	1
6	Conduit box base	1

Table 7-87

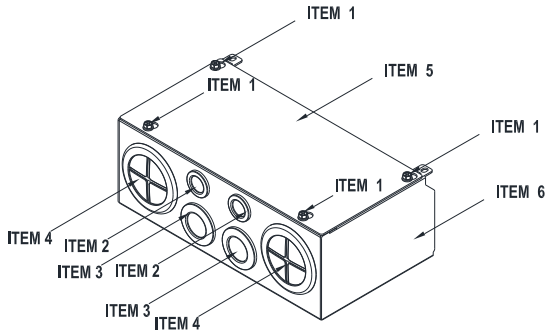


Figure 7-87

Frame D

Applicable models: VFD300C23A-00; VFD370C23A-00; VFD550C43A-00; VFD750C43A-00; VFD450C63B-00; VFD550C63B-00

Model『MKC-DN1CB』

ITEM	Description	Qty.
1	Screw M5*0.8*10L	4
2	Bushing Rubber 28	2
3	Bushing Rubber 44	2
4	Bushing Rubber 88	2
5	Conduit box cover	1
6	Conduit box base	1

Table 7-88

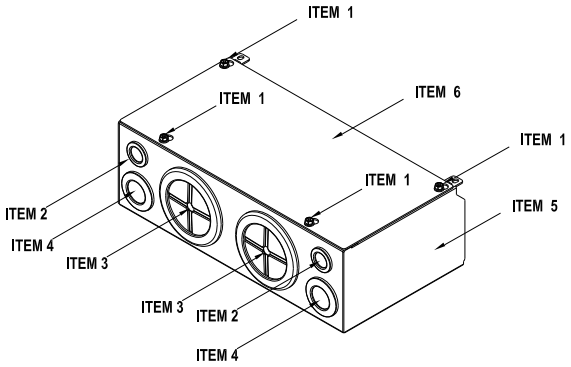


Figure 7-88

Frame E

Applicable models: VFD450C23A-00; VFD550C23A-00; VFD750C23A-00; VFD900C43A-00; VFD1100C43A-00; VFD750C63B-00; VFD900C63B-00; VFD1100C63B-00; VFD1320C63B-00

Model『MKC-EN1CB』

ITEM	Description	Qty.
1	Screw M5*0.8*10L	6
2	Bushing Rubber 28	2
3	Bushing Rubber 44	4
4	Bushing Rubber 100	2
5	Conduit box cover	1
6	Conduit box base	1

Table 7-89

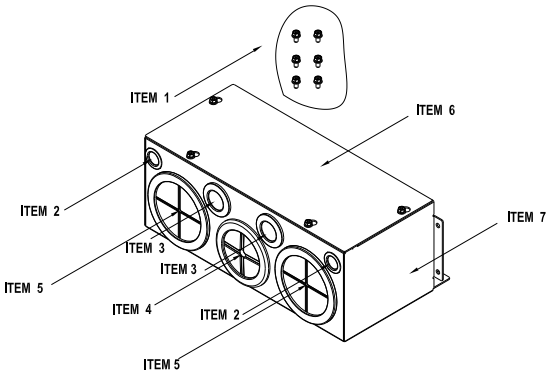


Figure 7-89

Frame F

Applicable models: VFD900C23A-00; VFD1320C43A-00; VFD1600C43A-00; VFD1600C63B-00; VFD2000C63B-00

Model『MKC-FN1CB』

ITEM	Description	Qty.
1	Screw M5*0.8*10L	8
2	Bushing Rubber28	2
3	Bushing Rubber 44	4
4	Bushing Rubber 100	2
5	Conduit box cover	1
6	Conduit box base	1

Table 7-90

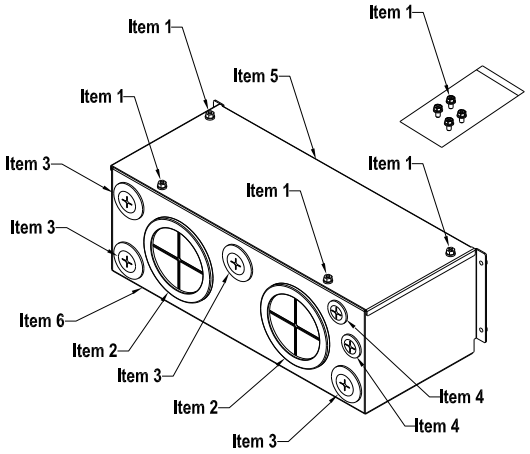


Figure 7-90

Frame G

Applicable models: VFD1850C43A-00; VFD2000C43A-00; VFD2200C43A-00; VFD2500C43A-00; VFD2500C63B-00; VFD3150C63B-00

Model『MKC-GN1CB』

ITEM	Description	Qty.
1	Screw M5*0.8*10L	12
2	Bushing Rubber 28	2
3	Bushing Rubber 44	2
4	Bushing Rubber 130	3
5	Conduit box cover	1
6	Conduit box base	1

Table 7-91

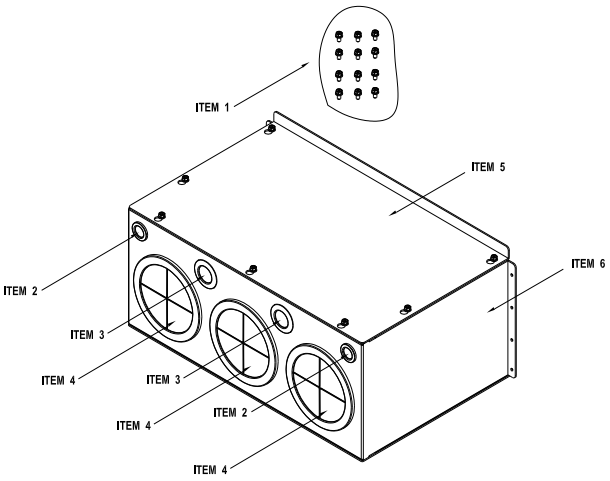


Figure 7-91

Frame H

Applicable models: VFD2800C43A-00; VFD3150C43A-00; VFD3550C43A-00; VFD4000C43A-00; VFD4500C43A-00; VFD5000C43A-00; VFD5600C43A-00; VFD5000C43C-21; VFD5600C43C-21

Model『MKC-HN1CB』

ITEM	Description	Qty.
1	Screw M6*1.0*25L	8
2	Screw M8*1.25*30L	3
3	NUT M8	4
4	NUT M10	4
5	Bushing Rubber 28	4
6	Bushing Rubber 44	2
7	Bushing Rubber 102	4
8	Bushing Rubber 130	4
9	Conduit box cover 1	1
10	Conduit box cover 2	2
11	Conduit box cover 3	2
12	Conduit box cover 4	2
13	Conduit box base	1
14	Accessories 1	2
15	Accessories 2	1

Table 7-92

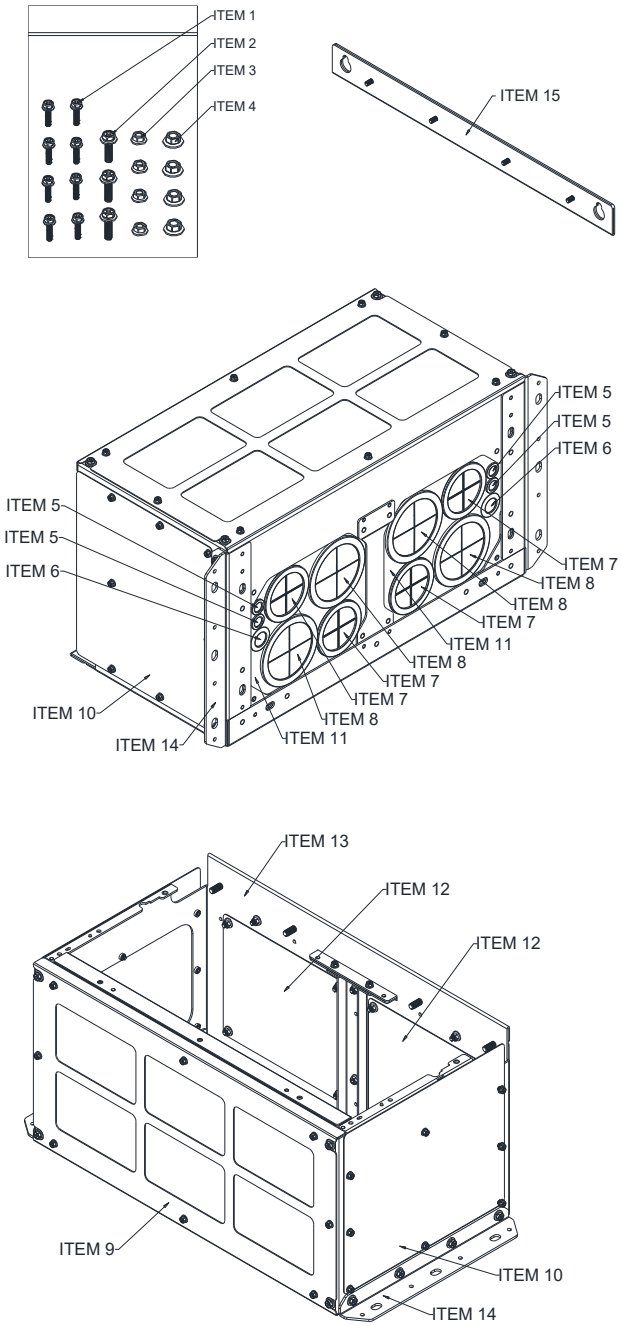


Figure 7-92

- Installation

Frame D0

1. Loosen the cover screws and press the tabs on each side of the cover to remove the cover, as shown in the following figure.
   Screw torque: 12–15 kg-cm / (10.4–13 lb-in.) / (1.2–1.5 Nm)

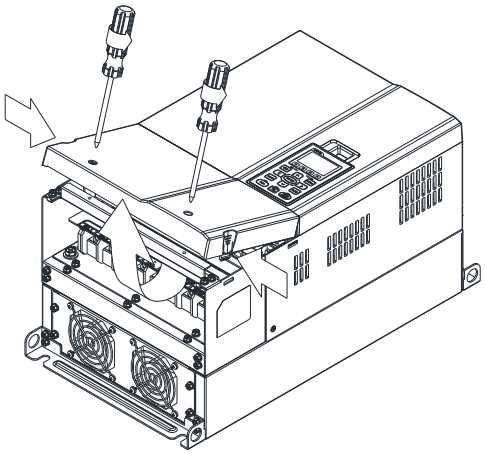


Figure 7-93

2. Remove the 5 screws shown in the following figure.
   Screw torque: 24–26 kg-cm / (20.8–22.6 lb-in.) / (2.4–2.5 Nm)

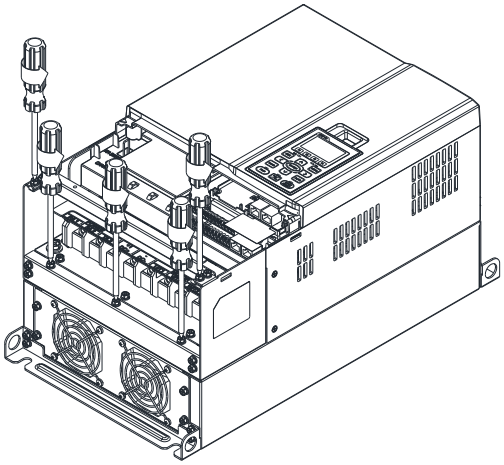


Figure 7-94

3. Install the conduit box by tightening the 5 screws shown in the following figure.
   Screw torque: 24–26 kg-cm / (20.8–22.6 lb-in.) / (2.4–2.5 Nm)

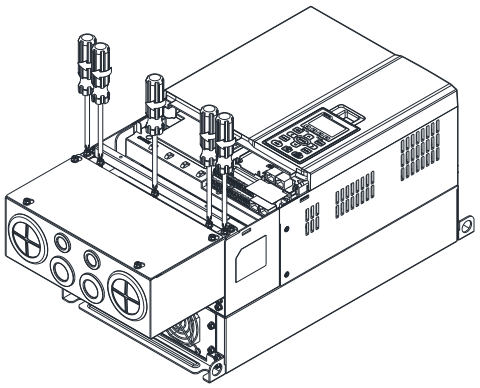


Figure 7-95

4. Tighten the 2 screws shown in the following figure.
   Screw torque: 12–15 kg-cm / (10.4–13 lb-in.) / (1.2–1.5 Nm)

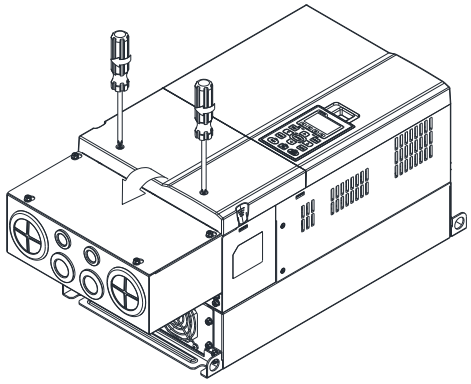


Figure 7-96

Frame D

1. Loosen the cover screws and press the tabs on each side of the cover to remove the cover, as shown in the following figure.
   Screw torque: 12–15 kg-cm / (10.4–13 lb-in.) / (1.2–1.5 Nm)

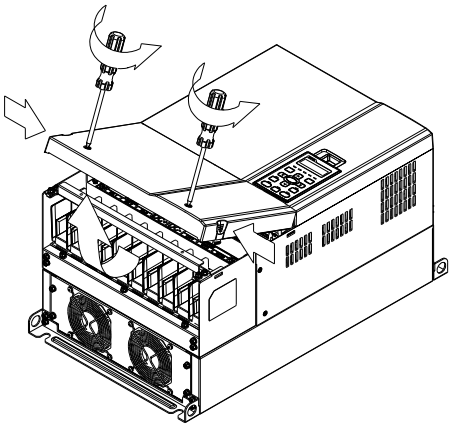


Figure 7-97

2. Remove the 5 screws shown in the following figure.
   Screw torque: 24–26 kg-cm / (20.8–22.6 lb-in.) / (2.4–2.5 Nm)

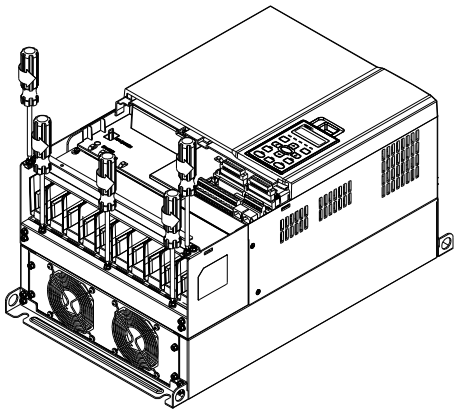


Figure 7-98

3. Install the conduit box by tightening the 5 screws shown in the following figure.
   Screw torque: 24–26 kg-cm / (20.8–22.6 lb-in.) / (2.4–2.5 Nm)

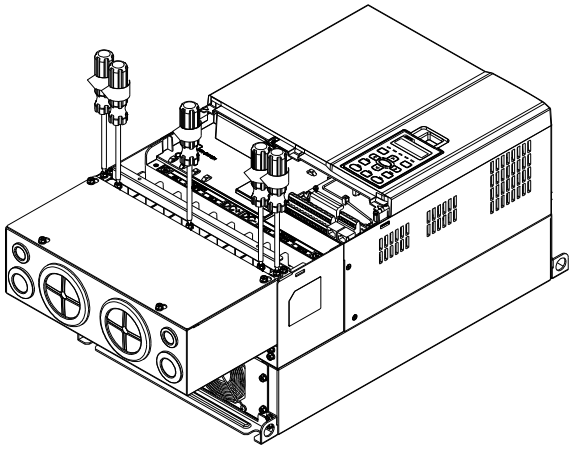


Figure 7-99

4. Tighten the 2 screws shown in the following figure. Screw torque: 12–15 kg-cm / (10.4–13 lb-in.) / (1.2–1.5 Nm)

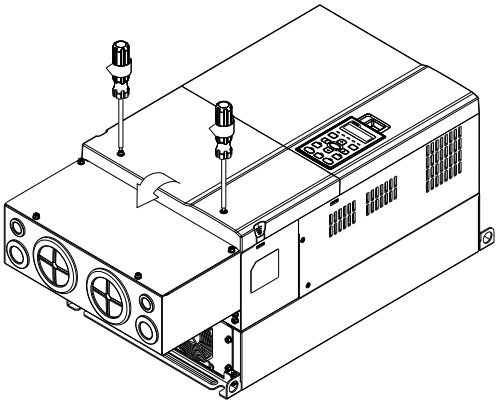


Figure 7-100

Frame E

1. Loosen the 4 cover screws and lift the cover.
   Screw torque: 12–15 kg-cm / (10.4–13 lb-in.) / (1.2–1.5 Nm)

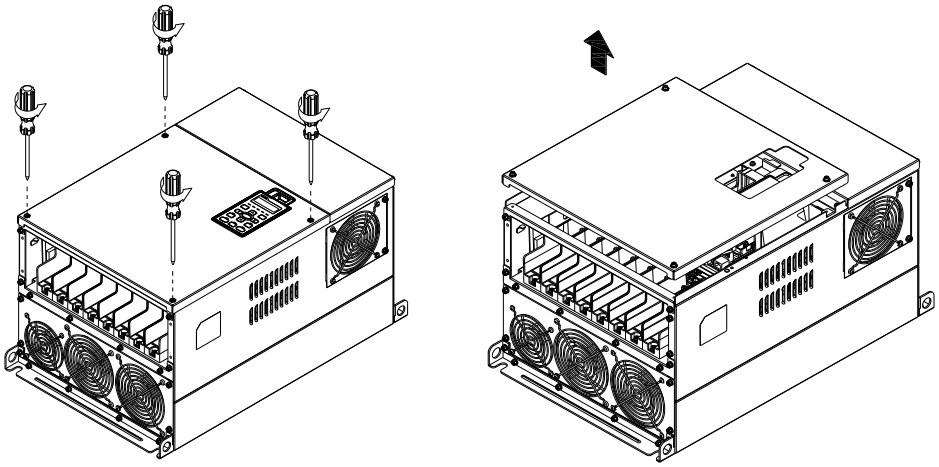


Figure 7-101

2. Tighten the 6 screws shown in the following figure and place the cover back to the original position.
   Screw torque: 24–26 kg-cm / (20.8–22.6 lb-in.) / (2.4–2.5 Nm)

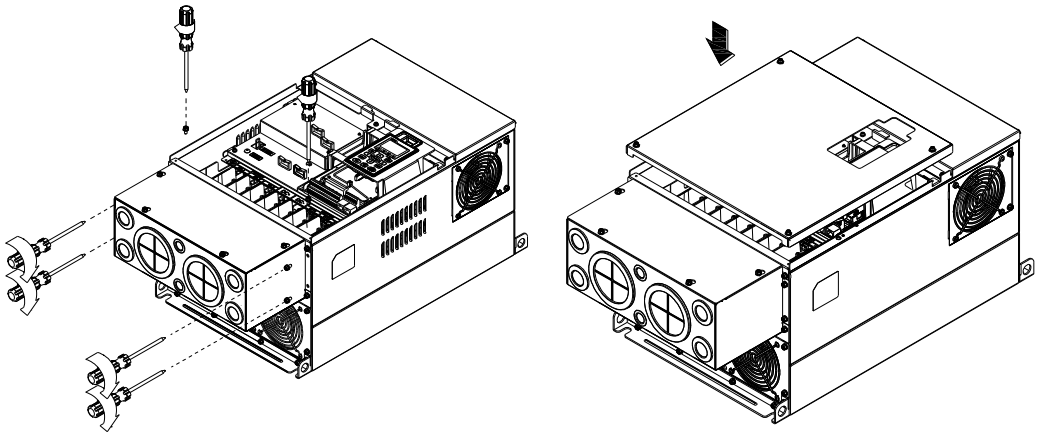


Figure 7-102

3. Tighten the 4 screws shown in the following figure.
   Screw torque: 12–15 kg-cm / (10.4–13 lb-in.) / (1.2–1.5 Nm)

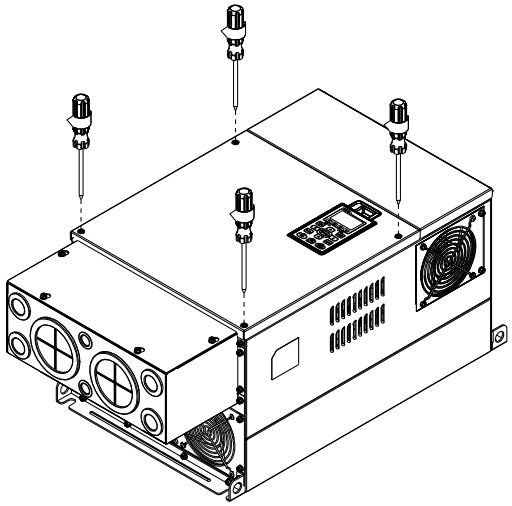


Figure 7-103

Frame F

1. Loosen the cover screws and press the tabs on each side of the cover to remove the cover, as shown in the following figure.
   Screw torque: 12–15 kg-cm / (10.4–13 lb-in.) / (1.2–1.5 Nm)

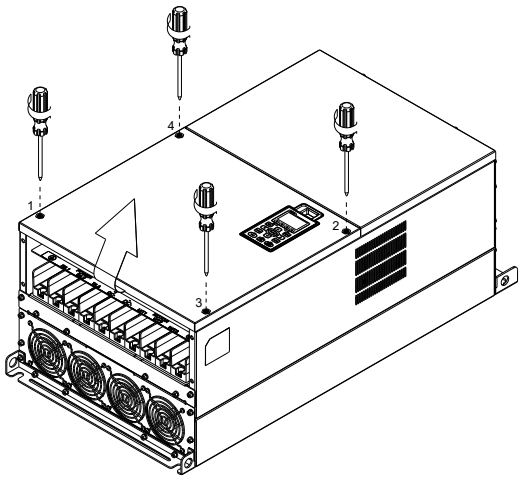


Figure 7-104

2. Install the conduit box by tightening the 4 screws, as shown in the following figure.
   Screw torque: 24–26 kg-cm / (20.8–22.6 lb-in.) / (2.4–2.5 Nm)

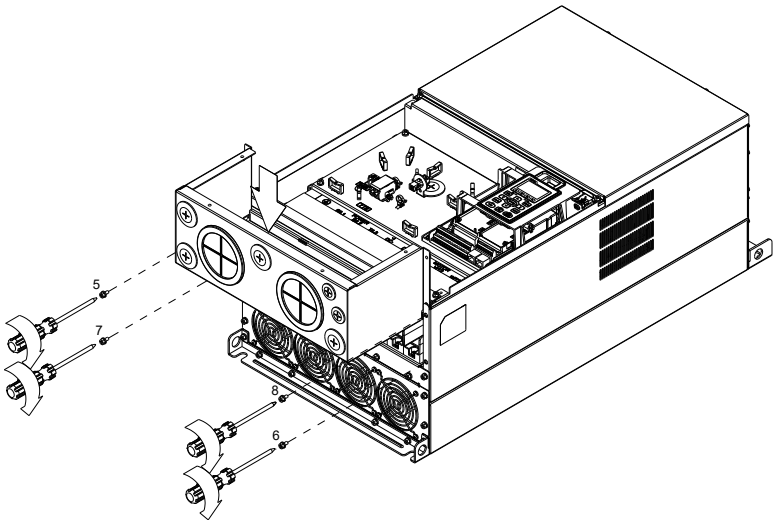


Figure 7-105

3. Install the conduit box by tightening all the screws shown in the following figure
   Screw 9–12 torque: 12–15 kg-cm / (10.4–13 lb-in.) / (1.2–1.5 Nm)
   Screw 13–16 torque: 24–26 kg-cm / (20.8–22.6 lb-in.) / (2.4–2.5 Nm)

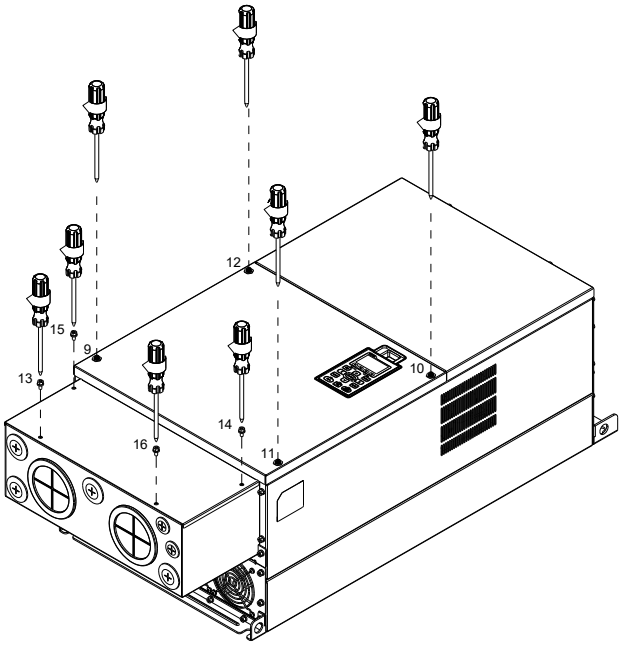


Figure 7-106

Frame G

1. On the conduit box, loosen 7 of the cover screws and remove the cover
   Screw torque: 24–26 kg-cm / (20.8–22.6 lb-in.) / (2.4–2.5 Nm)
2. On the drive, loosen 4 of the cover screws and press the tabs on each side of the cover to remove the cover, as shown in the following figure.
   Screw torque: 12–15 kg-cm / (10.4–13 lb-in.) / (1.2–1.5 Nm)

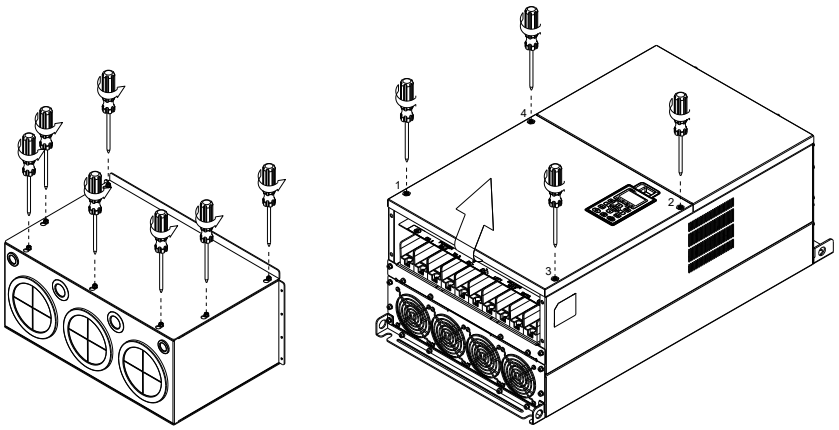


Figure 7-107

3. Remove the top cover and loosen the screws.
   M5 Screw torque: 24–26 kg-cm / (20.8–22.6 lb-in.) / (2.4–2.5 Nm)
   M8 Screw torque: 100–120 kg-cm / (86.7–104.1 lb-in.) / (9.8–11.8 Nm)

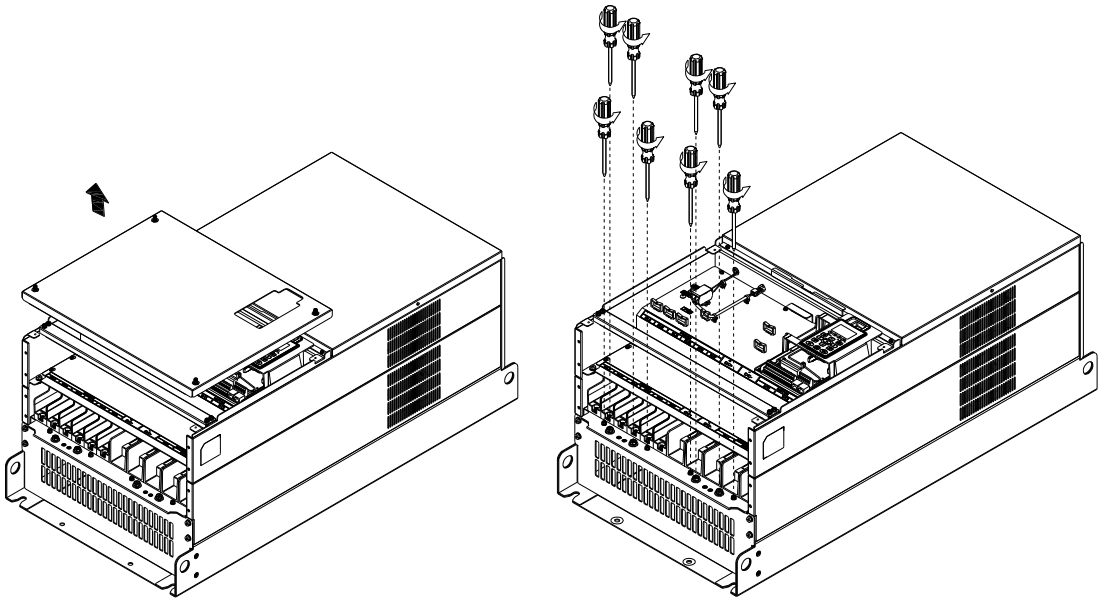


Figure 7-108

4. Install the conduit box by tightening all the screws shown in the following figure.
   M5 Screw torque: 24–26 kg-cm / (20.8–22.6 lb-in.) / (2.4–2.5 Nm)
   M8 Screw torque: 100–120 kg-cm / (86.7–104.1 lb-in.) / (9.8–11.8 Nm)

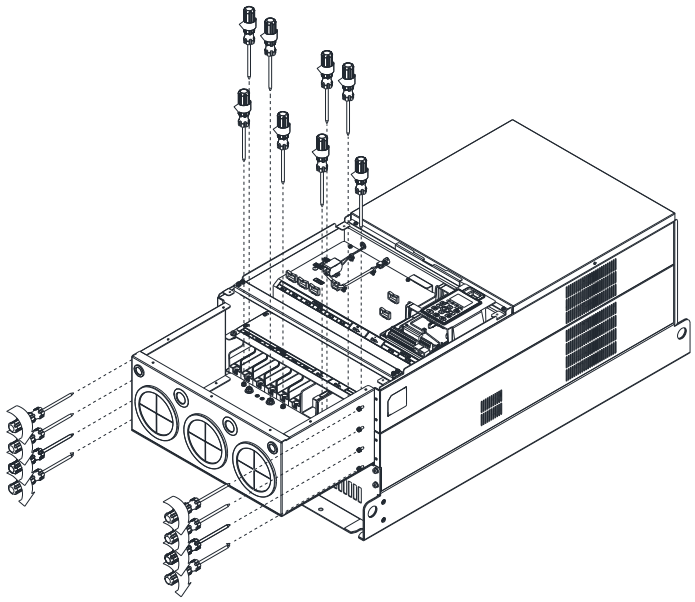


Figure 7-109

5. Tighten all the screws.
   Screw torque: 24–26 kg-cm / (20.8–22.6 lb-in.) / (2.4–2.5 Nm)

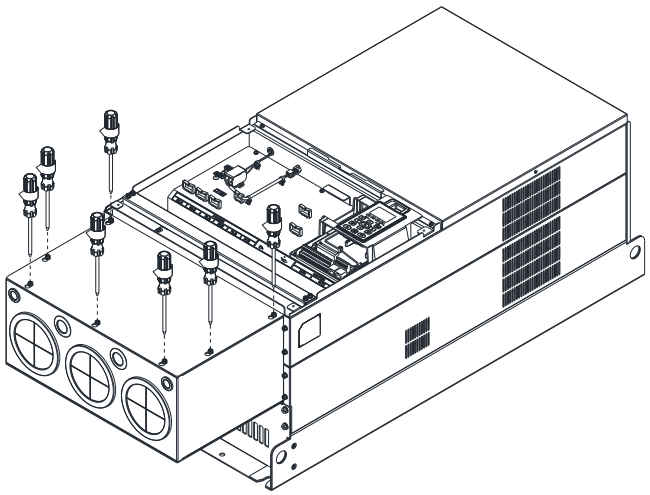


Figure 7-110

6. Place the cover back to the top and tighten the screws (as shown in the figure).

   Screw torque: 12–15 kg-cm / (10.4–13 lb-in.) / (1.2–1.5 Nm)

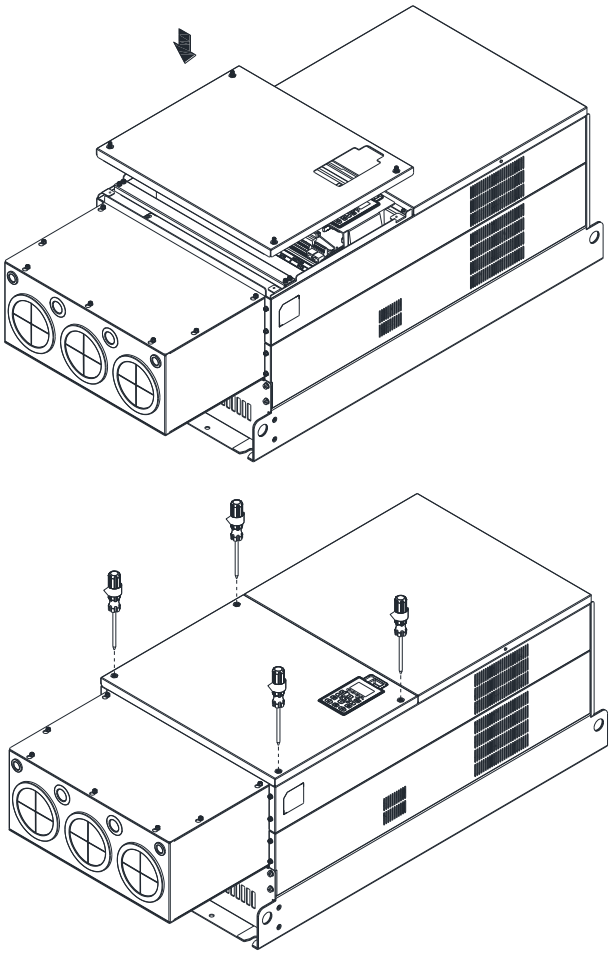


Figure 7-111

Frame H

Assembly for Frame H3 (Conduit Box)

1. Loosen the 3 screws and remove the cover of conduit box H3 as preparation.

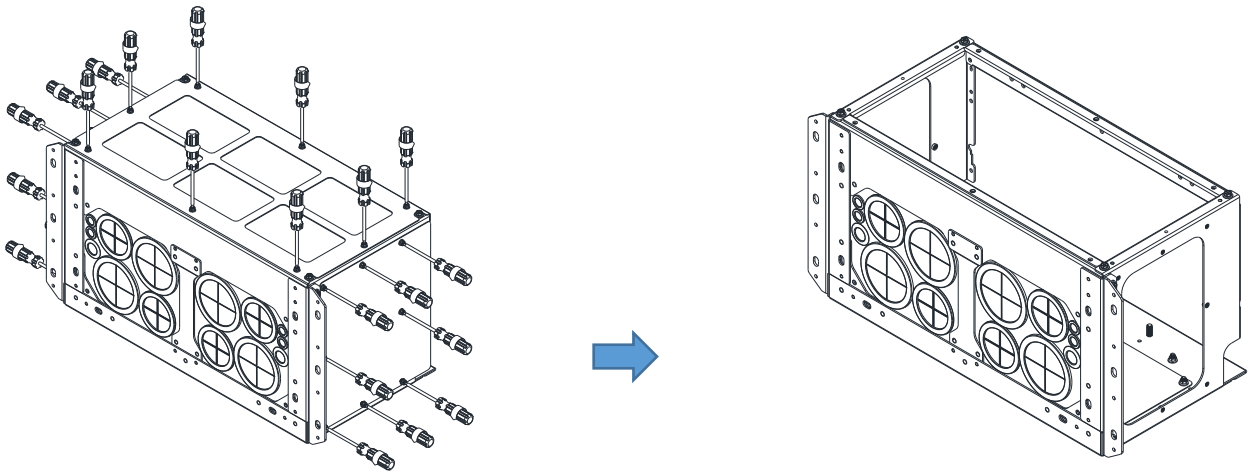


Figure 7-112

2. Loosen the screws as below figure shown.

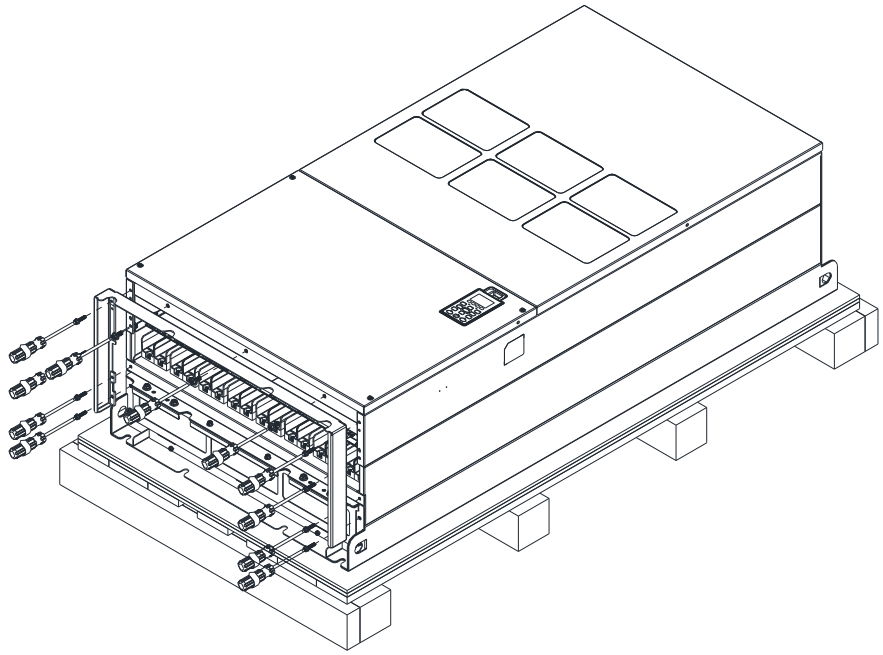


Figure 7-113

3. Tighten the M6 screws to locations shown in the following figure.
   Screw Torque: 35–45 kg-cm / (30.3–39 lb-in.) / (3.4–4.4 Nm)

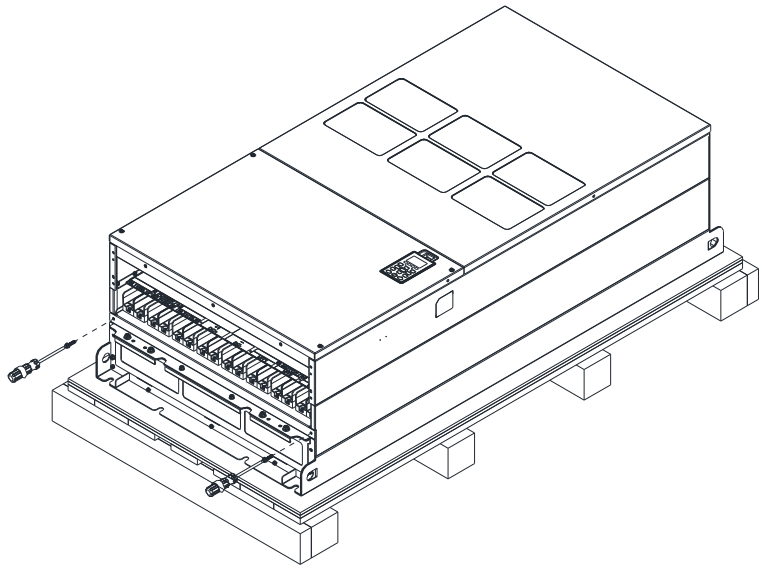


Figure 7-114

4. Install the conduit box by tightening all the screws shown in the following figure.
   Screw 1–6: M6 screw torque: 55–65 kg-cm / (47.7–56.4 lb-in) / (5.4–6.4 Nm)
   Screw 7–9: M8 screw torque: 100–110 kg-cm / (86.7–95.4 lb-in) / (9.8–10.8 Nm)
   Screw 10–13: M10 screw torque: 250–300 kg-cm / (216.9–260.3 lb-in) / (24.5–29.4 Nm)
   Screw 14–17: M8 screw torque: 100–110 kg-cm / (86.7–95.4 lb-in) / (9.8–10.8 Nm)

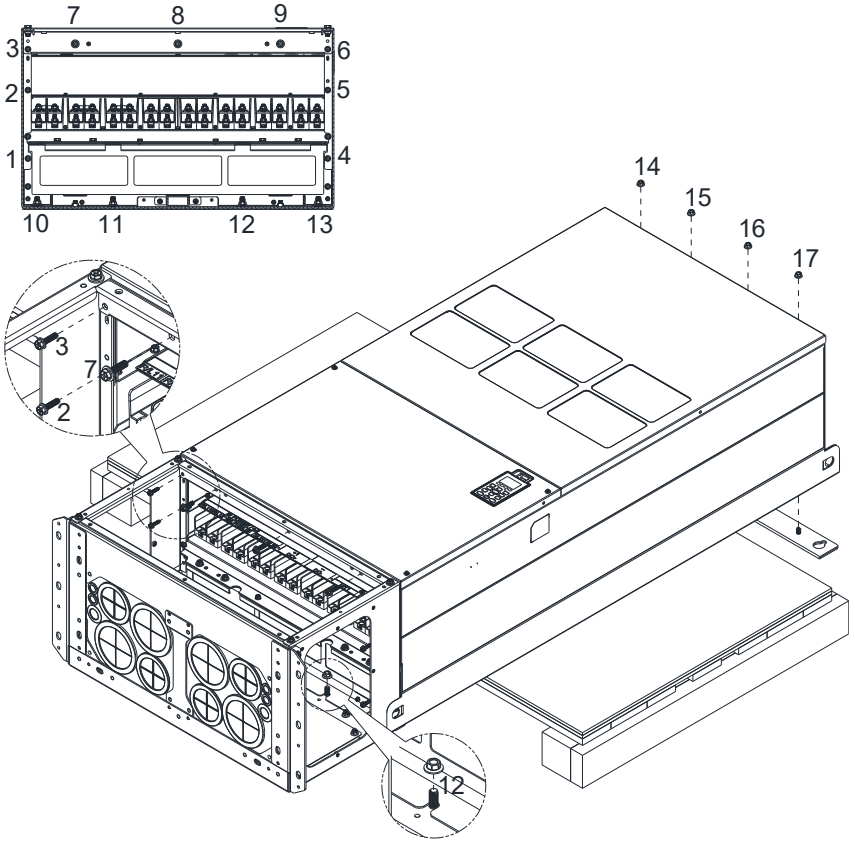


Figure 7-115

5. Tighten the 3 covers and screws, which were loosen from step 1, to the original location.
   Screw Torque: 35–45 kg-cm / (30.3–39 lb-in.) / (3.4–4.4 Nm)

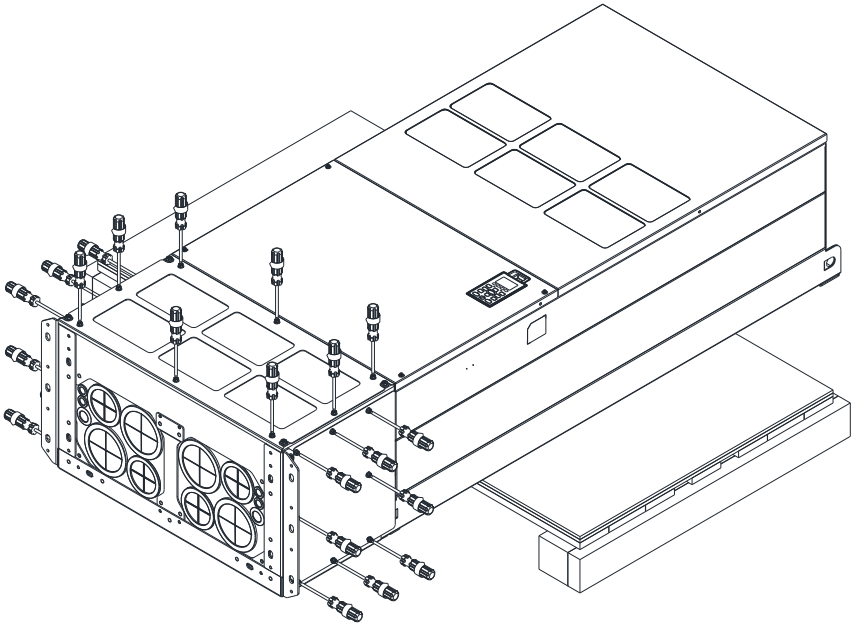


Figure 7-116

6. Installation complete.

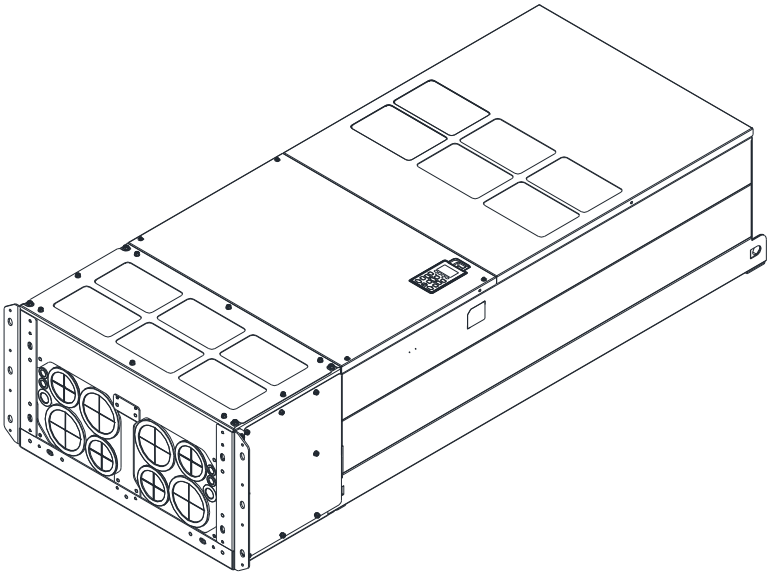


Figure 7-117

Assembly for Frame H2 (Straight Stand)

1. Loosen the 3 screws and remove the cover of conduit box.

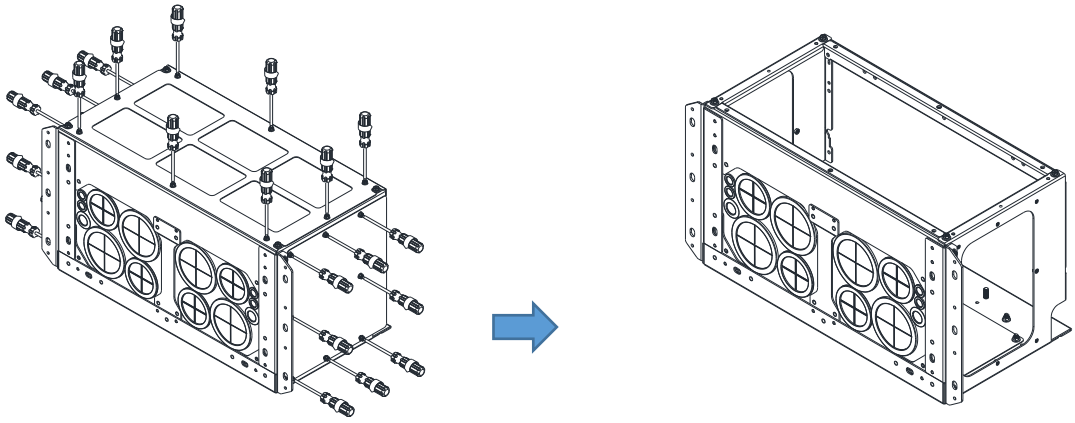


Figure 7-118

2. Remove the 4 covers of conduit box, and tighten the loosen screws back to the original location.
   Screw Torque: 100–110 kg-cm / (86.7–95.4 lb-in) / (9.8–10.8 Nm)

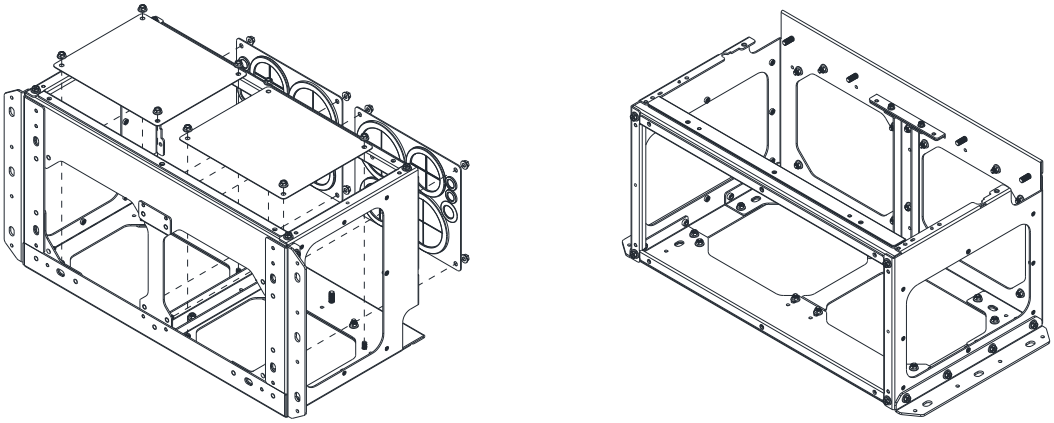


Figure 7-119

3. Remove the parts and screws as below figure shown.

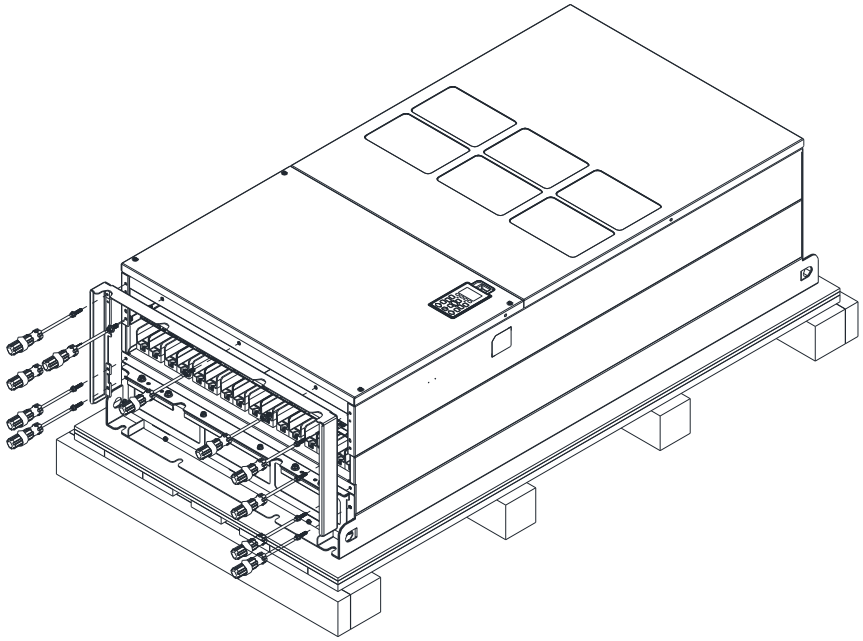


Figure 7-120

4. Tighten the M6 screws to locations shown in below figure.
   Screw Torque: 35–45 kg-cm / (30.3–39 lb-in.) / (3.4–4.4 Nm)

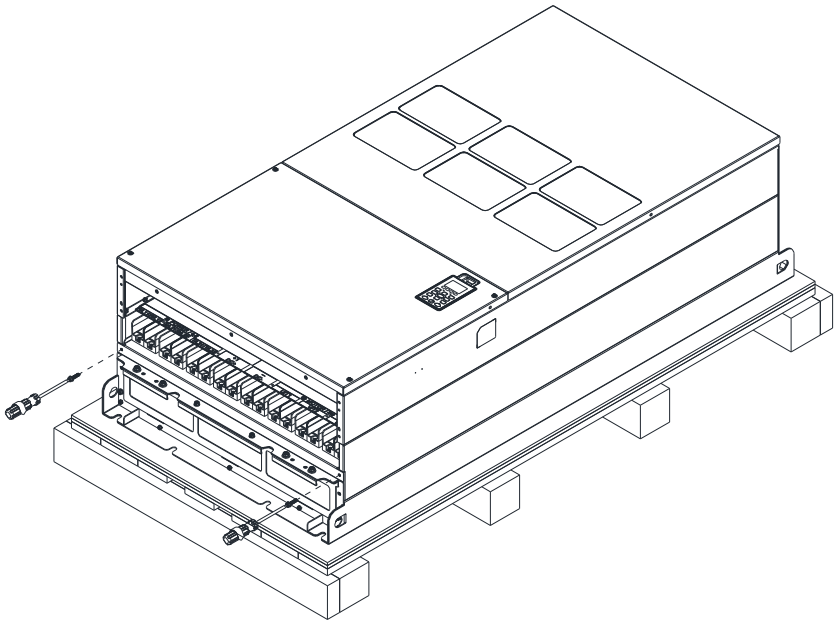


Figure 7-121

5. Install conduit box and accessories by tightening all the screws shown in the following figure.

   Screw 1–6: M6 screw torque: 55–65 kg-cm / (47.7–56.4 lb-in) / (5.4–6.4 Nm)

   Screw 7–9: M8 screw torque: 100–110 kg-cm / (86.7–95.4 lb-in) / (9.8–10.8 Nm)

   Screw 10–13: M10 screw torque: 250–300 kg-cm / (216.9–260.3 lb-in) / (24.5–29.4 Nm)

   Screw 14–17: M8 screw torque: 100–110 kg-cm / (86.7–95.4 lb-in) / (9.8–10.8 Nm)

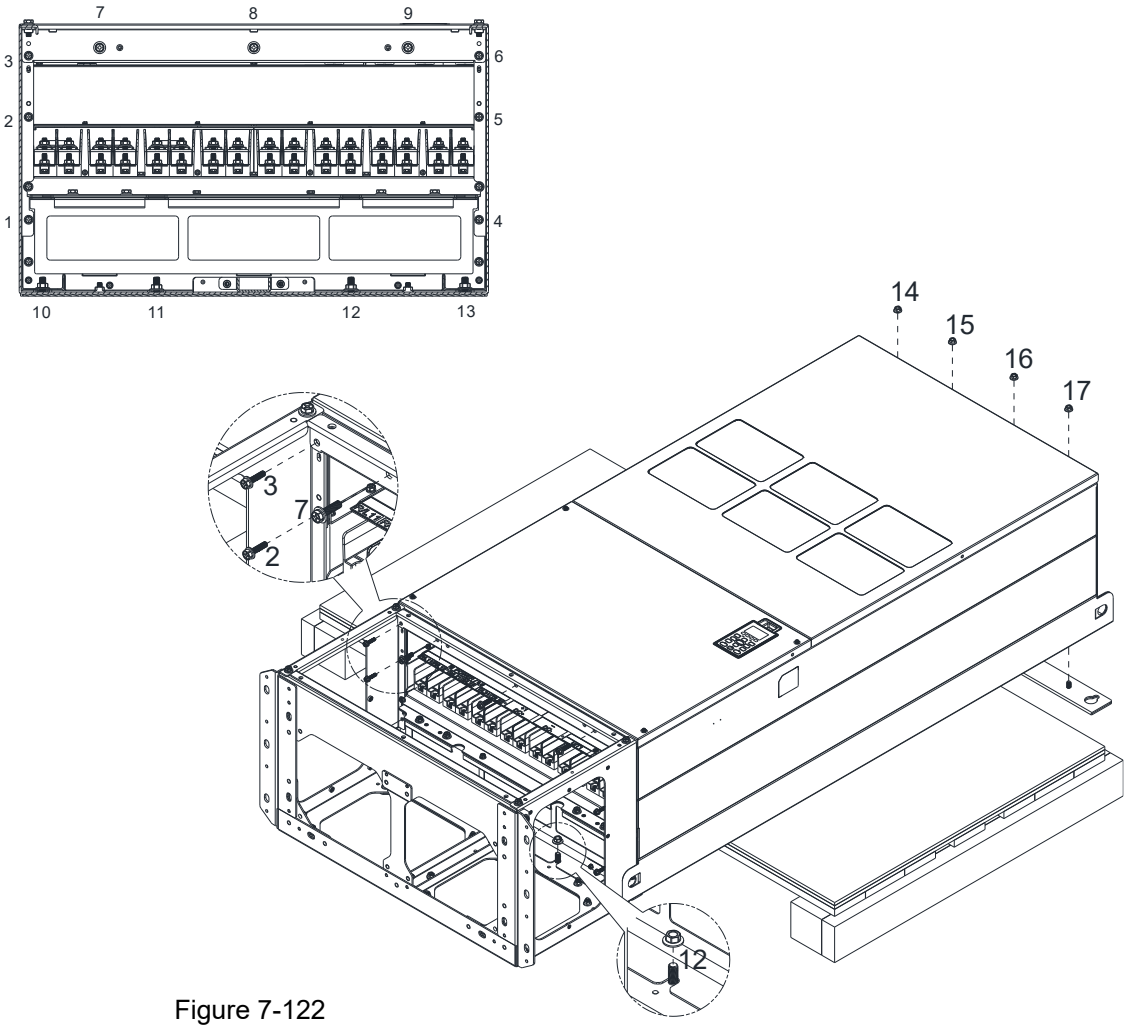


Figure 7-122

6. Installation completed.

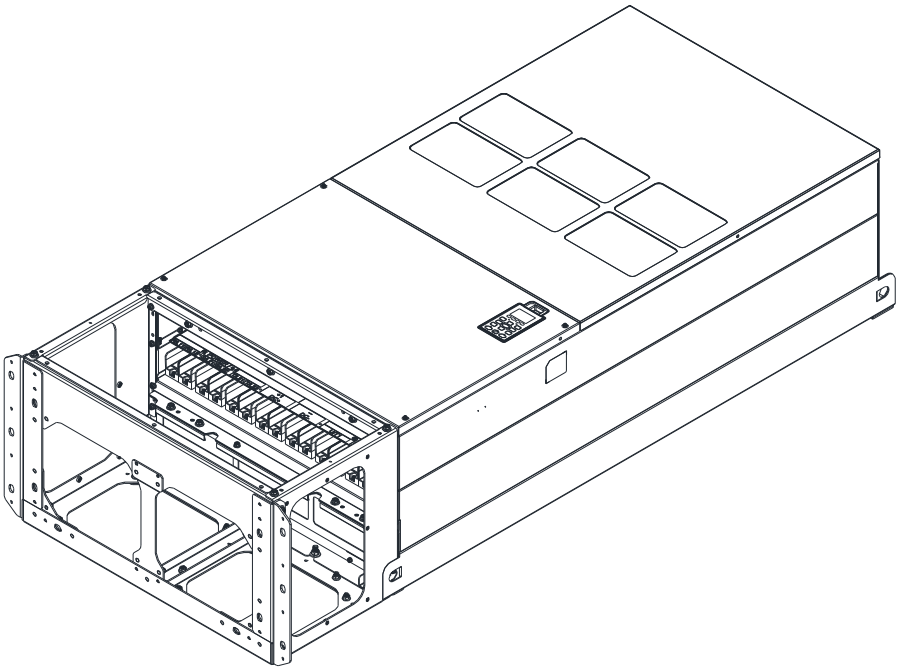


Figure 7-123

7-9 Fan Kit

- Appearance

NOTE: The fan does not support hot swap function. For replacement, turn the power off before replacing the fan.

Frame A

Applicable models

VFD015C23A-21; VFD022C23A-21; VFD037C23A-21;
VFD022C43A-21; VFD037C43A-21; VFD040C43A-21;
VFD055C43A-21; VFD022C4EA-21; VFD037C4EA-21;
VFD040C4EA-21; VFD055C4EA-21; VFD015C53A-21;
VFD022C53A-21; VFD037C53A-21

Heat sink Fan Model “MKC-AFKM”

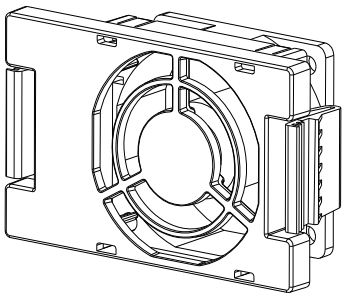


Figure 7-124

Frame B

Applicable models

VFD055C23A-21; VFD075C43A-21; VFD075C4EA-21;
VFD055C53A-21; VFD075C53A-21; VFD110C53A-21;
VFD150C53A-21

Heat sink Fan Model “MKC-BFKM1”

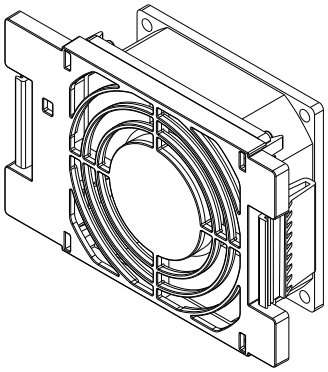


Figure 7-125

Frame B

Applicable models

VFD075C23A-21; VFD110C23A-21; VFD110C43A-21;
VFD150C43A-21; VFD110C4EA-21; VFD150C4EA-21

Heat sink Fan Model “MKC-BFKM2”

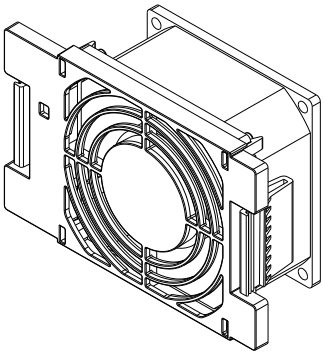


Figure 7-126

Frame B

Applicable models

VFD055C23A-21; VFD075C23A-21; VFD110C23A-21;
VFD075C43A-21; VFD110C43A-21; VFD150C43A-21;
VFD075C4EA-21; VFD110C4EA-21; VFD150C4EA-21;
VFD055C53A-21; VFD075C53A-21; VFD110C53A-21;
VFD150C53A-21

Capacitor Fan Model “MKC-BFKB”

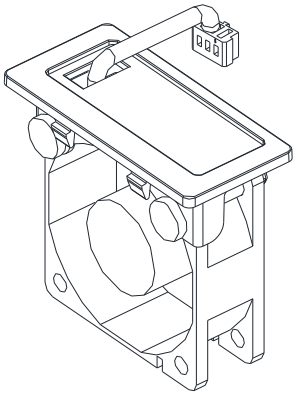


Figure 7-127

Frame C

Applicable models

VFD150C23A-21; VFD185C23A-21; VFD220C23A-21

Capacitor Fan Model “MKC-CFKB1”

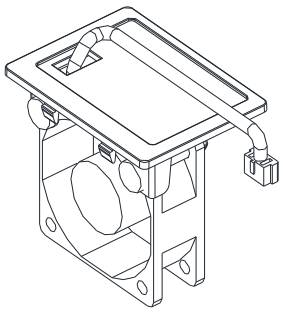


Figure 7-128

Frame C

Applicable models

VFD185C43A-21; VFD220C43A-21; VFD300C43A-21;
VFD185C4EA-21; VFD220C4EA-21; VFD300C4EA-21

Capacitor Fan Model “MKC-CFKB2”

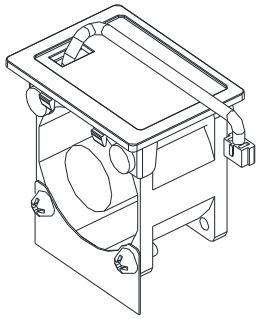


Figure 7-129

Frame C

- Following models use one set of MKC-CFKM:

VFD185C43A-21; VFD220C43A-21; VFD300C43A-21;
VFD185C4EA-21; VFD220C4EA-21

- Following models use two sets of MKC-CFKM:

VFD150C23A-21; VFD185C23A-21; VFD220C23A-21;
VFD300C4EA-21

Heat sink Fan “MKC-CFKM”

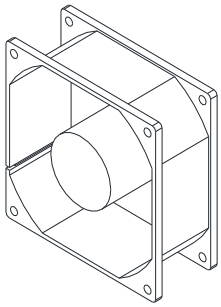


Figure 7-130

Frame C

Applicable models

VFD185C63B-21; VFD220C63B-21; VFD300C63B-21;
VFD370C63B-21

Heat sink Fan “MKC-CFKM1”

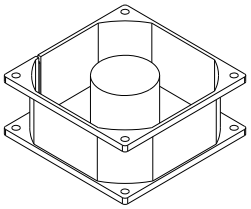


Figure 7-131

Capacitor Fan “MKC-CFKB3”

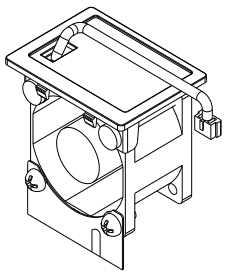


Figure 7-132

Frame D0

Applicable models

VFD370C43S-00; VFD450C43S-00; VFD370C43S-21;
VFD450C43S-21

Heat sink Fan Model “MKC-D0FKM”

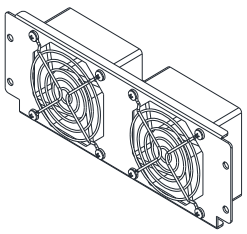


Figure 7-133

Capacitor Fan Model ”MKC-DFKB”

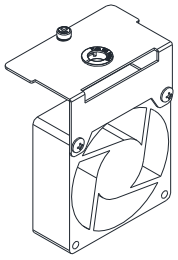


Figure 7-134

Frame D

Applicable models

VFD300C23A-00; VFD370C23A-00; VFD300C23A-21; VFD370C23A-21; VFD550C43A-00; VFD750C43A-00; VFD550C43A-21; VFD750C43A-21; VFD450C63B-00; VFD550C63B-00; VFD450C63B-21; VFD550C63B-21

Heat sink Fan Model "MKC-DFKM"

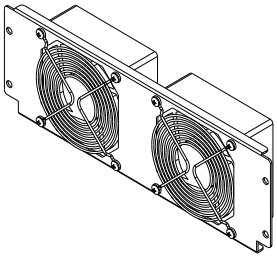


Figure 7-135

Capacitor Fan Model "MKC-DFKB"

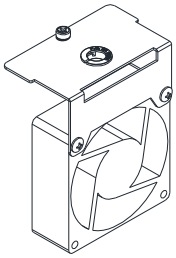


Figure 7-136

Frame E

Applicable models

VFD450C23A-00; VFD550C23A-00; VFD450C23A-21; VFD550C23A-21

Heat sink Fan Model "MKC-EFKM1"

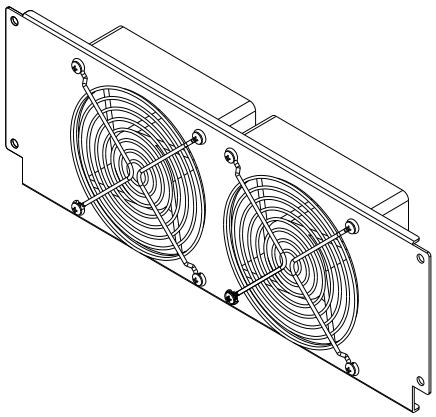


Figure 7-137

Frame E

Applicable models

VFD750C23A-00; VFD750C23A-21; VFD900C43A-00; VFD1100C43A-00; VFD900C43A-21; VFD1100C43A-21

Heat sink Fan Model "MKC-EFKM2"

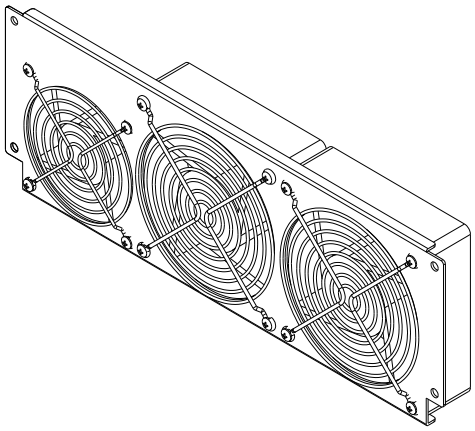


Figure 7-138

Frame E

Applicable models

VFD750C63B-00; VFD900C63B-00; VFD1100C63B-00; VFD1320C63B-00; VFD750C63B-21; VFD900C63B-21; VFD1100C63B-21; VFD1320C63B-21

Heat Sink Fan Model "MKC-EFKM3"

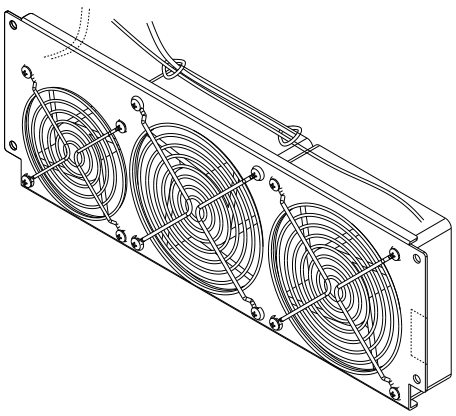


Figure 7-139

Frame E

Applicable models

VFD450C23A-00; VFD550C23A-00; VFD750C23A-00;
VFD450C23A-21; VFD550C23A-21; VFD750C23A-21;
VFD900C43A-00; VFD1100C43A-00; VFD900C43A-21;
VFD1100C43A-21; VFD750C63B-00; VFD900C63B-00;
VFD1100C63B-00; VFD1320C63B-00; VFD750C63B-21;
VFD900C63B-21; VFD1100C63B-21; VFD1320C63B-21

Capacitor Fan Model “MKC-EFKB”

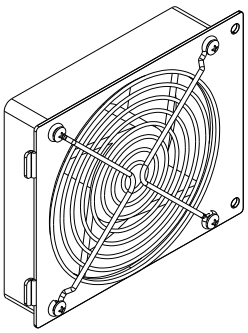


Figure 7-140

Frame F

Applicable models

VFD900C23A-00; VFD900C23A-21; VFD1320C43A-00;
VFD1600C43A-00; VFD1320C43A-21; VFD1600C43A-21;
VFD1600C63B-00; VFD2000C63B-00; VFD1600C63B-21;
VFD2000C63B-21

Heat sink Fan Model “MKC-FFKM”

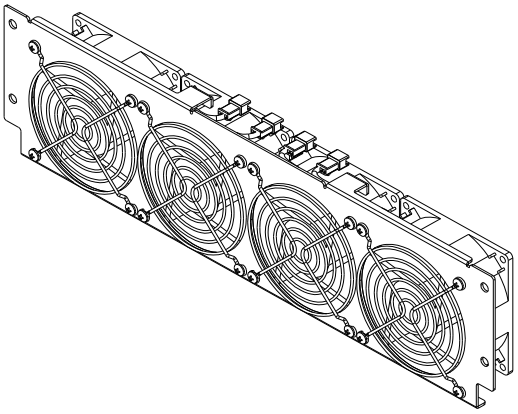


Figure 7-141

Frame F

Applicable models

VFD900C23A-00; VFD900C23A-21; VFD1320C43A-00;
VFD1600C43A-00; VFD1320C43A-21; VFD1600C43A-21;
VFD1600C63B-00; VFD2000C63B-00; VFD1600C63B-21;
VFD2000C63B-21

Capacitor Fan Model “MKC-FFKB”

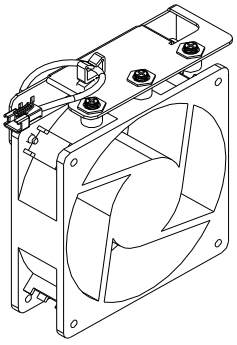


Figure 7-142

Frame G

Applicable models

VFD1850C43A-00; VFD2000C43A-00; VFD2200C43A-00;
VFD2500C43A-00; VFD1850C43A-21; VFD2000C43A-21;
VFD2200C43A-21; VFD2500C43A-21; VFD2500C63B-00;
VFD3150C63B-00; VFD2500C63B-21; VFD3150C63B-21

Heat sink Fan Model “MKC-GFKM”

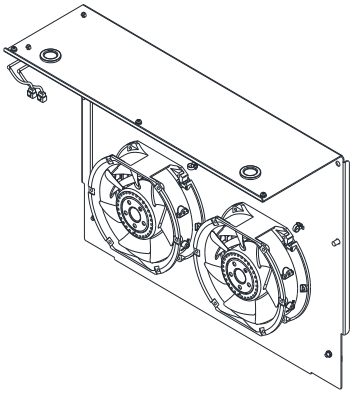


Figure 7-143

Frame H

Applicable models

Following models use two sets of MKC-HFKM fan kit:
VFD2800C43A-00; VFD3150C43A-00; VFD3550C43A-00;
VFD2800C43C-21; VFD3150C43C-21; VFD3550C43C-21

Heat sink Fan Model “MKC-HFKM”

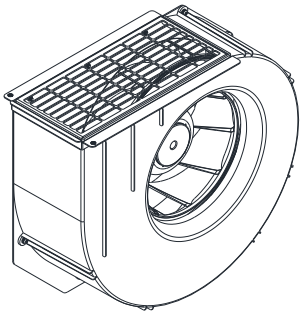


Figure 7-144

Frame H

Applicable models

- Following models use two sets of MKC-HFKM2 fan kit:
VFD4000C43A-00; VFD4000C43C-21

- Following models use three sets of MKCHS-HFKM fan kit:
VFD4500C43A-00; VFD5000C43A-00; VFD5600C43A-00;
VFD4500C43C-21; VFD5000C43C-21; VFD5600C43C-21

Heat sink Fan Model “MKCHS-HFKM”

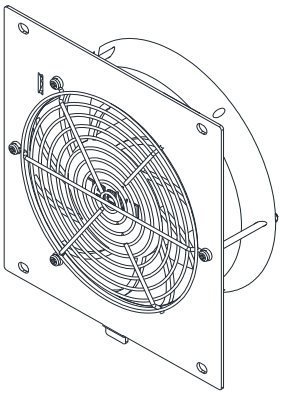


Figure 7-145

Frame H

Applicable models

- Following models use two sets of MKC-HFKM1:
VFD4000C63B-00; VFD4000C63B-21

- Following models use three sets of MKC-HFKM1:
VFD4500C63B-00; VFD5600C63B-00; VFD6300C63B-00;
VFD4500C63B-21; VFD5600C63B-21; VFD6300C63B-21

Heat sink Fan Model “MKC-HFKM1”

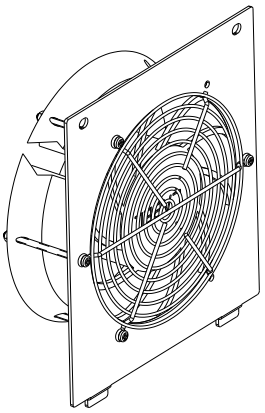


Figure 7-146

- Fan Removal

Frame A

Model “MKC-AFKM” : Heat Sink Fan

Applicable models

VFD015C23A-21; VFD022C23A-21; VFD037C23A-21; VFD022C43A-21; VFD037C43A-21; VFD040C43A-21; VFD055C43A-21; VFD022C4EA-21; VFD037C4EA-21; VFD040C4EA-21; VFD055C4EA-21; VFD015C53A-21; VFD022C53A-21; VFD037C53A-21

1. Refer to the figure below, press the tabs on both side of the fan to successfully remove the fan.

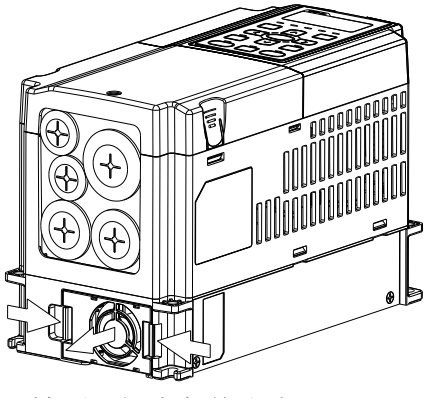


Figure 7-147

2. Disconnect the power terminal before removing the fan. (As shown below.)

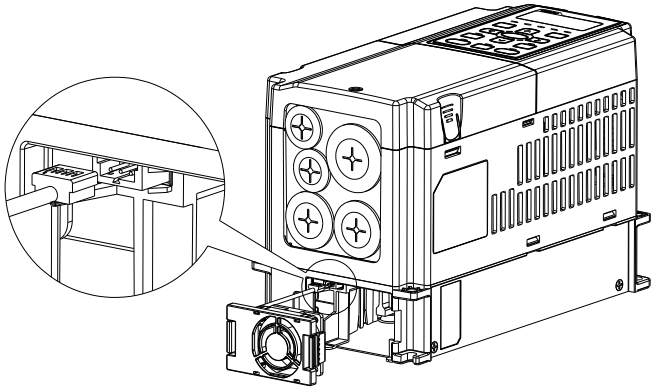


Figure 7-148

Frame B

Model ”MKC-BFKM1” Heat Sink Fan

Applicable models

VFD055C23A-21; VFD075C43A-21; VFD075C4EA-21; VFD055C53A-21; VFD075C53A-21; VFD110C53A-21; VFD150C53A-21

1. Refer to the figure below, press the tab on both side of the fan to successfully remove the fan.

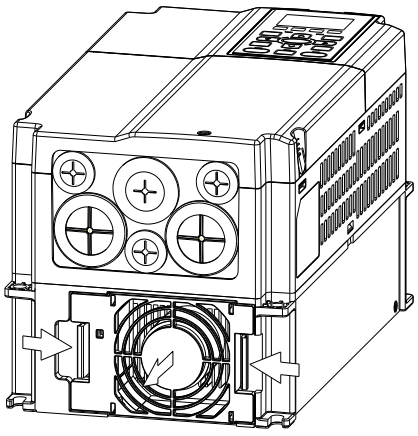


Figure 7-149

2. Disconnect the power terminal before removing the fan. (As shown below.)

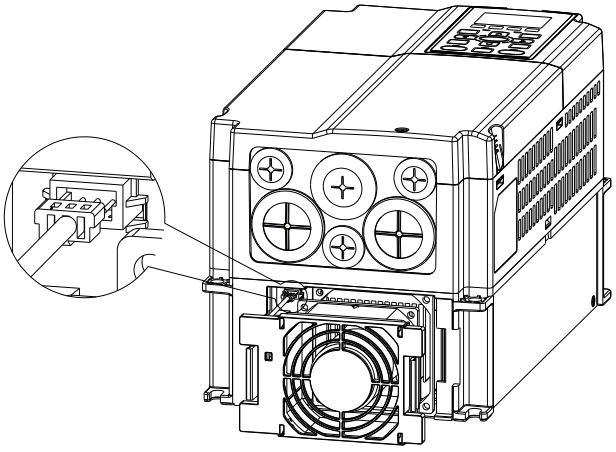


Figure 7-150

Frame B

Model “MKC-BFKM2” Heat Sink Fan

Applicable models

VFD075C23A-21; VFD110C23A-21; VFD110C43A-21; VFD150C43A-21; VFD110C4EA-21; VFD150C4EA-21

1. Refer to the figure below, press the tab on both side of the fan to successfully remove the fan.

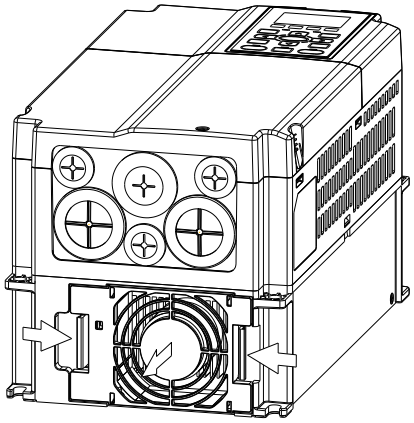


Figure 7-151

2. Disconnect the power terminal before removing the fan. (As shown below.)

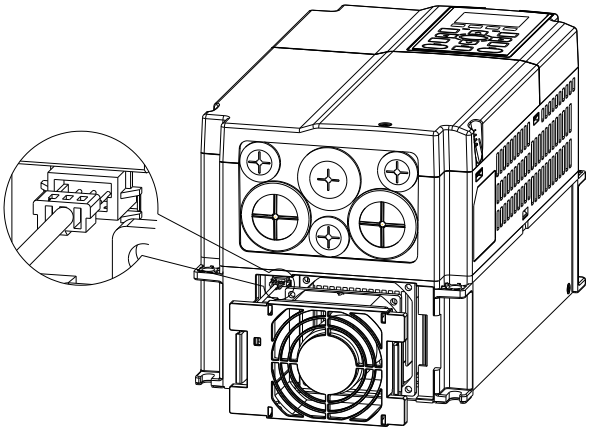


Figure 7-152

Frame B

Model ”MKC-BFKB” Capacitor Fan

Applicable models

VFD055C23A-21; VFD075C23A-21; VFD110C23A-21; VFD075C43A-21; VFD110C43A-21; VFD150C43A-21; VFD075C4EA-21; VFD110C4EA-21; VFD150C4EA-21; VFD055C53A-21; VFD075C53A-21; VFD110C53A-21; VFD150C53A-21

Disconnect fan power and pull out the fan by using a flat-head screwdriver. (As shown in the enlarged picture)

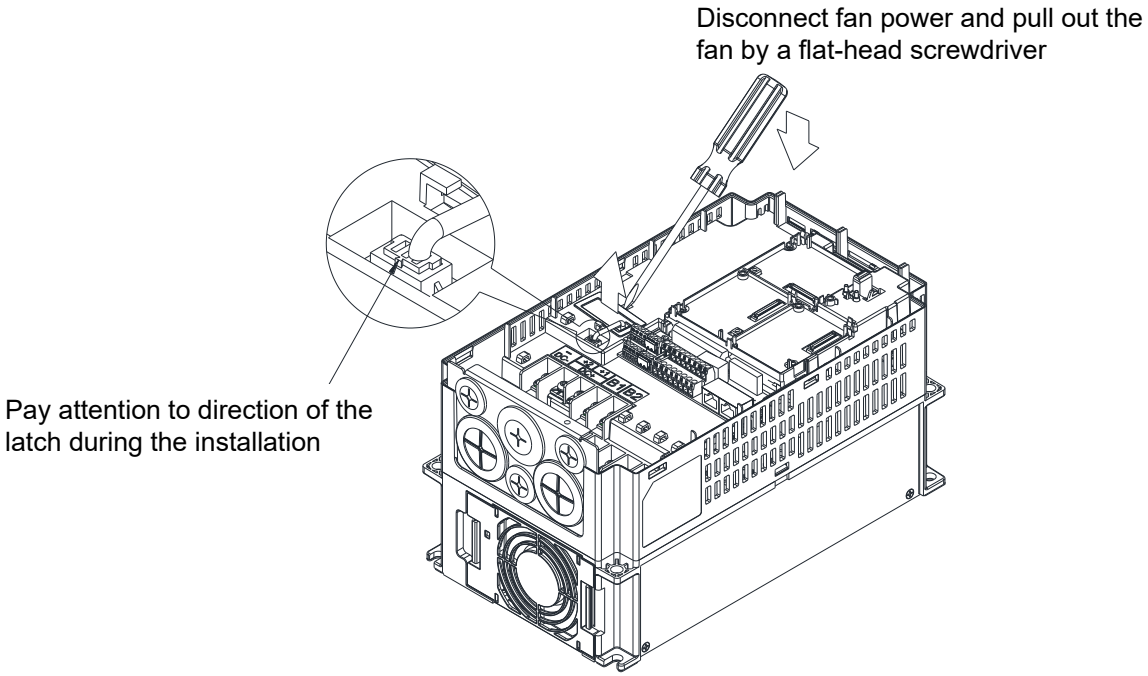


Figure 7-153

Frame C

Model ”MKC-CFKM / MKC-CFKM1” Heat Sink Fan

Applicable models

- Single fan kit applicable models (only fan kit 1 is required to be installed):

VFD185C43A-21; VFD220C43A-21; VFD300C43A-21; VFD185C4EA-21; VFD220C4EA-21; VFD185C63B-21; VFD220C63B-21; VFD300C63B-21; VFD370C63B-21

- Duo fan kit applicable models (both fan kit 1 and 2 are required to be installed):

VFD150C23A-21; VFD185C23A-21; VFD220C23A-21; VFD300C4EA-21

1. (As shown the figure below) Before removing the fan, remove the cover by using a slotted screwdriver.

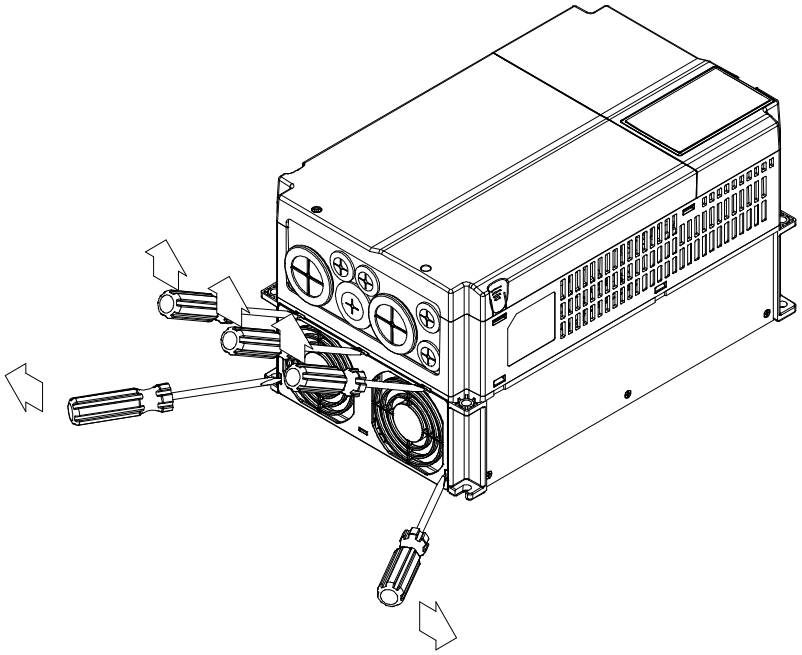


Figure 7-154

2. (As shown in the figure below), remove the power connector, loosen the screw and remove the fan kit.
   When installing the fan kit, have the label on the fan kit facing inside of the motor drive.
   Screw’s torque force: 10–12 kg-cm / (8.7–10.4 lb-in.) / (1.0–1.2 Nm)

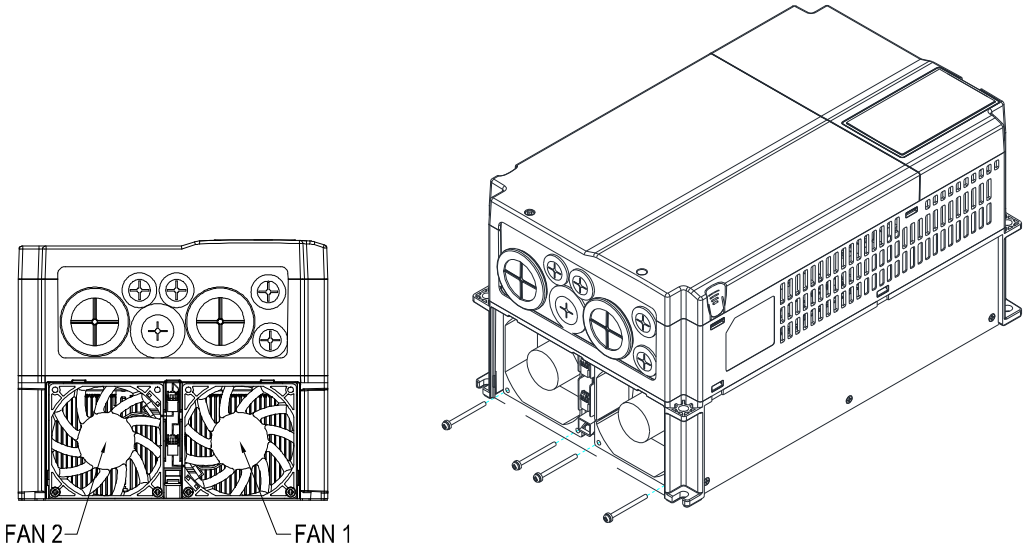


Figure 7-155

Frame C

Model “MKC-CFKB1” Capacitor Fan

Applicable models

VFD150C23A-21; VFD185C23A-21; VFD220C23A-21

Model “MKC-CFKB2” Capacitor Fan

Applicable models

VFD185C43A-21; VFD220C43A-21; VFD300C43A-21; VFD185C4EA-21; VFD220C4EA-21; VFD300C4EA-21

Model “MKC-CFKB3” Capacitor Fan

Applicable models

VFD185C63B-21; VFD220C63B-21; VFD300C63B-21; VFD370C63B-21

Disconnect fan power and pull out the fan by using a flat-head screwdriver. (As shown in the enlarged picture)

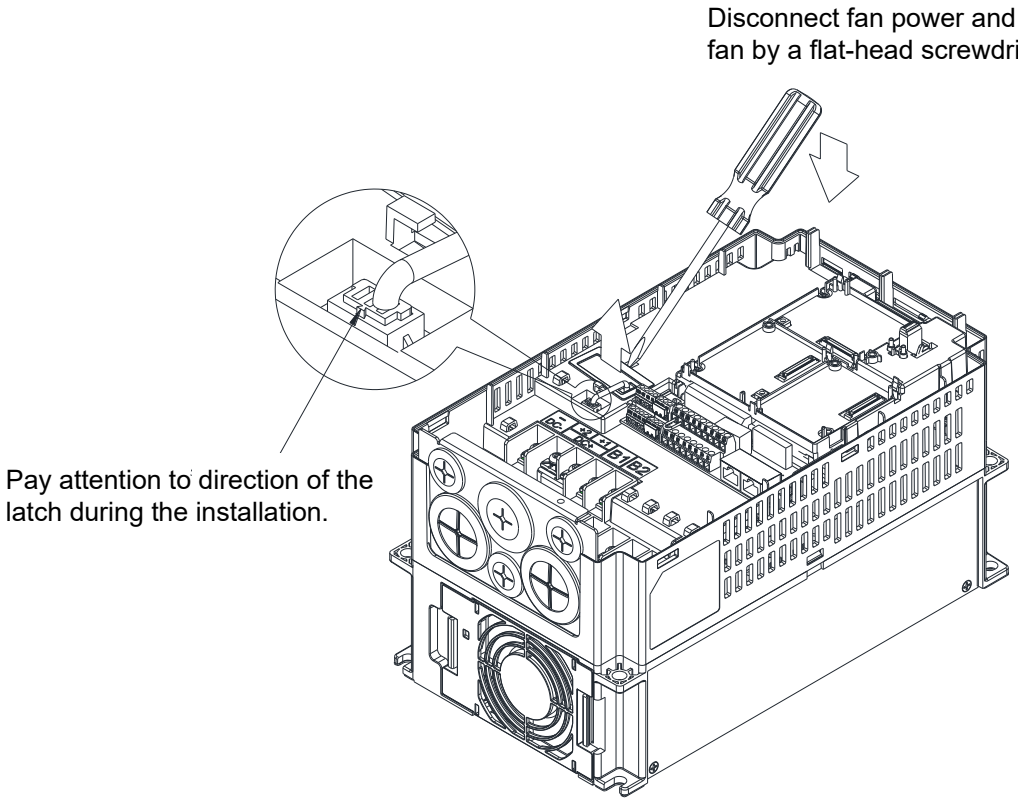


Figure 7-156

Frame D0

Model “MKC-DFKB” Capacitor Fan

Applicable models

VFD370C43S-00; VFD450C43S-00; VFD370C43S-21; VFD450C43S-21

1. Loosen screw 1 and screw 2, press the tab on the right and left to remove the cover, follow the direction the arrows indicate. Press on top of digital keypad to properly remove it. Screw 1, 2 Torque: 12–15 kg-cm / (10.4–13 lb-in.) / (1.2–1.5 Nm)

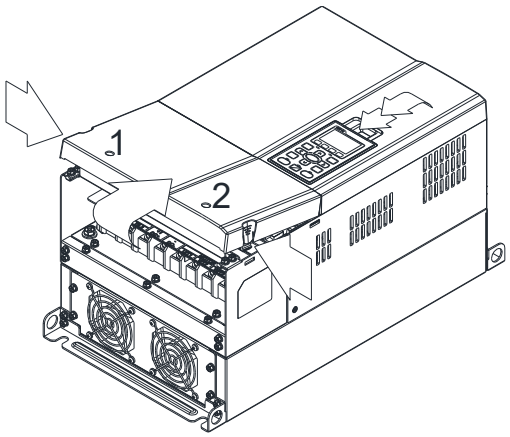


Figure 7-157

2. Loosen screw 3, press the tab on the right and the left to remove the cover. Screw 3 Torque: 6–8 kg-cm / (5.2–6.9 lb-in.) / (0.6–0.8 Nm)

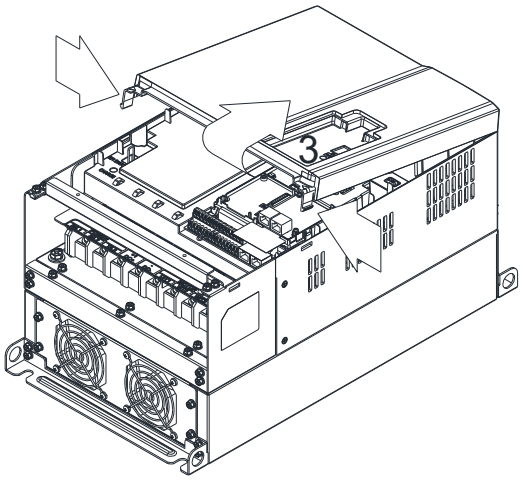


Figure 7-158

3. Loosen screw 4 (see the figure below) and disconnect fan power and pull out the fan. (As shown in the enlarged picture). Screw 4 Torque: 10–12 kg-cm / (8.7–10.4 lb-in.) / (1.0–1.2 Nm)

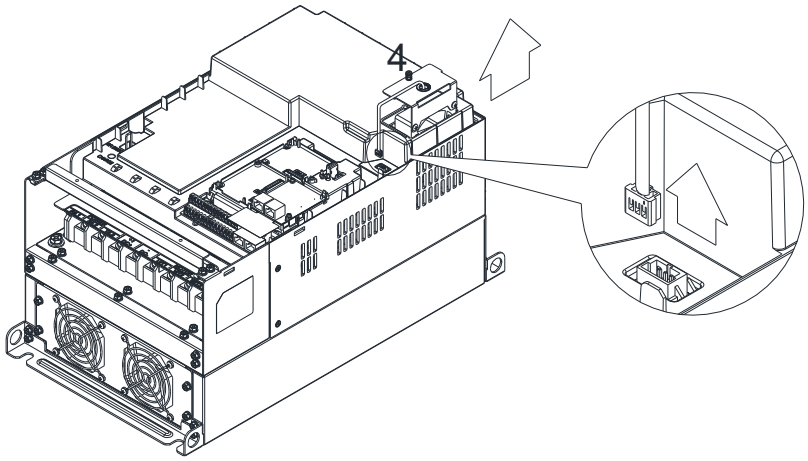


Figure 7-159

Frame D0

Model “MKC-D0FKM” Heat Sink Fan

Applicable models

VFD370C43S-00; VFD450C43S-00; VFD370C43S-21; VFD450C43S-21

1. Loosen the screw and remove the fan kit. Screw torque: 24–26 kg-cm / (20.8–22.6 lb-in. / (2.4–2.5 Nm)
2. (As shown in the figure below) Before pulling out the fan, make sure the fan power is disconnected.

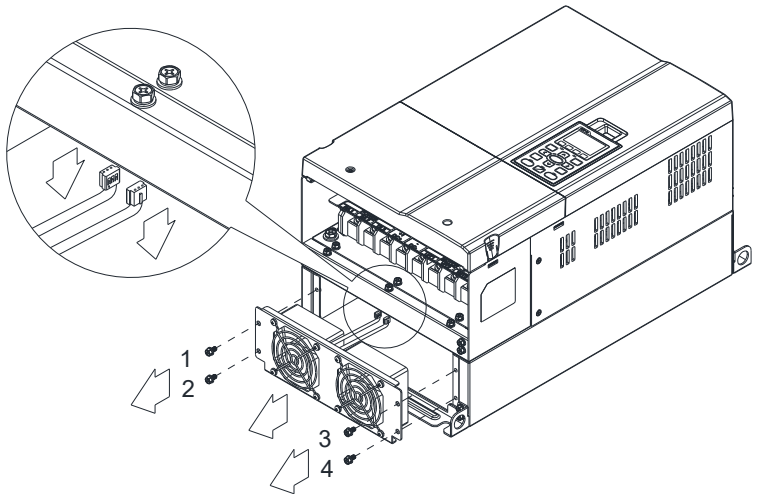


Figure 7-160

Frame D

Model “MKC-DFKB” Capacitor Fan

Applicable models

VFD300C23A-00; VFD370C23A-00; VFD300C23A-21; VFD370C23A-21; VFD550C43A-00; VFD750C43A-00; VFD550C43A-21; VFD750C43A-21; VFD450C63B-00; VFD550C63B-00; VFD450C63B-21; VFD550C63B-21

1. Loosen screw 1 and screw 2, press the tab on the right and the left to remove the cover, follow the direction the arrows indicate in the following figure. Press on the top of digital keypad to properly remove it.
   Screw 1, 2 Torque: 12–15 kg-cm / (10.4–13 lb-in.) / (1.2–1.5 Nm)

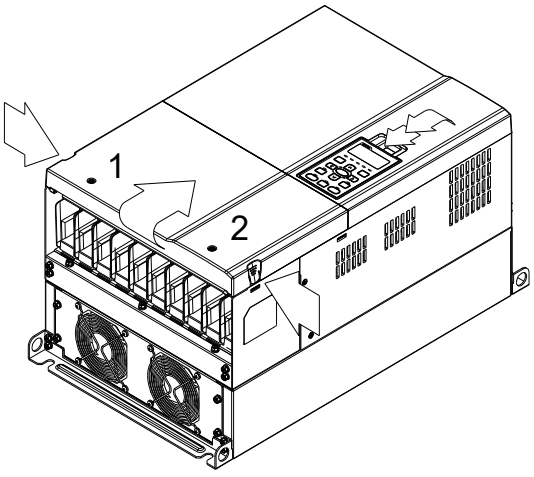


Figure 7-161

2. Loosen screw 3 & 4, press the tab on the right and the left to remove the cover.
   Screw 3, 4 Torque: 6–8 kg-cm / (5.2–6.9 lb-in.) / (0.6–0.8 Nm)

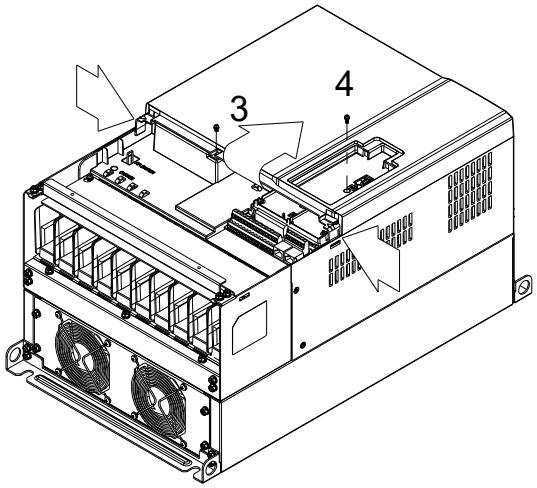


Figure 7-162

3. Loosen screw 5 and disconnect fan power and pull out the fan. (As shown in the enlarged picture) Screw 5 Torque: 10–12 kg-cm / (8.6–10.4 lb-in.) / (1.0–1.2 Nm)

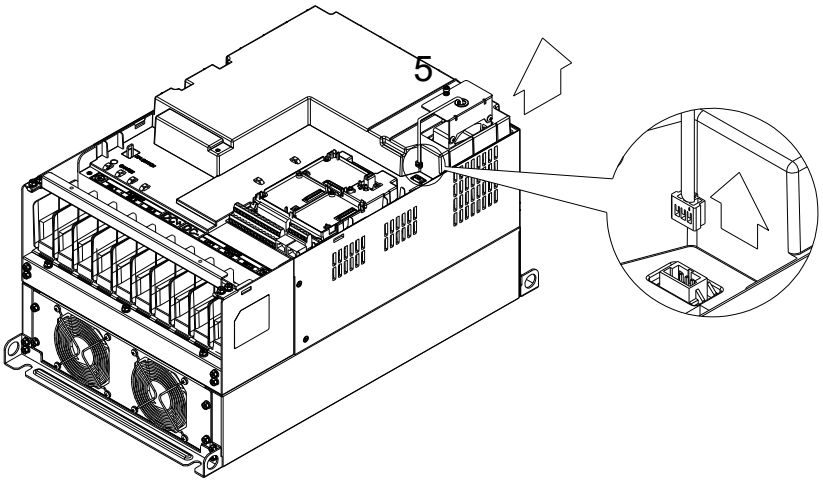


Figure 7-163

Frame D

Model “MKC-DFKM” Heat Sink Fan

Applicable models

VFD300C23A-00; VFD370C23A-00; VFD300C23A-21; VFD370C23A-21; VFD550C43A-00; VFD750C43A-00; VFD550C43A-21; VFD750C43A-21; VFD450C63B-00; VFD550C63B-00; VFD450C63B-21; VFD550C63B-21

1. Loosen the screw and remove the fan kit. Screw torque: 24–26 kg-cm / (20.8–22.6 lb-in.) / (2.4–2.5 Nm)
2. (As shown in the figure below) Before removing the fan, remove the cover by using a slotted screwdriver.

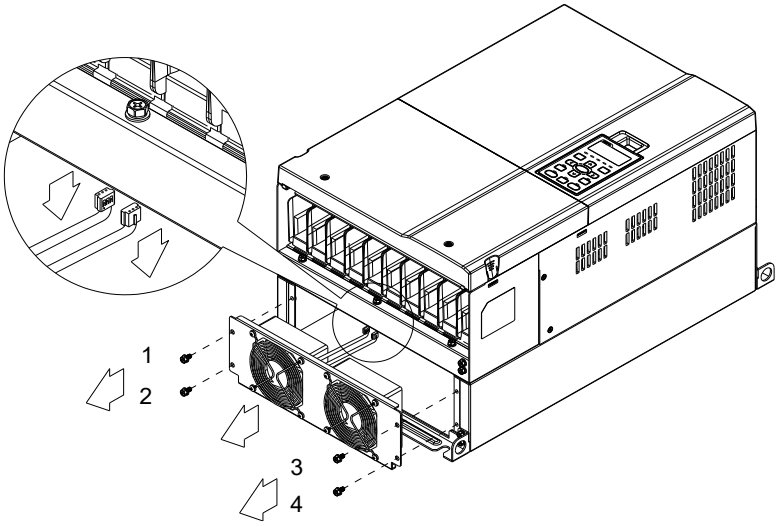


Figure 7-164

Frame E

Applicable models

Applicable for MKC-EFKM1: VFD450C23A-00; VFD550C23A-00; VFD450C23A-21; VFD550C23A-21
Applicable for MKC-EFKM2: VFD750C23A-00; VFD750C23A-21; VFD900C43A-00; VFD1100C43A-00; VFD900C43A-21; VFD1100C43A-21
Applicable for MKC-EFKM3: VFD750C63B-00; VFD900C63B-00; VFD1100C63B-00; VFD1320C63B-00; VFD750C63B-21; VFD900C63B-21; VFD1100C63B-21; VFD1320C63B-21
Applicable for MKC-EFKB: VFD450C23A-00; VFD550C23A-00; VFD750C23A-00; VFD450C23A-21; VFD550C23A-21; VFD750C23A-21; VFD900C43A-00; VFD1100C43A-00; VFD900C43A-21; VFD1100C43A-21; VFD750C63B-00; VFD900C63B-00; VFD1100C63B-00; VFD1320C63B-00; VFD750C63B-21; VFD900C63B-21; VFD1100C63B-21; VFD1320C63B-21

Model “MKC-EFKM1” Heat Sink Fan

Loosen screw 1–4 and disconnect fan power and pull out the fan. (As shown in the enlarged picture).
Screw 1–4 Torque: 24–26 kg-cm / (20.8–22.6 lb-in.) / (2.4–2.5 Nm)

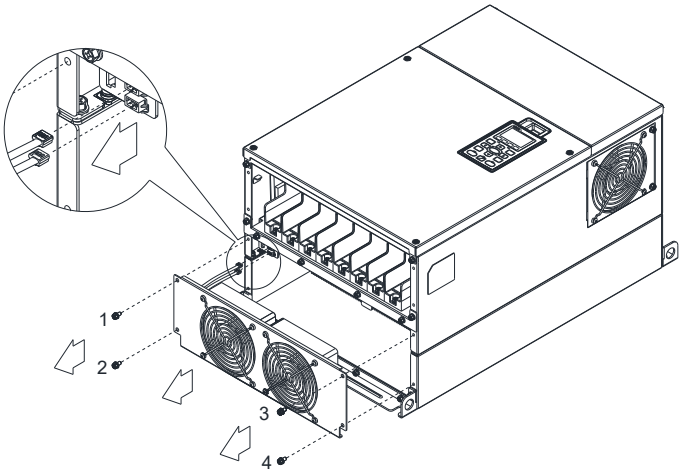


Figure 7-165

Model “MKC-EFKM2” / “MKC-EFKM3” Heat Sink Fan

Loosen screw 1–4 and disconnect fan power and pull out the fan. (As shown in the enlarged picture).
Screw 1–4 Torque: 24–26 kg-cm / (20.8–22.6 lb-in.) / (2.4–2.5 Nm)

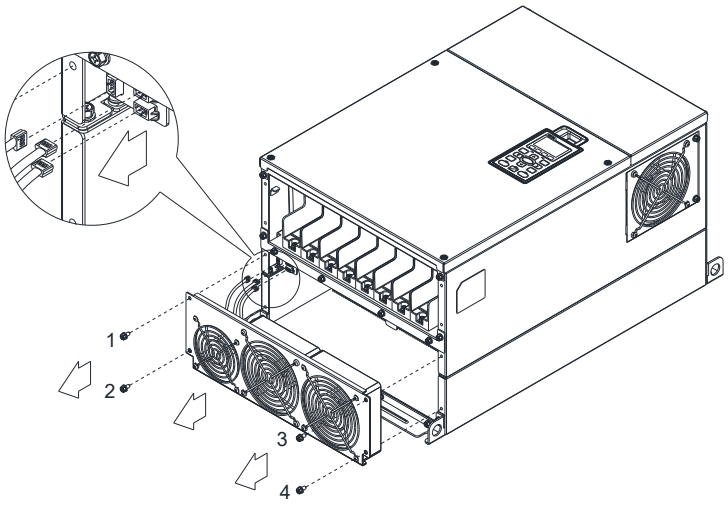


Figure 7-166

Model “MKC-EFKB” Capacitor Fan

Loosen screw 1–2 and disconnect fan power and pull out the fan. (As shown in the enlarged picture). Screw 1–2 Torque: 24–26 kg-cm / (20.8–22.6 lb-in.) / (2.4–2.5 Nm)

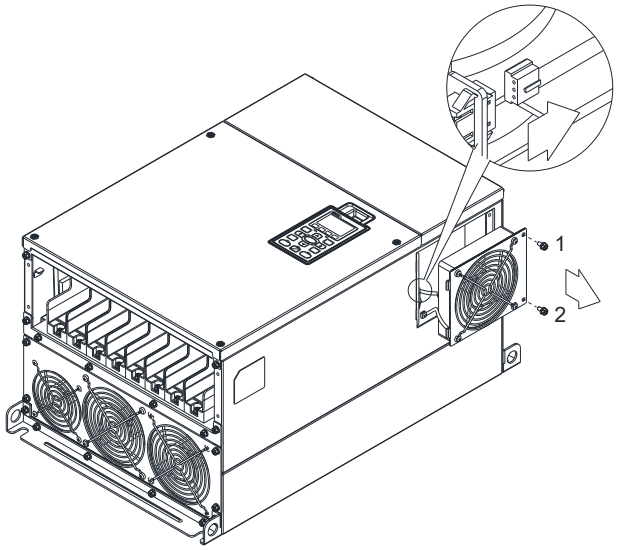


Figure 7-167

Frame F

Applicable models

VFD900C23A-00; VFD900C23A-21; VFD1320C43A-00; VFD1600C43A-00; VFD1320C43A-21; VFD1600C43A-21; VFD1600C63B-00; VFD2000C63B-00; VFD1600C63B-21; VFD2000C63B-21

Fan model “MKC-FFKM” Heat Sink Fan

Loosen the screws and plug out the power of fan before removing~~)~~.

Screw torque: 24–26 kg-cm / (20.8–22.6 lb-in.) / (2.4–2.5 Nm)

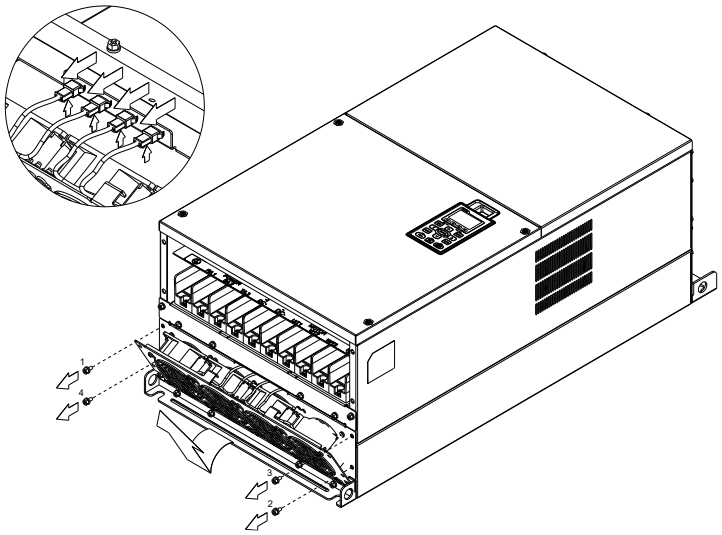


Figure 7-168

Fan model “MKC-FFKB” Capacitor Fan

1. Loosen the screw and remove the cover.
   Screw torque: 12–15 kg-cm / (10.4–13 lb-in.) / (1.2–1.5 Nm)

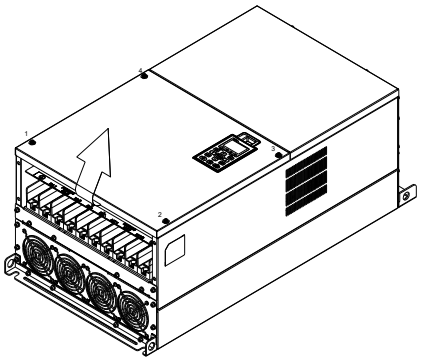


Figure 7-169

2. Loosen the screw and remove the cover.
   Screw torque: 24–26 kg-cm / (20.8–22.6 lb-in.) / (2.4–2.5 Nm)

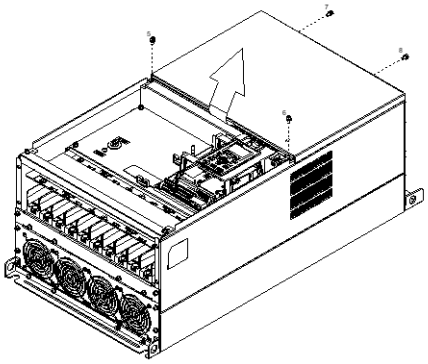


Figure 7-170

3. Loosen the screws and remove the fan.
   Screw torque: 12–15 kg-cm / (10.4–13.0 lb-in.) / (1.2–1.5 Nm)

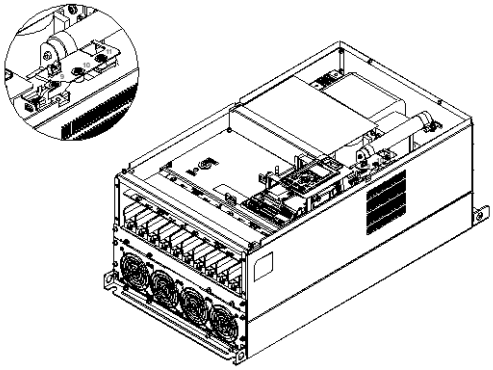


Figure 7-171

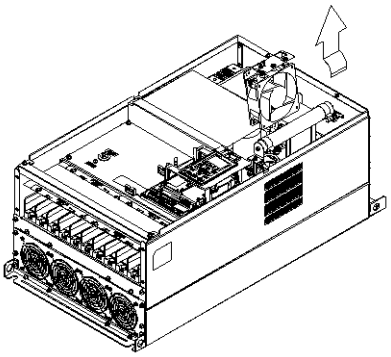


Figure 7-172

Frame G

Applicable models

VFD1850C43A-00; VFD2000C43A-00; VFD2200C43A-00; VFD2500C43A-00; VFD1850C43A-21; VFD2000C43A-21; VFD2200C43A-21; VFD2500C43A-21; VFD2500C63B-00; VFD3150C63B-00; VFD2500C63B-21; VFD3150C63B-21

Fan model “MKC-GFKM” Heat Sink Fan

1. Loosen the screw and remove the cover.
   Screw torque: 12–15 kg-cm / (10.4–13.1 lb-in.) / (1.2–1.5 Nm)

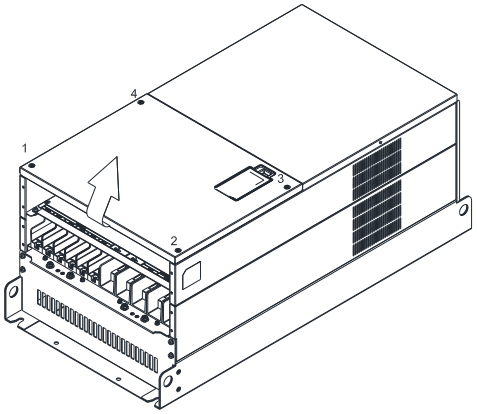


Figure 7-173

2. For 1–8 shown below: Loosen the screws
   Screw M6 torque: 35–40 kg-cm / (30.4–34.7 lb-in.) / (3.4–3.9 Nm)
3. For 9–11 shown below: Loosen the screws and remove the cover. Screw M4 torque: 14–16 kg-cm / (12.2–13.9 lb-in.) / (1.4–1.6 Nm)

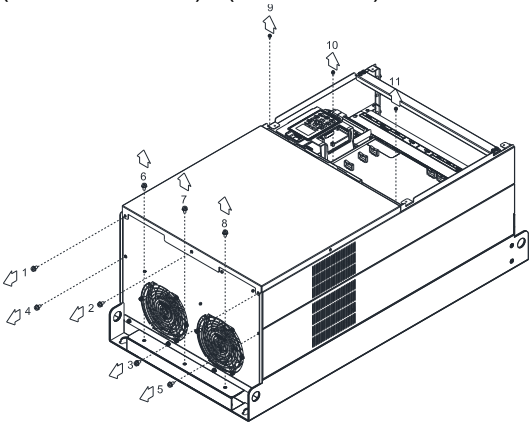


Figure 7-174

4. Loosen screw 1–3 and remove the protective ring. Screw torque: 14–16 kg-cm / (12.2–13.9 lb-in.) / (1.4–1.6 Nm)

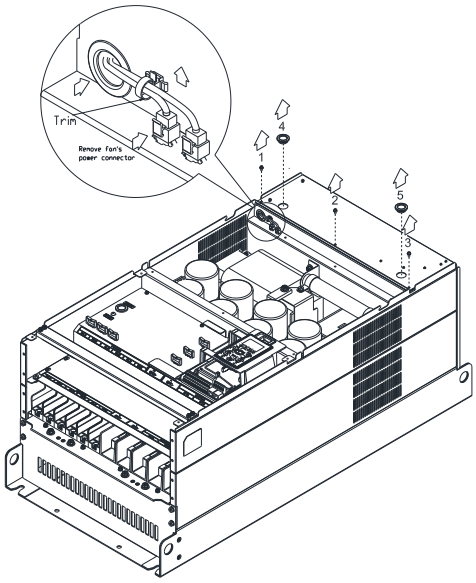


Figure 7-175

5. Lift the fan by putting your finger through the protective holes, as indicates in 1 and 2 in the figure below.

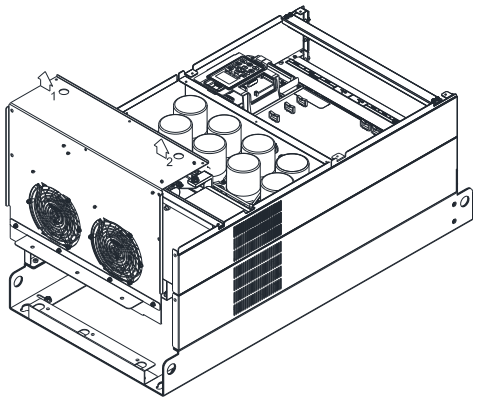


Figure 7-176

6. For old drives switching new fans, follow below steps:
   Loosen screws 1–5, remove the cover (as the figure shown below) Screw M4 torque: 14–16 kg-cm / (12.2–13.9 lb-in) / (1.4–1.6 Nm)

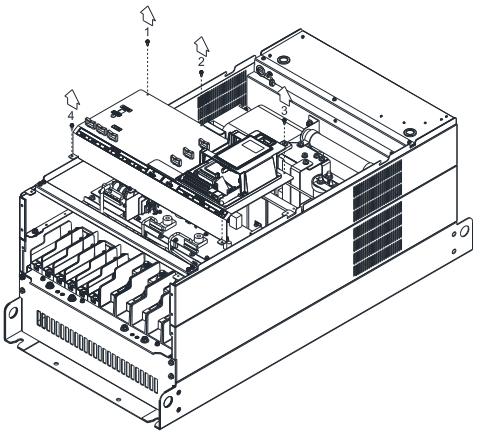


Figure 7-177

7. Add cable model 3864483201 to connect the power board and fan connector. (The cable 3864483201 goes with the fan as accessory)

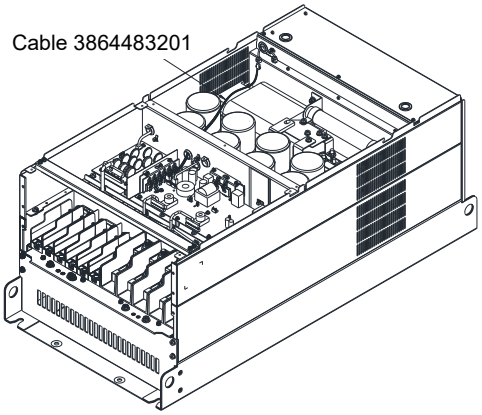


Figure 7-178

Frame H

Applicable models

VFD2800C43A-00; VFD3150C43A-00; VFD3550C43A-00; VFD2800C43C-21; VFD3150C43C-21; VFD3550C43C-21

Fan model “MKC-HFKM” Heat Sink Fan

1. Loosen the screw 1–4 and remove the top cover. Screw torque: 14–16 kg-cm / (12.2–13.9 lb-in.) / (1.4–1.6 Nm)

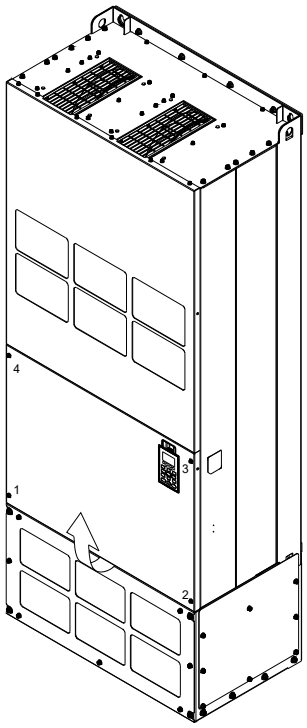


Figure 7-179

2. Loosen the screw 5–12 and remove the top cover. Screw torque: 24–26 kg-cm / (20.8–22.6 lb-in.) / (2.4–2.5 Nm)

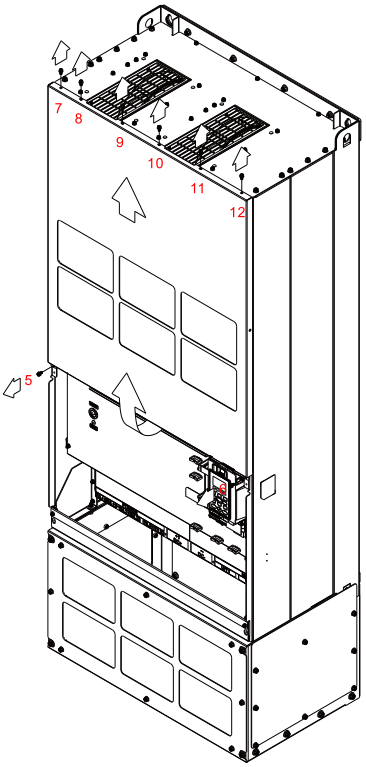


Figure 7-180

3. Press the latch to disconnect fan power.

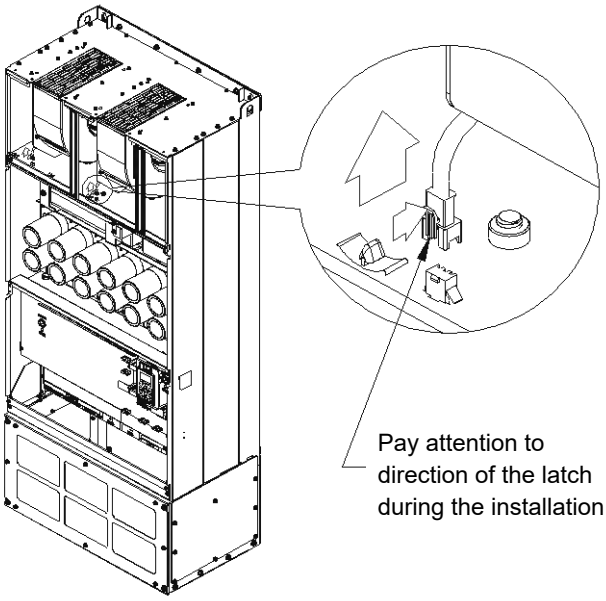


Figure 7-181

4. Loosen the screw 13–18 and remove the fan. Screw torque: 24–26 kg-cm / (20.8–22.6 lb-in.) / (2.4–2.5 Nm) (figure 4)

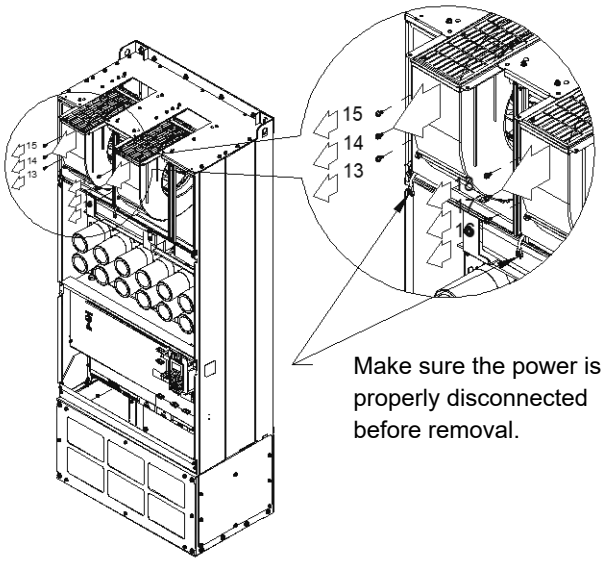


Figure 7-182

Frame H

Applicable models

VFD4000C43A-00*; VFD4000C43C-21*; VFD4500C43A-00; VFD5000C43A-00; VFD5600C43A-00; VFD4500C43C-21; VFD5000C43C-21; VFD5600C43C-21

NOTE: The models marked * are using two MKC-HFKM2; other models are using three MKC-HFKM2. They have the same fan removal steps.

Fan model “MKC-HFKM2” Heat Sink Fan

1. Loosen the screw 1–4 and remove the top cover. 2. Screw torque: 14–16 kg-cm / (12.2–13.9 lb-in.) / (1.4–1.6 Nm)

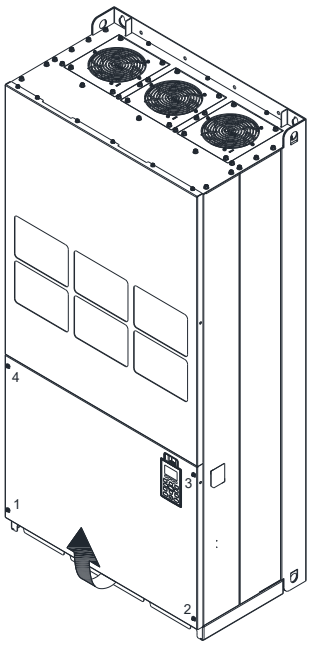


Figure 7-183

Loosen the screw 5–12 and remove the top cover. Screw torque: 24–26kg-cm / (20.8–22.6 lb-in.) / (2.4–2.5 Nm)

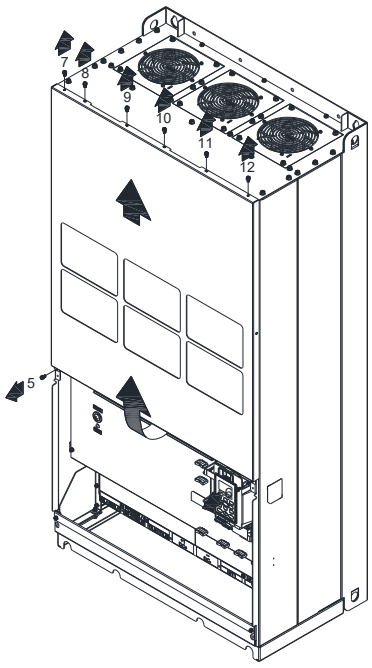


Figure 7-184

3. Press the latch to disconnect fan power, and cut the cable tie.

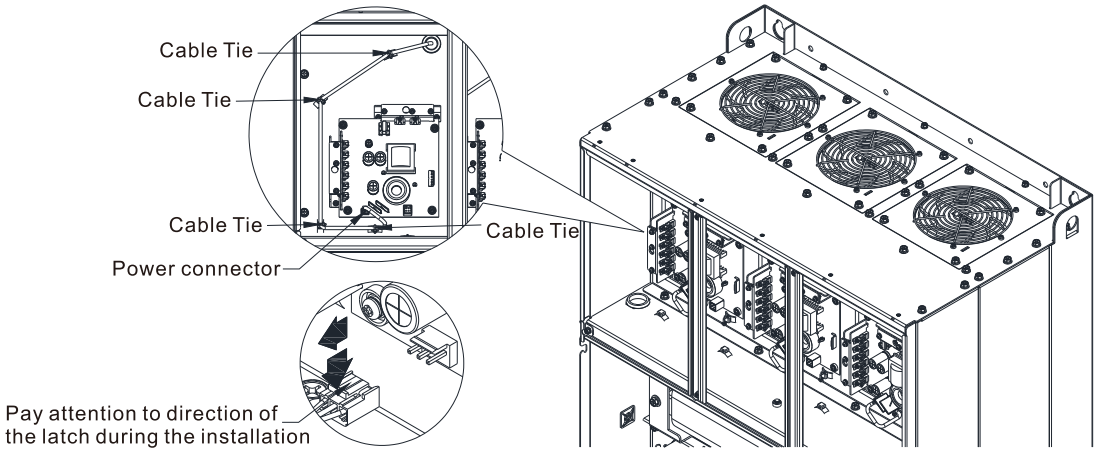


Figure 7-185

4. Two sets of fans: Loosen the screw 13–16 / 21–24 and remove the fan A and C.
   Three sets of fans: Loosen the screw 13–24 and remove the fan A, B, and C.
   Screw torque: 35–45 kg-cm / (30.4–39.1 lb-in.) / (3.4–4.4 Nm)

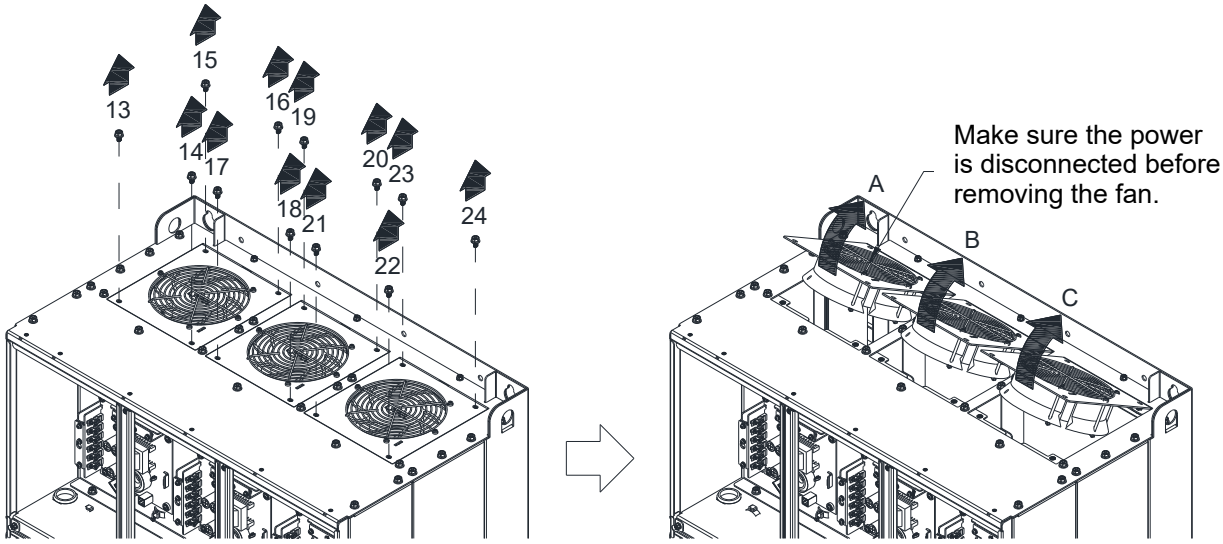


Figure 7-186

Frame H

Applicable models

VFD4000C63B-00; VFD4000C63B-21

Fan model “MKC-HFKM1” Heat Sink Fan, Two sets

1. Loosen the screw 1–4 and remove the top cover.
   Screw torque: 14–16 kg-cm / (12.2–13.9 lb-in.) / (1.4–1.6 Nm)

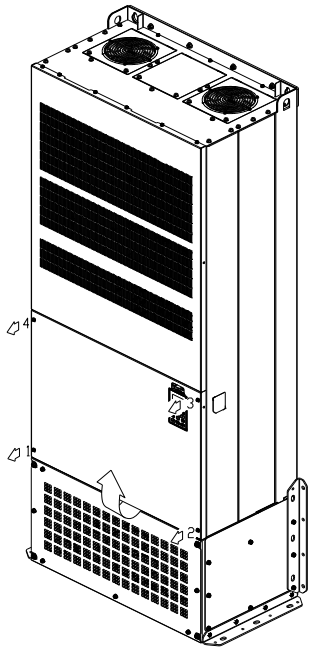


Figure 7-187

2. Loosen the screw 1–8 and remove the top cover.
   Screw torque: 24–26kg-cm / (20.8–22.6 lb-in.) / (2.4–2.5 Nm)

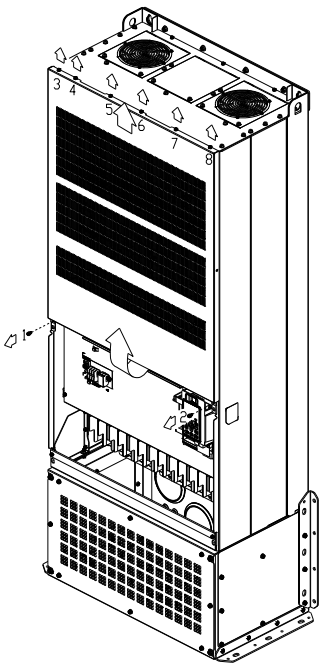


Figure 7-188

3. Disconnect the fan connector.

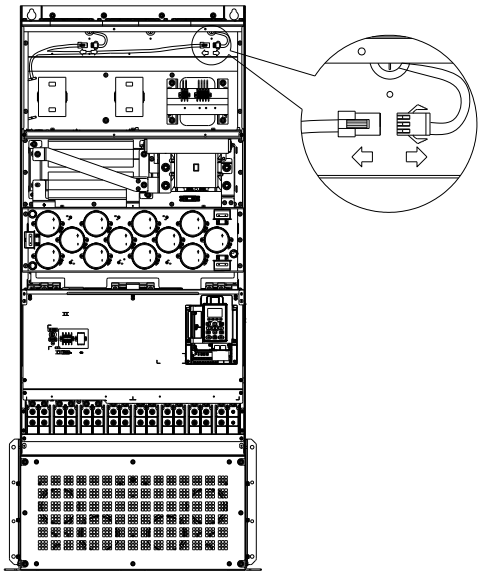


Figure 7-189

4. Loosen screws 1–4 (as shown below) and remove the fan. Make sure the fan is disconnected when removing. Screw torque: 24–26 kg-cm / (20.8–22.6 lb-in.) / (2.4–2.5 Nm)

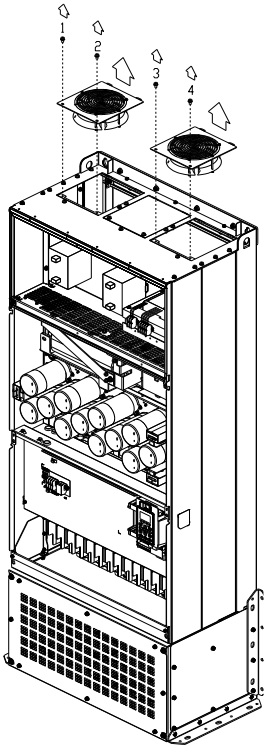


Figure 7-190

Frame H

Applicable models

VFD4500C63B-00; VFD5600C63B-00; VFD6300C63B-00; VFD4500C63B-21; VFD5600C63B-21; VFD6300C63B-21

Fan model “MKC-HFKM1” Heat Sink Fan, Three sets

1. Loosen the screw 1–4 and remove the top cover. Screw torque: 14–16 kg-cm / (12.2–13.9 lb-in.) / (1.4–1.6 Nm)

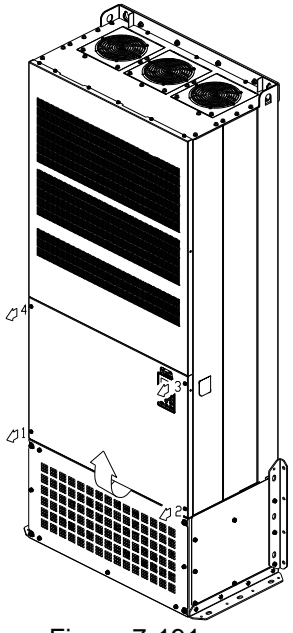


Figure 7-191

2. Loosen the screw 1–8 and remove the top cover. Screw torque: 24–26kg-cm / (20.8–22.6 lb-in.) / (2.4–2.5 Nm)

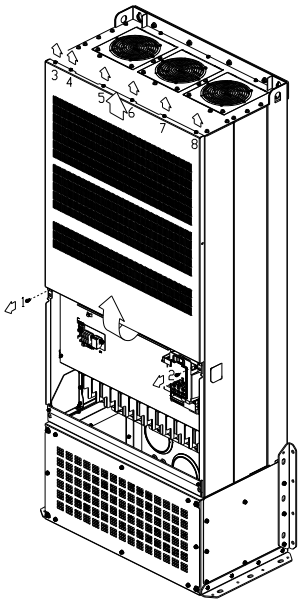


Figure 7-192

3. Disconnect the fan connector.

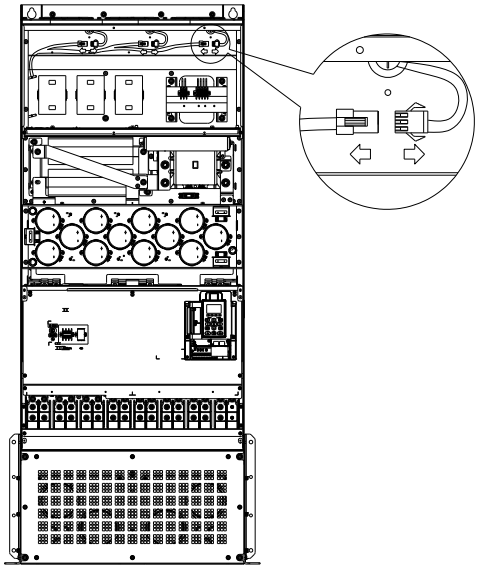


Figure 7-193

4. Loosen screws 1–6 (as shown below) and remove the fan. Make sure the fan is disconnected when removing. Screw torque: 24–26 kg-cm / (20.8–22.6 lb-in.) / (2.4–2.5 Nm)

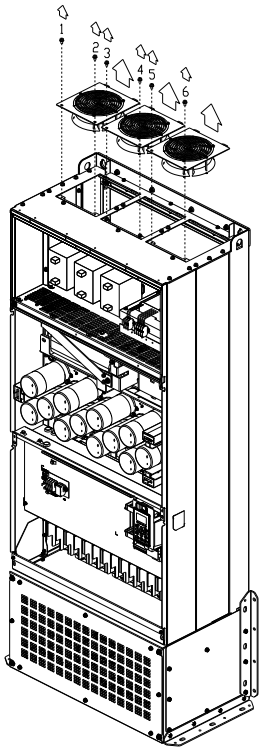


Figure 7-194

7-10 Flange Mounting Kit

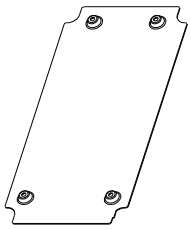
Applicable Models, Frame A–F

Frame A

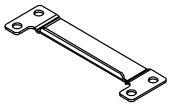
MKC-AFM1

Applicable models

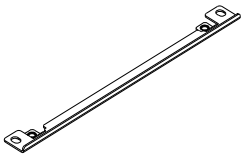
VFD015C23A-21; VFD015C53A-21; VFD022C23A-21; VFD022C43A-21; VFD022C4EA-21; VFD022C53A-21; VFD037C53A-21



Accessory 1*1



Accessory 2*2



Accessory 3*2



Screw 1*4
M3*P 0.5
L= 6 mm

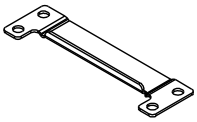


Screw 2*8
M6*P 1.0
L=16 mm

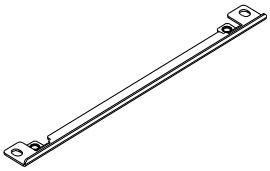
MKC-AFM

Applicable models

VFD007C23A-21; VFD007C43A-21; VFD007C4EA-21; VFD015C43A-21; VFD015C4EA-21; VFD037C23A-21; VFD037C43A-21; VFD037C4EA-21; VFD040C43A-21; VFD040C4EA-21; VFD055C43A-21; VFD055C4EA-21



Accessory 2*2



Accessory 3*2



Screw 1*8
M6*P 1.0
L= 16 mm

Hole sites and dimension

Unit: mm (inch)

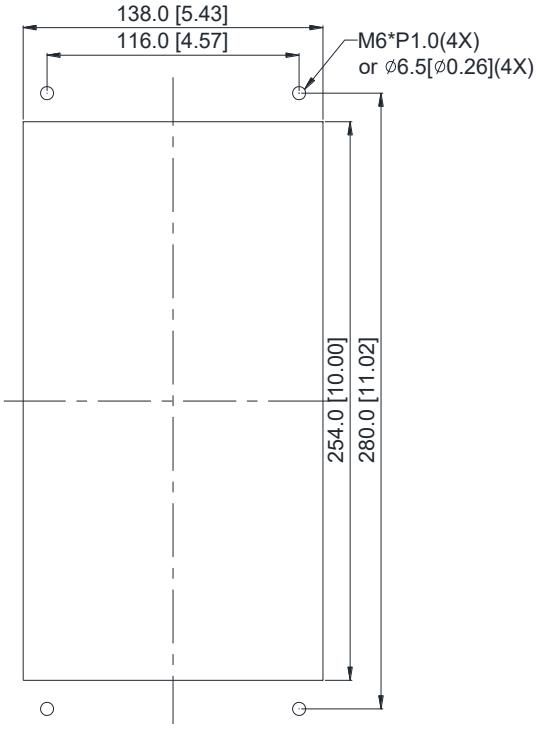


Figure 7-195

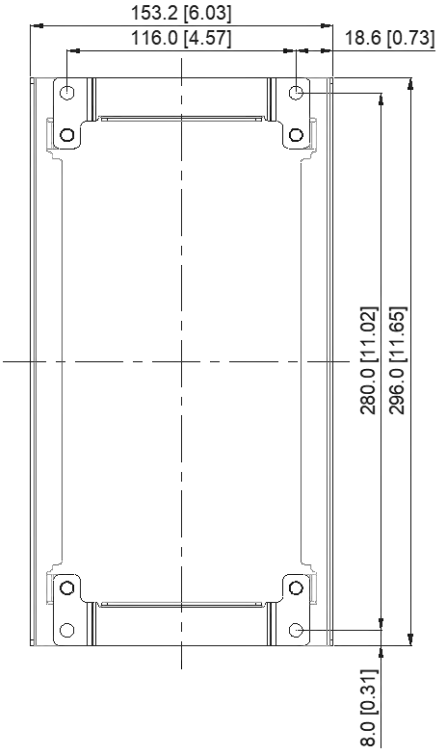


Figure 7-196

"MKC-AFM1" Installation

1. Install accessory 1 by tightening 4 of the screw 1 (M3, as shown in the figure below). Screw torque: 6–8 kg-cm / (5.21–6.94 lb-in.) / (0.6–0.8 Nm)

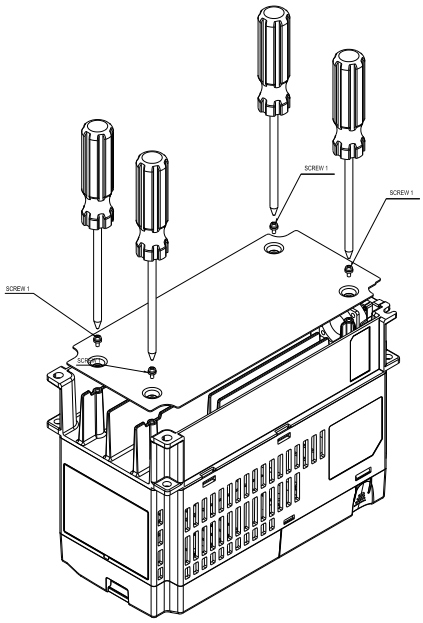


Figure 7-197

2. Install accessory 2 & 3 by tightening 2 of the screw 2 (M6, as shown in the figure below). Screw torque: 25–30 kg-cm / (21.7–26 lb-in.) / (2.5–2.9 Nm)

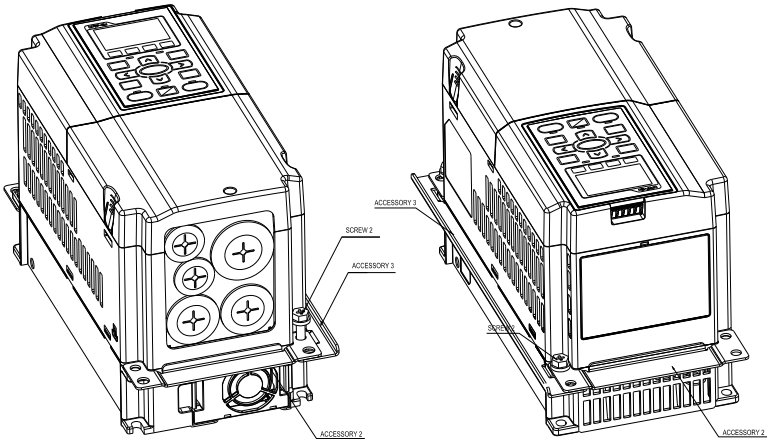


Figure 7-198

3. Install accessory 2 & 3 by tightening 2 of the screw 2 (M6, as shown in the figure below). Screw torque: 25–30 kg-cm / (21.7–26 lb-in.) / (2.5–2.9 Nm)

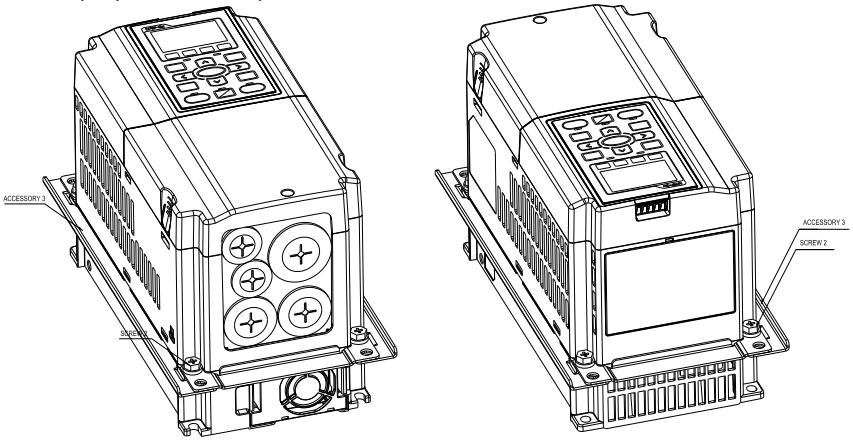


Figure 7-199

4. Plate installation, place 4 of the screw 2 (M6, as shown in the figure below) through accessory 2 & 3 and the plate then tighten the screws. Screw torque: 25–30 kg-cm / (21.7–26 lb-in.) / (2.5–2.9 Nm)

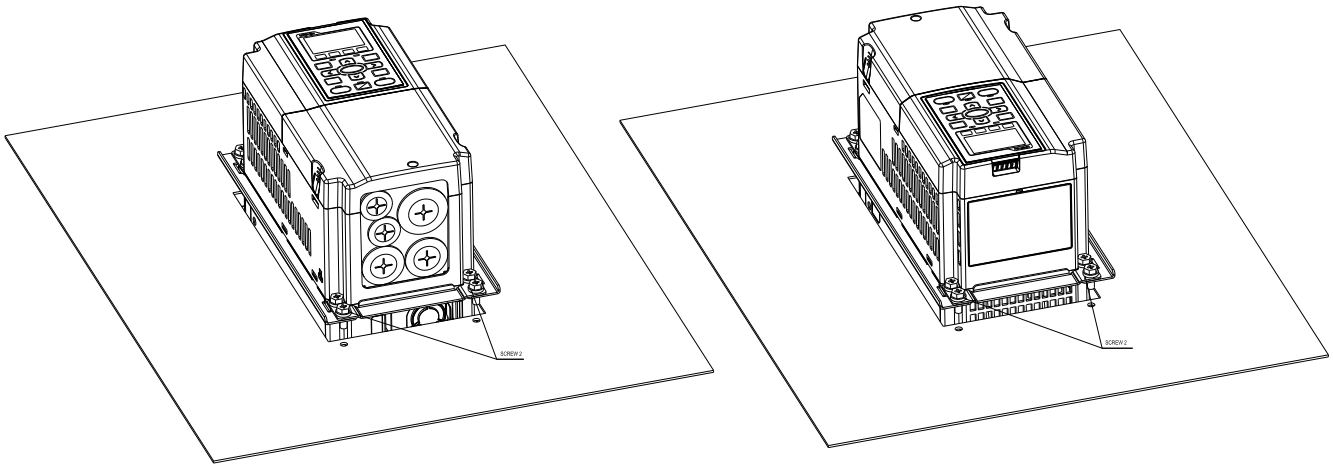


Figure 7-200

"MKC-AFM" Installation

1. Tighten screw*2 (M6) and accessory 2 & 3. Screw torque: 25–30 kg-cm / (21.7–26 lb-in.) / (2.5–2.9 Nm) (as shown in the figure below)

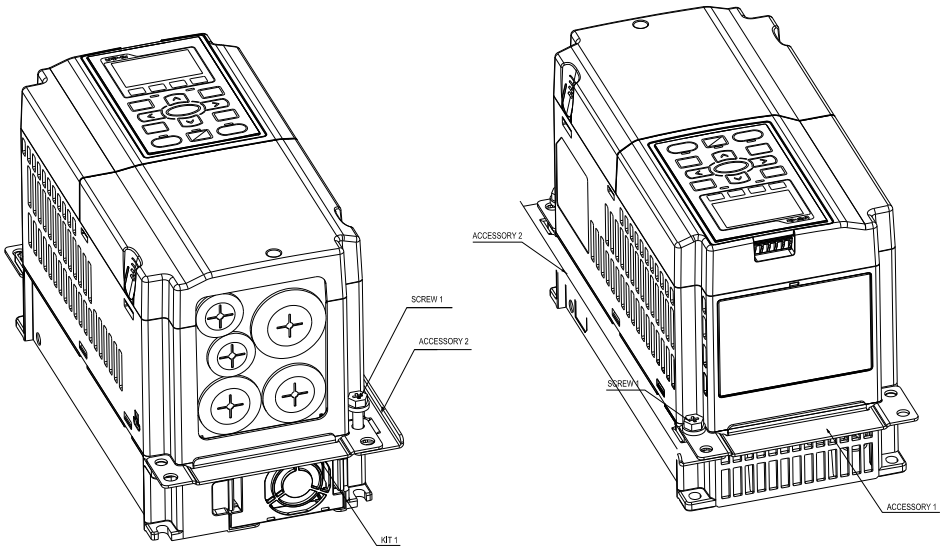


Figure 7-201

2. Tighten screw*2 (M6) and accessory 2 & 3. Screw torque: 25–30 kg-cm / (21.7–26 lb-in.) / (2.5–2.9 Nm) (as shown in the figure below)

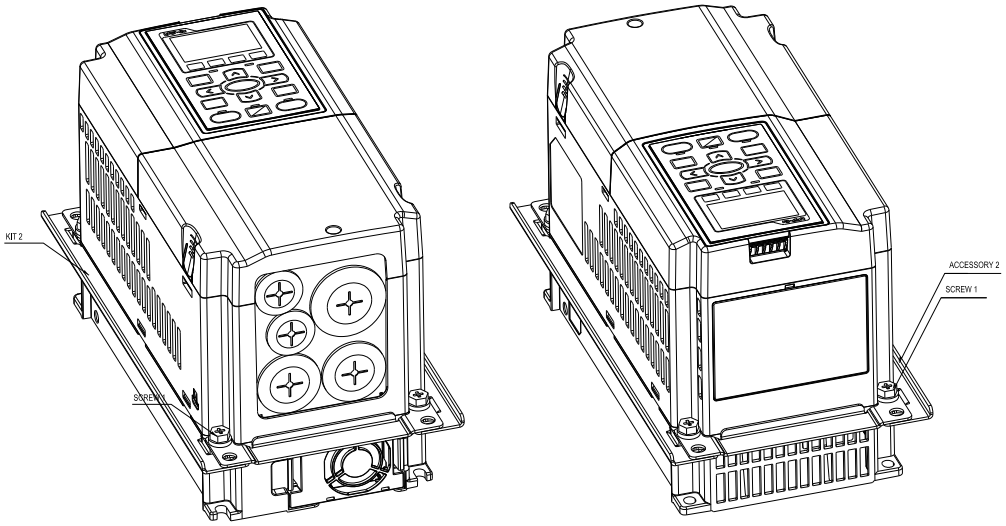


Figure 7-202

3. Plate installation, place 4 of the screw *4 (M6) through accessory 2 & 3 and the plate then tighten the screws. Screw torque: 25–30 kg-cm / (21.7–26 lb-in.) / (2.5–2.9 Nm) (as shown in the figure below)

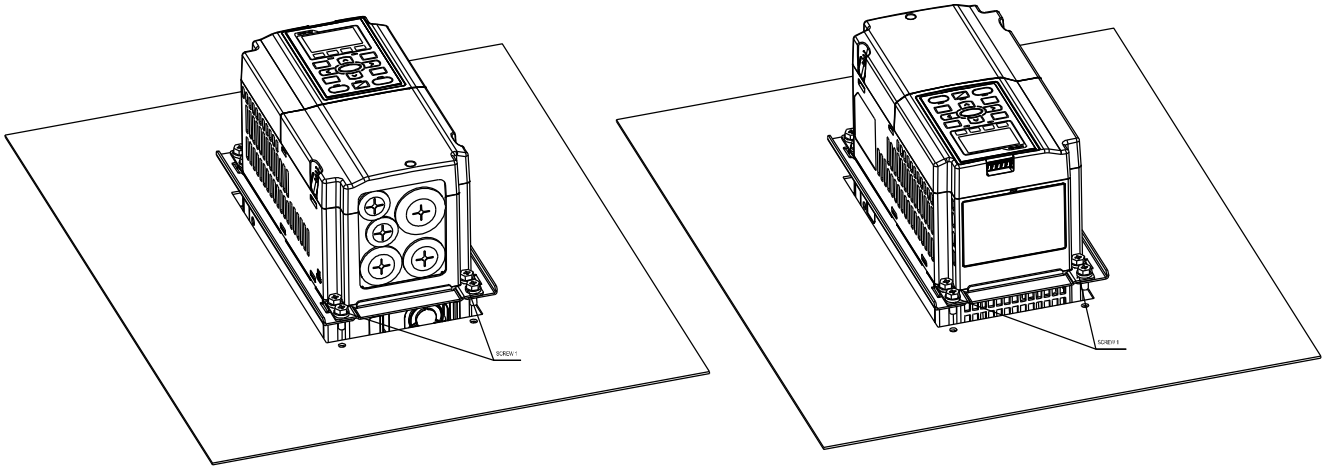


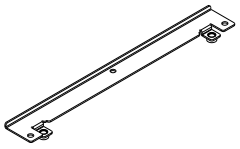
Figure 7-203

Frame B

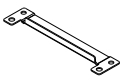
MKC-BFM

Applicable models

VFD055C23A-21; VFD055C53A-21; VFD075C23A-21; VFD075C43A-21; VFD075C4EA-21; VFD075C53A-21; VFD110C23A-21; VFD110C43A-21; VFD110C4EA-21; VFD110C53A-21; VFD150C43A-21; VFD150C4EA-21; VFD150C53A-21



Accessory 1*2



Accessory 2*2



Screw 1*4
M8*P 1.25



Screw 2*6
M6*P 1.0

Hole sites and dimension

Unit: mm (inch)

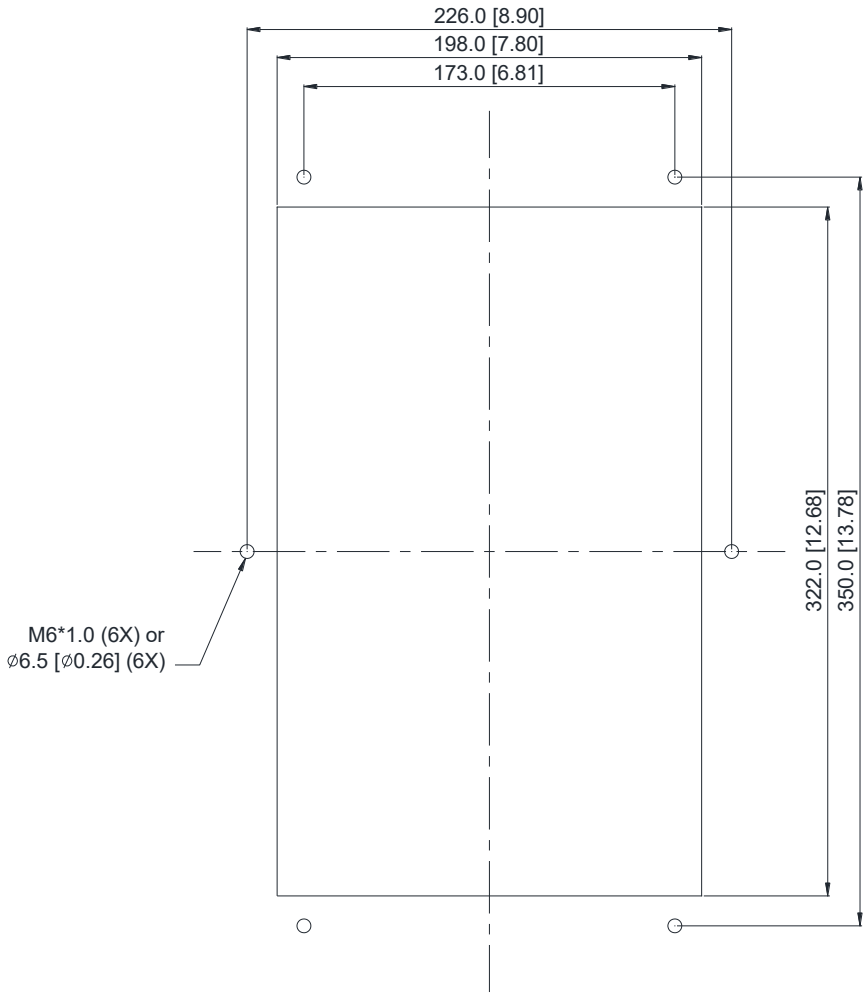


Figure 7-204

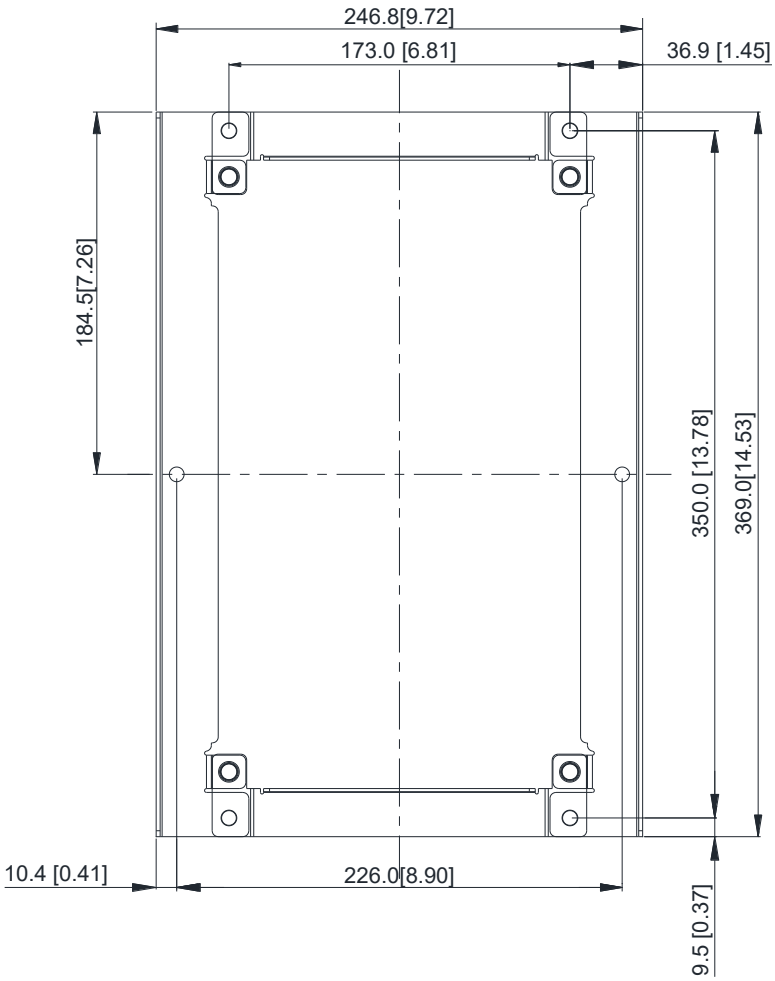

246.8[9.72]
173.0 [6.81]
36.9 [1.45]
184.5[7.26]
350.0 [13.78]
369.0[14.53]
10.4 [0.41]
226.0[8.90]
9.5 [0.37]

Figure 7-205

“MKC-BFM” Installation

1. Install accessory 1& 2 by tightening 4 of the screw 1 (M8). Screw torque: 40–45 kg-cm / (34.7–39.0 lb-in.) / (3.9–4.4 Nm) (as shown in the figure below)

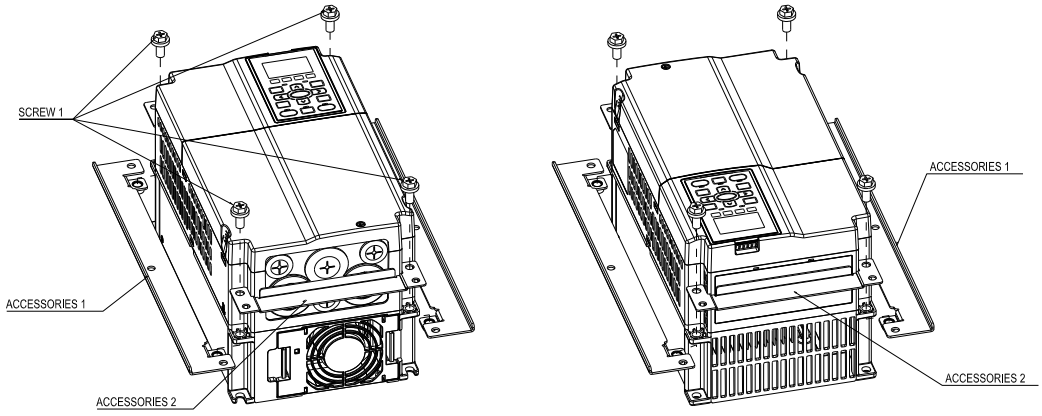


Figure 7-206

2. Plate installation, place 6 of the screw 2 (M6) through accessory 1 & 2 and the plate then tighten the screws. Screw torque: 25–30 kg-cm / (21.7–26 lb-in.) / (2.5–2.9 Nm) (as shown in the figure below)

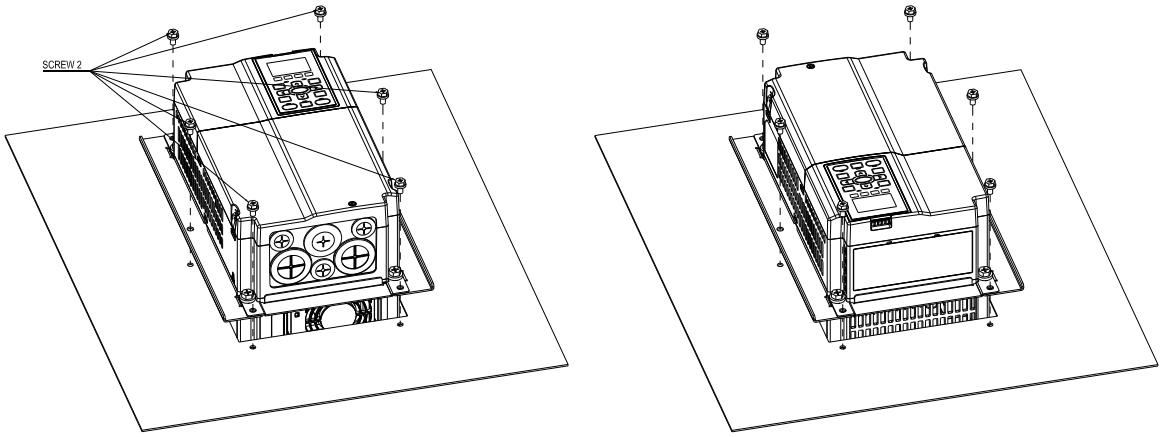


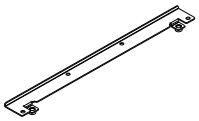
Figure 7-207

Frame C

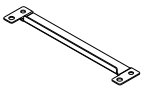
MKC-CFM

Applicable models

VFD150C23A-21; VFD185C23A-21; VFD185C43A-21; VFD185C4EA-21; VFD185C63B-21; VFD220C23A-21; VFD220C43A-21; VFD220C4EA-21; VFD220C63B-21; VFD300C43A-21; VFD300C4EA-21; VFD300C63B-21; VFD370C63B-21



Accessory 1*2



Accessory 2*2



Screw 1*4
M8*P 1.25



Screw 2*8
M6*P 1.0

Hole sites and dimension

Unit: mm (inch)

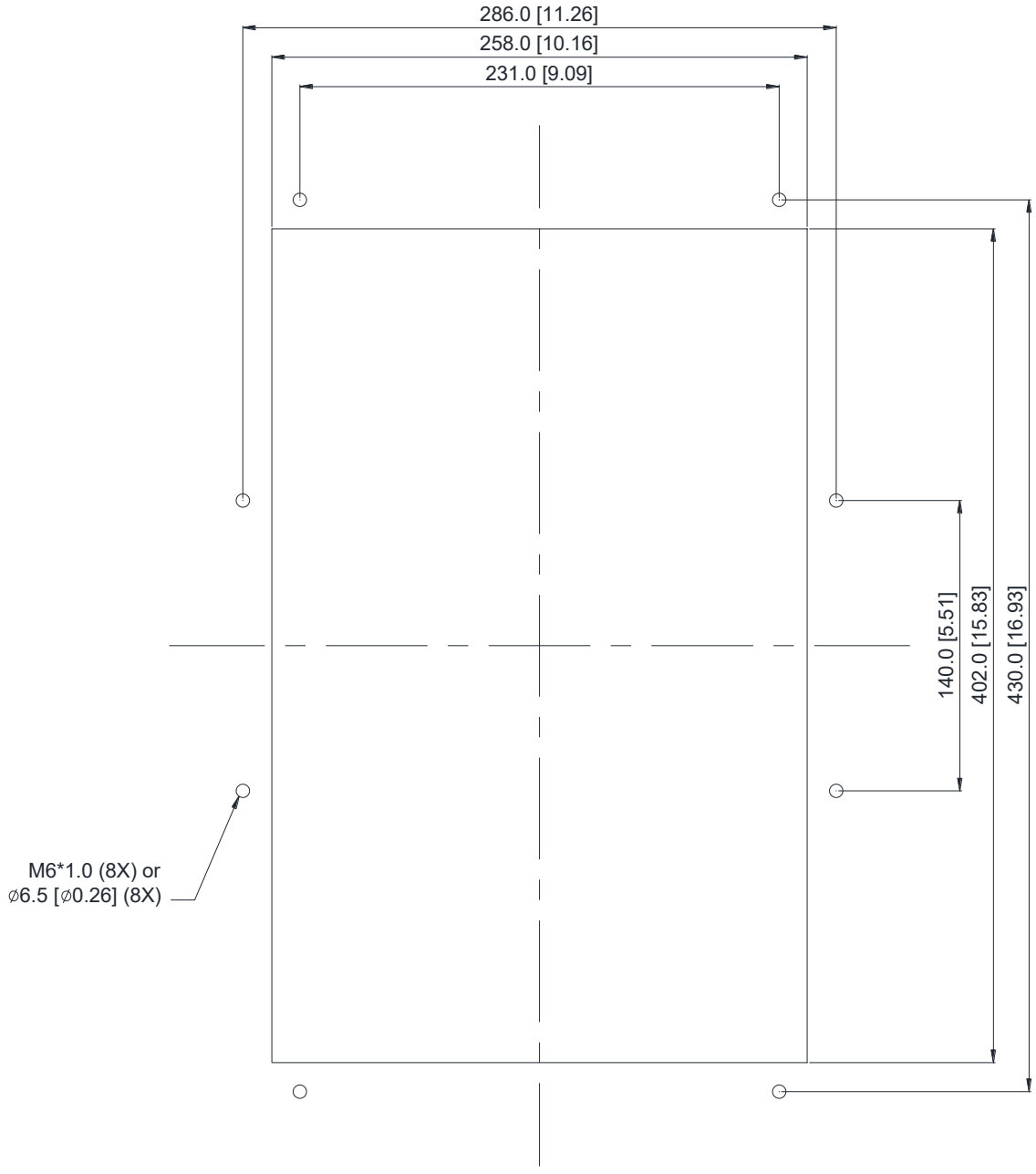


Figure 7-208

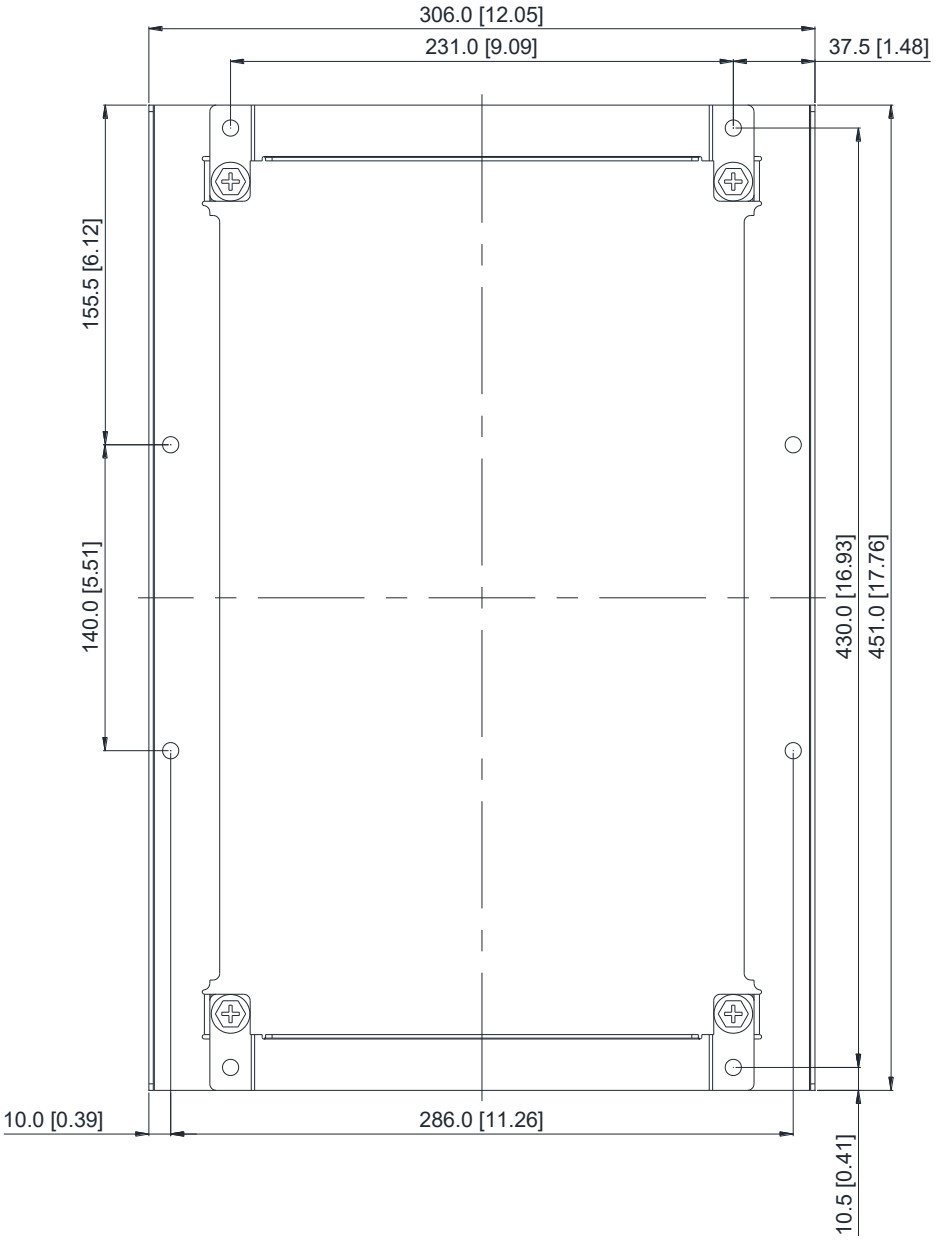

306.0 [12.05]
231.0 [9.09]
37.5 [1.48]
155.5 [6.12]
140.0 [5.51]
430.0 [16.93]
451.0 [17.76]
10.0 [0.39]
286.0 [11.26]
10.5 [0.41]

Figure 7-209

"MKC-CFM" Installation

1. Install accessory 1& 2 by tightening 4 of the screw 1(M8). Screw torque: 50–55 kg-cm / (43.4–47.7 lb-in.) / (4.9–5.4 Nm) (as shown in the figure below)

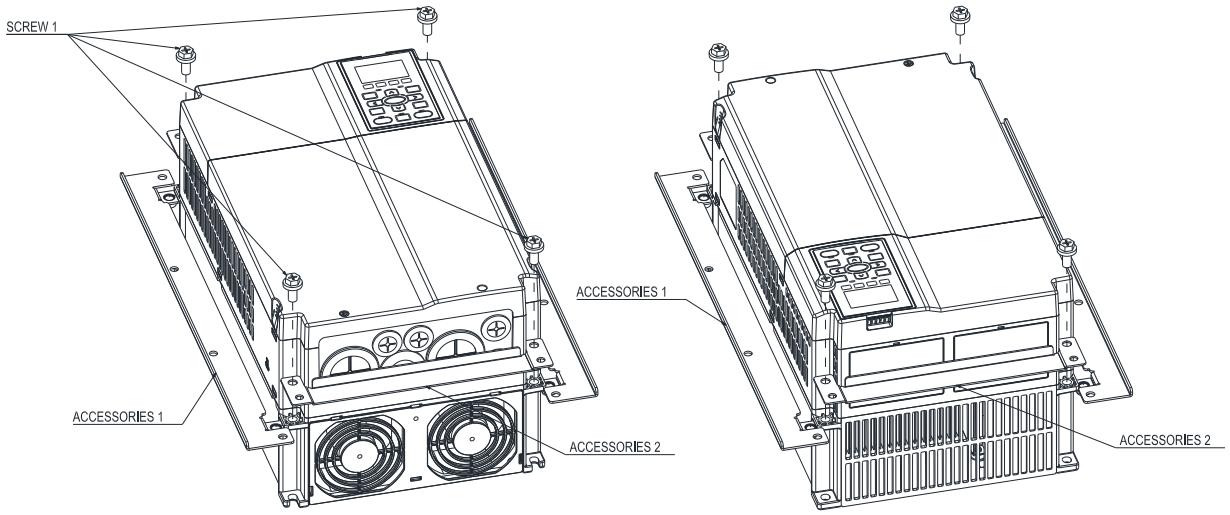


Figure 7-210

2. Plate installation, place 8 of the screw 2 (M6) through Accessory 1 & 2 and the plate then tighten the screws. Screw torque: 25–30 kg-cm / (21.7–26 lb-in.) / (2.5–2.9 Nm) (as shown in the figure below)

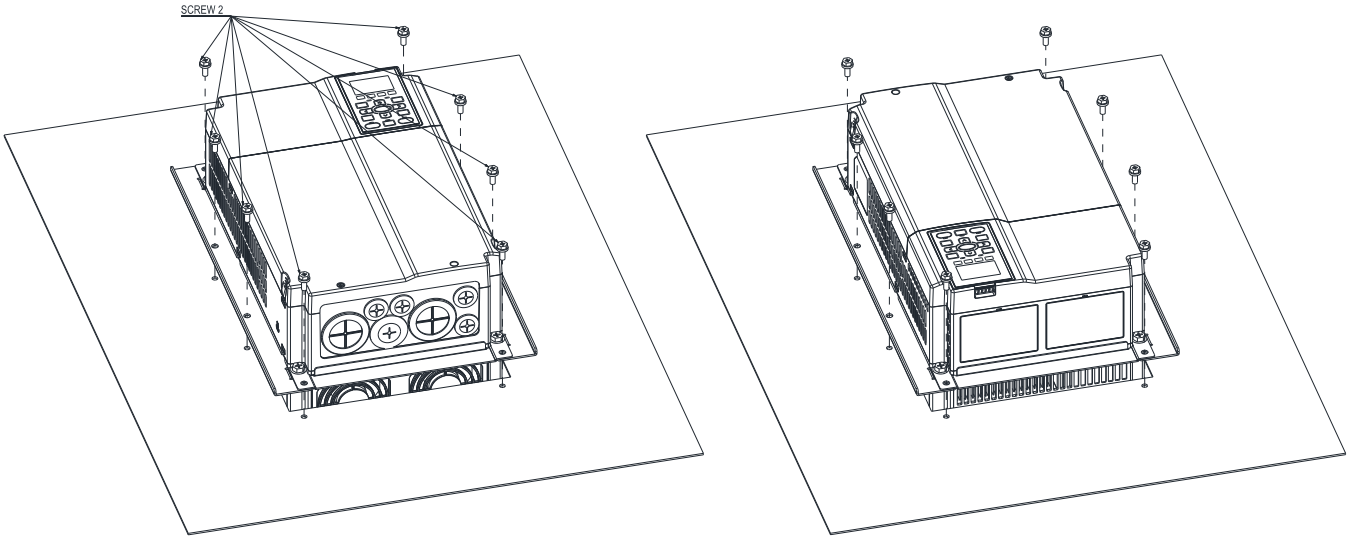


Figure 7-211

Frame D0

Applicable models
VFD370C43S-00; VFD370C43S-21; VFD450C43S-00; VFD450C43S-21

Hole sites and dimension Unit: mm (inch)

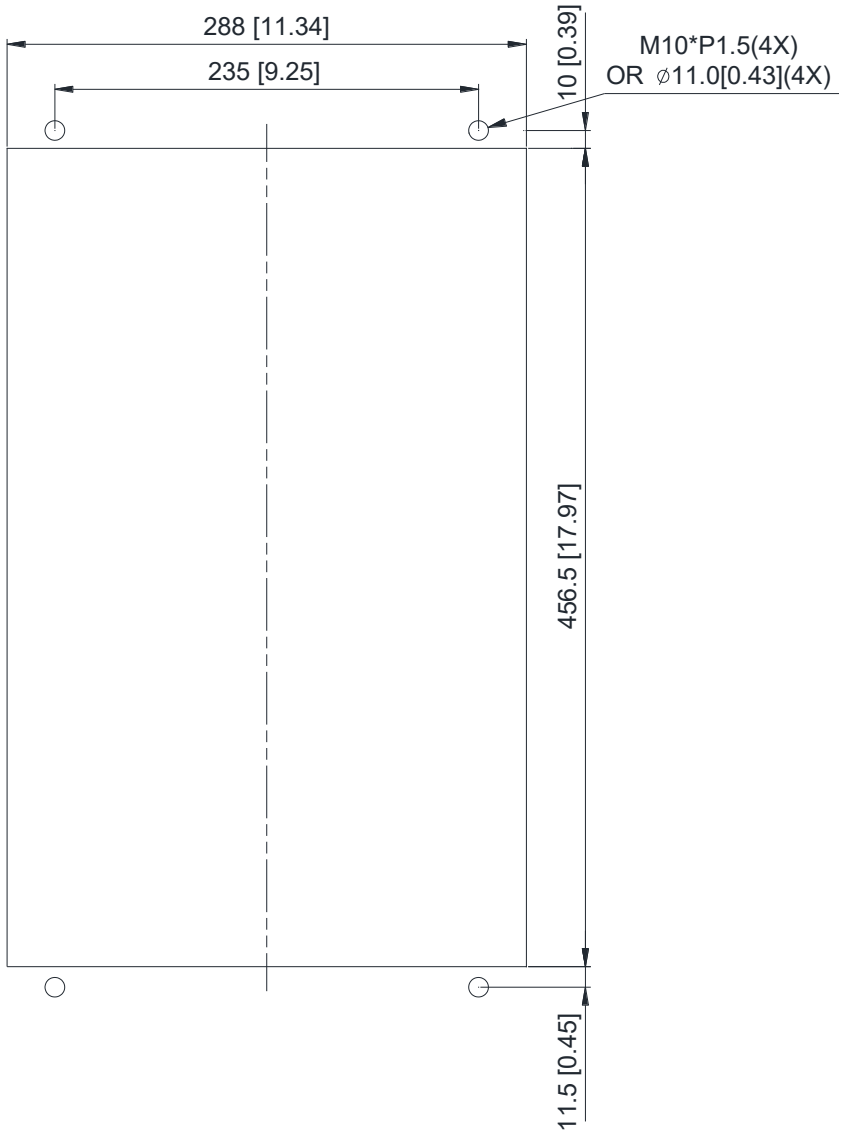


Figure 7-212

Frame D

Applicable models

VFD300C23A-00; VFD300C23A-21; VFD370C23A-00; VFD370C23A-21; VFD450C63B-00; VFD450C63B-21; VFD550C43A-00; VFD550C43A-21; VFD550C63B-00; VFD550C63B-21; VFD750C43A-00; VFD750C43A-21

Hole sites and dimension Unit: mm (inch)



Figure 7-213

Frame E

Applicable models

VFD450C23A-00; VFD450C23A-21; VFD550C23A-00; VFD550C23A-21; VFD750C23A-00; VFD750C23A-21; VFD750C63B-00; VFD750C63B-21; VFD900C43A-00; VFD900C43A-21; VFD900C63B-00; VFD900C63B-21; VFD1100C43A-00; VFD1100C43A-21; VFD1100C63B-00; VFD1100C63B-21; VFD1320C63B-00; VFD1320C63B-21

Hole sites and dimension Unit: mm (inch)

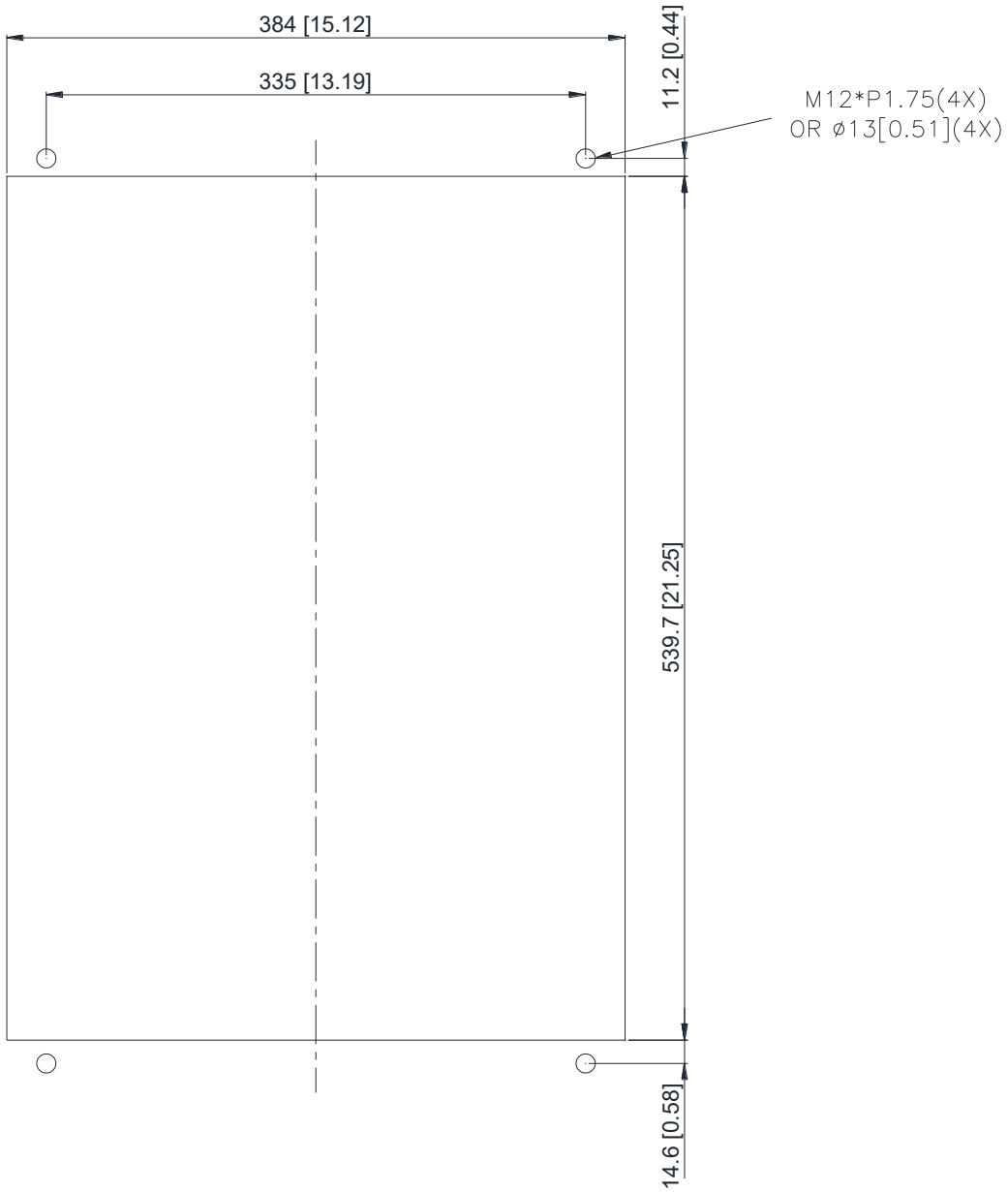


Figure 7-214

Frame D0, D and E installation

1. Loosen 8 screws and remove Fixture 2 (as shown in the figure below).

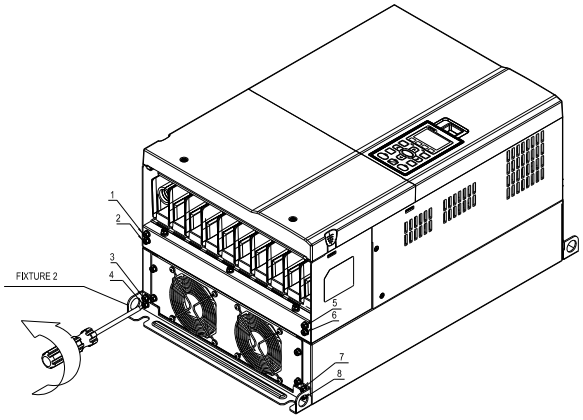


Figure 7-215

2. Loosen 10 screws and remove Fixture 1 (as shown in the figure below).

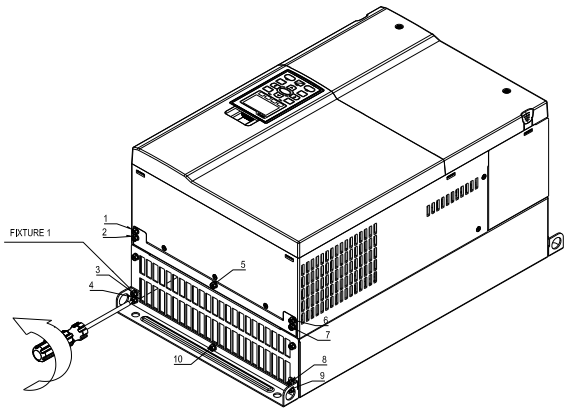


Figure 7-216

3. Tighten 4 screws (as shown in the figure below). Screw torque: 30–32 kg-cm / (26.0–27.8 lb-in.) / (2.9–3.1 Nm).

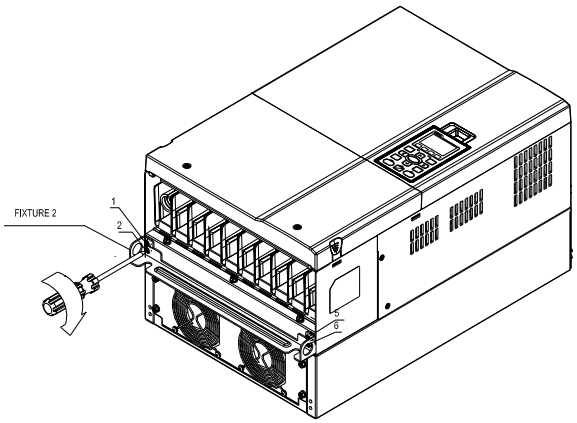


Figure 7-217

4. Tighten 5 screws (as shown in the figure below). Screw torque: 30–32 kg-cm / (26.0–27.8 lb-in.) / (2.9–3.1 Nm)

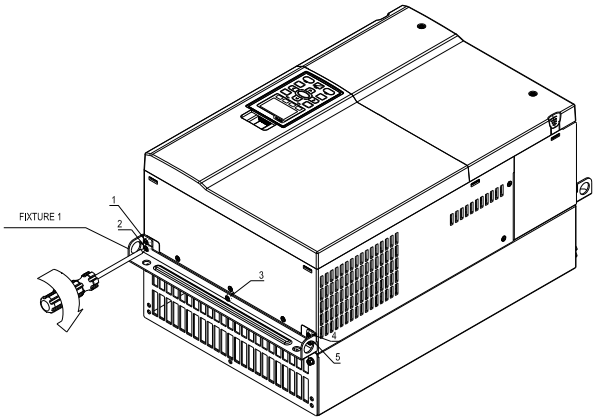


Figure 7-218

5. Tighten 4 screws (as shown in the figure below). Screw torque: 24–26 kg-cm / (20.8–22.6 lb-in.) / (2.4–2.5 Nm)

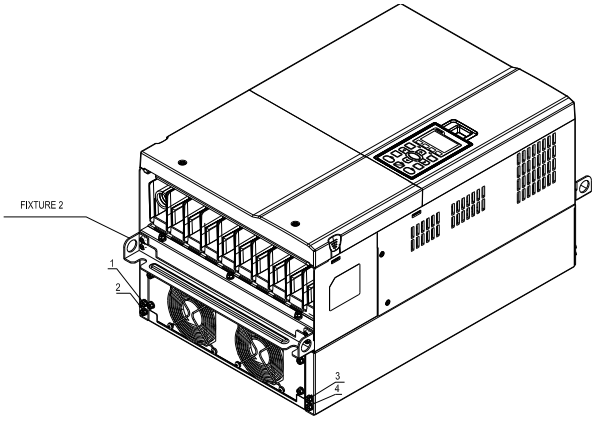


Figure 7-219

6. Tighten 5 screws (as shown in the figure below). Screw torque: 24–26 kg-cm / (20.8–22.6 lb-in.) / (2.4–2.5 Nm)

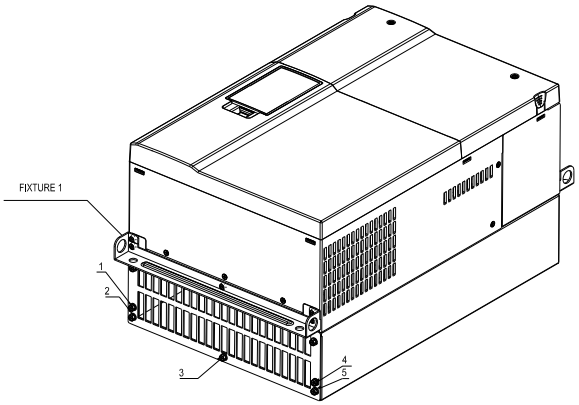


Figure 7-220

7. Place 4 screws (M10) through Fixture 1 & 2 and the plate then tighten the screws. (as shown in the figure below)
   Frame D0/D M10*4
   Screw torque: 200–240 kg-cm / (173.6–208.3 lb-in.) / (19.6–235 Nm)
   Frame E M12*4
   Screw torque: 300–400 kg-cm / (260–347 lb-in.) / (29.4–39.2 Nm)

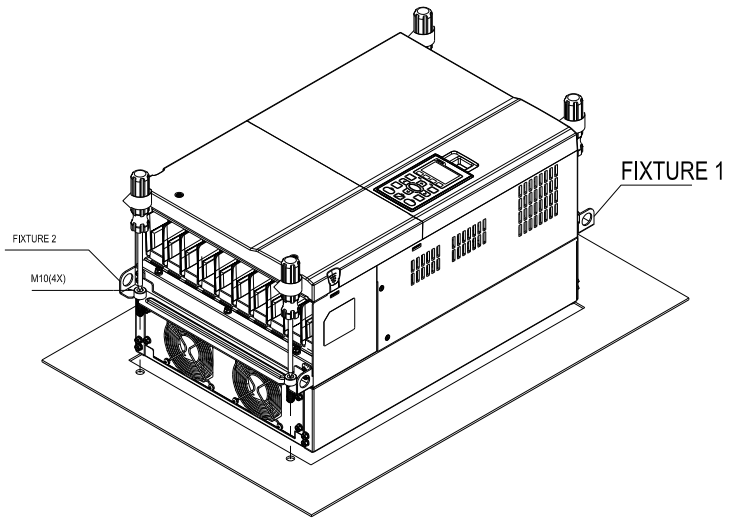


Figure 7-221

Frame F

Applicable models

VFD900C23A-00; VFD900C23A-21; VFD1320C43A-00; VFD1320C43A-21; VFD1600C43A-00; VFD1600C43A-21; VFD1600C63B-00; VFD1600C63B-21; VFD2000C63B-00; VFD2000C63B-21

Hole sites and dimension Unit: mm (inch)

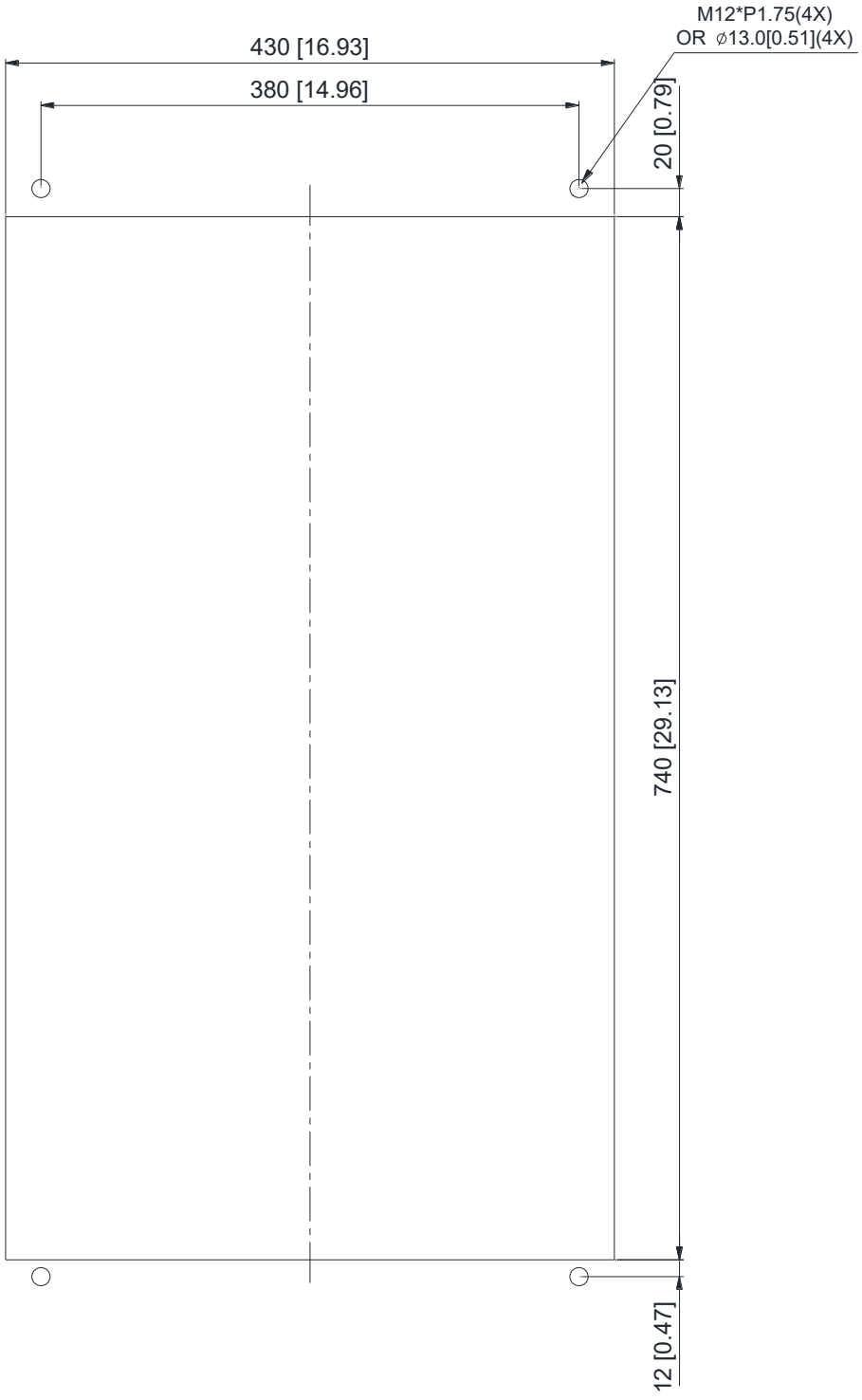


Figure 7-222

Frame F installation

1. Loosen 12 screws and remove Fixture 2.

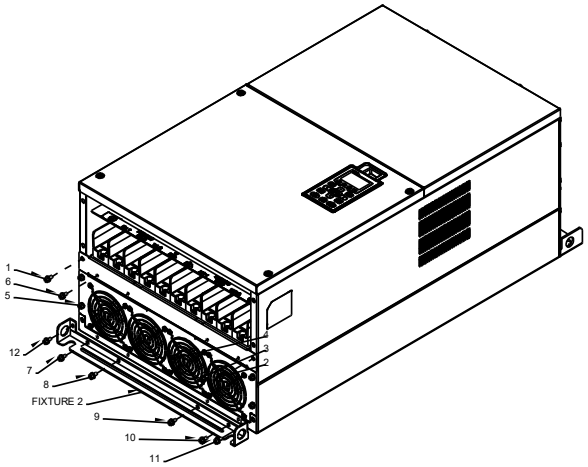


Figure 7-223

2. Loosen 12 screws and remove Fixture 2.
   Screw torque: 24–26 kg-cm / (20.8–22.6 lb-in.) / (2.4–2.5 Nm)

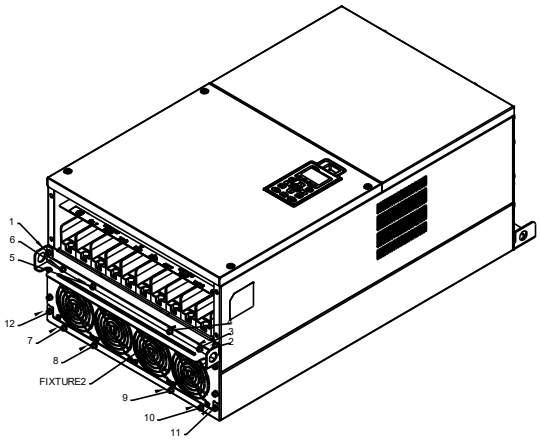


Figure 7-224

3. Loosen screw 13 –26 and remove Fixture 1.

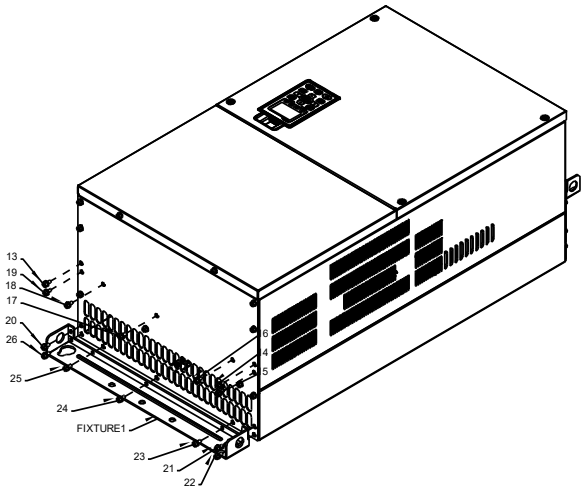


Figure 7-225

4. Install Fixture 1 by tightening screw 13 –26
   Screw torque: 24–26 kg-cm / (20.8–22.6 lb-in.) / (2.4–2.5 Nm)

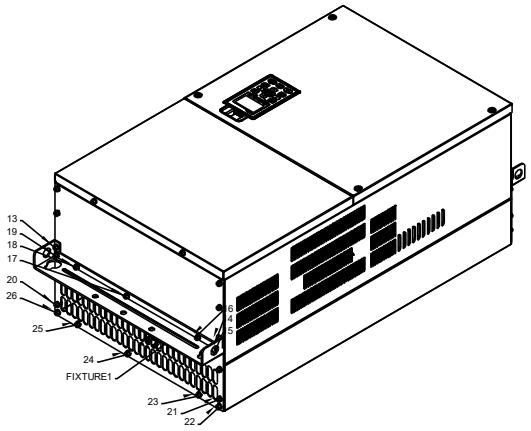


Figure 7-226

5. Place 4 of the M12 screws through Fixture 1&2 and plate then tighten the screws.
   Screw torque: 300–400 kg-cm / (260–347 lb-in.) / (29.4–39.2 Nm)

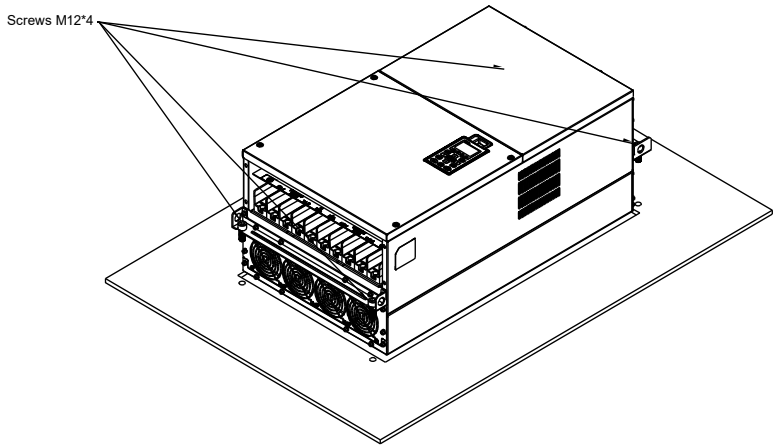


Figure 7-227

7-11 Power Terminal Kit

MKC-PTCG

Applicable models: VFD1850C43A-00; VFD2200C43A-00
(MKC-PTCG is optional for the models above. 12 pulse becomes 6 pulse when the installation is done.)

Accessories

Item	Description	Q'ty
1	Copper Assy.	3
1.1	Copper	3
1.2	Screw M12*25L	6
1.3	Spring	6
1.4	Washer	6
1.5	Nuts	6

Table 7-93

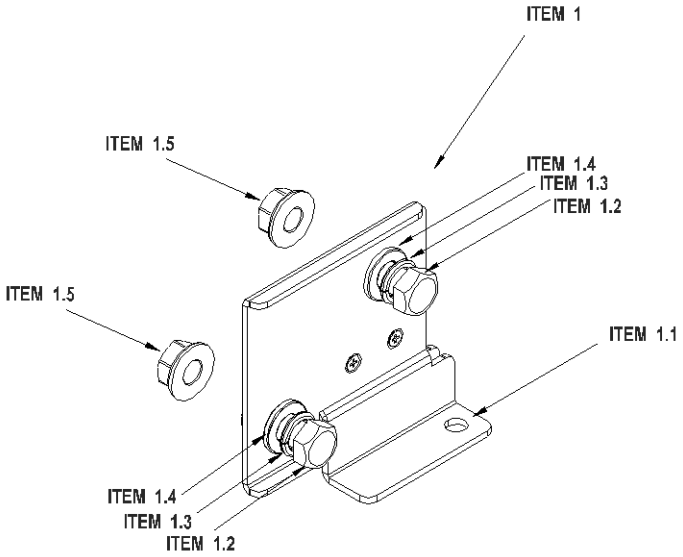


Figure 7-228

Diagram of power terminal connection
M12 torque: 408 kg-cm / (354.1 lb-in) / (39.98 Nm)

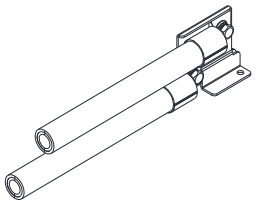


Figure 7-229

"MKC-PTCG" Installation

1. Loosen the 4 screws on the cover, as shown in the figure below. Screw Torque: 12–15 kg-cm / (10.4–13 lb-in) / (1.2–1.5 Nm)

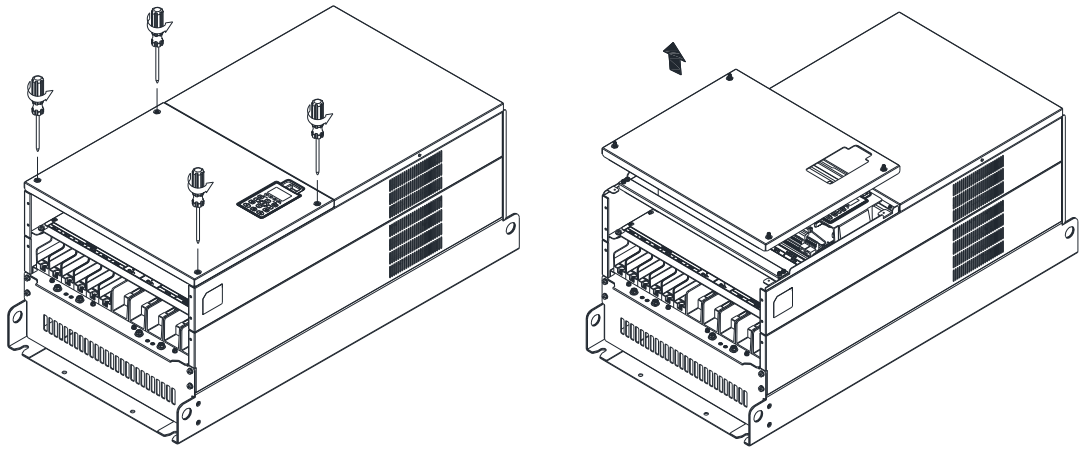


Figure 7-230

2. Remove the 5 screws from the FR4 board, as shown in the following figure. (The FR4 board is not needed after the installation of the power terminal kit). Screw Torque: 12–15 kg-cm / (10.4–13 lb-in) / (1.2–1.5 Nm)

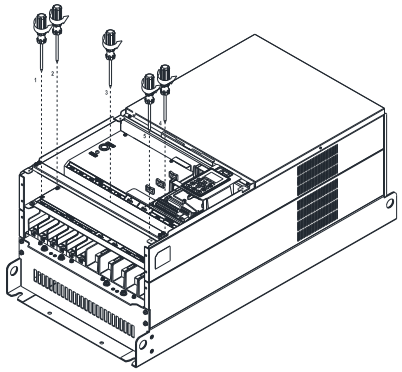


Figure 7-231

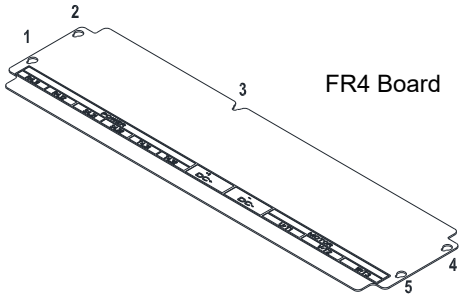


Figure 7-232

3. Loosen the upper M8 nuts (1–6) with a sleeve wrench (12mm of the sleeve). M8 Torque: 90kg / (78.1 lb-in) / (8.8 Nm)

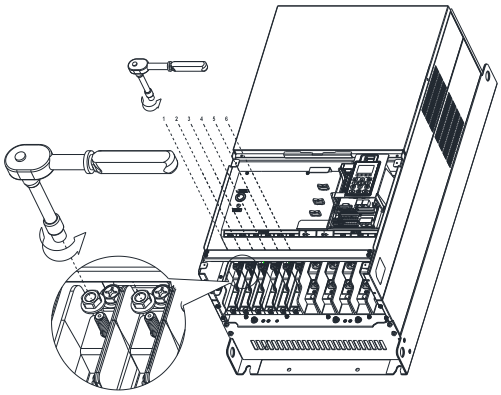


Figure 7-233

4. Install the 3 pcs copper assy., as shown in the Figure 234. Tighten the upper M8 nuts (1–6) with a sleeve wrench (12mm of the sleeve), as shown in the Figure 235 below.

   M8 Torque: 180 kg-cm / (156.2 lb-in) / (17.65 Nm)

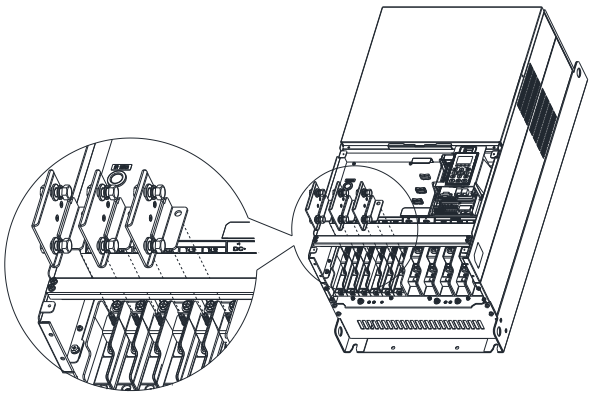


Figure 7-234

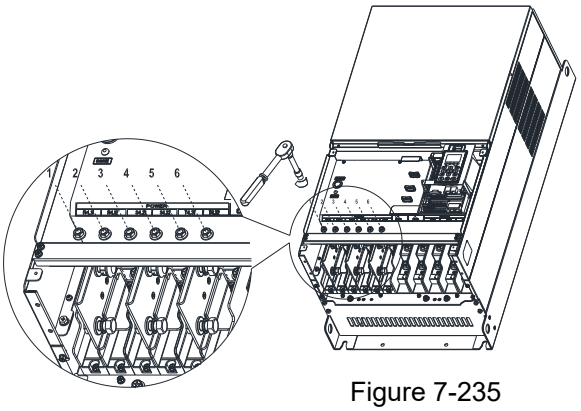


Figure 7-235

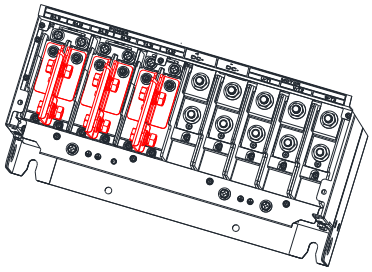


Figure 7-236

Copper assy. installation completed

5. Put the cover back and tighten the screws as shown in the figure below. Screw Torque: 12–15 kg-cm / (10.4–13 lb-in) / (1.2–1.5 Nm)

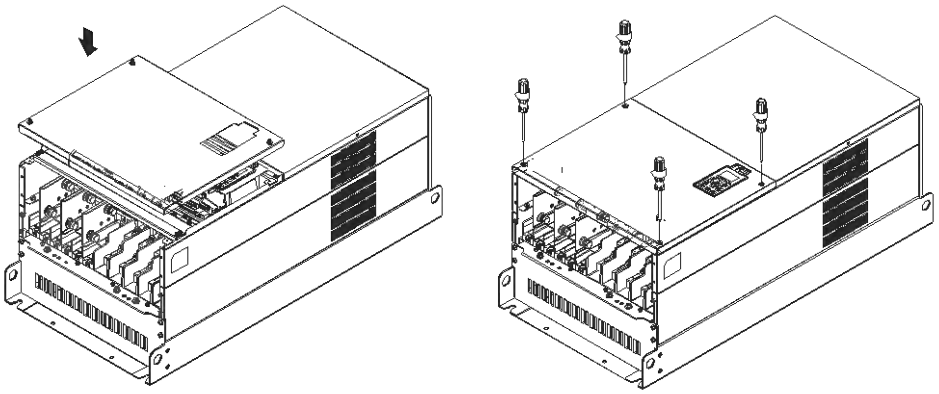


Figure 7-237

7-12 USB/RS-485 Communication Interface IFD6530

⚠ Warning

✓ *Please thoroughly read this instruction sheet before installation and putting it into use.*

✓ *The content of this instruction sheet and the driver file may be revised without prior notice.*

Please consult our distributors or download the most updated instruction/ driver version at http://www.delta.com.tw/product/em/control/cm/control_cm_main.asp

Introduction

IFD6530 is a convenient RS-485-to-USB converter, which does not require external power-supply and complex setting process. It supports baud rate from 75 to 115.2 Kbps and auto switching direction of data transmission. In addition, it adopts RJ45 in RS-485 connector for users to wire conveniently. And its tiny dimension, handy use of plug-and-play and hot-swap provide more conveniences for connecting all DELTA IABG products to your PC.

Applicable Models: All DELTA IABG products.

- Application & Dimension

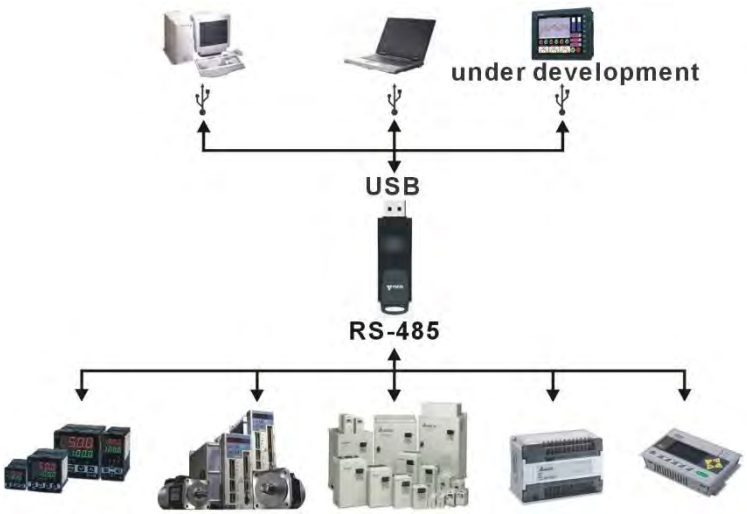


Figure 7-238

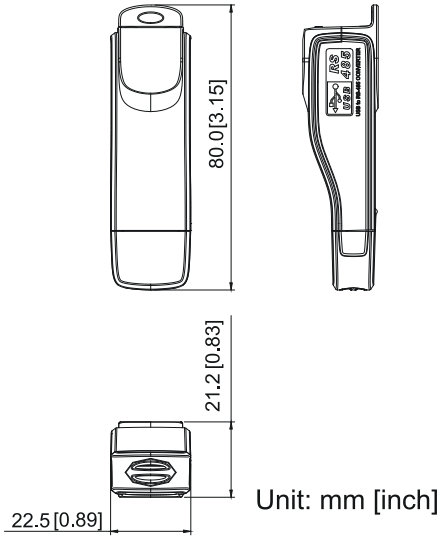


Figure 7-239

Specifications

Power supply	No external power is needed
Power consumption	1.5W
Isolated voltage	2,500V_{DC}
Baud rate	75Kbps, 150Kbps, 300Kbps, 600Kbps, 1,200Kbps, 2,400Kbps, 4,800Kbps, 9,600Kbps, 19,200Kbps, 38,400Kbps, 57,600Kbps, 115,200Kbps
RS-485 connector	RJ45
USB connector	A type (plug)
Compatibility	Full compliance with USB V2.0 specification
Max. cable length	RS-485 Communication Port: 100 m
Support RS-485 half-duplex transmission	

Table 7-94

RJ-45



PIN	Description
1	Reserved
2	Reserved
3	GND
4	SG-

PIN	Description
5	SG+
6	GND
7	Reserved
8	+9V

Preparations before Driver Installation

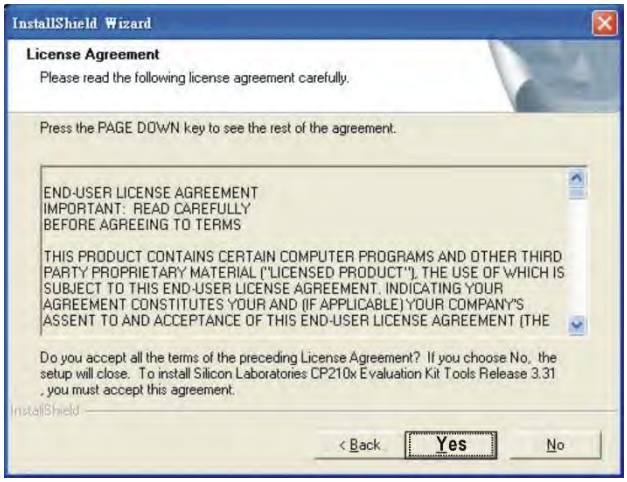
Extract the driver file (IFD6530_Drivers.exe) by following steps. Download the driver file (IFD6530_Drivers.exe) at www.deltaww.com/iadownload_acmotordrive/IFD6530_Drivers .

NOTE: DO NOT connect IFD6530 to PC before extracting the driver file.

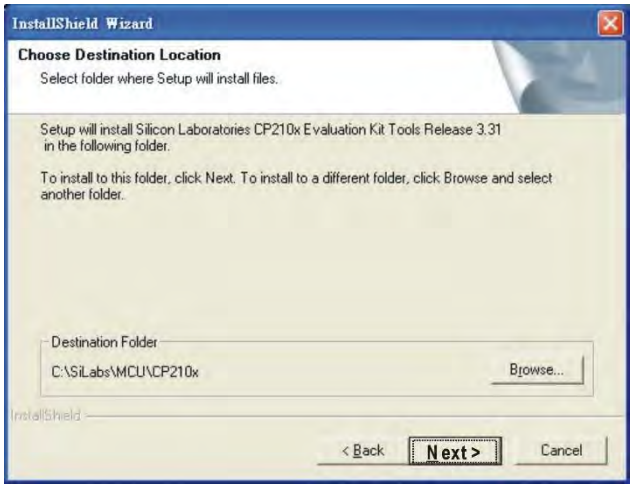
STEP 1



STEP 2



STEP 3



STEP 4



STEP 5

You should have a folder marked SiLabs under drive C. c:\ SiLabs

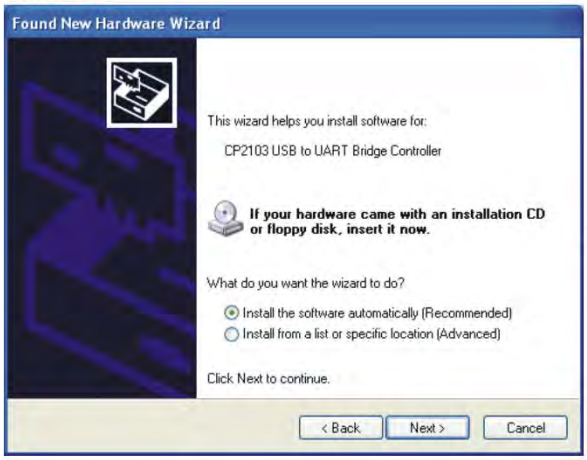
Driver Installation

After connecting IFD6530 to PC, please install driver by following steps.

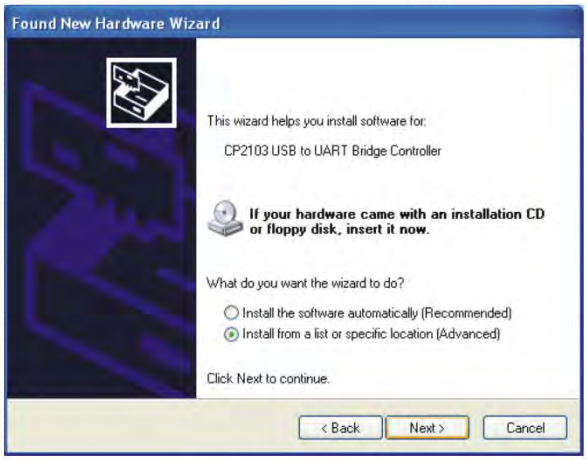
STEP 1

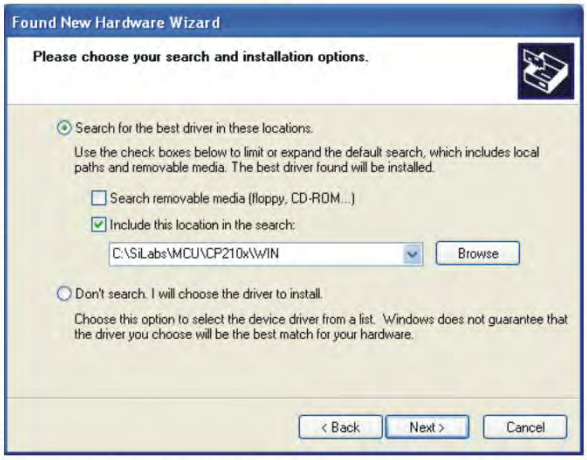


STEP 2

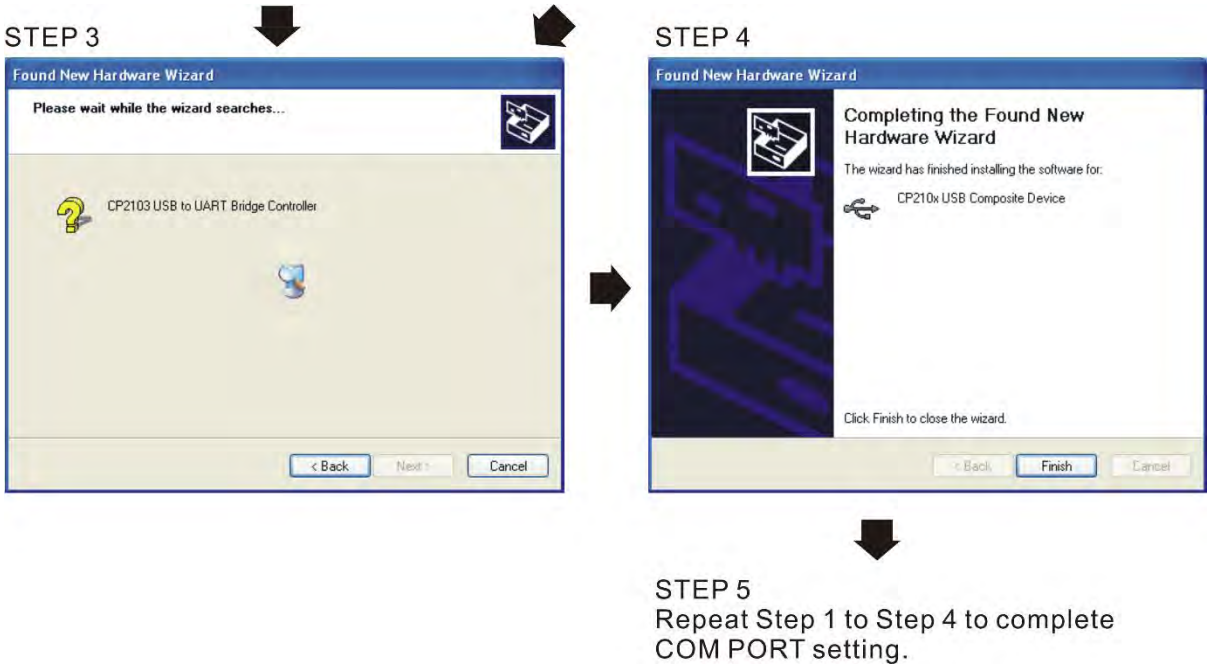


OR





Browse and select directory, or enter C:\SiLabs\MCU\CP210x\WIN



LED Display

1. Steady Green LED ON: power is ON.
2. Blinking orange LED: data is transmitting.

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Chapter 8 Option Cards

8-1 Option Card Installation

8-2 EMC-D42A -- Extension card for 4-point digital input / 2-point digital input

8-3 EMC-D611A -- Extension card for 6-point digital input (110 VAC input voltage)

8-4 EMC-R6AA -- Relay output extension card (6-point N.O. output contact)

8-5 EMC-BPS01 -- +24V power card

8-6 EMC-A22A -- Extension card for 2-point analog input/ 2-point analog output

8-7 EMC-PG01L / EMC-PG02L -- PG card (Line driver)

8-8 EMC-PG01O / EMC-PG02O -- PG card (Open collector)

8-9 EMC-PG01U / EMC-PG02U -- PG card (ABZ Incremental encoder signal / UVW Hall position signal input)

8-10 EMC-PG01R -- PG card (Resolver)

8-11 EMC-PG01H – PG card (Resolver)

8-12 EMC-MC01 -- Motion control card

8-13 CMC-PD01 -- Communication card, PROFIBUS DP

8-14 CMC-DN01 -- Communication card, DeviceNet

8-15 CMC-EIP01 / CMC-EIP02 -- Communication card, EtherNet/IP

8-16 CMC-EC01 -- Communication card, EtherCAT

8-17 CMC-PN01 -- Communication card, PROFINET

8-18 EMC-COP01 -- Communication card, CANopen

8-19 Delta Standard Fieldbus Cables

- The option cards in this chapter are optional accessories. Select the applicable option cards for your motor drive, or contact your local distributor for suggestions. The option cards can significantly improve the efficiency of the motor drive.
- To prevent damage to the motor drive during installation, remove the digital keypad and the cover before wiring.
- The option cards do not support hot swapping. Power off the motor drive before you install or remove the option cards.

8-1 Option Card Installation

8-1-1 Remove Covers

Frame A–C
Screw Torque: 8–10 kg-cm / (6.9–8.7 lb-in.) / (0.8–1.0 Nm)

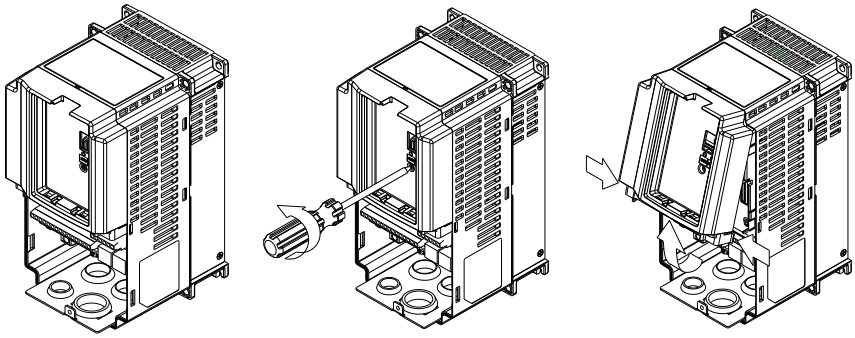


Figure 8-1

Frame D0
Screw Torque: 8–10 kg-cm / (6.9–8.7 lb-in.) / (0.8–1.0 Nm)

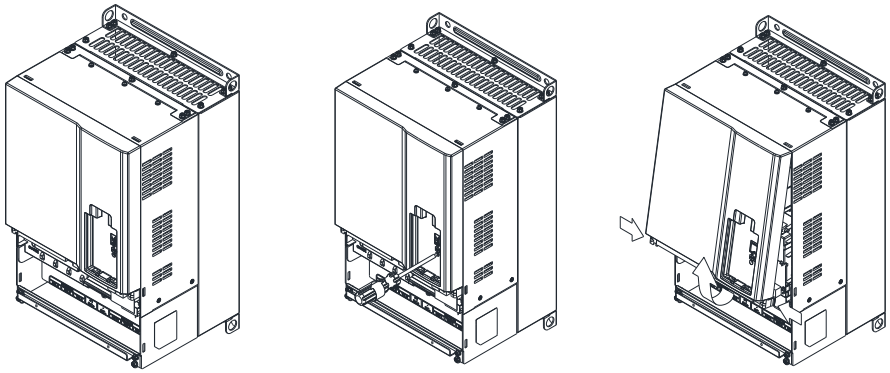


Figure 8-2

Frame D
Screw Torque: 8–10 kg-cm / (6.9–8.7 lb-in.) / (0.8–1.0 Nm)

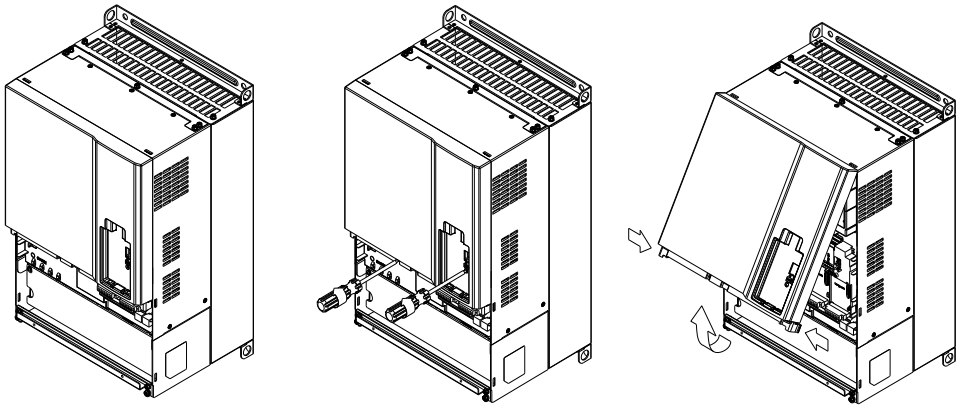


Figure 8-3

Frame E
Screw Torque: 12–15 kg-cm / (10.4–13 lb-in.) / (1.2–1.5 Nm)

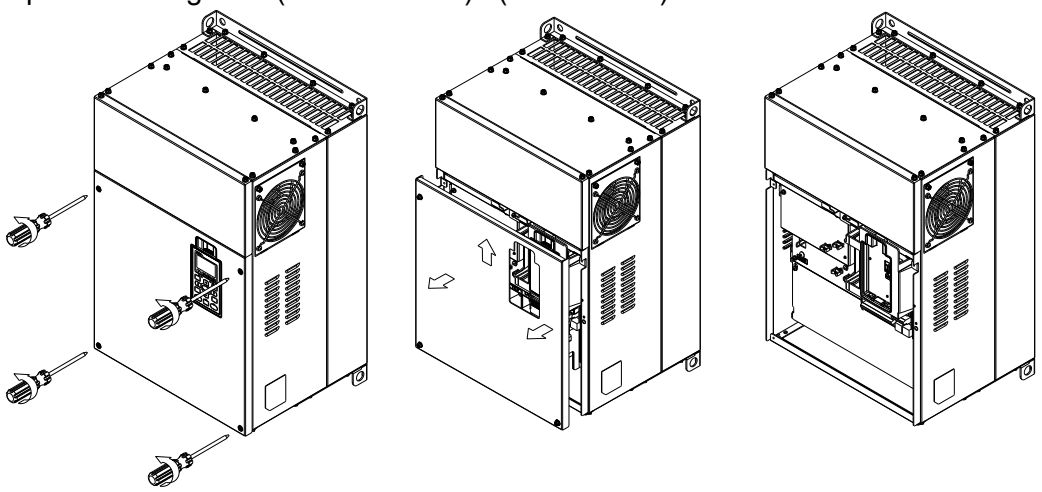


Figure 8-4

Frame F
Screw Torque: 12–15 kg-cm / (10.4–13 lb-in.) / (1.2–1.5 Nm)

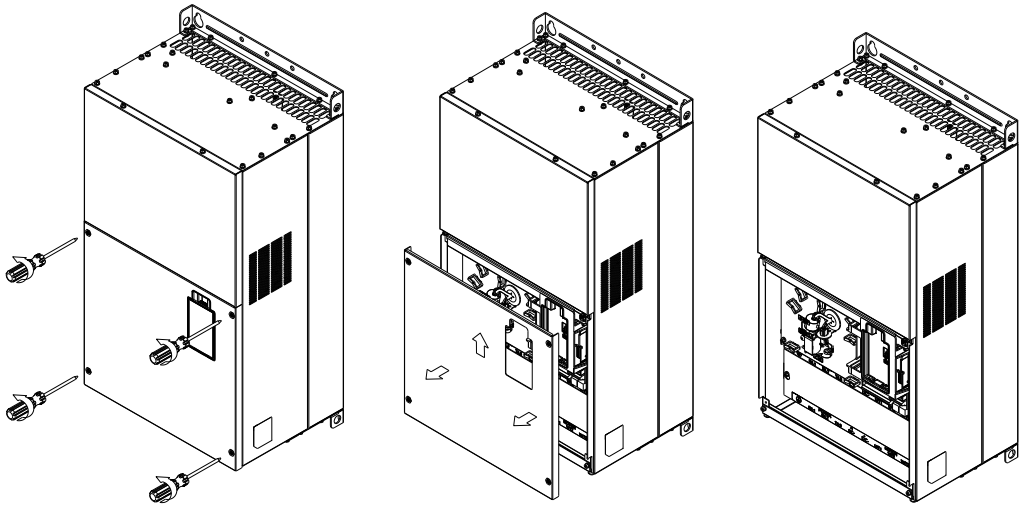


Figure 8-5

Frame G
Screw Torque: 12–15 kg-cm / (10.4–13 lb-in.) / (1.2–1.5 Nm)

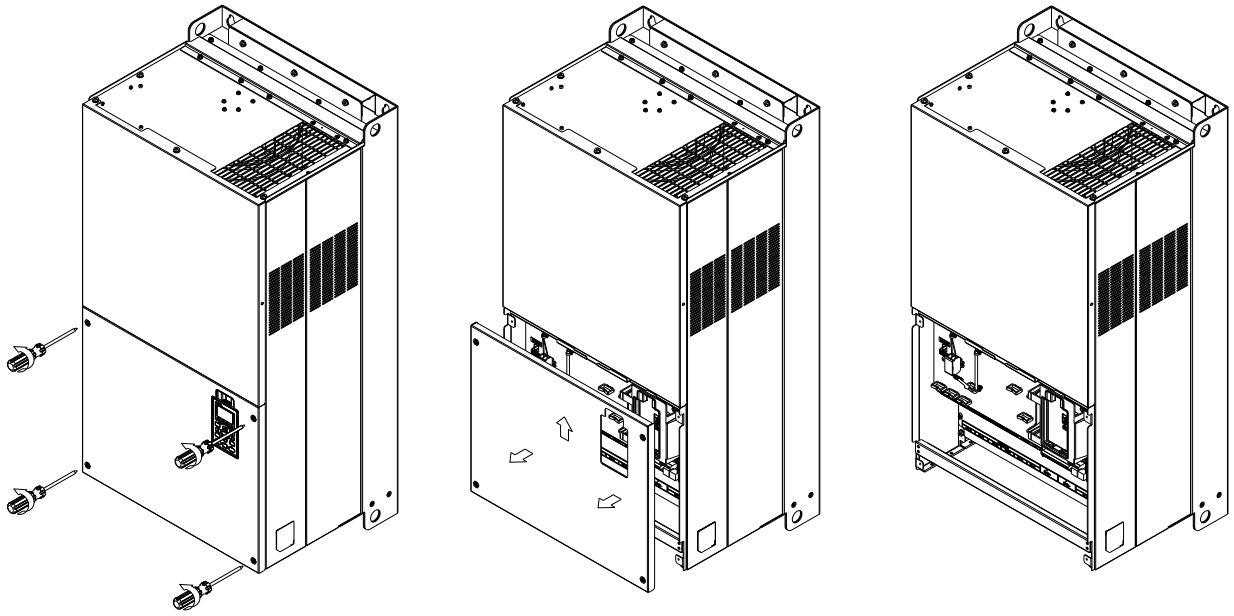


Figure 8-6

Frame H
Screw Torque: 14–16 kg-cm / (12.15–13.89 lb-in.) / (1.4–1.6 Nm)

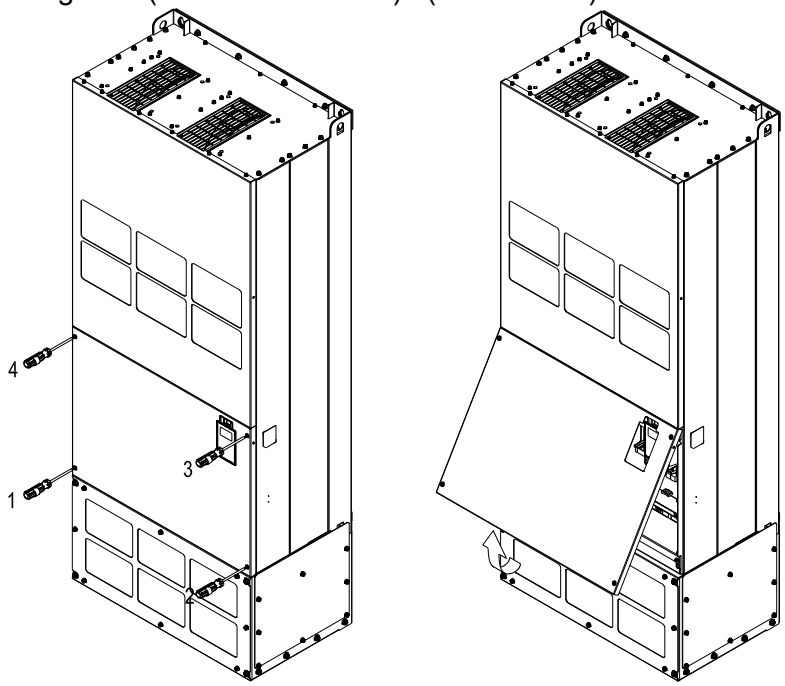


Figure 8-7

8-1-2 Option Card Installation Position

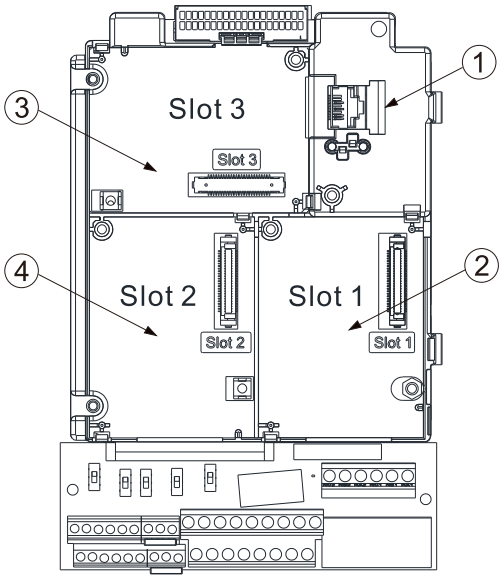


Figure 8-8

1	RJ45 (Socket) for digital keypad KPC-CC01 ● Refer to Chapter 10 Digital Keypad for more details on KPC-CC01. ● Refer to Chapter 10 Digital Keypad for more details on optional accessory RJ45 extension cable.
2	Communication extension card (Slot 1) CMC-PD01; CMC-DN01; CMC-EIP01; CMC-EIP02; EMC-COP01; CMC-EC01; CMC-PN01
3	I/O & Relay extension card (Slot 3) EMC-D42A; EMC-D611A; EMC-A22A: EMC-R6AA; EMC-BPS01
4	PG Card (Slot 2) EMC-PG01L; EMC-PG02L; EMC-PG01O; EMC-PG02O; EMC-PG01U; EMC-PG02U; EMC-PG01R; EMC-PG01H; EMC-MC01

Table 8-1

Screw specification for option card terminals:

EMC-D42A; EMC-D611A; EMC-BPS01	Wire gauge	0.2–0.5 mm^2 (26–20 AWG)
	Torque	5 kg-cm / (4.4 lb-in) / (0.5 Nm)
EMC-R6AA	Wire gauge	0.2–0.5 mm^2 (26–20 AWG)
	Torque	8 kg-cm / (7 lb-in) / (0.8 Nm)
EMC-A22A	Wire gauge	0.2–4 mm^2 (24–12 AWG)
	Torque	5 kg-cm / (4.4 lb-in) / (0.5 Nm)
EMC-PG01L; EMC-PG02L; EMC-PG01O; EMC-PG02O; EMC-PG01U; EMC-PG02U; EMC-PG01R; EMC-PG01H	Wire gauge	0.2–0.5 mm^2 (26–20 AWG)
	Torque	2 kg-cm / (1.73 lb-in) / (0.2 Nm)

Table 8-2

I/O & Relay extension card (Slot 3)

EMC-D42A

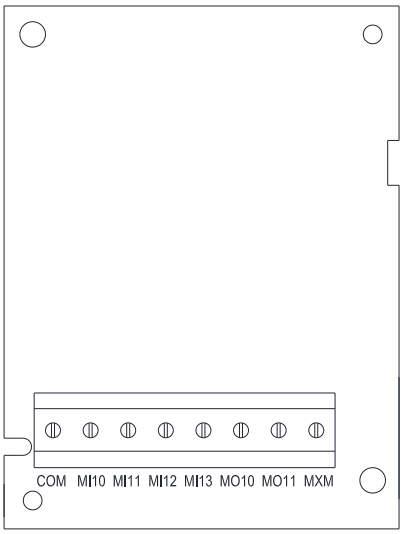


Figure 8-9

EMC-R6AA

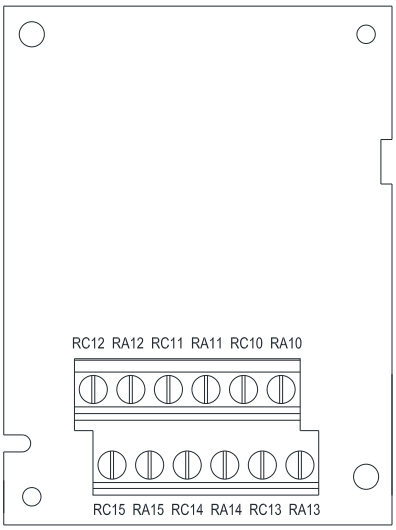


Figure 8-10

EMC-BPS01

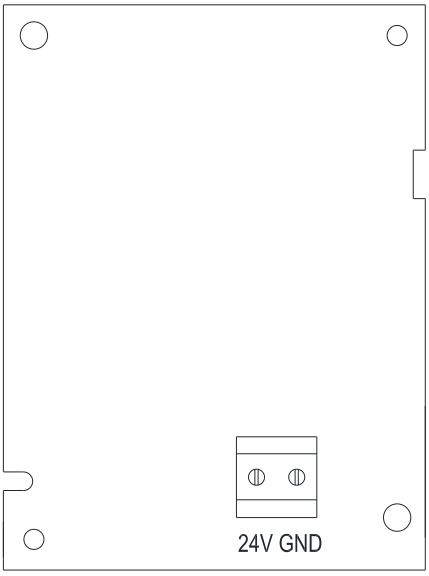


Figure 8-11

EMC-D611A

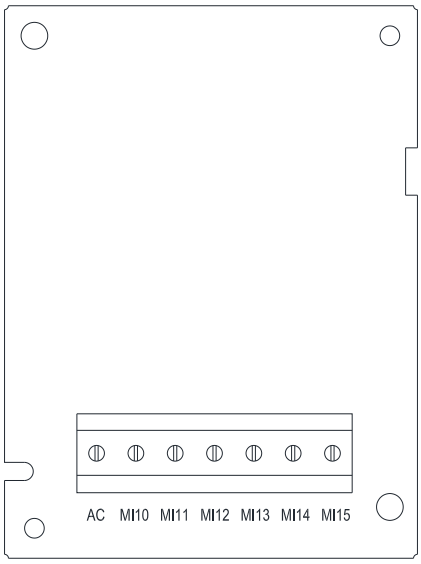


Figure 8-12

EMC-A22A

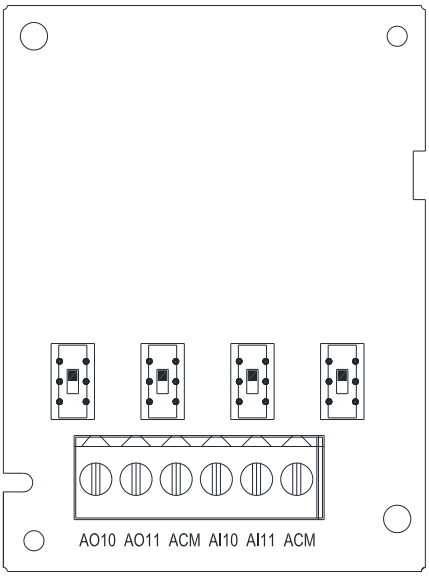


Figure 8-13

PG card (Slot 2)

EMC-PG01O / EMC-PG02O

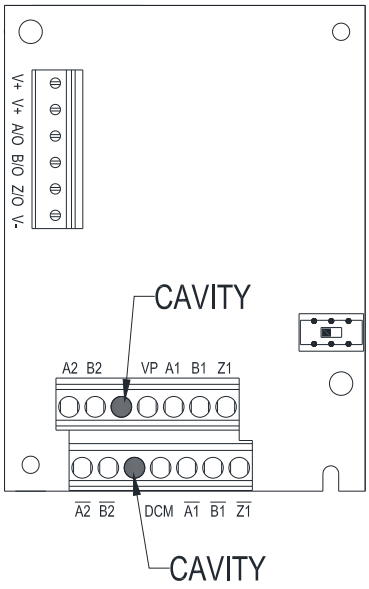


Figure 8-14

EMC-PG01L / EMC-PG02L

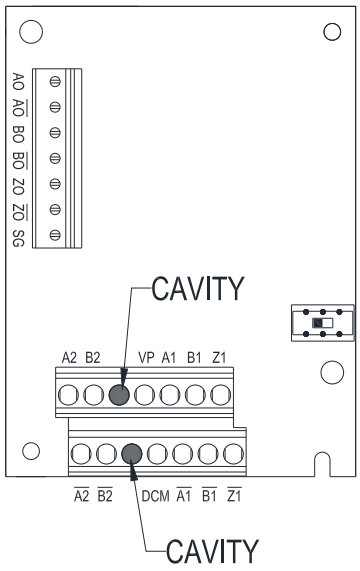


Figure 8-15

EMC-PG01U / EMC-PG02U

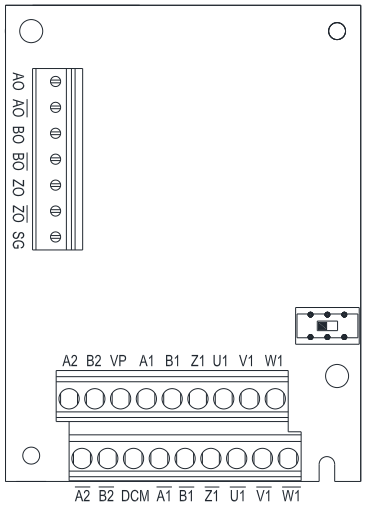


Figure 8-16

EMC-PG01R

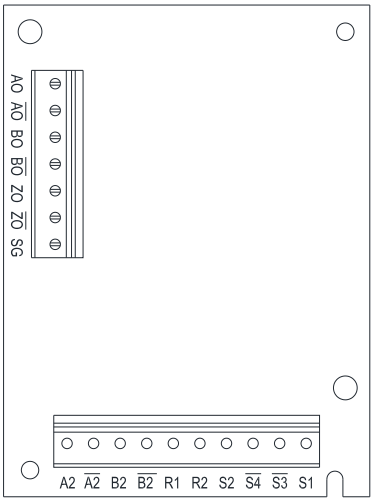


Figure 8-17

EMC-PG01H

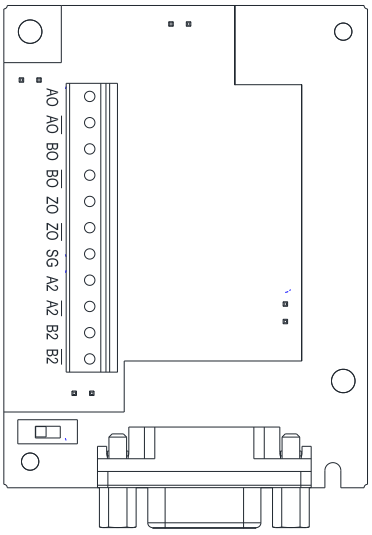


Figure 8-18

EMC-MC01

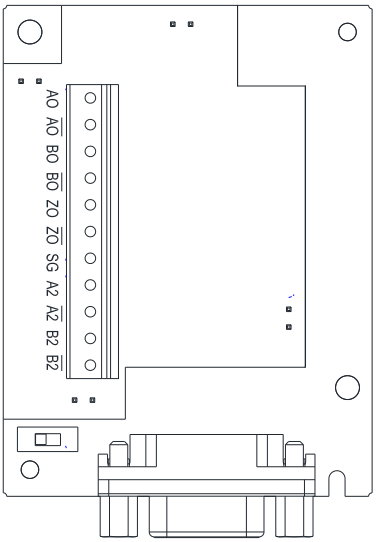


Figure 8-19

Communication extension card (Slot 1)

CMC-PD01

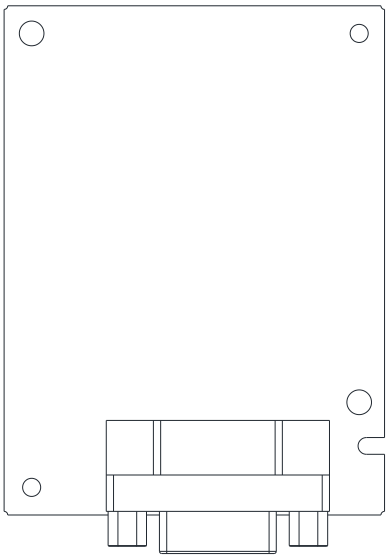


Figure 8-20

CMC-DN01

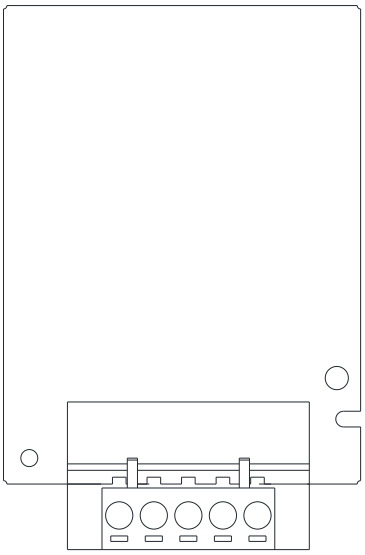


Figure 8-21

CMC-EIP01

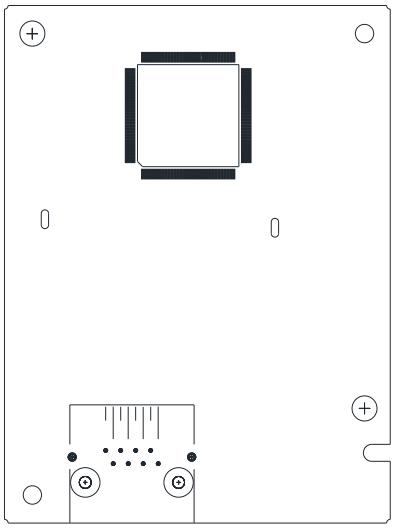


Figure 8-22

EMC-COP01

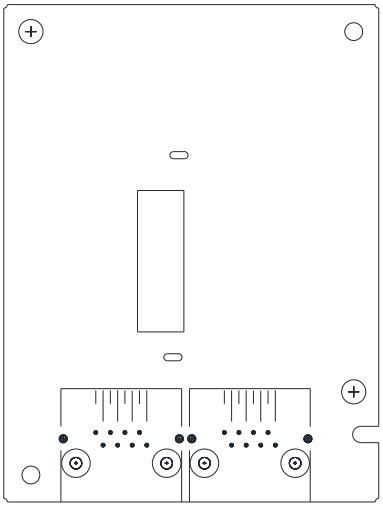


Figure 8-23

CMC-EC01

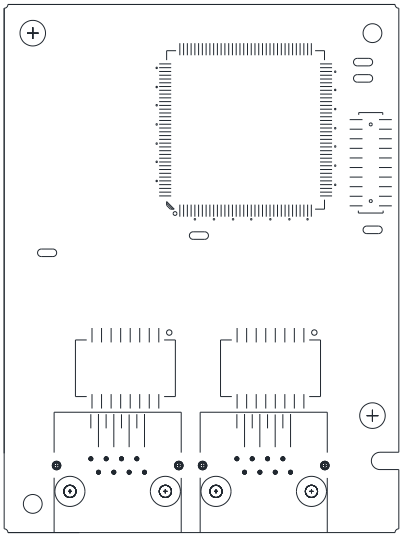


Figure 8-24

CMC-PN01

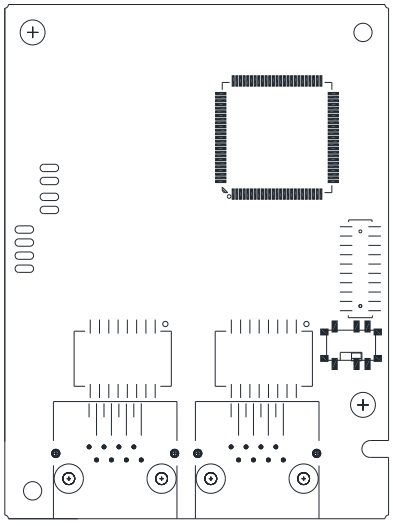


Figure 8-25

8-1-3 Installation and Disconnection of Extension Card

8-1-3-1 Installation

Communication card: EMC-COP01, CMC-EIP01 / CMC-EIP02, CMC-DN01, CMC-PD01, CMC-EC01, CMC-PN01

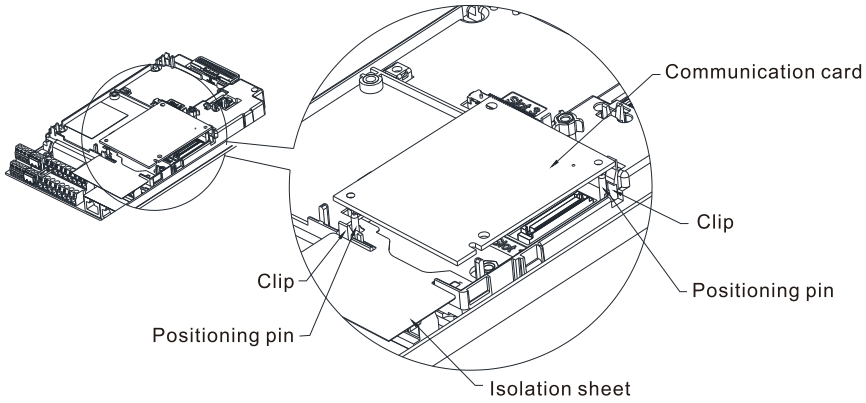


Figure 8-26

Put the isolation sheet into the positioning pin. Aim the two holes at the positioning pin. Press the pin to clip the holes with the PCB.

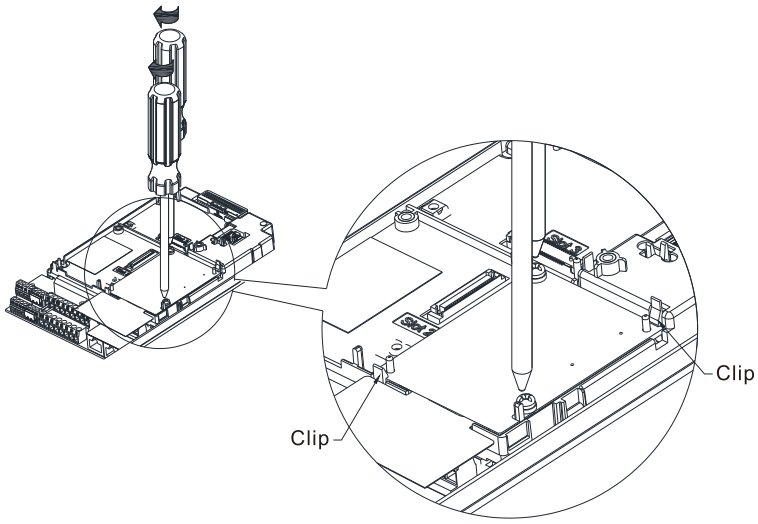


Figure 8-27

Fasten the screws after the PCB is clipped with the holes.
Screw torque: 6–8 kg-cm / [5.21–6.94 lb-in]

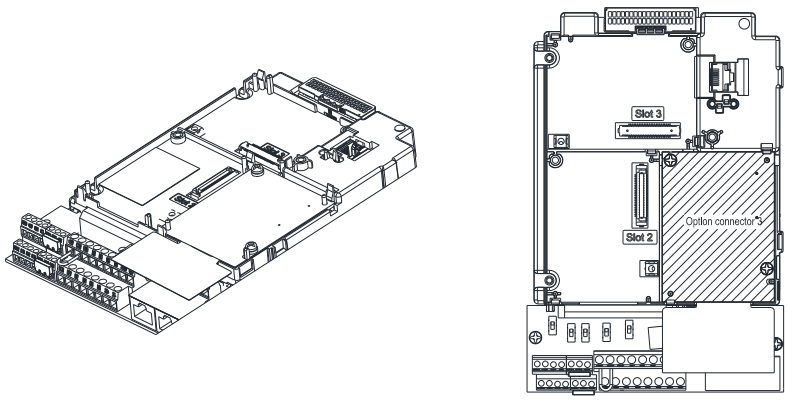
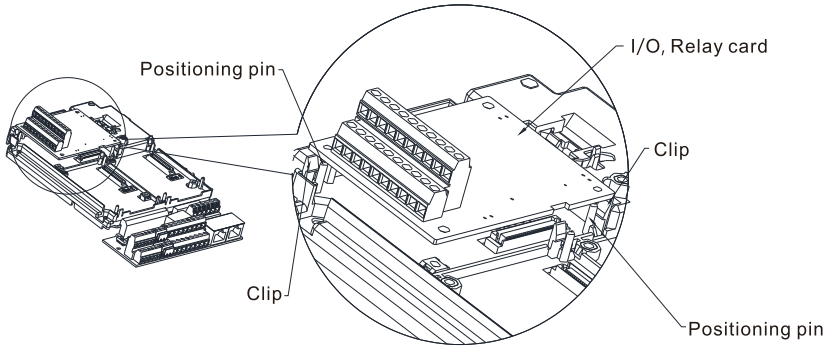


Figure 8-28

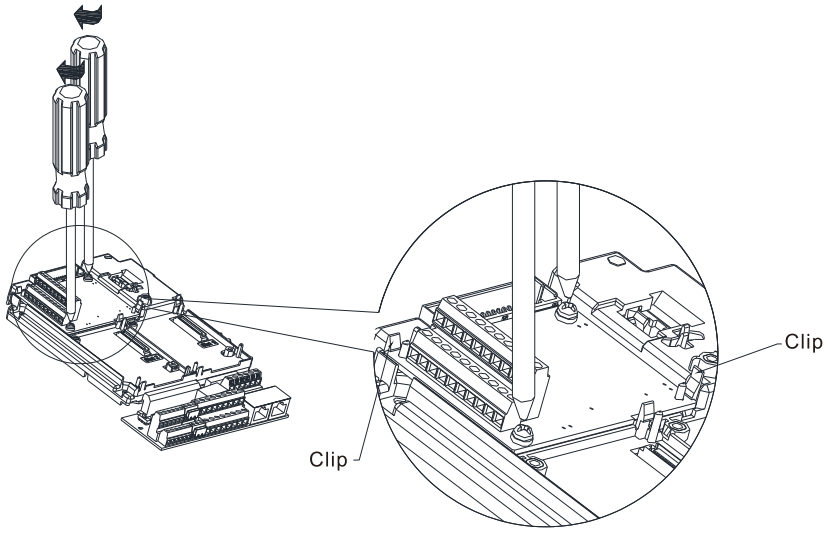
The installation is completed.

I/O & Relay card: EMC-D42A, EMC-D611A, EMC-R6AA, EMC-BPS01, EMC-A22A



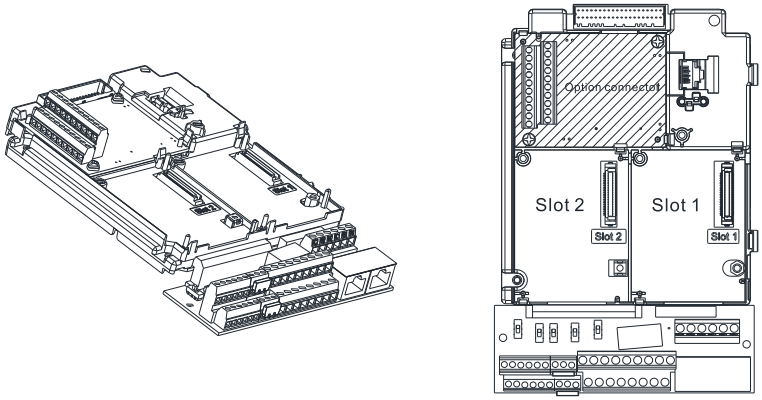
Aim the two holes at the positioning pin. Press the pin to clip the holes with the PCB.

Figure 8-29



Fasten the screws after the PCB is clipped with the holes.
Screw torque: 6–8 kg-cm / [5.21–6.94 lb-in]

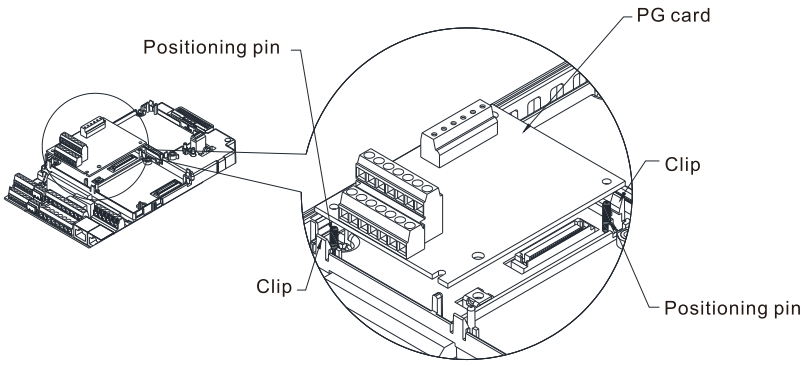
Figure 8-30



The installation is completed.

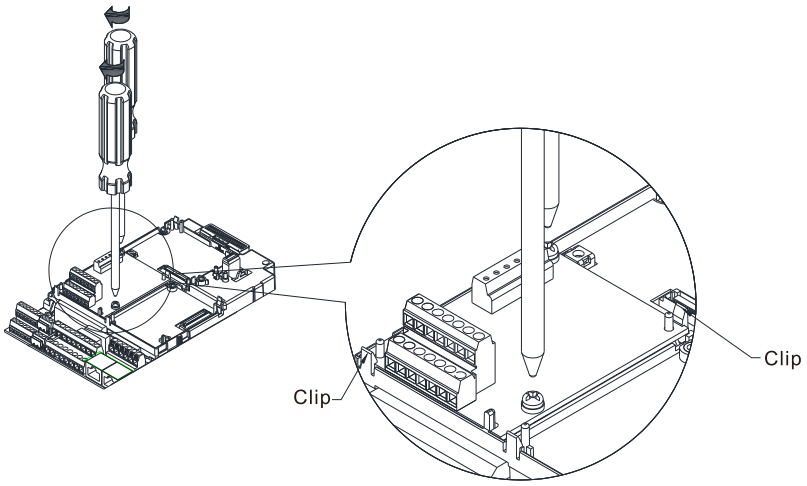
Figure 8-31

PG card: EMC-PG01O / EMC-PG02O, EMC-PG01L / EMC-PG02L, EMC-PG01U / EMC-PG02U, EMC-PG01R, EMC-PG01H, EMC-MC01



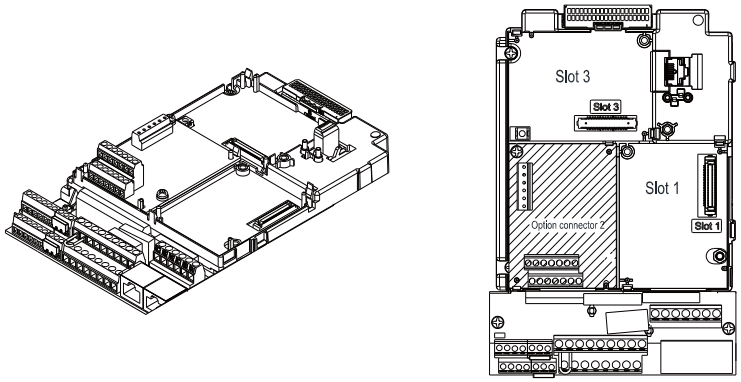
Aim the two holes at the positioning pin. Press the pin to clip the holes with the PCB.

Figure 8-32



Fasten the screws after the PCB is clipped with the holes.
Screw torque: 6–8 kg-cm / [5.21–6.94 lb-in]

Figure 8-33

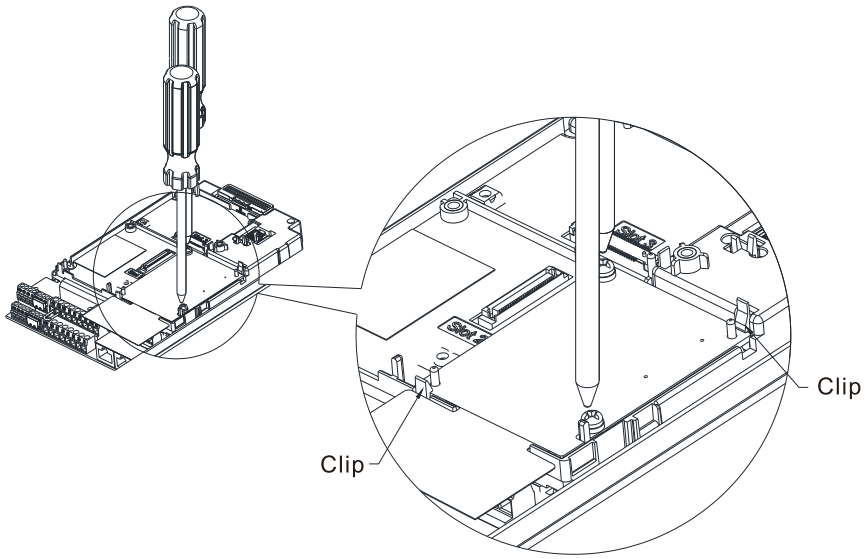


The installation is completed.

Figure 8-34

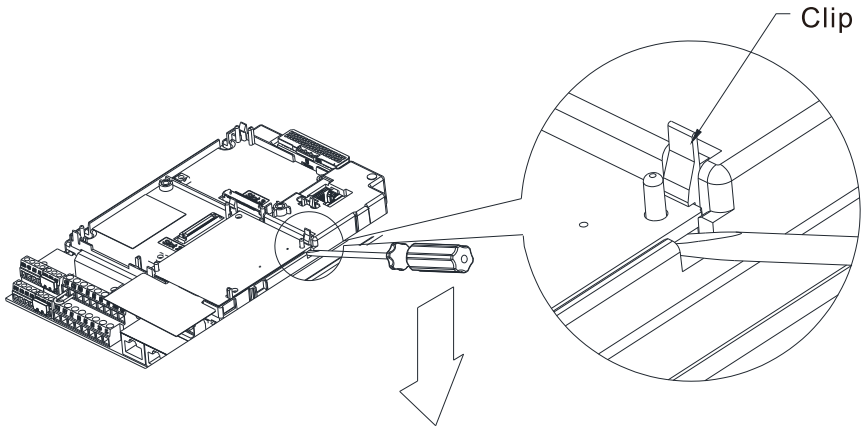
8-1-3-2 Disconnect the Extension Card

Communication card: EMC-COP01, CMC-EIP01 / CMC-EIP02, CMC-DN01, CMC-PD01, CMC-EC01, CMC-PN01



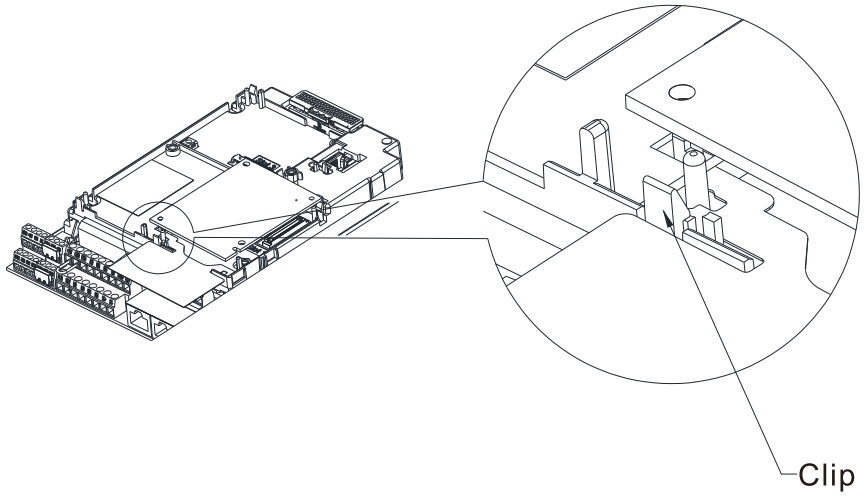
Remove the two screws as shown in the figure on the left.

Figure 8-35



Twist to open the clip. Insert a slot type screwdriver into the hollow to prize the PCB off the clip.

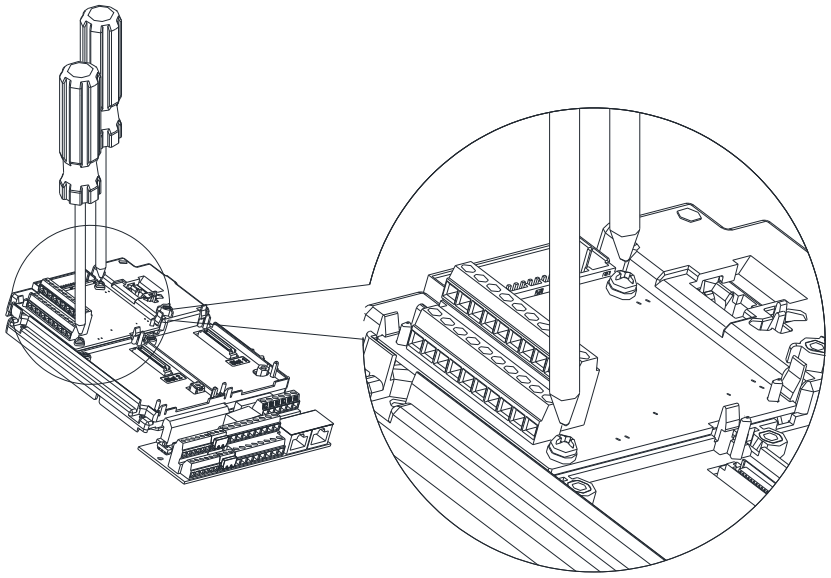
Figure 8-36



Twist to open the other clip to remove the PCB.

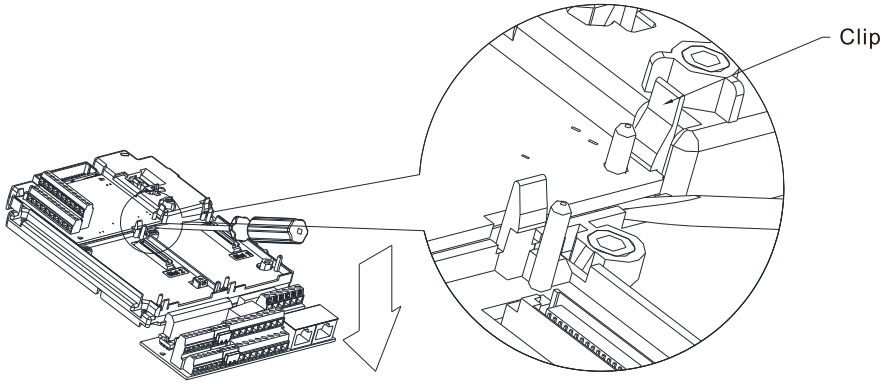
Figure 8-37

I/O & Relay card: EMC-D42A, EMC-D611A, EMC-R6AA, EMC-BPS01, EMC-A22A



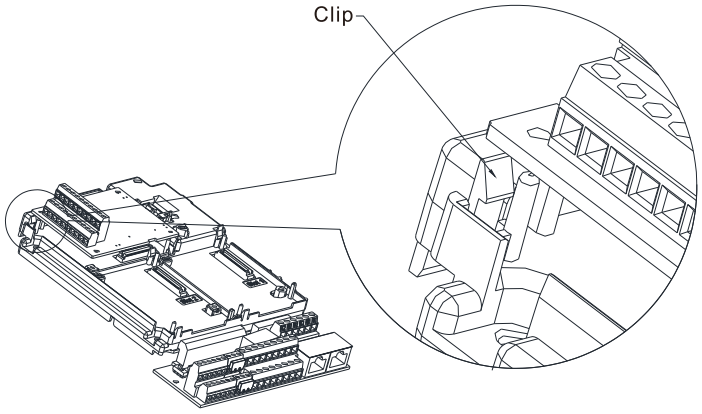
Remove the two screws as shown in the figure on the left.

Figure 8-38



Twist to open the clip. Insert a slot type screwdriver into the hollow to prize the PCB off the clip.

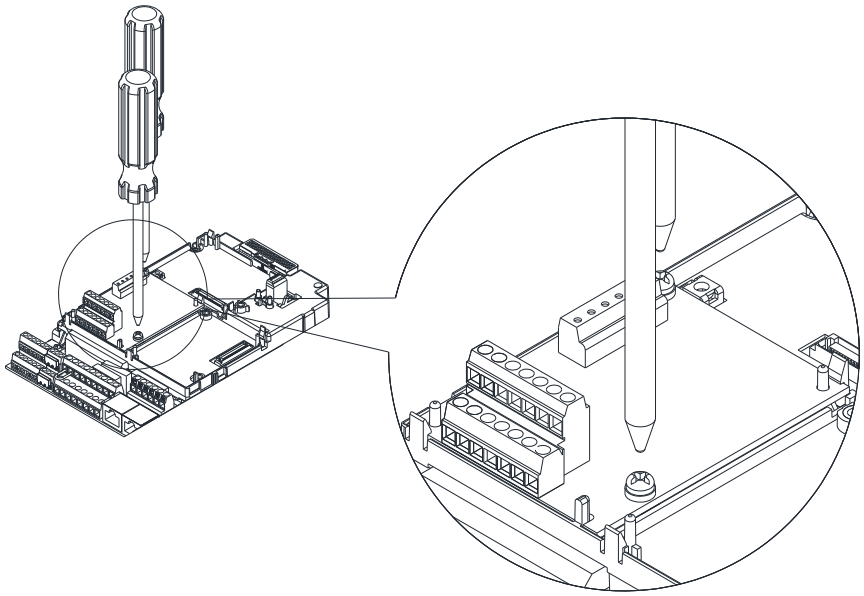
Figure 8-39



Twist to open the other clip to remove the PCB.

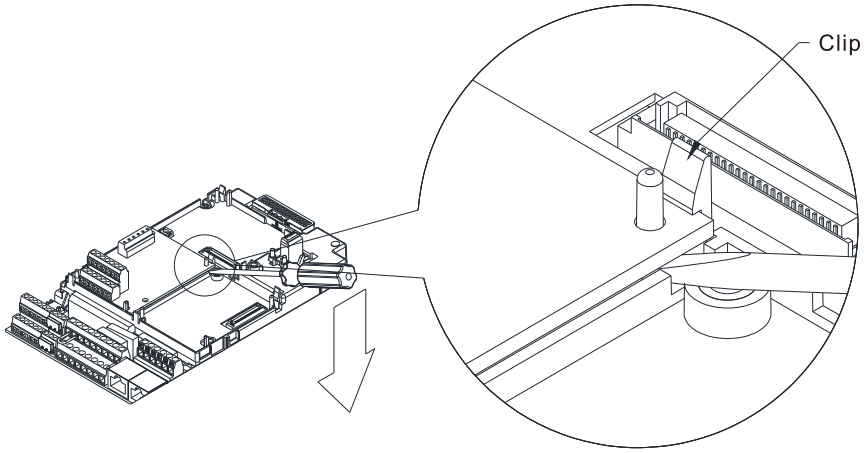
Figure 8-40

PG card: EMC-PG01O / EMC-PG02O, EMC-PG01L / EMC-PG02L, EMC-PG01U / EMC-PG02U, EMC-PG01R, EMC-PG01H, EMC-MC01



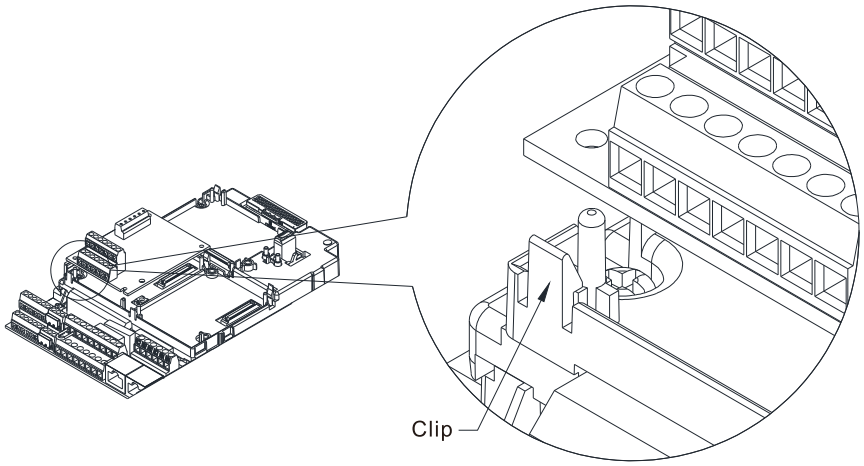
Remove the two screws as shown in the figure on the left.

Figure 8-41



Twist to open the clip. Insert a slot type screwdriver into the hollow to prize the PCB off the clip.

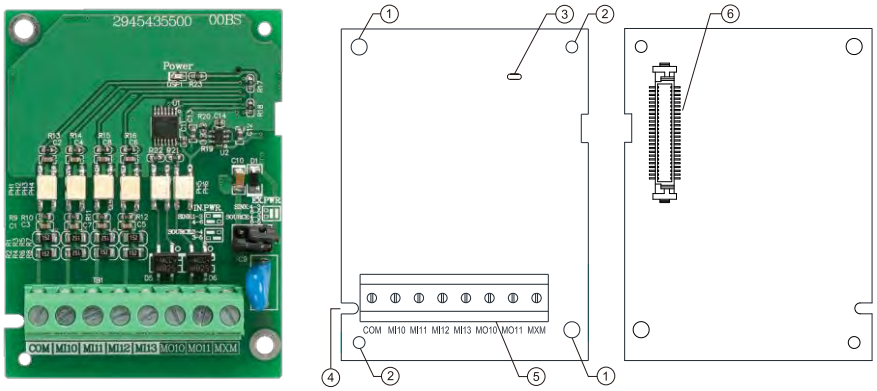
Figure 8-42



Twist to open the other clip to remove the PCB.

Figure 8-43

8-2 EMC-D42A -- Extension card for 4-point digital input / 2-point digital input



1. Screw fixing hole
2. Positioning hole
3. POWER indicator light
4. Analog I/O card fool-proof groove
5. Terminal block
6. AC motor drive connection port

Figure 8-44

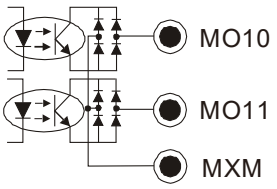
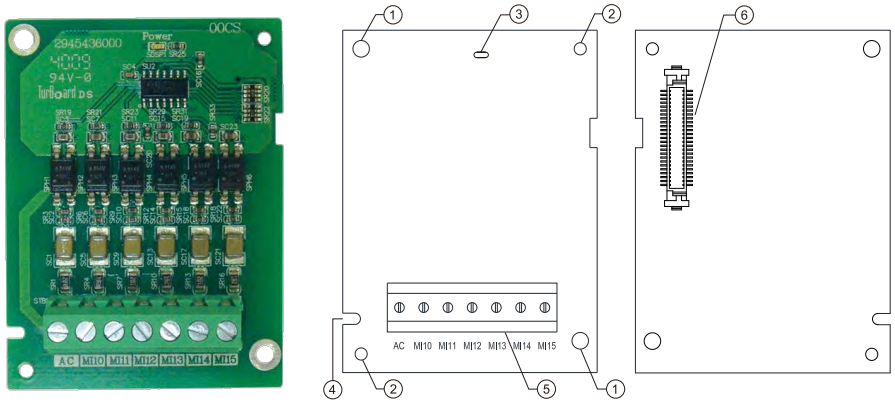
	Terminals	Descriptions
I/O Extension Card	COM	Common for Multi-function input terminals Select SINK (NPN) / SOURCE (PNP) in J1 jumper / external power supply
	MI10–MI13	Refer to Pr.02-26–02-29 to program the multi-function inputs MI10–MI13. Internal power is applied from terminal E24: +24 V_{DC} ± 5% 200 mA, 5W External power +24 V_{DC}: max. voltage 30 V_{DC}, min. voltage 19 V_{DC}, 30W ON: the activation current is 6.5 mA OFF: leakage current tolerance is 10 μA
	MO10–MO11	Multi-function output terminals (photocoupler) The AC motor drive releases various monitor signals, such as drive in operation, frequency attained and overload indication, via transistor (open collector).  Figure 8-45
	MXM	Common for multi-function output terminals MO10, MO11 (photocoupler) Max 48 V_{DC} 50 mA

Table 8-3

8-3 EMC-D611A -- Extension card for 6-point digital input (110 V_{AC} input voltage)



1. Screw fixing hole
2. Positioning hole
3. POWER indicator light
4. Analog I/O card fool-proof groove
5. Terminal block
6. AC motor drive connection port

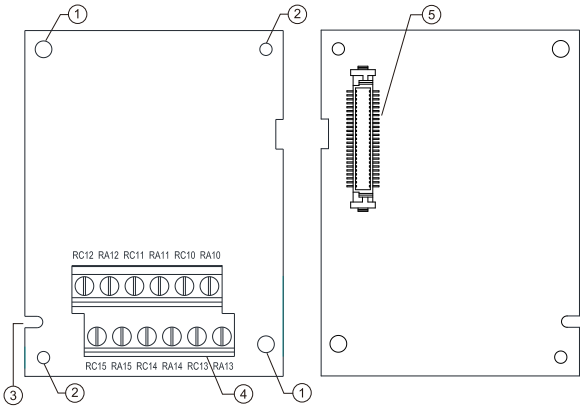
Figure 8-46

	Terminals	Descriptions
I/O Extension Card	AC	AC power Common for multi-function input terminal (Neutral)
	MI10–MI15	Refer to Pr.02-26–Pr. 02-31 for multi-function input selection Input voltage: 100–130 V_{AC} Input frequency: 47–63 Hz Input impedance: 27 KΩ Terminal response time: ON: 10 ms OFF: 20 ms

Table 8-4

8-4 EMC-R6AA -- Relay output extension card (6-point N.O. output contact)





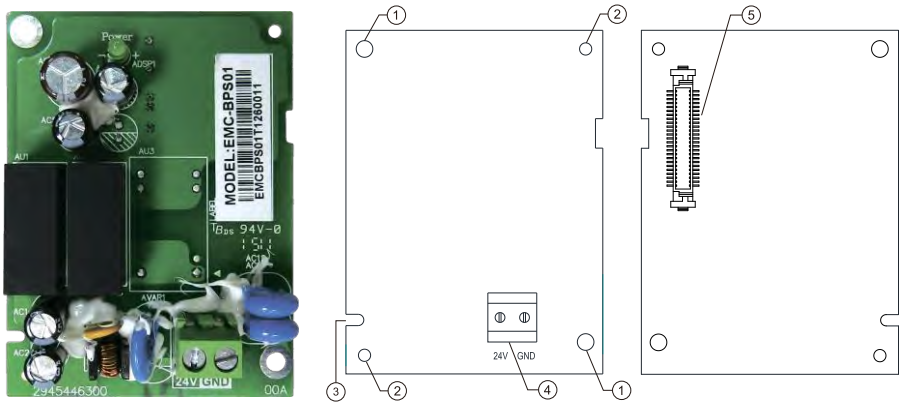
1. Screw fixing hole
2. Positioning hole
3. Analog I/O card fool-proof groove
4. Terminal block
5. AC motor drive connection port

Figure 8-47

	Terminals	Descriptions
Relay Extension Card	RA10–RA15 RC10–RC15	Refer to Pr.02-36– Pr.02-41 for multi-function output selection Resistive load: 3A (N.O.) / 250 V_{AC} 5A (N.O.) / 30 V_{DC} Inductive load (COS 0.4) 1.2A (N.O.) / 250 V_{AC} 2.0A (N.O.) / 30 V_{DC} It is used to output each monitor signal, such as drive is in operation, frequency attained or overload indication.

Table 8-5

8-5 EMC-BPS01 -- +24V power card



1. Screw fixing hole
2. Positioning hole
3. Analog I/O card fool-proof groove
4. Terminal block
5. AC motor drive connection port

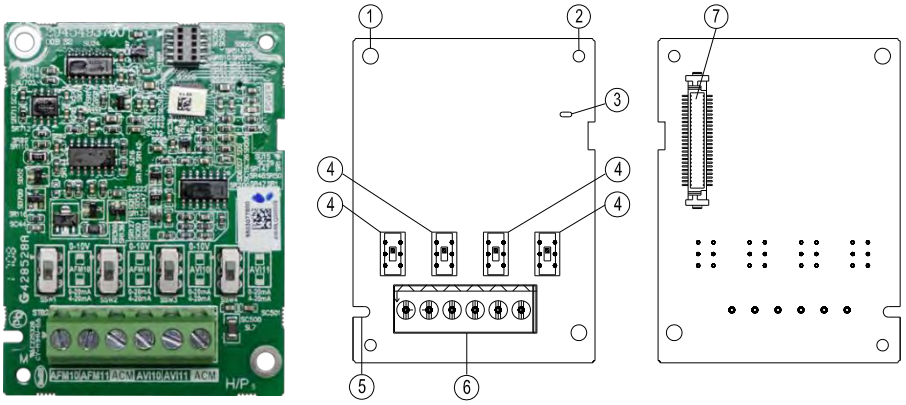
Figure 8-48

	Terminals	Descriptions
External Power Supply	24V GND	Input power: 24 V± 5% Maximum input current: 0.5 A **NOTE:** Do not connect drive control terminal GND directly to the EMC-BPS01 input terminal GND.
		Function: When the drive is only powered by EMC-BPS01, the communication can be assured and support all communication cards and following functions: ● Parameters read and write ● Keypad can be displayed ● Keypad button can be operated (except RUN) ● Analog input is effective ● Multi-input (FWD, REV, MI1–MI8) needs external power supply to operate Following functions are not supported: ● Relay output (including extension card), PG card, PLC function

Table 8-6

8-6 EMC-A22A -- Extension card for 2-point analog input/ 2-point analog output

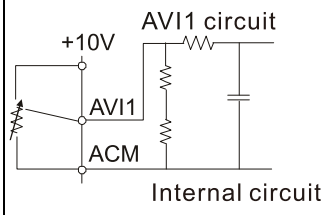
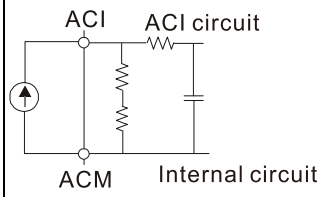
8-6-1 Product File



1. Screw fixing hole
2. Positioning hole
3. POWER indicator light
4. Switch
5. Analog I/O card fool-proof groove
6. Terminal block
7. AC motor drive connection port

Figure 8-49

8-6-2 Terminal Specifications

	Terminals	Descriptions	
Analog I/O Extension Card	AI10, AI11	Refer to Pr.14-00–Pr.14-01 for function selection (input), and Pr.14-18–Pr.14-19 for mode selection. There are two sets of AI port, SSW3 (AI10) and SSW4 (AI11), which can be switched to Voltage or Current mode. Voltage mode: Input 0–10 V Current mode: Input 0–20 mA / 4–20 mA	
		Analog voltage frequency command  Figure 8-50	Impedance: 20 kΩ Range: 0–10 V = 0–Max. Output Frequency (Pr.01-00) Switch: AI10 / AI11 Switch, default 0–10 V
		Analog current frequency command  Figure 8-51	Impedance: 250 Ω Range: 0–20 mA / 4–20 mA = 0–Max. Output Frequency (Pr.01-00) Switch: AI10 / AI11 Switch, default 0–10 V

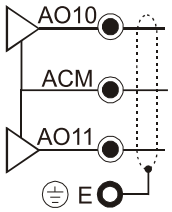
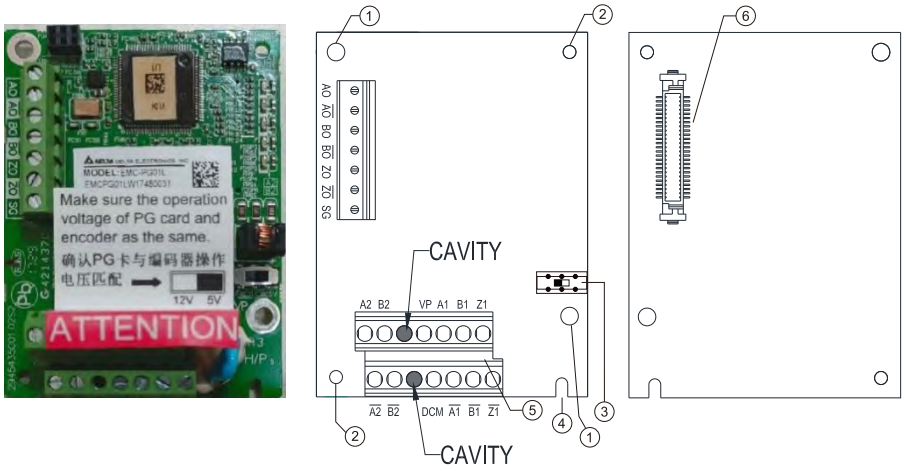
<table>
<tr><td rowspan="3"></td><td rowspan="3">AO10, AO11</td><td colspan="2">Refer to Pr.14-12–Pr.14-13 for function selection (output), and Pr.14-36–Pr.14-37 for mode selection.
There are two sets of AO port, SSW1 (AO10) and SSW2 (AO11), which can be switched to Voltage or Current mode.
Voltage mode: Output 0–10 V
Current mode: Output 0–20 mA / 4–20 mA</td></tr>
<tr><td>Multi-function analog output
 

Figure 8-52</td><td>AVO:
0–10 V Max. output current 2 mA, Max. load 5 kΩ
Output current: 2 mA max
Resolution: 0–10 V corresponds to Max. operation frequency
Switch: AO10 / AO11 Switch, default 0–10 V</td></tr>
<tr><td>ACO:
0–20 mA Max. Load 500 Ω
Output current: 20 mA max
Resolution: 0–20 mA / 4–20 mA corresponds to Max. operation frequency
Switch: AO10 / AO11 Switch, default 0–10 V</td></tr>
<tr><td>ACM</td><td>Analog Signal Common</td><td>Common for analog terminals</td></tr>
</table>

Table 8-7

8-7 EMC-PG01L / EMC-PG02L -- PG card (Line driver)

8-7-1 Product File



1. Screw fixing hole
2. Positioning hole
3. Switch
4. PG card fool-proof groove
5. Terminal block
6. AC motor drive connection port

Figure 8-53

8-7-2 Terminal Description

Set by Pr.10-00–10-02, Pr.10-16–10-18

Terminals		Descriptions
PG1	VP	Output voltage for power: +5 V / +12 V ± 5% (use FSW3 to switch +5V / +12 V) Max. output current: 200 mA
	DCM	Common for power and signal
	A1, /A1, B1, /B1, Z1, /Z1	Encoder input signal (Line Driver or Open Collector) Open Collector input voltage: +5 – +24V (NOTE 1) It can be single-phase or two-phase input. EMC-PG01L: Max. input frequency: 300 kHz EMC-PG02L: Max. input frequency: 30 kHz (NOTE 2)
PG2	A2, /A2, B2, /B2	Pulse Input signal (Line Driver or Open Collector) Open Collector input voltage: +5 – +24V (NOTE 1) It can be single-phase or two-phase input. EMC-PG01L: Max. input frequency: 300 kHz EMC-PG02L: Max. input frequency: 30 kHz (NOTE 2)
PG OUT	AO, /AO, BO, /BO, ZO, /ZO, SG	PG Card Output signals. It has division frequency function: 1–255 times Max. output voltage for Line driver: 5 V_{DC} Max. output current: 15 mA EMC-PG01L Max. output frequency: 300 kHz EMC-PG02L Max. output frequency: 30 kHz SG is the GND of PG card. It is also the GND of position machine or PLC to make the output signal to be the common pivot point.

Table 8-8

NOTE:

1. Open Collector application, input current 5–15 mA to each set then each set needs one pull-up resistor.

If input voltage of open collector is 24V, the power of encoder needs to be connected externally. Refer to diagram 2 of PG1.

5V	Recommended pull-up resistor: above 100–220 Ω, 1/2W
12V	Recommended pull-up resistor: above 510–1.35 kΩ, 1/2W
24V	Recommended pull-up resistor, above 1.8k–3.3 kΩ, 1/2W

Table 8-9

2. If the required bandwidth is not over 30 kHz at the application, it is recommended to use EMC-PG02O / EMC-PG02L (bandwidth 30 kHz) to avoid interference.

PG1 card wiring diagram (two images below are wiring diagrams of open collector encoder)

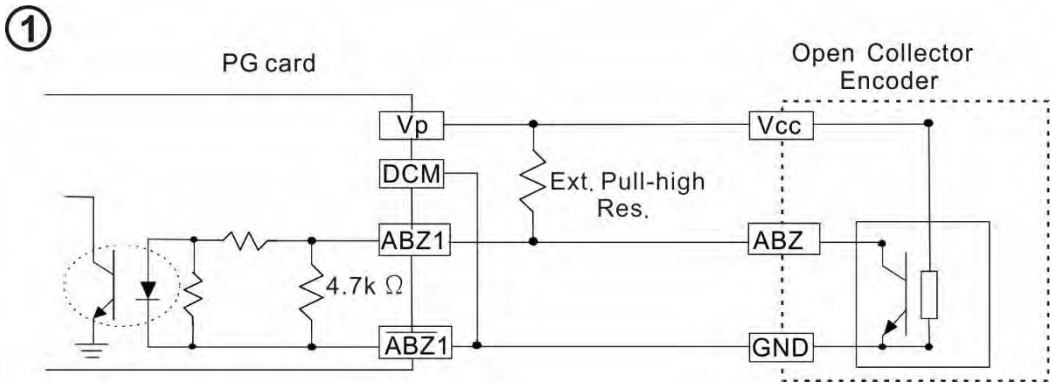


Figure 8-54

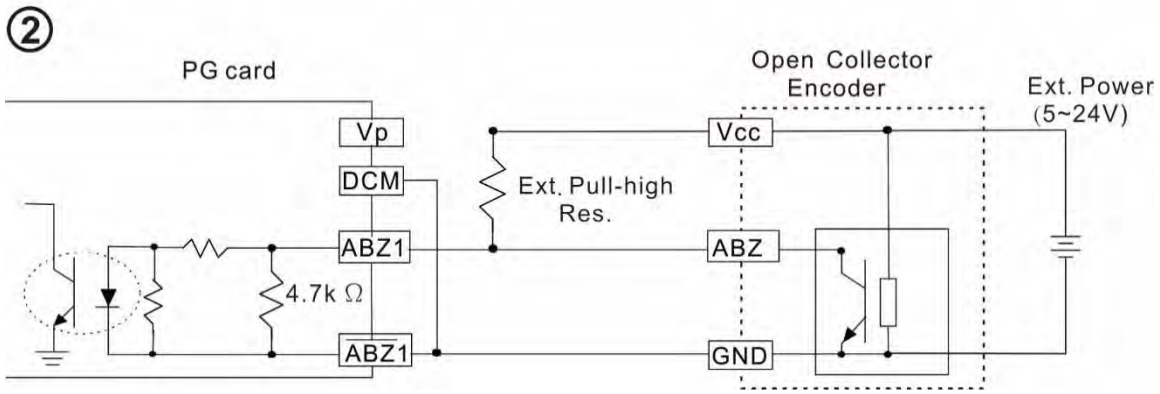


Figure 8-55

PG2 wiring diagram

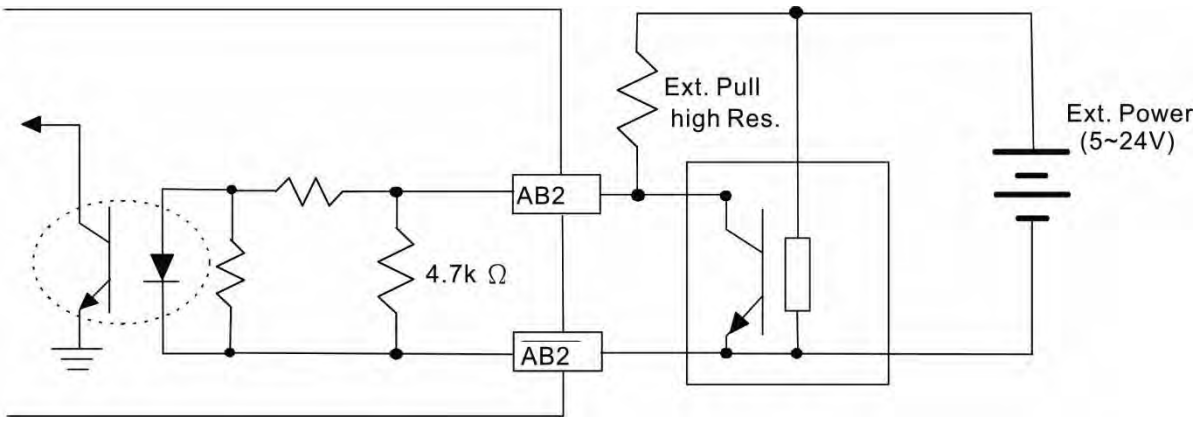


Figure 8-56

8-7-3 EMC-PG01L / EMC-PG02L Wiring Diagram

- Use a shielded cable to prevent interference. Do not run control wires parallel to any high voltage AC power line (200 V_{AC} and above).
- Recommended wire size 0.2–0.75 mm^2 (24–18 AWG).
- Cable length: Single-phase input, less than 30 m / two-phase input, less than 100 m.

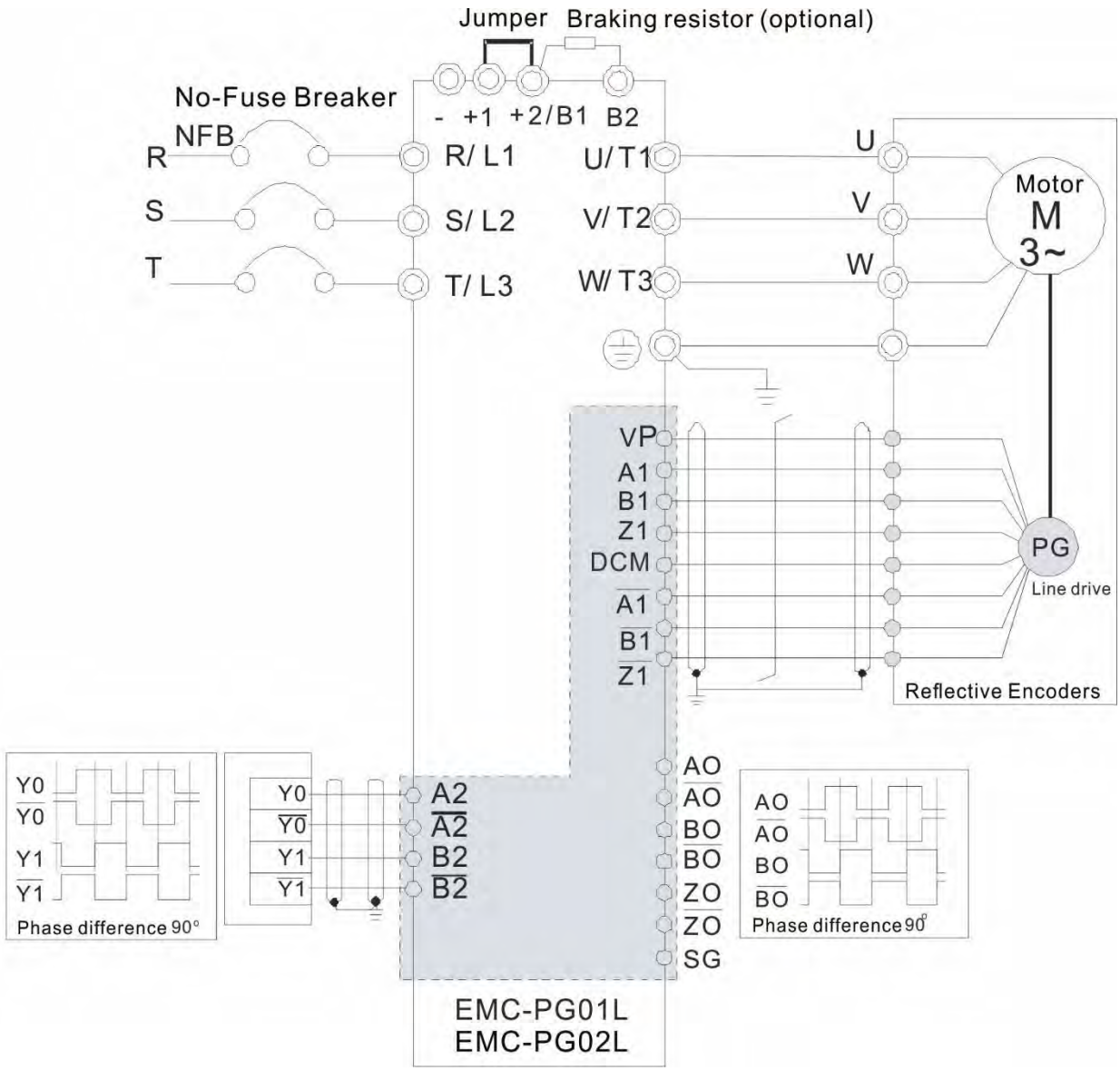
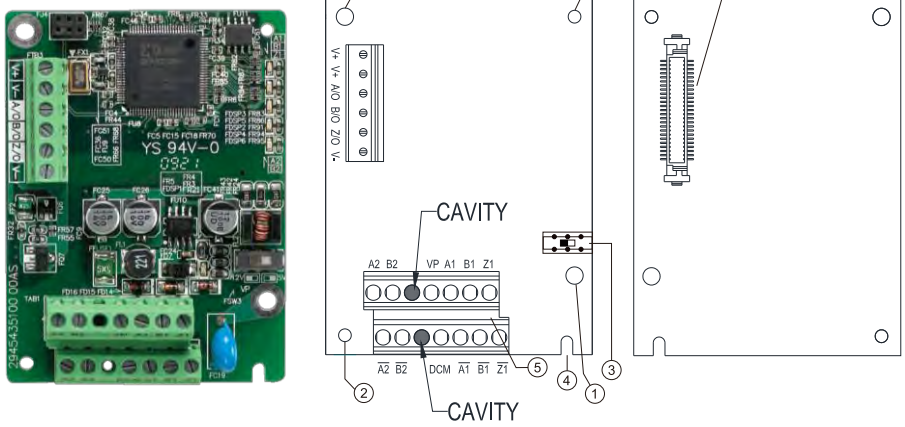


Figure 8-57

8-8 EMC-PG01O / EMC-PG02O -- PG card (Open collector)

8-8-1 Product File



1. Screw fixing hole
2. Positioning hole
3. Switch
4. PG card fool-proof groove
5. Terminal block
6. AC motor drive connection port

Figure 8-58

8-8-2 Terminal Descriptions

Set by Pr.10-00–10-02, Pr.10-16–10-18

Terminals		Descriptions
PG1	VP	Output voltage for power: +5V/+12V±5% (use FSW3 to switch +5V/+12V) Max. output current: 200 mA
	DCM	Common for power and signal
	A1, /A1, B1, /B1, Z1, /Z1	Encoder Input signal (Line Driver or Open Collector) Open Collector Input Voltage: +5V – +24V (NOTE 1) It can be single-phase or two-phase input. EMC-PG01O Max. input frequency: 300 kHz EMC-PG02O Max. input frequency: 30 kHz (NOTE 2)
PG2	A2, /A2, B2, /B2	Pulse Input Signal (Line Driver or Open Collector) Open Collector Input Voltage: +5 – +24V (NOTE 1) It can be single-phase or two-phase input. EMC-PG01O Max. input frequency: 300 kHz EMC-PG02O Max. input frequency: 30 kHz (NOTE 2)
PG OUT	V+, V+	Needs external power source for PG OUT circuit. Input voltage of power: +7V – +24V
	V-	Input voltage for the negative side
	A/O, B/O, Z/O	PG Card Output signals have division frequency function: 1–255 times. On the open collector's output signal, add a high-pull resistor on the external power V+ – V- (e.g. power of PLC) to prevent the interference of the receiving signal. Max. [Three pull-up resistor are included in the package (1.8 kΩ / 1W)] (NOTE 1) EMC-PG01O Max. input frequency: 300 kHz EMC-PG02O Max. input frequency: 30 kHz (NOTE 2)

Table 8-10

NOTE:

1. Open Collector application, input current 5–15 mA to each set then each set needs one pull-up resistor. If input voltage of open collector is 24V, the power of encoder needs to be connected externally. Refer to diagram 2 of PG1.

5V	Recommended pull-up resistor: above 100–220 Ω, 1/2W
12V	Recommended pull-up resistor: above 510–1.35 kΩ, 1/2W
24V	Recommended pull-up resistor, above 1.8k–3.3k Ω, 1/2W

Table 8-11

2. If the required bandwidth is not over 30 kHz at the application, it is recommended to use EMC-PG02O / EMC-PG02L (bandwidth 30 kHz) to avoid interference.

PG1 card wiring diagram (three images below are wiring diagrams of open collector encoder)

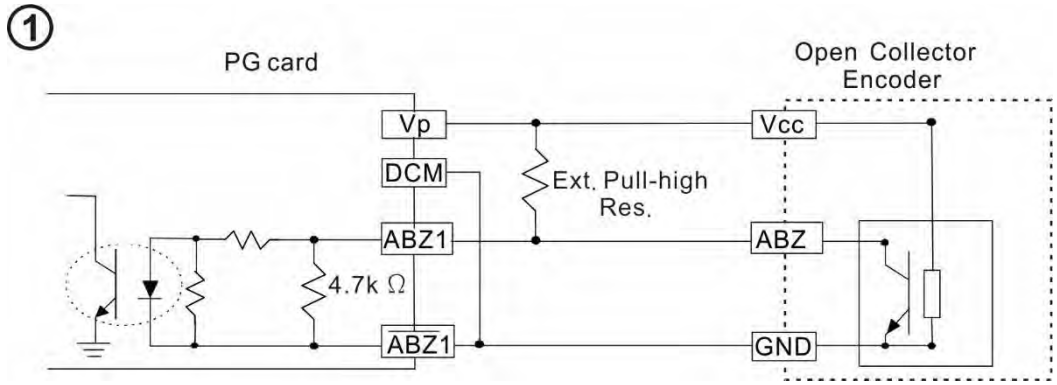


Figure 8-59

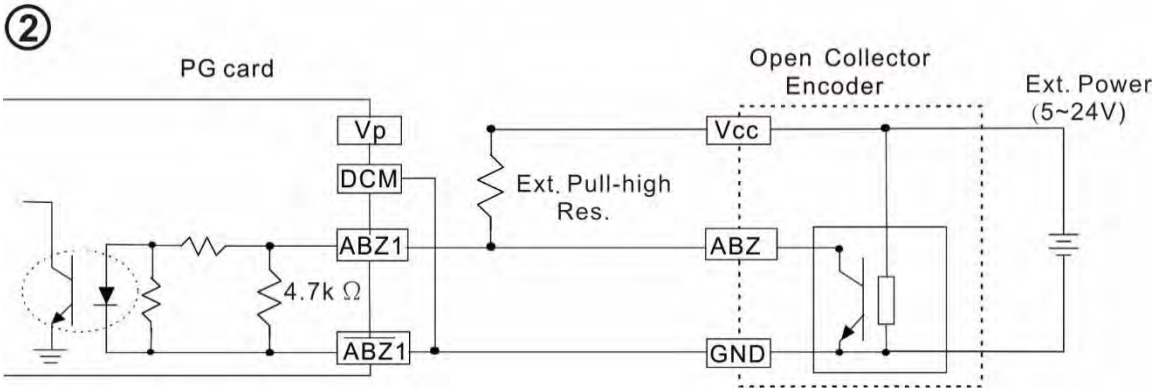


Figure 8-60

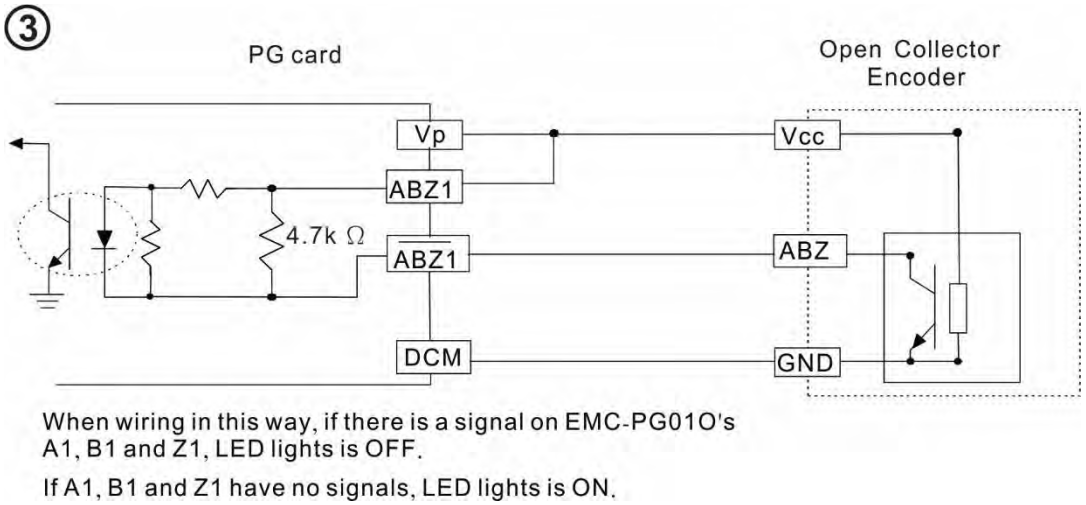


Figure 8-61

PG2 Wiring Diagram

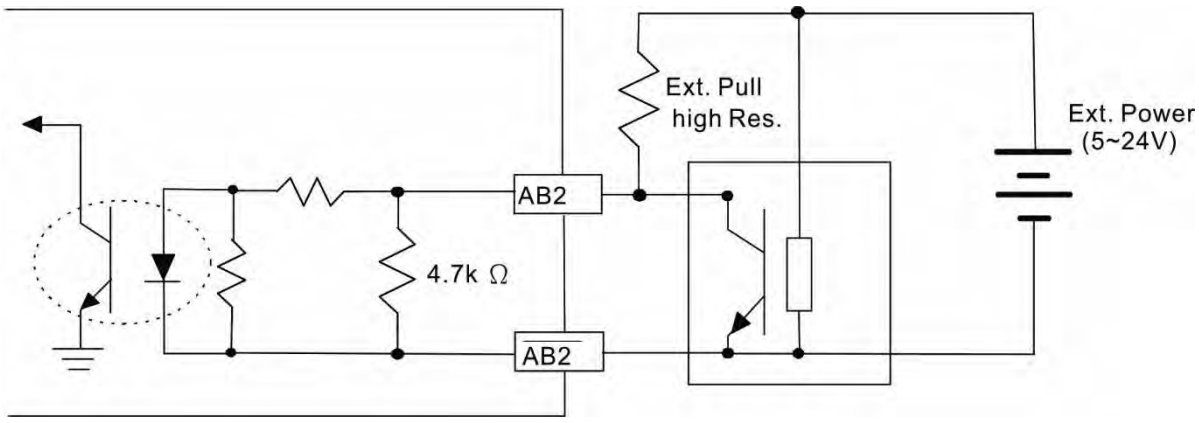


Figure 8-62

8-8-3 EMC-PG01O / EMC-PG02O Wiring Diagram

- Use a shielded cable to prevent interference. Do not run control wires parallel to any high voltage AC power line (200 V and above).
- Recommended wire size 0.2–0.75 mm^2 (24–18 AWG).
- Cable length: Single-phase input, less than 30 m / two-phase input, less than 100 m.

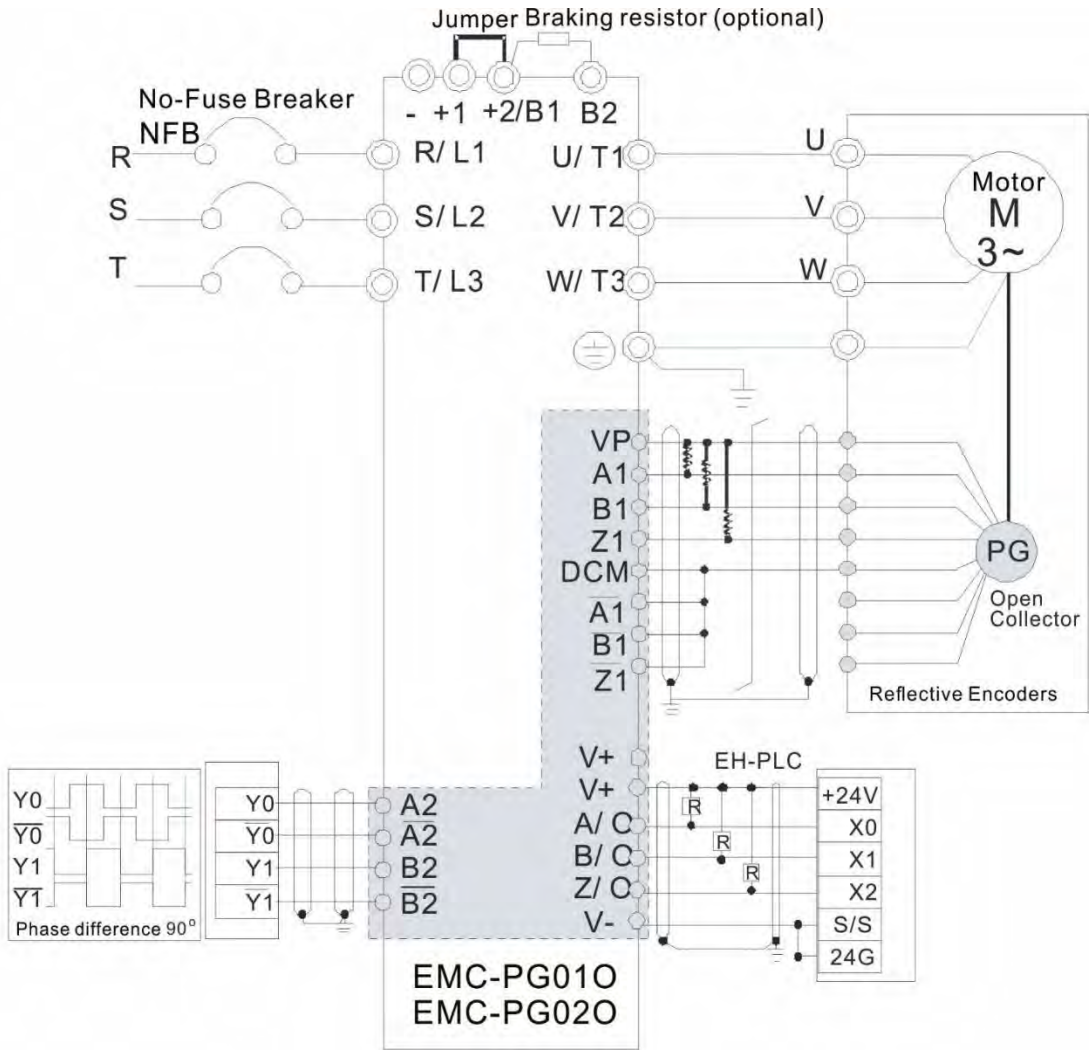
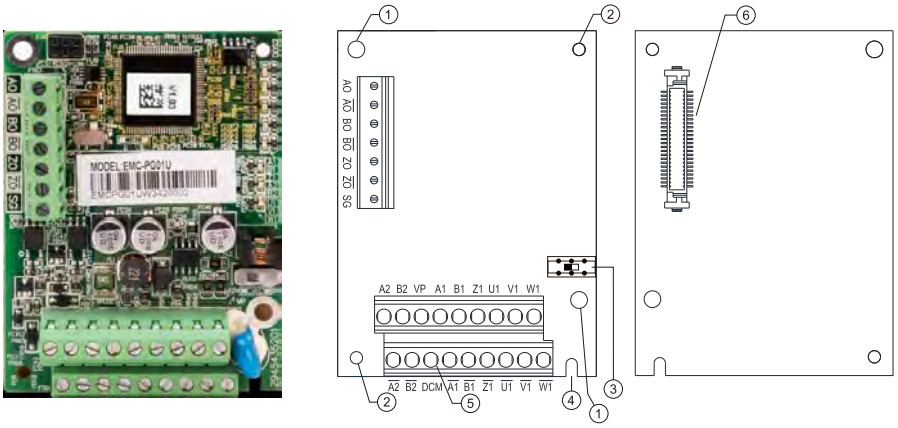


Figure 8-63

8-9 EMC-PG01U / EMC-PG02U -- PG card (ABZ Incremental encoder signal / UVW Hall position signal input)

1. FSW1 S: Standard UVW Output Encoder; D: Delta Encoder
2. When using the Delta Encoder, wait for at least 250 ms after powering up to receive signals from UVW. If a running command is received before UVW signals finished, a PGF5 error message will be given. So wait for 250 ms before sending a running command.
3. EMC-PG02U has encoder disconnection detection function.

8-9-1 Product File



1. Screw fixing hole
2. Positioning hole
3. Switch
4. PG card fool-proof groove
5. Terminal block
6. AC motor drive connection port

Figure 8-64

8-9-2 Terminal Descriptions

Set by Pr.10-00–10-02, Pr.10-16–10-18

Terminals		Descriptions
PG1	VP	Output voltage for power: +5V / +12V ± 5% (use FSW3 to switch +5V / +12V) Max. output current: 200 mA
	DCM	Common for power and signal
	A1, /A1, B1, /B1, Z1, /Z1	Encoder input signal (Line Driver) It can be single-phase or two-phase input. Max. output frequency: 300 kHz
	U1, /U1, V1, /V1, W1, /W1	Encoder input signal
PG2	A2, /A2, B2, /B2	Pulse Input signal (Line Driver or Open Collector) Open Collector Input Voltage: +5 – +24V (NOTE1) It can be single-phase or two-phase input. Max. output frequency: 300 kHz.

PG OUT	AO, /AO, BO, /BO, ZO, /ZO, SG	PG Card Output signals. It has division frequency function: 1–255 times Max. output voltage for Line driver: 5 V_{DC} Max. output current: 15 mA Max. output frequency: 300 kHz SG is the GND of PG card. It is also the GND of position machine or PLC to make the output signal to be the common pivot point.

Table 8-12

NOTE:

1. Open Collector application, input current 5–15 mA to each set then each set needs one pull-up resistor.

5V	Recommended pull-up resistor: above 100–220 Ω, 1/2W
12V	Recommended pull-up resistor: above 510–1.35 kΩ, 1/2W
24V	Recommended pull-up resistor, above 1.8k–3.3 kΩ, 1/2W

Table 8-13

PG2 Wiring Diagram

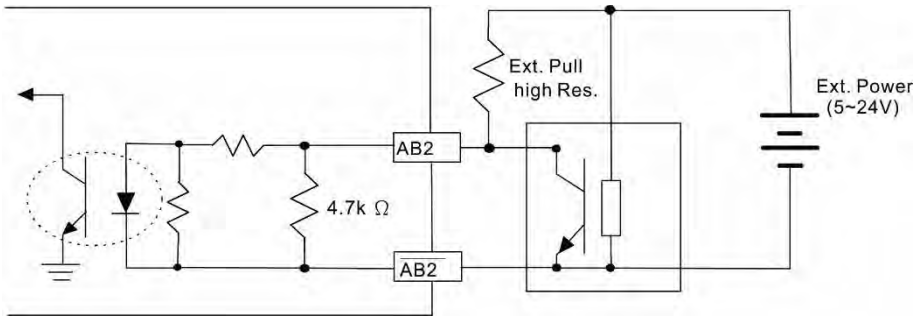


Figure 8-65

8-9-3 EMC-PG01U Wiring Diagram

- Use a shielded cable to prevent interference. Do not run control wires parallel to any high voltage AC power line (200 V and above).
- Recommended wire size 0.2–0.75 mm^2 (24–18 AWG).
- Cable length: Single-phase input, less than 30 m / two-phase input, less than 100 m.

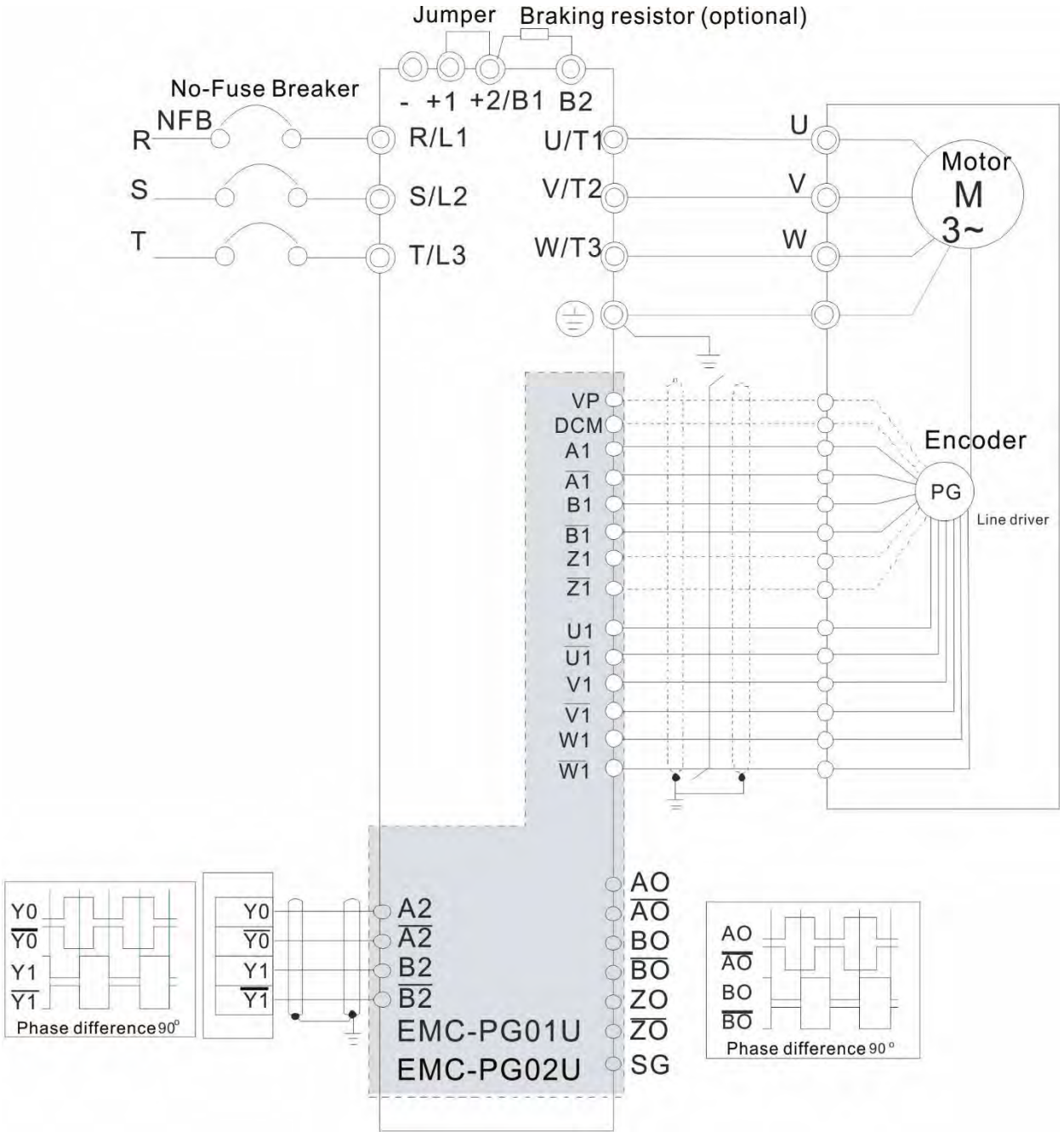
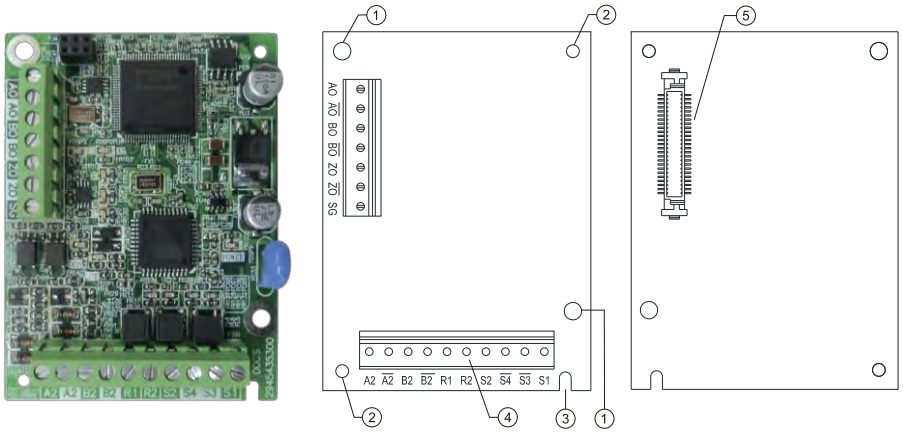


Figure 8-66

8-10 EMC-PG01R -- PG card (Resolver)

8-10-1 Product File



1. Screw fixing hole
2. Positioning hole
3. PG card fool-proof groove
4. Terminal block
5. AC motor drive connection port

Figure 8-67

8-10-2 Terminal Descriptions

Set by Pr.10-00–10-02 and Pr.10-30 Resolver. (Pr.10-00=3, Pr.10-01=1024)

Terminals		Descriptions
PG1	R1- R2	Resolver Output Power 7 Vrms, 10 kHz
	S1, /S3, S2, /S4,	Resolver Input Signal (S2, /S4=Sin; S1, /S3=Cos) 3.5±0.175 Vrms, 10 kHz
PG2	A2, /A2, B2, /B2	Pulse Input signal (Line Driver or Open Collector) Open Collector Input Voltage: +5 – +24V (NOTE 1) It can be single-phase or two-phase input. Max. output frequency: 300 kHz
PG OUT	AO, /AO, BO, /BO, ZO, /ZO, SG,	PG Card Output signals. It has division frequency function: 1–255 times Max. output voltage for Line driver: 5 V_{DC} Max. output current: 15 mA Max. output frequency: 300 kHz SG is the GND of PG card. It is also the GND of position machine or PLC to make the output signal to be the common pivot point.

Table 8-14

NOTE:

1. Open Collector application, input current 5–15 mA to each set then each set needs one pull-up resistor.

5V	Recommended pull-up resistor: above 100–220 Ω, 1/2W
12V	Recommended pull-up resistor: above 510–1.35 kΩ, 1/2W
24V	Recommended pull-up resistor, above 1.8k–3.3 kΩ, 1/2W

Table 8-15

PG2 Wiring Diagram

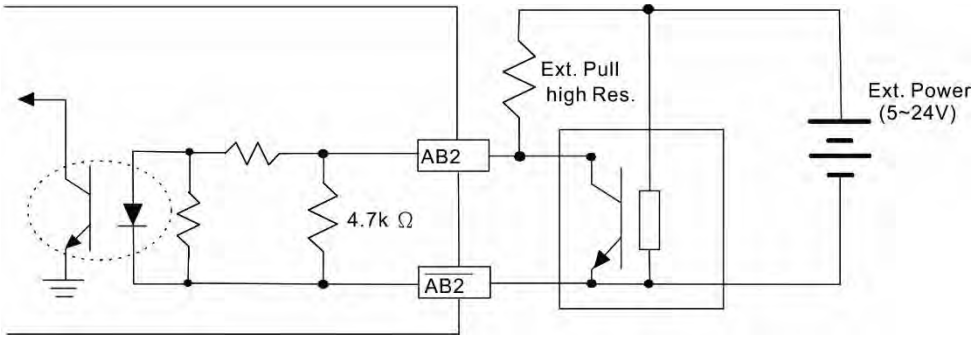


Figure 8-68

- DOS (Degradation of Signal): If the amplitude of the sine wave input of the S1-/S3/ S2-/S4 is lower than or higher than the encoder IC's specification, a red light will be on. The possible reasons which cause this problem are the following.
  1. The turns ratio of the resolver encoder is not 1:0.5 which makes the sine wave input of the S1-/S3/S2-/S4 not equal to 3.5±0.175 Vrms.
  2. While motor is running, motor creates common mode noise which makes accumulated voltage to be more than 3.5±0.175 Vrms

- LOT (Loss of Tracking): Compare the angle of S1-/S3/S2-/S4 sine wave input to the R1-R2 cosine wave. If their difference is more than 5 degrees, a red light will be on. Here are the possible reasons why that happens:
  1. The output frequency of the PG card is incorrect.
  2. The specification of Resolver's encoder is not 10 kHz
  3. The motor creates common mode noise while it is running. That causes a big difference, while the motor is rotating, between main winding's cosine wave angle and the sine wave angle of second and third windings.

8-10-3 EMC-PG01R Wiring Diagram

- Use a shielded cable to prevent interference. Do not run control wires parallel to any high voltage AC power line (200 V_{AC} and above).
- Recommended wire size 0.2–0.75 mm^2 (24–18 AWG).
- Cable length: PG1 input, less than 30m; PG2 single-phase input, less than 30 m / two-phase input, less than 100 m.

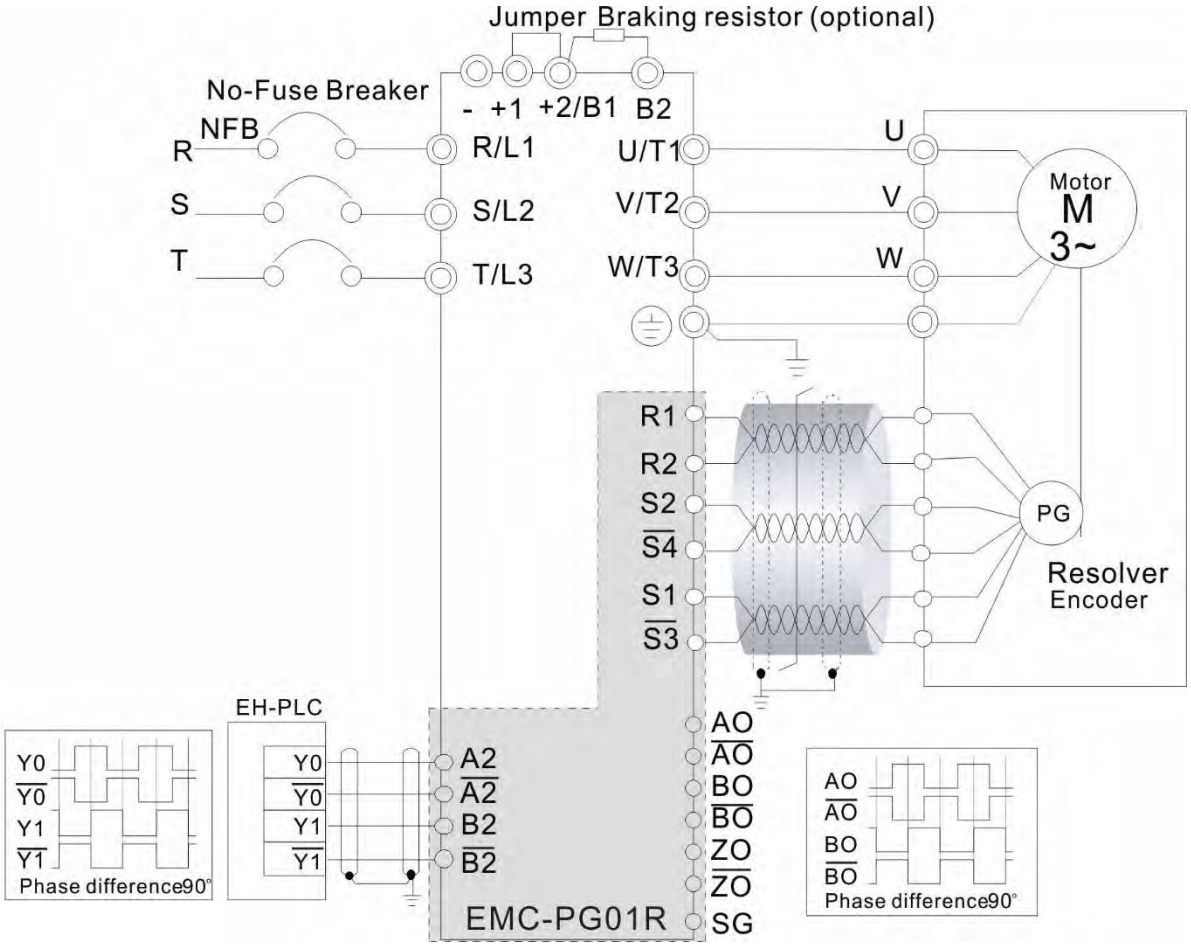
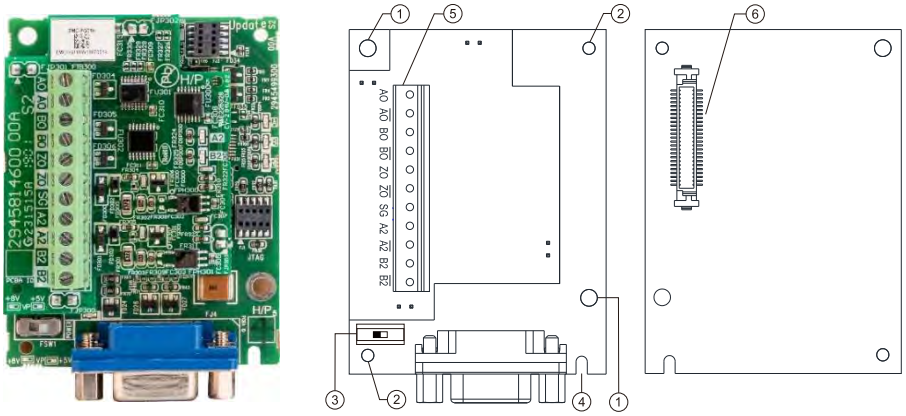


Figure 8-69

8-11 EMC-PG01H – PG card (SinCos)

1. The PG1 at input side is SinCos signal of 1 Vpp, and the bandwidth is 600 kHz.
2. The principle of operation for a SinCos encoder is similar to a square-wave encoder, but use SinCos signal instead.
3. The pulse unit of SinCos encoder is LPR (Lines per revolution), 1024 LPR means 1024 SinCos signals per revolution with single phase.

8-11-1 Product File

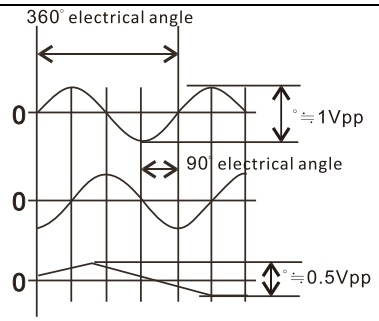
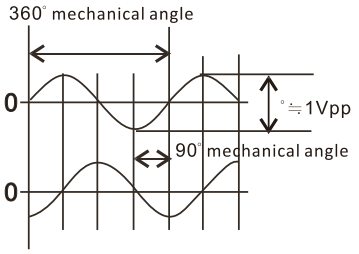


1. Screw fixing hole
2. Positioning hole
3. Switch
4. PG card fool-proof groove
5. Terminal block
6. AC motor drive connection port

Figure 8-70

8-11-2 Terminal Descriptions

Set by Pr.10-00–10-03 and Pr.10-16–10-18.

Terminals		Descriptions	
PG1	VP	Power output voltage: +5V / +8V ± 5% (+5V / +8V decided by FSW1) Max. output current: 200 mA	
	DCM	Digital control / Frequency signal common	
	A+, A-, B+, B-, R+, R-	Encoder wave difference signal input (Incremental signal) Max. output frequency: 600 kHz	 Figure 8-71
	C+, C-, D+, D-	Encoder wave difference signal input (Absolute signal)	 Figure 8-72

PG2	A2, /A2, B2, /B2	Pulse Input signal (Line Driver or Open Collector) Open Collector Input Voltage: +5 – +24V (NOTE 1) It can be single-phase or two-phase input. Max. output frequency: 300 kHz
PG OUT	AO, /AO, BO, /BO, ZO, /ZO, SG	PG Card Output signals. It has division frequency function: 1–255 times Max. output voltage for Line driver: 5 V_{DC} Max. output current: 15 mA Max. output frequency: 600 kHz ± 5% SG is the GND of PG card. It is also the GND of position machine or PLC to make the output signal to be the common pivot point.
FSW1 		Use FSW1 to switch the power of VP: +5V / +8V  +8V +5V

Table 8-16

NOTE:

1. Open Collector application, input current 5–15 mA to each set then each set needs one pull-up resistor. If input voltage of open collector is 24V, the power of encoder needs to be connected externally. Refer to diagram 2 of PG2.

5V	Recommended pull-up resistor: above 100–220 Ω, 1/2W
12V	Recommended pull-up resistor: above 510Ω–1.35 kΩ, 1/2W
24V	Recommended pull-up resistor: above 1.8k–3.3 kΩ, 1/2W

Table 8-17

PG1 Terminal descriptions (15pin D-SUB female connector)

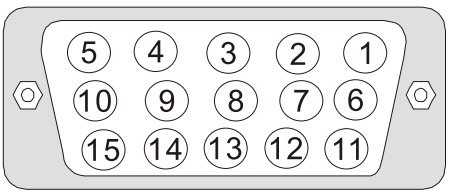


Figure 8-73

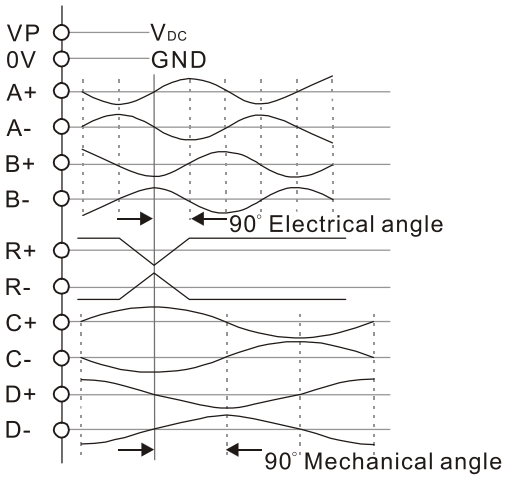


Figure 8-74

No.	Terminals	No.	Terminals
1	B-	9	VP
2	NC	10	C+
3	R+	11	C-
4	R-	12	D+
5	A+	13	D-
6	A-	14	NC
7	DCM	15	NC
8	B+		

Table 8-18

PG2 wiring diagram

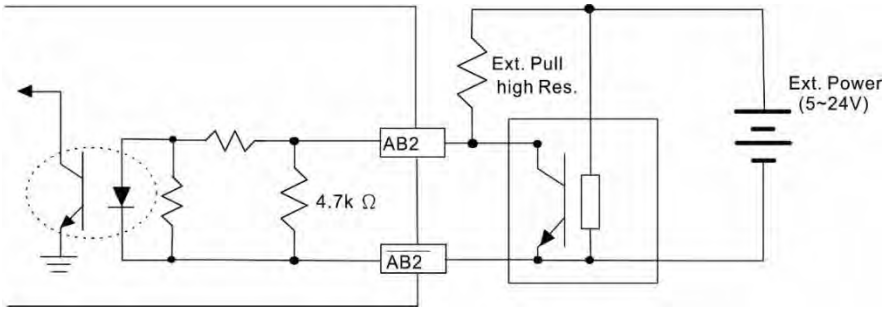


Figure 8-75

8-11-3 EMC-PG01H Wiring Diagram

- Use a shielded cable to prevent interference. Do not run control wires parallel to any high voltage AC power line (200 V_{AC} and above).
- Recommended wire size 0.2–0.75 mm^2 (24–18 AWG).
- Cable length: PG1 input, less than 10 m; PG2 single-phase input, less than 30 m / two-phase input, less than 100 m.

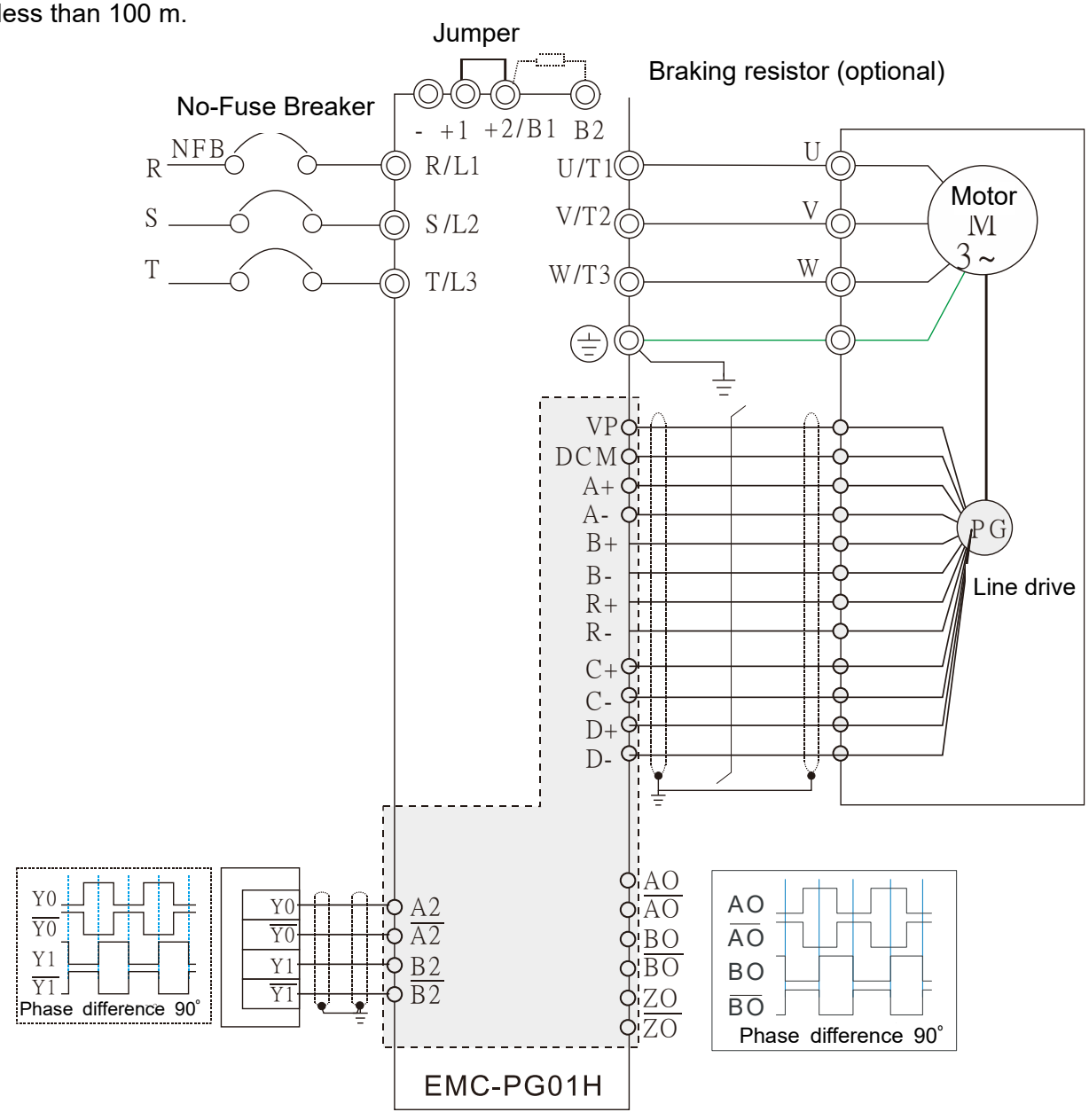


Figure 8-76

8-12 EMC-MC01 – Motion control card

EMC-MC01 motion control card supports C2000 Plus and CH2000 drives to meet the high accuracy and high response motion control demand. This product provides two functions: synchronous motion control mode, and decoding the communication encoder.

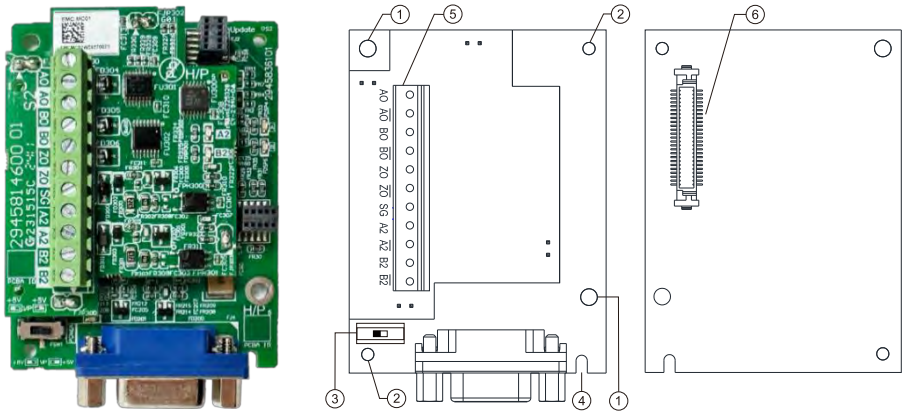
Comply with CiA402 international regulation, use EMC-MC01 with EtherCAT communication for its synchronous motion control function (CSP, CST). For the communication encoder function, in addition to receiving the encoder data and supplying the encoder power, the EMC-MC01 also supports a set of pulse input and a set of pulse output, which increases the diversity of practical applications.

8-12-1 Specification

Items		Specifications
Main Specification	Motion Control Mode	CSP: Cyclic Synchronous Position Mode CST: Cyclic Synchronous Torque Mode HM: Homing Mode PP: Profile Position Mode PT: Profile Torque Mode VL: Velocity Mode IP: Interpolated Position Mode
	Encoder Format	Supports Tamagawa encoder signal, use DATA+ / DATA- to decode the signal
Hardware Specification	Dimension (W × H × D)	52.5 mm × 75.9 mm × 16.8 mm
	Encoder Input	RS-485 (Tamagawa communication format)
	Power Output	5V / 8V ± 5%
	Wire Length	Maximum 10 m
Certifications		ESD (IEC 61800-5-1, IEC 61000-4-2) EFT (IEC 61800-5-1, IEC 61000-4-4) Surge Test (IEC 61800-5-1, IEC 61000-4-5) Conducted Susceptibility Test (IEC 61800-5-1, IEC 61000-4-6)
Operation Environment		Temperature: -10–50°C Humidity: 90%

Table 8-19

8-12-2 Product File



1. Screw fixing hole
2. Positioning hole
3. Switch
4. Motion control card fool-proof groove
5. Terminal block
6. AC motor drive connection port

Figure 8-77

8-12-3 Terminal Descriptions

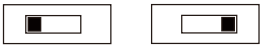
Terminals		Descriptions
PG1	VP	Power output voltage: +5V / +8V ± 5% (+5V / +8V determined by FSW1) *1 Max. output current: 200 mA
	DCM	Digital control / Frequency signal common
	DATA+, DATA-	Read and process the encoder data transmission
PG2	A2, /A2, B2, /B2	Pulse Input signal (Line Driver or Open Collector) Open Collector Input Voltage: +5V – +24V *2 It can be single-phase or two-phase input Max. input frequency: 300 kHz
PG OUT	AO, /AO, BO, /BO, ZO, /ZO, SG	PG Card output signals. It has division frequency function: 1–255 times Max. output voltage for Line driver: 5 V_{DC} Max. output current:15 mA Max. output frequency: 600 kHz ± 5% SG is the GND of PG card. It is also the GND of position machine or PLC to make the output signal to be the common pivot point.
FSW1 		Use FSW1 to switch the power of VP: +5V / +8V *1  +8V +5V

Table 8-20

NOTE:

1. The current input voltage for Tamagawa encoder is +5V, ensure to switch to +5V before the installation. The voltage +8V is reserved for the power demand of other encoders in the future.
2. Open Collector application, input current 5–15 mA to each set then each set needs one pull-up resistor. If input voltage of open collector is 24V, the power of encoder needs to be connected externally. Refer to diagram 2 of PG2.

PG1 Terminal Descriptions (15pin D-SUB female connector)

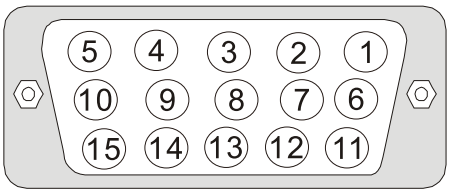


Figure 8-78

No.	Terminal	No.	Terminal
1	Reserved	9	VP
2	NC	10	NC
3	Data+	11	NC
4	Data-	12	NC
5	Reserved	13	NC
6	Reserved	14	Reserved
7	DCM	15	Reserved
8	Reserved		

Table 8-21

PG2 Wiring Diagram

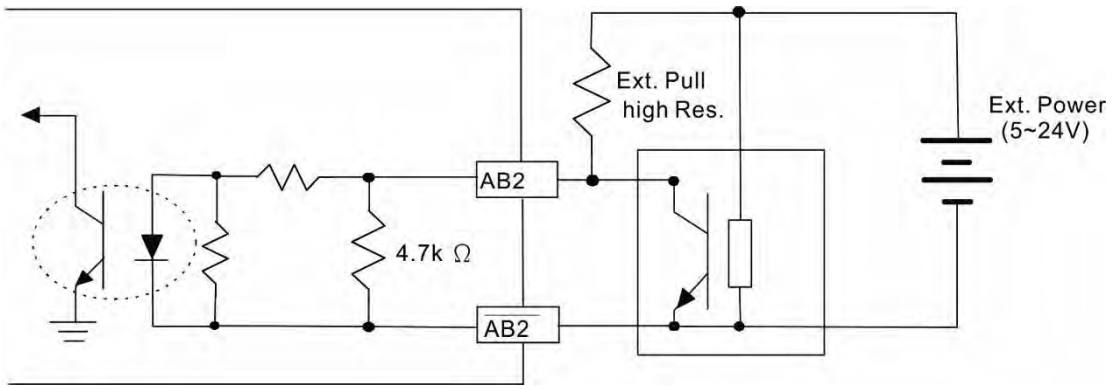


Figure 8-79

8-12-4 EMC-MC01 Wiring Diagram

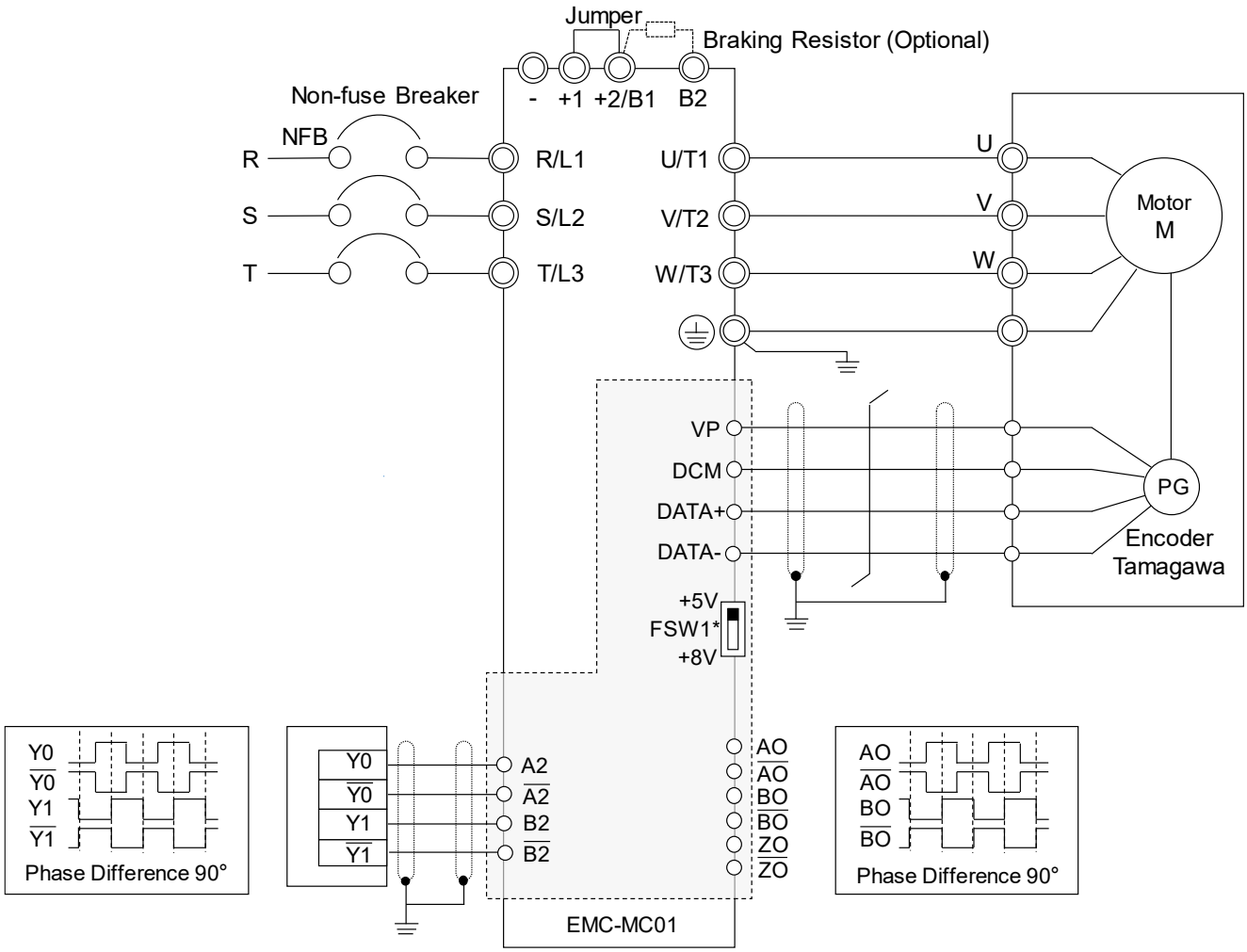


Figure 8-80

NOTE: The current input voltage for Tamagawa encoder is +5V, ensure to switch to +5V before the installation. The voltage +8V is reserved for the power demand of other encoders in the future.

8-12-5 Drive Setting

The following is the drive's parameter setting when install EMC-MC01.

Example: Delta Servo Motor MSJ series 7 kW models (Model: MSJ-LA2070E42E):

Encoder Information

Signal Format: Tamagawa

Resolution: 17bit (Single-turn)

2^{17} = 131072

131072 ÷ 4 = 32768

Parameter Setting

Refer to the following descriptions for more details.

Pr.10-00 = 8

Pr.10-01 = 32768

Pr.10-02 = 1

10-00 Encoder Type Selection

Default: 0

Settings 0: Disabled
8: Tamagawa

📖 Pr.10-00 = 8 (Tamagawa), encoder input type (Pr.10-02) is set to 1. The default of encoder pulses per revolution (Pr.10-01) is 32768.

10-01 Encoder Pulses per Revolution

Default: 600

Settings 1–65535

📖 Pr.10-00 = 8 (Tamagawa), the default for Pr.10-01 is 32768, which is only applied to Tamagawa encoder with 17bit single-turn revolution.

📖 When the single-turn resolution of communication encoder is not 17 bit, you can change the setting for Pr.10-01. Divide the actual encoder single-turn resolution by 4 before the setting. For example: when the communication encoder resolution is 14 bit (16384), Pr.10-01 = 4096. This setting method does not affect the encoder resolution, it is used only to comply the old ABZ incremental encoder setting rules.

📖 Currently support the encoder resolution to maximum 17 bit.

10-02 Encoder Input Type Setting

Default: 0

📖 When Pr.10-00 = 8 (Tamagawa), Pr.10-02 is set to 1.

📖 When Pr.10-00 = 8 (Tamagawa): if the drive appears PGF1 error when pressing RUN under the PG mode, switch any two of the motor UVW wires then restart the operation. If it is PM, you need to re-execute the dynamic test for PM magnetic pole (Pr.05-00 = 4).

10-03 Frequency Division Output Setting (Denominator)

Default: 1

Settings 1–255

📖 When the encoder input type is Tamagawa (Pr.10-00 = 8), set Pr.10-03 as indicated below:

One turn of the encoder, PG card single-phase pulse output (A-phase and B-phase) = $\left(\frac{\text{Encoder single-turn resolution}}{2^{(10\text{-}03)+5}}\right) \div 4$ 。

For example: When the encoder resolution is 131072 and Pr.10-03 = 1, the PG card single-turn pulse output for one turn of the encoder: $\left(\frac{\text{Encoder single-turn resolution}}{2^{(10\text{-}03)+5}}\right) \div 4 = (131072 \div 64) \div 4 =$ 512, both A-phase and B-phase output 512 pulses, the phase difference is 90 degrees.

📖 When Pr.10-03 value + 5 > 30, the program processes as 30.

For example: Pr.10-03 = 50, the PG card single-phase pulse output (A-phase and B-phase) for one turn of the encoder is $\left(\frac{\text{Encoder single-turn resolution}}{2^{30}}\right) \div 4$ 。

NOTE: Encoder single-turn resolution = Pr.10-01 × 4.

8-13 CMC-PD01 -- Communication card, PROFIBUS DP

8-13-1 Features

1. Support PZD control data exchange.
2. Support PKW access AC motor drive parameters.
3. Support user diagnosis function.
4. Auto-detects baud rates; supports a Max. 12 Mbps.

8-13-2 Product Profile

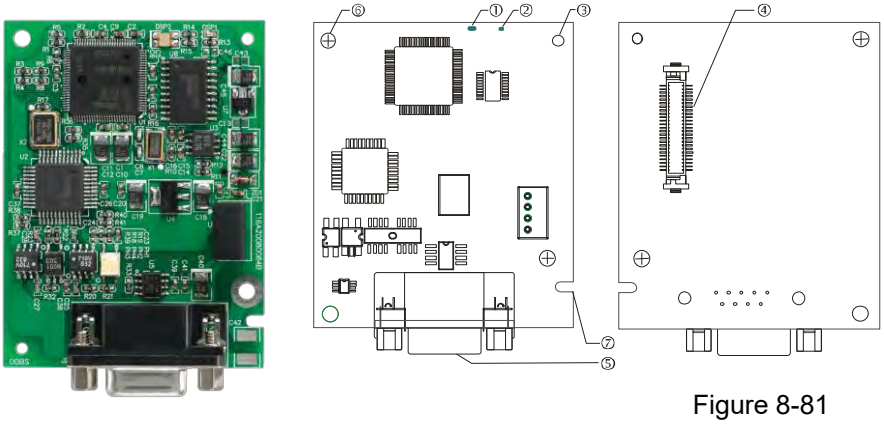


Figure 8-81

1. NET indicator light
2. POWER indicator light
3. Communication positioning hole
4. AC motor drive connection port
5. PROFIBUS DP connection port
6. Screw fixing hole
7. Communication module fool-proof groove

8-13-3 Specifications

PROFIBUS DP Connector

Interface	DB9 connector
Transmission method	High-speed RS-485
Transmission cable	Shielded twisted pair cable
Electrical isolation	500 V_{DC}

Table 8-22

Communication

Message type	Cyclic data exchange
Module name	CMC-PD01
GSD document	DELA08DB.GSD
Company ID	08DB (HEX)
Serial transmission speed supported (auto-detection)	9.6 Kbps; 19.2 Kbps; 93.75 Kbps; 187.5 Kbps; 500 Kbps; 1.5 Mbps; 3 Mbps; 6 Mbps; 12 Mbps (bit per second)

Table 8-23

Electrical Specification

Power supply voltage	5 V_{DC} (supplied by the AC motor drive)
Insulation voltage	500 V_{DC}
Power consumption	1 W
Weight	28 g

Table 8-24

Environment

Noise immunity	ESD (IEC 61800-5-1, IEC 61000-4-2) EFT (IEC 61800-5-1, IEC 61000-4-4) Surge Teat (IEC 61800-5-1, IEC 61000-4-5) Conducted Susceptibility Test (IEC 61800-5-1, IEC 61000-4-6)
Operation /storage	Operation: -10ºC – 50ºC (temperature), 90% (humidity) Storage: -25ºC – 70ºC (temperature), 95% (humidity)
Shock / vibration resistance	International standards: IEC61131-2, IEC60068-2-6 (TEST Fc) / IEC61131-2 & IEC 60068-2-27 (TEST Ea)

Table 8-25

8-13-4 Installation

PROFIBUS DP Connector

PIN	Signal	Definition
1	-	Not defined
2	-	Not defined
3	Rxd/Txd-P	Sending / receiving data P(B)
4	-	Not defined
5	DGND	Data reference ground
6	VP	Power voltage – positive
7	-	Not defined
8	Rxd/Txd-N	Sending / receiving data N(A)
9	-	Not defined

Table 8-26

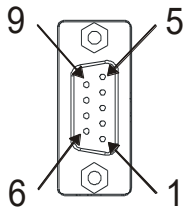


Figure 8-82

8-13-5 LED Indicator & Troubleshooting

There are 2 LED indicators on CMC-PD01: POWER LED and NET LED. POWER LED displays the status of the working power. NET LED displays the connection status of the communication.

POWER LED

LED status	Indication	Corrective Action
Green light ON	Power supply in normal status.	--
OFF	No power	Check if the connection between CMC-PD01 and AC motor drive is normal.

Table 8-27

NET LED

LED status	Indication	Corrective Action
Green light ON	Normal status	--
Red light ON	CMC-PD01 is not connected to PROFIBUS DP bus.	Connect CMC-PD01 to PROFIBUS DP bus.
Red light flashes	Invalid PROFIBUS communication address	Set the PROFIBUS address of CMC-PD01 between 1 – 125 (decimal)
Orange light flashes	CMC-PD01 fails to communicate with the AC motor drive.	Switch OFF the power and check whether CMC-PD01 is correctly and normally connected to AC motor drive.

Table 8-28

8-14 CMC-DN01 -- Communication card, DeviceNet

8-14-1 Functions

1. Based on the high-speed communication interface of Delta HSSP protocol, which is able to conduct immediate control to AC motor drive.
2. Supports Group 2 only slave device connection and polling I/O data exchange.
3. For I/O mapping, supports Max. 32 words of input and 32 words of output.
4. Supports EDS file configuration in DeviceNet configuration software.
5. Supports all baud rates on DeviceNet bus: 125 Kbps, 250 Kbps, 500 Kbps and extendable serial transmission speed mode.
6. Node address and serial transmission speed can be set up on AC motor drive.
7. Power supplied from AC motor drive.

8-14-2 Product Profile

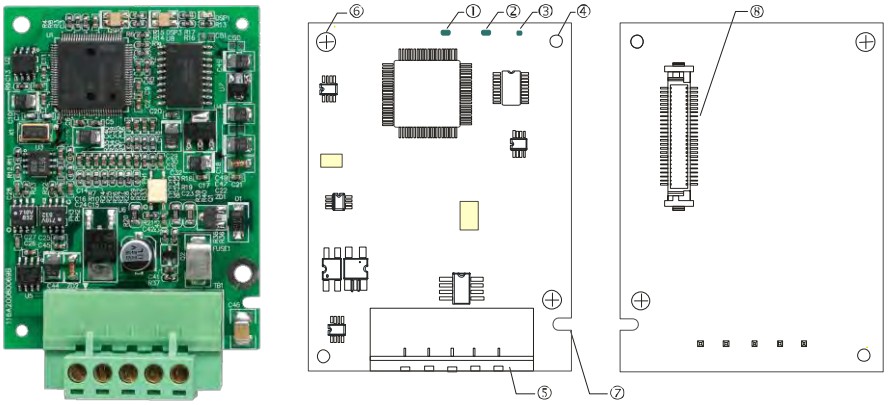


Figure 8-83

1. NS indicator light
2. MS indicator light
3. POWER indicator light
4. Communication module positioning hole
5. DeviceNet connection port
6. Screw fixing hole
7. Communication card fool-proof groove
8. AC motor drive connection port

8-14-3 Specifications

DeviceNet Connector

Interface	5-PIN open removable connector of 5.08 mm PIN interval
Transmission method	CAN
Transmission cable	Shielded twisted pair cable (with 2 power cables)
Transmission speed	125 Kbps, 250 Kbps, 500 Kbps and extendable serial transmission speed mode
Network protocol	DeviceNet protocol

Table 8-29

AC Motor Drive Connection Port

Interface	50 PIN communication terminal
Transmission method	SPI communication
Terminal function	1. Communicating with the AC motor drive 2. Transmitting power supply from the AC motor drive
Communication protocol	Delta HSSP protocol

Table 8-30

Electrical Specification

Power supply voltage	5 V_{DC} (supplied by the AC motor drive)
Insulation voltage	500 V_{DC}
Communication wire power consumption	0.85 W
Power consumption	1 W
Weight	23 g

Table 8-31

Environment

Noise immunity	ESD (IEC 61800-5-1, IEC 61000-4-2) EFT (IEC 61800-5-1, IEC 61000-4-4) Surge Teat(IEC 61800-5-1, IEC 61000-4-5) Conducted Susceptibility Test (IEC 61800-5-1, IEC 61000-4-6)
Operation /storage	Operation: -10ºC – 50ºC (temperature), 90% (humidity) Storage: -25ºC – 70ºC (temperature), 95% (humidity)
Shock / vibration resistance	International standards: IEC61800-5-1, IEC60068-2-6 (TEST Fc) / IEC61800-5-1 & IEC60068-2-27 (TEST Ea)

Table 8-32

8-14-4 Installation

DeviceNet Connector

PIN	Signal	Color	Definition
1	V+	Red	DC 24V
2	H	White	Signal+
3	S	-	Earth
4	L	Blue	Signal-
5	V-	Black	0V

Table 8-33

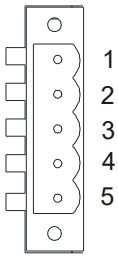


Figure 8-84

8-14-5 LED Indicator & Troubleshooting

There are three LED indicators on the CMC-DN01. POWER LED displays the status of power supply. MS LED and NS LED are dual-color LED, displaying the connection status of the communication and error messages.

POWER LED

LED status	Indication	Corrective Action
OFF	Power supply in abnormal status.	Check the power supply of CMC-DN01.
Green light ON	Power supply in normal status	--

Table 8-34

NS LED

LED status	Indication	Corrective Action
OFF	No power supply or CMC-DN01 does not pass the MAC ID test.	1. Check the power of CMC-DN01 and see if the connection is normal. 2. Make sure at least one or more nodes are on the bus. 3. Check if the serial transmission speed of CMC-DN01 is the same as that of other nodes.
Green light flashes	CMC-DN01 is on-line but does not connect to the master.	1. Configure CMC-DN01 to the scan list of the master. 2. Re-download the configured data to the master.
Green light ON	CMC-DN01 is on-line and normally connects to the master	--
Red light flashes	CMC-DN01 is on-line, but I/O connection is timed-out.	1. Check if the network connection is normal. 2. Check if the master operates normally.
Red light ON	1. The communication is down. 2. MAC ID test failure. 3. No network power supply. 4. CMC-DN01 is off-line.	1. Make sure all the MAC IDs on the network are not repeated. 2. Check if the network installation is normal. 3. Check if the baud rate of CMC-DN01 the same as that of other nodes. 4. Check if the node address of CMC-DN01 is illegal. 5. Check if the network power supply is normal.

Table 8-35

MS LED

LED status	Indication	Corrective Action
OFF	No power supply or being off-line	Check the power supply of CMC-DN01 and see if the connection is normal.
Green light flashes	Waiting for I/O data	Switch the master PLC to RUN status
Green light ON	I/O data is normal	--
Red light flashes	Mapping error	1. Reset CMC-DN01 2. Re-power the AC motor drive
Red light ON	Hardware error	1. See the fault codes displayed on the AC motor drive. 2. Send back to the factory for repair if necessary.
Orange light flashes	CMC-DN01 is establishing connection with the AC motor drive.	If the flashing lasts for a long time, turn off the power and check if CMC-DN01 and the AC motor drive are correctly installed and normally connected to each other.

Table 8-36

8-15 CMC-EIP01 / CMC-EIP02 -- Communication card, EtherNet/IP

8-15-1 Features

1. Supports Modbus TCP and Ethernet/IP protocol
2. User-defined corresponding parameters (use with EIP V.1.06)
3. IP filter simple firewall function
4. MDI/MDI-X auto-detect
5. Baud rate: 10/100Mbps auto-detect

8-15-2 Product Profile

CMC-EIP01

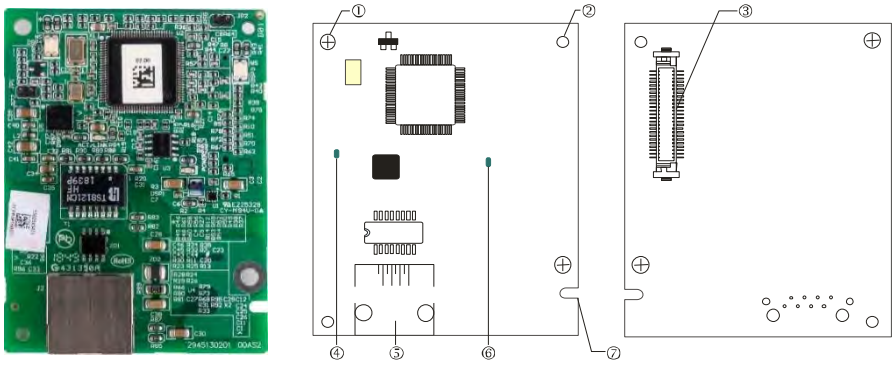


Figure 8-85

1. Screw fixing hole
2. Communication card positioning hole
3. AC motor drive connection port
4. LINK indicator light
5. RJ45 connection port
6. POWER indicator light
7. Communication module positioning hole
8. Communication card fool-proof groove

CMC-EIP02

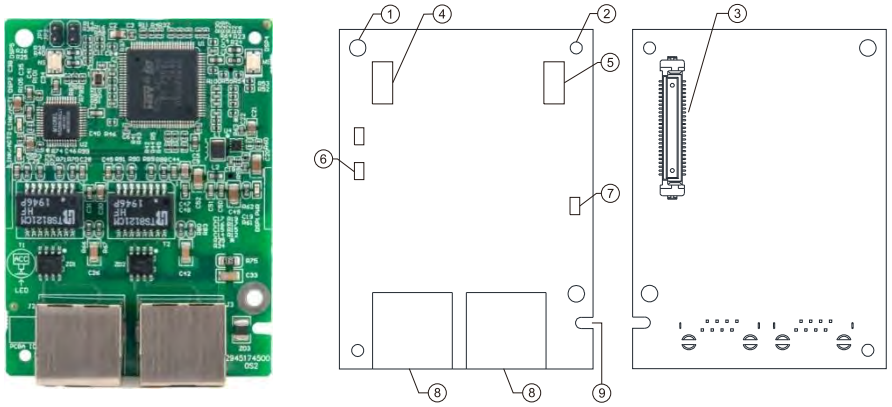


Figure 8-86

1. Screw fixing hole
2. Communication card positioning hole
3. AC motor drive connection port
4. NS indicator light
5. MS indicator light
6. LINK indicator light
7. POWER indicator light
8. Ethernet connection port (RJ45)
9. Communication card fool-proof groove

8-15-3 Specifications

Network Interface

Interface	RJ45 with Auto MDI/MDIX
Number of ports	CMC-EIP01: 1 Port CMC-EIP02: 2 Ports (switch)
Transmission method	IEEE 802.3, IEEE 802.3u
Transmission cable	Category 5e shielding 100M
Transmission speed	10/100 Mbps Auto-Detect
Network protocol	ICMP, IP, TCP, UDP, DHCP, BOOTP, SMTP, Modbus TCP, EtherNet/IP

Table 8-37

Electrical Specification

Weight	25 g (CMC-EIP01) / 30g (CMC-EIP02)
Insulation voltage	500 V_{DC}
Power consumption	0.8 W (CMC-EIP01) / 1.4 W (CMC-EIP02)
Power supply voltage	5 V_{DC}

Table 8-38

Environment

Noise immunity	ESD (IEC 61800-5-1, IEC 61000-4-2) EFT (IEC 61800-5-1, IEC 61000-4-4) Surge Test (IEC 61800-5-1, IEC 61000-4-5) Conducted Susceptibility Test (IEC 61800-5-1, IEC 61000-4-6)
Operation / storage	Operation: -10°C–50°C (temperature), 90% (humidity) Storage: -25°C–70°C (temperature), 95% (humidity)
Vibration / shock immunity	International standards: IEC 61800-5-1, IEC 60068-2-6/IEC 61800-5-1, IEC 60068-2-27

Table 8-39

8-15-4 Installation

Connecting CMC-EIP01 to Network

1. Turn OFF the power of the drive.
2. Open the cover of the AC motor drive.
3. Connect a CAT-5e network cable to the RJ45 port on the CMC-EIP01 (See the figure on the right-hand side).

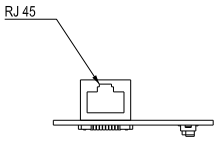


Figure 8-87

RJ45 PIN Definition

PIN	Signal	Definition	PIN	Signal	Definition
1	Tx+	Positive pole for data transmission	5	--	N/C
2	Tx-	Negative pole for data transmission	6	Rx-	Negative pole for data reception
3	Rx+	Positive pole for data reception	7	--	N/C
4	--	N/C	8	--	N/C

Table 8-40

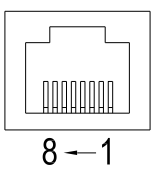


Figure 8-88

8-15-5 C2000 Plus Communication Parameter Settings for Connecting to Ethernet

When the C2000 Plus is connected to an Ethernet network, please set up the communication parameters for it according to the table below. The Ethernet master is only able to reads and writes the frequency words and control word of C2000 Plus after the communication parameters are set.

Parameters	Functions	Current Setting Value	Descriptions
00-20	Master frequency command setting	8	The frequency command is controlled by communication card.
00-21	Source of operation command setting	5	The operation command is controlled by communication card.
09-30	Communication decoding method	0	The decoding method for Delta AC motor drive
09-75	IP configuration	0	0: Static IP 1: Dynamic IP (DHCP)
09-76	IP address -1	192	IP address 192.168.1.5
09-77	IP address -2	168	IP address 192.168.1.5
09-78	IP address -3	1	IP address 192.168.1.5
09-79	IP address -4	5	IP address 192.168.1.5
09-80	Netmask -1	255	Netmask 255.255.255.0
09-81	Netmask -2	255	Netmask 255.255.255.0
09-82	Netmask -3	255	Netmask 255.255.255.0
09-83	Netmask -4	0	Netmask 255.255.255.0
09-84	Default gateway -1	192	Default gateway 192.168.1.1
09-85	Default gateway -2	168	Default gateway 192.168.1.1
09-86	Default gateway -3	1	Default gateway 192.168.1.1
09-87	Default gateway -4	1	Default gateway 192.168.1.1

Table 8-41

8-15-6 LED Indicator & Troubleshooting

There are two LED indicators on the CMC-EIP01. The POWER LED displays the status of power supply, and the LINK LED displays the connection status of the communication.

LED Indicators

LED	Status		Indication	Corrective Action
POWER	Green	ON	Power supply in normal status	--
		OFF	No power supply	Check the power supply.
LINK	Green	ON	Network connection in normal status	--
		Flashing	Network in operation	--
		OFF	Network not connected	Check if the network cable is connected.

Table 8-42

Troubleshooting

Abnormality	Cause	Corrective Action
POWER LED OFF	The AC motor drive not powered	Check the power of the AC motor drive, and see if the power supply is normal.
	The CMC-EIP01 not connected to the AC motor drive	Ensure that CMC-EIP01 is connected to the AC motor drive.
LINK LED OFF	The CMC-EIP01 not connected to network	Ensure that the network cable is correctly connected to network.
	Poor contact to RJ45 connector	Ensure that RJ45 connector is connected to Ethernet port.
Cannot find communication card	The CMC-EIP01 not connected to network	Ensure that CMC-EIP01 is connected to network.
	The PC and CMC-EIP01 in different networks and blocked by network firewall.	Search by IP or set up relevant settings by the AC motor drive keypad.
Cannot open CMC-EIP01 setup page	The CMC-EIP01 not connected to network	Ensure that CMC-EIP01 is connected to the network.
	Incorrect communication setting in DCISoft	Ensure that the communication setting in DCISoft is set to Ethernet.
	The PC and CMC-EIP01 in different networks and blocked by network firewall.	Set up with the AC motor drive keypad.
The CMC-EIP01 setup page opens successfully but webpage monitoring is unavailable	Incorrect network setting in CMC-EIP01	Check if the network setting for CMC-EIP01 is correct. For the Intranet setting in your company, please consult your IT staff. For the Internet setting in your home, please refer to the network setting instruction provided by your ISP.
Cannot send e-mails	Incorrect network setting in CMC-EIP01	Check if the network setting for CMC-EIP01 is correct.
	Incorrect mail server setting	Please confirm the IP address for SMTP-Server.

Table 8-43

8-16 CMC-EC01 -- Communication card, EtherCAT

8-16-1 Features

The EtherCAT card used in C2000 plus currently provides the standard CiA 402 velocity control (Index 6060 = 2), profile position (Index 6060 = 1), homing (Index 6060 = 6) and torque (Index 6060 = 4) modes. However, it should be noted that the above modes are asynchronous control modes. There is no need to turn on the DC (Distribute Clock) function when operating. However, if the DC function is required for using with synchronous products (e.g. ASDA-A2), the CMC-EC01 can still be used normally under this circumstances. C2000 Plus supports the EtherCAT function with firmware version 3.05 and later. Make sure the firmware you use.

8-16-2 Product Profile

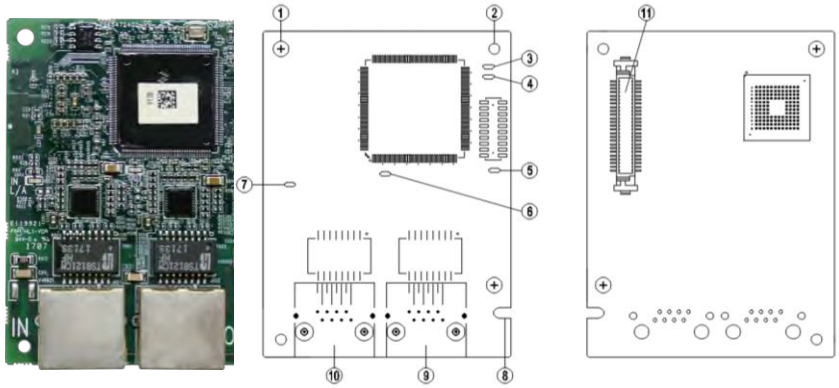


Figure 8-89

1. Screw fixing hole
2. Communication card positioning hole
3. Communication card RUN indicator light
4. ERR indicator light
5. POWER indicator light
6. OUT LINK indicator light
7. IN LINK indicator light
8. Communication card fool-proof groove
9. RJ45 connection port
10. RJ45 connection port
11. Control board connection port

8-16-3 Specifications

Network Interface

Interface	RJ45
Number of ports	2 ports
Transmission method	IEEE802.3, IEEE802.3u
Transmission cable	Category 5e shielding 100 M
Transmission speed	10 / 100 Mbps Auto-Defect
Network protocol	EtherCAT

Table 8-44

Electrical Specification

Power supply voltage	5 V_{DC}
Power consumption	0.8 W
Insulation voltage	500 V_{DC}
Weight (g)	27

Table 8-45

Environment

Noise immunity	ESD (IEC 61800-5-1, IEC 61000-4-2) EFT (IEC 61800-5-1, IEC 61000-4-4) Surge Test (IEC 61800-5-1, IEC 61000-4-5) Conducted Susceptibility Test (IEC 61800-5-1, IEC 61000-4-6)
Operation	-10°C – 15°C (temperature), 90% (humidity)
Storage	-25°C – 70°C (temperature), 95% (humidity)
Vibration / shock immunity	International standard: IEC 61800-5-1, IEC 60068-2-6 / IEC 61800-5-1, IEC 60068-2-27

Table 8-46

8-16-4 RJ45 PIN Definition

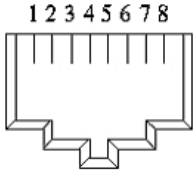
RJ45	PIN No.	Signal	Definition
 Figure 8-90	1	Tx+	Positive pole for data transmission
	2	Tx-	Negative pole for data transmission
	3	Rx+	Positive pole for data receiving
	4	--	N / C
	5	--	N / C
	6	Rx-	Negative pole for data receiving
	7	--	N / C
	8	--	N / C

Table 8-47

8-16-5 Communication Parameters for C2000 Plus Connected to EtherCAT

When operating C2000 Plus via CMC-EC01, set the control and operation command as controlled by communication card. When C2000 Plus connects to EtherCAT network, set up the communication parameters according to the table below.

Parameters	Set value (Dec)	Explanation
00-20	8	The frequency command is controlled by communication card.
00-21	5	The operation command is controlled by communication card.
09-60	6	Identification: when CMC-EC01 is connected, Pr.09-60 will show value 6 (EtherCAT Slave)
09-61	--	Version of communication card

Table 8-48

8-16-6 LED Indicator

LED	Status		Indication
POWER	Green	ON	Power supply in normal status
		OFF	No power supply
LINK	Green	ON	Normal operation
		Flashing	Pre-operation (The light stays ON for 200 ms and then goes OFF for 200 ms alternately)
			Operate in safe mode (The light stays ON for 200 ms and then goes OFF for 1000 ms alternately)
		OFF	Initial state
ERROR	Red	Flashing	Basic configuration error (The light stays ON for 200 ms and then goes OFF for 200 ms alternately)
			Status switching error (The light stays ON for 200 ms and then goes OFF for 1000 ms alternately)
			Times out (ON 200 ms twice / Off 1000 ms)
		OFF	No error
IN LINK	Green	ON	Network connection is in normal status
		Flashing	Network is in operation
		Off	Doesn't connect to network
OUT LINK	Green	ON	Network connection is in normal status
		Flashing	Network is in operation
		OFF	Doesn't connect to network

Table 8-49

8-16-7 Network Connection

Because the packet delivery of EtherCAT has directional characteristics, the connection must be correct. The designed delivery direction of CMC-EC01 is left for IN / right for ON, the correct wiring is shown as below:

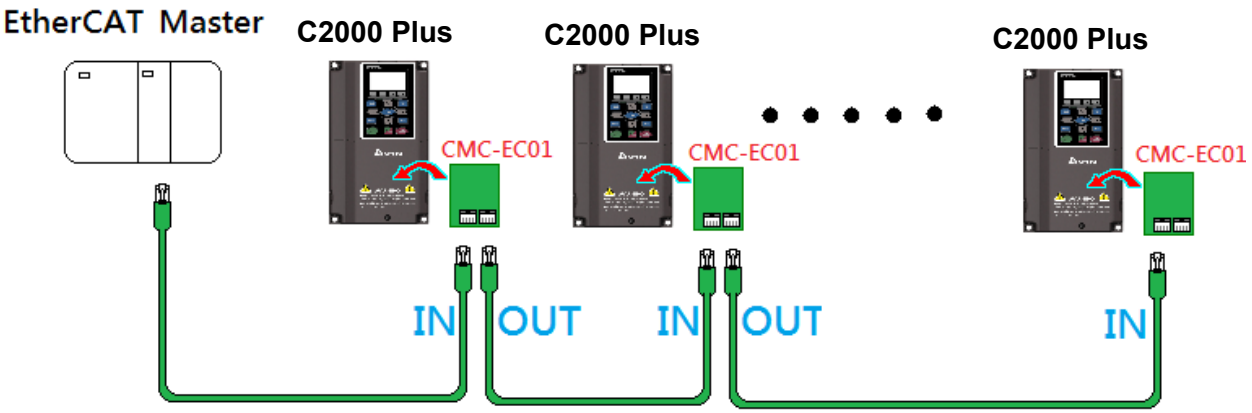


Figure 8-91

When the hardware is installed and power on, check for the display. The current set value of Pr.09-60 will be 6, and shows “EtherCAT” on the display. If the above information does not show on the display, check the version of C2000 Plus (V3.05 and later) and the connection of the card.

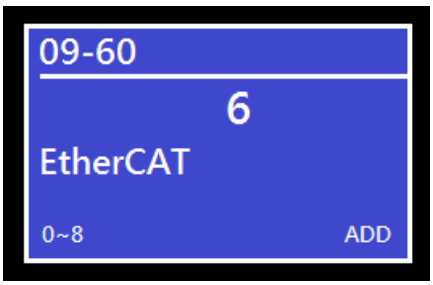


Figure 8-92

8-17 CMC-PN01 -- Communication card, PROFINET

8-17-1 Features

CMC-PN01 connects C2000 Plus drive to PROFINET to exchange data with the host controller easily. This simple network solution saves cost and time for connection and installation of factory automation. Moreover, its components are compatible with suppliers'.

By installing CMC-PN01 in C2000 Plus through the main PROFINET device, you can:

1. Control the drive through PROFINET
2. Modify the drive's parameters through PROFINET
3. Monitor the drive's status through PROFINET.

8-17-2 Product profile

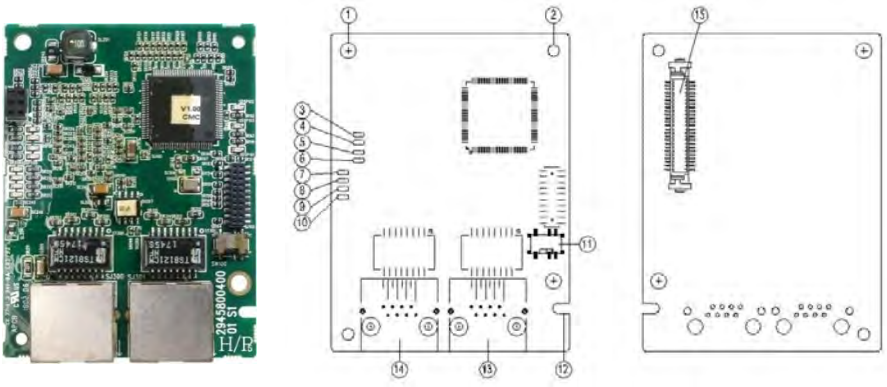


Figure 8-93

1. Screw fixing hole
2. Communication card positioning hole
3. Ready out indicator light
4. MT out indicator light
5. SD indicator light
6. BF out indicator light
7. ACT PHY2 indicator light
8. LINK PHY2 indicator light
9. ACT PHY1 indicator light
10. LINK PHY1 indicator light
11. Switch
12. Communication card fool-proof groove
13. RJ45 connection port (Port 2)
14. RJ45 connection port (Port 1)
15. Control board connection port

Label with MAC address

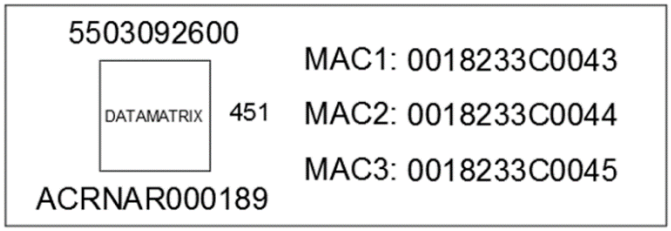


Figure 8-94

Definition	Description
MAC1	Port 1 MAC Address
MAC2	Port 2 MAC Address
MAC3	Interface MAC Address

Table 8-50

8-17-3 Specifications

Network interface

Interface	RJ45
Number of ports	2 ports
Transmission cable	IEEE 802.3
Transmission rate	Category 5e shielding 100 M
Communication protocol	10/100 Mbps auto-negotiate
Interface	PROFINET

Table 8-51

Electrical specification

Power supply voltage	5 V_{DC}
Power consumption	0.8 W
Insulation voltage	500 V_{DC}
Weight (g)	27 (g)

Table 8-52

Environmental conditions

Noise immunity	ESD (IEC 61800-5-1, IEC 6100-4-2) EFT (IEC 61800-5-1, IEC 6100-4-4) Surge Teat (IEC 61800-5-1, IEC 6100-4-5) Conducted Susceptibility Test (IEC 61800-5-1, IEC 6100-4-6)
Operation and storage	-10–50°C (temperature), 90% (humidity)
Vibration & shock resistance	International Standard: IEC 61800-5-1, IEC 60068-2-6 / IEC 61800-5-1, IEC 60068-2-27

Table 8-53

8-17-4 Definition of PINs in RJ45 port

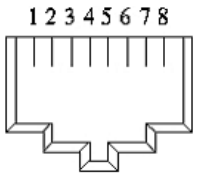
RJ45	PIN	Signal	Definition
 Figure 8-95	1	Tx+	Positive pole for data transmission
	2	Tx-	Negative pole for data transmission
	3	Rx+	Positive pole for receiving data
	4	--	N/C
	5	--	N/C
	6	Rx-	Negative pole for receiving data
	7	--	N/C
	8	--	N/C

Table 8-54

8-17-5 To set the communication parameters when C2000 Plus connects with PROFINET

When you operate C2000 Plus through CMC-PN01, set up the communication card as the source of C2000 Plus controls and settings. You need to use the keypad to configure the following parameter addresses to the corresponding values:

Parameters	Setting value	Description
00-20	8	The frequency command is controlled by communication card
00-21	5	The frequency command is controlled by communication card
09-30	1	Use decoding method (60xx or 20xx)
09-60	12	Communication card identification: When CMC-PN01 communication card is connected, the value of this parameter displays “12”.
11-33	5	The torque command is controlled by communication card

Table 8-55

8-17-6 LED Indicator

Name	Indicator status		Indication
Ready out indicator	Yellow LED	Always ON	PN Stack starts normally
		Flashing	PN Stack starts normally, and waiting for syncing with MCU
		OFF	PN Stack failed to start
MT out indicator	Green LED	-	-
SD indicator	Red LED	-	-
BF out indicator	Red LED	Always ON	Connection with PROFINET Controller is interrupted
		Flashing	Connection is in normal state, but the communication with PROFINET Controller is abnormally
		OFF	Connection with PROFINET Controller is in normal state
ACT PHY1 indicator	Orange LED	Always ON	It’s online, and exchanging the data with Master normally
		Flashing	It’s offline, but hand shaking the data with Master
		OFF	Initial state
LINK PHY1 indicator	Green LED	Always ON	Internet connection is in normal state
		OFF	Doesn’t connect to network
ACT PHY2 indicator	Orange LED	Always ON	It’s online, and exchanging the data with Master normally
		Flashing	It’s offline, but hand shaking the data with Master
		OFF	Initial state
LINK PHY2 indicator	Green LED	Always ON	Internet connection is in normal state
		OFF	Doesn’t connect to network

Table 8-56

8-17-7 Network connection

The wiring of CMC-PN01 shows as follows:

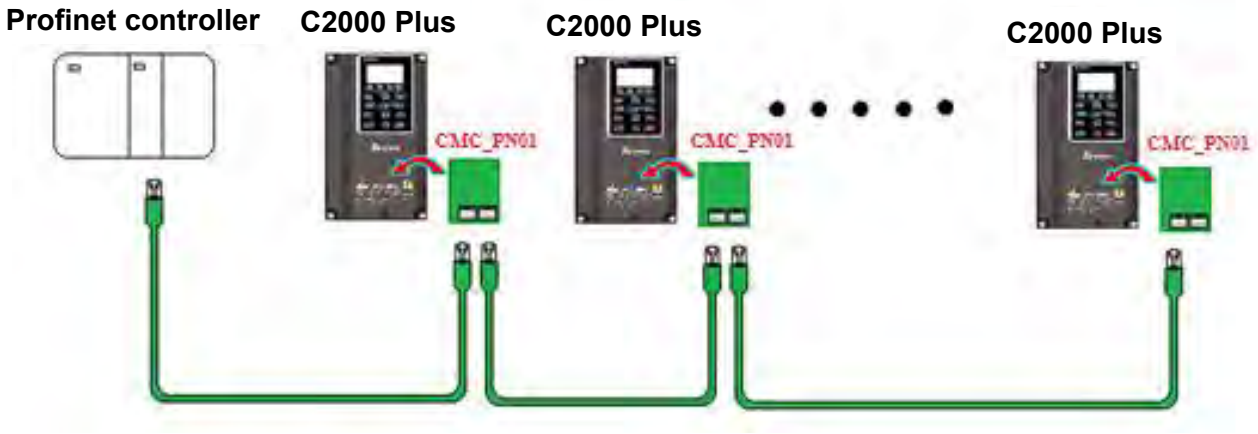


Figure 8-96

When the installation is finished, supply electricity to the drive. The Pr.09-60 of the drive should be able to display “PROFINET” with a current value of 12. If not, make sure your version of the drive is correct (C2000 Plus needs V3.05 or later versions) and the communication card is correctly connected.



Figure 8-97

8-18 EMC-COP01 -- Communication card, CANopen

8-18-1 Product Profile

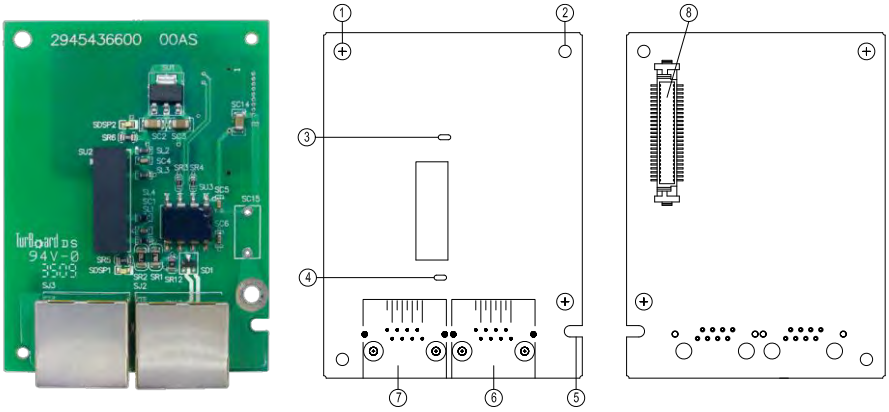


Figure 8-98

1. Screw fixing hole
2. Communication card positioning hole
3. POWER indicator light
4. POWER indicator light
5. Communication card fool-proof groove
6. RJ45 connection port
7. RJ45 connection port
8. Control board connection port

8-18-2 Terminating Resistor Position

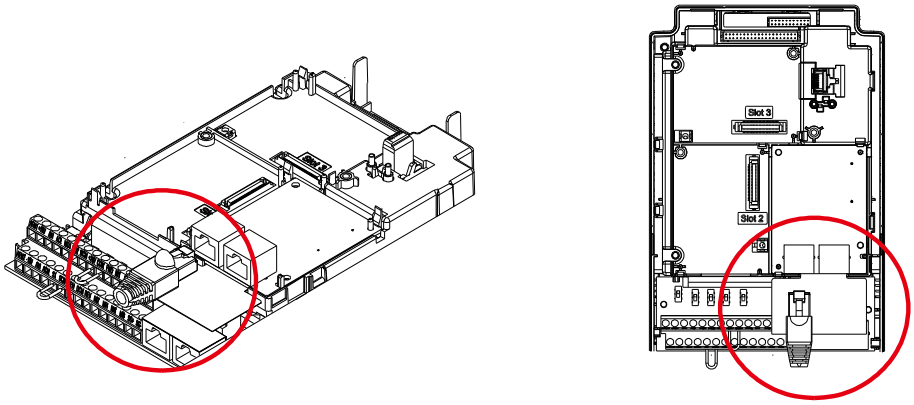


Figure 8-99

8-18-3 RJ45 Pin Definition



RS485 socket

Figure 8-100

Pin	Pin name	Definition
1	CAN_H	CAN_H bus line (dominant high)
2	CAN_L	CAN_L bus line (dominant low)
3	CAN_GND	Ground / 0V / V-
7	CAN_GND	Ground / 0V / V-

Table 8-57

8-18-4 Specifications

Network interface

Interface	RJ45
Number of ports	2 Ports
Transmission method	CAN
Transmission cable	CAN standard cable
Transmission speed	1 Mbps, 500 Kbps, 250 Kbps, 125 Kbps, 100 Kbps, 50 Kbps
Communication protocol	CANopen protocol

Table 8-58

Electrical specification

Weight	27 g
Insulation voltage	500 V_{DC}
Power consumption	0.8 W
Power supply voltage	5 V_{DC}

Table 8-59

Environmental conditions

Noise immunity	ESD (IEC 61800-5-1, IEC 6100-4-2) EFT (IEC 61800-5-1, IEC 6100-4-4) Surge Teat (IEC 61800-5-1, IEC 6100-4-5) Conducted Susceptibility Test (IEC 61800-5-1, IEC 6100-4-6)
Operation	-10–50°C (temperature), 90% (humidity)
Storage	-25–70°C (temperature), 95% (humidity)
Vibration & shock resistance	International Standard: IEC 61800-5-1, IEC 60068-2-6 / IEC 61800-5-1, IEC 60068-2-27

Table 8-60

8-19 Delta Standard Fieldbus Cables

Delta Cables	Part Number	Description	Length
CANopen Cable / RJ45 extension cable for keypad	UC-CMC003-01A	CANopen cable, RJ45 connector	0.3 m
	UC-CMC005-01A	CANopen cable, RJ45 connector	0.5 m
	UC-CMC010-01A	CANopen cable, RJ45 connector	1 m
	UC-CMC015-01A	CANopen cable, RJ45 connector	1.5 m
	UC-CMC020-01A	CANopen cable, RJ45 connector	2 m
	UC-CMC030-01A	CANopen cable, RJ45 connector	3 m
	UC-CMC050-01A	CANopen cable, RJ45 connector	5 m
	UC-CMC100-01A	CANopen cable, RJ45 connector	10 m
	UC-CMC200-01A	CANopen cable, RJ45 connector	20 m
DeviceNet Cable	UC-DN01Z-01A	DeviceNet cable	305 m
	UC-DN01Z-02A	DeviceNet cable	305 m
EtherNet / EtherCAT Cable	UC-EMC003-02A	Ethernet / EtherCAT cable, Shielding	0.3 m
	UC-EMC005-02A	Ethernet / EtherCAT cable, Shielding	0.5 m
	UC-EMC010-02A	Ethernet / EtherCAT cable, Shielding	1 m
	UC-EMC020-02A	Ethernet / EtherCAT cable, Shielding	2 m
	UC-EMC050-02A	Ethernet / EtherCAT cable, Shielding	5 m
	UC-EMC100-02A	Ethernet / EtherCAT cable, Shielding	10 m
	UC-EMC200-02A	Ethernet / EtherCAT cable, Shielding	20 m
CANopen / DeviceNet TAP	TAP-CN01	1 in 2 out, built-in 121 Ω terminal resistor	1 in 2 out
	TAP-CN02	1 in 4 out, built-in 121 Ω terminal resistor	1 in 4 out
	TAP-CN03	1 in 4 out, RJ45 connector, built-in 121 Ω terminal resistor	1 in 4 out, RJ45
PROFIBUS Cable	UC-PF01Z-01A	PROFIBUS DP cable	305 m

Table 8-61

Chapter 9 Specification

9-1 230V Models

9-2 460V Models

9-3 575V Models

9-4 690V Models

9-5 Environment for Operation, Storage and Transportation

9-6 Operation Noise Level

9-7 Specification for Operation Temperature and Protection Level

9-8 Derating Curve

9-9 Efficiency Curve

9-1 230V Models

Frame Size				A				B			C			D		E			F
VFD _ _ _C23A-00 / -21				007	015	022	037	055	075	110	150	185	220	300	370	450	550	750	900
Output Rating*	Heavy duty	Rated Output Capacity (kVA)		2.0	3.2	4.4	6.8	10	13	20	26	30	36	48	58	72	86	102	138
		Rated Output Current (A)		5	8	11	17	25	33	49	65	75	90	120	146	180	215	255	346
		Applicable Motor Output (kW)		0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55	75	90
		Applicable Motor Output (HP)		1	2	3	5	7.5	10	15	20	25	30	40	50	60	75	100	125
		Overload Capacity		150% of rated output current: 1 minute for every 5 minutes; 180% of rated output current: 3 seconds for every 30 seconds															
		Max. Output Frequency (Hz)		0.00–599.00															
		Carrier Frequency (kHz)		2–15 (Default: 8)							2–10 (Default: 6)					2–9 (Default: 4)			
	Super Heavy Duty	Rated Output Capacity (kVA)		1.2	2	3.2	4.4	6.8	10	13	20	26	30	36	48	58	72	86	102
		Rated Output Current (A)		3	5	8	11	17	25	33	49	65	75	90	120	146	180	215	255
		Applicable Motor Output (kW)		0.4	0.75	1.5	2.2	3.7	5.5	7.5	11	15	19	22	30	37	45	55	75
		Applicable Motor Output (HP)		0.5	1	2	3	5	7.5	10	15	20	25	30	40	50	60	75	100
		Overload Capacity		150% of rated output current: 1 minute for every 5 minutes; 200% of rated output current: 3 seconds for every 30 seconds															
		Max. Output Frequency (Hz)		0.00–599.00															
		Carrier Frequency (kHz)		2–15 (Default: 4)							2–10 (Default: 4)					2–9 (Default: 4)			
Input Rating	Input Current (A)		Heavy Duty	6.4	12	16	20	28	36	52	72	83	99	124	143	171	206	245	331
			Super Heavy Duty	3.9	6.4	12	16	20	28	36	52	72	83	99	124	143	171	206	245
	Rated Voltage / Frequency			3-phase AC 200–240V (-15 % – +10 %), 50 / 60 Hz															
	Operating Voltage Range			170–264 V_{AC}															
	Frequency Tolerance			47–63 Hz															
	Power Supply Capacity (kVA)		Heavy Duty	2.7	5.0	6.7	8.3	11.6	15.0	21.6	29.9	34.5	41.2	51.5	59.4	71.1	85.6	101.8	137.6
			Super Heavy Duty	1.6	2.7	5.0	6.7	8.3	11.6	15.0	21.6	29.9	34.5	41.2	51.5	59.4	71.1	85.6	101.8
Efficiency (%)				97.8												98.2			
Displacement Power Factor (cosθ)				>0.98															
Weight (Kg)				2.6 ± 0.3				5.4 ± 1			9.8 ± 1.5			38.5 ± 1.5		64.8 ± 1.5			86.5 ± 1.5
Cooling Method				Natural cooling	Fan cooling														
Braking Chopper				Frame A–C: Built-in										Frame D–F: Optional					
DC choke				Frame A–C: Optional										Frame D–F: Built-in					
EMC Filter				Frame A~F: Optional															
EMC-COP01				Frame A~F: Optional															

Table 9-1

NOTE:

1. * : The default is heavy duty mode.
2. The carrier frequency is default. Increasing the carrier frequency requires a reduction in current. Refer to Section 9-7 Derating Curve for details.
3. The AC motor drive should operate in derating current when its control method is set to FOC Sensorless, TQC+PG, TQC sensorless. PM+PG, PM sensorless Refer to Pr.06-55 for more information.
4. The rated input current will be affected by not only power transformer and the connection of the reactors on input side, but also fluctuates with the impedance of power side.
5. Rated output capacity is calculated by 460 V_{AC}, it is as a reference for the mains power drive capacity selection.

9-2 460V Models

Frame Size			A						B			C		
VFD _ _ _ C_ _ -00 / -21			007	015	022	037	040	055	075	110	150	185	220	300
Output Rating*	Heavy duty	Rated Output Capacity (kVA)	2.4	3.2	4.8	7.2	8.4	10	14	19	25	30	36	48
		Rated Output Current (A)	3.0	4.0	6.0	9.0	10.5	12	18	24	32	38	45	60
		Applicable Motor Output (kW)	0.75	1.5	2.2	3.7	4.0	5.5	7.5	11	15	18.5	22	30
		Applicable Motor Output (HP)	1	2	3	5	5	7.5	10	15	20	25	30	40
		Overload Capacity	150% of rated output current: 1 minute for every 5 minutes; 180% of rated output current: 3 seconds for every 30 seconds											
		Max. Output Frequency (Hz)	0.00–599.00											
		Carrier Frequency (kHz)	2–15 (Default: 8)									2–10 (Default: 6)		
	Super Heavy Duty	Rated Output Capacity (kVA)	1.4	2.4	3.2	4.8	7.2	8.4	9.6	14	19	25	30	36
		Rated Output Current (A)	1.7	3	4	6	9	10.5	12	18	24	32	38	45
		Applicable Motor Output (kW)	0.4	0.75	1.5	2.2	3.7	4.0	5.5	7.5	11	15	18.5	22
		Applicable Motor Output (HP)	0.5	1	2	3	5	5	7.5	10	15	20	25	30
		Overload Capacity	150% of rated output current: 1 minute for every 5 minutes; 200% of rated output current: 3 seconds for every 30 seconds											
		Max. Output Frequency (Hz)	0.00–599.00											
		Carrier Frequency (kHz)	2–15 (Default: 4)									2–10 (Default: 4)		
Input Rating	Input Current (A)	Heavy Duty	4.3	5.9	8.7	14	15.5	17	20	26	35	40	47	63
		Super Heavy Duty	3.5	4.3	5.9	8.7	14	15.5	17	20	26	35	40	47
	Rated Voltage / Frequency		3-phase AC 380–480V (-15 % – +10 %), 50 / 60 Hz											
	Operating Voltage Range		323–528 V_{AC}											
	Frequency Tolerance		47–63 Hz											
	Power Supply Capacity (kVA)	Heavy Duty	3.6	4.9	7.2	11.6	12.9	14.1	16.6	21.6	29.1	33.3	39.1	52.4
		Super Heavy Duty	2.9	3.6	4.9	7.2	11.6	12.9	14.1	16.6	21.6	29.1	33.3	39.1
Efficiency (%)			97.8											
Displacement Power Factor (cosθ)			>0.98											
Drive Weight (Kg)			2.6± 0.3						5.4± 1			9.8± 1.5		
Cooling Method			Natural cooling	Fan cooling										
Braking Chopper			Frame A–C: Built-in											
DC choke			Frame A–C: Optional											
EMC Filter			Frame A–C (VFDxxxC43A-21): Optional Frame A–C (VFDxxxC4EA-21): Built-in											
EMC-COP01			Frame A–C (VFDxxxC43A-21): Optional Frame A–C (VFDxxxC4EA-21): Built-in											

Table 9-2

NOTE:

1. * : The factory setting is heavy duty mode.
2. The carrier frequency is default. Increasing the carrier frequency requires a reduction in current. Refer to Section 9-7 Derating Curve for details.
3. The AC motor drive should operate in derating current when its control method is set to FOC Sensorless, TQC+PG, TQC sensorless. PM+PG, PM sensorless. Refer to Pr. 06-55 for more information.
4. The rated input current will be affected by not only power transformer and the connection of the reactors on input side, but also fluctuates with the impedance of power side.
5. Rated output capacity is calculated by 460 V_{AC}, it is as a reference for the mains power drive capacity selection.

Frame Size			D0		D		E		F	
VFD-_ _ _ C_ _ _-21 / -00			370	450	550	750	900	1100	1320	1600
Output Rating*	Heavy duty	Rated Output Capacity (kVA)	58	73	88	120	143	175	207	247
		Rated Output Current (A)	73	91	110	150	180	220	260	310
		Applicable Motor Output (kW)	37	45	55	75	90	110	132	160
		Applicable Motor Output (HP)	50	60	75	100	125	150	175	215
		Overload Capacity	150% of rated output current: 1 minute for every 5 minutes; 180% of rated output current: 3 seconds for every 30 seconds							
		Max. Output Frequency (Hz)	0.00–599.00							
		Carrier Frequency (kHz)	2–10 (Default: 6)			2–9 (Default: 4)				
	Super Heavy Duty	Rated Output Capacity (kVA)	48	58	73	88	120	143	175	207
		Rated Output Current (A)	60	73	91	110	150	180	220	260
		Applicable Motor Output (kW)	30	37	45	55	75	90	110	132
		Applicable Motor Output (HP)	40	50	60	75	100	125	150	175
		Overload Capacity	150% of rated output current: 1 minute for every 5 minutes; 200% of rated output current: 3 seconds for every 30 seconds							
		Max. Output Frequency (Hz)	0.00–599.00							
		Carrier Frequency (kHz)	2–10 (Default: 4)			2–9 (Default: 4)				
Input Rating	Input Current (A)	Heavy Duty	74	101	114	157	167	207	240	300
		Super Heavy Duty	63	74	101	114	157	167	207	240
	Rated Voltage / Frequency		3-phase AC 380–480V (-15 % – +10 %), 50 / 60 Hz							
	Operating Voltage Range		323–528 V_{AC}							
	Frequency Tolerance		47–63 Hz							
	Power Supply Capacity (kVA)	Heavy Duty	61.5	84.0	94.8	130.5	138.8	172.1	199.5	249.4
		Super Heavy Duty	52.4	61.5	84.0	94.8	130.5	138.8	172.1	199.5
Efficiency (%)			97.8				98.2			
Displacement Power Factor (cosθ)			>0.98							
Drive Weight (Kg)			27 ± 1.5		38.5 ± 1.5		64.8 ± 1.5		86.5 ± 1.5	
Cooling Method			Fan cooling							
Braking Chopper			Frame D0–F: Optional							
DC choke			Frame D0–F: Built-in							
EMC Filter			Frame D0–F: Optional							
EMC-COP01			Frame D0–F (VFDxxxC43A-00): Optional Frame D0–F (VFDxxxC43A-21): Built-in							

Table 9-3

NOTE:

1. * : The factory setting is heavy duty mode.
2. The carrier frequency is default. Increasing the carrier frequency requires a reduction in current. Refer to Section 9-7 Derating Curve for details.
3. The AC motor drive should operate in derating current when its control method is set to FOC Sensorless, TQC+PG, TQC sensorless. PM+PG, PM sensorless Please refer to Pr. 06-55 for more information.
4. The rated input current will be affected by not only power transformer and the connection of the reactors on input side, but also fluctuates with the impedance of power side.
5. Rated output capacity is calculated by 460 V_{AC}, it is as a reference for the mains power drive capacity selection.

Frame Size				G				H						
VFD-_ _ _ C_ _ _-21 / -00				1850	2000	2200	2500	2800	3150	3550	4000	4500	5000	5600
Output Rating*	Heavy duty	Rated Output Capacity (kVA)		295	315	367	383	438	491	544	613	690	741	872
		Rated Output Current (A)		370	395	460	481	550	616	683	770	866	930	1094
		Applicable Motor Output (kW)		185	200	220	250	280	315	355	400	450	500	560
		Applicable Motor Output (HP)		250	270	300	340	375	420	475	530	600	675	750
		Overload Capacity		150% of rated output current: 1 minute for every 5 minutes; 180% of rated output current: 3 seconds for every 30 seconds										
		Max. Output Frequency (Hz)		0.00–599.00										
		Carrier Frequency (kHz)		2–9 (Default: 4)										
	Super Heavy Duty	Rated Output Capacity (kVA)		247	247	295	315	366	438	491	544	544	690	741
		Rated Output Current (A)		310	310	370	395	460	550	616	683	683	866	930
		Applicable Motor Output (kW)		160	160	185	200	220	280	315	355	355	450	500
		Applicable Motor Output (HP)		215	215	250	270	300	375	425	475	475	600	675
		Overload Capacity		150% of rated output current: 1 minute for every 5 minutes; 200% of rated output current: 3 seconds for every 30 seconds										
		Max. Output Frequency (Hz)		0.00–599.00										
		Carrier Frequency (kHz)		2–9 (Default: 4)				2–9 (Default: 3)						
Input Rating	Input Current (A)		Heavy Duty	380	395	400	447	494	555	625	770	866	930	1094
			Super Heavy Duty	300	300	380	390	400	494	555	590	625	866	930
	Rated Voltage / Frequency			3-phase AC 380–480V (-15 % – +10 %), 50 / 60 Hz										
	Operating Voltage Range			323–528 V_{AC}										
	Frequency Tolerance			47–63 Hz										
	Power Supply Capacity (kVA)		Heavy Duty	315.9	328.4	332.5	371.6	410.7	461.4	519.6	640.1	720.0	773.2	909.5
			Super Heavy Duty	249.4	249.4	315.9	324.2	332.5	410.7	461.4	490.5	519.6	720.0	773.2
Efficiency (%)				98.2										
Displacement Power Factor (cosθ)				>0.98										
Drive Weight (Kg)				134 ± 4				228						
Cooling Method				Fan cooling										
Braking Chopper				Frame G–H: Optional										
DC choke				Frame G–H: Built-in										
EMC Filter				Frame G–H: Optional										
EMC-COP01				Frame G–H (VFDxxxC43A-00): Optional Frame G–H (VFDxxxC43A-21): Built-in										

Table 9-4

NOTE:

1. * : The factory setting is heavy duty mode.
2. The carrier frequency is default. Increasing the carrier frequency requires a reduction in current. Refer to Section 9-7 Derating Curve for details.
3. The AC motor drive should operate in derating current when its control method is set to FOC Sensorless, TQC+PG, TQC sensorless. PM+PG, PM sensorless Please refer to Pr. 06-55 for more information.
4. The rated input current will be affected by not only power transformer and the connection of the reactors on input side, but also fluctuates with the impedance of power side.
5. Model VFD4500C43x-xx, VFD5000C43x-xx, VFD5600C43x-xx do not have UL certification.
6. Rated output capacity is calculated by 460 V_{AC}, it is as a reference for the mains power drive capacity selection.

9-3 575V Models

Frame Size			A			B			
VFD-_ _ _ C53A-21			015	022	037	055	075	110	150
*Output Rating	Light Duty	Rated Output Capacity (kVA)	3	4.3	6.7	9.9	12.1	18.6	24.1
		Rated Output Current (A)	3	4.3	6.7	9.9	12.1	18.7	24.2
		Applicable Motor Output (kW)	1.5	2.2	3.7	5.5	7.5	11	15
		Applicable Motor Output (HP)	2	3	5	7.5	10	15	20
		Overload Capacity	120% of rated output current: 1 minute for every 5 minutes						
	Normal Duty	Rated Output Capacity (kVA)	2.5	3.6	5.5	8.2	10	15.4	19.9
		Rated Output Current (A)	2.5	3.6	5.5	8.2	10	15.5	20
		Applicable Motor Output (kW)	0.75	1.5	2.2	3.7	5.5	7.5	11
		Applicable Motor Output (HP)	1	2	3	5	7.5	10	15
		Overload Capacity	120% of rated output current: 1 minute for every 5 minutes; 160% of rated output current: 3 seconds for every 30 seconds						
	Heavy Duty	Rated Output Capacity (kVA)	2.1	3	4.6	6.9	8.3	12.9	16.7
		Rated Output Current (A)	2.1	3	4.6	6.9	8.3	13	16.8
		Applicable Motor Output (kW)	0.75	1.5	2.2	3.7	3.7	7.5	7.5
		Applicable Motor Output (HP)	1	2	3	5	5	10	10
		Overload Capacity	150% of rated output current: 1 minute for every 5 minutes; 180% of rated output current: 3 seconds for every 30 seconds						
	Max. Output Frequency (Hz)		0.00–599.00						
	Carrier Frequency (kHz)		2–15 (Default: 4)						
Input Rating	Input Current (A)	Light Duty	3.8	5.4	10.4	14.9	16.9	21.3	26.3
		Normal Duty	3.1	4.5	7.2	12.3	15	18	22.8
		Heavy Duty	2.6	3.8	5.8	10.7	12.5	16.9	19.7
	Rated Voltage / Frequency		3-phase AC 525–600 V (-15% – +10%), 50 / 60 Hz						
	Operating Voltage Range		446–660 V_{AC}						
	Frequency Tolerance		47–63Hz						
	Power Supply Capacity (kVA)	Light Duty	3.9	5.6	10.8	15.5	17.6	22.1	27.3
		Normal Duty	3.2	4.7	7.5	12.8	15.6	18.7	23.7
		Heavy Duty	2.7	3.9	6.0	11.1	13.0	17.6	20.5
Efficiency (%)			97			98			
Displacement Power Factor (cosθ)			>0.98						
Drive Weight (Kg)			3 ± 0.3			4.8 ± 1			
Cooling Method			Natural cooling		Fan cooling				
Braking Chopper			Frame A~B: Built-in						
DC choke			Frame A~B: Optional						
EMC Filter			Frame A~B: Optional						

Table 9-5

NOTE:

1. * Pr.00-16; available duty modes: Light Duty (LD), Normal Duty (ND) and Heavy Duty (HD); default setting is LD mode
2. Rated output capacity is calculated by 460 V_{AC}, it is as a reference for the mains power drive capacity selection.

9-4 690V Models

Frame Size			C				D		E			
VFD-_ _ _ C63B-00 / -21			185	220	300	370	450	550	750	900	1100	1320
*Output Rating	Light Duty	Rated Output Capacity (kVA)	29	36	43	54	65	80	103	124	149	179
		Applicable Motor Output (690V, kW)	18.5	22	30	37	45	55	75	90	110	132
		Applicable Motor Output (690V, HP)	25	30	40	50	60	75	100	125	150	175
		Applicable Motor Output (575V, HP)	20	25	30	40	50	60	75	100	125	150
		Rated Output Current (A)	24	30	36	45	54	67	86	104	125	150
		Overload Capacity	120% of rated output current: 1 minute for every 5 minutes									
	Normal Duty	Rated Output Capacity (kVA)	24	29	36	43	54	65	80	103	124	149
		Applicable Motor Output (690V, kW)	15	18.5	22	30	37	45	55	75	90	110
		Applicable Motor Output (690V, HP)	20	25	30	40	50	60	75	100	125	150
		Applicable Motor Output (575V, HP)	15	20	25	30	40	50	60	75	100	125
		Rated Output Current (A)	20	24	30	36	45	54	67	86	104	125
		Overload Capacity	120% of rated output current: 1 minute for every 5 minutes; 160% of rated output current: 3 seconds for every 30 seconds									
	Heavy Duty	Rated Output Capacity (kVA)	17	24	29	36	43	54	65	80	103	124
		Applicable Motor Output (690V, kW)	11	15	18.5	22	30	37	45	55	75	90
		Applicable Motor Output (690V, HP)	15	20	25	30	40	50	60	75	100	125
		Applicable Motor Output (575V, HP)	10	15	20	25	30	40	50	60	75	100
		Rated Output Current (A)	14	20	24	30	36	45	54	67	86	104
		Overload Capacity	150% of rated output current: 1 minute for every 5 minutes; 180% of rated output current: 3 seconds for every 30 seconds									
	Max. Output Frequency (Hz)		0.00–599.00									
	Carrier Frequency (kHz)		2–9 (Default: 4)									
Input Rating	Input Current (A)	Light Duty	29	36	43	54	65	81	84	102	122	147
		Normal Duty	24	29	36	43	54	65	66	84	102	122
		Heavy Duty	20	24	29	36	43	54	53	66	84	102
	Rated Voltage / Frequency		3-phase AC 525–690 V (-15% – +10%), 50 / 60 Hz									
	Operating Voltage Range		446–759 V_{AC}									
	Frequency Tolerance		47–63Hz									
	Power Supply Capacity (kVA)	Light Duty	34.7	43.0	51.4	64.5	77.7	96.8	100.4	121.9	145.8	175.7
		Normal Duty	28.7	34.7	43.0	51.4	64.5	77.7	78.9	100.4	121.9	145.8
		Heavy Duty	23.9	28.7	34.7	43.0	51.4	64.5	63.3	78.9	100.4	121.9
Efficiency (%)			97									
Displacement Power Factor (cosθ)			>0.98									
Drive Weight (Kg)			10 ± 1.5				39 ± 1.5		61 ± 1.5			
Cooling Method			Fan cooling									
Braking Chopper			Frame C: Built-in				Frame D–E: Optional					
DC choke			Frame C: Optional				Frame D–E: Built-in					
EMC Filter			Frame C–E: Optional									

Table 9-6

NOTE:

1. * Pr.00-16; available duty modes: Light Duty (LD), Normal Duty (ND) and Heavy Duty (HD); default setting is LD mode
2. Rated output capacity is calculated by 460 V_{AC}, it is as a reference for the mains power drive capacity selection.

Frame Size			F		G		H			
VFD-_ _ _ C63B-00/21			1600	2000	2500	3150	4000	4500	5600	6300
*Output Rating	Light Duty	Rated Output Capacity (kVA)	215	263	347	418	494.5	534.7	678.5	776
		Applicable Motor Output (690V, kW)	160	200	250	315	400	450	560	630
		Applicable Motor Output (690V, HP)	215	270	335	425	530	600	745	850
		Applicable Motor Output (575V, HP)	175	200	250	350	400	450	500	745
		Rated Output Current (A)	180	220	290	350	430	465	590	675
		Overload Capacity	120% of rated output current: 1 minute for every 5 minutes							
	Normal Duty	Rated Output Capacity (kVA)	179	215	239	347	402.5	442.7	534.7	776
		Applicable Motor Output (690V, kW)	132	160	200	250	315	355	450	630
		Applicable Motor Output (690V, HP)	175	215	270	335	425	475	600	850
		Applicable Motor Output (575V, HP)	150	175	200	250	350	400	450	745
		Rated Output Current (A)	150	180	220	290	350	385	465	675
		Overload Capacity	120% of rated output current: 1 minute for every 5 minutes; 160% of rated output current: 3 seconds for every 30 seconds							
	Heavy Duty	Rated Output Capacity (kVA)	149	179	215	263	333.5	356.5	483	776
		Applicable Motor Output (690V, kW)	110	132	160	200	250	280	400	630
		Applicable Motor Output (690V, HP)	150	175	215	270	335	375	530	850
		Applicable Motor Output (575V, HP)	125	150	175	200	250	335	450	745
		Rated Output Current (A)	125	150	180	220	290	310	420	675
		Overload Capacity	150% of rated output current: 1 minute for every 5 minutes; 180% of rated output current: 3 seconds for every 30 seconds							
	Max. Output Frequency (Hz)		0.00–599.00							
	Carrier Frequency (kHz)		2–9 (Default: 4)							2–9 (Default: 3)
Input Rating	Input Current (A)	Light Duty	178	217	292	353	454	469	595	681
		Normal Duty	148	178	222	292	353	388	504	681
		Heavy Duty	123	148	181	222	292	313	423	681
	Rated Voltage / Frequency		3-phase AC 525–690 V (-15% – +10%), 50 / 60 Hz							
	Operating Voltage Range		446–759 V_{AC}							
	Frequency Tolerance		47–63 Hz							
	Power Supply Capacity (kVA)	Light Duty	212.7	259.3	349.0	421.9	542.6	560.5	711.1	813.8
		Normal Duty	176.9	212.7	265.3	349.0	421.9	463.7	602.3	813.8
		Heavy Duty	147.0	176.9	216.3	265.3	349.0	374.1	505.5	813.8
Efficiency (%)			97		98					
Displacement Power Factor (cosθ)			>0.98							
Drive Weight (Kg)			88 ± 1.5		135 ± 4		243 ± 5			
Cooling Method			Fan cooling							
Braking Chopper			Frame F~H: Optional							
DC choke			Frame F~H: Built-in							
EMC Filter			Frame F~H: Optional							

Table 9-7

NOTE:

1. * Pr.00-16; available duty modes: Light Duty (LD), Normal Duty (ND) and Heavy Duty (HD); default setting is LD mode
2. Rated output capacity is calculated by 460 V_{AC}, it is as a reference for the mains power drive capacity selection.

General Specifications

Item		Specifications
Control Characteristics	Control Mode*1	230V_{AC} / 460V_{AC} models Select a control mode listed below via parameter, ● IMVF (Induction Motor, V/F control) ● IMVF + PG (Induction Motor, V/F control, with encoder) ● IM / PM SVC (Induction Motor / Permanent-Magnet Synchronous Motor, Space Vector Control) ● IMFOC + PG (Induction Motor, Field-Oriented Control, with encoder) ● PMFOC + PG (Permanent-Magnet Synchronous Motor, Field-Oriented Control, with encoder) ● IMFOC Sensorless (Induction Motor, sensorless Field-Oriented Control) ● PM Sensorless (Permanent-Magnet Synchronous Motor, sensorless Field-Oriented Control) ● IPM Sensorless (Interior Permanent-Magnet Synchronous Motor, sensorless Field-Oriented Control) ● SynRM Sensorless (Synchronous Reluctance Motor, sensorless Field-Oriented Control) ● IM TQCPG (Induction Motor, Torque Control, with encoder) ● PM TQCPG (Permanent-Magnet Synchronous Motor, Torque Control, with encoder) ● IM TQC Sensorless (Induction Motor, sensorless Torque Control) ● SynRM TQC Sensorless (Synchronous Reluctance Motor, sensorless Torque Control)
		575V_{AC} / 690V_{AC} models Select a control mode listed below via parameter, ● IMVF (Induction Motor, V/F control) ● IMVF + PG (Induction Motor, V/F control, with encoder) ● IM / PM SVC (Induction Motor / Permanent-Magnet Synchronous Motor, Space Vector Control)
	Max. Output Frequency*2	0–599 Hz
	Frequency Output Accuracy	Digital command: ±0.01% of the maximum output frequency (Pr.01-00), -10°C– +40°C; Analog command: ±0.1% of the maximum output frequency (Pr.01-00), 25±10°C
	Frequency Setting Resolution	Digital command: 0.01 Hz ; Analog command: 0.05% x max. output frequency (Pr.01-00), 11 bit plus sign
	Speed Control Range (Ratio of Speed control)*3	● IMVF, IMVF + PG, IMSVC 1:50 ● IMFOC Sensorless 1:100 ● IMFOC + PG 1:1000 ● PMSVC 1:20 ● PM Sensorless 1:50 ● IPM Sensorless 1:100 ● PMFOC + PG 1:1000
	Starting Torque	● IMVF, IMVF + PG, IMSVC 150% / 3 Hz ● IMFOC Sensorless 200% / 0.5 Hz ● IMFOC + PG 200% / 0 Hz

Item		Specifications
		● PMSVC 100% / (motor rated frequency / 20) ● PM Sensorless 100% / (motor rated frequency / 50) ● IPM Sensorless 100% / 0 Hz ● PMFOC + PG 200% / 0 Hz
	Torque Accuracy*4	TQC + PG: ±5%; TQC Sensorless: ±15%
	Torque Limit	230V AC / 460V AC models Heavy duty 180%, super heavy duty 220% of torque current ➢ Under field-oriented control (FOC), you can set up separately in quadrant via parameters. 575V AC / 690V AC models Maximum 200% of torque current
Protection Characteristics	Output Over-current	230V AC / 460V AC models Over-current protection for 240% of rated current (Heavy duty) 575V AC / 690V AC models Over-current protection for 240% rated current (Normal duty) ➢ Drive stops and display related fault code when over current tripped.
	Output Current Clamp	230V AC / 460V AC models Current clamp by hardware, heavy duty and super heavy duty: 190–195% rated current 575V AC / 690V AC models ● Current clamp by hardware, Light duty: 125–145% rated current; normal duty: 170–175% rated current; heavy duty: 200–250% rated current ● VFD6300C63B-00/21: Current clamp by hardware, light duty / normal duty / heavy duty: 170–175% rated current ➢ Drive will be auto-recovered after output backs to rated current.
	Over-voltage (DC)	C2000 Plus shuts down under below condition: 230V$_{AC}$: DC bus over 410 V; 460V$_{AC}$: DC bus over 820 V; 575 V$_{AC}$ / 690 V$_{AC}$: DC bus over 1189 V
	Grounding Leakage Current Protection*5	The output is grounding, the leakage current is higher than 60% of the rated current.
	Output Low / Under Current Fault*5	The output is broken, no current outputs.
	Short-circuit Current Rating (SCCR)	Per UL 508C, the drive is suitable for using on a circuit capable of delivering not more than 100kA symmetrical amperes (rms) when protected by fuses given in the fuse table.
	Motor Overheat Protection*5	Support electronic thermal relay, PTC, KTY84-13-, PT100 for overheat protection.
	Drive Overheat Protection	Built-in temperature sensor (driven element oH1, capacitance module oH2) for overheat protection.
	Fan Control	230V AC models For the models VFD150C2XX-XX and above use PWM control; for the models VFD110C2XX-XX and below use switch button (ON / OFF) 460V AC models For the models VFD185C4XX-XX and above use PWM control; for the models VFD150C4XX-XX and below use switch button (ON / OFF) 575V AC / 690V AC model PWM control

Item	Specifications
Product Compliance*10	**CE** Low Voltage Directive(LVD) 2014/35/EU, EN61800-5-1 EMC Directive 2014/35/EU, EN61800-3 **UL**508C, **cUL** CAN/CSA C22.2 No.14-13, No.274*6 , **Plenum rated** **RCM**, **KC***7, **EAC***7, (**C**م mark)*8 , **SEMI F47**-0706, **GB**12668.3 **WEEE** 2012/19/EU**, RoHS** 2011/95/EU*9, **RoHs** 2015/863/EU Quality assurance system **ISO 9001** and Environmental system **ISO 14001**
Safety Standard*9	Safe Torque Off (EN / IEC61800-5-2) TUV Rheinland Certified IEC62061/IEC61508, SIL CL2 EN ISO13849-1, Cat.3/PL d

Table 9-8

NOTE:

*1: 230V AC / 460V AC models: support synchronous reluctance control mode after the firmware V3.06;
575V AC / 690V AC models: support field-oriented control (FOC) mode after the firmware V2.06.

*2: The setting range of the maximum output frequency varies from carrier and control modes. Refer to Pr.01-00 and Pr.06-55 for more information.

*3: Based on heavy duty, and the speed control range varies from environment, application conditions, types of motor and encoder.

*4: Defined under torque control (TQC) mode.

*5: The protection level can adjust via parameters.

*6: VFD4500C43x-xx, VFD5000C43x-xx, VFD5600C43x-xx do not have UL certification.

*7: Only for 230V AC / 460V AC models.

*8: Mandatory conformity mark in Morocco.

*9: For information on Certifications and Declaration of Conformity (DoC), visit
Delta | Download Center (deltaww.com)

9-5 Environment for Operation, Storage and Transportation

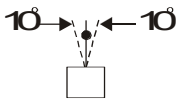
<table>
<tr><td colspan="5">DO NOT expose the AC motor drive in the bad environment, such as dust, direct sunlight, corrosive / inflammable gasses, humidity, liquid and vibration environment. The salt in the air must be less than 0.01mg / cm^2 every year.</td></tr>
<tr><td rowspan="13">Environment</td><td>Installation location</td><td colspan="3">IEC60364-1 / IEC60664-1 Pollution degree 2, Indoor use only</td></tr>
<tr><td rowspan="2">Surrounding Temperature (°C)</td><td>Storage / Transportation</td><td colspan="2">-25 – +70</td></tr>
<tr><td colspan="3">Non-condensation, non-frozen</td></tr>
<tr><td rowspan="3">Rated Humidity (%)</td><td>Operation</td><td colspan="2">Max. 95</td></tr>
<tr><td>Storage / Transportation</td><td colspan="2">Max. 95</td></tr>
<tr><td colspan="3">No condense water</td></tr>
<tr><td rowspan="2">Air Pressure (kPa)</td><td>Operation / Storage</td><td colspan="2">86–106</td></tr>
<tr><td>Transportation</td><td colspan="2">70–106</td></tr>
<tr><td rowspan="5">Pollution Level</td><td colspan="3">IEC 60721-3-3</td></tr>
<tr><td>Operation</td><td colspan="2">Class 3C3; Class 3S2</td></tr>
<tr><td>Storage</td><td colspan="2">Class 1C2; Class 1S2</td></tr>
<tr><td>Transportation</td><td colspan="2">Class 2C2; Class 2S2</td></tr>
<tr><td colspan="3">If the AC motor drive is to be used under harsh environment with high level of contamination (e.g. dew, water, dust), make sure it is installed in an environment qualified for IP54 such as in a cabinet.</td></tr>
<tr><td>Altitude</td><td>Operation</td><td colspan="2">If the AC motor drive is installed at an altitude of 0–1000 m, follow normal operation restrictions. For altitudes of 1000–2000 m, decrease the drive's rated current by 1% or lower the temperature by 0.5°C for every 100 m increase in altitude. The maximum altitude for corner grounding is 2000 m.</td></tr>
<tr><td rowspan="2">Package Drop</td><td>Storage</td><td colspan="3" rowspan="2">ISTA procedure 1A (according to weight) IEC60068-2-31</td></tr>
<tr><td>Transportation</td></tr>
<tr><td>Vibration</td><td colspan="4">1.0 mm, peak to peak value range from 2 Hz to 13.2 Hz; 0.7–1.0G range from 13.2 Hz to 55 Hz; 1.0G range from 55 Hz to 512 Hz. Comply with IEC 60068-2-6</td></tr>
<tr><td>Impact</td><td colspan="4">IEC / EN 60068-2-27</td></tr>
<tr><td>Operation Position</td><td colspan="2">Max. allowed offset angle ±10° (under normal installation position)</td><td colspan="2"> 
</td></tr>
</table>

Table 9-9

9-6 Operation Noise Level

According to IEC61800-5-1: 2022, operators working in an environment above 70Db must take appropriate hearing protection.

230V models

Frame	Model	Noise Level (dB)	
		70% Output Load	100% Output Load
A	VFD007C23A	No fan	
	VFD015C23A	46.6 (No speed control on tan)	46.6
	VFD022C23A		
	VFD037C23A		
B	VFD055C23A	56 (No speed control on fan)	56
	VFD075C23A		
	VFD110C23A		
C	VFD150C23A	60.0	65.3
	VFD185C23A		
	VFD220C23A		
D	VFD300C23A	57.6	60.8
	VFD370C23A		
E	VFD450C23A	62.2	68.6
	VFD550C23A		
	VFD750C23A		
F	VFD900C23A	58.7	68.1

Table 9-10

460V models

Frame	Model	Noise Level (dB)	
		70% Output Load	100% Output Load
A	VFD007C43A	No fan	
	VFD015C43A		
	VFD022C43A	46.6 (No speed control on tan)	46.6
	VFD037C43A		
	VFD040C43A		
	VFD055C43A		
B	VFD075C43A	56 (No speed control on tan)	56
	VFD110C43A		
	VFD150C43A		
C	VFD185C43A	60.0	65.3
	VFD220C43A		
	VFD300C43A		
D0	VFD370C43S	58.0	61.1
	VFD450C43S		
D	VFD370C43A	57.6	60.8
	VFD450C43A		
	VFD550C43A		
	VFD750C43A		
E	VFD900C43A	62.2	68.6
	VFD1100C43A		

Frame	Model	Noise Level (dB)	
		70% Output Load	100% Output Load
F	VFD1320C43A	58.7	68.1
	VFD1600C43A		
G	VFD1850C43A	67.1	70.5
	VFD2200C43A		
H	VFD2800C43A	71.4	75
	VFD3150C43A		
	VFD3550C43A		
	VFD4500C43A		

Table 9-11

590V / 690V models

Frame	Model	Noise Level (dB)
A	VFD015C53A-21	60.2
	VFD022C53A-21	
	VFD037C53A-21	
B	VFD055C53A-21	62
	VFD075C53A-21	
	VFD110C53A-21	
	VFD150C53A-21	
C	VFD220C63B-21	68
	VFD300C63B-21	
	VFD370C63B-21	
D	VFD450C63B-21	76.3
	VFD550C63B-21	
	VFD750C63B-21	
	VFD900C63B-21	
E	VFD1100C63B-21	88.8
	VFD1320C63B-21	
F	VFD1600C63B-21	85.7
	VFD2000C63B-21	
G	VFD2500C63B-21	81.2
	VFD3150C63B-21	
H	VFD4000C63B-21	81.7 (Use two sets of fan)
	VFD4500C63B-21	77.8 (Use three sets of fan)
	VFD5600C63B-21	
	VFD6300C63B-21	

Table 9-12

9-7 Specification for Operation Temperature and Protection Level

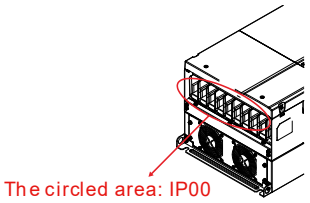
Model	Frame	Top cover	Conduit Box	Protection Level	Operation Temperature
VFDxxxCxxx-21	Frame A–C 230V: 0.75–22 kW 460V: 0.75–30 kW 575V: 1.5~15 kW 690V: 18.5–37 kW	Top cover removed	Standard conduit plate	IP20 / UL Open Type	-10–50°C
		Standard with top cover		IP20 / UL Type1 / NEMA1	-10–40°C
VFDxxxCxxx-21	Frame D0–H 230V: ≥ 22 kW 460V: ≥ 37 kW 690V: ≥ 45 kW	N/A	Standard conduit box	IP20 / UL Type1 / NEMA1	-10–40°C
VFDxxxCxxx-00	Frame D0–H 230V: ≥ 22 kW 460V: ≥ 37 kW 690V: ≥ 45 kW	N/A	No conduit box	IP00 IP20 / UL Open Type  Figure 9-1	-10–50°C

Table 9-13

9-8 Derating Curve

- For more information on calculation for derating curve, refer to Pr.06-55.
- When choosing the correct model, consider factors such as ambient temperature, altitude, carrier frequency, control mode, and so on. That is,
  Actual rated current for application (A) = Rated output current (A) x Ambient temp. rated derating (%) x Altitude rated derating (%) x (Normal / Advanced control) carrier frequency rated derating (%)

Protection Level	Operating Environment
UL Type I / IP20	**230V / 460V models:** If the AC motor drive operates at the rated current, the ambient temperature needs to be between -10–40°C. If the temperature is above 40°C, decrease 2% of the rated current for every 1°C increase in temperature. The maximum allowable temperature is 60°C. **575V / 690V models:** If the AC motor drive operates at the rated current, the ambient temperature needs to be between -10–40°C. If the temperature is above 40°C, decrease 2.5% of the rated current for every 1°C increase in temperature. The maximum allowable temperature is 60°C.
UL Open Type / IP20	**230V / 460V models:** If the AC motor drive operates at the rated current, the ambient temperature needs to be between -10–50°C. If the temperature is above 50°C, decrease 2% of the rated current for every 1°C increase in temperature. The maximum allowable temperature is 60°C. **575V / 690V models:** If the AC motor drive operates at the rated current, the ambient temperature needs to be between -10–50°C. If the temperature is above 50°C, decrease 2.5% of the rated current for every 1°C increase in temperature. The maximum allowable temperature is 60°C.

Table 9-14

Ambient Temperature Derating Curve

230V / 460V models

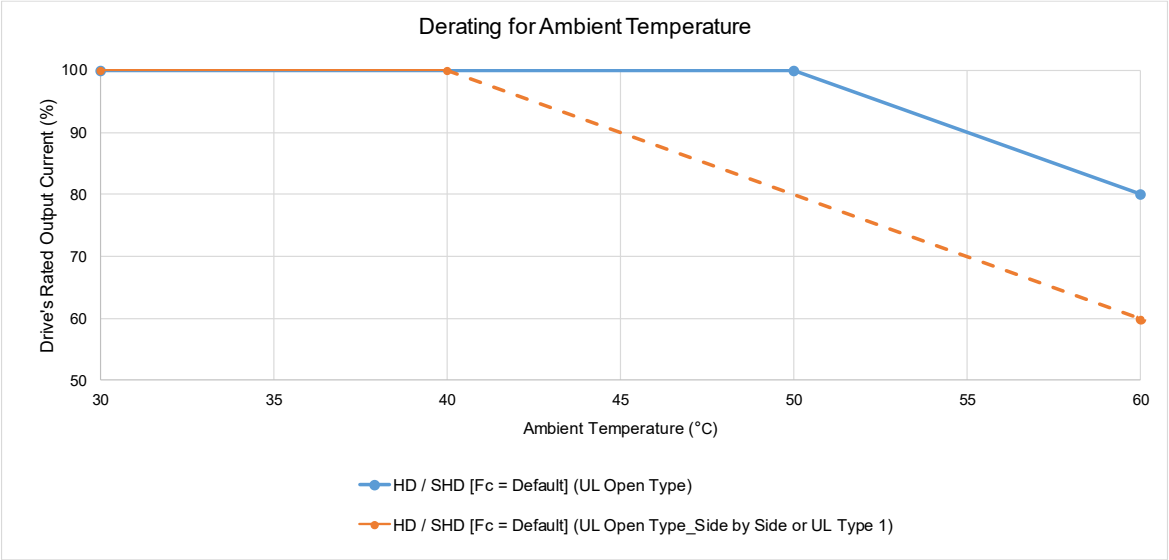


Figure 9-2

UL Open Type:

The rated output current derating (%) in normal duty / light duty / heavy duty when carrier frequency is the default value:

Ambient Temp. / 100% Load / Fc (kHz)	30°C	50°C	60°C
Default Value	100	100	80

Table 9-15

UL Open Type_Side by Side or UL Type 1:

The rated output current derating (%) in normal duty / light duty when carrier frequency is the default value:

Ambient Temp. / 100% Load / Fc (kHz)	30°C	40℃	60°C
Default Value	100	100	60

Table 9-16

575V / 690V models

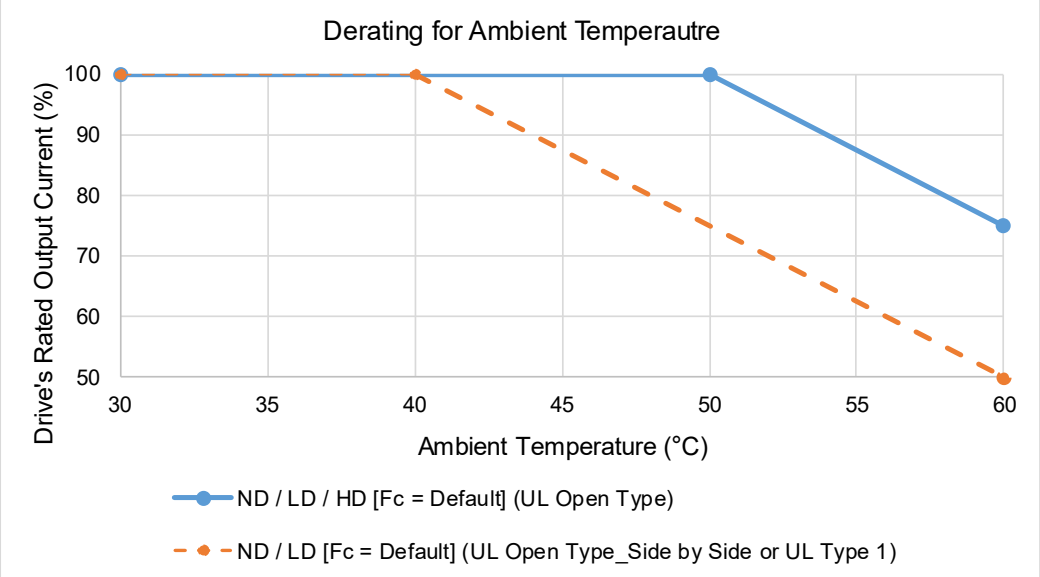


Figure 9-3

UL Open Type:

The rated output current derating (%) in normal duty / light duty / heavy duty when carrier frequency is the default value:

Ambient Temp. / 100% Load / Fc (kHz)	30°C	50°C	60°C
Default Value	100	100	75

Table 9-17

UL Open Type_Side by Side or UL Type 1:

The rated output current derating (%) in normal duty / light duty when carrier frequency is the default value:

Ambient Temp. / 100% Load / Fc (kHz)	30°C	40°C	60°C
Default Value	100	100	50

Table 9-18

Altitude Derating Curve

Condition	Operating Environment
High Altitude	If the AC motor drive is installed at an altitude of 0–1000 m, follow normal operation restrictions. For altitudes of 1000–2000 m, decrease the drive's rated current by 1% or lower the temperature by 0.5°C for every 100 m increase in altitude. The maximum altitude for corner grounding is 2000 m. If installing at an altitude higher than 2000 m is required, contact Delta for more information.

Table 9-19

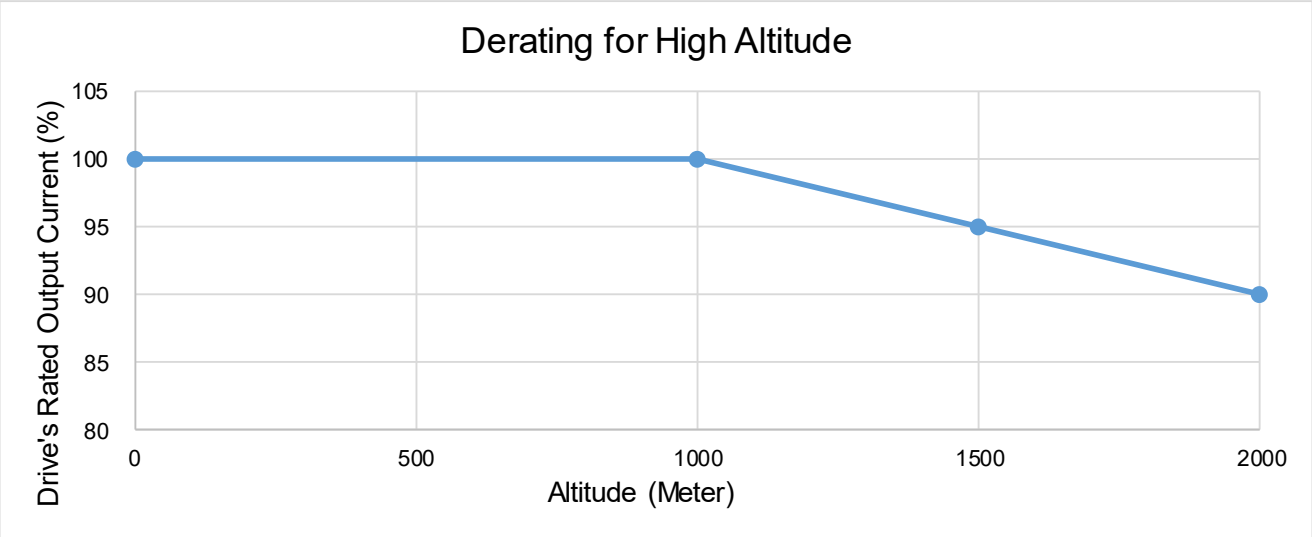


Figure 9-4

The rated output current derating (%) for different altitudes above sea level:

Altitude above Sea Level (Meter)	0	1000	1500	2000	2000	2000
Output Current / Rated Current (%)	100	100	95	90	85	80

Table 9-20

Carrier Frequency Derating Curve

- 230V / 460V models, Normal Control

  Pr.00-11 = 0 (IMVF)

  = 1 (IMVFPG)

  = 2 (IM SVC, Pr.05-33 = 0)

  = 3 (IMFOCPG)

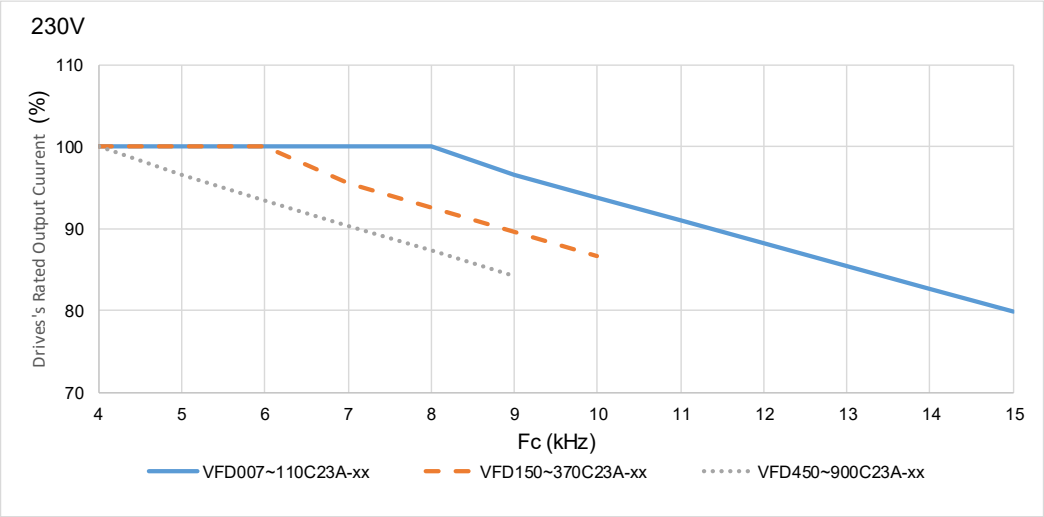


Figure 9-5

The rated output current derating (%) of 230V models in normal control mode for different carrier frequencies:

Fc (kHz) / Model No.	4	5	6	7	8	9	10	11	12	13	14	15
VFD007~110C23A-xx	100	100	100	100	100	97	94	91	88	85	83	80
VFD150~370C23A-xx	100	100	100	96	93	90	87	-	-	-	-	-
VFD450~900C23A-xx	100	97	93	90	87	84	-	-	-	-	-	-

Table 9-21

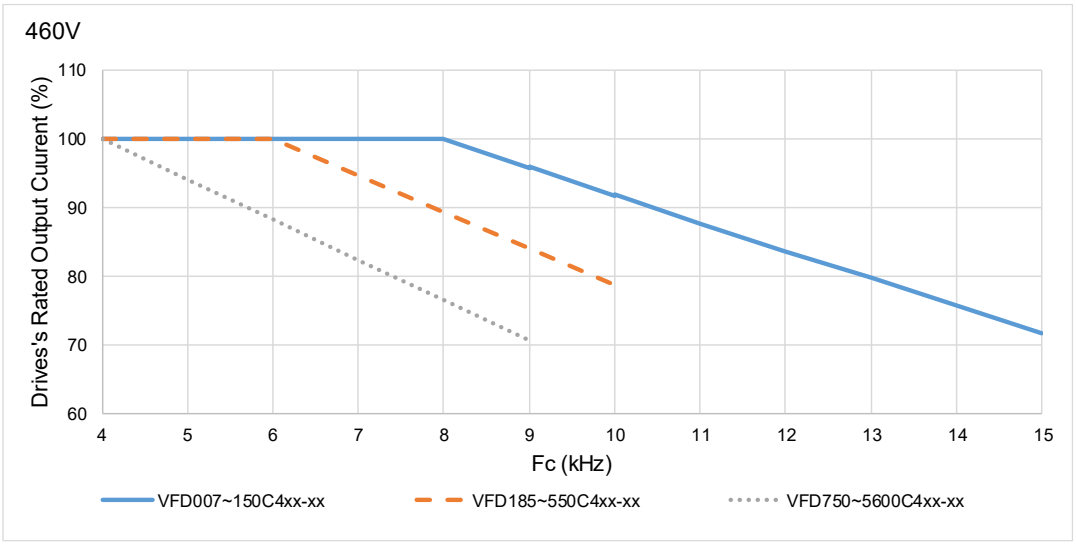


Figure 9-6

The rated output current derating (%) of 460V models in normal control mode for different carrier frequencies:

Fc (kHz) / Model No.	4	5	6	7	8	9	10	11	12	13	14	15
VFD007~150C4xx-xx	100	100	100	100	100	96	92	88	84	80	76	72
VFD185~550C4xx-xx	100	100	100	95	89	84	79	-	-	-	-	-
VFD750~5600C4xx-xx	100	94	88	82	76	71	-	-	-	-	-	-

Table 9-22

- 230V / 460V models, Advanced Control

  Pr.00-11 = 2 (PM SVC, Pr.05-33 = 1, 2)
  = 4 (PMFOCPG)
  = 5 (IMFOC Sensorless)
  = 6 (PM Sensorless)
  = 7 (IPM Sensorless)

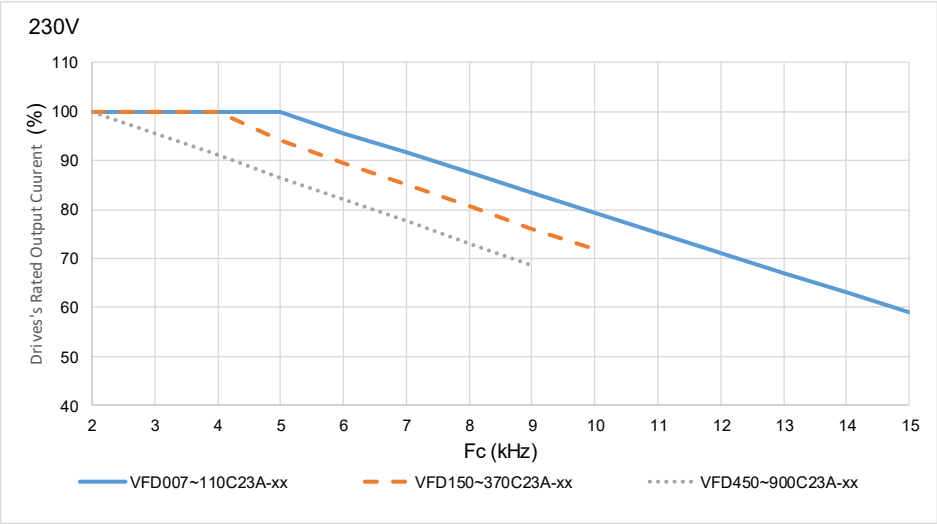


Figure 9-7

The rated output current derating (%) of 230V models in advanced control mode for different carrier frequencies:

Model No. \ Fc (kHz)	2	3	4	5	6	7	8	9	10	11	12	13	14	15
VFD007~110C23A-xx	100	100	100	100	96	92	88	83	79	75	71	67	63	59
VFD150~370C23A-xx	100	100	100	94	90	85	81	76	72	-	-	-	-	-
VFD450~900C23A-xx	100	96	91	87	82	78	73	69	-	-	-	-	-	-

Table 9-23

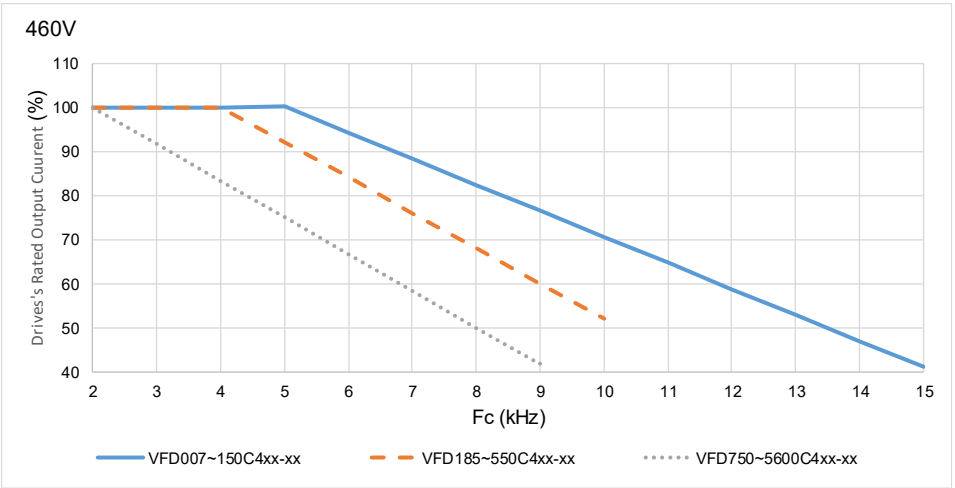


Figure 9-8

The rated output current derating (%) of 460V models in advanced control mode for different carrier frequencies:

Model No. \ Fc (kHz)	2	3	4	5	6	7	8	9	10	11	12	13	14	15
VFD007~150C4xx-xx	100	100	100	100	94	88	82	76	71	65	59	53	47	41
VFD185~550C4xx-xx	100	100	100	92	84	76	68	60	52	-	-	-	-	-
VFD750~5600C4xx-xx	100	92	83	75	67	58	50	42	-	-	-	-	-	-

Table 9-24

- 575V / 690V models

  Pr.00-16 = 2, light duty:

  Pr.00-11 = 0 (IMVF)

  = 1 (IMVFPG)

  = 2 (IM SVC, Pr.05-33 = 0)

  = 3 (IMFOCPG)

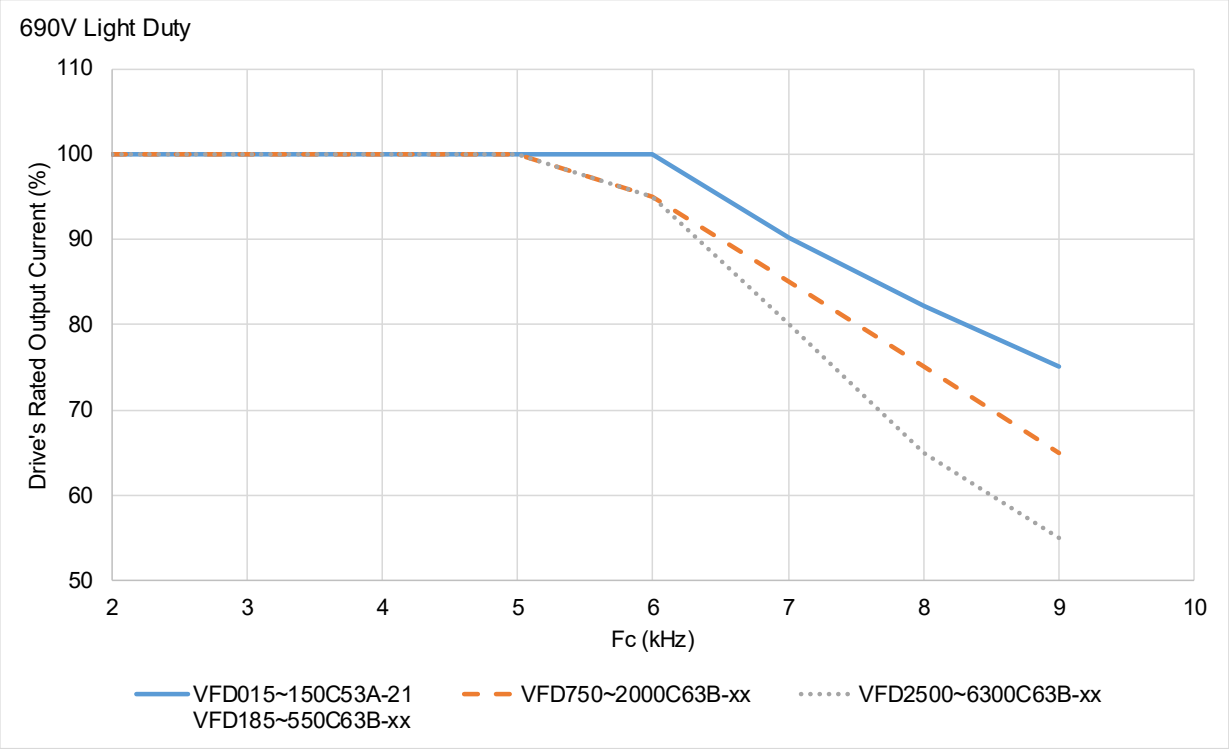


Figure 9-9

The rated output current derating (%) of 575V / 690V models in light duty for different carrier frequencies:

Fc (kHz) / Model No.	2	3	4	5	6	7	8	9
VFD015~150C53A-21 VFD185~550C63B-xx	100	100	100	100	100	90	82	75
VFD750~2000C63B-xx	100	100	100	100	95	85	75	65
VFD2500~6300C63B-xx	100	100	100	100	95	80	65	55

Table 9-25

Pr.00-16 = 0, normal duty:

Pr.00-11 = 0 (IMVF)

= 1 (IMVFPG)

= 2 (IM SVC, Pr.05-33 = 0)

= 3 (IMFOCPG)

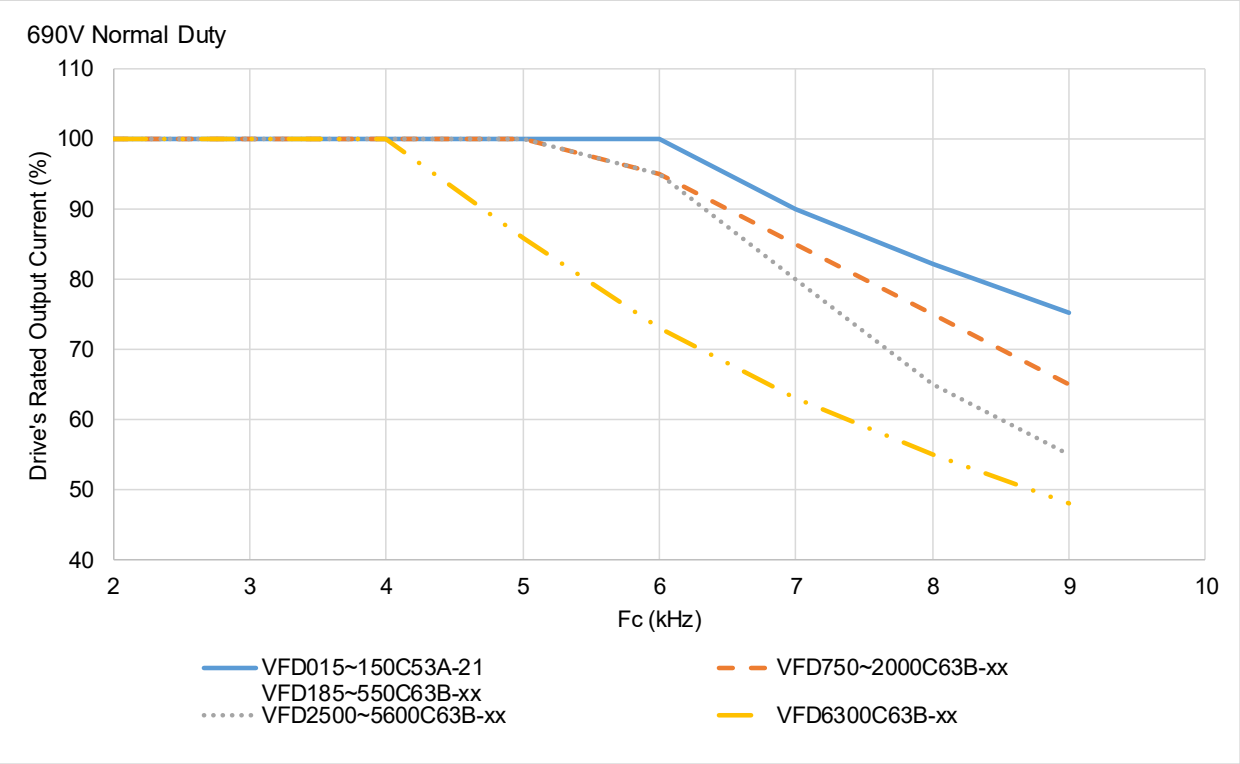


Figure 9-10

The rated output current derating (%) of 575V / 690V models in normal duty for different carrier frequencies:

Fc (kHz) / Model No.	2	3	4	5	6	7	8	9
VFD015~150C53A-21 VFD185~550C63B-xx	100	100	100	100	100	90	82	75
VFD750~2000C63B-xx	100	100	100	100	95	85	75	65
VFD2500~5600C63B-xx	100	100	100	100	95	80	65	55
VFD6300C63B-xx	100	100	100	86	73	63	55	48

Table 9-26

Pr.00-16 = 1, heavy duty:

Pr.00-11 = 0 (IMVF)

= 1 (IMVFPG)

= 2 (IM SVC, Pr.05-33 = 0)

= 3 (IMFOCPG)

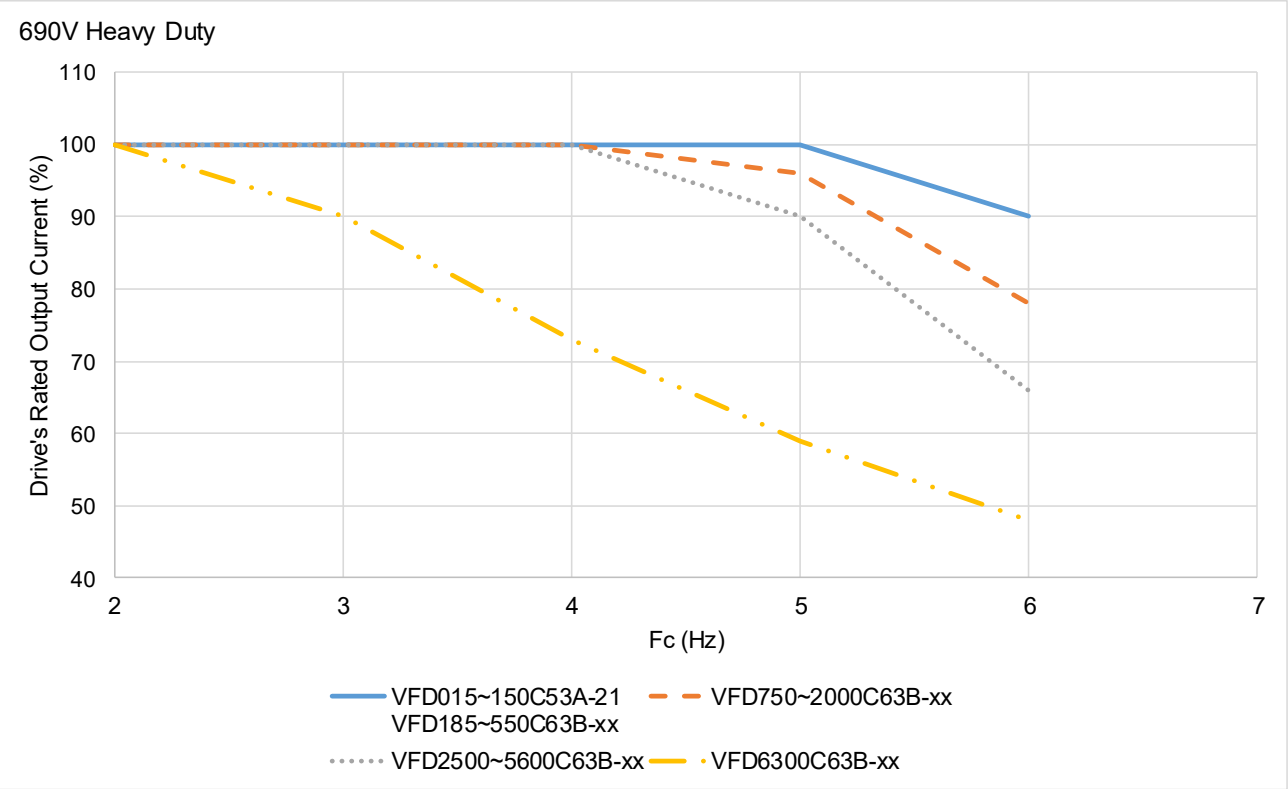


Figure 9-11

The rated output current derating (%) of 575V / 690V models in heavy duty for different carrier frequencies:

Fc (kHz) / Model No.	2	3	4	5	6
VFD015~150C53A-21 VFD185~550C63B-xx	100	100	100	100	90
VFD750~2000C63B-xx	100	100	100	96	78
VFD2500~5600C63B-xx	100	100	100	90	66
VFD6300C63B-xx	100	90	73	59	48

Table 9-27

9-9 Efficiency Curve

- Models:
  VFD007~370C23A-xx
  VFD007~750C4xx-xx

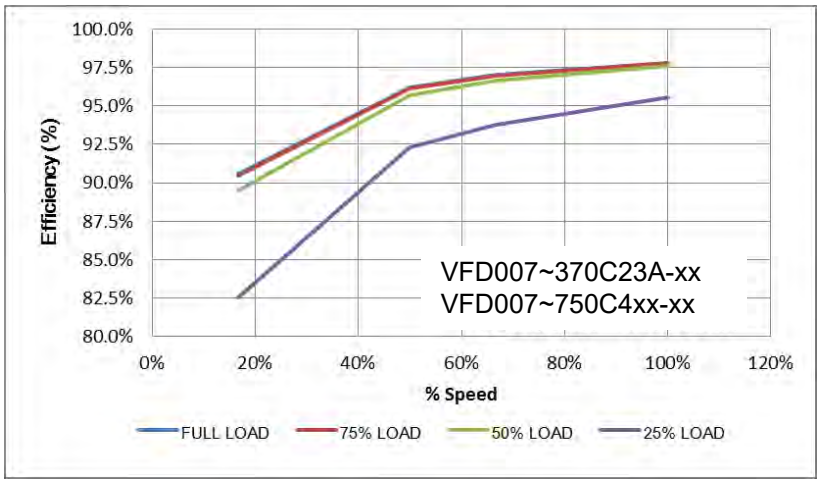


Figure 9-12

Efficiency (%) under different loads:

Speed (%) / Load (%)	16.7	50	66.7	100
100% Load	90.6	96.2	97.0	97.8
75% Load	90.4	96.1	96.9	97.8
50% Load	89.5	95.7	96.6	97.6
25% Load	82.5	92.3	93.8	95.5

Table 9-28

- Models:
  VFD450~900C23A-xx
  VFD900~5600C4xx-xx

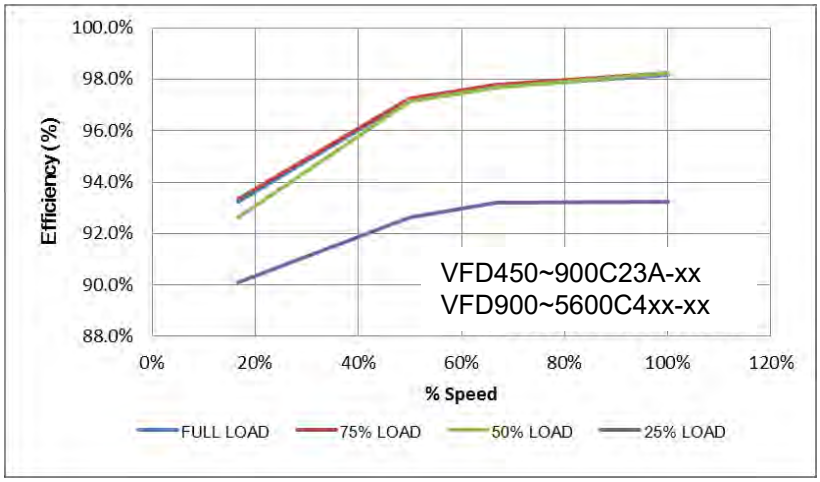


Figure 9-13

Efficiency (%) under different loads:

Speed (%) / Load (%)	16.7	50	66.7	100
100% Load	93.4	97.3	97.8	98.3
75% Load	93.4	97.3	97.8	98.3
50% Load	92.6	97.1	97.7	98.2
25% Load	90.1	92.6	93.2	93.2

Table 9-29

- Models:
  VFD055~150C53A-21
  VFD2500~4500C63B-xx

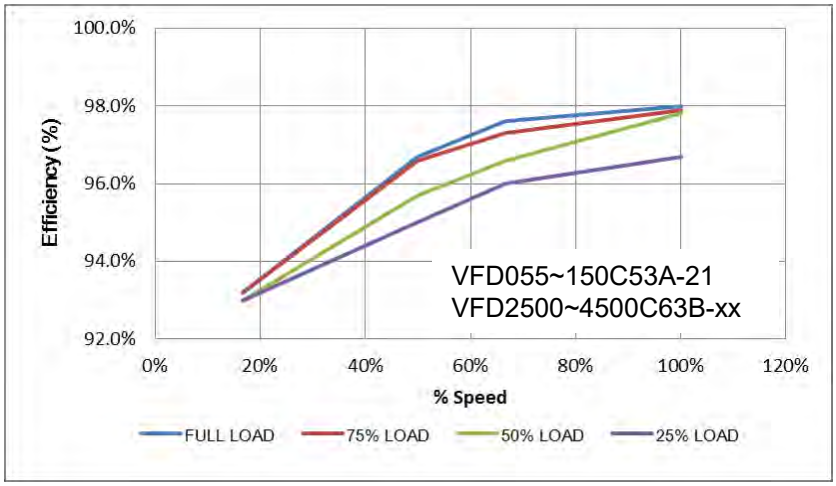


Figure 9-14

Efficiency (%) under different loads:

Speed (%) / Load (%)	16.7	50	66.7	100
100% Load	93.2	96.7	97.6	98
75% Load	93.2	96.6	97.3	97.9
50% Load	93	95.7	96.6	97.8
25% Load	93	95	96	96.7

Table 9-30

- Models:
  VFD015~037C53A-21
  VFD185~2000C63B-xx

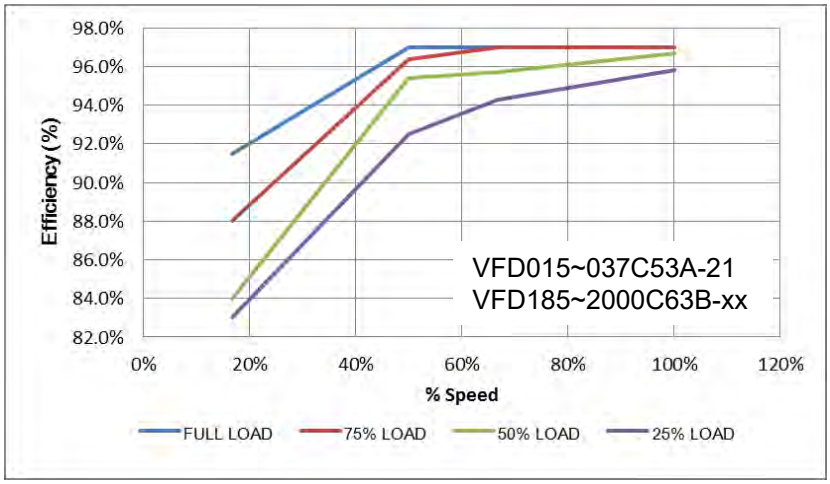


Figure 9-15

Efficiency (%) under different loads:

Speed (%) / Load (%)	16.7	50	66.7	100
100% Load	91.5	97	97	97
75% Load	88	96.4	97	97
50% Load	84	95.4	95.7	96.7
25% Load	83	92.5	94.3	95.8

Table 9-31

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Chapter 10 Digital Keypad

10-1 Descriptions of Digital Keypad

10-2 Function of Digital Keypad KPC-CC01

10-3 TPEditor Installation Instruction

10-4 Digital Keypad KPC-CC01 Fault Codes and Descriptions

10-5 Unsupported Functions when using TPEditor with the KPC-CC01

10-1 Descriptions of Digital Keypad

KPC-CC01



Communication Interface
RJ45 (socket), RS-485 interface

Communication protocol:
RTU19200, 8, N, 2

Installation Method

1. The embedded type can be installed flat on the surface of the control box. The front cover is waterproof.
2. Buy a MKC-KPPK model for wall mounting or embedded mounting. Its protection level is IP66.
3. The maximum RJ45 extension lead is 5 m (16ft).
4. This keypad can only be used on Delta's motor drive C2000 series, CH2000 and CP2000 series.

Keypad Function Description

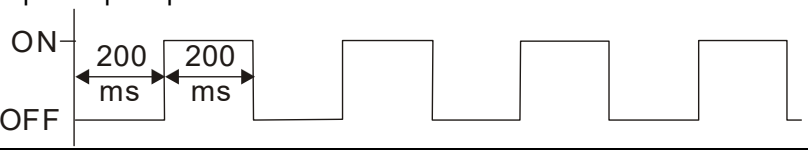
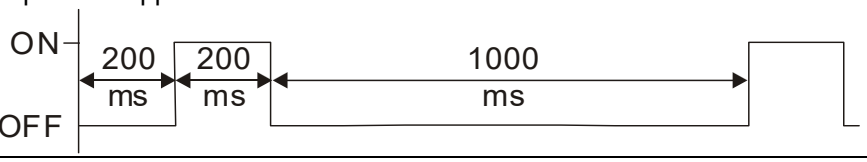
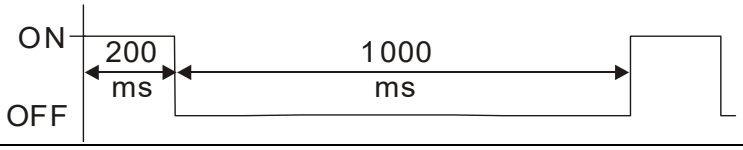
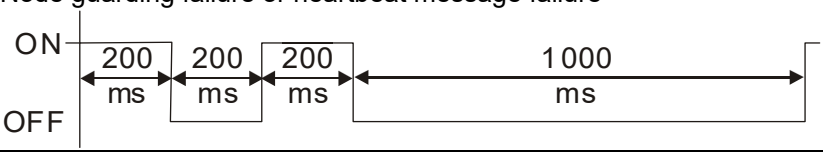
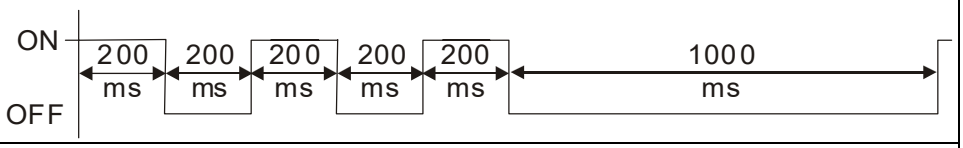
Key	Descriptions
RUN	Start Operation Key 1. Only valid when the source of operation command is the keypad. 2. Operates the AC motor drive by the function setting. The RUN LED will be ON. 3. Can be pressed repeatedly at the stop process.
STOP RESET	Stop Command Key. 1. This key has the highest priority when the command is from the keypad. 2. When it receives the STOP command, regarless of whether the AC motor drive is in operation or stop status, the AC motor drive executes the "STOP" command. 3. Use the STOP / RESET key to reset the drive after a fault occurs. 4. If you cannot reset after the error: a. The condition which triggers the fault is not cleared. After you clear the condition, you can then reset the fault. b. The drive is in fault status when powered on. After you clear the condition, restart and then you can reset the fault.
FWD REV	Operation Direction Key 1. Only controls the operation direction, NOT the drive activation. FWD: forward, REV: reverse. 2. Refer to the LED descriptions for more details.
ENTER	ENTER Key Goes to the next menu level. If at the last level, press ENTER to execute the command.
ESC	ESC Key Leaves the current menu and returns to the previous menu; also functions as a return key or cancel key in a sub-menu.
MENU	Returns to the main menu. Menu commands: 1. Parameter Setup 2. Quick Start 3. Application Selection List 4. Changed List 5. Copy Parameter 6. Fault Record 7. Language Setup 8. Time Setup 9. Keypad Locked 10. PLC Function 11. Copy PLC 12. Display Setup 13. Start-up Menu 14. Main Page 15. PC Link 16. Start Wizard
^ v < >	Direction: Left / Right / Up / Down 1. In the numeric value setting mode, moves the cursor and changes the numeric value. 2. In the menu / text selection mode, selects an item.

Key	Descriptions
F1 F2 F3 F4	Function Key 1. The functions keys have defaults and can also be use-defined. The defaults for F1 and F4 work with the function list below. For example, F1 is the JOG function, and F4 is a speed setting key for adding / deleting user-defined parameters. 2. Other functions must be defined using TPEditor. (Download TPEditor software at Delta website. Select TPEditor version 1.60 or later. Refer to the installation instruction for TPEditor in Section 10-3.)
HAND	HAND Key 1. Use this key to select HAND mode. In this mode, the drive's parameter settings for frequency command source is Pr.00-30, and that for operation command source is Pr.00-31. 2. Press the HAND key at STOP, then the setting switches to the HAND frequency source and HAND operation source. 3. Press HAND key at RUN, and it stops the AC motor drive first (displays AHSP warning), and switches to HAND frequency source and HAND operation source. 4. Successful mode switching for the KPC-CC01 displays HAND mode on the screen.
AUTO	AUTO Key 1. The default of the drive is AUTO mode. 2. Use this key to select AUTO mode. In this mode, the drive's parameter settings for frequency command source is Pr.00-20, and that for operation command is Pr.00-21. 3. Press the AUTO key at STOP, then the setting switches to the AUTO frequency source and AUTO operation source. 4. Press AUTO key at RUN, and it stops the AC motor drive first (displays AHSP warning), and switches to AUTO frequency source and AUTO operation source. 5. Successful mode switching for the KPC-CC01 displays AUTO mode on the screen

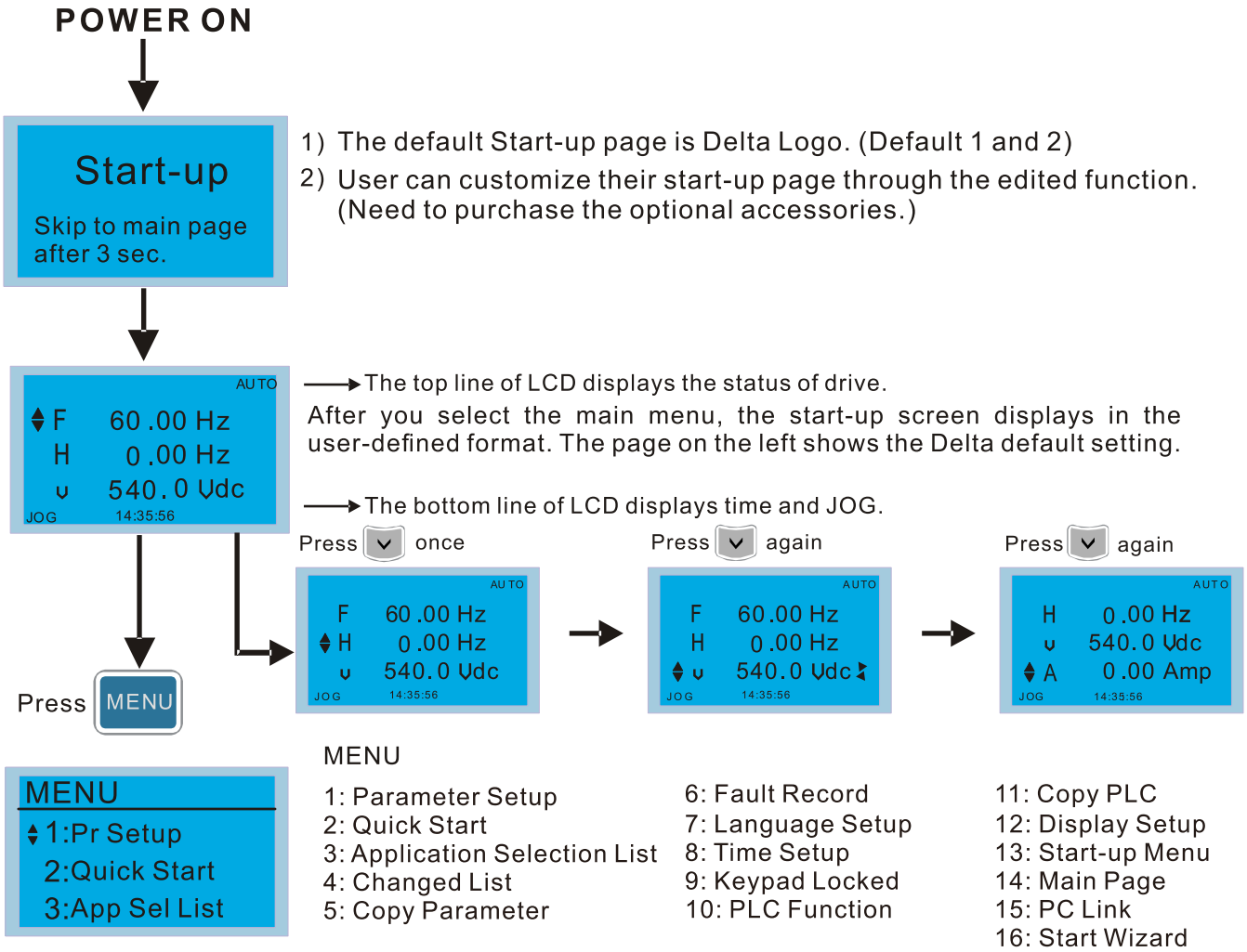
NOTE: The defaults for the frequency command and operation command source of HAND / AUTO mode are both from the keypad.

LED Functions Descriptions

LED	Descriptions
STOP RESET	Steady ON: STOP indicator for the AC motor drive. Blinking: the drive is in standby. Steady OFF: the drive does not execute the "STOP" command.
FWD REV	Operation Direction LED 1. Green light: the drive is running forward. 2. Red light: the drive is running backward. 3. Flashing light: the drive is changing direction. Operation Direction LED under Torque Mode 1. Green light: when the torque command ≥ 0, and the motor is running forward. 2. Red light: when the torque command < 0, and the motor is running backward. 3. Flashing light: when the torque command < 0, and the motor is running forward.

<table>
<tr><th>LED</th><th>Descriptions</th></tr>
<tr><td>CANopen–RUN</td><td>RUN LED:
<table>
<tr><th>LED status</th><th>Condition / State</th></tr>
<tr><td>OFF</td><td>CANopen at initial state
No LED</td></tr>
<tr><td>Flashing</td><td>CANopen at pre-operation state
 
</td></tr>
<tr><td>Single flash</td><td>CANopen at stopped state
 
</td></tr>
<tr><td>ON</td><td>CANopen at operational state
 
</td></tr>
</table></td></tr>
<tr><td>CANopen–ERR</td><td>ERR LED:
<table>
<tr><th>LED status</th><th>Condition / State</th></tr>
<tr><td>OFF</td><td>No error</td></tr>
<tr><td>Single flash</td><td>At least one packet of CANopen is in failure
 
</td></tr>
<tr><td>Double flash</td><td>Node guarding failure or heartbeat message failure
 
</td></tr>
<tr><td>Triple flash</td><td>Synchronization failure
 
</td></tr>
<tr><td>ON</td><td>Bus off
 
</td></tr>
</table></td></tr>
</table>

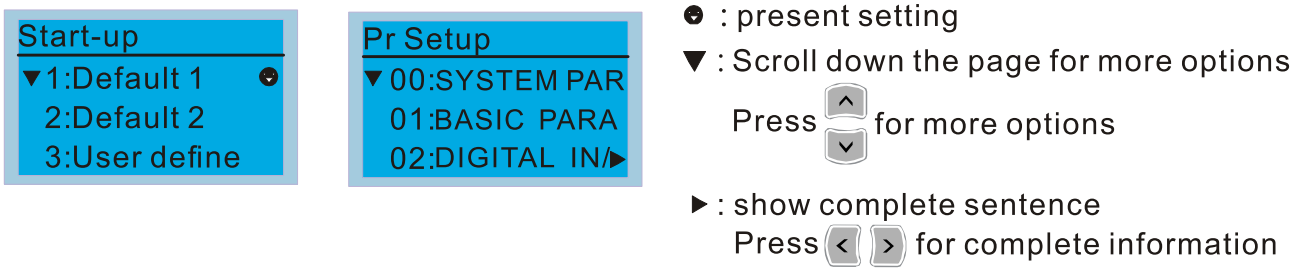
10-2 Function of Digital Keypad KPC-CC01



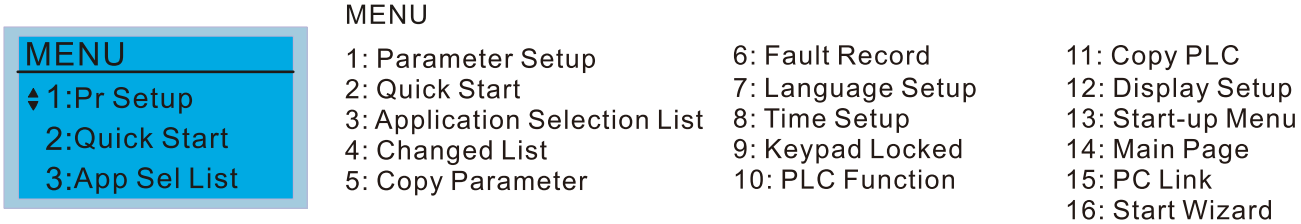
NOTE:

1. Start-up screen can only display pictures, not animation.
2. When powered ON, it displays the start-up screen then the main screen. The main screen displays Delta's default setting F/H/A/U. You can set the display order with Pr.00-03 (Start-up display). When you select the U screen, use the left / right keys to switch between the items, and set the display order for the U screen with Pr.00-04 (User display).

Display Icon



Display item

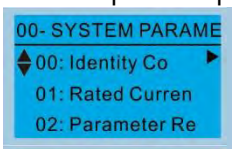


1. Parameter Setup

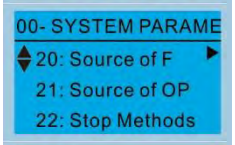


Press ENTER to select.
Press UP / DOWN to select the parameter group.
Once you select a parameter group, press ENTER to go into that group.

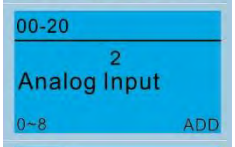
For example: Setup source for the master frequency command.



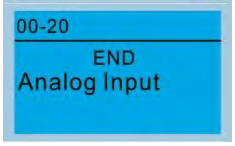
In the Group 00 Motor Drive Parameter,
use UP / DOWN keys to select parameter 20: Auto Frequency Command.



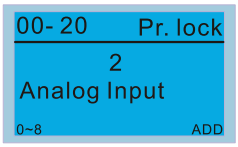
Press ENTER to go to this parameter's setting menu.



Use the UP / DOWN keys to choose a setting.
For example: choose 2 Analogue Input, and then press ENTER key.

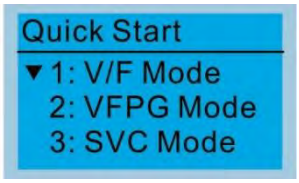


After you press ENTER, END is displayed which means that the parameter setting is done.



NOTE: When parameter lock / password protection function is enabled, it displays "Pr. lock" on the upper right corner of the keypad. The parameter cannot be written or is protected by the password under this circumstance.

2. Quick Start

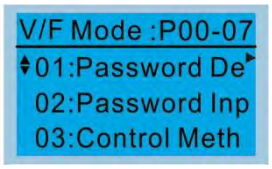


Press ENTER to select.

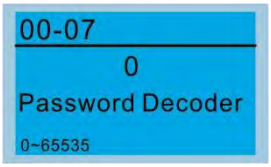
Quick Start:
1. V/F Mode
2. VFPG Mode
3. SVC Mode
4. FOCPG Mode
5. TQCPG Mode
6. My Mode

Description:

1. VF Mode



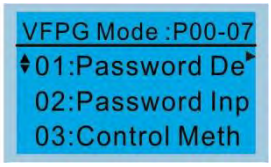
01:Password Decoder



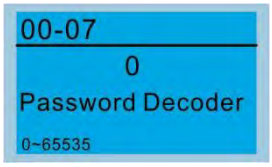
Items
1. Parameter protection password input (Pr.00-07)
2. Parameter protection password setting (Pr.00-08)
3. Control mode (Pr.00-10)
4. Speed control mode (Pr.00-11)
5. Load selection (Pr.00-16)
6. Carrier frequency (Pr.00-17)
7. Master frequency command source / Source selection of the PID target (AUTO)(Pr.00-20)
8. Operation command source (AUTO) (Pr.00-21)
9. Stop method (Pr.00-22)
10. Digital keypad STOP function (Pr.00-32)
11. Max. operation frequency (Pr.01-00)
12. Motor 1 rated / base frequency (Pr.01-01)
13. Motor 1 rated / base voltage (Pr.01-02)
14. Motor 1 mid-point frequency 1 (Pr.01-03)
15. Motor 1 min-point voltage 1 (Pr.01-04)
16. Motor 1 mid-point frequency 2 (Pr.01-05)
17. Motor 1 mid-point voltage 2 (Pr.01-06)
18. Motor 1 min. output frequency (Pr.01-07)
19. Motor 1 min. output voltage (Pr.01-08)
20. Output frequency upper limit (Pr.01-10)
21. Output frequency lower limit (Pr.01-11)
22. Acceleration time 1 (Pr.01-12)
23. Deceleration time 1 (Pr.01-13)
24. Over-voltage stall prevention (Pr.06-01)
25. Derating protection (Pr.06-55)
26. Software brake chopper action level (Pr.07-00)

27. Speed tracking during start-up (Pr.07-12)
28. Emergency stop (EF) & force to stop selection (Pr.07-20)
29. Torque command filter time (Pr.07-24)
30. Slip compensation filter time (Pr.07-25)
31. Torque compensation gain (Pr.07-26)
32. Slip compensation gain (Pr.07-27)

2. VFPG Mode

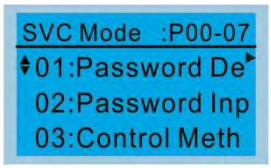


01: Password Decoder

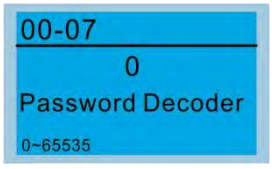


Items
1. Parameter protection password input (Pr.00-07)
2. Parameter protection password setting (Pr.00-08)
3. Control mode (Pr.00-10)
4. Speed control mode (Pr.00-11)
5. Load selection (Pr.00-16)
6. Master frequency command source (AUTO) / Source selection of the PID target (Pr.00-20)
7. Operation command source (AUTO) (Pr.00-21)
8. Stop method (Pr.00-22)
9. Digital keypad STOP function (Pr.00-32)
10. Max. operation frequency (Pr.01-00)
11. Motor 1 rated / base frequency (Pr.01-01)
12. Motor 1 rated / base voltage (Pr. 01-02)
13. Motor 1 min. output frequency (Pr.01-07)
14. Motor 1 min. output voltage (Pr.01-08)
15. Output frequency upper limit (Pr.01-10)
16. Output frequency lower limit (Pr.01-11)
17. Acceleration time 1 (Pr.01-12)
18. Deceleration time 1 (Pr.01-13)
19. Over-voltage stall prevention (Pr.06-01)
20. Software brake chopper action level (Pr.07-00)
21. Torque command filter time (Pr.07-24)
22. Slip compensation filter time (Pr.07-25)
23. Slip compensation gain (Pr.07-27)
24. Encoder type selection (Pr.10-00)
25. Encoder pulses per revolution (Pr.10-01)
26. Encoder input type setting (Pr.10-02)
27. ASR 1 gain (Pr.11-06)
28. ASR 1 integral time (Pr.11-07)
29. ASR 2 gain (Pr.11-08)
30. ASR 2 integral time (Pr.11-09)
31. ASR gain of zero speed (Pr.11-10)
32. ASR1 integral time of zero speed (Pr.11-11)

3. SVC Mode



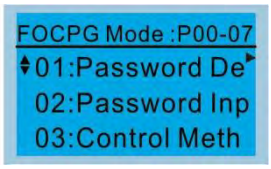
01: Password Decoder



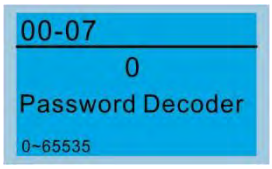
Items
1. Parameter protection password input (Pr.00-07)
2. Parameter protection password setting (Pr.00-08)
3. Control mode (Pr.00-10)
4. Speed control mode (Pr.00-11)
5. Load selection (Pr.00-16)
6. Carrier frequency (Pr.00-17)
7. Master frequency command source (AUTO) / Source selection of the PID target (Pr.00-20)

8. Operation command source (AUTO) (Pr.00-21)
9. Stop method (Pr.00-22)
10. Digital keypad STOP function (Pr.00-32)
11. Max. operation frequency (Pr.01-00)
12. Motor 1 rated / base frequency (Pr.01-01)
13. Motor 1 rated / base voltage (Pr.01-02)
14. Motor 1 min. output frequency (Pr.01-07)
15. Motor 1 min. output voltage (Pr.01-08)
16. Output frequency upper limit (Pr.01-10)
17. Output frequency lower limit (Pr.01-11)
18. Acceleration time 1 (Pr.01-12)
19. Deceleration time 1 (Pr.01-13)
20. Full-load current for induction motor 1 (Pr.05-01)
21. Rated power for induction motor 1 (Pr.05-02)
22. Rated speed for induction motor 1 (Pr.05-03)
23. Number of poles for induction motor 1 (Pr.05-04)
24. No-load current for induction motor 1 (Pr.05-05)
25. Over-voltage stall prevention (Pr.06-01)
26. Over-current stall prevention during acceleration (Pr.06-03)
27. Derating protection (Pr.06-55)
28. Software brake chopper action level (Pr.07-00)
29. Emergency stop (EF) & force to stop selection (Pr.07-20)
30. Torque command filter time (Pr.07-24)
31. Slip compensation filter time (Pr.07-25)
32. Slip compensation gain (Pr.07-27)

4. FOCPG Mode



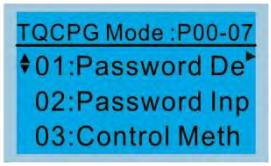
01: Password Decoder



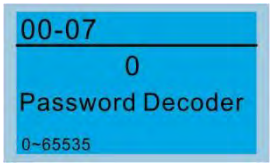
Items
1. Parameter protection password input (Pr.00-07)
2. Parameter protection password setting (Pr.00-08)
3. Control mode (Pr.00-10)
4. Speed control mode (Pr.00-11)
5. Master frequency command source (AUTO) / Source selection of the PID target (Pr.00-20)
6. Operation command source (AUTO) (Pr.00-21)
7. Stop method (Pr.00-22)
8. Max. operation frequency (Pr.01-00)
9. Motor 1 rated / base frequency (Pr.01-01)
10. Motor 1 rated / base voltage (Pr.01-02)
11. Output frequency upper limit (Pr.01-10)
12. Output frequency lower limit (Pr.01-11)
13. Acceleration time 1 (Pr.01-12)
14. Deceleration time 1 (Pr.01-13)
15. Full-load current for induction motor 1 (Pr.05-01)
16. Rated power for induction motor 1 (Pr.05-02)
17. Rated speed for induction motor 1 (Pr.05-03)

18. Number of poles for induction motor 1 (Pr.05-04)
19. No-load current for induction motor 1 (Pr.05-05)
20. Over-voltage stall prevention (Pr.06-01)
21. Over-current stall prevention during acceleration (Pr.06-03)
22. Derating protection (Pr.06-55)
23. Software brake chopper action level (Pr.07-00)
24. Emergency stop (EF) & force to stop selection (Pr.07-20)
25. Encoder type selection (Pr.10-00)
26. Encoder pulses per revolution (Pr.10-01)
27. Encoder input type setting (Pr.10-02)
28. System control (Pr.11-00)
29. Per-unit of system inertia (Pr.11-01)
30. ASR1 low-speed bandwidth (Pr.11-03)
31. ASR2 high-speed bandwidth (Pr.11-04)
32. Zero-speed bandwidth (Pr.11-05)

5. TQCPG Mode



01: Password Decoder

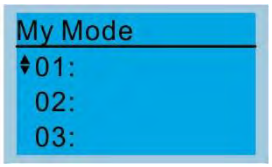


Items

1. Parameter protection password input (Pr.00-07)
2. Parameter protection password setting (Pr.00-08)
3. Control mode (Pr.00-10)
4. Speed control mode (Pr.00-11)
5. Master frequency command source (AUTO) / Source selection of the PID target (Pr.00-20)
6. Operation command source (AUTO) (Pr.00-21)
7. Max. operation frequency (Pr.01-00)
8. Motor 1 rated / base frequency (Pr.01-01)
9. Motor 1 rated / base voltage (Pr.01-02)
10. Full-load current for induction motor 1 (Pr.05-01)
11. Rated power for induction motor 1 (Pr.05-02)
12. Rated speed for induction motor 1 (Pr.05-03)
13. Number of poles for induction motor 1 (Pr.05-04)
14. No-load current of induction motor 1 (Pr.05-05)
15. Over-voltage stall prevention (Pr.06-01)
16. Software brake chopper action level (Pr.07-00)
17. Encoder type selection (Pr.10-00)
18. Encoder pulses per revolution (Pr.10-01)
19. Encoder input type setting (Pr.10-02)
20. System control (Pr.11-00)
21. Per-unit of system inertia (Pr.11-01)
22. ASR1 low-speed bandwidth (Pr.11-03)
23. ASR2 high-speed bandwidth (Pr.11-04)
24. Zero-speed bandwidth (Pr.11-05)
25. Max. torque command (Pr.11-27)
26. Torque offset source (Pr.11-28)
27. Torque offset setting (Pr.11-29)

28. Torque command source (Pr.11-33)
29. Torque command (Pr.11-34)
30. Speed limit selection (Pr.11-36)
31. Forward speed limit (torque mode) (Pr.11-37)
32. Reverse speed limit (torque mode) (Pr.11-38)

6. My Mode



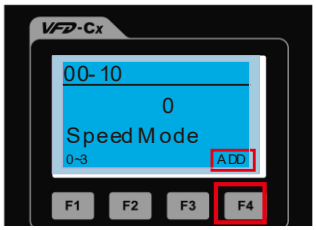
Press F4 in parameter setting screen to save the parameter to My Mode. To delete or correct the parameter, select this parameter and press F4 for DEL in the bottom right corner.

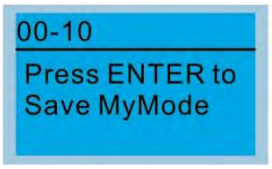
Items

It can save 1–32 sets of parameters (Pr).

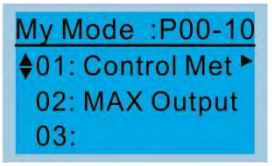
Setup process

1. Go to Parameter Setup function.
   Press ENTER to select the parameter to use. There is an ADD on the bottom right corner of the screen. Press F4 to add this parameter to My Mode.

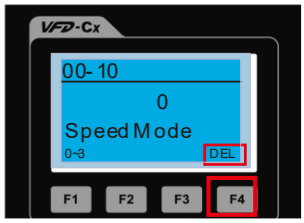


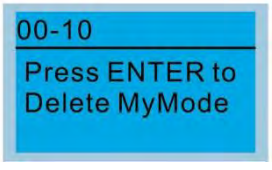


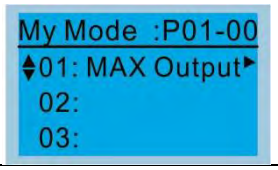
2. The parameter (Pr) displays in My mode if it is properly saved.
   To correct or to delete this parameter, press F4 for DEL.



3. To delete a parameter, go to My Mode and select the parameter to delete.
   Press ENTER to enter the parameter setting screen. DEL appears in the bottom left corner of the screen. Press F4 to delete this parameter from My Mode.





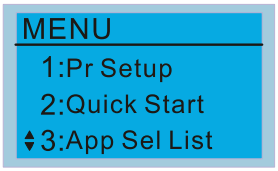
	4. After you press ENTER to delete <01 Control Mode>, the <02 Maximum Operating Frequency > automatically replaces <01 Control Mode>. 

3. Application Selection List

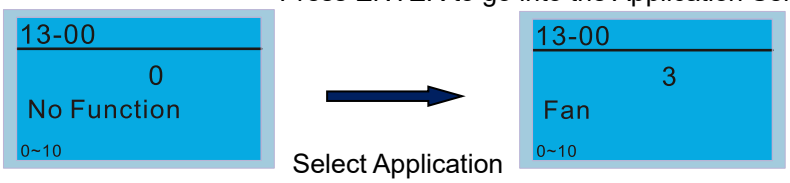


This function enables you to select application and its parameters sets.

Example:
In the menu content, select 3: Application Selection List



Press ENTER to go into the Application Selection List

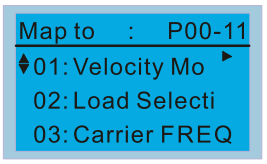


Select Application

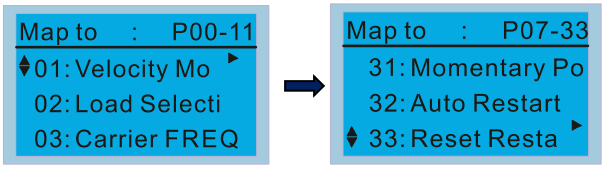
Press ENTER to enter the application selection screen, and the selected application industry is “Fan”.

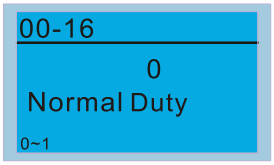


Press ENTER to enter the Fan application screen.



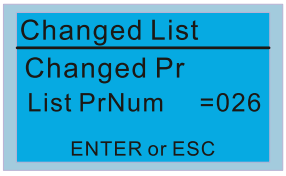
Press the UP / DOWN keys to select the parameter to set.





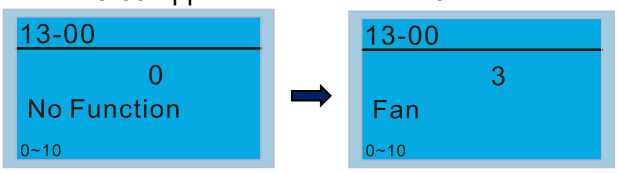
Choose 0: Normal duty or 1: Heavy duty according to your needs, then press ENTER.

4. Changed List

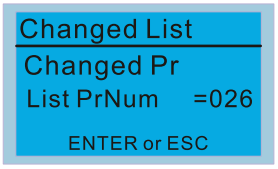


This function records the parameters you have changed.

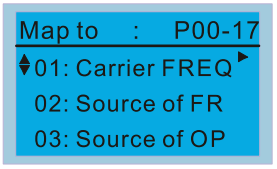
Example:
Set Pr.13-00 Application Selection = 3: Fan



Enter the changed list screen. List PrNum=026 means that there are 26 parameters that have been changed.



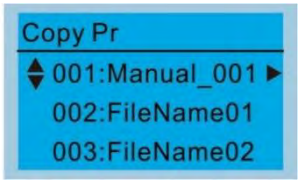
Press ENTER to enter the changed list screen.



Use the UP / DOWN keys to select the parameters to check or to change.
Press ENTER to enter the parameter.



5. Copy Parameter

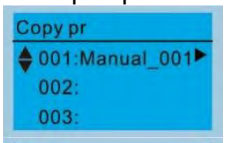


Press ENTER to go to

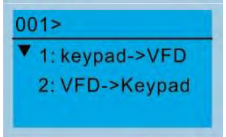
001–004 content storage

Four groups of parameters are available to copy
The steps are shown in the example below.

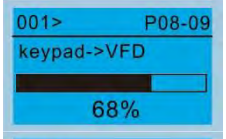
Example: parameter saved in the motor drive.



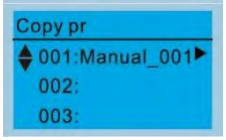
1. Go to Copy Parameter
2. Select the parameter group to copy and press ENTER.



1. Select 1: keypad→VFD
2. Press ENTER to go to the “keypad→VFD” screen.

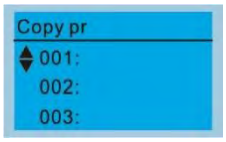


Begin copying parameters until it is done.

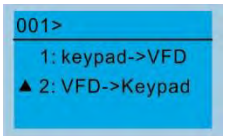


After copying is done, the keypad automatically returns to this screen.

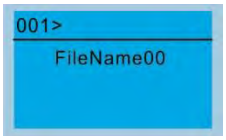
Example: parameter saved in the keypad.



1. Go to Copy parameter
2. Select the parameter group to copy and press ENTER.

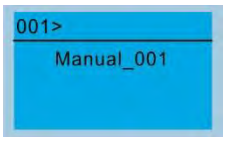


Press ENTER to go to the “VFD→keypad” screen.

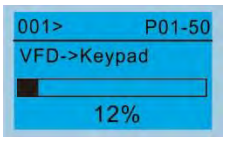


Press the UP / DOWN keys to select a symbol.
Press the LEFT / RIGHT keys to move the cursor to select a file name.

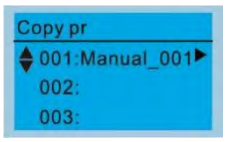
String & Symbol Table:
！” ＃＄％＆’ （）＊＋，－．／０１２３４５６７８９：；＜＝＞？＠ＡＢＣＤＥＦＧＨＩＪＫＬＭＮＯＰＱＲＳＴＵＶＷＸＹＺ〔＼〕＾＿ ‘ａｂｃｄｆｇｈｉｊｋｌｍｎｏｐｑｒｓｔｕｖｗｘｙｚ｛｜｝～



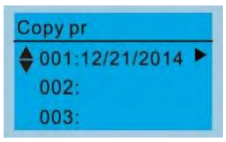
After you confirm the file name, press ENTER.



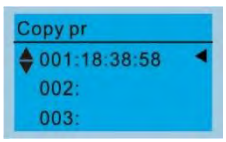
Begin copying parameters until it is done.



After copying parameters is done, the keypad automatically returns to this screen.



Press the RIGHT key to see the date of the parameters copied.



Press the RIGHT key to see the time of the parameters copied.

6. Fault Record

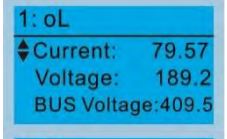


Press ENTER to see an error record’s details.

Able to store 6 error codes (Keypad V1.02 and previous versions)
Able to store 30 error codes (Keypad V1.20 and later version)
The most recent error record shows as the first record. Choose an error record to see details such as date, time, frequency, current, voltage, and DC bus voltage)

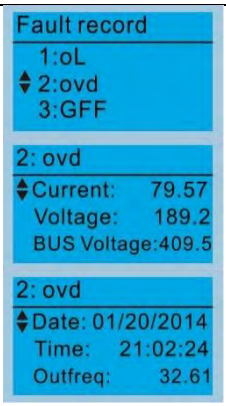


Press the UP / DOWN keys to select an error record.
Press ENTER to see that error record’s details.





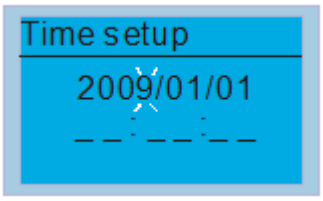
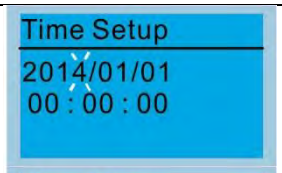
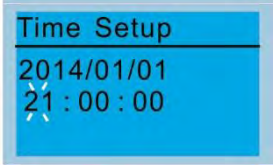
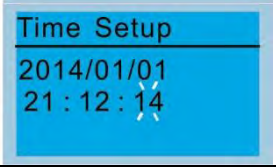
Press the UP / DOWN keys to scroll through an error record’s details such as date, time, frequency, current, voltage, and DC bus voltage.

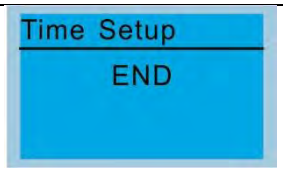
	 Press the UP / DOWN keys to select the next error code. After selecting an error code, press ENTER to see that error record's details. Press the UP / DOWN keys to see an error record's details such as date, time, frequency, current, voltage, and DC bus voltage. **NOTE:** The AC motor drive actions are recorded and saved to the KPC-CC01. When you remove the KPC-CC01 and connect it to another AC motor drive, the previous fault records are not deleted. The new fault records of the new AC motor drive continue to be added to the KPC-CC01.

7. Language Setup

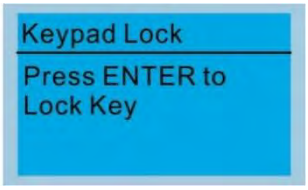
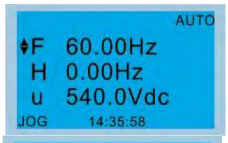
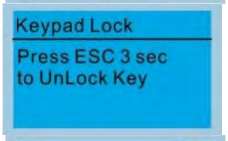
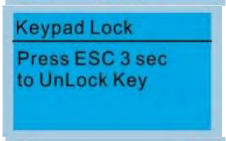
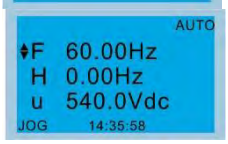
 Use the UP / DOWN keys to select the language, and than press ENTER.	The language setting option is displayed in the language of your choice. Language setting options: 1. English 5. Русский 9. Polski 2. 繁體中文 6. Español 10. Deutsch 3. 简体中文 7. Português 11. Italiano 4. Türkçe 8. Français 12. Svenska

8. Time Setup

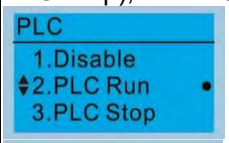
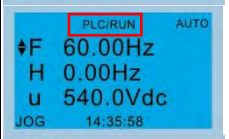
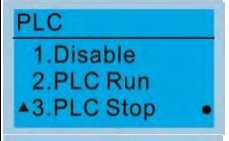
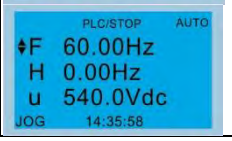
 Use the LEFT / RIGHT keys to select Year, Month, Day, Hour, Minute or Second to change.		Press the UP / DOWN keys to set the Year
		Press the UP / DOWN keys to set the Month
		Press the UP / DOWN keys to set the Day
		Press the UP / DOWN keys to set the Hour
		Press the UP / DOWN keys to set the Minute
		Press the UP / DOWN keys to set the Second

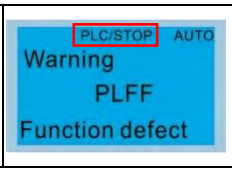
	 Press ENTER to confirm the Time Setup. **NOTE:** Limitation: The charging process for the keypad super capacitor finishes in about 6 minutes. **When the digital keypad is removed, the time setting is saved for 7 days**. After 7 days, you must reset the time.

9. Keypad Locked

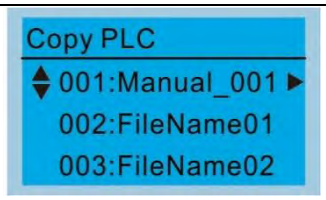
 Press ENTER to lock	Lock the keypad Use this function to lock the keypad. The main screen does not display “keypad locked” when the keypad is locked; however, it displays the message “Press ESC 3 sec to UnLock Key” when you press any key.  When the keypad is locked, the main screen does not indicate the lock status.  Press any key on the keypad; a message displays as shown on the left.  If you do not press the ESC key, the keypad automatically returns to this screen.  Press any key on the keypad, a message displays as shown on the left.  Press ESC for 3 seconds to unlock the keypad; the keypad returns to this screen. All keys on the keypad is functional. All keys on the keypad is functional. Turning the power off and on does not lock the keypad.

10. PLC Function

 Press the UP / DOWN keys to select a PLC function, and then press ENTER.	When activating and stopping the PLC function (choosing 2: PLC Run or 3: PLC Stop), the PLC status displays on main screen (Delta default setting).  Choose option 2: PLC Run to enable the PLC function.  The default on the main screen displays the PLC / RUN status message.  Choose option 3: PLC Stop to disable the PLC function.  The default on the main screen displays the PLC / STOP status message.

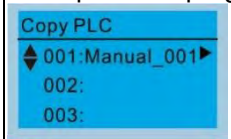
	 If the PLC program is not available in the control board, the PLFF warning displays when you choose option 2 or 3. In this case, choose option 1: Disable to clear PLFF warning.

11. Copy PLC

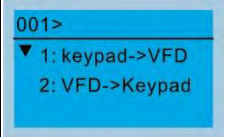


Four groups of parameters are available to copy.
The steps are shown in the example below.

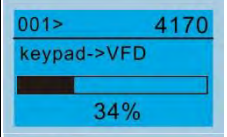
Example: PLC program saved in the motor drive.



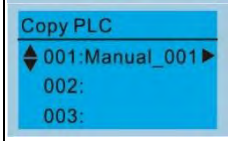
1. Go to Copy PLC
2. Select the PLC program to copy and press ENTER.



1. Select 1: Keypad→VFD
2. Press ENTER to go to the “Keypad→VFD” screen.

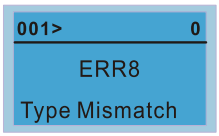


Begin copying the PLC program until it is done.

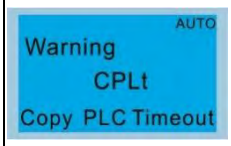


After copying is done, the keypad automatically returns to this screen.

NOTE:

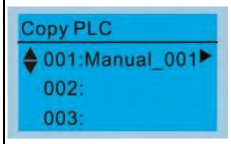


If you select “Option 1: Keypad→VFD”, check if the PLC program is built-in to the KPC-CC01 keypad. If the PLC program is not available in the keypad when you select “Option 1: Keypad→VFD”, an “ERR8 Warning: Type Mismatch” displays on the screen.

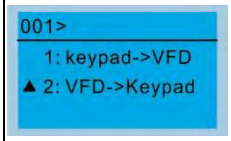


If you unplug the keypad and plug it back while copying the PLC program, the screen displays a CPLt warning.

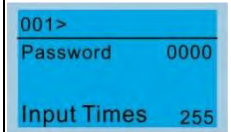
Example: PLC program saved in the keypad.



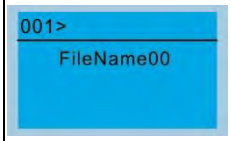
1. Go to Copy PLC.
2. Select the PLC program to copy and press ENTER.



Press ENTER to go to the “VFD→Keypad” screen.



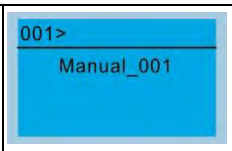
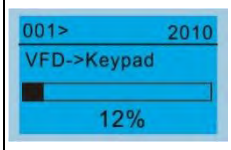
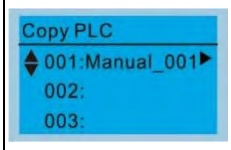
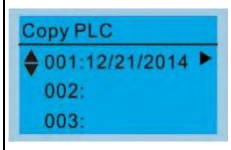
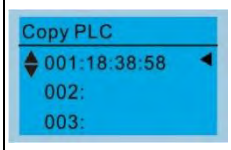
If the WPLSoft editor is installed uses password, enter the password to save the file to the keypad.



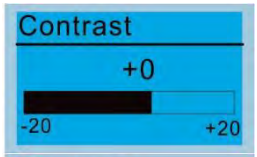
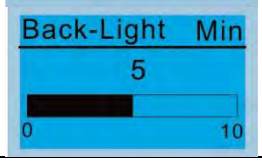
Press the UP / DOWN keys to select a symbol.
Press the LEFT / RIGHT keys to move the cursor to select a file name.

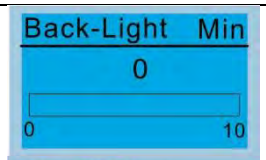
String & Symbol Table:

！” ＃＄％＆’ （） ＊＋，－・／０１２３４５６７８９：；＜＝＞？＠Ａ
ＢＣＤＥＦＧＨＩＪＫＬＭＮＯＰＱＲＳＴＵＶＷＸＹＺ〔＼〕＾＿ ‘ａｂ
ｃｄｆｇｈｉｊｋｌｍｎｏｐｑｒｓｔｕｖｗｘｙｚ｛｜｝～

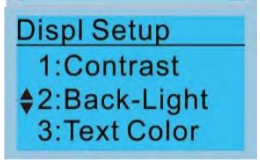
		After you confirm the file name, press ENTER.
		Begin copying the PLC program until it is done.
		After copying is done, the keypad automatically returns to this screen.
		Press the RIGHT key to see the date of the program copied.
		Press the RIGHT key to see the time of program copied.

12. Display setup

 Press ENTER to go to the setting screen.	1. Contrast  Press the UP / DOWN keys to adjust the setting value.  For example, increase Contrast to +10.  After you set the value, press ENTER to see the screen display after contrast is adjusted to +10.  Then press ENTER and decrease the Contrast to -10.  Press ENTER to see screen display after contrast is adjusted to -10. 2. Back-light  Press ENTER to go to the Back-Light Time Setting screen.  Press the UP / DOWN keys to adjust the setting value.

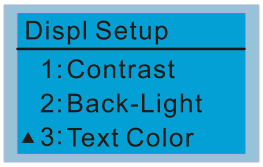


When the setting value is 0 Min, the backlight remains on.



When the setting value is 10 Min, the backlight turns off in 10 minutes.

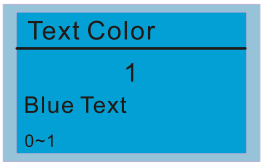
3. Text Color



Press ENTER go to the Text Color Setting screen.



The default value is White Text.

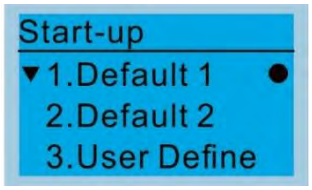


Press the UP / DOWN keys to adjust the setting value, and then press ENTER.



The setting value changes to Blue Text.

13. Start-up



1. Default 1 DELTA LOGO



2. Default 2 DELTA Text



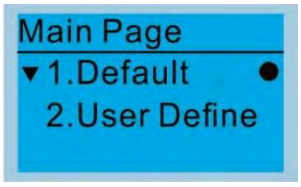
3. User Defined: an optional accessory is required (TPEditor & USB / RS-485 Communication Interface-IFD6530) to design your own start-up screen.
If the editor accessory is not installed, the User Define option displays a blank screen.



USB/RS-485 Communication Interface-IFD6530
Refer to Chapter 07 Optional Accessories for more details.

TPEditor
Download TPEditor software at Delta website. Select TPEditor version 1.60 or later. Refer to the installation instruction for TPEditor in Section 10-3.

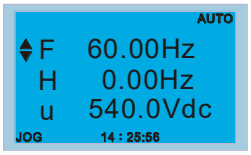
14. Main page



Default screen and editable screen are available.

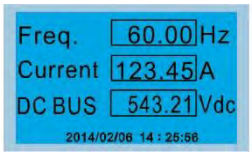
Press ENTER to select.

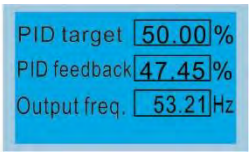
1. Default page



F 60.00Hz >>> H >>> A >>> U (options rotate)

2. User Define: an optional accessory is required (TPEditor & USB / RS-485 Communication Interface-IFD6530) to design your own main screen. If the editor accessory is not installed, the User Define option displays a blank screen.





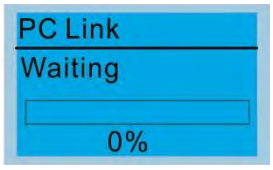
USB/RS-485 Communication Interface-IFD6530
Refer to Chapter 07 Optional Accessories for more details.

TPEditor
Download TPEditor software at Delta website. Select TPEditor version 1.60 or later. Refer to the installation instruction for TPEditor in Section 10-3.

15. PC Link

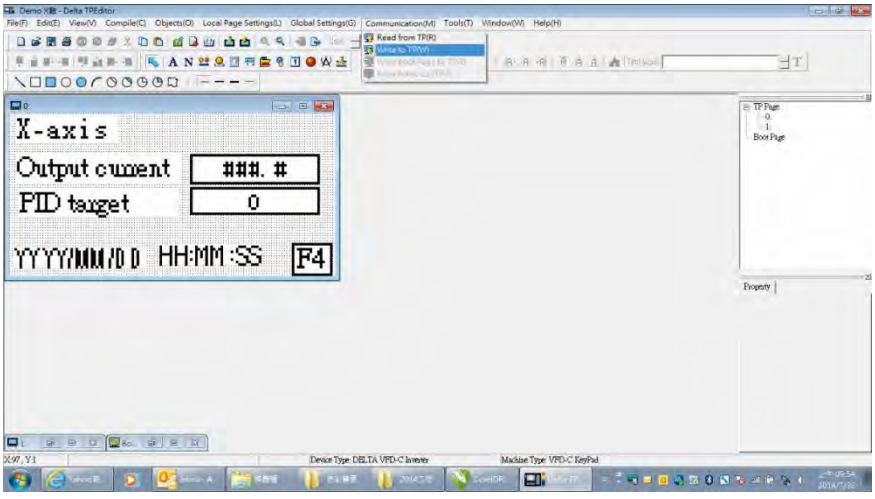


1. TPEditor: This function enables you to connect the keypad to a computer then download and edit user-defined screens.

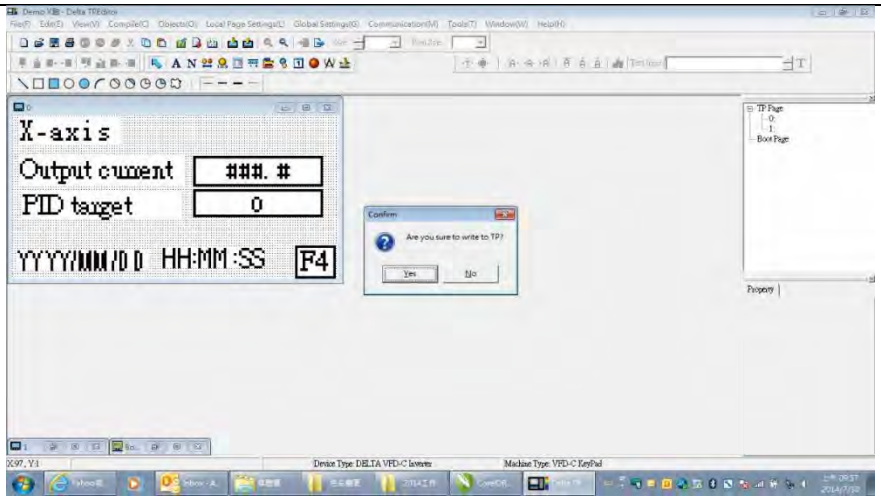


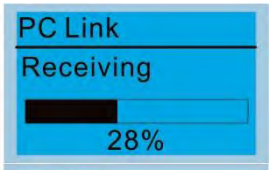
Press ENTER to go to Waiting to connect to PC screen.

In TPEditor, from the **Communication** menu, choose **Write to HMI**.

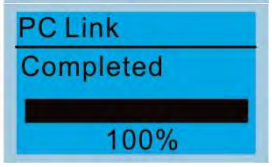


In the **Confirm** message box, click **YES**.





The software starts downloading screens to edit to the KPC-CC01.

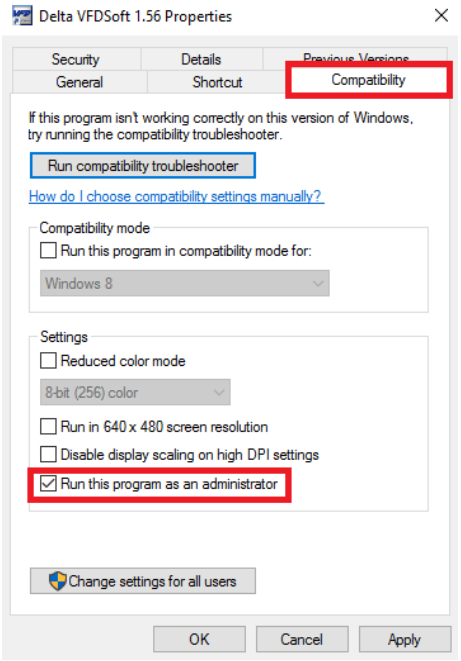


Download completed

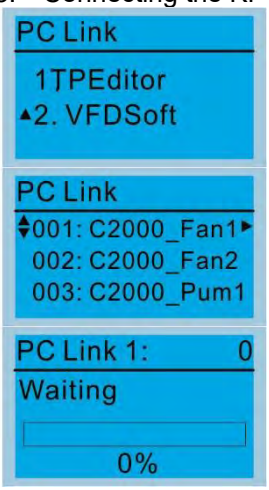
2. VFDSoft: this function enables you to link to the VFDSoft then upload the parameters 1–4 you have saved in the KPC-CC01.

NOTE

If the Operation System (OS) of your computer is Windows 10, right-click the VFDSoft icon to enter the **Property**. Then, click the **Compatibility** tab and select the **Run this program as an administrator** checkbox. (as shown in the red frames in the figure below)



3. Connecting the KPC-CCO1 to a computer

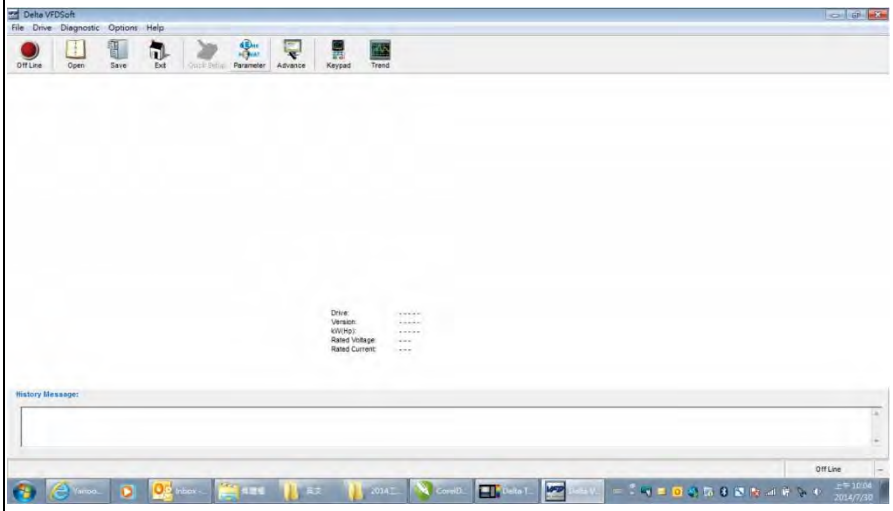


Select 2: VFDSoft, and then press ENTER.

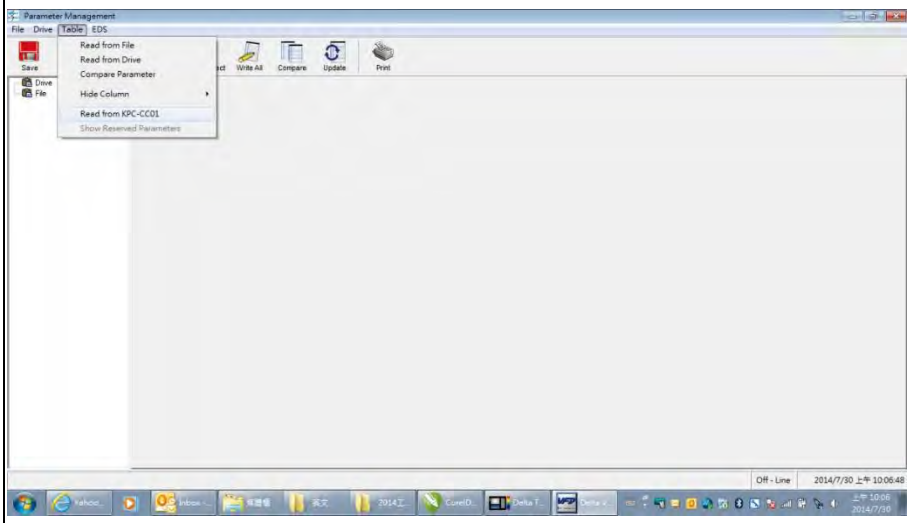
Press the UP / DOWN keys to select a parameter group to upload to VFDSoft.

Press ENTER to go to Waiting to connect to PC screen.

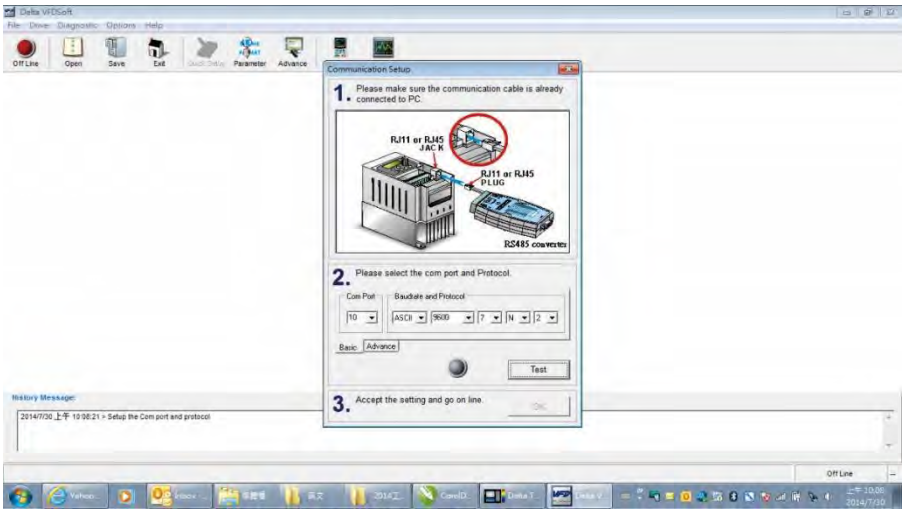
Open VFDSoft and click **Parameter** on the toolbar

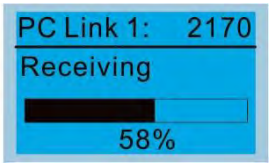


In Parameter Manager, from the **Table** menu, choose **Read from KPC-CC01**.

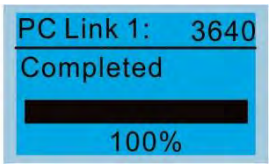


Choose the correct communication port and click **OK**.





Start to upload parameters to VFDSoft



Uploading parameter is completed

Before using the user-defined start-up screen and user-defined main screen, you must preset the start-up screen and the main screen as user-defined. If you do not download the user-defined screen to the KPC-CC01, the start-up screen and the main screen are blank.

16. Start Wizard (applicable for C2000 Plus firmware V3.05 and later)

16.1 New drive start-up setting process

When a new drive is powered on, it directly enters the Start Wizard. There are three modes in the start-up setting process: Start Wizard, Exit Wizard and Test Mode.

(1) Start Wizard:

- In Start Wizard, you can set drive's parameters such as Calendar, Maximum operation frequency and Maximum voltage…; refer to Table 1 for setting items and orders.
- The drive exits Start Wizard when you finish the complete setting process, and will not enter this process when rebooting the power.

(2) Exit Wizard:

- Exit the Start Wizard mode. The drive does not go to Start Wizard when rebooting the power.

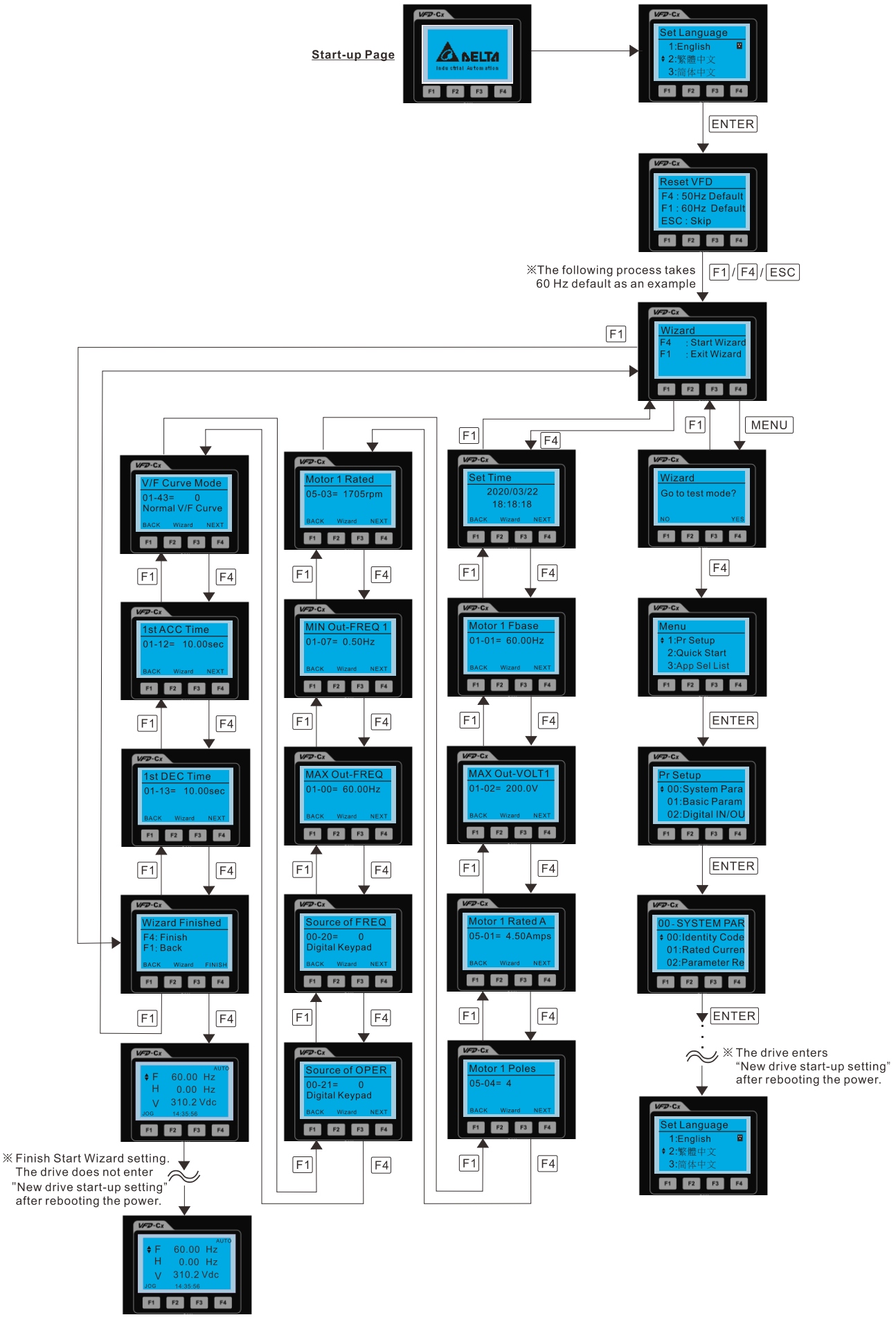
(3) Test Mode:

- This function is hidden to avoid misuse. Refer to the following flow chart to enter Test Mode.
- When the drive is in Test mode, it temporarily disables the Start Wizard and Exit Wizard mode.
- The Test Mode is designed for distributors / suppliers / clients to manage and operate the drive before shipping it out.
- If you enter Test Mode without exiting the Start Wizard process, the drive will begin with the new drive start-up process upon next power on.

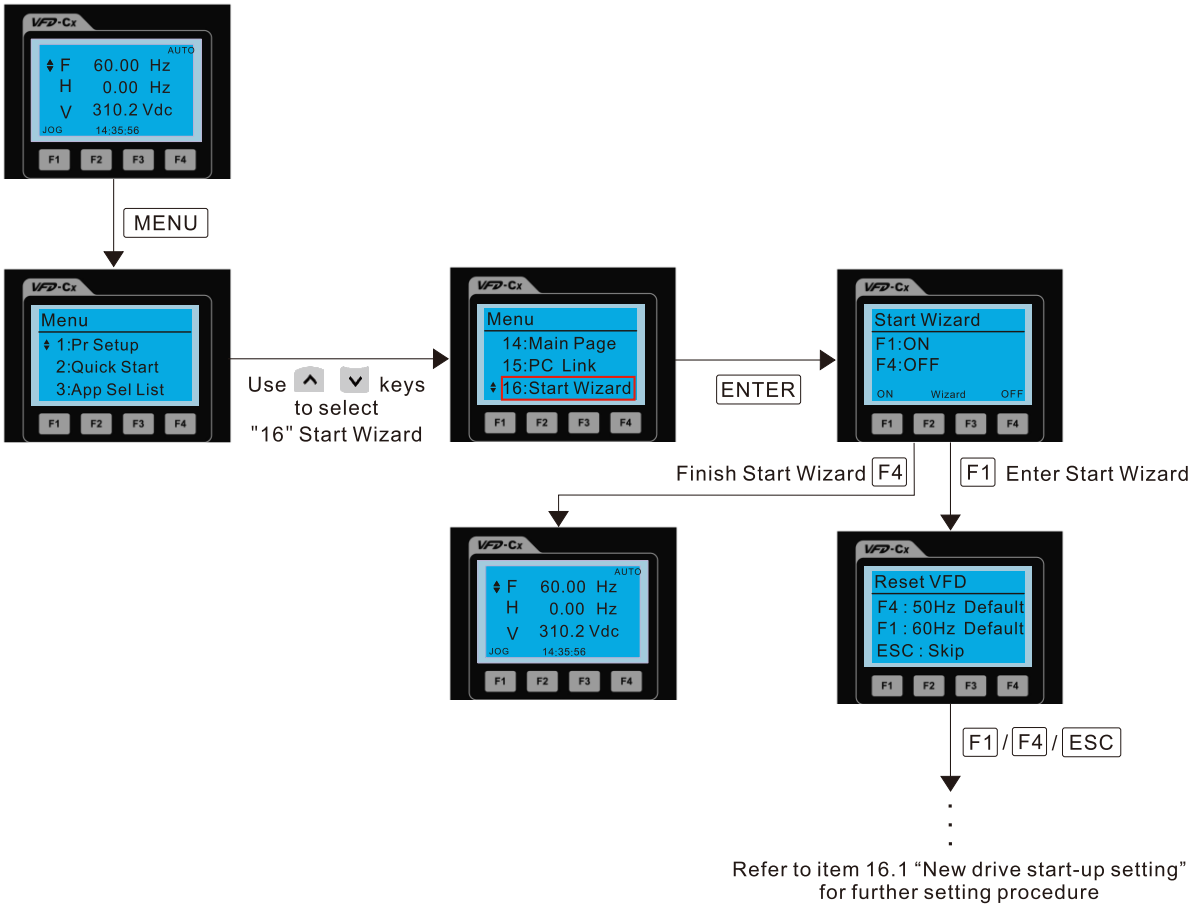
Setting Order	Description	Parameter
1	Calendar	N/A
2	Motor 1 rated / base frequency	01-01
3	Motor 1 rated / base voltage	01-02
4	Full-load current for induction motor 1 (A)	05-01
5	Number of poles for induction motor 1	05-04
6	Rated speed for induction motor 1 (rpm)	05-03
7	Minimum output frequency of motor 1	01-07
8	Maximum operation frequency	01-00
9	Master frequency command source (AUTO) / Source selection of the PID target	00-20
10	Operation command source (AUTO)	00-21
11	V/F curve selection	01-43
12	Acceleration time 1	01-12
13	Deceleration time 1	01-13

Table 1: Start Wizard setting items

Flow chart for the above setting process:



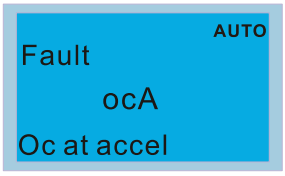
16.2 Re-start Start Wizard

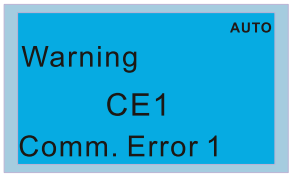


NOTE: The “16: Start Wizard” on the menu is to set whether the screen shows start wizard when powering on the drive.

Other displays

When a fault occurs, the screen display shows the fault or warning:





1. Press the STOP / RESET key to reset the fault code. If there is no response, contact your local distributor or return the unit to the factory. To view the fault DC bus voltage, output current and output voltage, press MENU and then choose 6: Fault Record.
2. After resetting, if the screen returns to the main page and shows no fault after you press ESC, the fault is cleared.
3. When the fault or warning message appears, the LED backlight blinks until you clear the fault or warning.

Optional accessory: RJ45 Extension Lead for Digital Keypad

Part No.	Description
CBC-K3FT	RJ45 extension lead, 3 feet (approximately 0.9 m)
CBC-K5FT	RJ45 extension lead, 5 feet (approximately 1.5 m)
CBC-K7FT	RJ45 extension lead, 7 feet (approximately 2.1 m)
CBC-K10FT	RJ45 extension lead, 10 feet (approximately 3 m)
CBC-K16FT	RJ45 extension lead, 16 feet (approximately 4.9 m)

NOTE: When you need communication cables, buy non-shielded, 24 AWG, four-wire twisted pair, 100 ohms communication cables.

10-3 TPEditor Installation Instruction

TPEditor can edit up to 256 HMI (Human-Machine Interface) pages with a total storage capacity of 256 KB. Each page can include 50 normal objects and 10 communication objects.

1) TPEditor: Setup & Basic Functions

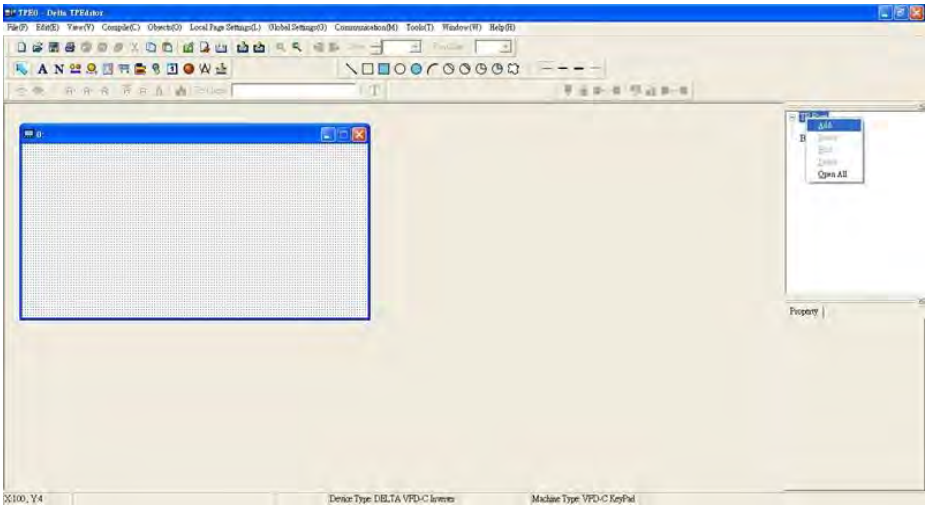
1. Run TPEditor version 1.60 or later by double-clicking the program icon.



2. On the **File** menu, click **New**. In the New project dialog box, for **Set Device Type**, select **DELTA VFD-C Inverter**. For **TP Type**, select **VFD-C KeyPad**. For **File Name**, enter TPE0 and then click **OK**.

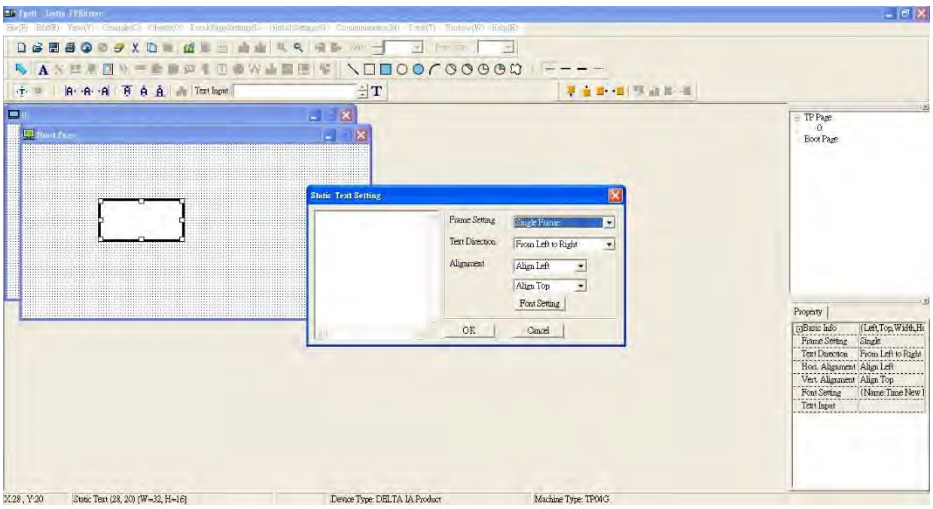


3. The editor displays the Design window. On the **Edit** menu, click **Add a New Page**. You can also right-click on the TP page in the upper right corner of the Design window and click **Add** to add one more page(s) to edit.

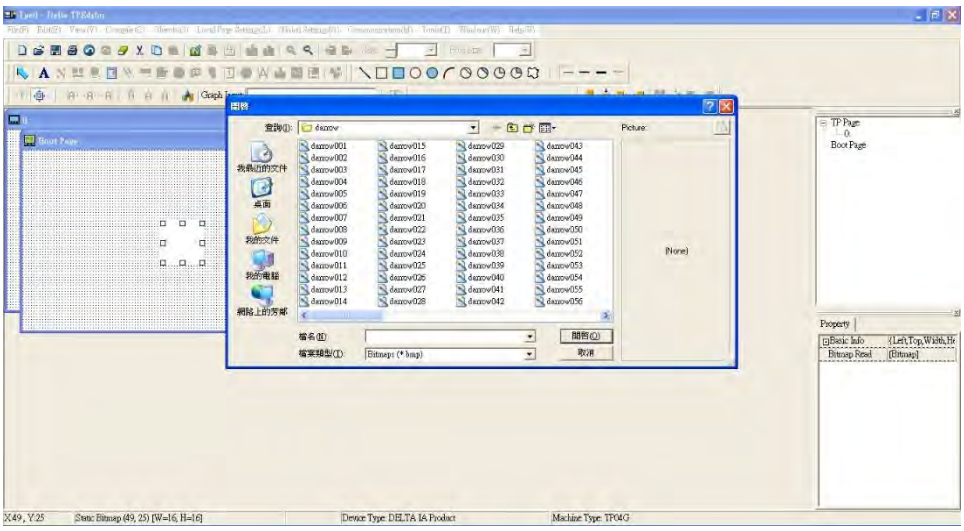


4. Edit the start-up screen.

5. Add static text. Open a blank page (step 3), then on the toolbar click  . Double-click the blank page to display the **Static Text Setting** dialog box, and then enter the static text.



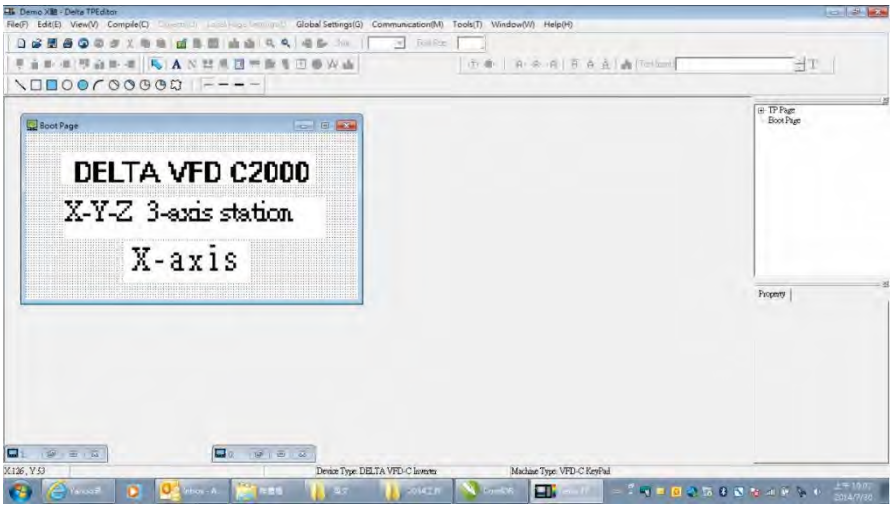
6. Add a static bitmap. Open a blank page (step 3), then on the toolbar, click  . Double-click the blank page to display the **Static Bitmap Setting** dialog box where you can choose the bitmap.



You can only use images in the BMP format. Click the image and then click Open to show the image in the page.

7. Add a geometric bitmap. There are 11 kinds of geometric bitmaps to choose. Open a new blank page (step 3), then on the toolbar click the geometric bitmap icon that you need  . In the page, drag the geometric bitmap and enlarge it to the size that you need.

8. When you finish editing the start-up screen, on the **Communication** menu, click **Input User Defined Keypad Starting Screen.**

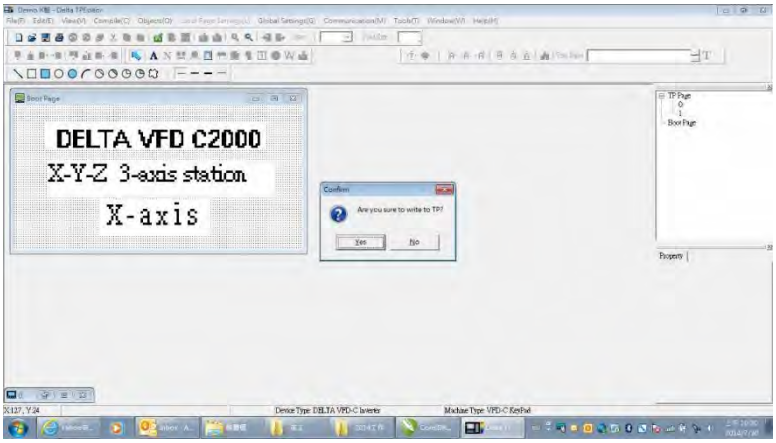


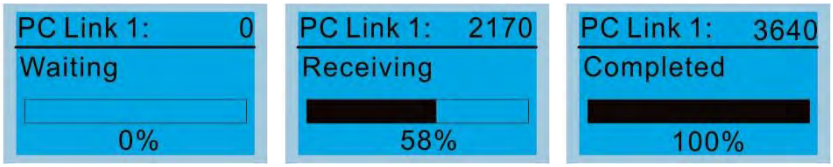
9. Download the new setting: On the **Tool** menu, click **Communication**. Set up the communication port and speed for the IFD6530. There are three speeds available: 9600 bps, 19200 bps, and 38400 bps.

10. On the **Communication** menu, click **Input User Defined Keypad Starting Screen**.



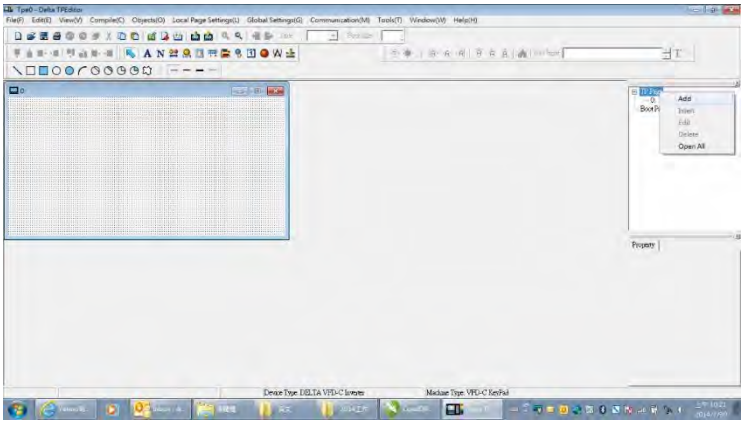
11. The Editor displays a message asking you to confirm the new setting. Before you click **OK**, on the keypad, go to MENU, select PC LINK, press ENTER and then wait for few seconds. Then click **YES** in the confirmation dialog box to start downloading.





2) Edit the Main Page and Download to the Keypad

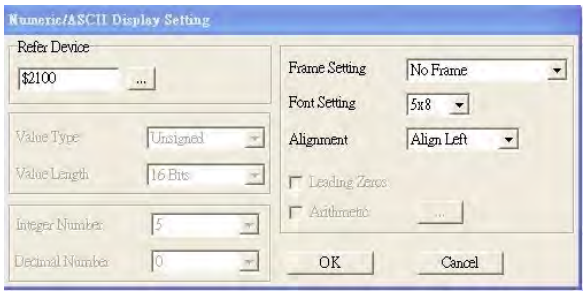
1. In the Editor, add a page to edit. On the **Edit** menu, click **Add a New Page**. You can also right-click on the TP page in the upper right corner of the Design window and click **Add** to add one more pages to edit. This keypad currently supports up to 256 pages.



2. In the bottom right-hand corner of the Editor, click the page number to edit, or on the **View** menu, click **HMI Page** to start editing the main page. As shown in the picture above, the following objects are available. From left to right they are: Static Text, ASCII Display, Static Bitmap, Scale, Bar Graph, Button, Clock Display, Multi-state bit map, Units, Numeric Input, the 11 geometric bitmaps, and lines of different widths. Use the same steps to add Static Text, Static Bitmap, and geometric bitmaps as for the start-up page.



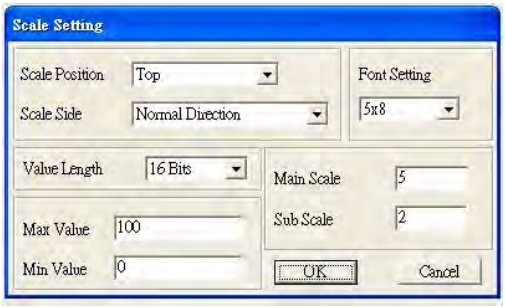
3. Add a numeric/ASCII display. On the toolbar, click the **Numeric/ASCII** button. In the page, double-click the object to specify the **Refer Device**, **Frame Setting**, **Font Setting** and **Alignment**.



Click **[…]**. In the **Refer Device** dialog box, choose the VFD communication port that you need. If you want to read the output frequency (H), set the **Absolute Addr.** to 2202. For other values, refer to the ACMD Modbus Comm Address List (see Pr.09-04 in Chapter 12 Group 09 Communication Parameters).



4. Scale Setting. On the toolbar, click  to add a scale. You can also edit the Scale Setting in the Property Window on the right-hand side of your computer screen.



a. **Scale Position**: specifies where to place the scale.

b. **Scale Side**: specifies whether the scale is numbered from smaller numbers to larger numbers or from larger to smaller.

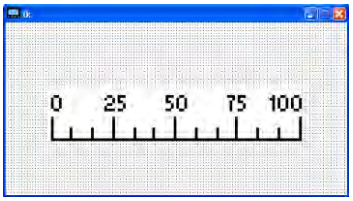
c. **Font Setting**: specifies the font.

d. **Value Length**: specifies 16 bits or 32 bits.

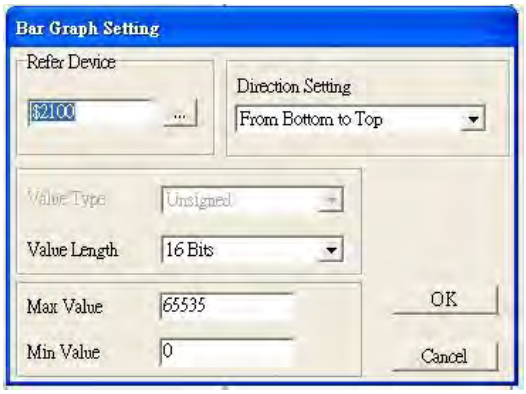
e. **Main Scale & Sub-Scale**: divides the whole scale into equal parts; enter the numbers for the main scale and sub-scale.

f. **Max Value & Min Value**: specifies the numbers on the two ends of the scale. They can be negative numbers, but the maximum and minimum values are limited by the **Value Length** setting. For example, when **Value Length** is **hexadecimal** (**16 bits**), the maximum and the minimum value cannot be entered as -40000.

Clicking **OK** creates a scale as in the picture below.



5. Bar Graph setting. On the toolbar, click  to add a bar graph.

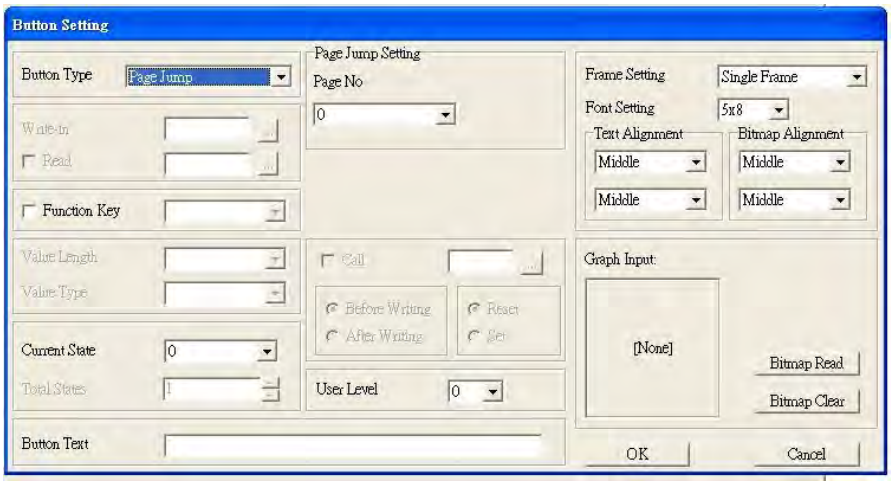


a. **Refer Device**: specifies the VFD communication port.

b. **Direction Setting**: specifies the direction: **From Bottom to Top**, **From Top to Bottom**, **From Left to Right** or **From Right to Left**.

c. **Max Value** and **Min Value**: specifies the maximum value and minimum value. A value smaller than or equal to the minimum value causes the bar graph to be blank (0). A value is bigger or equal to the maximum value causes the bar graph is full (100%). A value between the minimum and maximum values causes the bar graph to be filled proportionally.

6. Button : on the toolbar, click . Currently this function only allows the keypad to switch pages; other functions are not yet available (including text input and insert image). In the blank page, double-click to open the Button Setting dialog box.

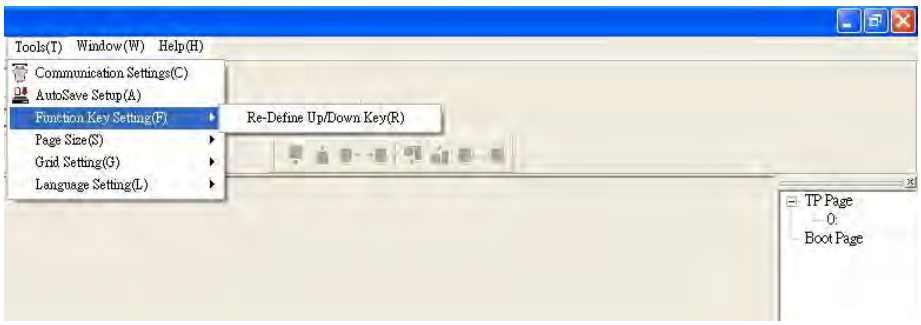


Button Type: specifies the button's functions.

Page Jump and **Constant Setting** are the only functions currently supported.

A. Page Jump Setting

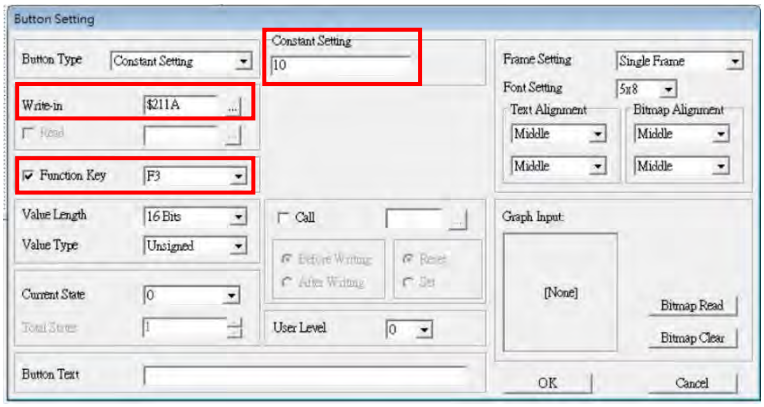
- **Page Jump Setting**: in the **Button Type** list, choose **Page Jump** to show the **Page Jump Setting**.
- **Function Key**: specifies the functions for the following keys on the KPC-CC01 keypad: F1, F2, F3, F4, Up, Down, Left and Right. Note that the Up and Down keys are locked by TPEditor. You cannot program these two keys. If you want to program Up and Down keys, on the **Tool** menu, click **Function Key Setting**, and then click **Re-Define Up/Down Key**.



- **Button Text**: specifies the text that appears on a button. For example, when you enter Next Page for the button text, that text appears on the button.

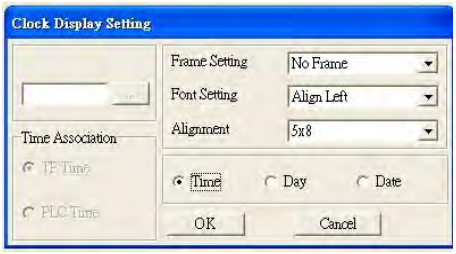
B. Constant setting

This function specifies the memory address' values for the VFD or PLC. When you press the **Function Key**, it writes a value to the memory address specified by the value for **Constant Setting**. You can use this function to initialize a variable.

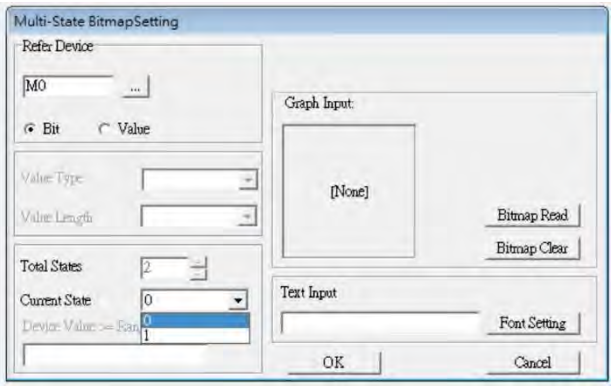


7. **Clock Display Setting**: on the toolbar, click  . You can display the time, day, or date on the keypad. Open a new page and click once in that window to add a clock display.

Choose to display **Time**, **Day**, or **Date** on the keypad. To adjust time, go to #8 on the keypad's menu. You can also specify the **Frame Setting**, **Font Setting**, and **Alignment**.

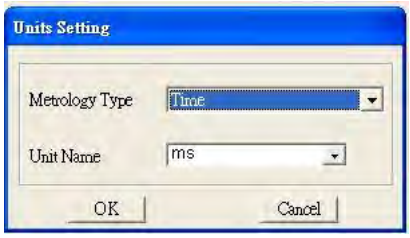


8. Multi-state bitmap: on the toolbar, click  . Open a new page and click once in that window to add a Multi-state bitmap. This object reads a bit's property value from the PLC. It defines the image or text that appears when this bit is 0 or 1. Set the initial status (**Current State**) to be 0 or 1 to define the displayed image or text.



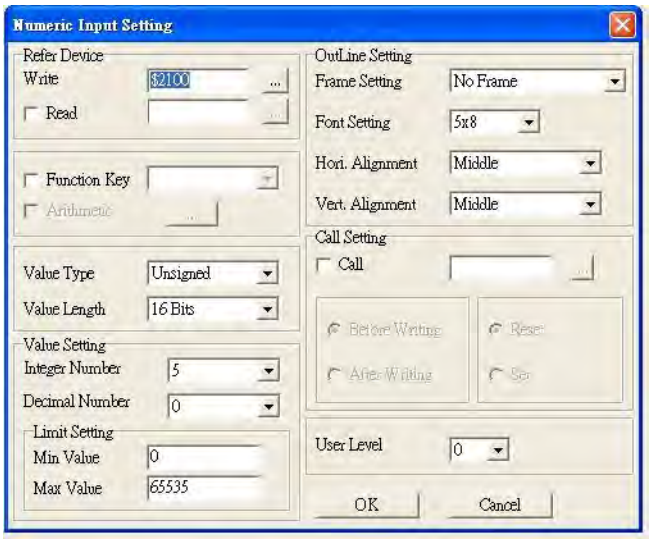
9. Unit Measurement: on the toolbar, click  .

Open a new blank page, and double-click on that window to display the **Units Setting** dialog box. Choose the Metrology Type and the Unit Name. For Metrology, the choices are Length, Square Measure, Volume/Solid Measure, Weight, Speed, Time, and Temperature. The unit name changes automatically when you change metrology type.



10. Numeric Input Setting: on the toolbar, click 

This object enables you to provide parameters or communication ports (0x22xx) and to input numbers. Open a new file and double click on that window to display the **Numeric Input Setting** dialog box.



a. **Refer Device**: specifies the **Write** and the **Read** values. Enter the numbers to display and the corresponding parameter and communication port numbers. For example, enter 012C to Read and Write Parameter Pr.01-44.

b. **OutLine Setting**: specifies the **Frame Setting**, **Font Setting**, **Hori. Alignment**, and **Vert. Alignment** for the outline.

c. **Function Key**: specifies the function key to program on the keypad in the **Function Key** box. The corresponding key on the keypad starts to blink. Press ENTER to confirm the setting.

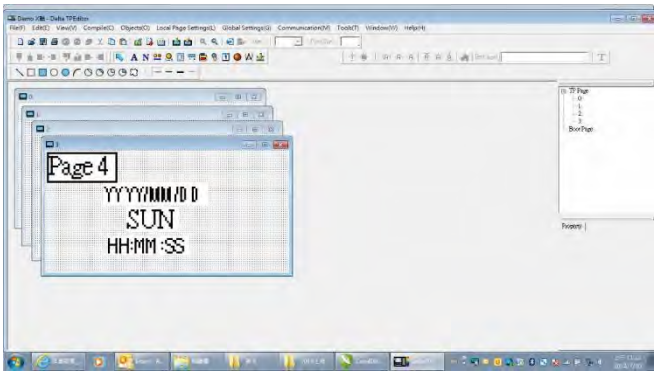
d. **Value Type** and **Value Length**: specify the range of the **Min Value** and **Max Value** for the **Limit Setting**. Note that the corresponding supporting values for C2000 Plus must be 16 bits. 32-bit values are not supported.

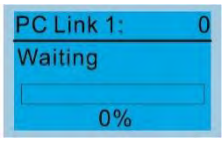
e. **Value Setting**: automatically set by the keypad itself.

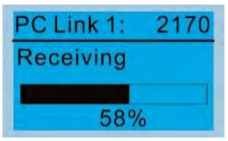
f. **Limit Setting**: specifies the range for the numeric input here.

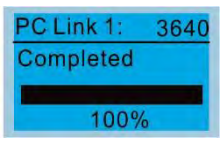
For example, if you set **Function Key** to **F1**, **Min Value** to 0 and **Max Value** to 4, when you press F1 on the keypad, then you can press Up/Down on the keypad to increase or decrease the value. Press ENTER on the keypad to confirm your setting. You can also view the parameter table 01-44 to verify if you correctly entered the value.

11. Download TP Page: Press Up / Down on the keypad to select #13 PC Link.
Then press ENTER on the keypad. The screen displays “Waiting”. In TPEditor, choose a page that you have created, and then on the **Communication** menu click **Write to TP** to start downloading the page to the keypad.
When you see “Completed” on the keypad screen, the download is finished. You can then press ESC on the keypad to go back to the menu screen.

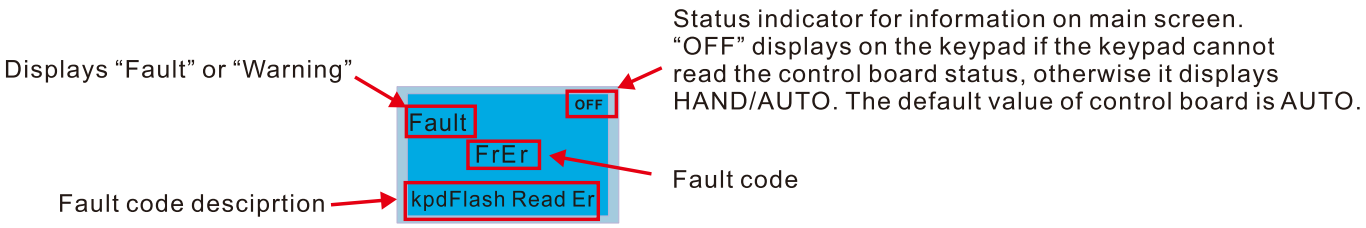




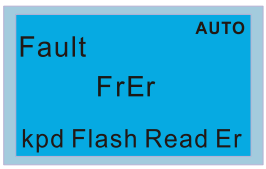
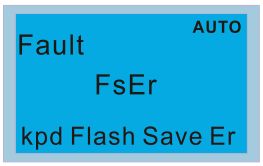
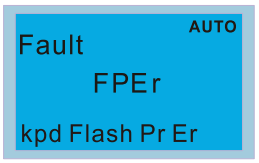
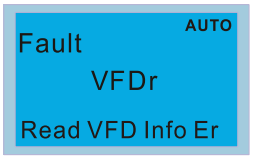
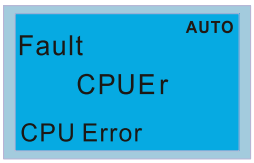




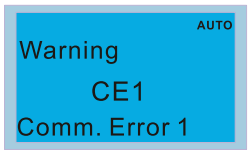
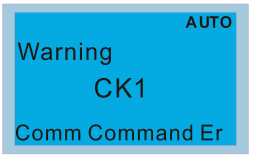
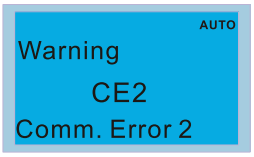
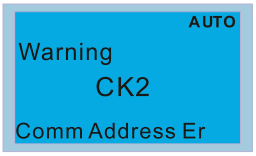
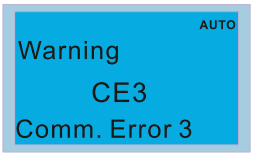
10-4 Digital Keypad KPC-CC01 Fault Codes and Descriptions

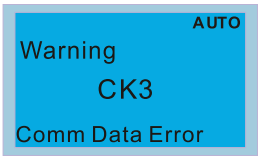
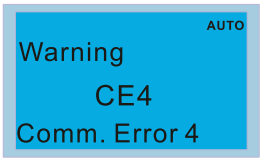
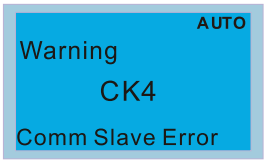
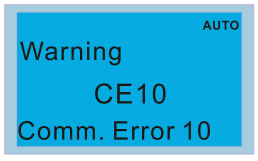
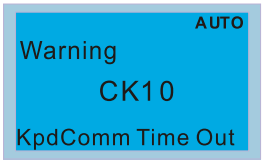


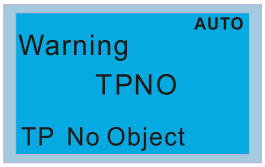
Fault Codes

LCD Display *	Fault Name	Description	Corrective Actions
	Flash memory read error (FrEr)	Keypad flash memory read error	Error in the keypad’s flash memory. 1. Press RESET to clear the errors. 2. Check for any problem on Flash IC. 3. Shut down the system, wait for ten minutes, and then restart the system. If none of the above solutions works, contact your authorized local dealer for assistance.
	Flash memory save error (FsEr)	Keypad flash memory save error	Error in the keypad’s flash memory. 1. Press RESET to clear the errors. 2. Check for any problem on Flash IC. 3. Shut down the system, wait for ten minutes, and then restart the system. If none of the above solutions works, contact your authorized local dealer for assistance.
	Flash memory parameter error (FPEr)	Keypad flash memory parameter error	Error in the default parameters. It might be caused by a firmware update. 1. Press RESET to clear the errors. 2. Check for any problem on Flash IC. 3. Shut down the system, wait for ten minutes, and then restart the system. If none of the above solutions works, contact your authorized local dealer for assistance.
	Reading AC motor drive data error (VFDr)	Keypad error when reading AC motor drive data	Keypad cannot read any data sent from the VFD. 1. Verify that the keypad is properly connected to the motor drive by a communication cable such as RJ45. 2. Press RESET to clear the errors. 3. Shut down the system, wait for ten minutes, and then restart the system. If none of the above solutions works, contact your authorized local dealer for assistance.
	CPU error (CPUEr)	Keypad CPU error	A serious error in the keypad’s CPU. 1. Check for any problem on CPU clock. 2. Check for any problem on Flash IC. 3. Check for any problem on RTC IC. 4. Verify that the communication quality of the RS-485 cable is good. 5. Shut down the system, wait for ten minutes, and then restart the system. If none of the above solutions works, contact your authorized local dealer for assistance.

Warning Codes

LCD Display *	Warning Name	Description	Corrective Actions
	Commuication error 1 (CE1)	RS-485 Modbus illegal function code	Motor drive does not accept the communication command sent from the keypad. 1. Verify that the keypad is properly connected to the motor drive by a communication cable such as RJ45. 2. Press RESET on the keypad to clear errors. If none of the above solutions works, contact your local authorized dealer for assistance.
	Communication command error 1 (CK1)	Keypad communication data, illegal function code (Keypad auto-detect this error and display it)	Keypad does not accept the motor drive's communication command. 1. Remove the keypad and reconnect it. 2. Verify if the Baud rate = 19200 bps, and the Format = RTU8, N, 2 3. Verify if the keypad is properly connected to the motor drive on the communication contact by a communication cable such as RJ45. If none of the above solution works, contact your local authorized dealer.
	Communication error 2 (CE2)	RS-485 Modbus illegal data address	Motor drive does not accept the keypad's communication address. 1. Verify that the keypad is properly connected to the motor drive by a communication cable such as RJ45. 2. Press RESET to clear the errors. If none of the above solutions works, contact your local authorized dealer for assistance.
	Communication address error (CK2)	Keypad communication data, illegal data address (Keypad auto-detect this error and display it)	Keypad does not accept the motor drive's communication command. 1. Remove the keypad and reconnect it. 2. Verify if the Baud rate = 19200 bps, and the Format = RTU8, N, 2 3. Verify if the keypad is properly connected to the motor drive on the communication contact by a communication cable such as RJ45. If none of the above solution works, contact your local authorized dealer.
	Communication error 3 (CE3)	RS-485 Modbus illegal data value	Motor drive does not accept the communication data sent from the keypad. 1. Verify that the keypad is properly connected to the motor drive by a communication cable such as RJ45. 2. Press RESET to clear the errors. If none of the above solutions works, contact your local authorized dealer for assistance.

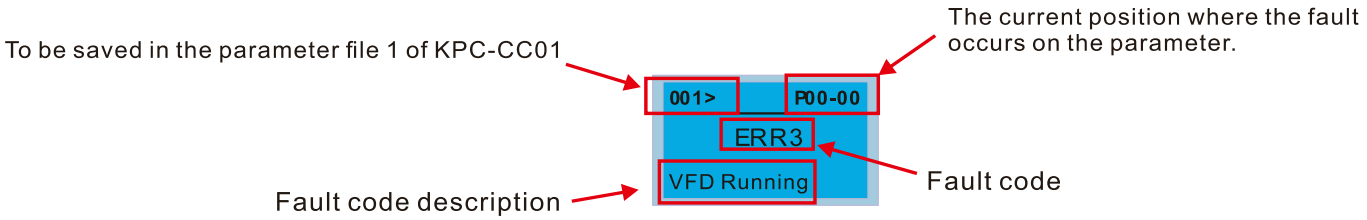
LCD Display *	Warning Name	Description	Corrective Actions
	Communication data error (CK3)	Keypad communication data, illegal data value (Keypad auto-detect this error and display it)	Keypad does not accept the motor drive's communication command. 1. Remove the keypad and reconnect it. 2. Verify if the Baud rate = 19200 bps, and the Format = RTU8, N, 2 3. Verify if the keypad is properly connected to the motor drive on the communication contact by a communication cable such as RJ45. If none of the above solution works, contact your local authorized dealer.
	Communication error 4 (CE4)	RS-485 Modbus data is written to read-only address	Motor drive cannot process the communication command sent from the keypad. 1. Verify that the keypad is properly connected to the motor drive by a communication cable such as RJ45. 2. Press RESET to clear the errors. 3. Shut down the system, wait for ten minutes, and then restart the system. If none of the above solutions works, contact your local authorized dealer for assistance.
	Communication slave error (CK4)	Keypad communication data is written to read-only address (Keypad auto-detect this error and display it)	Keypad does not accept the motor drive's communication command. 1. Remove the keypad and reconnect it. 2. Verify if the Baud rate = 19200 bps, and the Format = RTU8, N, 2 3. Verify if the keypad is properly connected to the motor drive on the communication contact by a communication cable such as RJ45. If none of the above solution works, contact your local authorized dealer.
	Communication error 10 (CE10)	RS-485 Modbus transmission time-Out	Motor drive does not respond to the communication command sent from the keypad. 1. Verify that the keypad is properly connected to the motor drive by a communication cable such as RJ45. 2. Press RESET to clear the errors. 3. Shut down the system, wait for ten minutes, and then restart the system. If none of the above solutions works, contact your local authorized dealer for assistance.
	Keypad communication time out (CK10)	Keypad communication data, transmission time-out (Keypad auto-detect this error and display it).	Keypad does not accept the motor drive's communication command. 1. Remove the keypad and reconnect it. 2. Verify if the Baud rate = 19200 bps, and the Format = RTU8, N, 2 3. Verify if the keypad is properly connected to the motor drive on the communication contact by a communication cable such as RJ45. If none of the above solution works, contact your local authorized dealer.

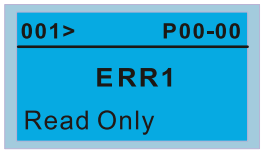
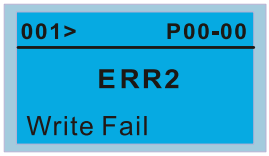
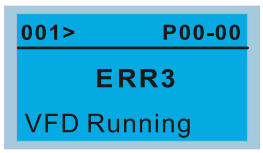
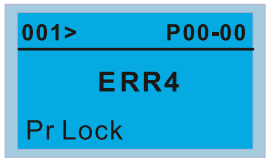
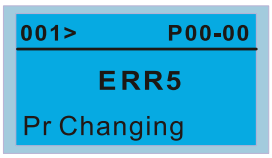
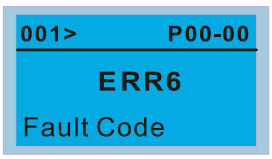
LCD Display *	Warning Name	Description	Corrective Actions
	TP object not defined (TPNO)	Object not supported by TPEditor	Keypad's TPEditor uses an unsupported object. 1. Verify that the TPEditor is not using an unsupported object or setting. Delete unsupported objects and unsupported settings. 2. Re-edit the object in the TPEditor, and then download it to the keypad. 3. Verify that the motor drive supports the TP functions. If the drive does not support TP function, the main page displays Default. If none of the above solutions works, contact your local authorized dealer for assistance.

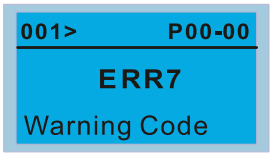
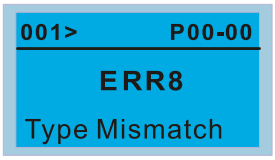
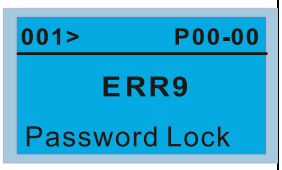
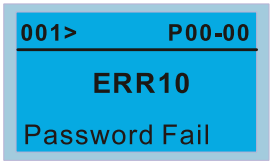
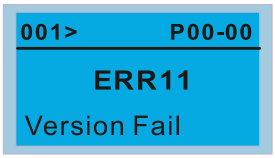
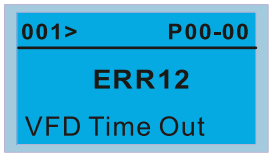
NOTE: The warning code CExx only occurs when the communication problem is between the drive and the keypad. It has nothing to do with the drive and other devices. Note the warning code description to find the cause of the error if CExx appears.

File Copy Setting Fault Description:

These faults occur when KPC-CC01 cannot perform the command after clicking the ENTER key in the copy function.



LCD Display *	Fault Name	Description	Corrective Actions
	Read only (ERR1)	Parameter and file are read-only	The parameter / file is read-only and cannot be written to. 1. Verify the specification in the user manual. If this solution does not work, contact your local authorized dealer for assistance.
	Write in error (ERR2)	Fail to write parameter and file	An error occurred while writing to a parameter / file. 1. Check for any problem on the Flash IC. 2. Shut down the system, wait for ten minutes, and then restart the system. If this solution does not work, contact your local authorized dealer for assistance.
	Drive operating (ERR3)	AC motor drive is in operating status	A setting cannot be changed while the motor drive is in operation. 1. Verify that the drive is not in operation. If this solution does not work, contact your local authorized dealer for assistance.
	Parameter locked (ERR4)	AC motor drive parameter is locked	A setting cannot be changed because a parameter is locked. 1. Check if the parameter is locked. If it is locked, unlock it and try to set the parameter again. If this solution does not work, contact your local authorized dealer for assistance.
	Parameter changing (ERR5)	AC motor drive parameter is changing	A setting cannot be changed because a parameter is being modified. 1. Check if the parameter is being modified. If it is not being modified, try to change that parameter again. If this solution does not work, contact your local authorized dealer for assistance.
	Fault code (ERR6)	Fault code is not cleared	A setting cannot be changed because an error has occurred in the motor drive. 1. Check if any error occurred in the motor drive. If there is no error, try to change the setting again. If this solution does not work, contact your local authorized dealer for assistance.

LCD Display *	Fault Name	Description	Corrective Actions
	Warning code (ERR7)	Warning code is not cleared	A setting cannot be changed because of a warning message given to the motor drive. 1. Check if there is a warning message given to the motor drive. If this solution does not work, contact your local authorized dealer for assistance.
	File type mismatch (ERR8)	File type mismatch	Data to be copied are not the correct type, so the setting cannot be changed. 1. Check if the products' serial numbers to be copied are in the same category. If they are in the same category, try to copy the setting again. If this solution does not work, contact your local authorized dealer for assistance.
	Password locked (ERR9)	File is locked with password	A setting cannot be changed because some data are locked. 1. Check if the data are unlocked or able to be unlocked. If the data are unlocked, try to change the setting again. 2. Shut down the system, wait for ten minutes, and then restart the system. If none of the above solutions works, contact your local authorized dealer for assistance.
	Password fail (ERR10)	File password mismatch	A setting cannot be changed because the password is incorrect. 1. Check if the password is correct. If the password is correct, try to change the setting again. 2. Shut down the system, wait for ten minutes, and then restart the system. If none of the above solutions works, contact your local authorized dealer for assistance.
	Version fail (ERR11)	File version mismatch	A setting cannot be changed because the version of the data is incorrect. 1. Check if the version of the data matches the motor drive. If it matches, try to change the setting again. If none of the above solutions works, contact your local authorized dealer for assistance.
	VFD Time out (ERR12)	AC motor drive copy function time-out	A setting cannot be changed because the data copying time-out expired. 1. Try copying the data again. 2. Check if copying data is authorized. If it is authorized, try to copy the data again. 3. Shut down the system, wait for ten minutes, and then restart the system. If none of the above solutions works, contact your local authorized dealer for assistance.

NOTE: The content in this section only applies to the KPC-CC01 keypad V1.01 and later versions.

10-5 Unsupported Functions when using TPEditor with the KPC-CC01

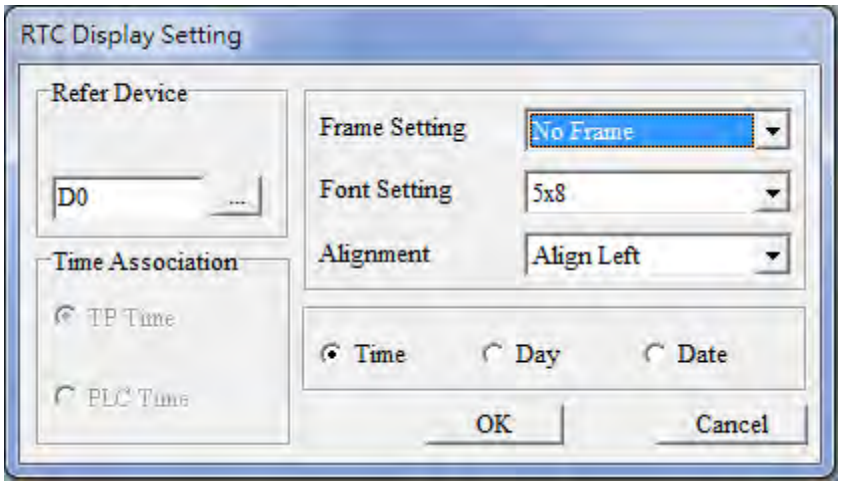
1. **Local Page Setting** and **Global Setting** functions are not supported.



2. In the **Communication** menu, **Read from TP** function is not supported.



3. In the **RTC Display Setting**, you cannot change the **Refer Device**.



Chapter 11 Summary of Parameter Settings

00 Drive Parameters

01 Basic Parameters

02 Digital Input / Output Parameters

03 Analog Input / Output Parameters

04 Multi-step Speed Parameters

05 Motor Parameters

06 Protection Parameters

07 Special Parameters

08 High-function PID Parameters

09 Communication Parameters

10 Feedback Control Parameters

11 Advanced Parameters

13 Application Parameters by Industry (applied to 230V / 460V models)

14 Extension Card Parameters

This chapter provides a summary of parameter (Pr.) setting ranges and defaults. You can set, change, and reset parameters through the digital keypad.

NOTE:

1）↗: You can set this parameter during operation

2）For more details on parameters, refer to chapter 12 Description of Parameter Settings.

3）The following are abbreviations for different types of motors:

- IM: Induction motor
- PM: Permanent magnet synchronous AC motor
- IPM: Interior permanent magnet synchronous AC motor
- SPM: Surface permanent magnet synchronous AC motor
- SynRM: Synchronous reluctance motor

00 Drive Parameters

Pr.	Parameter Name	Setting Range	Default
00-00	AC Motor Drive Identity Code	4: 230V, 0.75 kW 5: 460V, 0.75 kW 6: 230V, 1.50 kW 7: 460V, 1.50 kW 8: 230V, 2.20 kW 9: 460V, 2.20 kW 10: 230V, 3.70 kW 11: 460V, 3.70 kW 12: 230V, 5.50 kW 13: 460V, 5.50 kW 14: 230V, 7.50 kW 15: 460V, 7.50 kW 16: 230V, 11.0 kW 17: 460V, 11.0 kW 18: 230V, 15.0 kW 19: 460V, 15.0 kW 20: 230V, 18.5 kW 21: 460V, 18.5 kW 22: 230V, 22.0 kW 23: 460V, 22.0 kW 24: 230V, 30.0 kW 25: 460V, 30.0 kW 26: 230V, 37.0 kW 27: 460V, 37.0 kW 28: 230V, 45.0 kW 29: 460V, 45.0 kW 30: 230V, 55.0 kW 31: 460V, 55.0 kW 32: 230V, 75.0 kW	Read only

Pr.	Parameter Name	Setting Range	Default
		33: 460V, 75.0 kW 34: 230V, 90.0 kW 35: 460V, 90.0 kW 37: 460V, 110.0 kW 39: 460V, 132.0 kW 41: 460V, 160.0 kW 43: 460V, 185.0 kW 45: 460V, 220.0 kW 47: 460V, 280.0 kW 49: 460V, 315.0 kW 51: 460V, 355.0 kW 53: 460V, 400.0 kW 55: 460V, 450.0 kW 57: 460V, 500.0 kW 59: 460V, 560.0 kW 93: 460V, 4 kW 486: 460V, 200.0 kW 487: 460V, 250.0 kW 505: 575V, 1.5 kW 506: 575V, 2.2 kW 507: 575V, 3.7 kW 508: 575V, 5.5 kW 509: 575V, 7.5 kW 510: 575V, 11 kW 511: 575V, 15 kW 612: 690V, 18.5 kW 613: 690V, 22 kW 614: 690V, 30 kW 615: 690V, 37 kW 616: 690V, 45 kW 617: 690V, 55 kW 618: 690V, 75 kW 619: 690V, 90 kW 620: 690V, 110 kW 621: 690V, 132 kW 622: 690V, 160 kW 686: 690V, 200 kW 687: 690V, 250 kW 626: 690V, 315 kW 628: 690V, 400 kW 629: 690V, 450 kW 631: 690V, 560 kW 632: 690V, 630 kW	

	Pr.	Parameter Name	Setting Range	Default
	00-01	AC Motor Drive Rated Current Display	Display by models	Read only
✓	00-02	Parameter Reset	0: No function 1: Write protection for parameters 5: Return kWh displays to 0 6: Reset PLC (including CANopen Master Index) 7: Reset CANopen Slave index 9: Reset all parameters to defaults (base frequency is 50 Hz) 10: Reset all parameters to defaults (base frequency is 60 Hz)	0
✓	00-03	Start-Up Display	0: F (frequency command) 1: H (output frequency) 2: U (user-defined, see Pr.00-04) 3: A (output current)	0
✓	00-04	Content of Multi-Function Display (User-Defined)	0: Display output current (A) (unit: Amp) 1: Display counter value (c) (Unit: CNT) 2: Display the motor's actual output frequency (H.) (Unit: Hz) 3: Display the drive's DC bus voltage (v) (Unit: V_{DC}) 4: Display the drive's output voltage (E) (Unit: V_{AC}) 5: Display the drive's output power angle (n) (Unit: deg) 6: Display the drive's output power (P) (Unit: kW) 7: Display the motor speed rpm (r) (Unit: rpm) 8: Display the drive's estimated output torque, motor's rated torque is 100% (t) (Unit: %) 9: Display PG feedback (G) (refer to Pr.10-00 and Pr.10-01) (Unit: PLS) 10: Display PID feedback (b) (Unit: %) 11: Display AVI analog input terminal signal (1.) (Unit: %) 12: Display ACI analog input terminal signal (2.) (Unit: %) 13: Display AUI analog input terminal signal (3.) (Unit: %) 14: Display the drive's IGBT temperature (i.) (Unit: °C) 15: Display the drive's capacitance temperature (c.) (Unit: °C) 16: The digital input status (ON / OFF) (i) 17: The digital output status (ON / OFF) (o)	3

Pr.	Parameter Name	Setting Range	Default
		18: Display multi-step speed (S) 19: The corresponding CPU digital input pin status (d) 20: The corresponding CPU digital output pin status (0.) 21: Actual motor position (PG1 of PG card) (P.) The maximum value is 32bits display 22: Pulse input frequency (PG2 of PG card) (S.) 23: Pulse input position (PG2 of PG card) (q.) The maximum value is 32bits display 24: Position command tracing error (E.) 25: Overload count (0.00–100.00%) (o.) (Unit: %) 26: Ground fault GFF (G.) (Unit: %) 27: DC bus voltage ripple (r.) (Unit: V_{DC}) 28: Display PLC register D1043 data (C) 29: Display PM pole section (EMC-PG01U application) (4.) 30: Display the output of user-defined (U) 31: Display Pr.00-05 user gain (K) 32: Number of actual motor revolution during operation (PG card plug in and Z phase signal input) (Z.) 34: Operation speed of fan (F.) (Unit: %) 35: Control mode display: 0 = Speed control mode (SPD) 1 = Torque control mode (TQR) (t.) 36: Present operating carrier frequency of the drive (Unit: Hz) (J.) 38: Display the drive status (6.) 39: Display the drive's estimated output torque, positive and negative, using Nt-m as unit (t 0.0: positive torque; -0.0: negative torque (C.) 40: Torque command (L.) (Unit: %) 41: kWh display (J) (Unit: kWh) 42: PID target value (h.) (Unit: %) 43: PID compensation (o.) (Unit: %) 44: PID output frequency (b.) (Unit: Hz) 45: Hardware ID 49: Motor temperature (KTY84-130 only) 51: PMSVC torque offset 52: AI10% 53: AI11% 54: PMFOC Ke estimation value	

	Pr.	Parameter Name	Setting Range	Default
			68: STO version (d) 69: STO checksum-high word (d) 70: STO checksum-low word (d)	
✓	00-05	Coefficient Gain in Actual Output Frequency	0.00–160.00	1.00
	00-06	Firmware Version	Read only	Read only
	00-07	Parameter Protection Password Input	0–65535 0–4: the number of password attempts allowed	0
	00-08	Parameter Protection Password Setting	0–65535 0: No password protection or password entered correctly (Pr.00-07) 1: Parameter has been set	0
✓	00-10	Control Mode	0: Speed control mode 1: Position control mode 2: Torque mode	0
	00-11	Speed Control Mode	0: IMVF (IM V/F control) 1: IMVFPG (IM V/F control + Encoder) 2: IM / PM / SynRM SVC (IM / PM / SynRM space vector control) 3: IMFOCPG (IM FOC + Encoder) 4: PMFOCPG (PM FOC + Encoder) 5: IMFOC sensorless (IM field-oriented sensorless vector control) 6: PM sensorless (PM field-oriented sensorless vector control) 7: IPM sensorless (Interior PM field-oriented sensorless vector control) 8: SynRM sensorless control **NOTE:** 575V models and 690V models only support the setting value 0, 1, and 2 (SynRM SVC not included)	0
	00-12	Point-to-Point Position Mode	0: Increment point-to-point positioning 1: Absolute point-to-point positioning	0
	00-13	Torque Mode Control	0: IM TQCPG (IM torque control + Encoder) 1: PM TQCPG (PM torque control + Encoder) 2: IM TQC sensorless (IM sensorless torque control) 4: SynRM TQC sensorless (SynRM sensorless torque control)	0

<table>
<tr><th>Pr.</th><th>Parameter Name</th><th>Setting Range</th><th>Default</th></tr>
<tr><td rowspan="2">00-16</td><td rowspan="2">Duty Selection</td><td>230V / 460V models
0: Heavy duty
1: Super Heavy duty</td><td>0</td></tr>
<tr><td>575V / 690V models
0: Normal duty
1: Heavy duty
2: Light duty</td><td>2</td></tr>
<tr><td rowspan="3">00-17</td><td rowspan="3">Carrier Frequency (kHz)</td><td>Heavy duty
<table>
<tr><th>Control mode / Model</th><th>VF, SVC</th><th>VFPG</th><th>IMFOC PG, IMTQC PG</th><th>PMFOC PG, PMTQC PG</th><th>PMFOC, IPMFOC</th><th>IMFOC, IMTQC</th><th>SRM FOC*</th></tr>
<tr><td>VFD007–110C23A/E
VFD007–150C43A/E</td><td>2–15</td><td>2–10</td><td>2–8</td><td>4–8</td><td>4–10</td><td>4–12</td><td>4–8</td></tr>
<tr><td>VFD150–370C23A/E
VFD185–550C43A/E</td><td>2–10</td><td>2–10</td><td>2–8</td><td>4–8</td><td>4–10</td><td>4–10</td><td>4–8</td></tr>
<tr><td>VFD450–900C23A/E
VFD750–5600C43A/E</td><td>2–9</td><td>2–9</td><td>2–8</td><td>4–8</td><td>4–9</td><td>4–9</td><td>4–8</td></tr>
</table>
*The default for SRMFOC is 4 kHz.</td><td>8
6
4</td></tr>
<tr><td>Super Heavy duty
<table>
<tr><th>Control mode / Model</th><th>VF, SVC</th><th>VFPG</th><th>IMFOC PG, IMTQC PG</th><th>PMFOC PG, PMTQC PG</th><th>PMFOC, IPMFOC</th><th>IMFOC, IMTQC</th><th>SRM FOC*</th></tr>
<tr><td>VFD007–110C23A/E
VFD007–150C43A/E</td><td>2–15</td><td>2–10</td><td>2–8</td><td>4–8</td><td>4–10</td><td>4–12</td><td>4–8</td></tr>
<tr><td>VFD150–450C23A/E
VFD185–550C43A/E</td><td>2–10</td><td>2–10</td><td>2–8</td><td>4–8</td><td>4–10</td><td>4–10</td><td>4–8</td></tr>
<tr><td>VFD550–900C23A/E
VFD750–3150C43A/E</td><td>2–9</td><td>2–9</td><td>2–8</td><td>4–8</td><td>4–9</td><td>4–9</td><td>4–8</td></tr>
<tr><td>VFD3550–5600C43A
VFD3550–5600C43E</td><td>2–9</td><td>2–9</td><td>2–8</td><td>4–8</td><td>4–9</td><td>4–9</td><td>4–8</td></tr>
</table>
*The default for SRMFOC is 4 kHz.</td><td>4
4
4
3</td></tr>
<tr><td>575V/690V (Light / Heavy / Super Heavy duty)
<table>
<tr><th>Power/ Control mode</th><th>VF, VFPG, SVC</th></tr>
<tr><td>1–15 HP (575V)</td><td>2–15 kHz</td></tr>
<tr><td>20–600 HP (690V)</td><td>2–9 kHz</td></tr>
<tr><td>850 HP (690V)</td><td>2–9 kHz</td></tr>
</table></td><td>4
4
3</td></tr>
<tr><td>00-19</td><td>PLC Command Mask</td><td>bit0: Control command is forced by PLC control
bit1: Frequency command is forced by PLC control
bit2: Position command is forced by PLC control
bit3: Torque command is forced by PLC control</td><td>Read only</td></tr>
<tr><td>00-20</td><td>Master Frequency Command Source (AUTO) / Source Selection of the PID Target</td><td>0: Digital keypad
1: RS-485 communication input
2: External analog input (Refer to Pr.03-00–03-02)
3: External UP / DOWN terminal (multi-function input terminals)</td><td>0</td></tr>
</table>

	Pr.	Parameter Name	Setting Range	Default
			4: Pulse input without direction command (refer to Pr.10-16 without considering direction), use with PG card 5: Pulse input with direction command (refer to Pr.10-16), use with PG card 6: CANopen communication card 8: Communication card (does not include CANopen card)	
	00-21	Operation Command Source (AUTO)	0: Digital keypad 1: External terminals 2: RS-485 communication input 3: CANopen communication card 5: Communication card (CANopen card not included)	0
✓	00-22	Stop Method	0: Ramp to stop 1: Coast to stop	0
✓	00-23	Motor Direction Control	0: Enable forward / reverse 1: Disable reverse 2: Disable forward	0
	00-24	Digital Operator (Keypad) Frequency Command Memory	Read only	Read only
✓	00-25	User Defined Characteristics	bit0–3: user-defined decimal place 0000b: no decimal place 0001b: one decimal place 0010b: two decimal places 0011b: three decimal places bit4–15: user-defined unit 000xh: Hz 001xh: rpm 002xh: % 003xh: kg 004xh: m/s 005xh: kW 006xh: HP 007xh: ppm 008xh: 1/m 009xh: kg/s 00Axh: kg/m 00Bxh: kg/h 00Cxh: lb/s 00Dxh: lb/m 00Exh: lb/h 00Fxh: ft/s 010xh: ft/m 011xh: m	0

Pr.	Parameter Name	Setting Range	Default
		012xh: ft 013xh: degC 014xh: degF 015xh: mbar 016xh: bar 017xh: Pa 018xh: kPa 019xh: mWG 01Axh: inWG 01Bxh: ftWG 01Cxh: psi 01Dxh: atm 01Exh: L/s 01Fxh: L/m 020xh: L/h 021xh: m3/s 022xh: m3/h 023xh: GPM 024xh: CFM xxxxh: Hz	
00-26	Maximum User-Defined Value	0: Disabled 0–65535 (when Pr.00-25 is set to no decimal place) 0.0–6553.5 (when Pr.00-25 is set to 1 decimal place) 0.00–655.35 (when Pr.00-25 is set to 2 decimal places) 0.000–65.535 (when Pr.00-25 is set to 3 decimal places)	0
00-27	User-Defined Value	Read only	Read only
00-29	LOCAL / REMOTE Selection	0: Standard HOA function 1: When switching between LOCAL and REMOTE, the drive stops. 2: When switching between LOCAL and REMOTE, the drive runs with REMOTE settings for frequency and operation status. 3: When switching between LOCAL and REMOTE, the drive runs with LOCAL settings for frequency and operation status. 4: When switching between LOCAL and REMOTE, the drive runs with LOCAL settings when switched to Local and runs with REMOTE settings when switched to Remote for frequency and operation status.	0

	Pr.	Parameter Name	Setting Range	Default
	00-30	Master Frequency Command Source (HAND)	0: Digital keypad 1: RS-485 communication input 2: External analog input (Refer to Pr.03-00–03-02) 3: External UP / DOWN terminal (multi-function input terminals) 4: Pulse input without direction command (refer to Pr.10-16 without considering direction) 5: Pulse input with direction command (refer to Pr.10-16) 6: CANopen communication card 8: Communication card (CANopen card not included)	0
	00-31	Operation Command Source (HAND)	0: Digital keypad 1: External terminals 2: RS-485 communication input 3: CANopen communication card 5: Communication card (CANopen card not included)	0
✓	00-32	Digital Keypad STOP Function	0: STOP key disabled 1: STOP key enabled	0
	00-33	RPWM Mode Selection	0: Disabled 1: RPWM mode 1 2: RPWM mode 2 3: RPWM mode 3	0
✓	00-34	RPWM Range	0.0–4.0 kHz Pr.00-17 = 4 kHz, 8 kHz: the setting range is 0.0–2.0 kHz Pr.00-17 = 5–7 kHz: the setting range is 0.0–4.0 kHz	0.0
✓	00-37	Over-Modulation Gain	80–120	100
✓	00-48	Display Filter Time (Current)	0.001–65.535 sec.	0.100
✓	00-49	Display Filter Time (Keypad)	0.001–65.535 sec.	0.100
	00-50	Software Version (Date)	Read only	Read only

01 Basic Parameters

	Pr.	Parameter Name	Setting Range	Default
✓	01-00	Maximum Operation Frequency	0.00–599.00 Hz	60.00 / 50.00
✓	01-01	Motor 1 Rated / Base Frequency	0.00–599.00 Hz	60.00 / 50.00
✓	01-02	Motor 1 Rated / Base Output Voltage	230V models: 0.0–255.0 V 460V models: 0.0–510.0 V 575V models: 0.0–637.0 V 690V models: 0.0–765.0 V	200.0 400.0 600.0 660.0
	01-03	Motor 1 Mid-Point Frequency 1	0.00–599.00 Hz	3.00
✓	01-04	Motor 1 Mid-Point Voltage 1	230V models: 0.0–240.0 V 460V models: 0.0–480.0 V 575V models: 0.0–637.0 V 690V models: 0.0–720.0 V	11.0 22.0 0.0 0.0
	01-05	Motor 1 Mid-Point Frequency 2	0.00–599.00 Hz	1.50
✓	01-06	Motor 1 Mid-Point Voltage 2	230V models: 0.0–240.0 V 460V models: 0.0–480.0 V 575V models: 0.0–637.0 V 690V models: 0.0–720.0 V	5.0 10.0 0.0 0.0
	01-07	Motor 1 Minimum Output Frequency	0.00–599.00 Hz	0.50
✓	01-08	Motor 1 Minimum Output Voltage	230V models: 0.0–240.0 V 460V models: 0.0–480.0 V 575V models: 0.0–637.0 V 690V models: 0.0–720.0 V	1.0 2.0 0.0 0.0
	01-09	Start-Up Frequency	0.00–599.00 Hz	0.50
✓	01-10	Output Frequency Upper Limit	0.00–599.00 Hz	599.00
✓	01-11	Output Frequency Lower Limit	0.00–599.00 Hz	0.00
✓	01-12	Acceleration Time 1	Pr.01-45 = 0: 0.00–600.00 sec. Pr.01-45 = 1: 0.00–6000.0 sec. The default of motor drive with 30HP and above: 60.00 / 60.0	10.00
✓	01-13	Deceleration Time 1	Pr.01-45 = 0: 0.00–600.00 sec. Pr.01-45 = 1: 0.00–6000.0 sec. The default of motor drive with 30HP and above: 60.00 / 60.0	10.00
✓	01-14	Acceleration Time 2	Pr.01-45 = 0: 0.00–600.00 sec. Pr.01-45 = 1: 0.00–6000.0 sec. The default of motor drive with 30HP and above: 60.00 / 60.0	10.00

	Pr.	Parameter Name	Setting Range	Default
✓	01-15	Deceleration Time 2	Pr.01-45 = 0: 0.00–600.00 sec. Pr.01-45 = 1: 0.00–6000.0 sec. The default of motor drive with 30HP and above: 60.00 / 60.0	10.00
✓	01-16	Acceleration Time 3	Pr.01-45 = 0: 0.00–600.00 sec. Pr.01-45 = 1: 0.00–6000.0 sec. The default of motor drive with 30HP and above: 60.00 / 60.0	10.00
✓	01-17	Deceleration Time 3	Pr.01-45 = 0: 0.00–600.00 sec. Pr.01-45 = 1: 0.00–6000.0 sec. The default of motor drive with 30HP and above: 60.00 / 60.0	10.00
✓	01-18	Acceleration Time 4	Pr.01-45 = 0: 0.00–600.00 sec. Pr.01-45 = 1: 0.00–6000.0 sec. The default of motor drive with 30HP and above: 60.00 / 60.0	10.00
✓	01-19	Deceleration Time 4	Pr.01-45 = 0: 0.00–600.00 sec. Pr.01-45 = 1: 0.00–6000.0 sec. The default of motor drive with 30HP and above: 60.00 / 60.0	10.00
✓	01-20	JOG Acceleration Time	Pr.01-45 = 0: 0.00–600.00 sec. Pr.01-45 = 1: 0.00–6000.0 sec. The default of motor drive with 30HP and above: 60.00 / 60.0	10.00
✓	01-21	JOG Deceleration Time	Pr.01-45 = 0: 0.00–600.00 sec. Pr.01-45 = 1: 0.00–6000.0 sec. The default of motor drive with 30HP and above: 60.00 / 60.0	10.00
✓	01-22	JOG Frequency	0.00–599.00 Hz	6.00
✓	01-23	Switch Frequency between the First and Fourth Accel./Decel.	0.00–599.00 Hz	0.00
✓	01-24	S-Curve for Acceleration Begin Time 1	Pr.01-45 = 0: 0.00–25.00 sec. Pr.01-45 = 1: 0.0–250.0 sec.	0.20
✓	01-25	S-Curve for Acceleration Arrival Time 2	Pr.01-45 = 0: 0.00–25.00 sec. Pr.01-45 = 1: 0.0–250.0 sec.	0.20
✓	01-26	S-Curve for Deceleration Begin Time 1	Pr.01-45 = 0: 0.00–25.00 sec. Pr.01-45 = 1: 0.0–250.0 sec.	0.20
✓	01-27	S-Curve for Deceleration Arrival Time 2	Pr.01-45 = 0: 0.00–25.00 sec. Pr.01-45 = 1: 0.0–250.0 sec.	0.20
	01-28	Skip Frequency 1 (Upper Limit)	0.00–599.00 Hz	0.00
	01-29	Skip Frequency 1 (Lower Limit)	0.00–599.00 Hz	0.00

	Pr.	Parameter Name	Setting Range	Default
	01-30	Skip Frequency 2 (Upper Limit)	0.00–599.00 Hz	0.00
	01-31	Skip Frequency 2 (Lower Limit)	0.00–599.00 Hz	0.00
	01-32	Skip Frequency 3 (Upper Limit)	0.00–599.00 Hz	0.00
	01-33	Skip Frequency 3 (Lower Limit)	0.00–599.00 Hz	0.00
	01-34	Zero-Speed Mode	0: Output waiting 1: Zero-speed operation 2: Output frequency lower limit (Refer to Pr.01-11)	0
✓	01-35	Motor 2 Rated / Base Frequency	0.00–599.00 Hz	60.00 / 50.00
✓	01-36	Motor 2 Rated / Base Output Voltage	230V models: 0.0–255.0 V 460V models: 0.0–510.0 V 575V models: 0.0–637.0 V 690V models: 0.0–765.0 V	200.0 400.0 600.0 660.0
	01-37	Motor 2 Mid-Point Frequency 1	0.00–599.00 Hz	3.00
✓	01-38	Motor 2 Mid-Point Voltage 1	230V models: 0.0–240.0 V 460V models: 0.0–480.0 V 575V models: 0.0–637.0 V 690V models: 0.0–720.0 V	11.0 22.0 0.0 0.0
	01-39	Motor 2 Mid-Point Frequency 2	0.00–599.00 Hz	1.50
✓	01-40	Motor 2 Mid-Point Voltage 2	230V models: 0.0–240.0 V 460V models: 0.0–480.0 V 575V models: 0.0–637.0 V 690V models: 0.0–720.0 V	5.0 10.0 0.0 0.0
	01-41	Motor 2 Minimum Output Frequency	0.00–599.00 Hz	0.50
✓	01-42	Motor 2 Minimum Output Voltage	230V models: 0.0–240.0 V 460V models: 0.0–480.0 V 575V models: 0.0–637.0 V 690V models: 0.0–720.0 V	1.0 2.0 0.0 0.0
	01-43	V/F Curve Selection	0: V/F curve determined by Pr.01-00–01-08 1: V/F curve to the power of 1.5 2: V/F curve to the power of 2 3: 60 Hz, voltage saturation in 50 Hz 4: 72 Hz, voltage saturation in 60 Hz 5: 50 Hz, decrease gradually with cube 6: 50 Hz, decrease gradually with square 7: 60 Hz, decrease gradually with cube 8: 60 Hz, decrease gradually with square 9: 50 Hz, medium starting torque 10: 50 Hz, high starting torque	0

	Pr.	Parameter Name	Setting Range	Default
			11: 60 Hz, medium starting torque 12: 60 Hz, high starting torque 13: 90 Hz, voltage saturation in 60 Hz 14: 120 Hz, voltage saturation in 60 Hz 15: 180 Hz, voltage saturation in 60 Hz	
↗	01-44	Auto-Acceleration and Auto-Deceleration Setting	0: Linear acceleration and deceleration 1: Auto-acceleration and linear deceleration 2: Linear acceleration and auto-deceleration 3: Auto-acceleration and auto-deceleration 4: Stall prevention by auto-acceleration and auto-deceleration (limited by Pr.01-12–Pr.01-21)	0
	01-45	Time Unit for Acceleration / Deceleration and S-Curve	0: Unit: 0.01 sec. 1: Unit: 0.1 sec.	0
↗	01-46	CANopen Quick Stop Time	Pr.01-45 = 0: 0.00–600.00 sec. Pr.01-45 = 1: 0.0–6000.0 sec.	1.00
	01-49	TEC Function	0: Disabled 1: Enabled	0
↗	01-50	Electromagnetic Traction Energy Consumption Coefficient	0.00–5.00 Hz	0.50
↗	01-51	Flux-Weakening Overload Stall Prevention Time	0.00–600.00 sec.	1.00
	01-52	Zero-Speed Delay Time	0–65535	0
	01-53	Zero-Speed Delay Level	0.00–599.00 Hz	1.00
	01-54	Zero-Speed Delay Time Out	0.00–655.35 sec.	0.00

02 Digital Input / Output Parameters

Pr.	Parameter Name	Setting Range	Default
02-00	Two-Wire / Three-Wire Operation Control	0: Two-wire mode 1, power on for operation control 1: Two-wire mode 2, power on for operation control 2: Three-wire, power on for operation control 7: Single-wire mode, the Servo ON terminal under position control mode (only the FWD terminal is valid)	0
02-01	Multi-Function Input Command 1 (MI1)	0: No function 1: Multi-step speed command 1 / multi-step position command 1 2: Multi-step speed command 2 / multi-step position command 2 3: Multi-step speed command 3 / multi-step position command 3 4: Multi-step speed command 4 / multi-step position command 4 5: Reset 6: JOG operation (by external control or KPC-CC01) 7: Acceleration / deceleration speed inhibit 8: 1st and 2nd acceleration / deceleration time selection 9: 3rd and 4th acceleration / deceleration time selection 10: External Fault (EF) input (Pr.07-20) 11: Base Block (B.B) input from external 12: Output voltage stops 13: Cancel the setting of auto-acceleration / auto-deceleration time 14: Switch between motor 1 and motor 2 15: Rotating speed command from AVI 16: Rotating speed command from ACI 17: Rotating speed command from AUI 18: Forced to stop (Pr.07-20) 19: Frequency up command 20: Frequency down command 21: PID function disabled 22: Clear the counter 23: Input the counter value (MI6)	1
02-02	Multi-Function Input Command 2 (MI2)		2
02-03	Multi-Function Input Command 3 (MI3)		3
02-04	Multi-Function Input Command 4 (MI4)		4
02-05	Multi-Function Input Command 5 (MI5)		0
02-06	Multi-Function Input Command 6 (MI6)		0
02-07	Multi-Function Input Command 7 (MI7)		0
02-08	Multi-Function Input Command 8 (MI8)		0
02-26	Input Terminal of I/O Extension Card (MI10)		0
02-27	Input Terminal of I/O Extension Card (MI11)		0
02-28	Input Terminal of I/O Extension Card (MI12)		0
02-29	Input Terminal of I/O Extension Card (MI13)		0
02-30	Input Terminal of I/O Extension Card (MI14)		0
02-31	Input Terminal of I/O Extension Card (MI15)		0

Pr.	Parameter Name	Setting Range	Default
		24: FWD JOG command 25: REV JOG command 26: TQC / FOC mode selection 27: ASR1 / ASR2 selection 28: Emergency stop (EF1) 29: Signal confirmation for Y-connection 30: Signal confirmation for Δ-connection 31: High torque bias (Pr.11-30) 32: Middle torque bias (Pr.11-31) 33: Low torque bias (Pr.11-32) 35: Enable single-point positioning 36: Enable multi-step position teaching function– 37: Enable pulse-train position command position control 38: Disable write EEPROM function 39: Torque command direction 40: Force coasting to stop 41: HAND switch 42: AUTO switch 43: Enable resolution selection (Pr.02-48) 44: Negative limit switch (NL) 45: Positive limit switch (PL) 46: Homing (ORG) 47: Enable homing function 48: Mechanical gear ratio switch 49: Enable drive 50: Slave dEb action to execute 51: Selection for PLC mode bit 0 52: Selection for PLC mode bit 1 53: Trigger CANopen quick stop 55: Brake release 56: Local / Remote selection 88: Multi-step position command confirm 89: Speed / position control mode switch 0: Speed mode 1: Position mode 90: Position command source switch 0: Inputs from internal register 1: Inputs from external pulse	
✓	02-09	External UP / DOWN Key Mode	0: By the acceleration / deceleration time 1: Constant speed (Pr.02-10)	0

	Pr.	Parameter Name	Setting Range	Default
✓	02-10	Acceleration / Deceleration Speed of External UP / DOWN Key	0.001–1.000 Hz / ms	0.001
✓	02-11	Multi-Function Input Response Time	0.000–30.000 sec.	0.005
✓	02-12	Multi-Function Input Mode Selection	0000h–FFFFh (0: N.O.; 1: N.C.)	0000h
✓	02-13	Multi-Function Output 1 (Relay1)	0: No function 1: Indication during RUN 2: Operation speed reached 3: Desired frequency reached 1 (Pr.02-22) 4: Desired frequency reached 2 (Pr.02-24) 5: Zero speed (Frequency command) 6: Zero speed including STOP (Frequency command) 7: Over-torque 1 (Pr.06-06–06-08) 8: Over-torque 2 (Pr.06-09–06-11) 9: Drive is ready 10: Low voltage warning (Lv) (Pr.06-00) 11: Malfunction indication 12: Mechanical brake release (Pr.02-32) 13: Overheat warning (Pr.06-15) 14: Software brake signal indication (Pr.07-00) 15: PID feedback error (Pr.08-13, Pr.08-14) 16: Slip error (oSL) 17: Count value reached, does not return to 0 (Pr.02-20) 18: Count value reached, returns to 0 (Pr.02-19) 19: External interrupt B.B. input (Base Block) 20: Warning output 21: Over-voltage 22: Over-current stall prevention 23: Over-voltage stall prevention 24: Operation source 25: Forward command 26: Reverse command 27: Output when current ≥ Pr.02-33 28: Output when current < Pr.02-33 29: Output when frequency ≥ Pr.02-34 30: Output when frequency < Pr.02-34 31: Y-connection for the motor coil 32: Δ-connection for the motor coil	11
✓	02-14	Multi-Function Output 2 (Relay2)		1
✓	02-16	Multi-Function Output 3 (MO1)		66
✓	02-17	Multi-Function Output 4 (MO2)		0
✓	02-36	Output Terminal of I/O Extension Card (MO10) or (RA10)		0
✓	02-37	Output Terminal of I/O Extension Card (MO11) or (RA11)		0
✓	02-38	Output Terminal of I/O Extension Card (RA12)		0
✓	02-39	Output Terminal of I/O Extension Card (RA13)		0
✓	02-40	Output Terminal of I/O Extension Card (RA14)		0
✓	02-41	Output Terminal of I/O Extension Card (RA15)		0
✓	02-42	Output Terminal of I/O Extension Card (MO16 Virtual Terminal)		0
✓	02-43	Output Terminal of I/O Extension Card (MO17 Virtual Terminal)		0
✓	02-44	Output Terminal of I/O Extension Card (MO18 Virtual Terminal)		0
✓	02-45	Output Terminal of I/O Extension Card (MO19 Virtual Terminal)		0
✓	02-46	Output Terminal of I/O Extension Card (MO20 Virtual Terminal)		0

	Pr.	Parameter Name	Setting Range	Default
			33: Zero speed (actual output frequency) 34: Zero speed including stop (actual output frequency) 35: Error output selection 1 (Pr.06-23) 36: Error output selection 2 (Pr.06-24) 37: Error output selection 3 (Pr.06-25) 38: Error output selection 4 (Pr.06-26) 39: Position reached (Pr.11-65, Pr.11-66) 40: Speed reached (including stop) 42: Crane function 43: Motor actual speed detection 44: Low current output (use with Pr.06-71–06-73) 45: UVW output magnetic contactor operates 46: Master dEb output 47: Closed brake output 49: Homing action completed 50: Output control for CANopen 51: Analog output control for RS-485 interface (InnerCOM / Modbus) 52: Output control for communication cards 65: Output control for both CANopen and RS485 66: SO output logic A 67: Analog input level reached 68: SO output logic B 70: FAN warning output 75: Forward running status 76: Reverse running status	
↗	02-18	Multi-Function Output Direction	0000h–FFFFh (0: N.O.; 1: N.C.)	0000h
↗	02-19	Terminal Counting Value Reached (Returns to 0)	0–65500	0
↗	02-20	Preliminary Counting Value Reached (Does Not Return to 0)	0–65500	0
↗	02-21	Digital Output Gain (DFM)	1–166	1
↗	02-22	Desired Frequency Reached 1	0.00–599.00 Hz	60.00 / 50.00
↗	02-23	The Width of the Desired Frequency Reached 1	0.00–599.00 Hz	2.00
↗	02-24	Desired Frequency Reached 2	0.00–599.00 Hz	60.00 / 50.00
↗	02-25	The Width of the Desired Frequency Reached 2	0.00–599.00 Hz	2.00
	02-32	Brake Delay Time	0.000–65.000 sec.	0.000

	Pr.	Parameter Name	Setting Range	Default
✓	02-33	Output Current Level Setting for Multi-Function Output Terminal	0–100%	0
✓	02-34	Output Frequency Setting for Multi-Function Output Terminal	0.00–599.00 Hz (Motor speed when using PG Card)	3.00
✓	02-35	External Operation Control Selection after Reset and Reboot	0: Disabled 1: Drive runs if the RUN command remains after reset or reboot	0
✓	02-47	Motor Zero-Speed Level	0–65535 rpm	0
✓	02-48	Maximum Frequency of Resolution Switch	0.00–599.00 Hz	60.00
✓	02-49	Switch Delay Time of Maximum Output Frequency	0.000–65.000 sec.	0.000
	02-50	Display the Status of Multi-Function Input Terminal	Monitor the status of multi-function input terminals	Read only
	02-51	Display the Status of Multi-Function Output Terminal	Monitor the status of multi-function output terminals	Read only
	02-52	Display the External Multi-Function Input Terminals Used by PLC	Monitor the status of PLC input terminals	Read only
	02-53	Display the External Multi-Function Output Terminals Used by PLC	Monitor the status of PLC output terminals	Read only
	02-54	Display the Frequency Command Executed by External Terminal	0.00–599.00 Hz (Read only)	Read only
	02-56	Brake Release Check Time	0.000–65.000 sec.	0.000
✓	02-57	Multi-Function Output Terminal (Function 42): Brake Current Check Point	0–100%	0
✓	02-58	Multi-Function Output Terminal (Function 42): Brake Frequency Check Point	0.00–599.00 Hz	0.00
✓	02-63	Frequency Reached Detection Amplitude	0.00–599.00 Hz	0.00
	02-70	IO Card Types	1: EMC-BPS01 4: EMC-D611A 5: EMC-D42A 6: EMC-R6AA 11: EMC-A22A	Read only
	02-71	DFM Output Selection	0: Use frequency with speed control as DFM output frequency 1: Use frequency with system acceleration / deceleration as DFM output frequency	0

	Pr.	Parameter Name	Setting Range	Default
↙	02-74	Internal / External Multi-Function Input Terminal Selection	0000–FFFFh	0000h
↙	02-75	Internal Multi-Function Input Terminal Selection	0000–FFFFh	0000h

03 Analog Input / Output Parameters

	Pr.	Parameter Name	Setting Range	Default
✓	03-00	AVI Analog Input Selection	0: No function 1: Frequency command (speed limit under torque control mode) 2: Torque command (torque limit under speed control mode) 3: Torque compensation command 4: PID target value 5: PID feedback signal 6: Thermistor (PTC / KTY-84) input value 7: Positive torque limit 8: Negative torque limit 9: Regenerative torque limit 10: Positive / negative torque limit 11: PT100 thermistor input value 13: PID compensation value	1
✓	03-01	ACI Analog Input Selection		0
✓	03-02	AUI Analog Input Selection		0
✓	03-03	AVI Analog Input Bias	-100.0–100.0%	0.0
✓	03-04	ACI Analog Input Bias	-100.0–100.0%	0.0
✓	03-05	AUI Analog Input Bias	-100.0–100.0%	0.0
✓	03-07	AVI Positive / Negative Bias Mode	0: No bias 1: Lower than or equal to bias 2: Greater than or equal to bias 3: The absolute value of the bias voltage while serving as the center 4: Bias serves as the center	0
✓	03-08	ACI Positive / Negative Bias Mode		
✓	03-09	AUI Positive / Negative Bias Mode		
✓	03-10	Reverse Setting When Analog Signal Input is Negative Frequency	0: Negative frequency input is not allowed. The digital keypad or external terminal controls the forward and reverse direction. 1: Negative frequency is **allowed**. Positive frequency = run in a forward direction; Negative frequency = run in a reverse direction. The digital keypad or external terminal control cannot change the running direction.	0
✓	03-11	AVI Analog Input Gain	-500.0–500.0%	100.0
✓	03-12	ACI Analog Input Gain	-500.0–500.0%	100.0
✓	03-13	AUI Analog Positive Input Gain	-500.0–500.0%	100.0
✓	03-14	AUI Analog Negative Input Gain	-500.0–500.0%	100.0
✓	03-15	AVI Analog Input Filter Time	0.00–20.00 sec.	0.01
✓	03-16	ACI Analog Input Filter Time	0.00–20.00 sec.	0.01
✓	03-17	AUI Analog Input Filter Time	0.00–20.00 sec.	0.01

	Pr.	Parameter Name	Setting Range	Default
✓	03-18	Analog Input Addition Function	0: Disabled (AVI, ACI, AUI) 1: Enabled	0
	03-19	Signal Loss Selection for the Analog Input 4–20 mA	0: Disabled 1: Continue operation at the last frequency 2: Decelerate to 0 Hz 3: Stop immediately and display ACE 4: Operate with output frequency lower limit (Pr.01-11) and displays ANL	0
✓	03-20	AFM1 Multi-Function Output 1	0: Output frequency (Hz) 1: Frequency command (Hz) 2: Motor speed (Hz) 3: Output current (rms) 4: Output voltage 5: DC bus voltage 6: Power factor 7: Power 8: Output torque 9: AVI 10: ACI 11: AUI 12: Iq current command 13: Iq feedback value 14: Id current command 15: Id feedback value 18: Torque command 19: PG2 frequency command 20: CANopen analog output 21: RS-485 analog output 22: Communication card analog output 23: Constant voltage output 25: CANopen and RS-485 analog output	0
✓	03-23	AFM2 Multi-Function Output 2		0
✓	03-21	AFM1 Analog Output Gain 1	0.0–500.0%	100.0
✓	03-22	AFM1 Analog Output 1 in REV Direction	0: Absolute value in output voltage 1: Reverse output 0 V; forward output 0–10 V 2: Reverse output 5–0 V; forward output 5–10 V	0
✓	03-24	AFM2 Analog Output Gain 2	0.0–500.0%	100.0

	Pr.	Parameter Name	Setting Range	Default
✓	03-25	AFM2 Analog Output 2 in REV Direction	0: Absolute value in output voltage 1: Reverse output 0 V; forward output 0–10 V 2: Reverse output 5–0 V; forward output 5–10 V	0
✓	03-27	AFM2 Output Bias	-100.00–100.00%	0.00
✓	03-28	AVI Terminal Input Selection	0: 0–10 V 1: 0–20 mA 2: 4–20 mA	0
✓	03-29	ACI Terminal Input Selection	0: 4–20 mA 1: 0–10 V 2: 0–20 mA	0
	03-30	PLC Analog Output Terminal Status	Monitor the status of the PLC analog output terminals	Read only
✓	03-31	AFM2 Output Selection	0: 0–20 mA output 1: 4–20 mA output	0
✓	03-32	AFM1 DC Output Setting Level	0.00–100.00%	0.00
✓	03-33	AFM2 DC Output Setting Level	0.00–100.00%	0.00
✓	03-35	AFM1 Output Filter Time	0.00–20.00 sec.	0.01
✓	03-36	AFM2 Output Filter Time	0.00–20.00 sec.	0.01
✓	03-44	Multi-Function Output (MO) By AI Level Source	0: AVI 1: ACI 2: AUI	0
✓	03-45	AI Upper Level (MO)	-100.00–100.00%	50.00
✓	03-46	AI Lower Level (MO)	-100.00–100.00%	10.00
✓	03-50	Analog Input Curve Selection	0: Normal curve 1: Three-point curve of AVI 2: Three-point curve of ACI 3: Three-point curve of AVI & ACI 4: Three-point curve of AUI 5: Three-point curve of AVI & AUI 6: Three-point curve of ACI & AUI 7: Three-point curve of AVI & ACI & AUI	0
✓	03-51	AVI Lowest Point	Pr.03-28 = 0, 0.00–10.00 V Pr.03-28 = 1, 0.00–20.00 mA Pr.03-28 = 2, 4.00–20.00 mA	0.00 0.00 4.00
✓	03-52	AVI Proportional Lowest Point	-100.00–100.00%	0.00
✓	03-53	AVI Mid-Point	Pr.03-28 = 0, 0.00–10.00 V Pr.03-28 = 1, 0.00–20.00 mA Pr.03-28 = 2, 4.00–20.00 mA	5.00 10.00 12.00
✓	03-54	AVI Proportional Mid-Point	-100.00–100.00%	50.00

	Pr.	Parameter Name	Setting Range	Default
✓	03-55	AVI Highest Point	Pr.03-28 = 0, 0.00–10.00 V Pr.03-28 = 1, 0.00–20.00 mA Pr.03-28 = 2, 4.00–20.00 mA	10.00 20.00 20.00
✓	03-56	AVI Proportional Highest Point	-100.00–100.00%	100.00
✓	03-57	ACI Lowest Point	Pr.03-29 = 0, 4.00–20.00 mA Pr.03-29 = 1, 0.00–10.00 V Pr.03-29 = 2, 0.00–20.00 mA	4.00 0.00 0.00
✓	03-58	ACI Proportional Lowest Point	-100.00–100.00%	0.00
✓	03-59	ACI Mid-Point	Pr.03-29 = 0, 4.00–20.00 mA Pr.03-29 = 1, 0.00–10.00 V Pr.03-29 = 2, 0.00–20.00 mA	12.00 5.00 10.00
✓	03-60	ACI Proportional Mid-Point	-100.00–100.00%	50.00
✓	03-61	ACI Highest Point	Pr.03-29 = 0, 4.00–20.00 mA Pr.03-29 = 1, 0.00–10.00 V Pr.03-29 = 2, 0.00–20.00 mA	20.00 10.00 20.00
✓	03-62	ACI Proportional Highest Point	-100.00–100.00%	100.00
✓	03-63	Positive AUI Voltage Lowest Point	0.00–10.00 V	0.00
✓	03-64	Positive AUI Voltage Proportional Lowest Point	-100.00–100.00%	0.00
✓	03-65	Positive AUI Voltage Mid-Point	0.00–10.00 V	5.00
✓	03-66	Positive AUI Voltage Proportional Mid-Point	-100.00–100.00%	50.00
✓	03-67	Positive AUI Voltage Highest Point	0.00–10.00 V	10.00
✓	03-68	Positive AUI Voltage Proportional Highest Point	-100.00–100.00%	100.00
✓	03-69	Negative AUI Voltage Highest Point	-10.00–0.00 V	0.00
✓	03-70	Negative AUI Voltage Proportional Highest Point	-100.00–100.00%	0.00
✓	03-71	Negative AUI Voltage Mid-Point	-10.00–0.00 V	-5.00
✓	03-72	Negative AUI Voltage Proportional Mid-Point	-100.00–100.00%	-50.00
✓	03-73	Negative AUI Voltage Lowest Point	-10.00–0.00 V	-10.00
✓	03-74	Negative AUI Voltage Proportional Lowest Point	-100.00–100.00%	-100.00

04 Multi-step Speed Parameters

	Pr.	Parameter Name	Setting Range	Default
✓	04-00	1st Step Speed Frequency	0.00–599.00 Hz	0.00
✓	04-01	2nd Step Speed Frequency	0.00–599.00Hz	0.00
✓	04-02	3rd Step Speed Frequency	0.00–599.00 Hz	0.00
✓	04-03	4th Step Speed Frequency	0.00–599.00 Hz	0.00
✓	04-04	5th Step Speed Frequency	0.00–599.00 Hz	0.00
✓	04-05	6th Step Speed Frequency	0.00–599.00 Hz	0.00
✓	04-06	7th Step Speed Frequency	0.00–599.00 Hz	0.00
✓	04-07	8th Step Speed Frequency	0.00–599.00 Hz	0.00
✓	04-08	9th Step Speed Frequency	0.00–599.00 Hz	0.00
✓	04-09	10th Step Speed Frequency	0.00–599.00 Hz	0.00
✓	04-10	11th Step Speed Frequency	0.00–599.00 Hz	0.00
✓	04-11	12th Step Speed Frequency	0.00–599.00 Hz	0.00
✓	04-12	13th Step Speed Frequency	0.00–599.00 Hz	0.00
✓	04-13	14th Step Speed Frequency	0.00–599.00 Hz	0.00
✓	04-14	15th Step Speed Frequency	0.00–599.00 Hz	0.00
✓	04-15	Position Command 1 (Rotation)	-30000–30000	0
✓	04-16	Position Command 1 (Pulse)	-32767–32767	0
✓	04-17	Position Command 2 (Rotation)	-30000–30000	0
✓	04-18	Position Command 2 (Pulse)	-32767–32767	0
✓	04-19	Position Command 3 (Rotation)	-30000–30000	0
✓	04-20	Position Command 3 (Pulse)	-32767–32767	0
✓	04-21	Position Command 4 (Rotation)	-30000–30000	0
✓	04-22	Position Command 4 (Pulse)	-32767–32767	0
✓	04-23	Position Command 5 (Rotation)	-30000–30000	0
✓	04-24	Position Command 5 (Pulse)	-32767–32767	0
✓	04-25	Position Command 6 (Rotation)	-30000–30000	0
✓	04-26	Position Command 6 (Pulse)	-32767–32767	0
✓	04-27	Position Command 7 (Rotation)	-30000–30000	0
✓	04-28	Position Command 7 (Pulse)	-32767–32767	0
✓	04-29	Position Command 8 (Rotation)	-30000–30000	0
✓	04-30	Position Command 8 (Pulse)	-32767–32767	0
✓	04-31	Position Command 9 (Rotation)	-30000–30000	0
✓	04-32	Position Command 9 (Pulse)	-32767–32767	0
✓	04-33	Position Command 10 (Rotation)	-30000–30000	0
✓	04-34	Position Command 10 (Pulse)	-32767–32767	0
✓	04-35	Position Command 11 (Rotation)	-30000–30000	0
✓	04-36	Position Command 11 (Pulse)	-32767–32767	0
✓	04-37	Position Command 12 (Rotation)	-30000–30000	0

	Pr.	Parameter Name	Setting Range	Default
↗	04-38	Position Command 12 (Pulse)	-32767–32767	0
↗	04-39	Position Command 13 (Rotation)	-30000–30000	0
↗	04-40	Position Command 13 (Pulse)	-32767–32767	0
↗	04-41	Position Command 14 (Rotation)	-30000–30000	0
↗	04-42	Position Command 14 (Pulse)	-32767–32767	0
↗	04-43	Position Command 15 (Rotation)	-30000–30000	0
↗	04-44	Position Command 15 (Pulse)	-32767–32767	0
↗	04-50	PLC Buffer 0	0–65535	0
↗	04-51	PLC Buffer 1	0–65535	0
↗	04-52	PLC Buffer 2	0–65535	0
↗	04-53	PLC Buffer 3	0–65535	0
↗	04-54	PLC Buffer 4	0–65535	0
↗	04-55	PLC Buffer 5	0–65535	0
↗	04-56	PLC Buffer 6	0–65535	0
↗	04-57	PLC Buffer 7	0–65535	0
↗	04-58	PLC Buffer 8	0–65535	0
↗	04-59	PLC Buffer 9	0–65535	0
↗	04-60	PLC Buffer 10	0–65535	0
↗	04-61	PLC Buffer 11	0–65535	0
↗	04-62	PLC Buffer 12	0–65535	0
↗	04-63	PLC Buffer 13	0–65535	0
↗	04-64	PLC Buffer 14	0–65535	0
↗	04-65	PLC Buffer 15	0–65535	0
↗	04-66	PLC Buffer 16	0–65535	0
↗	04-67	PLC Buffer 17	0–65535	0
↗	04-68	PLC Buffer 18	0–65535	0
↗	04-69	PLC Buffer 19	0–65535	0
↗	04-70	PLC Application Parameter 0	0–65535	0
↗	04-71	PLC Application Parameter 1	0–65535	0
↗	04-72	PLC Application Parameter 2	0–65535	0
↗	04-73	PLC Application Parameter 3	0–65535	0
↗	04-74	PLC Application Parameter 4	0–65535	0
↗	04-75	PLC Application Parameter 5	0–65535	0
↗	04-76	PLC Application Parameter 6	0–65535	0
↗	04-77	PLC Application Parameter 7	0–65535	0
↗	04-78	PLC Application Parameter 8	0–65535	0
↗	04-79	PLC Application Parameter 9	0–65535	0
↗	04-80	PLC Application Parameter 10	0–65535	0
↗	04-81	PLC Application Parameter 11	0–65535	0

	Pr.	Parameter Name	Setting Range	Default
✓	04-82	PLC Application Parameter 12	0–65535	0
✓	04-83	PLC Application Parameter 13	0–65535	0
✓	04-84	PLC Application Parameter 14	0–65535	0
✓	04-85	PLC Application Parameter 15	0–65535	0
✓	04-86	PLC Application Parameter 16	0–65535	0
✓	04-87	PLC Application Parameter 17	0–65535	0
✓	04-88	PLC Application Parameter 18	0–65535	0
✓	04-89	PLC Application Parameter 19	0–65535	0
✓	04-90	PLC Application Parameter 20	0–65535	0
✓	04-91	PLC Application Parameter 21	0–65535	0
✓	04-92	PLC Application Parameter 22	0–65535	0
✓	04-93	PLC Application Parameter 23	0–65535	0
✓	04-94	PLC Application Parameter 24	0–65535	0
✓	04-95	PLC Application Parameter 25	0–65535	0
✓	04-96	PLC Application Parameter 26	0–65535	0
✓	04-97	PLC Application Parameter 27	0–65535	0
✓	04-98	PLC Application Parameter 28	0–65535	0
✓	04-99	PLC Application Parameter 29	0–65535	0

05 Motor Parameters

	Pr.	Parameter Name	Setting Range	Default
	05-00	Motor Parameter Auto-Tuning	0: No function 1: Simple rolling auto-tuning for induction motor (IM) 2: Static auto-tuning for induction motor (IM) 4: Dynamic test for PM magnetic pole (with the running in forward direction) 5: Rolling auto-tuning for PM (IPM / SPM) 6: Advanced rolling auto-tuning for IM 11: Static auto-tuning for SynRM 12: FOC sensorless inertia estimation 13: Static auto-tuning for PM	0
	05-01	Full-Load Current for Induction Motor 1 (A)	Depending on the model power	Depending on the model power
✓	05-02	Rated Power for Induction Motor 1 (kW)	0.00–655.35 kW	Depending on the model power
✓	05-03	Rated Speed for Induction Motor 1 (rpm)	0–xxxx rpm (Depending on the motor's number of poles)	Depending on the motor's number of poles
	05-04	Number of Poles for Induction Motor 1	2–64	4
	05-05	No-Load Current for Induction Motor 1 (A)	0.00–Pr.05-01 default	Depending on the model power
	05-06	Stator Resistance (Rs) for Induction Motor 1	0.000–65.535 Ω	Depending on the model power
	05-07	Rotor Resistance (Rr) for Induction Motor 1	0.000–65.535 Ω	Depending on the model power
	05-08	Magnetizing Inductance (Lm) for Induction Motor 1	0.0–6553.5 mH	Depending on the model power
	05-09	Stator Inductance (Lx) for Induction Motor 1	0.0–6553.5 mH	Depending on the model power
	05-13	Full-Load Current for Induction Motor 2 (A)	Depending on the model power	Depending on the model power
✓	05-14	Rated Power for Induction Motor 2 (kW)	0.00–655.35 kW	Depending on the model power
✓	05-15	Rated Speed for Induction Motor 2 (rpm)	0–xxxx rpm (Depending on the motor's number of poles)	Depending on the motor's number of poles
	05-16	Number of Poles for Induction Motor 2	2–64	4

	Pr.	Parameter Name	Setting Range	Default
	05-17	No-Load Current for Induction Motor 2 (A)	0.00–Pr.05-13 default	Depending on the model power
	05-18	Stator Resistance (Rs) for Induction Motor 2	0.000–65.535 Ω	Depending on the model power
	05-19	Rotor Resistance (Rr) for Induction Motor 2	0.000–65.535 Ω	Depending on the model power
	05-20	Magnetizing Inductance (Lm) for Induction Motor 2	0.0–6553.5 mH	Depending on the model power
	05-21	Stator Inductance (Lx) for Induction Motor 2	0.0–6553.5 mH	Depending on the model power
	05-22	Induction Motor 1 / 2 Selection	1: Motor 1 2: Motor 2	1
✓	05-23	Frequency for Y-Connection / Δ-Connection Switch for an Induction Motor	0.00–599.00 Hz	60.00
	05-24	Y-Connection / Δ-Connection Switch for an Induction Motor	0: Disabled 1: Enabled	0
✓	05-25	Delay Time for Y-Connection / Δ-Connection Switch for an Induction Motor	0.000–60.000 sec.	0.200
	05-28	Cumulative Watt-Hour for a Running Motor (Wh)	0.0–999.9	Read only
	05-29	Cumulative Kilowatt-Hour for a Running Motor (kWh)	0.0–999.9	Read only
	05-30	Cumulative Megawatt-Hour for a Motor in High Word (MWh)	0–65535	Read only
	05-31	Cumulative Motor Running Time (Minutes)	0–1439	0
	05-32	Cumulative Motor Running Time (Days)	0–65535	0
	05-33	Induction Motor (IM) or Permanent Magnet Synchronous AC Motor (PM) Selection	0: IM 1: SPM 2: IPM 3: SynRM	0
	05-34	Full-Load Current for a Permanent Magnet Synchronous AC Motor / Reluctance Motor	Depending on the model power	Depending on the model power
✓	05-35	Rated Power for a Permanent Magnet Synchronous AC Motor / Reluctance Motor	0.00–655.35 kW	Depending on the model power

	Pr.	Parameter Name	Setting Range	Default
✓	05-36	Rated Speed for a Permanent Magnet Synchronous AC Motor / Reluctance Motor	0–65535 rpm	2000
	05-37	Number of Poles for a Permanent Magnet Synchronous AC Motor / Reluctance Motor	0–65535	10
	05-38	System Inertia for a Permanent Magnet Synchronous AC Motor / Reluctance Motor	0.0–6553.5 kg-cm^2	Depending on the motor power
	05-39	Stator Resistance for a Permanent Magnet Synchronous AC Motor / Reluctance Motor	0.000–65.535 Ω	0.000
	05-40	Permanent Magnet Synchronous AC Motor / Reluctance Motor Ld	0.00–655.35 mH / 0.0–6553.5 mH	0.00 / 0.0
	05-41	Permanent Magnet Synchronous AC Motor / Reluctance Motor Lq	0.00–655.35 mH / 0.0–6553.5 mH	0.00 / 0.0
✓	05-42	PG Offset Angle for a Permanent Magnet Synchronous AC Motor / Reluctance Motor	0.0–360.0°	0.0
✓	05-43	Ke Parameter of a Permanent Magnet Synchronous AC Motor / Reluctance Motor	0–65535 (V / krpm)	0

06 Protection Parameters

	Pr.	Parameter Name	Setting Range	Default
✓	06-00	Low Voltage Level	230V models: Frame A–D: 150.0–220.0 V_{DC} Frame E and above: 190.0–220.0 V_{DC} 460V models: Frame A–D: 300.0–440.0 V_{DC} Frame E and above: 380.0–440.0 V_{DC} 575V models: 420.0–520.0 V_{DC} 690V models: 450.0–660.0 V_{DC}	 180.0 200.0 360.0 400.0 470.0 480.0
✓	06-01	Over-Voltage Stall Prevention	0: Disabled 230V models: 0.0–450.0 V_{DC} 460V models: 0.0–900.0 V_{DC} 575V models: 0.0–920.0 V_{DC} 690V models: 0.0–1087.0 V_{DC}	 380.0 760.0 920.0 1087.0
✓	06-02	Selection for Over-Voltage Stall Prevention	0: Traditional over-voltage stall prevention 1: Smart over-voltage stall prevention	0
✓	06-03	Over-Current Stall Prevention during Acceleration	230V / 460V models Heavy duty: 0–195% (100% corresponds to the rated current of the drive) Super Heavy duty: 0–210% (100% corresponds to the rated current of the drive) 575V / 690V models Light duty: 0–125% (100% corresponds to the rated current of the drive) Normal duty: 0–150% (100% corresponds to the rated current of the drive) Heavy duty: 0–180% (100% corresponds to the rated current of the drive)	 150 150 120 120 150
✓	06-04	Over-Current Stall Prevention during Operation	230V / 460V models Heavy duty: 0–195% (100% corresponds to the rated current of the drive) Super Heavy duty: 0–210% (100% corresponds to the rated current of the drive) 575V / 690V models Light duty: 0–125% (100% corresponds to the rated current of the drive) Normal duty: 0–150% (100% corresponds to the rated current of the drive) Heavy duty: 0–180% (100% corresponds to the rated current of the drive)	 150 150 120 120 150

	Pr.	Parameter Name	Setting Range	Default
✓	06-05	Acceleration / Deceleration Time Selection for Stall Prevention at Constant Speed	0: By current acceleration / deceleration time 1: By the first acceleration / deceleration time 2: By the second acceleration / deceleration time 3: By the third acceleration / deceleration time 4: By the fourth acceleration / deceleration time 5: By Auto-acceleration / auto-deceleration	0
✓	06-06	Over-Torque Detection Selection (OT1)	0: No function 1: Continue operation after over-torque detection during constant speed operation 2: Stop after over-torque detection during constant speed operation 3: Continue operation after over-torque detection during RUN 4: Stop after over-torque detection during RUN	0
✓	06-07	Over-Torque Detection Level (OT1)	10–250% (100% corresponds to the rated current of the drive)	120
✓	06-08	Over-Torque Detection Time (OT1)	0.0–60.0 sec.	0.1
✓	06-09	Over-Torque Detection Selection (OT2)	0: No function 1: Continue operation after over-torque detection during constant speed operation 2: Stop after over-torque detection during constant speed operation 3: Continue operation after over-torque detection during RUN 4: Stop after Over-torque detection during RUN	0
✓	06-10	Over-Torque Detection Level (OT2)	10–250% (100% corresponds to the rated current of the drive)	120
✓	06-11	Over-Torque Detection Time (OT2)	0.0–60.0 sec.	0.1
	06-12	Current Limit	230V / 460V models: 0–195% (100% corresponds to the rated current of the drive) 575V / 690V models: 0–250% (100% corresponds to the rated current of the drive)	190 170
✓	06-13	Electronic Thermal Relay Selection 1 (Motor 1)	0: Inverter motor (with external forced cooling) 1: Standard motor (motor with fan on the shaft) 2: Disabled	2
✓	06-14	Electronic Thermal Relay Action Time 1 (Motor 1)	30.0–600.0 sec.	60.0

	Pr.	Parameter Name	Setting Range	Default
✓	06-15	Temperature Level Overheat (OH) Warning	0.0–110.0°C	105.0
✓	06-16	Stall Prevention Limit Level (Weak Magnetic Field Current Stall Prevention Level)	230V / 460V models: 0–100% (refer to Pr.06-03) 575V / 690V models: 0–100% (refer to Pr.06-03)	100 50
	06-17	Fault Record 1	0: No fault record 1: Over-current during acceleration (ocA) 2: Over-current during deceleration (ocd) 3: Over-current during steady operation (ocn) 4: Ground fault (GFF) 5: IGBT short-circuit between upper bridge and lower bridge (occ) 6: Over-current at stop (ocS) 7: Over-voltage during acceleration (ovA) 8: Over-voltage during deceleration (ovd) 9: Over-voltage at constant speed (ovn) 10: Over-voltage at stop (ovS) 11: Low-voltage during acceleration (LvA) 12: Low-voltage during deceleration (Lvd) 13: Low-voltage at constant speed (Lvn) 14: Low-voltage at stop (LvS) 15: Phase loss protection (OrP) 16: IGBT overheating (oH1) 17: Heatsink overheating (oH2) 18: IGBT temperature detection failure (tH1o) 19: Capacitor hardware error (tH2o) 21: Over load (oL) 22: Electronic thermal relay 1 protection (EoL1) 23: Electronic thermal relay 2 protection (EoL2) 24: Motor overheating (oH3) (PTC / PT100) 25: Interrupt error (INTR) 26: Over torque 1 (ot1) 27: Over torque 2 (ot2) 28: Under current (uC) 29: Limit error (LiT) 30: EEPROM write error (cF1) 31: EEPROM read error (cF2) 33: U-phase error (cd1) 34: V-phase error (cd2) 35: W-phase error (cd3)	0
	06-18	Fault Record 2		0
	06-19	Fault Record 3		0
	06-20	Fault Record 4		0
	06-21	Fault Record 5		0
	06-22	Fault Record 6		0

Pr.	Parameter Name	Setting Range	Default
		36: cc (current clamp) hardware error (Hd0) 37: oc (over-current) hardware error (Hd1) 38: ov (over-voltage) hardware error (Hd2) 39: occ hardware error (Hd3) 40: Auto-tuning error (AUE) 41: PID loss ACI (AFE) 42: PG feedback error (PGF1) 43: PG feedback loss (PGF2) 44: PG feedback stall (PGF3) 45: PG slip error (PGF4) 48: ACI loss (ACE) 49: External fault (EF) 50: Emergency stop (EF1) 51: External base block (bb) 52: Enter wrong password three times and locked (Pcod) 53: SW code error (ccod) 54: Illegal command (CE1) 55: Illegal data address (CE2) 56: Illegal data value (CE3) 57: Data is written to read-only address (CE4) 58: Modbus transmission time-out (CE10) 60: Brake transistor error (bF) 61: Y-connection / △-connection switch error (ydc) 62: Deceleration energy backup error (dEb) 63: Over slip error (oSL) 64: Electric valve switch error (ryF) 65: Hardware error of PG card (PGF5) 68: Reverse direction of the speed feedback (SdRv) 69: Over speed rotation feedback (SdOr) 70: Large deviation of speed feedback (SdDe) 71: Watchdog (WDTT) (applied to 230V / 460V models) 72: STO loss 1 (STL1) 73: Emergency stop for external safety (S1) 75: External brake error (Brk) (applied to 230V / 460V models) 76: Safe torque off (STO) 77: STO loss 2 (STL2) 78: STO loss 3 (STL3) 82: Output phase loss U phase (OPHL)	

Pr.	Parameter Name	Setting Range	Default
		83: Output phase loss V phase (OPHL) 84: Output phase loss W phase (OPHL) 85: PG ABZ line off (AboF) (PG-02U) 86: PG UVW line off (UvoF) (PG-02U) 87: Overload protection at low frequency (oL3) 89: Rotor position detection error (RoPd) 90: Force to stop (FStp) 92: Pulse tuning Ld / Lq error (LEr) 93: CPU error 0 (TRAP) (Applied to 230V / 460V models) 101: CANopen guarding error (CGdE) 102: CANopen heartbeat error (CHbE) 104: CANopen bus off error (CbFE) 105: CANopen index error (CidE) 106: CANopen station address error (CAdE) 107: CANopen memory error (CFrE) 111: InrCOM time-out error (ictE) 112: PM sensorless shaft lock error (SfLK) 142: Auto-tune error 1 (no feedback current error) (AUE1) (applied to 230V / 460V models) 143: Auto-tune error 2 (motor phase loss error) (AUE2) (applied to 230V / 460V models) 144: Auto-tune error 3 (no-load current I_0 measuring error) (AUE3) (applied to 230V / 460V models) 148: Auto-tune error 4 (leakage inductance Lsigma measuring error) (AUE4) (applied to 230V / 460V models) 164: Communication timeout between communication card and controller (ECto) 165: Communication card disconnected (ECcb) 171: Over position error (oPEE) 174: Encoder error (EcEr) 175: Encoder communication error (EcCe) 176: Encoder multi-turn overflows (EcOF) 177: Encoder power off (EcNP) 178: Encoder multi-turn error (EcMc) 179: PG multi-turn read error (PgMr) 180: Encoder single-turn error (EcSc) 181: PG command error (PgCe) 182: Interpolation time error (IPTE) 183: Interpolation command failure (IPCM)	

	Pr.	Parameter Name	Setting Range	Default
			184: No motion control (NoMo) 185: Motor code error (MoTo) 187: Flux linkage observer failure (FobF) 188: Load estimation error (TLAT) 189: Inertia estimation error (JsAT) 190: Bandwidth estimation error (BWAT) 191: Positioning failure during estimation (ATPF) 192: Homing deviation is too large (HmOE) 193: Cleaning multi-turn data failure (CMTE) 195: ASR AT process is too short (ATTv)	
✓	06-23	Fault Output Option 1	0–65535 (refer to bit table for fault code)	0
✓	06-24	Fault Output Option 2	0–65535 (refer to bit table for fault code)	0
✓	06-25	Fault Output Option 3	0–65535 (refer to bit table for fault code)	0
✓	06-26	Fault Output Option 4	0–65535 (refer to bit table for fault code)	0
✓	06-27	Electronic Thermal Relay Selection 2 (Motor 2)	0: Inverter motor (with external forced cooling) 1: Standard motor (motor with fan on the shaft) 2: Disabled	2
✓	06-28	Electronic Thermal Relay Action Time 2 (Motor 2)	30.0–600.0 sec.	60.0
✓	06-29	PTC Detection Selection / PT100 Motion	0: Warn and continue operation 1: Fault and ramp to stop 2: Fault and coast to stop 3: No warning	0
✓	06-30	PTC Level / KTY84 Level	0.0–100.0%	50.0
	06-31	Frequency Command at Malfunction	0.00–599.00 Hz	Read only
	06-32	Output Frequency at Malfunction	0.00–599.00 Hz	Read only
	06-33	Output Voltage at Malfunction	0.0–6553.5 V	Read only
	06-34	DC Bus Voltage at Malfunction	0.0–6553.5 V	Read only
	06-35	Output Current at Malfunction	0.0–6553.5 Amp	Read only
	06-36	IGBT Temperature at Malfunction	-3276.7–3276.7°C	Read only
	06-37	Capacitance Temperature at Malfunction	-3276.7–3276.7°C	Read only
	06-38	Motor Speed at Malfunction	-32767–32767 rpm	Read only

	Pr.	Parameter Name	Setting Range	Default
	06-39	Torque Command at Malfunction	-32767–32767%	Read only
	06-40	Status of the Multi-Function Input Terminal at Malfunction	0000h–FFFFh	Read only
	06-41	Status of the Multi-Function Output Terminal at Malfunction	0000h–FFFFh	Read only
	06-42	Drive Status at Malfunction	0000h–FFFFh	Read only
✓	06-44	STO Latch Selection	0: STO latch 1: STO no latch	0
✓	06-45	Output Phase Loss Detection Action (OPHL)	0: Warn and continue operation 1: Fault and ramp to stop 2: Fault and coast to stop 3: No warning	3
✓	06-46	Detection Time for Output Phase Loss	230V / 460V models: 0.000–65.535 sec. 575V / 690V models: 0.000–65.535 sec.	3.000 0.500
✓	06-47	Current Detection Level for Output Phase Loss	0.00–100.00%	1.00
✓	06-48	DC Brake Time for Output Phase Loss	0.000–65.535 sec.	0.000
✓	06-49	Lvx Auto-Reset	0: Disabled 1: Enabled	0
✓	06-50	Time for Input Phase Loss Detection	0.00–600.00 sec.	0.20
✓	06-51	Capacitance oH Warning Level (Applied to 230V / 460V Models)	0.0–110.0 degree	Depending on the model power
✓	06-52	Ripple of Input Phase Loss	230V models: 0.0–160.0 V_{DC} 460V models: 0.0–320.0 V_{DC} 575V models: 0.0–400.0 V_{DC} 690V models: 0.0–480.0 V_{DC}	30.0 60.0 75.0 90.0
✓	06-53	Input Phase Loss Detection Action (OrP)	0: Fault and ramp to stop 1: Fault and coast to stop	0
✓	06-55	Derating Protection	0: Auto-decrease carrier frequency and limit output current 1: Constant carrier frequency and limit output current 2: Auto-decrease carrier frequency	0
✓	06-56	PT100 Voltage Level 1	0.000–10.000 V	5.000
✓	06-57	PT100 Voltage Level 2	0.000–10.000 V	7.000
✓	06-58	PT100 Level 1 Frequency Protection	0.00–599.00 Hz	0.00

	Pr.	Parameter Name	Setting Range	Default
✓	06-59	PT100 Activation Level 1 Protection Frequency Delay Time	0–6000 sec.	60
✓	06-60	Software Detection GFF Current Level	0.0–200.0%	60.0
✓	06-61	Software Detection GFF Filter Time	0.00–655.35 sec.	0.10
✓	06-62	dEb Reset Bias Level (Applied to 230V / 460V Models)	230V models: 0.0–100 V_{DC} 460V models: 0.0–200.0 V_{DC}	20.0 40.0
	06-63	Operation Time of Fault Record 1 (Days)	0–65535 days	Read only
	06-64	Operation Time of Fault Record 1 (Minutes)	0–1439 min.	Read only
	06-65	Operation Time of Fault Record 2 (Days)	0–65535 days	Read only
	06-66	Operation Time of Fault Record 2 (Minutes)	0–1439 min.	Read only
	06-67	Operation Time of Fault Record 3 (Days)	0–65535 days	Read only
	06-68	Operation Time of Fault Record 3 (Minutes)	0–1439 min.	Read only
	06-69	Operation Time of Fault Record 4 (Days)	0–65535 days	Read only
	06-70	Operation Time of Fault Record 4 (Minutes)	0–1439 min.	Read only
✓	06-71	Low Current Setting Level	0.0–100.0%	0.0
✓	06-72	Low Current Detection Time	0.00–360.00 sec.	0.00
✓	06-73	Low Current Action	0: No function 1: Fault and coast to stop 2: Fault and ramp to stop by the second deceleration time 3: Warn and continue operation	0
✓	06-86	PTC Type (Applied to 230V / 460V Models)	0: PTC 1: KTY84-130	0

07 Special Parameters

	Pr.	Parameter Name	Setting Range	Default
✓	07-00	Software Brake Chopper Action Level	230V models: 350.0–450.0 V_{DC} 460V models: 700.0–900.0 V_{DC} 575V models: 850.0–1116.0 V_{DC} 690V models: 939.0–1318.0 V_{DC}	370.0 740.0 895.0 1057.0
✓	07-01	DC Brake Current Level	0–100%	0
✓	07-02	DC Brake Time at Start-Up	0.0–60.0 sec.	0.0
✓	07-03	DC Brake Time at STOP	0.0–60.0 sec.	0.0
✓	07-04	DC Brake Frequency at STOP	0.00–599.00 Hz	0.00
✓	07-05	Voltage Increasing Gain	1–200%	100
✓	07-06	Restart after Momentary Power Loss	0: Stop operation 1: Speed tracking by the speed before the power loss 2: Speed tracking by the minimum output frequency	0
✓	07-07	Allowed Power Loss Duration	0.0–20.0 sec.	2.0
✓	07-08	Base Block Time	0.0–5.0 sec.	Depending on the model power
✓	07-09	Current Limit of Speed Tracking	20–200%	100
✓	07-10	Restart after Fault Action	0: Stop operation 1: Speed tracking by current speed 2: Speed tracking by minimum output frequency	0
✓	07-11	Number of Times of Restart after Fault	0–10	0
✓	07-12	Speed Tracking during Start-Up	0: Disabled 1: Speed tracking by the maximum output frequency 2: Speed tracking by the current frequency command at start-up 3: Speed tracking by the minimum output frequency 4: Speed tracking by vector-type flux	0
✓	07-13	dEb Function Selection	0: Disabled 1: dEb with auto-acceleration / auto-deceleration, the drive does not output the frequency after the power is restored. 2: dEb with auto-acceleration / auto-deceleration, the drive outputs the frequency after the power is restored 3: dEb low-voltage control, then the drive's voltage increases to 350 V_{DC} / 700 V_{DC} and ramps to stop after low frequency 4: dEb high-voltage control of 350 V_{DC} / 700 V_{DC}, and the drive ramps to stop	0
✓	07-14	dEb Function Reset Time	0.0–25.0 sec.	3.0
✓	07-15	Dwell Time at Acceleration	0.00–600.00 sec.	0.00

	Pr.	Parameter Name	Setting Range	Default
✓	07-16	Dwell Frequency at Acceleration	0.00–599.00 Hz	0.00
✓	07-17	Dwell Time at Deceleration	0.00–600.00 sec.	0.00
✓	07-18	Dwell Frequency at Deceleration	0.00–599.00 Hz	0.00
✓	07-19	Fan Cooling Control	0: Fan always ON 1: Fan is OFF after the AC motor drive stops for one minute 2: Fan is ON when the AC motor drive runs; fan is OFF when the AC motor drive stops. 3: Fan turns ON when temperature (IGBT) reaches around 60°C. 4: Fan always OFF	0
✓	07-20	Emergency Stop (EF) & Force to Stop Selection	0: Coast to stop 1: Stop by the first deceleration time 2: Stop by the second deceleration time 3: Stop by the third deceleration time 4: Stop by the fourth deceleration time 5: System deceleration 6: Automatic deceleration	0
✓	07-21	Automatic Energy-Saving Selection	0: Disabled 1: Power factor energy-saving improvement (for VF, SVC and VFPG control modes) 2: Automatic energy-saving (AES) optimization (for VF, SVC and VFPG control modes)	0
✓	07-23	Automatic Voltage Regulation (AVR) Function	0: Enable AVR 1: Disable AVR 2: Disable AVR during deceleration	0
✓	07-24	Torque Command Filter Time	0.001–10.000 sec.	0.500
✓	07-25	Slip Compensation Filter Time	0.001–10.000 sec.	0.100
✓	07-26	Torque Compensation Gain	IM: 0–10 (when Pr.05-33 = 0) PM: 0–5000 (when Pr.05-33 = 1 or 2)	0
✓	07-27	Slip Compensation Gain	0.00–10.00	0.00 (Default value is 1.00 in SVC mode)
	07-28	Industrial Application Macros	9: Electromagnetic stirring (EMS) function 13: D2D (device to device) load sharing function 50: FOCPG hoist macro 51: Synchro shaft control macro 52: Trolley macro 53: Long travel macro 54: Gantry crane correction control macro 55: Tower crane slew control macro 56: Open-loop hoist macro	0

	Pr.	Parameter Name	Setting Range	Default
			57: Closed-loop to open-loop switch hoist macro **NOTE:** ● Related parameter settings for setting value 9, refer to the section 12-3 in the manual. ● Related parameter settings for setting value 13, refer to the section 12-4 in the manual. ● Setting value 50–57 are functions for crane, refer to the application manual (click here)	
✓	07-29	Slip Deviation Level	0.0–100.0% 0: No detection	0.0
✓	07-30	Over-Slip Deviation Detection Time	0.0–10.0 sec.	1.0
✓	07-31	Over-Slip Deviation Treatment	0: Warn and continue operation 1: Fault and ramp to stop 2: Fault and coast to stop 3: No warning	0
✓	07-32	Motor Oscillation Compensation Factor	0–10000 0: Disabled	1000
✓	07-33	Auto-Restart Interval of Fault	0.0–6000.0 sec.	60.0
	07-38	PMSVC Voltage Feed Forward Gain	0.00–2.00	1.00
✓	07-41	Minimum Frequency for AES	0.00–40.00 Hz	10.00
	07-42	Delay Time for AES	0–600 sec.	5
✓	07-43	Targeted Power Factor Angle for AES	0.00–65.00°	40.00
✓	07-44	Maximum Voltage Drop for AES	0.00–70.00%	60.00
✓	07-45	AES Coefficient	0–10000%	100
✓	07-62	dEb Gain (Kp)	0–65535	8000
✓	07-63	dEb Gain (Ki)	0–65535	150

08 High-function PID Parameters

	Pr.	Parameter Name	Setting Range	Default
✓	08-00	Terminal Selection of PID Feedback	0: No function 1: Negative PID feedback: by analog input (Pr.03-00–03-02) 2: Negative PID feedback: by PG card pulse input, without direction (Pr.10-02) 3: Negative PID feedback: by PG card pulse input, with direction (Pr.10-02) 4: Positive PID feedback: by analog input (Pr.03-00–03-02) 5: Positive PID feedback: by PG card pulse input, without direction (Pr.10-02) 6: Positive PID feedback: by PG card pulse input, with direction (Pr.10-02) 7: Negative PID feedback: by communication protocols 8: Positive PID feedback: by communication protocols	0
✓	08-01	Proportional Gain (P)	0.0–500.0	1.0
✓	08-02	Integral Time (I)	0.00–100.00 sec. 0.0: No integral	1.00
✓	08-03	Differential Time (D)	0.00–1.00 sec.	0.00
✓	08-04	Upper Limit of Integral Control	0.0–100.0%	100.0
✓	08-05	PID Output Command Limit	0.0–110.0%	100.0
✓	08-06	PID Feedback Value by Communication Protocol	-200.00–200.00%	Read only
✓	08-07	PID Delay Time	0.0–35.0 sec.	0.0
✓	08-08	Feedback Signal Detection Time	0.0–3600.0 sec.	0.0
✓	08-09	Feedback Signal Fault Treatment	0: Warn and continue operation 1: Fault and ramp to stop 2: Fault and coast to stop 3: Warn and operate at last frequency	0
✓	08-10	Sleep Level	0.00–599.00 Hz / 0.00–200.00%	0.00
✓	08-11	Wake-Up Level	0.00–599.00 Hz / 0.00–200.00%	0.00
✓	08-12	Sleep Delay Time	0.0–6000.0 sec.	0.0
✓	08-13	PID Feedback Signal Error Deviation Level	1.0–50.0%	10.0
✓	08-14	PID Feedback Signal Error Deviation Detection Time	0.1–300.0 sec.	5.0
✓	08-16	PID Compensation Selection	0: Parameter setting (Pr.08-17) 1: Analog input	0

	Pr.	Parameter Name	Setting Range	Default
✓	08-17	PID Compensation	-100.0–100.0%	0.0
	08-18	Sleep Mode Function Setting	0: Refer to PID output command 1: Refer to PID feedback signal	0
✓	08-19	Wake-Up Integral Limit	0.0–200.0%	50.0
	08-20	PID Mode Selection	0: Serial connection 1: Parallel connection	0
	08-21	Enable PID to Change the Operation Direction	0: Operation direction cannot be changed 1: Operation direction can be changed	0
✓	08-22	Wake-Up Delay Time	0.00–600.00 sec.	0.00
✓	08-23	PID Control Flag	bit0 = 1, PID running in reverse follows the setting for Pr.00-23. bit0 = 0, PID running in reverse refer to PID's calculated value. bit1 = 1, two decimal places for PID Kp bit1 = 0, one decimal place for PID Kp	0000h

09 Communication Parameters

	Pr.	Parameter Name	Setting Range	Default
✓	09-00	Modbus Slave Communication Address	1–254	1
✓	09-01	COM1 Modbus Transmission Speed	4.8–115.2 Kbps	9.6
✓	09-02	COM1 Modbus Transmission Fault Treatment	0: Warn and continue operation 1: Fault and ramp to stop 2: Fault and coast to stop 3: No warning, no fault and continue operation	3
✓	09-03	COM1 Modbus Time-Out Detection	0.0–100.0 sec.	0.0
✓	09-04	COM1 Modbus Communication Protocol	1 : 7, N, 2 (ASCII) 2 : 7, E, 1 (ASCII) 3 : 7, O, 1 (ASCII) 4 : 7, E, 2 (ASCII) 5 : 7, O, 2 (ASCII) 6 : 8, N, 1 (ASCII) 7 : 8, N, 2 (ASCII) 8 : 8, E, 1 (ASCII) 9 : 8, O, 1 (ASCII) 10 : 8, E, 2 (ASCII) 11 : 8, O, 2 (ASCII) 12: 8, N, 1 (RTU) 13: 8, N, 2 (RTU) 14: 8, E, 1 (RTU) 15: 8, O, 1 (RTU) 16: 8, E, 2 (RTU) 17: 8, O, 2 (RTU)	1
✓	09-09	Modbus Communication Response Delay Time	0.0–200.0 ms	2.0
	09-10	Communication Main Frequency	0.00–599.00 Hz	60.00
✓	09-11	Block Transfer 1	0000–FFFFh	0000h
✓	09-12	Block Transfer 2	0000–FFFFh	0000h
✓	09-13	Block Transfer 3	0000–FFFFh	0000h
✓	09-14	Block Transfer 4	0000–FFFFh	0000h
✓	09-15	Block Transfer 5	0000–FFFFh	0000h
✓	09-16	Block Transfer 6	0000–FFFFh	0000h
✓	09-17	Block Transfer 7	0000–FFFFh	0000h
✓	09-18	Block Transfer 8	0000–FFFFh	0000h
✓	09-19	Block Transfer 9	0000–FFFFh	0000h
✓	09-20	Block Transfer 10	0000–FFFFh	0000h
✓	09-21	Block Transfer 11	0000–FFFFh	0000h

	Pr.	Parameter Name	Setting Range	Default
✓	09-22	Block Transfer 12	0000–FFFFh	0000h
✓	09-23	Block Transfer 13	0000–FFFFh	0000h
✓	09-24	Block Transfer 14	0000–FFFFh	0000h
✓	09-25	Block Transfer 15	0000–FFFFh	0000h
✓	09-26	Block Transfer 16	0000–FFFFh	0000h
	09-30	Communication Decoding Method	0: Decoding method 1 (20xx) 1: Decoding method 2 (60xx)	1
	09-31	Internal Communication Protocol	0: Modbus 485 -1: Internal communication slave 1 -2: Internal communication slave 2 -3: Internal communication slave 3 -4: Internal communication slave 4 -5: Internal communication slave 5 -6: Internal communication slave 6 -7: Internal communication slave 7 -8: Internal communication slave 8 -10: Internal communication master -12: Internal PLC control	0
✓	09-33	PLC Command Force to 0	bit0: Before PLC scans, set up PLC target frequency = 0 bit1: Before PLC scans, set up PLC target torque = 0 bit2: Before PLC scans, set up the speed limit of torque control mode = 0	0
	09-35	PLC Address	1–254	2
	09-36	CANopen Slave Address	0: Disabled 1–127	0
	09-37	CANopen Speed	0: 1 Mbps 1: 500 Kbps 2: 250 Kbps 3: 125 Kbps 4: 100 Kbps (Delta only) 5: 50 Kbps	0
	09-39	CANopen Warning Record	bit0: CANopen guarding time out bit1: CANopen heartbeat time out bit2: CANopen SYNC time out bit3: CANopen SDO time out bit4: CANopen SDO buffer overflow bit5: Can bus off	Read only

Pr.	Parameter Name	Setting Range	Default
		bit6: Error protocol of CANopen bit8: The setting values of CANopen indexes are failed bit9: The setting value of CANopen address is failed bit10: The checksum value of CANopen indexes is failed	
09-40	CANopen Decoding Method	0: Disabled (Delta-defined decoding method) 1: Enabled (CANopen standard DS402 protocol)	1
09-41	CANopen Communication Status	0: Node reset state 1: Com reset state 2: Boot up state 3: Pre-operation state 4: Operation state 5: Stop state	Read only
09-42	CANopen Control Status	0: Not ready for use state 1: Inhibit start state 2: Ready to switch on state 3: Switched on state 4: Enable operation state 7: Quick stop active state 13: Error reaction activation state 14: Error state	Read only
09-45	CANopen Master Function	0: Disabled 1: Enabled	0
09-46	CANopen Master Address	0–127	100
09-49	CANopen Extension Setting	bit0: Index 604F and 6050 update to the 1st acceleration / deceleration time or not. bit0 = 0: update to the 1st acceleration / deceleration time (default) bit0 = 1: do not update bit1: The verification of CANopen identification code is distinguished by power module or drive series. bit1 = 0: distinguished by power module bit1 = 1: distinguished by drive series	0002h
09-60	Communication Card Identification	0–12 0: No communication card 1: DeviceNet Slave 2: Profibus-DP Slave	Read only

	Pr.	Parameter Name	Setting Range	Default
			3: CANopen Slave / Master 5: EtherNet / IP Slave 6: EtherCAT (applied to 230V / 460V models) 12: PROFINET (applied to 230V / 460V models)	
	09-61	Firmware Version of Communication Card	Read only	Read only
	09-62	Product Code	Read only	Read only
	09-63	Error Code	Read only	Read only
✓	09-65	Alias Address	0–65535	0
✓	09-68	Treatment for Communication BUS-off	0: Display warning code, and stop according to the communication card's stopping method. 1: Display warning code, and operate according to Pr.09-69 frequency. 2: Display warning code, and stop according to Pr.00-22. 3: Display fault code, and stop according to Pr.00-22. 4: Stop according to Pr.00-22, and display warning code after stop is completed. 5: Stop according to Pr.00-22, and display fault code after stop is completed.	3
✓	09-69	Frequency Command after Communication BUS-off	0.00–Pr.01-00 Hz	3.00
✓	09-70	Communication Card Address (for DeviceNet or PROFIBUS)	DeviceNet: 0–63 Profibus-DP: 1–125	1
✓	09-71	Communication Card Speed Setting (for DeviceNet)	Standard DeviceNet: 0: 125 Kbps 1: 250 Kbps 2: 500 Kbps 3: 1 Mbps (Delta only) Non-standard DeviceNet: (Delta only) 0: 10 Kbps 1: 20 Kbps 2: 50 Kbps 3: 100 Kbps 4: 125 Kbps 5: 250 Kbps 6: 500 Kbps 7: 800 Kbps 8: 1 Mbps	2

	Pr.	Parameter Name	Setting Range	Default
✓	09-72	Additional Settings for Communication Card Speed (for DeviceNet)	0: Standard DeviceNet In this mode, the baud rate can only be 125 Kbps, 250 Kbps or 500 Kbps in standard DeviceNet speed 1: Non-standard DeviceNet In this mode, DeviceNet baud rate can be same as that for CANopen (0–8).	0
	09-74	Communication Card Control Flag	bit0: set the EDS identity definition of EIP card bit0 = 0: identify EIP card by the drive's family bit0 = 1: identify EIP card by the drive's series	1
✓	09-75	Communication Card IP Configuration (for EtherNet)	0: Static IP 1: Dynamic IP (DHCP)	0
✓	09-76	Communication Card IP Address 1 (for EtherNet)	0–65535	0
✓	09-77	Communication Card IP Address 2 (for EtherNet)	0–65535	0
✓	09-78	Communication Card IP Address 3 (for EtherNet)	0–65535	0
✓	09-79	Communication Card IP Address 4 (for EtherNet)	0–65535	0
✓	09-80	Communication Card Address Mask 1 (for EtherNet)	0–65535	0
✓	09-81	Communication Card Address Mask 2 (for EtherNet)	0–65535	0
✓	09-82	Communication Card Address Mask 3 (for EtherNet)	0–65535	0
✓	09-83	Communication Card Address Mask 4 (for EtherNet)	0–65535	0
✓	09-84	Communication Card Gateway Address 1 (for EtherNet)	0–65535	0
✓	09-85	Communication Card Gateway Address 2 (for EtherNet)	0–65535	0
✓	09-86	Communication Card Gateway Address 3 (for EtherNet)	0–65535	0
✓	09-87	Communication Card Gateway Address 4 (for EtherNet)	0–65535	0
✓	09-88	Communication Card Password (Low Word) (for EtherNet)	0–99	0
✓	09-89	Communication Card Password (High Word) (for EtherNet)	0–99	0

	Pr.	Parameter Name	Setting Range	Default
✓	09-90	Reset Communication Card (for EtherNet)	0: Disabled 1: Reset to default	0
✓	09-91	Additional Settings for the Communication Card (for EtherNet)	bit0: Enable IP filter bit1: Enable internet parameters (1 bit). When the IP address is set, this bit is enabled. After updating the parameters for the communication card, this bit changes to disabled. bit2: Enable login password (1 bit). When you enter the login password, this bit is enabled. After updating the parameters for the communication card, this bit changes to disabled.	0
	09-92	Communication Card Status (for EtherNet)	bit0: Enable password When the communication card is set with a password, this bit is enabled. When the password is cleared, this bit is disabled.	0

10 Feedback Control Parameters

	Pr.	Parameter Name	Setting Range	Default
	10-00	Encoder Type Selection	0: Disabled 1: ABZ 2: ABZ (Delta encoder for Delta permanent magnet synchronous AC motor) 3: Resolver 4: ABZ / UVW 5: MI8 single-phase pulse input 6: Sin / Cos, absolute type (A / B, C / D, R) 7: Sin / Cos, incremental type (A / B, R) 8: Tamagawa absolute position encoder	0
	10-01	Encoder Pulses Per Revolution	1–65535	600
	10-02	Encoder Input Type Setting	0: Disabled 1: A / B phase pulse inputs, run forward if A-phase leads B-phase by 90 degrees 2: A / B phase pulse inputs, run forward if B-phase leads A-phase by 90 degrees 3: A-phase is a pulse input and B-phase is a direction input (L = reverse direction, H = forward direction) 4: A-phase is a pulse input and B-phase is a direction input (L = forward direction, H = reverse direction) 5: Single-phase input	0
✓	10-03	Frequency Division Output Setting (Denominator)	1–255	1
✓	10-04	Mechanical Gear at Load Side A1	1–65535	100
✓	10-05	Mechanical Gear at Motor Side B1	1–65535	100
✓	10-06	Mechanical Gear at Load Side A2	1–65535	100
✓	10-07	Mechanical Gear at Motor Side B2	1–65535	100
✓	10-08	Treatment for Encoder / Speed Observer Feedback Fault	0: Warn and continue operation 1: Fault and ramp to stop 2: Fault and coast to stop	2
✓	10-09	Detection Time of Encoder / Speed Observer Feedback Fault	0.0–10.0 sec. 0: Disabled	1.0
✓	10-10	Encoder / Speed Observer Stall Level	0–120% 0: Disabled	115

	Pr.	Parameter Name	Setting Range	Default
✓	10-11	Detection Time of Encoder / Speed Observer Stall	0.0–2.0 sec.	0.1
✓	10-12	Encoder / Speed Observer Stall Action	0: Warn and continue operation 1: Fault and ramp to stop 2: Fault and coast to stop	2
✓	10-13	Encoder / Speed Observer Slip Range	0–50% 0: Disabled	50
✓	10-14	Detection Time of Encoder / Speed Observer Slip	0.0–10.0 sec.	0.5
✓	10-15	Encoder / Speed Observer Stall and Slip Error Action	0: Warn and continue operation 1: Fault and ramp to stop 2: Fault and coast to stop	2
	10-16	Pulse Input Type Setting	0: Disabled 1: Phases A and B are pulse inputs, forward direction if A-phase leads B-phase by 90 degrees 2: Phases A and B are pulse inputs, forward direction if B-phase leads A-phase by 90 degrees 3: Phase A is a pulse input and phase B is a direction input (L = reverse direction, H = forward direction). 4: Phase A is a pulse input and phase B is a direction input. (L = forward direction, H = reverse direction). 5: Single-phase pulse input (MI8) (applied to 230V / 460V models)	0
✓	10-17	Electrical Gear A	1–65535	100
✓	10-18	Electrical Gear B	1–65535	100
	10-19	Encoder Single-Turn Resolution	0–17 bits	17
	10-20	Encoder Multi-Turn Resolution	0–16 bits	16
✓	10-21	PG2 Pulse Input Speed Command Low Pass Filter Time	0.000–65.535 sec.	0.100
	10-23	PG Control Flag	bit0: Enable battery power detection function bit0 = 0: Disabled bit0 =1: Enabled	1
✓	10-24	FOC & TQC Function Control	bit0: ASR control at sensorless torque (0: use PI as ASR; 1: use P as ASR) bit11: Activate DC braking when executing zero torque command (0: ON; 1: OFF) bit12: FOC Sensorless mode, cross zero means speed goes from negative to positive or reverse direction (0: determined by stator frequency; 1: determined by speed command)	0

	Pr.	Parameter Name	Setting Range	Default
			bit15: Direction control at open loop status (0: Switch ON direction control; 1: Switch OFF direction control)	
✓	10-25	FOC Bandwidth for Speed Observer	20.0–100.0 Hz	40.0
✓	10-26	FOC Minimum Stator Frequency	0.0–10.0% fN	2.0
✓	10-27	FOC Low-Pass Filter Time Constant	1–1000 ms	50
✓	10-28	FOC Gain for Excitation Current Rise Time	33–300% Tr	100
✓	10-29	Upper Limit of Frequency Deviation	0.00–200.00 Hz	20.00
	10-30	Resolver Pole Pair	1–50 pole pairs	1
✓	10-31	I/F Mode, Current Command	0–150% rated current of the motor	40
✓	10-32	PM FOC Sensorless Speed Estimator Bandwidth (High Speed)	0.00–600.00 Hz	5.00
✓	10-33	PM FOC Sensorless Speed Estimator Bandwidth (Low Speed)	0.00–600.00 Hz	1.00
✓	10-34	PM Sensorless Speed Estimator Low-Pass Filter Gain	0.00–655.35	1.00
✓	10-35	AMR (Kp) Gain	0.00–3.00	1.00
✓	10-36	AMR (Ki) Gain	0.00–3.00	0.20
✓	10-37	PM Sensorless Control Word	0000–FFFFh	0000h
✓	10-39	Frequency to Switch from I/F Mode to PM Sensorless Mode (Frequency to Switch from IMVF Mode to IMFOCPG Mode When Pr.11-00 Bit11 = 1 in IMFOCPG Mode)	0.00–599.00 Hz	20.00
✓	10-40	Frequency to Switch from PM Sensorless Mode to I/F Mode (Frequency to Switch from IMFOCPG Mode to IMVF Mode When Pr.11-00 Bit11 = 1 in IMFOCPG Mode)	0.00–599.00 Hz / 30.00–599.00 Hz	20.00 / 40.00
✓	10-41	I/F Mode, Id Current Low Pass-Filter Time	0.0–6.0 sec.	0.2

	Pr.	Parameter Name	Setting Range	Default
✓	10-42	Initial Angle Detection Pulse Value	0.0–3.0	1.0
	10-43	PG Card Version	0.00–655.35	Read only
	10-47	PG1 Pulse Imputation Scaling Factor	0: x1 1: x2 2: x4 3: x8	0
✓	10-48	Z-phase Signal Width	0–65535	0
✓	10-49	Zero Voltage Time During Start-Up	0.000–60.000 sec.	0.000
✓	10-50	Reverse Angle Limit (Electrical Angle)	0.00–30.00 degree	10.00
✓	10-51	Injection Frequency	0–1200 Hz	500
✓	10-52	Injection Magnitude	0.0–200.0 V 230V models: 0.0–100.0 V 460V models: 0.0–200.0 V 575V models: 0.0–200.0 V 690V models: 0.0–200.0 V	15.0 30.0 30.0 30.0
✓	10-53	PM Initial Rotor Position Detection Method	0: Disabled 1: Force attracting the rotor to zero degrees 2: High frequency injection 3: Pulse injection	0
✓	10-54	Magnetic Flux Linkage Estimate Low-Speed Gain	10–1000%	100
✓	10-55	Magnetic Flux Linkage Estimate High-Speed Gain	10–1000%	100
✓	10-56	Kp of Phase-Locked Loop	10–1000%	100
✓	10-57	Ki of Phase-Locked Loop	10–1000%	100
✓	10-58	Mutual Inductance Gain Compensation	0.00–655.35	1.00
	10-60	Coordinate Axis System Setting	bit0–3: Axis control mode 0: Increment operation 1: Absolute operation (only for absolute encoder) bit4–7: Coordinate axis mode 0: Linear axis 0x6064 position output range is +/- 2^{31} 1: Rotating axis 1 0x6064 position output limits in the setting for Pr.10-61 and Pr.10-62 2: Rotating axis 2 0x6064 position output range is	1

Pr.	Parameter Name	Setting Range	Default
		+/-2^{31}, the initial position limits in setting for Pr.11-61 and Pr.11-62 when initializing (power ON, homing) bit8–11: Encoder overflow treatment 0: Warn but continue operation until stop 1: Warn and stop 2: No warn and continue operation bit12–15: Encoder mode 1: Increment encoder 2: Absolute encoder	
10-61	Mechanical Cycle Range (High Word)	0–65535	0
10-62	Mechanical Cycle Range (Low Word)	0–65535	0

11 Advanced Parameters

	Pr.	Parameter Name	Setting Range	Default
	11-00	System Control	bit0: Auto-tuning for ASR bit1: Inertia estimate (only for FOCPG control mode) bit2: Zero-speed servo bit6: 0 Hz linear-cross (applied to 230V / 460V models) bit7: Saving or not saving the frequency bit8: Maximum speed for point-to-point position control bit11: Switch between IMFOCPG and IMVF modes	0000h
	11-01	Per-Unit of System Inertia	1–65535 (256 = 1PU)	256
✓	11-02	ASR1 / ASR2 Switch Frequency	5.00–599.00 Hz	7.00
✓	11-03	ASR1 Low-Speed Bandwidth	1– [(Pr.00-17 Carrier frequency) ÷ 40] Hz	10
✓	11-04	ASR2 High-Speed Bandwidth	1– [(Pr.00-17 Carrier frequency) ÷ 40] Hz	10
✓	11-05	Zero-Speed Bandwidth	1– [(Pr.00-17 Carrier frequency) ÷ 40] Hz	10
✓	11-06	ASR 1 Gain	0–40 Hz (IM) / 1–100 Hz (PM)	10
✓	11-07	ASR 1 Integral Time	0.000–10.000 sec.	0.100
✓	11-08	ASR 2 Gain	0–40 Hz (IM) / 0–100 Hz (PM)	10
✓	11-09	ASR 2 Integral Time	0.000–10.000 sec.	0.100
✓	11-10	ASR Gain of Zero Speed	0–40 Hz (IM) / 0–100 Hz (PM)	10
✓	11-11	ASR1 Integral Time of Zero Speed	0.000–10.000 sec.	0.100
✓	11-12	Gain for ASR Speed Feed Forward	0–150%	0
✓	11-13	PDFF Gain Value	0–200%	30
✓	11-14	ASR Output Low Pass Filter Time	0.000–0.350 sec.	0.004
✓	11-15	Notch Filter Depth	0–100 dB	0
✓	11-16	Notch Filter Frequency	0.0–6000.0 Hz	0.0
✓	11-17	Forward Motor Torque Limit Quadrant I	0–500%	500
✓	11-18	Forward Regenerative Torque Limit Quadrant II	0–500%	500
✓	11-19	Reverse Motor Torque Limit Quadrant III	0–500%	500
✓	11-20	Reverse Regenerative Torque Limit Quadrant IV	0–500%	500
✓	11-21	Flux Weakening Curve for Motor 1 Gain Value	0–200%	90

	Pr.	Parameter Name	Setting Range	Default
✓	11-22	Flux Weakening Curve for Motor 2 Gain Value	0–200%	90
✓	11-23	Flux Weakening Area Speed Response	0–150%	65
✓	11-24	APR Gain	0.00–40.00 Hz (IM) / 0–100.00 Hz (PM)	5.00
✓	11-25	Gain Value for the APR Feed Forward	0–100	90
✓	11-26	APR Feedforward Low Pass Filter Bandwidth	0.00–655.35 sec.	10.00
✓	11-27	Maximum Torque Command	0–500%	100
✓	11-28	Torque Offset Source	0: Disabled 1: Analog signal input (Pr.03-00) 2: Pr.11-29 3: Controlled through external terminals (Pr.11-30–11-32)	0
✓	11-29	Torque Offset Setting	-100.0–100.0%	0.0
✓	11-30	High Torque Offset	-100.0–100.0%	30.0
✓	11-31	Middle Torque Offset	-100.0–100.0%	20.0
✓	11-32	Low Torque Offset	-100.0–100.0%	10.0
✓	11-33	Torque Command Source	0 : Digital keypad 1 : RS-485 communication (Pr.11-34) 2: Analog signal input (Pr.03-00–03-02) 3: CANopen 5: Communication card	0
✓	11-34	Torque Command	-100.0–100.0% (Pr.11-27 set value = 100%)	0.0
✓	11-35	Torque Command Filter Time	0.000–1.000 sec.	0.000
	11-36	Speed Limit Selection	0: Set by Pr.11-37 (Forward speed limit) and Pr.11-38 (reverse speed limit) 1: Set by Pr.00-20 (Master frequency source command) and Pr.11-37, Pr.11-38 2: Set by Pr.00-20 (Master frequency source command).	0
✓	11-37	Forward Speed Limit (Torque Mode)	0–120%	10
✓	11-38	Reverse Speed Limit (Torque Mode)	0–120%	10
	11-39	Zero Torque Command Mode Selection	0: Torque mode 1: Speed mode	0
✓	11-40	Position Control Command Source	0: Input from internal register 1: Input from external pulse	0

	Pr.	Parameter Name	Setting Range	Default
			2: RS-485 3: CANopen 5: Communication card	
✓	11-42	System Control Flag	0000–FFFFh	0000h
✓	11-43	Position Control Maximum Frequency	0.00–599.00 Hz	60.00
✓	11-44	Position Control Acceleration Time	0.00–655.35 sec.	1.00
✓	11-45	Position Control Deceleration Time	0.00–655.35 sec.	1.00
✓	11-46	Torque Output Filter Time (Applied to 230V / 460V Models)	0.000–65.535 sec.	0.050
✓	11-47	Notch Filter Bandwidth	0–1000 Hz	0
✓	11-48	ASR Feed Forward Filter Time	0.000–65.535 sec.	0.000
	11-49	Inertia Estimation Filter Time	0–65535 sec.	3
	11-50	APR S-Curve Time	0.000–1.000	0.300
✓	11-51	Maximum Allowable Position Error	0–65535	1000
✓	11-52	Follow Position Fault Tolerance Range	0–65535	10
✓	11-53	Cumulative Time for Follow Position Fault Tolerance	0.000–65.535 sec.	0.500
✓	11-54	Treatment to the Large Position Control Error	0: Warn and continue operation (display oPE on keypad) 1: Fault and ramp to stop (display oPEE on keypad) 2: Fault and coast to stop (display oPEE on keypad)	0
✓	11-56	Software Positive Limit (High Word)	-32768–32767	30000
✓	11-57	Software Positive Limit (Low Word)	0–65535	0
✓	11-58	Software Negative Limit (High Word)	-32768–32767	-30000
✓	11-59	Software Negative Limit (Low Word)	0–65535	0
✓	11-60	Position Control Bit	bit0: Enable position memory function bit1: The pulse per revolution at load side counts by ppr bit2: Enable software limit switch function bit6: Enable Z-phase signal width function bit8: Set operation control direction bit9: Speed unit selection	000Ah

	Pr.	Parameter Name	Setting Range	Default
			bit10: Speed unit selection bit11: Speed unit multiple	
	11-62	Encoder at Load Side ppr Number (High Byte)	0–65535	0
	11-63	Encoder at Load Side ppr Number (Low Byte)	0–65535	2400
	11-64	Single-Point Positioning Rising Speed	0.10–depending on the maximum setting value calculated by setting value of Pr.11-43 and Pr.11-45	10.00
✓	11-65	Single-Point Positioning Position (High Byte)	0–ppr number at load side	0
✓	11-66	Single-Point Positioning Position (Low Byte)	0–ppr number at load side	0
	11-68	Homing Method	0000h–0128h	0008h
	11-69	Homing Control Time Out	0.0–6000.0 sec.	60.0
✓	11-70	Homing Control 1st Step Speed	0.00–599.00 Hz	8.00
✓	11-71	Homing Control 2nd Step Speed	0.00–599.00 Hz	2.00
✓	11-72	Homing Control Acceleration / Deceleration Time (0–Homing Control 1st Step Speed)	0.00–600.00 sec.	10.00
✓	11-73	Homing Control Offset (Revolution)	-30000–30000 revolutions	0
✓	11-74	Homing Control Offset (Pulse)	Refer to Pr.10-01 setting	0
✓	11-75	Position Record (Revolution)	-30000–30000 revolutions	0
✓	11-76	Position Record (Pulse)	Refer to Pr.10-01 setting	0
✓	11-78	HALT Revived Selection	0: Stopped 1: Continue according to the previous position command	0
✓	11-79	Position Arrival Reset Range	0–65535 pulse	0

13 Application Parameters by Industry (applied to 230V / 460V models)

Pr.	Parameter Name	Setting Range	Default
13-00	Industry-Specific Parameter Application	0: Disabled 1: User-defined parameter 2: Compressor (IM) 3: Fan 4: Pump 10: Air Handling Unit, AHU	0

14 Extension Card Parameters

	Pr.	Parameter Name	Setting Range	Default
✓	14-00	Extension Card Input Terminal Selection (AI10)	0: Disable 1: Frequency command 2: Torque command (torque limit under speed mode) 3: Torque compensation command 4: PID target value 5: PID feedback signal 6: Thermistor (PTC / KTY-84) input value 7: Positive torque limit 8: Negative torque limit 9: Regenerative torque limit 10: Positive / negative torque limit 11: PT100 thermistor input value 13: PID compensation value	0
✓	14-01	Extension Card Input Terminal Selection (AI11)		0
✓	14-08	Analog Input Filter Time (AI10)	0.00–20.00 sec.	0.01
✓	14-09	Analog Input Filter Time (AI11)	0.00–20.00 sec.	0.01
	14-10	Analog Input 4–20 mA Signal Loss Selection (AI10)	0: Disabled 1: Continue operation at the last frequency 2: Decelerate to 0 Hz 3: Stop immediately and display ACE 4: Operate with output frequency lower limit (Pr.01-11) and displays ANL	0
	14-11	Analog Input 4–20 mA Signal Loss Selection (AI11)		0
✓	14-12	Extension Card Output Terminal Selection (AO10)	0: Output frequency (Hz) 1: Frequency command (Hz) 2: Motor speed (Hz) 3: Output current (rms) 4: Output voltage 5: DC bus voltage 6: Power factor 7: Power 8: Torque 9: AVI 10: ACI 11: AUI 12: Iq current command 13: Iq feedback value 14: Id current command 15: Id feedback value 18: Torque command	0
✓	14-13	Extension Card Output Terminal Selection (AO11)		0

	Pr.	Parameter Name	Setting Range	Default
			19: PG2 frequency command 20: CANopen analog output 21: RS-485 analog output 22: Communication card analog output 23: Constant voltage output 25: CANopen and RS-485 analog output	
✓	14-14	Analog Output 1 Gain Output (AO10)	0.0–500.0%	100.0
✓	14-15	Analog Output 1 Gain Output (AO11)	0.0–500.0%	100.0
✓	14-16	Analog Output 1 in 0–10 V REV Direction (AO10)	0: Absolute value of output voltage 1: Reverse output 0V; Forward output 0–10V 2: Reverse output 5–0V; Forward output 5–10V	0
✓	14-17	Analog Output 1 in 0–10 V REV Direction (AO11)		0
✓	14-18	Extension Card Input Selection (AI10)	0: 0–10 V (AVI10) 1: 0–20 mA (ACI10) 2: 4–20 mA (ACI10)	0
✓	14-19	Extension Card Input Selection (AI11)	0: 0–10 V (AVI11) 1: 0–20 mA (ACI11) 2: 4–20 mA (ACI11)	0
✓	14-20	AO10 DC Output Setting Level	0.00–100.00%	0.00
✓	14-21	AO11 DC Output Setting Level	0.00–100.00%	0.00
✓	14-22	AO10 Filter Output Time	0.00–20.00 sec.	0.01
✓	14-23	AO11 Filter Output Time	0.00–20.00 sec.	0.01
✓	14-36	AO10 Output Selection	0: 0–10 V 1: 0–20 mA 2: 4–20 mA	0
✓	14-37	AO11 Output Selection		0

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