

## CHAPTER 3 WIRING



### DANGER

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#### Hazardous Voltage

Before accessing the AC drive:

- ♦ Disconnect all power to the AC drive.
- ♦ Wait five minutes for DC bus capacitors discharge.

***Any electrical or mechanical modification to this equipment without prior written consent of Delta Electronics, Inc. will void all warranties and may result in a safety hazard in addition to voiding the UL listing.***

#### Short Circuit Withstand:

The rated voltage must be equal to or less than 240V (460V model is 480Volts) and the current must be equal to or less than 5000A RMS. (the model of 51HP or above is 10000A RMS)

#### General Wiring Information

##### Applicable Codes

VFD-V AC drives (007V23/43A, 015V23/43A, 022V23/43A, 037V23/43A, 055V23/43A, 075V23/43A, 110V43B, 110V23/43A, 150V23/43A, 185V23/43A, 220V23/43A, 300V23/43A, 370V23/43A, 450V43A) are Underwriters Laboratories, Inc. (UL) and Canadian Underwriters Laboratories (cUL) listed, and therefore comply with the requirements of the National Electrical Code (NEC) and the Canadian Electrical Code (CEC).

Installation intended to meet the UL and cUL requirements must follow the instructions provided in "Wiring Notes" as a minimum standard. Follow all local codes that exceed UL and cUL requirements. Refer to the technical data label affixed to the AC drive and the motor nameplate for electrical data.

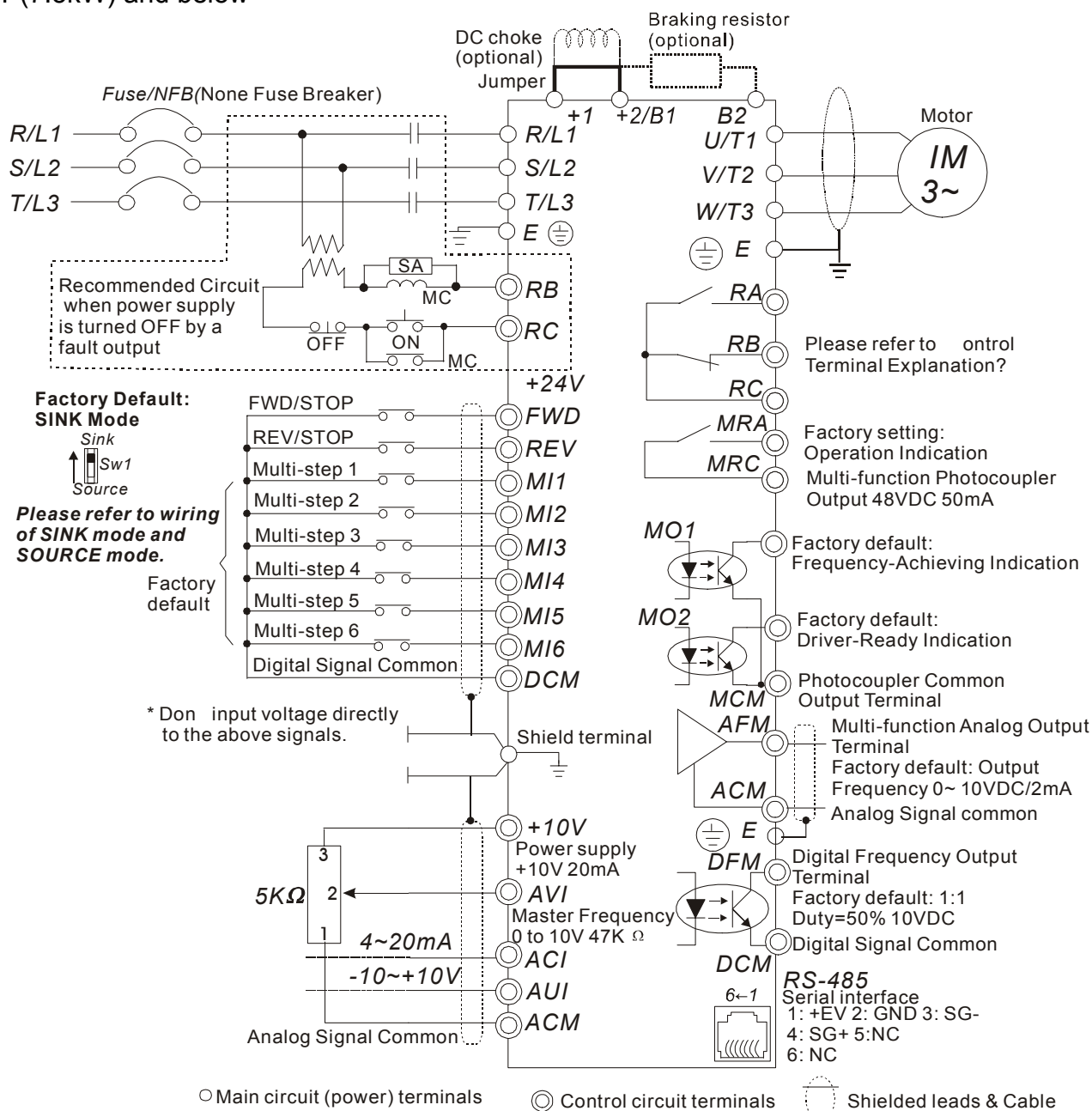
The "Line Fuse Specification" in Appendix B, lists the recommended fuse part number for each V-Series part number. These fuses (or equivalent) must be used on all installations where compliance with U.L. standards is a required.

### 3.1 Basic Wiring Diagram

For wiring of the inverter, it is divided into the main circuit and the control circuit. Users could open the case cover, and could inspect the main circuit terminal and the control circuit terminal; users connect the circuit in compliance with the following wiring method.

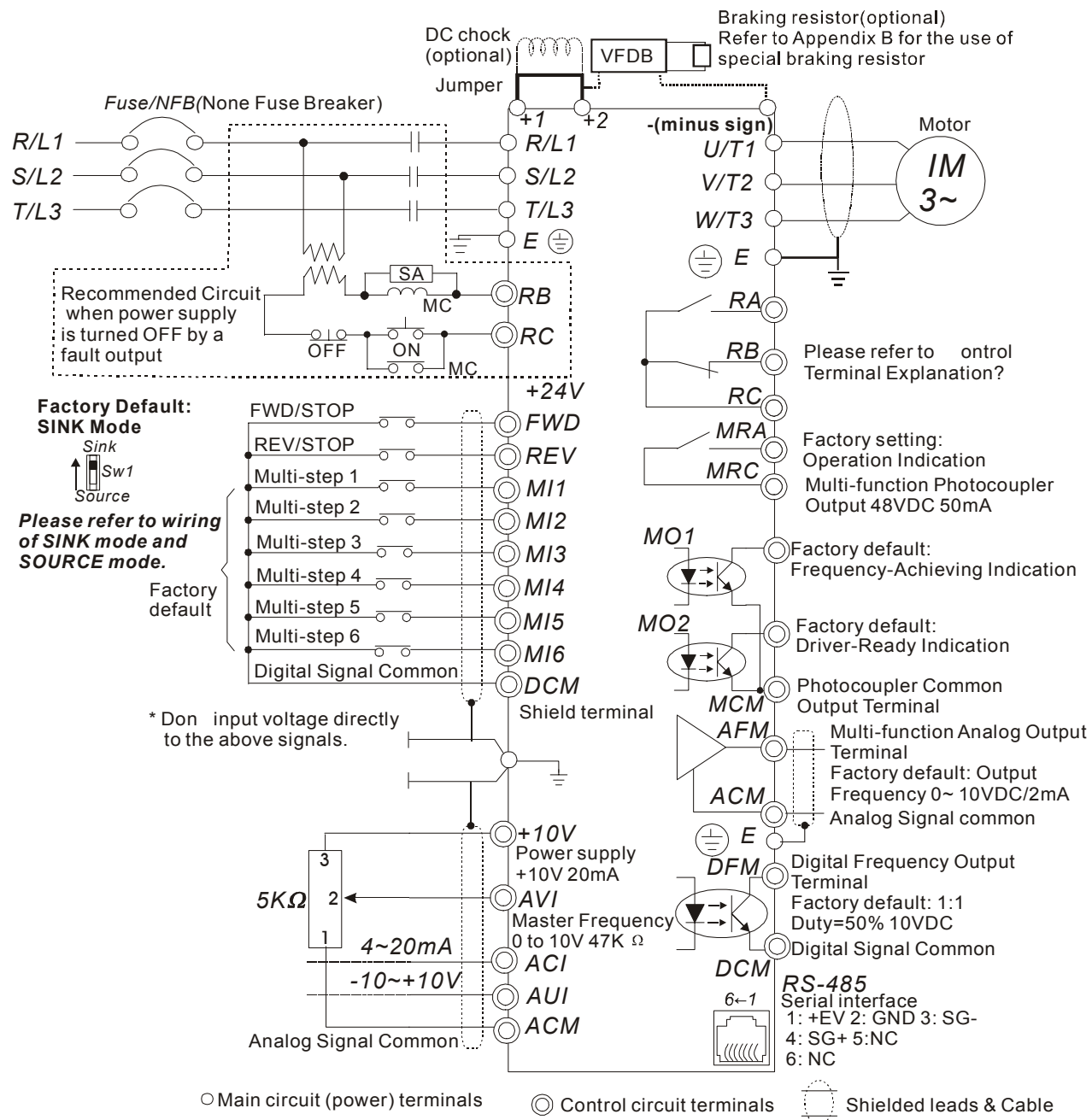
The following diagram is the standard wiring diagram for the VFD-V inverter.

**Wiring Diagram 1**  
10HP(7.5kW) and below



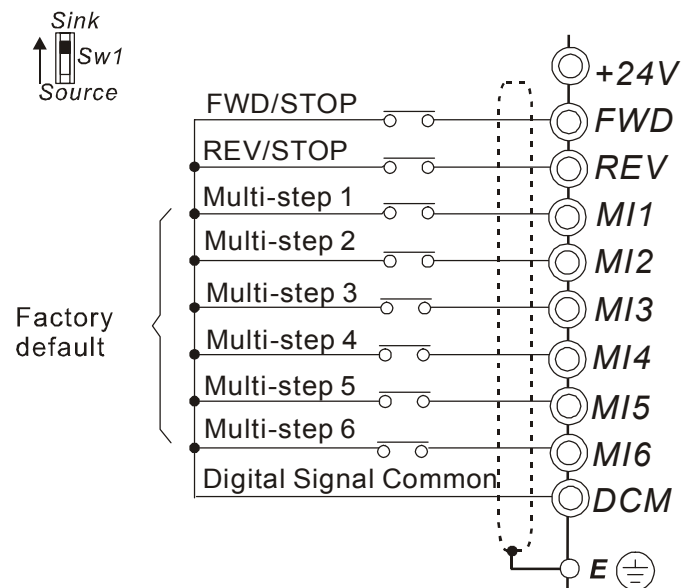
## Wiring Diagram 2

15HP(11kW) and above

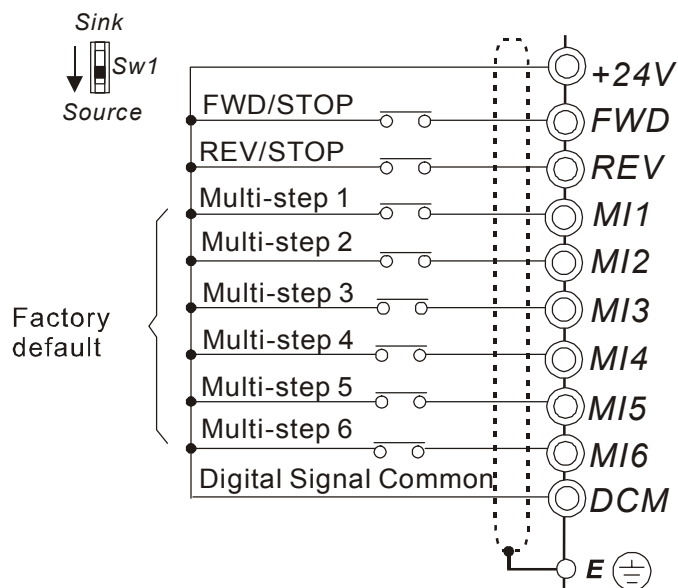


## Wiring of SINK mode and SOURCE mode

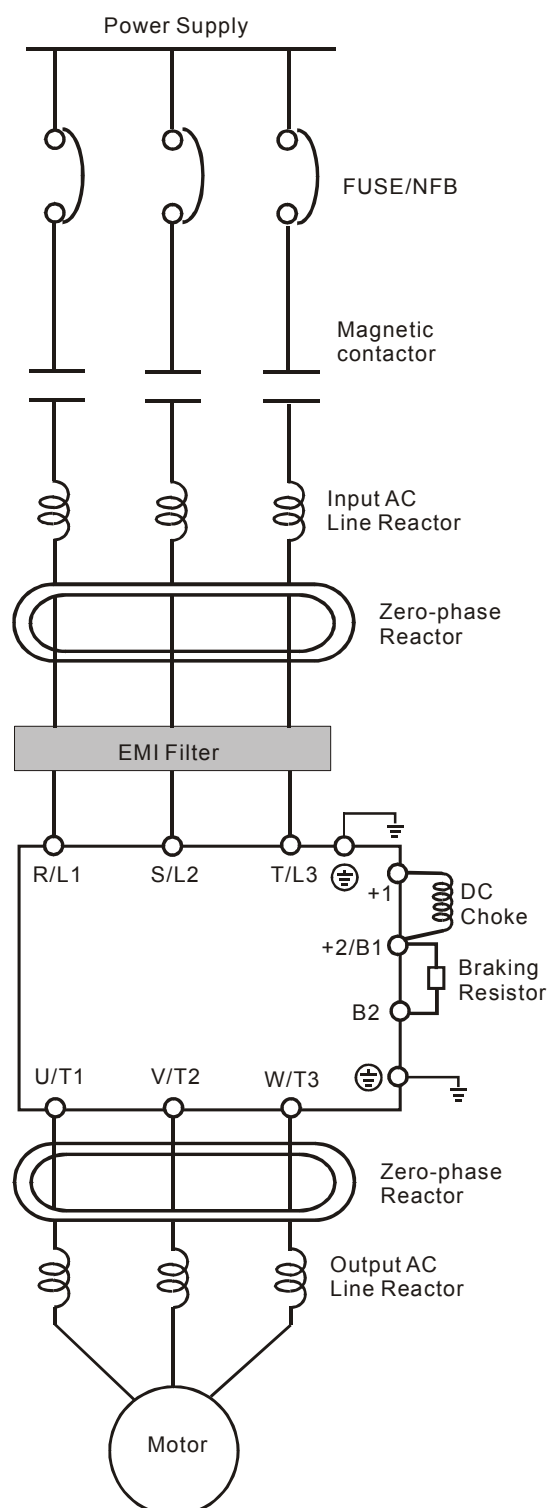
### SINK Mode



### SOURCE Mode




## 3.2 External Wiring



Items	Explanations
Power supply	Please follow the specific power supply requirement shown in APPENDIX-A.
Fuse/NFB (Optional)	There may be inrush current during power up. Please check the chart of APPENDIX B and select the correct fuse with rated current. NFB is optional.
Magnetic contactor (Optional)	Please do not use a Magnetic contactor as the I/O switch of the AC drive, this will reduce the operating life cycle of the AC drive.
Input AC Line Reactor (Optional)	In order to improve the input power factor, reduces harmonics and protection from AC line disturbances. (Surge, switching spike, power flick, etc.) AC line reactor should be installed when the power supply capacity is 500kVA or more and exceeds 6 times of the inverter capacity, or the wiring distance within 10m.
Zero-phase Reactor (Ferrite Core Common Choke) (Optional)	Zero phase reactors are used to reduce radio noise specify when the audio equipments installed near the inverter. Good effective for noise reduction on both the input and output sides. Attenuation quality is good in a wide range from AM band to 10Mhz. Appendix B for specifies zero phase reactors. (RF220X00A)
EMI filter (Optional)	To reduce the electromagnetic interference. Please refer to Appendix B for detail.
Braking Resistor (Optional)	Used to reduce stopping time of the motor. Please refer to the chart on Appendix B for specific Braking Resistors.
Output AC Line Reactor (Optional)	Motor surge voltage amplitudes depending on the motor cable length. For long motor cable application, it is necessary installed on the inverter output side.

### 3.3 Main Circuit Terminal Explanations

Terminal Symbol	Content Explanation
R/L1, S/L2, T/L3	Input terminals for business-used power supply
U/T1, V/T2, W/T3	Output terminals for the AC motor drivers (at the side of the motor)
+1~+2/B1	Power-improved continuing terminals of the DC reactor; disconnect the short-circuit piece when the device is installed
+2/B1~B2	Connecting terminals of the braking resistor; purchase and install these devices according to the selection chart
+2/B1~ —	Continuing terminals of the braking module (the VFDB series)
	Ground terminals, please have these terminals grounded following the third-type grounding of 230V series and the special grounding of 460V series within the electrician regulations

### 3.4 Control Terminal Explanations

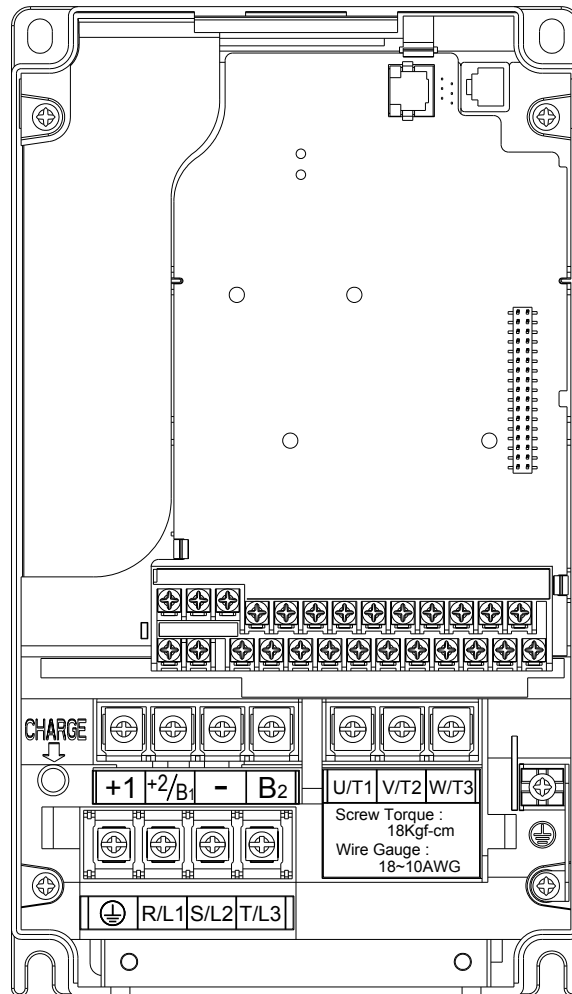
Terminal Symbol	Explanation on the Terminal Function	Factory Setting
FWD	FWD RUN-STOP command	
REV	REV RUN-STOP command	
MI1	Multi-function input selection 1 (3-wire STOP-designated terminal)	Multi-step 1 command
MI2	Multi-function input selection 2	Multi-step 2 command
MI3	Multi-function input selection 3	Multi-step 3 command
MI4	Multi-function input selection 4	Multi-step 4 command
MI5	Multi-function input selection 5	Abnormal reset command
MI6	Multi-function input selection 6 (TRG-designated terminal)	EF
DFM	Digital frequency signal output	1 : 1
+24V	Digital control signal – the common end	+24V 20mA
DCM	Digital control signal – the common end	
RA	Multi-function relay output contact (NO a)	Resistive Load 5A(N.O.)/3A(N.C.) 240VAC 5A(N.O.)/3A(N.C.) 24VDC Inductive Load 1.5A(N.O.)/0.5A(N.C.) 240VAC 1.5A(N.O.)/0.5A(N.C.) 24VDC Refer to Pr.02-11 to Pr.02-12
RB	Multi-function relay output contact (NC b)	
RC	Multi-function relay output contact	
MRA	Multi-function relay output contact (NO a)	
MRC	Multi-function relay output contact – the common end	
MO1	Multi-function output terminal 1 (photo coupler)	Instruction during operation

Terminal Symbol	Explanation on the Terminal Function	Factory Setting
MO2	Multi-function output terminal 2 (photo coupler) (Max 48VDC 50mA)	Set up the frequency attained
MO3	Multi-function output terminal 3 (photo coupler) (Max 48VDC 50mA)	Driver ready
MCM	Multi-function output terminal – the common end	Max 48VDC 50mA
+10V	Auxiliary reference power	+10V 20mA
AVI	Analog voltage frequency command	The greatest operation frequency corresponding to 0~+10V
ACI	Analog current frequency command	The greatest operation frequency corresponding to 4~20mA
AUI	Auxiliary analog voltage frequency command	The greatest operation frequency corresponding to -10~+10V
AFM	Multi-function analog voltage output	The greatest operation frequency corresponding to -10~10V
ACM	Analog control signal – the common end	

\* Analog control signal wire specification: 18 AWG (0.8 mm<sup>2</sup>), cover the isolation twisted wire.

### 3.5 Component Explanations

1 HP to 5 HP (VFD007V23A/43A, VFD015V23A/43A, VFD022V23A/43A, VFD037V23A/43A)



Control Terminal

Torque: 8Kgf-cm (6.9 in-lbf)

Wire: 22-14 AWG

Power Terminal

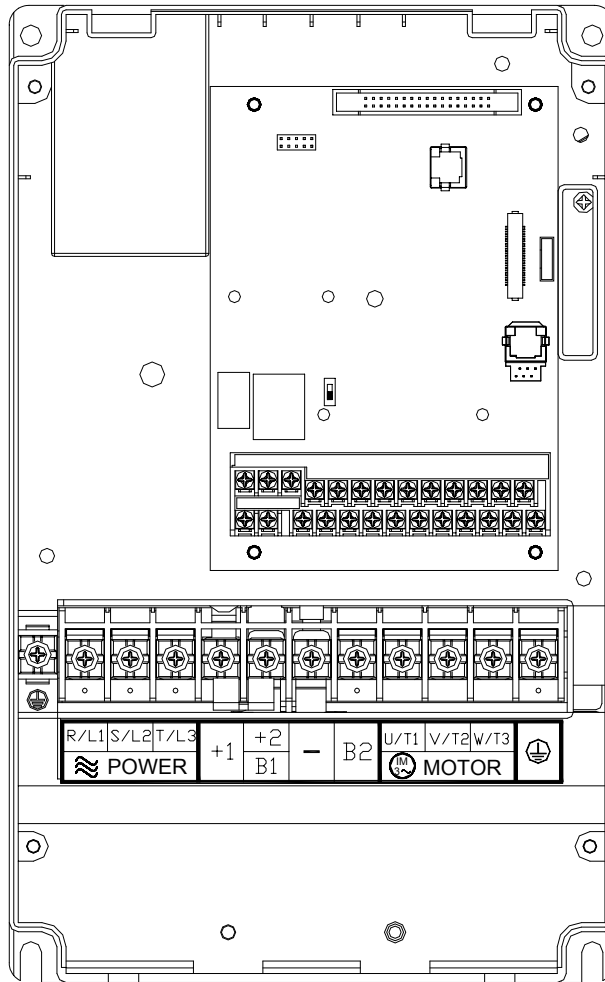
Torque: 18 kgf-cm (15.6 in-lbf)

Wire Gauge: 18-10 AWG

Wire Type: Stranded Copper only, 75°C



## 7.5 HP to 15 HP (VFD055V23A/43A, VFD075V23A/43A, VFD110V43B)



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### Control Terminal

Torque: 8Kgf-cm (6.9 in-lbf)

Wire: 22-14 AWG

### Power Terminal

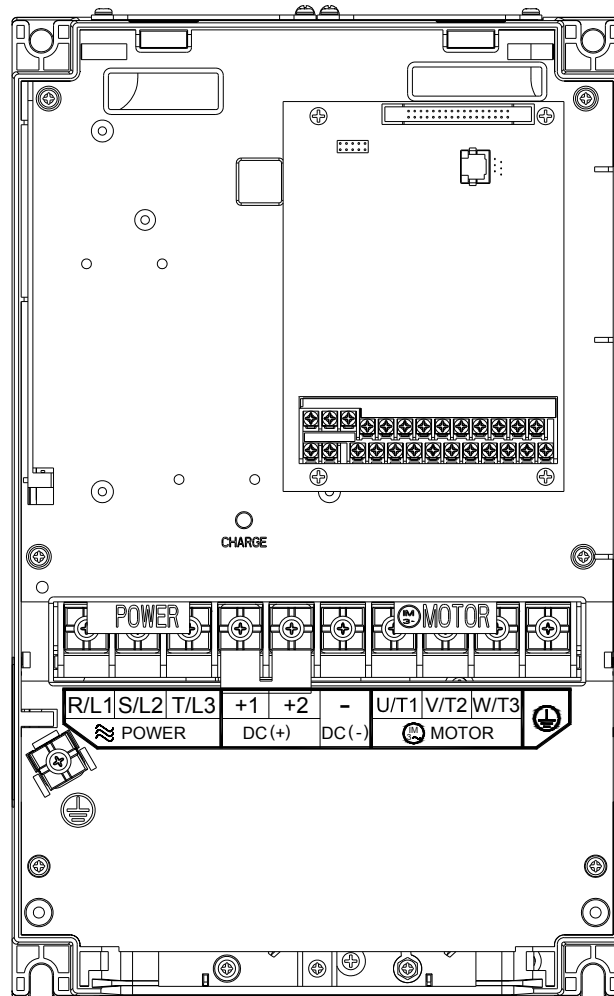
Torque: 30 kgf-cm (26 in-lbf)

Wire Gauge: 12-8 AWG

Wire Type: Stranded Copper only, 75°C

**Note:** If wiring of the terminal utilizes the wire with a 6AWG-diameter, it is thus necessary to use the Recongized Ring Terminal to conduct a proper wiring.

**15HP to 30HP (VFD110V23A/43A, VFD150V23A/43A, VFD185V23A/43A,  
VFD220V23A/43A)**



Control Terminal

Torque: 8Kgf-cm (6.9 in-lbf)

Wire: 22-14 AWG

Power Terminal

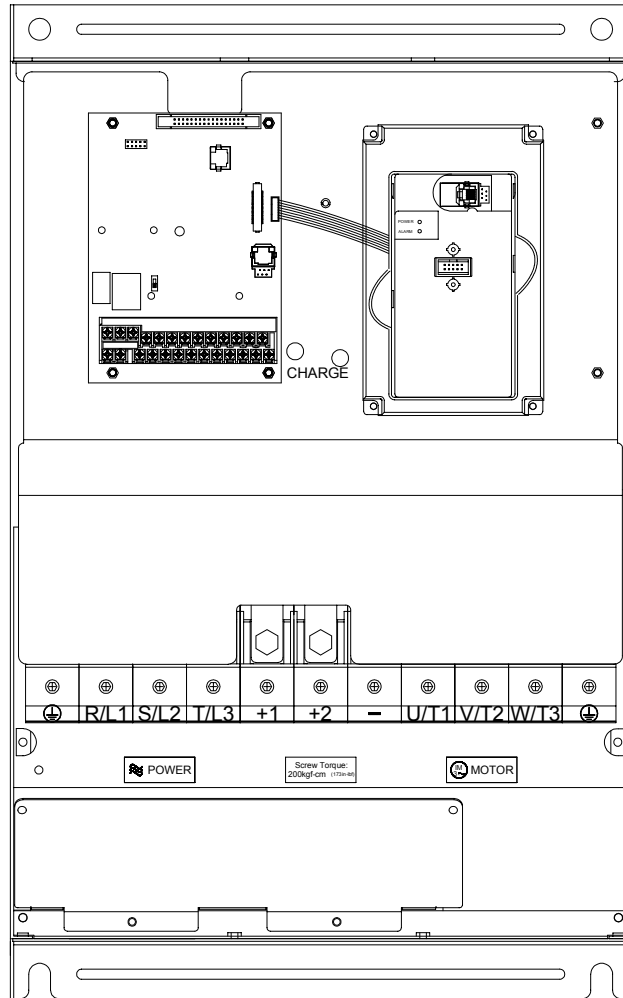
Torque: 30 kgf-cm (26 in-lbf)

Wire Gauge: 8-2 AWG

Wire Type: Stranded Copper only, 75°C

**NOTE:** If wiring of the terminal of VFD220V23A utilizes the wire with a 1AWG-diameter, it is thus necessary to use the Recognized Ring Terminal to conduct a proper wiring.

## 40 to 50 HP 230V (VFD300V23A, VFD370V23A)



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### Control Terminal

Torque: 8Kgf-cm (6.9 in-lbf)

Wire: 22-14 AWG

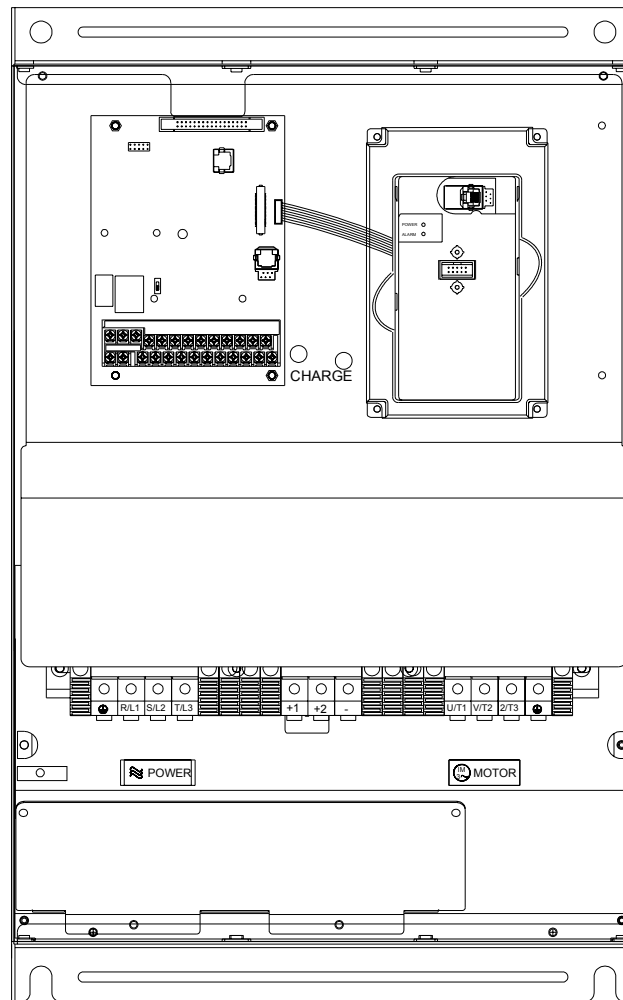
### Power Terminal

Torque: 200 kgf-cm (173.6 in-lbf)

Wire Gauge: 1/0 – 4/0 AWG

Wire Type: Stranded Copper only, 75°C

**40HP to 60HP 460V (VFD300V43A, VFD370V43A, VFD450V43A)**



**Control Terminal**

Torque: 8Kgf-cm (6.9 in-lbf)

Wire: 22-14 AWG

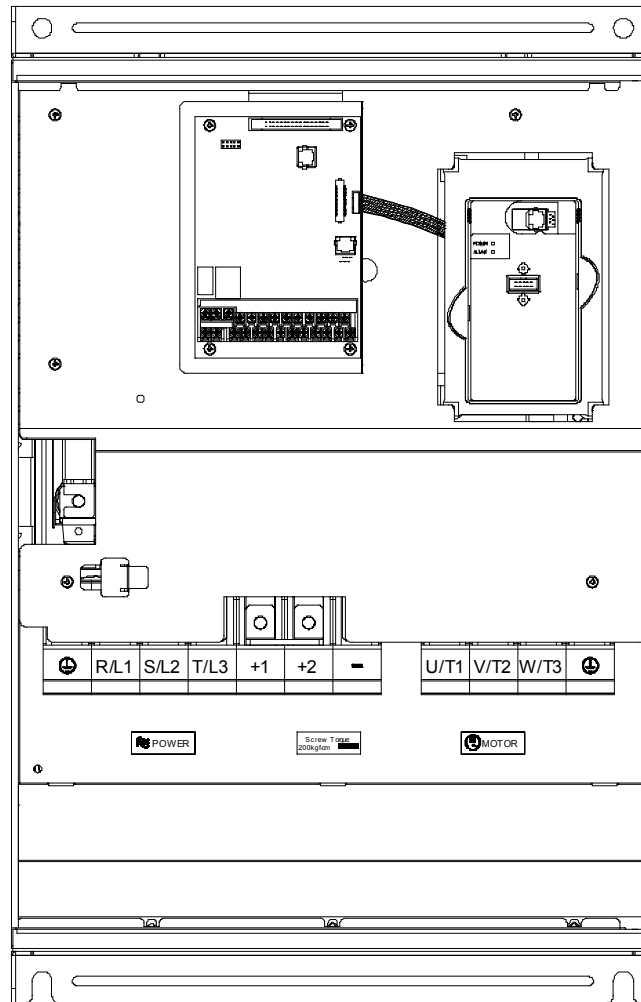
**Power Terminal**

Torque: 57 kgf-cm (49.5 in-lbf)

Wire Gauge: 4-2 AWG

Wire Type: Stranded Copper only, 75°C

## 75-100 HP 460V (VFD550V43A, VFD750V43A)



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### Control Terminal

Torque: 8Kgf-cm (6.9 in-lbf)

Wire: 22-14 AWG

### Power Terminal

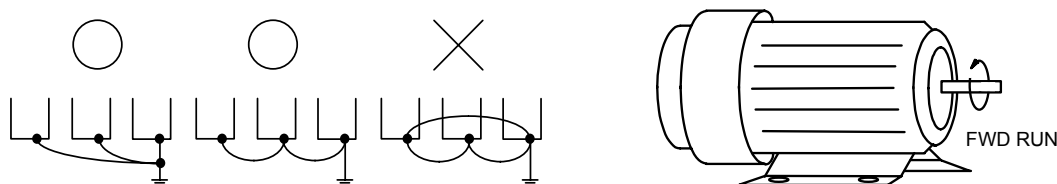
Torque: 200 kgf-cm (173.6 in-lbf)

Wire Gauge: 1/0 – 4/0 AWG

Wire Type: Stranded Copper only, 75°C

### 3.6 Wiring Notice

1. There are corresponding ring terminals which will be included with each unit (15-30HP), and please use the proper crimping tool by KST INC. P/N: KST-HDC38A for securing the conductor.
2. When wiring up, and that the wiring route specifications are settled, please conduct the wiring following the electrician regulations.
3. The connection between the three-phase AC input power and the main circuit terminal R/L1, S/L2, T/L3 has to set up a none-fusing switch in between. The best is to series connect with an electro-magnetic contactor (MC) so as to cut off the power supply at the same time when the inverter protection function acts. (The two ends of the electro-magnetic contactor should have the R-C Varistor).
4. There is no phase-order differentiation in the input power R/L1, S/L2, T/L3 and users could connect with either one of use.
5. The ground terminal E is grounded with the third-type grounding method (with the grounding impedance under  $100\Omega$ ).
6. The grounding wire of the inverter could not be grounded at the same time with machinery with grand current loading, like that of the electric soldering machine and of the motor with grand horsepower; they have to be grounded individually.
7. The shorter the ground wire, the better it is.
8. When several inverters are grounded at the same time, be sure not to make it into a ground circuit. Please refer to the following diagram:



9. If the output terminals U/T1, V/T2 and W/T3 of the inverter are connecting relatively to the U, V, and W terminals of the motor, the FWD indicator located on the digital control panel of the inverter will be lit, and that means the inverter is running forward, and the rotation direction of the motor will be shown as the right hand side diagram above; if the REV indicator is lit, it means that the inverter is running in reverse direction, and the rotation direction will be of the opposite direction compared with the above diagram. If users are not sure of whether the connection between output terminals U/T1, V/T2 and W/T3 of the inverter is of one-to-one connection with U, V, and W terminals of the motor, simply swap either two wires among the U, V, and W terminals of the motor for correction if the inverter is running forward while the motor is running at reverse direction.

10. Be sure of the power voltage and the greatest current possible supplied.
11. When the “Digital Hand-held Programming Panel” is displayed, please do not disconnect or disassemble any wiring.
12. No braking resistor is installed within the VFD-V inverter (selective purchasing item), therefore, be sure to purchase and install the braking resistor if to be used on occasions when the loading inertia is great or that it is of frequent start/stop.
13. Be sure not to connect the AC power with the terminals U/T1, V/T2 and W/T3 on the power-generating side of the inverter.
14. Please tightly fasten the screws of the main circuit terminals so as to prevent sparks generated due to the vibration and loosening of the screws.
15. Wiring of the main circuit and of the control circuit should be separated so as to prevent erroneous actions. If the interlock connection is needed, please make it an intersection of 90°.
16. If terminals U/T1, V/T2 and W/T3 on the power-generating side of the inverter is in need of the noise wave-filter, it is then necessary to use the induction-type L-Varistor, but be sure not to add in the phase-carrying capacitor or the L-C- and R-C-type wave filters.
17. Please use the separating wire as much as possible during control wiring, and be sure not to expose the peeled-off separation net in front of the terminal to the external.
18. Please use the separating wire or tube as much as possible during power wiring, and ground these two ends of the separating layer or tube to the ground.
19. If the installation site of the inverter is sensitive to interferences, please have the RFI wave filters installed, and the nearer the inverter to the installation site, the better. In addition, the lower the carrier wave frequency of, the less the interferences.
20. If the electric-leakage circuit breaker is installed in the inverter, it could serve as the protection for the electric-leakage error, and as the prevention on the erroneous actions of the electric-leakage circuit breaker; please select the sensor current above 200mA with the action time of more than 0.1 second to have these actions accessible.