Preface

Thank you for choosing DELTA's multifunction VFD-EL Series. The VFD-EL Series is manufactured with high-quality components and materials and incorporate the latest microprocessor technology available.

📖 Getting Started

This quick start will be helpful in the installation and parameter setting of the AC motor drives. To guarantee safe operation of the equipment, read the following safety guidelines before connecting power to the AC motor drives. For detail information, refer to the VFD-EL User Manual on the CD supplied with the drive.

⚠️ **DANGER!**

1. AC input power must be disconnected before any wiring to the AC motor drive is made.

2. A charge may still remain in the DC-link capacitors with hazardous voltages, even if the power has been turned off. To prevent personal injury, please ensure that power has turned off before opening the AC motor drive and wait ten minutes for the capacitors to discharge to safe voltage levels.

3. Never reassemble internal components or wiring.

4. The AC motor drive may be destroyed beyond repair if incorrect cables are connected to the input/output terminals. Never connect the AC motor drive output terminals U/T1, V/T2, and W/T3 directly to the AC mains circuit power supply.

5. Ground the VFD-EL using the ground terminal. The grounding method must comply with the laws of the country where the AC motor drive is to be installed. Refer to the Basic Wiring Diagram.

6. VFD-EL series is used only to control variable speed of 3-phase induction motors, NOT for 1-phase motors or other purpose.

7. VFD-EL series is the specific drive for the elevator door and other automatic door control, NOT for those devices that may cause personal injury, such as life support equipment or any life safety situation.

8. To prevent drive damage, the RFI jumper connected to ground shall be cut off if the AC motor drive is installed on an ungrounded power system or a high resistance-grounded (over 30 ohms) power system or a corner grounded TN system.

⚠️ **WARNING!**

1. DO NOT use Hi-pot test for internal components. The semi-conductor used in AC motor drive easily damage by high-pressure.

2. There are highly sensitive MOS components on the printed circuit boards. These components are especially sensitive to static electricity. To prevent damage to these components, do not touch these components or the circuit boards with metal objects or your bare hands.

3. Only quality person is allowed to install, wire and maintain AC motor drive.

⚠️ **CAUTION!**

1. Some parameters settings can cause the motor to run immediately after applying power.

2. DO NOT install the AC motor drive in a place subjected to high temperature, direct sunlight, high humidity, excessive vibration, corrosive gases or liquids, or airborne dust or metallic particles. Only use AC motor drives within specification. Failure to comply may result in fire, explosion or electric shock. To prevent personal injury, please keep children and unqualified people away from the equipment.

3. When the motor cable between AC motor drive and motor is too long, the layer insulation of the motor may be damaged. Please use a frequency inverter duty motor or add an AC output reactor to prevent damage to the motor. Refer to appendix B Reactor for details.

4. The rated voltage for AC motor drive must be ≤ 240V (≤ 480V for 460V models) and the mains supply current capacity must be ≤ 5000A RMS.

Specifications

Voltage Class		115V Class		
Model Number VFD-XXXEL		002	004	007
Max. Applicable Motor Output (kW)		0.2	0.4	0.75
Max. Applicable Motor Output (hp)		0.25	0.5	1.0
Output Rating	Rated Output Capacity (kVA)	0.6	1.0	1.6
	Rated Output Current (A)	1.6	2.5	4.2
	Maximum Output Voltage (V)	3-Phase Proportional to Twice the Input Voltage		
	Output Frequency (Hz)	0.1~600 Hz		
	Carrier Frequency (kHz)	2-12		
Input Rating	Rated Input Current (A)	6.4	9	18
	Rated Voltage/Frequency	Single phase, 100-120V, 50/60Hz		
	Voltage Tolerance	± 10%(90~132 V)		
	Frequency Tolerance	± 5%(47~63 Hz)		
Cooling Method		Natural Cooling		
Weight (kg)		1.1	1.1	1.4

Voltage Class			230V Class					
Model Number VFD-XXXEL			002	004	007	015	022	037
Max. Applicable Motor Output (kW)			0.2	0.4	0.75	1.5	2.2	3.7
Max. Applicable Motor Output (hp)			0.25	0.5	1.0	2.0	3.0	5.0
Output Rating	Rated Output Capacity (kVA)		0.6	1.0	1.6	2.9	4.2	6.5
	Rated Output Current (A)		1.6	2.5	4.2	7.5	11.0	17
	Maximum Output Voltage (V)		3-Phase Proportional to Input Voltage					
	Output Frequency (Hz)		0.1~600 Hz					
	Carrier Frequency (kHz)		2-12					
Input Rating	XXXE L21A	Rated Input Current (A)	4.9	6.5	9.5	15.7	24	--
		Rated Voltage/Frequency	1-phase, 200-240 V, 50/60Hz					
	XXXE L23A	Rated Input Current (A)	1.9	2.7	4.9	9	15	20.6
		Rated Voltage/Frequency	3-phase, 200-240V, 50/60Hz					
	Voltage Tolerance		± 10%(180~264 V)					
	Frequency Tolerance		± 5%(47~63 Hz)					
Cooling Method			Natural Cooling			Fan Cooling		
Weight (kg)			1.2	1.2	1.2	1.7	1.7	1.7

Voltage Class		460V Class				
Model Number VFD-XXXEL		004	007	015	022	037
Max. Applicable Motor Output (kW)		0.4	0.75	1.5	2.2	3.7
Max. Applicable Motor Output (hp)		0.5	1.0	2.0	3.0	5.0
Output Rating	Rated Output Capacity (kVA)	1.2	2.0	3.3	4.4	6.8
	Rated Output Current (A)	1.5	2.5	4.2	5.5	8.2
	Maximum Output Voltage (V)	3-Phase Proportional to Input Voltage				
	Output Frequency (Hz)	0.1~600 Hz				
	Carrier Frequency (kHz)	2-12				
Input Rating	Rated Input Current (A)	1.8	3.2	4.3	7.1	9.0
	Rated Voltage/Frequency	3-phase, 380-480V, 50/60Hz				
	Voltage Tolerance	± 10%(342~528V)				
	Frequency Tolerance	± 5%(47~63Hz)				
Cooling Method		Natural Cooling		Fan Cooling		
Weight (kg)		1.2	1.2	1.2	1.7	1.7

General Specifications			
Control Characteristics	Control System		SPWM(Sinusoidal Pulse Width Modulation) control (V/f control)
	Frequency Setting Resolution		0.01Hz
	Output Frequency Resolution		0.01Hz
	Torque Characteristics		Including the auto-torque/auto-slip compensation; starting torque can be 150% at 5.0Hz
	Overload Endurance		150% of rated current for 1 minute
	Skip Frequency		Three zones, setting range 0.1-600Hz
	Accel/Decel Time		0.1 to 600 seconds (2 Independent settings for Accel/Decel time)
	Stall Prevention Level		Setting 20 to 250% of rated current
	DC Braking		Operation frequency 0.1-600.0Hz, output 0-100% rated current Start time 0-60 seconds, stop time 0-60 seconds
	Regenerated Braking Torque		Approx. 20% (up to 125% possible with optional brake resistor or externally mounted brake unit, 1-15hp (0.75-11kW) models have brake chopper built-in)
	V/f Pattern		Adjustable V/f pattern
Operating Characteristics	Frequency Setting	Keypad	Setting by ▲ ▼
		External Signal	Potentiometer-5kΩ/0.5W, 0 to +10VDC, 4 to 20mA, RS-485 interface; Multi-function Inputs 3 to 6 (15 steps, Jog, up/down)
	Operation Setting Signal	Keypad	Set by RUNand STOP
		External Signal	2 wires/3 wires ((MI1, MI2, MI3)), JOG operation, RS-485 serial interface (MODBUS), programmable logic controller
	Multi-function Input Signal		Multi-step selection 0 to 15, Jog, accel/decel inhibit, 2 accel/decel switches, counter, external Base Block, ACI/AVI selections, driver reset, UP/DOWN key settings, NPN/PNP input selection
	Multi-function Output Indication		AC drive operating, frequency attained, zero speed, Base Block, fault indication, overheat alarm, emergency stop and status selections of input terminals
	Analog Output Signal		Output frequency/current
	Operation Functions		AVR, accel/decel S-Curve, over-voltage/over-current stall prevention, 5 fault records, reverse inhibition, momentary power loss restart, DC braking, auto torque/slip compensation, auto tuning, adjustable carrier frequency, output frequency limits, parameter lock/reset, PID control, external counter, MODBUS communication, abnormal reset, abnormal re-start, power-saving, fan control, sleep/wake frequency, 1st/2nd frequency source selections, 1st/2nd frequency source combination, NPN/PNP selection
	Protection Functions		Over voltage, over current, under voltage, external fault, overload, ground fault, overheating, electronic thermal, IGBT short circuit, PTC
	Display Keypad (optional)		6-key, 7-segment LED with 4-digit, 4 status LEDs, master frequency, output frequency, output current, custom units, parameter values for setup and lock, faults, RUN, STOP, RESET, FWD/REV
	Built-in EMI Filter		For 230V 1-phase and 460V 3-phase models.
Enviromental Conditions	Enclosure Rating		IP20
	Pollution Degree		2
	Installation Location		Altitude 1,000 m or lower, keep from corrosive gasses, liquid and dust
	Ambient Temperature		-10°C to 50°C (40°C for side-by-side mounting) Non-Condensing and not frozen
	Storage/ Transportation Temperature		-20 oC to 60 °C
	Ambient Humidity		Below 90% RH (non-condensing)
	Vibration		9.80665m/s^2 (1G) less than 20Hz, 5.88m/s2 (0.6G) at 20 to 50Hz
Approvals			C E c UL us

Basic Wiring Diagram

Users must connect wiring according to the following circuit diagram shown below.

Figure 1 for models of VFD-EL Series
VFD002EL11A/21A, VFD004EL11A/21A, VFD007EL11A/21A, VFD015EL21A, VFD022EL21A
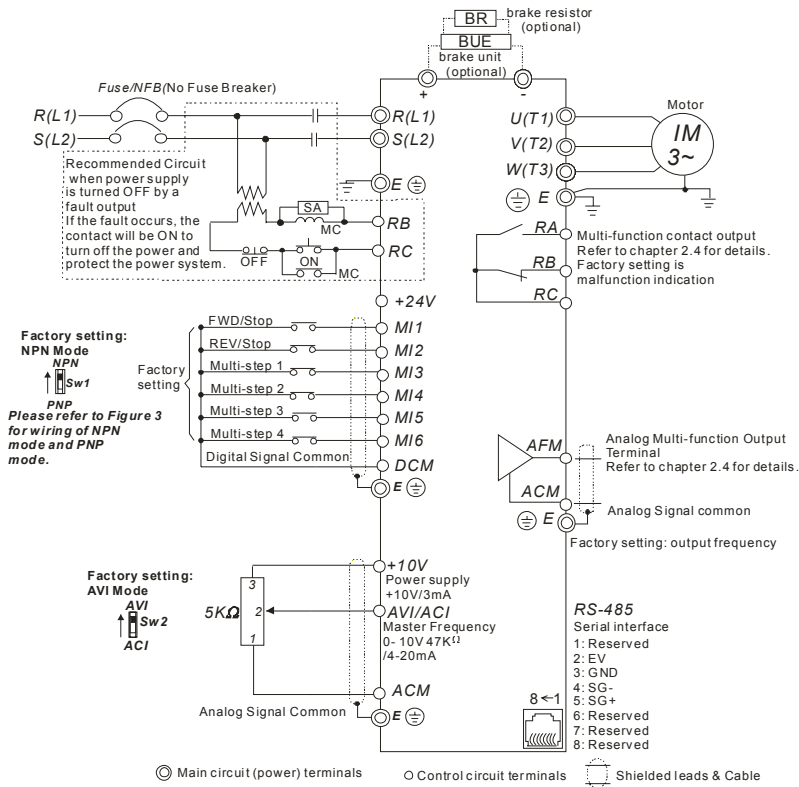
Figure 2 for models of VFD-EL Series
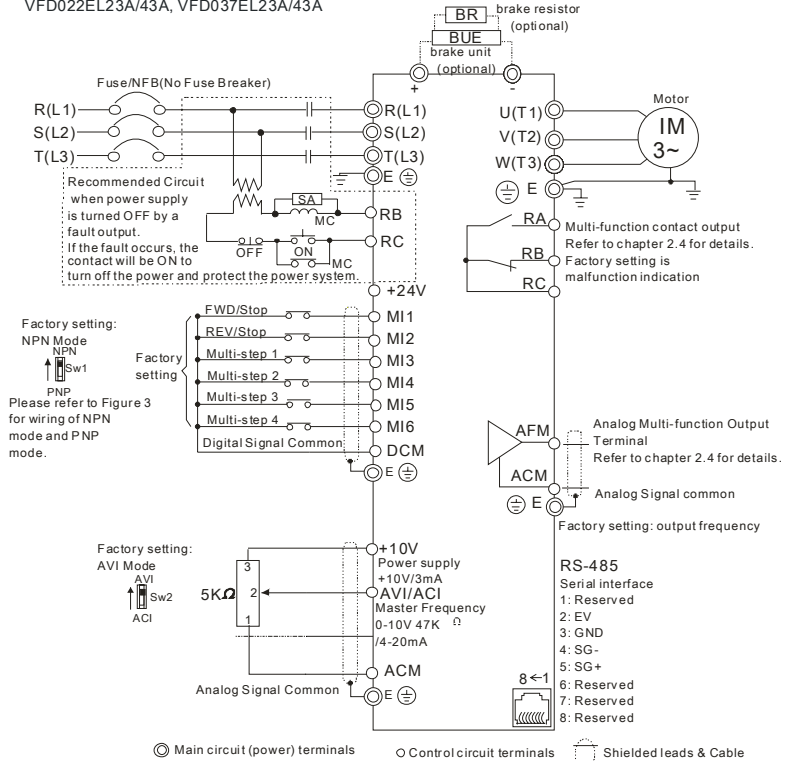VFD002EL23A, VFD004EL23A/43A, VFD007EL23A/43A, VFD015EL23A/43A,
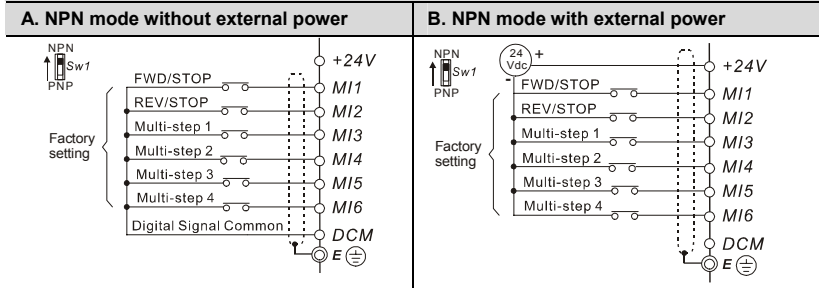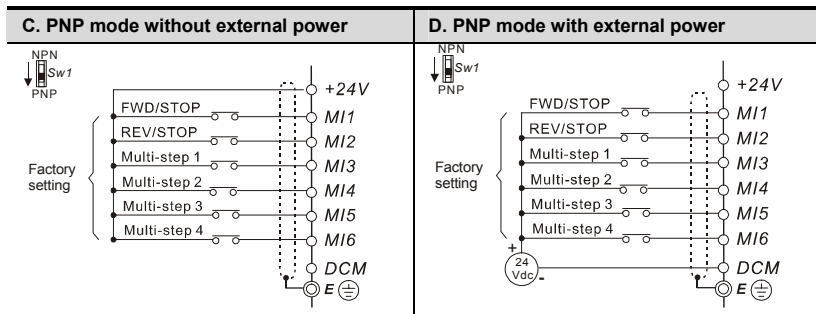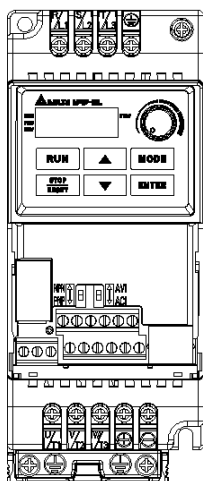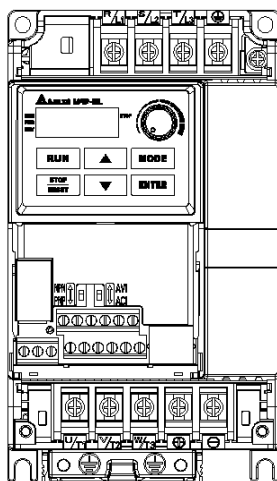VFD022EL23A/43A, VFD037EL23A/43A

Figure 3 Wiring for NPN mode and PNP mode

A. NPN mode without external power

B. NPN mode with external power

C. PNP mode without external power	D. PNP mode with external power

Power Terminals and Control Terminals

Frame A

Frame B

Frame	Power Terminals	Torque	Wire	Wire type
A	R/L1, S/L2, T/L3 U/T1, V/T2, W/T3, ⏚	14.2-16.3kgf-cm (12-14in-lbf)	12-18 AWG. (3.3-0.8mm^2)	Copper only, 75°C
B	R/L1, S/L2, T/L3 U/T1, V/T2, W/T3 +, -, ⏚	16.3-19.3kgf-cm (14-17in-lbf)	8-18 AWG. (8.4-0.8mm^2)	Copper only, 75°C

Terminal Explanations

Terminal Symbol	Explanation of Terminal Function
R/L1, S/L2, T/L3	AC line input terminals (1-phase/3-phase)
U/T1, V/T2, W/T3	AC drive output terminals for connecting 3-phase induction motor
+, -	Connections for External Brake unit (BUE series)
⏚	Earth connection, please comply with local regulations.

The specification for the control terminals

The position of the control terminals
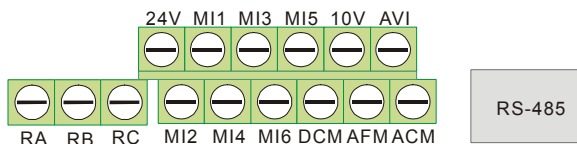
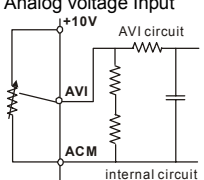| Frame	Torque	Wire
A, B	5.1-8.1kgf-cm (4.4-7in-lbf)	16-24 AWG. (1.3-0.2mm^2)
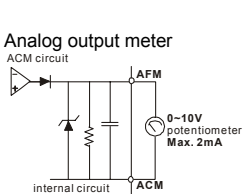
NOTE

Frame A: VFD002EL11A/21A/23A, VFD004EL11A/21A/23A/43A, VFD007EL21A/23A/43A,

VFD015EL23A/43A

Frame B: VFD007EL11A, VFD015EL21A, VFD022EL21A/23A/43A, VFD037EL23A/43A

Control Terminals Explanations

Terminal Symbol	Terminal Function	Factory Settings (NPN mode) ON: Connect to DCM	
MI1	Forward-Stop command	ON: OFF:	Run in MI1 direction Stop acc. to Stop Method
MI2	Reverse-Stop command	ON: OFF:	Run in MI2 direction Stop acc. to Stop Method
MI3	Multi-function Input 3	Refer to Pr.04.05 to Pr.04.08 for programming the Multi-function Inputs. ON: the activation current is 5.5mA. OFF: leakage current tolerance is 10 μA.	
MI4	Multi-function Input 4		
MI5	Multi-function Input 5		
MI6	Multi-function Input 6		

Terminal Symbol	Terminal Function	Factory Settings (NPN mode) ON: Connect to DCM
+24V	DC Voltage Source	+24VDC, 50mA used for PNP mode.
DCM	Digital Signal Common	Common for digital inputs and used for NPN mode.
RA	Multi-function Relay output (N.O.) 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.03.00 for programming
RB	Multi-function Relay output (N.C.) b	
RC	Multi-function Relay common	
+10V	Potentiometer power supply	+10VDC 3mA
AVI	Analog voltage Input	Impedance: 47kΩ Resolution: 10 bits Range: 0 ~ 10VDC/4~20mA = 0 ~ Max. Output Frequency (Pr.01.00) Selection: Pr.02.00, Pr.02.09, Pr.10.00 Set-up: Pr.04.14 ~ Pr.04.17
ACM	Analog control signal (common)	Common for AVI= and AFM
AFM	Analog output meter	0 to 10V, 2mA Impedance: 47Ω Output current 2mA max Resolution: 8 bits Range: 0 ~ 10VDC Function: Pr.03.03 to Pr.03.04 **NOTE** The voltage output type for this analog signal is PWM. It needs to read value by the movable coil meter and is not suitable for A/D signal conversion.

NOTE: Control signal wiring size: 18 AWG (0.75 mm^2) with shielded wire.

Description of the Digital keypad

❶ Status Display
Display the driver's current status.

❷ LED Display
Indicates frequency, voltage, current, user defined units and etc.

❸ Potentiometer
For master Frequency setting.

❹ RUN Key
Start AC drive operation.

❺ UP and DOWN Key
Set the parameter number and changes the numerical data, such as Master Frequency.

❻ MODE
Change between different display mode.

❼ STOP/RESET
Stops AC drive operation and reset the drive after fault occurred.

Operation steps of the Digital Keypad

Setting Mode

START

GO START

NOTE: In the selection mode, press 🖙MODE to set the parameters.

- -

Setting parameters

or

Success to set parameter.   Input data error

NOTE : In the parameter setting mode, you can press 🖙MODE to return the selecting mode.

- -

To shift data

START

- -

Setting direction (When operation source is digital keypad)
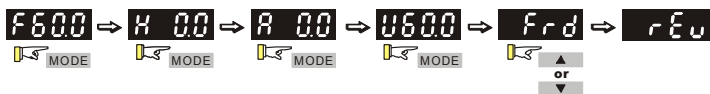
Summary of Parameter Settings

✔ : The parameter can be set during operation.

Pr.	Explanation	Settings	Factory Setting	NOTE
Group 0 User Parameters				
00.00	Identity Code of the AC motor drive	Read-only	##	
00.01	Rated Current Display of the AC motor drive	Read-only	#.#	
00.02	Parameter Reset	0: Parameter can be read/written 1: All parameters are read only 8: Keypad lock 9: All parameters are reset to factory settings (50Hz, 230V/400V or 220V/380V depends on Pr.00.12) 10: All parameters are reset to factory settings (60Hz, 220V/440V)	0	
✔00.03	Start-up Display Selection	0: Display the frequency command value (Fxxx) 1: Display the actual output frequency (Hxxx) 2: Display the content of user-defined unit (Uxxx) 3: Multifunction display, see Pr.00.04 4: FWD/REV command	0	
✔00.04	Content of Multi-function Display	0: Display the content of user-defined unit (Uxxx) 1: Display the counter value (c) 2: Display the status of multi-function input terminals (d) 3: Display DC-BUS voltage (u) 4: Display output voltage (E) 5: Display PID analog feedback signal value (b) (%) 6: Output power factor angle (n) 7: Display output power (P) 8: Display PID setting and feedback signal 9: Display AVI (I) (V) 10: Display ACI (i) (mA) 11: Display the temperature of IGBT (h) (°C)	0	
✔00.05	User-Defined Coefficient K	0. 1 to 160.0	1.0	
00.06	Software Version	Read-only	#.##	
00.07	Reserved			
00.08	Password Input	0 to 9999	0	
00.09	Password Set	0 to 9999	0	
00.10	Reserved			
00.11	Reserved			
00.12	50Hz Base Voltage Selection	0: 230V/400V 1: 220V/380V	0	
00.13	User-defined Value 1 (correspond to max. frequency)	0 to 9999	0	

Pr.	Explanation	Settings	Factory Setting	NOTE
00.14	Position of Decimal Point of User-defined Value 1	0 to 3	0	
Group 1 Basic Parameters				
01.00	Maximum Output Frequency (Fmax)	50.00 to 600.0 Hz	60.00	
01.01	Maximum Voltage Frequency (Fbase)	0.10 to 600.0 Hz	60.00	
01.02	Maximum Output Voltage (Vmax)	115V/230V series: 0.1V to 255.0V 460V series: 0.1V to 510.0V	220.0 440.0	
01.03	Mid-Point Frequency (Fmid)	0.10 to 600.0 Hz	1.50	
01.04	Mid-Point Voltage (Vmid)	115V/230V series: 0.1V to 255.0V 460V series: 0.1V to 510.0V	10.0 20.0	
01.05	Minimum Output Frequency (Fmin)	0.10 to 600.0 Hz	1.50	
01.06	Minimum Output Voltage (Vmin)	115V/230V series: 0.1V to 255.0V 460V series: 0.1V to 510.0V	10.0 20.0	
01.07	Output Frequency Upper Limit	0.1 to 120.0%	110.0	
01.08	Output Frequency Lower Limit	0.0 to100.0 %	0.0	
⚡01.09	Accel Time 1	0.1 to 600.0 / 0.01 to 600.0 sec	10.0	
⚡01.10	Decel Time 1	0.1 to 600.0 / 0.01 to 600.0 sec	10.0	
⚡01.11	Accel Time 2	0.1 to 600.0 / 0.01 to 600.0 sec	10.0	
⚡01.12	Decel Time 2	0.1 to 600.0 / 0.01 to 600.0 sec	10.0	
⚡01.13	Jog Acceleration Time	0.1 to 600.0 / 0.01 to 600.0 sec	1.0	
⚡01.14	Jog Deceleration Time	0.1 to 600.0 / 0.01 to 600.0 sec	1.0	
⚡01.15	Jog Frequency	0.10 Hz to Fmax (Pr.01.00) Hz	6.00	
01.16	Auto acceleration / deceleration (refer to Accel/Decel time setting)	0: Linear Accel/Decel 1: Auto Accel, Linear Decel 2: Linear Accel, Auto Decel 3: Auto Accel/Decel (Set by load) 4: Auto Accel/Decel (set by Accel/Decel Time setting)	0	
01.17	Acceleration S-Curve	0.0 to 10.0 / 0.00 to 10.00 sec	0.0	
01.18	Deceleration S-Curve	0.0 to 10.0 / 0.00 to 10.00 sec	0.0	
01.19	Accel/Decel Time Unit	0: Unit: 0.1 sec 1: Unit: 0.01 sec	0	
Group 2 Operation Method Parameters				
⚡02.00	Source of First Master Frequency Command	0: Digital keypad UP/DOWN keys or Multi-function Inputs UP/DOWN. Last used frequency saved. 1: 0 to +10V from AVI 2: 4 to 20mA from ACI 3: RS-485 (RJ-45) communication 4: Digital keypad potentiometer	1	

Pr.	Explanation	Settings	Factory Setting	NOTE
✗02.01	Source of First Operation Command	0: Digital keypad 1: External terminals. Keypad STOP/RESET enabled. 2: External terminals. Keypad STOP/RESET disabled.	1	
		3: RS-485 (RJ-45) communication. Keypad STOP/RESET enabled. 4: RS-485 (RJ-45) communication. Keypad STOP/RESET disabled.		
02.02	Stop Method	0: STOP: ramp to stop; E.F.: coast to stop 1: STOP: coast to stop; E.F.: coast to stop 2: STOP: ramp to stop; E.F.: ramp to stop 3: STOP: coast to stop; E.F.: ramp to stop	0	
02.03	PWM Carrier Frequency Selections	2 to 12kHz	8	
02.04	Motor Direction Control	0: Enable forward/reverse operation 1: Disable reverse operation 2: Disabled forward operation	0	
02.05	Line Start Lockout	0: Disable. Operation status is not changed even if operation command source Pr.02.01 is changed. 1: Enable. Operation status is not changed even if operation command source Pr.02.01 is changed. 2: Disable. Operation status will change if operation command source Pr.02.01 is changed. 3: Enable. Operation status will change if operation command source Pr.02.01 is changed.	1	
02.06	Loss of ACI Signal (4-20mA)	0: Decelerate to 0 Hz 1: Coast to stop and display "AErr" 2: Continue operation by last frequency command	1	
02.07	Up/Down Mode	0: by UP/DOWN Key 1: Based on accel/decel time 2: Constant speed (Pr.02.08) 3: Pulse input unit (Pr.02.08)	0	
02.08	Accel/Decel Rate of Change of UP/DOWN Operation with Constant Speed	0.01~10.00 Hz	0.01	
✗02.09	Source of Second Frequency Command	0: Digital keypad UP/DOWN keys or Multi-function Inputs UP/DOWN. Last used frequency saved. 1: 0 to +10V from AVI 2: 4 to 20mA from ACI 3: RS-485 (RJ-45) communication 4: Digital keypad potentiometer	0	

Pr.	Explanation	Settings	Factory Setting	NOTE
✔02.10	Combination of the First and Second Master Frequency Command	0: First Master Frequency Command 1: First Master Frequency Command+ Second Master Frequency Command 2: First Master Frequency Command - Second Master Frequency Command	0	
✔02.11	Keypad Frequency Command	0.00 to 600.0Hz	60.00	
✔02.12	Communication Frequency Command	0.00 to 600.0Hz	60.00	
02.13	The Selections for Saving Keypad or Communication Frequency Command	0: Save Keypad & Communication Frequency 1: Save Keypad Frequency only 2: Save Communication Frequency only	0	
02.14	Initial Frequency Selection (for keypad & RS485)	0: by Current Freq Command 1: by Zero Freq Command 2: by Frequency Display at Stop	0	
02.15	Initial Frequency Setpoint (for keypad & RS485)	0.00 ~ 600.0Hz	60.00	
02.16	Display the Master Freq Command Source	Read Only Bit0=1: by First Freq Source (Pr.02.00) Bit1=1: by Second Freq Source (Pr.02.09) Bit2=1: by Multi-input function	##	
02.17	Display the Operation Command Source	Read Only Bit0=1: by Digital Keypad Bit1=1: by RS485 communication Bit2=1: by External Terminal 2/3 wire mode Bit3=1: by Multi-input function	##	
02.18	User-defined Value 2 Setting	0 to Pr.00.13	0	
02.19	User-defined Value 2	0 to 9999	##	
Group 3 Output Function Parameters				
03.00	Multi-function Output Relay (RA1, RB1, RC1)	0: No function 1: AC drive operational 2: Master frequency attained 3: Zero speed 4: Over torque detection 5: Base-Block (B.B.) indication 6: Low-voltage indication 7: Operation mode indication 8: Fault indication 9: Desired frequency attained 10: Terminal count value attained 11: Preliminary count value attained 12: Over Voltage Stall supervision 13: Over Current Stall supervision 14: Heat sink overheat warning 15: Over Voltage supervision 16: PID supervision	8	

Pr.	Explanation	Settings	Factory Setting	NOTE
03.00	Multi-function Output Relay (RA1, RB1, RC1)	17: Forward command 18: Reverse command 19: Zero speed output signal 20: Warning(FbE,Cexx, AoL2, AUE, SAvE) 21: Brake control (Desired frequency attained) 22: AC motor drive ready		
03.01	Reserved			
03.02	Desired Frequency Attained	0.00 to 600.0Hz	0.00	
✔03.03	Analog Output Signal Selection (AFM)	0: Analog frequency meter 1: Analog current meter	0	
✔03.04	Analog Output Gain	1 to 200%	100	
03.05	Terminal Count Value	0 to 9999	0	
03.06	Preliminary Count Value	0 to 9999	0	
03.07	EF Active When Terminal Count Value Attained	0: Terminal count value attained, no EF display 1: Terminal count value attained, EF active	0	
03.08	Fan Control	0: Fan always ON 1: 1 minute after AC motor drive stops, fan will be OFF 2: Fan ON when AC motor drive runs, fan OFF when AC motor drive stops 3: Fan ON when preliminary heatsink temperature attained	0	
03.09	Reserved			
03.10	Reserved			
03.11	Brake Release Frequency	0.00 to 20.00Hz	0.00	
03.12	Brake Engage Frequency	0.00 to 20.00Hz	0.00	
03.13	Display the Status of Relay	Read only	##	
Group 4 Input Function Parameters				
✔04.00	Keypad Potentiometer Bias	0.0 to 100.0 %	0.0	
✔04.01	Keypad Potentiometer Bias Polarity	0: Positive bias 1: Negative bias	00	
✔04.02	Keypad Potentiometer Gain	0.1 to 200.0 %	100.0	
04.03	Keypad Potentiometer Negative Bias, Reverse Motion Enable/Disable	0: No negative bias command 1: Negative bias: REV motion enabled	0	
04.04	2-wire/3-wire Operation Control Modes	0: 2-wire: FWD/STOP, REV/STOP 1: 2-wire: FWD/REV, RUN/STOP 2: 3-wire operation	0	
04.05	Multi-function Input Terminal (MI3)	0: No function 1: Multi-Step speed command 1 2: Multi-Step speed command 2	1	

Pr.	Explanation	Settings	Factory Setting	NOTE
04.06	Multi-function Input Terminal (MI4)	3: Multi-Step speed command 3 4: Multi-Step speed command 4 5: External reset 6: Accel/Decel inhibit 7: Accel/Decel time selection command 8: Jog Operation 9: External base block 10: Up: Increment master frequency 11: Down: Decrement master frequency 12: Counter Trigger Signal	2	
04.07	Multi-function Input Terminal (MI5)	13: Counter reset 14: E.F. External Fault Input 15: PID function disabled 16: Output shutoff stop 17: Parameter lock enable	3	
04.08	Multi-function Input Terminal (MI6)	18: Operation command selection (external terminals) 19: Operation command selection(keypad) 20: Operation command selection(communication) 21: FWD/REV command 22: Source of second frequency command	4	
04.09	Multi-function Input Contact Selection	Bit0:MI1 Bit1:MI2 Bit2:MI3 Bit3:MI4 Bit4:MI5 Bit5:MI6 0:N.O., 1:N.C. P.S.: MI1 to MI3 will be invalid when it is 3-wire control.	0	
04.10	Digital Terminal Input Debouncing Time	1 to 20 (*2ms)	1	
04.11	Min AVI Voltage	0.0 to 10.0V	0.0	
04.12	Min AVI Frequency	0.0 to 100.0%	0.0	
04.13	Max AVI Voltage	0.0 to 10.0V	10.0	
04.14	Max AVI Frequency	0.0 to 100.0%	100.0	
04.15	Min ACI Current	0.0 to 20.0mA	4.0	
04.16	Min ACI Frequency	0.0 to 100.0%	0.0	
04.17	Max ACI Current	0.0 to 20.0mA	20.0	
04.18	Max ACI Frequency	0.0 to 100.0%	100.0	
04.19 | 04.25	Reserved			
04.26	Display the Status of Multi-function Input Terminal	Read only. Bit0: MI1 Status Bit1: MI2 Status Bit2: MI3 Status Bit3: MI4 Status Bit4: MI5 Status Bit5: MI6 Status	##	

Pr.	Explanation	Settings	Factory Setting	NOTE
04.27	Internal/External Multi-function Input Terminals Selection	0~4095	0	
✔04.28	Internal Terminal Status	0~4095	0	
Group 5 Multi-Step Speed Parameters				
✔05.00	1st Step Speed Frequency	0.00 to 600.0 Hz	0.00	
✔05.01	2nd Step Speed Frequency	0.00 to 600.0 Hz	0.00	
✔05.02	3rd Step Speed Frequency	0.00 to 600.0 Hz	0.00	
✔05.03	4th Step Speed Frequency	0.00 to 600.0 Hz	0.00	
✔05.04	5th Step Speed Frequency	0.00 to 600.0 Hz	0.00	
✔05.05	6th Step Speed Frequency	0.00 to 600.0 Hz	0.00	
✔05.06	7th Step Speed Frequency	0.00 to 600.0 Hz	0.00	
✔05.07	8th Step Speed Frequency	0.00 to 600.0 Hz	0.00	
✔05.08	9th Step Speed Frequency	0.00 to 600.0 Hz	0.00	
✔05.09	10th Step Speed Frequency	0.00 to 600.0 Hz	0.00	
✔05.10	11th Step Speed Frequency	0.00 to 600.0 Hz	0.00	
✔05.11	12th Step Speed Frequency	0.00 to 600.0 Hz	0.00	
✔05.12	13th Step Speed Frequency	0.00 to 600.0 Hz	0.00	
✔05.13	14th Step Speed Frequency	0.00 to 600.0 Hz	0.00	
✔05.14	15th Step Speed Frequency	0.00 to 600.0 Hz	0.00	
Group 6 Protection Parameters				
06.00	Over-Voltage Stall Prevention	115/230V series: 330.0V to 410.0V 460V series: 660.0V to 820.0V 0.0: Disable over-voltage stall prevention	390.0V 780.0V	
06.01	Over-Current Stall Prevention during Accel	0:Disable 20 to 250%	170	
06.02	Over-Current Stall Prevention during Operation	0:Disable 20 to 250%	170	

Pr.	Explanation	Settings	Factory Setting	NOTE
06.03	Over-Torque Detection Mode (OL2)	0: Disabled 1: Enabled during constant speed operation. After the over-torque is detected, keep running until OL1 or OL occurs. 2: Enabled during constant speed operation. After the over-torque is detected, stop running. 3: Enabled during accel. After the over-torque is detected, keep running until OL1 or OL occurs. 4: Enabled during accel. After the over-torque is detected, stop running.	0	
⤢06.04	Over-Torque Detection Level	10 to 200%	150	
06.05	Over-Torque Detection Time	0.1 to 60.0 sec	0.1	
06.06	Electronic Thermal Overload Relay Selection	0: Standard motor (self cooled by fan) 1: Special motor (forced external cooling) 2: Disabled	2	
06.07	Electronic Thermal Characteristic	30 to 600 sec	60	
06.08	Present Fault Record	0: No fault 1: Over current (oc) 2: Over voltage (ov) 3: IGBT Overheat (oH1) 4: Reserved 5: Overload (oL) 6: Overload1 (oL1) 7: Motor over load (oL2) 8: External fault (EF) 9: Current exceeds 2 times rated current during accel.(ocA)	0	
06.09	Second Most Recent Fault Record	10: Current exceeds 2 times rated current during decel.(ocd) 11: Current exceeds 2 times rated current during steady state operation (ocn) 12: Ground fault (GFF)		
06.10	Third Most Recent Fault Record	13: Reserved 14: Phase-Loss (PHL) 15: Reserved 16: Auto Acel/Decel failure (CFA) 17: SW/Password protection (codE) 18: Power Board CPU WRITE failure (cF1.0) 19: Power Board CPU READ failure (cF2.0) 20: CC, OC Hardware protection failure (HPF1) 21: OV Hardware protection failure (HPF2) 22: GFF Hardware protection failure (HPF3) 23: OC Hardware protection failure (HPF4)		
06.11	Fourth Most Recent Fault Record	24: U-phase error (cF3.0) 25: V-phase error (cF3.1) 26: W-phase error (cF3.2) 27: DCBUS error (cF3.3)		

Pr.	Explanation	Settings	Factory Setting	NOTE
06.12	Fifth Most Recent Fault Record	28: IGBT Overheat (cF3.4) 29: Reserved 30: Reserved 31: Reserved 32: ACI signal error (AErr) 33: Reserved 34: Motor PTC overheat protection (PtC1) 35-40: Reserved		
		Group 7 Motor Parameters		
✎07.00	Motor Rated Current	30 %FLA to 120% FLA	FLA	
✎07.01	Motor No-Load Current	0%FLA to 99% FLA	0.4*FLA	
✎07.02	Torque Compensation	0.0 to 10.0	0.0	
✎07.03	Slip Compensation (Used without PG)	0.00 to 10.00	0.00	
07.04 | 07.09	Reserved			
07.10	Accumulative Motor Operation Time (Min.)	0 to 1439 Min.	0	
07.11	Accumulative Motor Operation Time (Day)	0 to 65535 Day	0	
07.12	Motor PTC Overheat Protection	0: Disable 1: Enable	0	
07.13	Input Debouncing Time of the PTC Protection	0~9999(*2ms)	100	
07.14	Motor PTC Overheat Protection Level	0.1~10.0V	2.4	
07.15	Motor PTC Overheat Warning Level	0.1~10.0V	1.2	
07.16	Motor PTC Overheat Reset Delta Level	0.1~5.0V	0.6	
07.17	Treatment of the Motor PTC Overheat	0: Warn and RAMP to stop 1: Warn and COAST to stop 2: Warn and keep running	0	
		Group 8 Special Parameters		
08.00	DC Braking Current Level	0 to 100%	0	
08.01	DC Braking Time during Start-Up	0.0 to 60.0 sec	0.0	
08.02	DC Braking Time during Stopping	0.0 to 60.0 sec	0.0	
08.03	Start-Point for DC Braking	0.00 to 600.0Hz	0.00	
08.04	Momentary Power Loss Operation Selection	0: Operation stops after momentary power loss 1: Operation continues after momentary power loss, speed search starts with the Master Frequency reference value 2: Operation continues after momentary power loss, speed search starts with the minimum frequency	0	

Pr.	Explanation	Settings	Factory Setting	NOTE
08.05	Maximum Allowable Power Loss Time	0.1 to 5.0 sec	2.0	
08.06	Base-block Speed Search	0: Disable speed search 1: Speed search starts with last frequency command 2: Starts with minimum output frequency	1	
08.07	B.B. Time for Speed Search	0.1 to 5.0 sec	0.5	
08.08	Current Limit for Speed Search	30 to 200%	150	
08.09	Skip Frequency 1 Upper Limit	0.00 to 600.0 Hz	0.00	
08.10	Skip Frequency 1 Lower Limit	0.00 to 600.0 Hz	0.00	
08.11	Skip Frequency 2 Upper Limit	0.00 to 600.0 Hz	0.00	
08.12	Skip Frequency 2 Lower Limit	0.00 to 600.0 Hz	0.00	
08.13	Skip Frequency 3 Upper Limit	0.00 to 600.0 Hz	0.00	
08.14	Skip Frequency 3 Lower Limit	0.00 to 600.0 Hz	0.00	
08.15	Auto Restart After Fault	0 to 10 (0=disable)	0	
08.16	Auto Reset Time at Restart after Fault	0.1 to 6000 sec	60.0	
08.17	Auto Energy Saving	0: Disable 1: Enable	0	
08.18	AVR Function	0: AVR function enable 1: AVR function disable 2: AVR function disable for decel. 3: AVR function disable for stop	0	
08.19	Reserved			
✗08.20	Compensation Coefficient for Motor Instability	0.0~5.0	0.0	
Group 9 Communication Parameters				
09.00	Communication Address	1 to 254	1	
09.01	Transmission Speed	0: Baud rate 4800bps 1: Baud rate 9600bps 2: Baud rate 19200bps 3: Baud rate 38400bps	1	
09.02	Transmission Fault Treatment	0: Warn and keep operating 1: Warn and ramp to stop 2: Warn and coast to stop 3: No warning and keep operating	3	
09.03	Time-out Detection	0.1 ~ 120.0 seconds 0.0: Disable	0.0	

Pr.	Explanation	Settings	Factory Setting	NOTE
09.04	Communication Protocol	0: 7,N,2 (Modbus, ASCII) 1: 7,E,1 (Modbus, ASCII) 2: 7,O,1 (Modbus, ASCII) 3: 8,N,2 (Modbus, RTU) 4: 8,E,1 (Modbus, RTU) 5: 8,O,1 (Modbus, RTU) 6: 8,N,1 (Modbus, RTU) 7: 8,E,2 (Modbus, RTU) 8: 8,O,2 (Modbus, RTU) 9: 7,N,1 (Modbus, ASCII) 10: 7,E,2 (Modbus, ASCII) 11: 7,O,2 (Modbus, ASCII)	0	
09.05	Reserved			
09.06	Reserved			
09.07	Response Delay Time	0 ~ 200 (unit: 2ms)	1	
Group 10 PID Control Parameters				
10.00	PID Set Point Selection	0: Disable PID operation 1: Keypad (based on Pr.02.00) 2: 0 to +10V from AVI 3: 4 to 20mA from ACI 4: PID set point (Pr.10.11)	0	
10.01	Input Terminal for PID Feedback	0: Positive PID feedback from external terminal AVI (0 ~ +10VDC) 1: Negative PID feedback from external terminal AVI (0 ~ +10VDC) 2: Positive PID feedback from external terminal ACI (4 ~ 20mA) 3: Negative PID feedback from external terminal ACI (4 ~ 20mA)	0	
✗10.02	Proportional Gain (P)	0.0 to 10.0	1.0	
✗10.03	Integral Time (I)	0.00 to 100.0 sec (0.00=disable)	1.00	
✗10.04	Derivative Control (D)	0.00 to 1.00 sec	0.00	
10.05	Upper Bound for Integral Control	0 to 100%	100	
10.06	Primary Delay Filter Time	0.0 to 2.5 sec	0.0	
10.07	PID Output Freq Limit	0 to 110%	100	
10.08	PID Feedback Signal Detection Time	0.0 to 3600 sec (0.0 disable)	60.0	
10.09	Treatment of the Erroneous PID Feedback Signals	0: Warn and RAMP to stop 1: Warn and COAST to stop 2: Warn and keep operation	0	
10.10	Gain Over the PID Detection Value	0.0 to 10.0	1.0	
✗10.11	Source of PID Set point	0.00 to 600.0Hz	0.00	
10.12	PID Feedback Level	1.0 to 50.0%	10.0	

Pr.	Explanation	Settings	Factory Setting	NOTE
10.13	Detection Time of PID Feedback	0.1 to 300.0 sec	5.0	
10.14	Sleep/Wake Up Detection Time	0.0 to 6550 sec	0.0	
10.15	Sleep Frequency	0.00 to 600.0 Hz	0.00	
10.16	Wakeup Frequency	0.00 to 600.0 Hz	0.00	
10.17	Minimum PID Output Frequency Selection	0: By PID control 1: By minimum output frequency (Pr.01.05)	0	
10.18	PID Control Detection Signal Reference	1.0 to 99.9	99.9	
10.19	PID Calculation Mode Selection	0: Series mode 1: Parallel mode	0	
10.20	Treatment of the Erroneous PID Feedback Level	0: Keep operating 1: Coast to stop 2: Ramp to stop 3: Ramp to stop and restart after time set in Pr.10.21	0	
10.21	Restart Delay Time after Erroneous PID Deviation Level	1 to 9999 sec	60	
✔ 10.22	Set Point Deviation Level	0 to 100%	0	
10.23	Detection Time of Set Point Deviation Level	0 to 9999 sec	10	
✔ 10.24	Offset Level of Liquid Leakage	0 to 50%	0	
✔ 10.25	Liquid Leakage Change Detection	0 to 100% (0: disable)	0	
✔ 10.26	Time Setting for Liquid Leakage Change	0.1 to 10.0 sec (0: disable)	0.5	
10.27 | 10.33	Reserved			

Fault Codes

| Fault Name	Fault Descriptions	Corrective Actions
OC	**Over current** Abnormal increase in current.	1. Check if motor power corresponds with the AC motor drive output power. 2. Check the wiring connections to U/T1, V/T2, W/T3 for possible short circuits. 3. Check the wiring connections between the AC motor drive and motor for possible short circuits, also to ground. 4. Check for loose contacts between AC motor drive and motor. 5. Increase the Acceleration Time.

Fault Name	Fault Descriptions	Corrective Actions
		6. Check for possible excessive loading conditions at the motor.
		7. If there are still any abnormal conditions when operating the AC motor drive after a short-circuit is removed and the other points above are checked, it should be sent back to manufacturer.
$L u$	**Low voltage** The AC motor drive detects that the DC bus voltage has fallen below its minimum value.	1. Check whether the input voltage falls within the AC motor drive rated input voltage range. 2. Check whether the motor has sudden load. 3. Check for correct wiring of input power to R-S-T (for 3-phase models) without phase loss.
$O u$	**Over voltage** The DC bus voltage has exceeded its maximum allowable value.	1. Check if the input voltage falls within the rated AC motor drive input voltage range. 2. Check for possible voltage transients. 3. DC-bus over-voltage may also be caused by motor regeneration. Either increase the Decel. Time or add an optional brake resistor (and brake unit). 4. Check whether the required braking power is within the specified limits.
$oH1$	**Overheating** Heat sink temperature too high	1. Ensure that the ambient temperature falls within the specified temperature range. 2. Make sure that the ventilation holes are not obstructed. 3. Remove any foreign objects from the heatsinks and check for possible dirty heat sink fins.
$oH1$	**Overheating** Heat sink temperature too high	1. Check the fan and clean it. 2. Provide enough spacing for adequate ventilation.
oL	**Overload** The AC motor drive detects excessive drive output current. **NOTE: The AC motor drive can withstand up to 150% of the rated current for a maximum of 60 seconds.**	1. Check whether the motor is overloaded. 2. Reduce torque compensation setting in Pr.07.02. 3. Take the next higher power AC motor drive model.
$oL1$	**Overload 1** Internal electronic overload trip	1. Check for possible motor overload. 2. Check electronic thermal overload setting. 3. Use a higher power motor. 4. Reduce the current level so that the drive output current does not exceed the value set by the Motor Rated Current Pr.07.00.
$oL2$	**Overload 2** Motor overload.	1. Reduce the motor load. 2. Adjust the over-torque detection setting to an appropriate setting (Pr.06.03 to Pr.06.05).
$HPF1$	**CC (current clamp)**	Return to the factory.
$HPF2$	**OV hardware error**	

Fault Name	Fault Descriptions	Corrective Actions
$HPF3$	**GFF hardware error**	Return to the factory.
$HPF4$	**OC hardware error**	
bb	**External Base Block.** (Refer to Pr. 08.07)	1. When the external input terminal (B.B) is active, the AC motor drive output will be turned off. 2. Deactivate the external input terminal (B.B) to operate the AC motor drive again.
ocA	**Over-current during acceleration**	1. Short-circuit at motor output: Check for possible poor insulation at the output lines. 2. Torque boost too high: Decrease the torque compensation setting in Pr.07.02. 3. Acceleration Time too short: Increase the Acceleration Time. 4. AC motor drive output power is too small: Replace the AC motor drive with the next higher power model.
EF	**External Fault**	1. When multi-function input terminals (MI3-MI9) are set to external fault, the AC motor drive stops output U, V and W. 2. Give RESET command after fault has been cleared.
ocd	**Over-current during deceleration**	1. Short-circuit at motor output: Check for possible poor insulation at the output line. 2. Deceleration Time too short: Increase the Deceleration Time. 3. AC motor drive output power is too small: Replace the AC motor drive with the next higher power model.
ocn	**Over-current during steady state operation**	1. Short-circuit at motor output: Check for possible poor insulation at the output line. 2. Sudden increase in motor loading: Check for possible motor stall. 3. AC motor drive output power is too small: Replace the AC motor drive with the next higher power model.
$cF1.0$	**Internal EEPROM can not be programmed.**	Return to the factory.
$cF1.1$	**Internal EEPROM can not be programmed.**	Return to the factory.
$cF2.0$	**Internal EEPROM can not be read.**	1. Press RESET key to set all parameters to factory setting. 2. Return to the factory.
$cF2.1$	**Internal EEPROM can not be read.**	1. Press RESET key to set all parameters to factory setting. 2. Return to the factory.
$cF3.0$	**U-phase error**	
$cF3.1$	**V-phase error**	
$cF3.2$	**W-phase error**	Return to the factory.
$cF3.3$	**OV or LV**	
$cF3.4$	**Temperature sensor error**	

Fault Name	Fault Descriptions	Corrective Actions
GFF	**Ground fault**	When (one of) the output terminal(s) is grounded, short circuit current is more than 50% of AC motor drive rated current, the AC motor drive power module may be damaged. **NOTE: The short circuit protection is provided for AC motor drive protection, not for protection of the user.** 1. Check whether the IGBT power module is damaged. 2. Check for possible poor insulation at the output line.
FbE	**PID feedback signal error**	1. Check parameter settings (Pr.10.01) and AVI/ACI wiring. 2. Check for possible fault between system response time and the PID feedback signal detection time (Pr.10.08)
cFA	**Auto accel/decel failure**	1. Check if the motor is suitable for operation by AC motor drive. 2. Check if the regenerative energy is too large. 3. Load may have changed suddenly.
$cE - -$	**Communication Error**	1. Check the RS485 connection between the AC motor drive and RS485 master for loose wires and wiring to correct pins. 2. Check if the communication protocol, address, transmission speed, etc. are properly set. 3. Use the correct checksum calculation. 4. Please refer to group 9 in the chapter 5 for detail information.
$codE$	**Software protection failure**	Return to the factory.
$AErr$	**Analog signal error**	Check the wiring of ACI
PHL	**Phase Loss**	Check Power Source Input if all 3 input phases are connected without loose contacts.

Dimensions are in mm [inch]
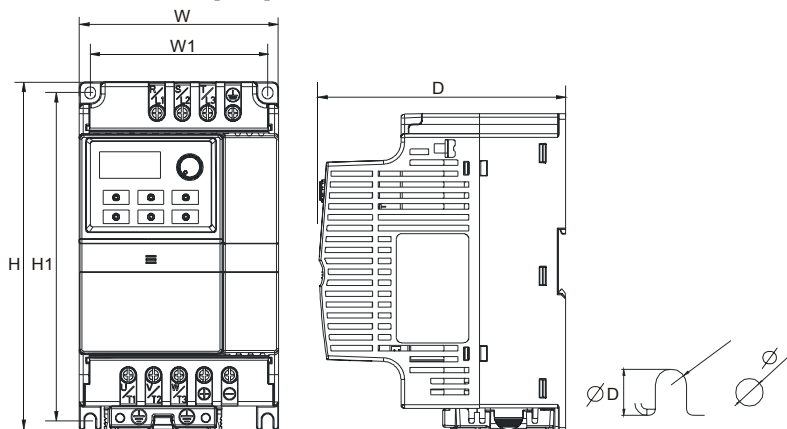
Frame	W	W1	H	H1	D	Ø	ØD
A	72.0[2.83]	59.0[2.32]	174.0[6.86]	151.6[5.97]	136.0[5.36]	5.4[0.21]	2.7[0.11]
B	100.0[3.94]	89.0[3.50]	174.0[6.86]	162.9[6.42]	136.0[5.36]	5.4[0.21]	2.7[0.11]

⬛▷ NOTE

Frame A: VFD002EL11A/21A/23A, VFD004EL11A/21A/23A/43A, VFD007EL21A/23A/43A,

VFD015EL23A/43A

Frame B: VFD007EL11A, VFD015EL21A, VFD022EL21A/23A/43A, VFD037EL23A/43A