The right choice for the ultimate yield!

LS ELECTRIC strives to maximize your profits in gratitude for choosing us as your partner.

AC Variable Speed Drive

SV-iP5A series

User's Manual

0.75-30kW [200V] 0.75-450kW [400V]



Safety Instructions

- Read this manual carefully before installing, wiring, operating, servicing or inspecting this equipment.
- Keep this manual within easy reach for quick reference.

LS ELECTRIC

Thank you for purchasing LS Variable Frequency Drives!

SAFETY INSTRUCTIONS

To prevent injury and property damage, follow these instructions during the installation and operation of the inverter.

Incorrect operation due to ignoring these instructions may cause harm or damage. The following symbols are used throughout the manual to highlight important information.

⚠ **DANGER**	This symbol indicates death or serious injury can occur if you do not follow instructions.
⚠ **WARNING**	This symbol indicates the possibility of death or serious injury.
⚠ **CAUTION**	This symbol indicates the possibility of damage to the inverter or other components.

■ The meaning of each symbol in this manual and on your equipment is as follows.

⚠ This is the safety alert symbol.
Read and follow instructions carefully to avoid a dangerous situation.

⚠ This symbol alerts the user to the presence of “dangerous voltage” inside the product that might cause bodily harm or electric shock.

■ This manual should be placed in a location where it can be accessed by users.

■ This manual should be given to the person who actually uses the inverter and is responsible for its maintenance.

⚠ WARNING

- **Do not remove the cover while power is applied or the unit is in operation.**
  Otherwise, electric shock could occur.
- **Do not operate the inverter with the front cover removed.**
  Otherwise, electric shock can occur due to the exposed terminals and bus bars.
- **Do not remove the cover except for periodic inspections or wiring, even if the input power is not applied.**
  Otherwise, electric shock can occur due to accessing capacitor banks.
- **Wiring and periodic inspections should be performed at least 10 minutes after disconnecting the input power and after checking the DC link voltage is discharged with a meter (below 30VDC).**
  Otherwise, electric shock could occur.
- **Operate the switches with dry hands.**
  Otherwise, electric shock could occur.
- **Do not use the cable when its insulating tube is damaged.**
  Otherwise, electric shock could occur.
- **Do not subject the cables to scratches, excessive stress, heavy loads or pinching.**
  Otherwise, electric shock could occur.

⚠ CAUTION

- **Install the inverter on a non-flammable surface. Do not place flammable materials nearby.**
  Otherwise, fire could occur.
- **Disconnect the input power if the inverter has been damaged.**
  Otherwise, it could result in a secondary accident and fire.
- **Do not touch the inverter after shutting down or disconnecting it. It will remain hot for a couple of minutes.**
  Otherwise, bodily injuries such as skin-burn or damage could occur.
- **Do not apply power to a damaged inverter or to an inverter with parts missing even if the installation is complete.**
  Otherwise, electric shock could occur.
- **Do not allow lint, paper, wood chips, dust, metallic chips or other foreign material into the drive.**
  Otherwise, fire or accident could occur.

- **Equipment is intended for installation in closed electrical operating areas only**
- **On User's Manual it shall be made clear that maintenance adjustments should be made by qualified personnel.**

OPERATING PRECAUTIONS

(1) Handling and installation

- The iP5A series inverter can be heavy. Lift according to the weight of the product. Use a hoist or crane to move and install the iP5A series inverter if necessary. Failure to do so may result in personal injury or damage to the inverter.
- Do not stack the inverter boxes higher than the number recommended.
- Install the inverter according to instructions specified in this manual.
- Do not open the cover during delivery.
- Do not place heavy items on the inverter.
- Check that the inverter mounting orientation is correct.
- Do not drop the inverter, or subject it to hard impact.
- Verify the ground impedance 100ohm or less for 230 V Class inverters and 10ohm or less for 460V class inverters.
- Take protective measures against ESD (Electrostatic Discharge) before touching the pcb boards during inspection, installation or repair.
- The inverter is designed for use under the following environmental conditions :

Environment	Ambient temp.	- 10 ~ 50 ℃ (14°F ~ 122°F) Decrease 2% of rated current for every 1℃ increase in above 40℃.
	Relative humidity	90% Relative Humidity or less (non-condensing)
	Storage temp.	- 20 ~ 65 ℃ (-4°F ~ 149°F)
	Location	Protected from corrosive gas, combustible gas, oil mist or dust (Pollution degree 2 environment)
	Altitude, Vibration	Max. 1,000m (3,300ft) above sea level, Max. 5.9m/sec^2 (0.6G) or less
	Atmospheric pressure	70 ~ 106 kPa (20.67 in Hg ~ 31.3 in Hg)

(2) Wiring

- Do not connect power factor correction capacitors, surge suppressors, or RFI filter to the output of the inverter.
- The connection orientation of the motor output cables U, V, W will affect the direction of rotation of the motor. Verify correct wiring before starting inverter.
- Incorrect terminal wiring could result in inverter and/or equipment damage.
- Reversing the polarity (+/-) of the terminals could damage the inverter.
- Only authorized personnel familiar with LS inverter should perform wiring and

inspections.
- Always install the inverter before wiring. Otherwise, electric shock or bodily injury can occur.
- Wire insulation recommended for main power circuits.(Refer to Appendix A)

(3) Trial run
- Check all parameters during operation. Parameter values might require adjustment depending on the application.
- Always apply voltage within the permissible range of each terminal as indicated in this manual. Otherwise, inverter damage may result.

- Current hunting can be occurred in the low speed territory during testing. It occurs where the capacity is above 110kW with no-load and the axis is not connected. The currnet hunting have a gap according to the motor characteristic. It will be disappeared when the load is connected and it is not the indication of abnormal condition. If the hunting is occurred seriously, please stop the testing and operates with the load.

(4) Operation precautions
- When the Auto restart function is selected, the inverter will restart after a fault has occurred.
- The Stop key on the keypad can only be used to stop the inverter when keypad control is enabled. Install a separate emergency stop switch if necessary.
- If a fault reset is made with the run command and /or reference signal present, a sudden start will occur. Check that the run command and /or reference signal is turned off in advance of resetting any faults. Otherwise an accident could occur.
- Do not modify the inverter.
- Depending on the motor specifications and user ETH overload settings, the motor may not be protected by electronic thermal function of inverter.
- The operation of the inverter is intended to be controlled by either keypad command or control input signals. Do not use a magnetic contactor or any other device that routinely disconnects the inverter and reconnects the inverter to the input supply power for the purpose of starting and stopping the motor.
- A noise filter may be installed to reduce the effect of electromagnetic interference. Otherwise nearby electronic equipment may be affected.
- In cases with input voltage unbalances, install an AC input reactor.
- Power Factor capacitors and generators may become overheated and damaged due to harmonics created by the inverter.
- Use an insulation-rectified motor or take measures to suppress the micro surge voltage when driving 460V class motor with inverter. A micro surge voltage attributable to wiring constant is generated at motor terminals, and may deteriorate insulation and damage motor.
- Before operating unit and prior to user programming, reset user parameters to default settings.

- The Inverter can be set to operate a motor at high-speeds. Verify the speed capability of motor and machinery prior to operating inverter.
- Holding torque is not produced when using the DC-Brake function. Install separate equipment when holding torque is required.

(5) Fault prevention precautions

- If required, provide a safety backup such as an emergency mechanical brake to prevent any hazardous conditions if the inverter fails during operation.

(6) Maintenance, inspection and parts replacement

- Do not megger (hi-pot or insulation resistance) test the power or control circuit of the inverter.
- Refer to 'Chapter 6 Troubleshooting and Maintenance' and parts replacement details.

(7) Disposal

- Handle the inverter as an industrial waste when disposing of it.

(8) General instructions

Many of the diagrams and drawings in this instruction manual show the inverter without a cover. Prior to operating the unit, be sure to restore covers and circuit protection according to specifications.

(9) Protective requirements

The accessible connections and parts listed below are of protective class 0, it means that the protection of these circuits relies only upon basic insulation and becomes hazardous in the event of a failure of the basic insulation. Therefore, devices connected to these circuits must provide electrical-shock protection as if the device was connected to supply mains voltage. In addition, during installation these parts must be considered, in relation with electrical-shock, as supply mains voltage circuits.

This applies to the following circuits :

STARTING CONTACT FUNCTION SELECT
➔ M1,M2,M3, FX [M7], RX [M8], JOG [M6], BX [M5], RST [M4], CM, 24
ANALOG FREQUENCY SETTING
➔ V+, V-, I, A0, B0, 5G (~30kW), CM(37kW~)
EXTERNAL MOTOR THERMAL DETECTION
➔ NT (~30kW), ET (37kw ~), 5G
BUILT-IN RS485 TERMINAL
➔ C+, C-, CM
ANALOG OUTPUT
➔ S0, S1, 5G
CONTACT
➔ 3A, 3C, 3B, "A1~4, C1~4"
CONSOLE PORT
FAN CIRCUITS

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Read and understand this manual before installing, operating or servicing this inverter. The inverter must be installed according to this manual.
The following conventions are used to indicate safety messages in this manual Failure to heed these messages could result in serious or possibly even fatal injury or damage to the products or to related equipment and systems.

CHAPTER 1 - BASIC INFORMATION

1.1 Inspection

- Remove the inverter from its packing and inspect its exterior for shipping damage. If damage is apparent notify the shipping agent and your LS ELECTRIC sales representative.
- Remove the cover and inspect the inverter for any apparent damage or foreign objects. Ensure that all mounting hardware and terminal connection hardware is properly seated, securely fastened, and undamaged.
- Check the nameplate on the iP5A inverter. Verify that the inverter unit is the correct horsepower and input voltage for the application.
- Inverter control is applied for AC asynchronous (Induction Motor) Synchronous motor is excluded.

1.1.1 Inverter model number

The numbering system of the inverter is as shown below.

SV 055 iP5A – 2 NE

Motor rating	
055	5.5kW
900	90kW

N : No Keypad
O : UL Open Type
E : UL Enclosed Type 1
L : Built-in DC Choke

Series Name
iP5A

Input Voltage	
2	200 - 230V
4	380 - 480V



* UL Open type : UL Open type product must be mounted on the panel in a house.
* UL Enclosed type 1 : UL Enclosed type1 product can be mounted without the panel in a house.

1.1.2 Installation

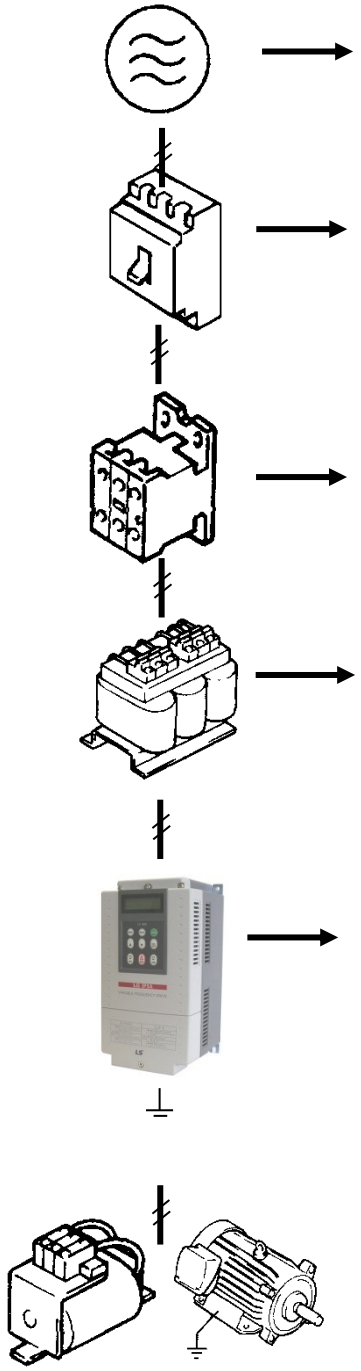
To operate the inverter reliably, install the inverter in a proper place with the correct direction and with the proper clearances.

1.1.3 Wiring

Connect the power supply, motor and operation signals (control signals) to the terminal block. Note that incorrect connection may damage the inverter and peripheral devices.

1.2 Basic configuration

The following devices are required to operate the inverter. Proper peripheral devices must be selected and correct connections made to ensure proper operation. An incorrectly applied or installed inverter can result in system malfunction or reduction in product life as well as component damage. You must read and understand this manual thoroughly before proceeding.



AC Source Supply	Use a power source with a voltage within the permissible range of inverter input power rating.
MCCB or Earth leakage circuit breaker (ELB)	Select circuit breakers or fuses in accordance with applicable national and local codes.
Inline Magnetic Contactor	Install if necessary. When installed, do not use it for the purpose of starting or stopping the drive. It can reduce the life of inverter.
AC Reactor	An AC reactor can be used when the harmonics are to be reduced and power factor is to be improved. One must be used when the inverter is installed on a power source with greater than 10 times the KVA rating of the drive.
AC Drive (SV-iP5A) Installation and wiring	To reliably operate the drive, install the inverter in the proper orientation and with proper clearances. Please pay attention, if the inverter is installed in the panel. Incorrect terminal wiring could result in the equipment damage. Control wire of control circuit must be wired separately with main ciruit wire to reduce the electric noise.
DC Reactor	A DC reactor may be used together with or in place of an AC reactor if necessary to reduce harmonics or improve power factor.
Motor	Do not connect power factor capacitors, surge arrestors or radio noise filters to the output side of the inverter.

CHAPTER 2 - SPECIFICATION

2.1 200~230V Class (0.75~30kW /1~40HP)

Model Number (SVxxxiP5A-2)				008	015	022	037	055	075	110	150	185	220	300
Capacity [kVA] (1)				1.9	3.0	4.6	6.1	9.1	12.2	17.5	22.9	28.2	33.5	43.8
Output ratings	Fan or pump load	Motor rating(2)	HP	1	2	3	5	7.5	10	15	20	25	30	40
			kW	0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30
		Current [A] (110% overload)		5	8	12	16	24	32	46	60	74	88	115
				110% 1Minute (Normal Duty)										
	General load	Motor rating(2)	HP	0.5	1	2	3	5	7.5	10	15	20	25	30
			kW	0.4	0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22
		Current [A] (150% overload)		2.5	5	8	12	17	23	33	44	54	68	84
				150% 1 Minute (Heavy Duty)										
	Frequency			0.01 ~ 120 Hz										
	Voltage			200 ~ 230 V(3)										
Input ratings	Voltage			3ϕ 200 ~ 230 V (-15% ~ +10 %)										
	Frequency			50/60 Hz (± 5 %)										
Protection degree				IP20 / UL Type1							IP00 / UL Open(3)			
Weight [kg (lbs.)]				4.1 (9.0)	4.2 (9.3)	4.2 (9.3)	4.9 (10.8)	4.9 (10.8)	6 (13.2)	6 (13.2)	13 (28.7)	13.5 (29.8)	20 (44.1)	20 (44.1)

2.2 380~480V Class (0.75~30kW / 1~40HP)

Model Number (SVxxxiP5A-4)				008	015	022	037	055	075	110	150	185	220	300
Capacity [kVA] (1)				2.0	3.2	4.8	6.4	9.6	12.7	19.1	23.9	31.1	35.9	48.6
Output ratings	Fan or pump load	Motor rating(2)	HP	1	2	3	5	7.5	10	15	20	25	30	40
			kW	0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30
		Current [A] (110% overload)		2.5	4	6	8	12	16	24	30	39	45	61
				110% 1Minute (Normal Duty)										
	General load	Motor rating(2)	HP	0.5	1	2	3	5	7.5	10	15	20	25	30
			kW	0.4	0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22
		Current [A]/ Built-in DCL Type (150% overload)		1.25	2.5	4	6	8.8	12	16	22/24	28/30	34/39	44/45
				150% 1 Minute (Heavy Duty)										
	Frequency			0.01 ~ 120 Hz										
	Voltage			380 ~ 480 V(3)										
Input ratings	Voltage			3ϕ 380 ~ 480 V (-15% ~ +10 %)										
	Frequency			50/60 Hz (± 5 %)										
Protection degree				IP20 / UL Type1							IP00 / UL Open(3)			
Weight [kg (lbs.)]	Standard Type			4.1 (9.04)	4.2 (9.26)	4.2 (9.26)	4.9 (10.8)	4.9 (10.8)	6 (13.2)	6 (13.2)	12.5 (27.6)	13 (28.7)	20 (44.1)	20 (44.1)
	Built-in DCL Type			-	-	-	-	-	-	-	19.5 (42.9)	19.5 (42.9)	26.5 (58.3)	26.5 (58.3)

2.3 380 ~ 480V Class (37~90kW / 50~125HP)

Model Number(SVxxxiP5A-4)				370	450	550	750	900
Capacity [kVA] (1)				59.8	72.5	87.6	121.1	145.8
Output ratings	Fan or pump load	motor rating(2)	HP	50	60	75	100	125
			kW	37	45	55	75	90
		Current [A] (110% overload)		75	91	110	152	183
				110% 1 Minute (Normal Duty)				
	General load	motor rating(2)	HP	40	50	60	75	100
			kW	30	37	45	55	75
		Current [A] (150% overload)		61	75	91	110	152
				150% 1 Minute (Heavy Duty)				
	Frequency			0.01 ~ 120 Hz				
	Voltage			380 ~ 480 V(3)				
Input ratings	Voltage			3ϕ 380 ~ 480 V (-15% ~ +10 %)				
	Frequency			50/60 Hz (± 5 %)				
Protection degree				IP00 / UL Open(3)				
Weight [kg (lbs.)]	Standard Type			27(59.5)	27(59.5)	29(64)	42(92.6)	43(94.8)
	Built-in DCL Type			39(86)	40(88.2)	42(92.6)	67(147.4)	68(149.9)

2.4 380 ~ 480V Class (110~450kW / 150~700HP)

Model Number(SVxxxiP5A-4)				1100	1320	1600	2200	2800	3150	3750	4500
Capacity [kVA] (1)				178	210	259	344	436	488	582	699
Output ratings	Fan or pump load	Motor rating(2)	HP	150	200	250	350	400	500	600	700
			kW	110	132	160	220	280	315	375	450
		Current [A] (110% overload)		223	264	325	432	547	613	731	877
				110% 1 Minute (Normal Duty)							
	General load	Motor rating(2)	HP	125	150	200	250	350	400	500	600
			kW	90	110	132	160	220	280	315	375
		Current [A] (150% overload)		183	223	264	325	432	547	613	731
				150% 1 Minute (Heavy Duty)							
	Frequency			0.01 ~ 120 Hz							
	Voltage			380 ~ 480 V(3)							
Input ratings	Voltage			3ϕ 380 ~ 480 V (15% ~ +10 %)							
	Frequency			50/60 Hz (± 5 %)							
Protection degree				IP00 / UL Open(4)							
DCL (DC Choke)				Built-in					External Option		

Weight [kg (lbs.)]	101 (222.7)	101 (222.7)	114 (251.3)	200 (441.9)	200 (441.9)	243 (535.7)	380 (837.7)	380 (837.7)

Common Specifications

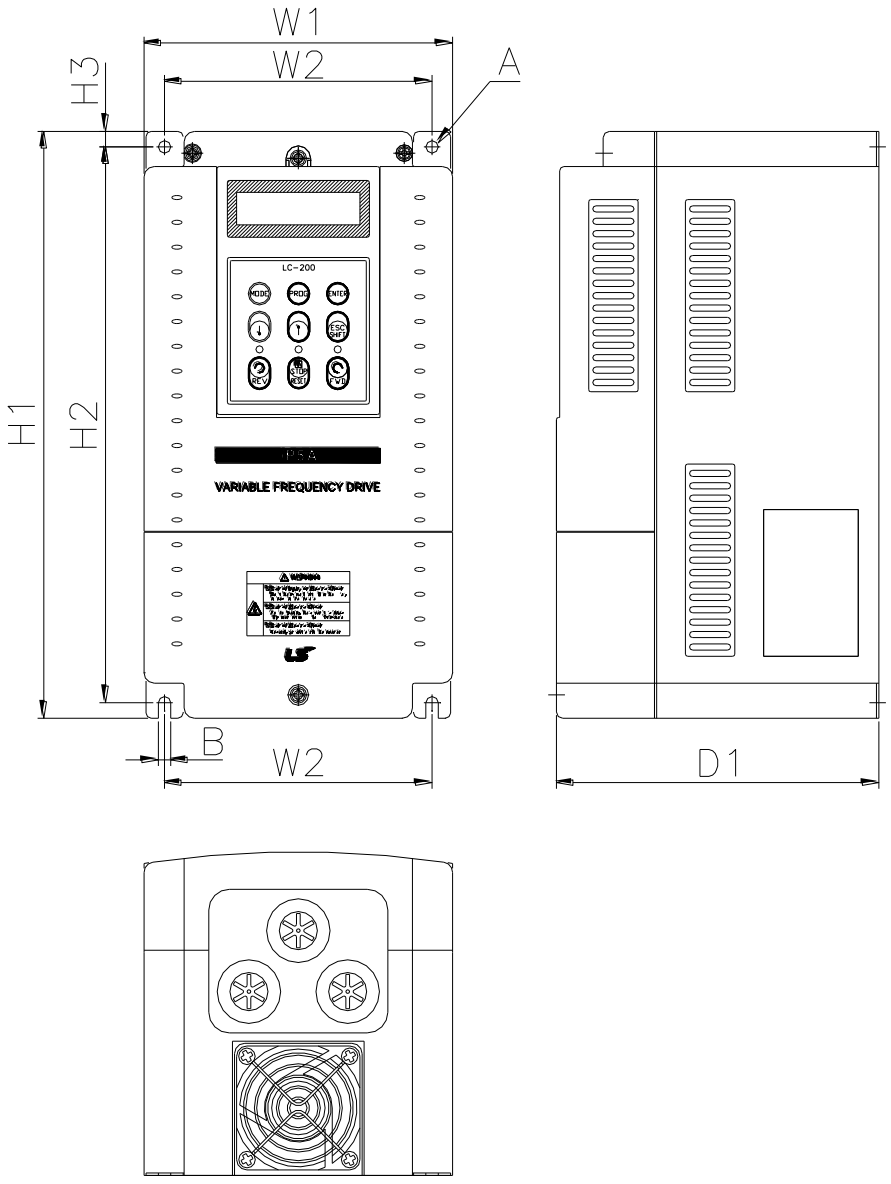
Cooling method			Forced air cooling (Self-cooling for below 1.5kW-2, 1.5kW-4)
Short Circuit Rating			65kA, suitable for use on a circuit capable of delivering not more than 100,000 RMS Symmetrical amperes, 240 (or 480V) volts maximum
Agency Approvals			UL and cUL listed, CE marked
CONTROL	Control Method		V/F, Sensorless Vector, Slip Compensation, Easy Start Selectable
	Frequency Setting Resolution		Digital Reference: 0.01 Hz (Below 100 Hz), 0.1 Hz (Over 100 Hz) Analog Reference: 0.01 Hz / 60 Hz
	Frequency Accuracy		Digital: 0.01 % of Max. Output Frequency Analog: 0.1 % of Max. Output Frequency
	V/F Ratio		Linear, Squared Pattern, User V/F
	Overload Capacity		110 % per 1 min, 120% per 1 min (5)
	Torque Boost		Manual Torque Boost (0 ~ 15 % settable), Auto Torque Boost
OPERATION	Operation Method		Keypad / Terminal / Communication Operation
	Frequency Setting		Analog: 0 ~ 12V / -12V ~ 12V / 4 ~ 20mA or 0~20mA/ Pulse / Ext-PID Digital: Keypad
	Input Signal	Start Signal	Forward, Reverse
		Multi-Step	Up to 18 Speeds can be set including Jog (Use Programmable Digital Input Terminal,Including Jog/Dwell)
		Multi Step Accel/Decel Time	0.1~ 6,000 sec, Max 4 types can be set via Multi- Function Terminal. Accel/Decel Pattern: Linear, U-Curve, S-Curve Selectable
		Emergency Stop	Interrupts the Output of Inverter
		Jog	Jog Operation
		Fault Reset	Trip Status is Reset when Protection Function is Active.
	Output signal	Operating Status	Frequency Detection Level, Overload Alarm, Stalling, Over Voltage, Low Voltage, Inverter Overheating/ Running/ Stopping/ Constant running, Inverter By-Pass, Speed Searching
		Fault Output	Contact Output (3A, 3C, 3B) – AC 250V 1A, DC 30V 1A
		Indicator	Choose 2 from Output Frequency, Output Current, Output Voltage, DC Link Voltage (Output Voltage: 0 ~ 10V)
	Operation Function		DC Braking, Frequency Limit, Frequency Jump, 2nd Function, Slip Compensation, Reverse Rotation Prevention, Auto Restart, Inverter By-Pass, Auto-Tuning, PID Control, Flying Start, Safety Stop, Flux Braking, Low leakage, Pre-PID, Dual-PID, MMC, Easy Start, Pre-heater

PROTECTION	Inverter Trip		Over Voltage, Low Voltage, Over Current, Ground Fault, Inverter Overheat, Motor Overheat, Output Phase Open, Overload Protection, External Fault 1, 2, Communication Error, Loss of Speed Command, Hardware Fault, Option Fault, etc.
	Inverter Alarm		Stall Prevention, Overload Alarm, Thermal Sensor Fault
DISPLAY	Keypad	Operation Information	Output Frequency, Output Current, Output Voltage, Frequency Set Value, Operating Speed, DC Voltage, Integrating Wattmeter, Fan ON time, Run-time, Last Trip Time
		Trip Information	Trips Indication when the Protection Function activates. Max. 5 Faults are saved. Last Trip Time.
ENVIRONMENT	Ambient Temperature		-10℃ ~ 50℃ (14℉ ~ 104℉) (Use loads less than 80% at 50℃)
	Storage Temperature		-20℃ ~ 65℃ (14℉ ~ 149℉)
	Ambient Humidity		Less Than 90 % RH Max. (Non-Condensing)
	Altitude – Vibration		Below 1,000m (3,300ft), Below 5.9m/sec^2 (0.6g)
	Application Site		Pollution degree 2, No Corrosive Gas, Combustible Gas, Oil Mist, or Dust

(1) Rated capacity (√3×V×I) is based on 220V for 200V class and 460V for 400V class.
(2) Indicates the maximum applicable capacity when using a 4-Pole standard motor.
(3) IP20 or UL Enclosed Type1 can be provided by the option.
(4) IP20 or UL Enclosed Type1 is not provided.
(5) Overload rating 120%, 1 min is based on ambient 25℃.

2.5 Dimensions

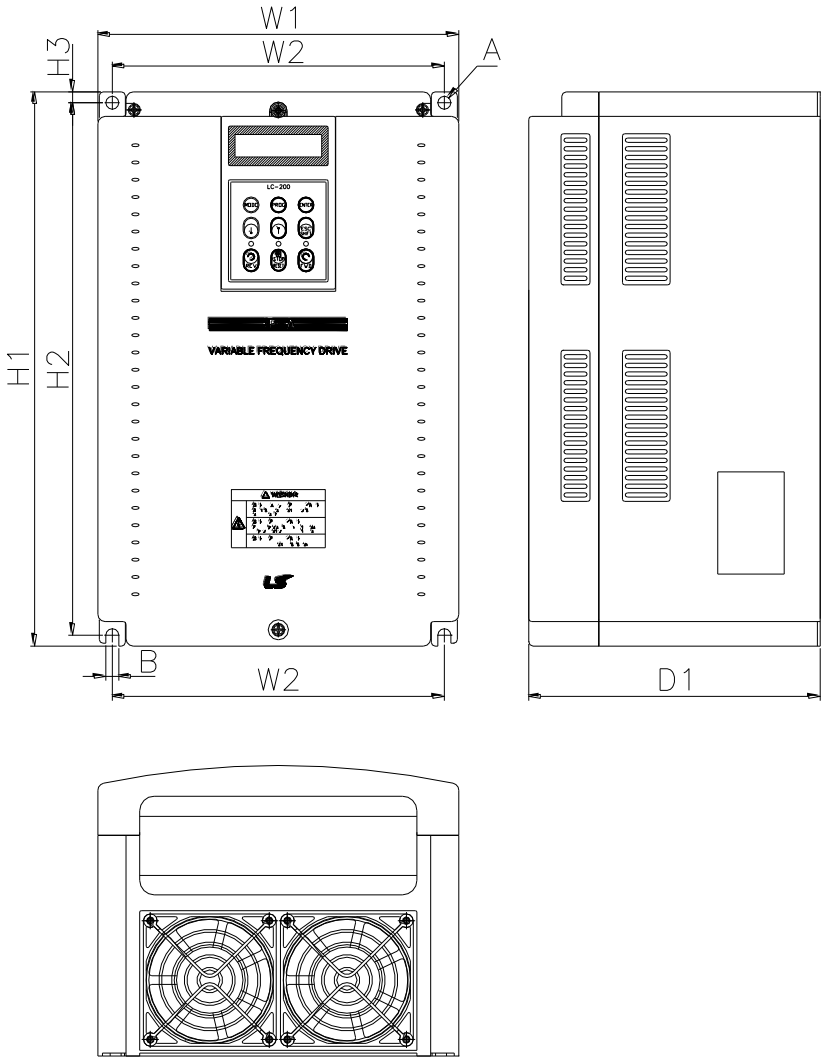
1) SV008~055iP5A (200/400V Class)



mm (inches)

Model	W1	W2	H1	H2	H3	A	B	D1	Enclosure Type
SV008 ~055iP5A-2/4	150 (5.91)	130 (5.12)	284 (11.18)	269 (10.69)	7.5 (0.29)	6 (0.23)	6 (0.23)	156.5 (6.16)	IP20 UL Type 1

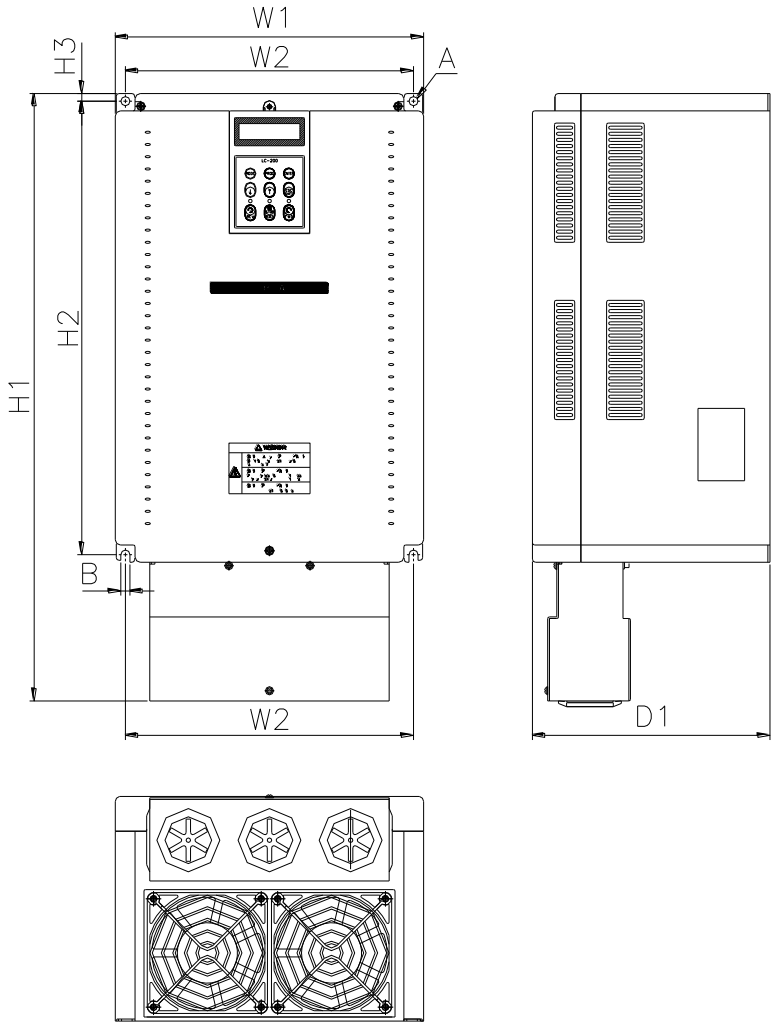
2) SV075~300iP5A (200/400V Class)



mm (inches)

Model	W1	W2	H1	H2	H3	D1	A	B	Enclosure Type
SV075iP5A-2/4	200 (7.87)	180 (7.09)	284 (11.18)	269 (10.69)	7.5 (0.29)	182 (7.16)	6 (0.23)	6 (0.23)	IP20 UL Type 1
SV110iP5A-2/4	200 (7.87)	180 (7.09)	284 (11.18)	269 (10.69)	7.5 (0.29)	182 (7.16)	6 (0.23)	6 (0.23)	IP20 UL Type 1
SV150iP5A-2/4	250 (9.84)	230 (9.06)	385 (15.16)	370 (14.57)	7.5 (0.29)	201 (7.91)	9 (0.35)	9 (0.35)	IP00 UL Open
SV185iP5A-2/4	250 (9.84)	230 (9.06)	385 (15.16)	370 (14.57)	7.5 (0.29)	201 (7.91)	9 (0.35)	9 (0.35)	IP00 UL Open
SV220iP5A-2/4	304 (11.97)	284 (11.18)	460 (18.11)	445 (17.52)	7.5 (0.29)	234 (9.21)	9 (0.35)	9 (0.35)	IP00 UL Open
SV300iP5A-2/4	304 (11.97)	284 (11.18)	460 (18.11)	445 (17.52)	7.5 (0.29)	234 (9.21)	9 (0.35)	9 (0.35)	IP00 UL Open

3) SV150~300iP5A (UL Type 1 or UL Open Type with Conduit Option used, 200V/400V Class)

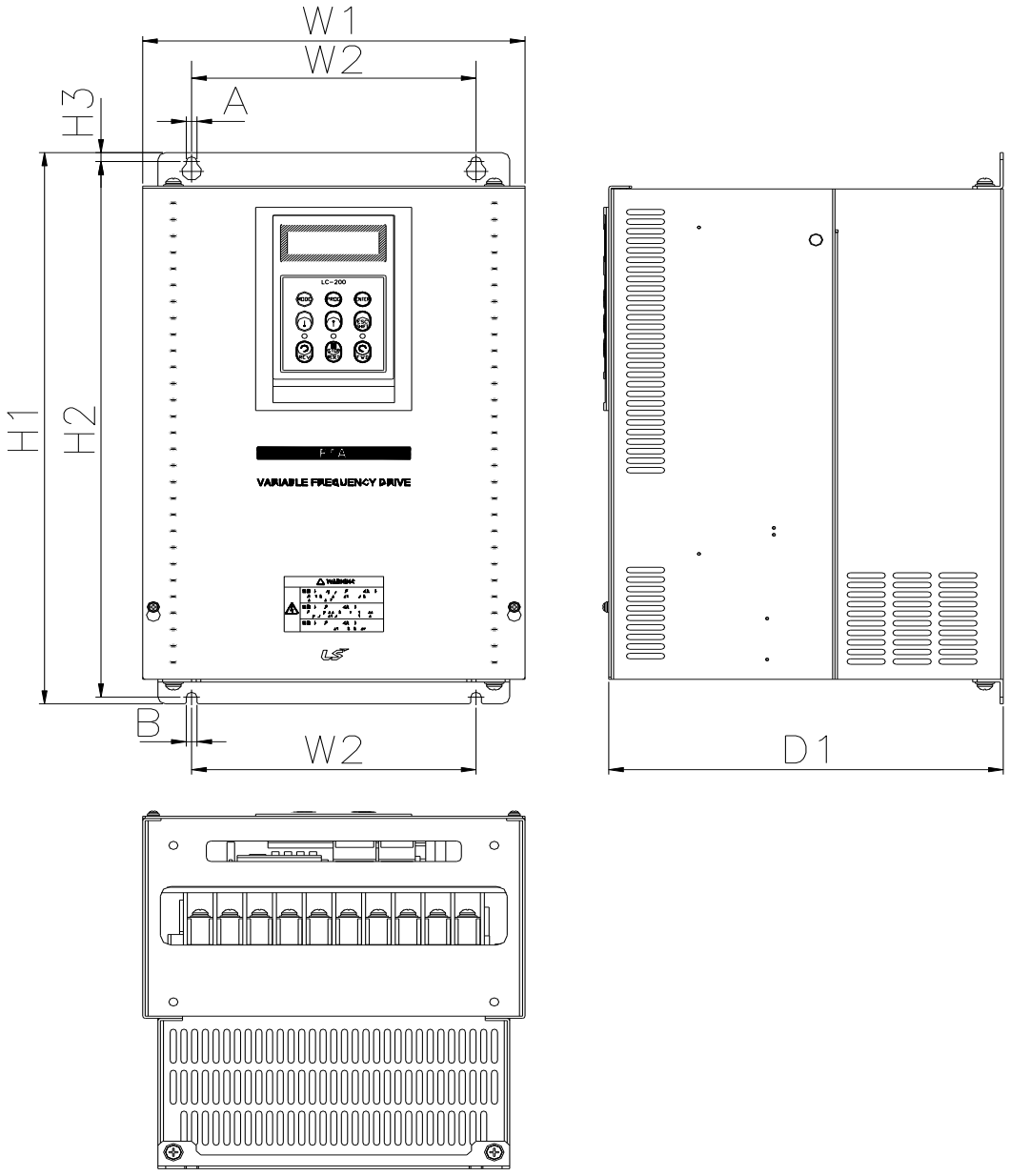


mm (inches)

Model	W1	W2	H1	H2	H3	D1	A	B	Enclosure Type
SV150iP5A-2/4	250 (9.84)	230 (9.06)	451.1 (17.75)	370 (14.57)	7.5 (0.29)	201 (7.91)	9 (0.35)	9 (0.35)	IP20 UL Type 1
SV185iP5A-2/4	250 (9.84)	230 (9.06)	451.1 (15.16)	370 (14.57)	7.5 (0.29)	201 (7.91)	9 (0.35)	9 (0.35)	IP20 UL Type 1
SV220iP5A-2/4	304 (11.97)	284 (11.18)	596.1 (23.46)	445 (17.52)	7.5 (0.29)	234 (9.21)	9 (0.35)	9 (0.35)	IP20 UL Type 1
SV300iP5A-2/4	304 (11.97)	284 (11.18)	596.1 (18.11)	445 (17.52)	7.5 (0.29)	234 (9.21)	9 (0.35)	9 (0.35)	IP20 UL Type 1

Note) Mounting NEMA 1 conduit option to the 15~90Kw(20~125HP) Open Type meets NEMA 1 but does not comply with UL Enclosed Type 1. To that end, please purchase UL Type 1 product.

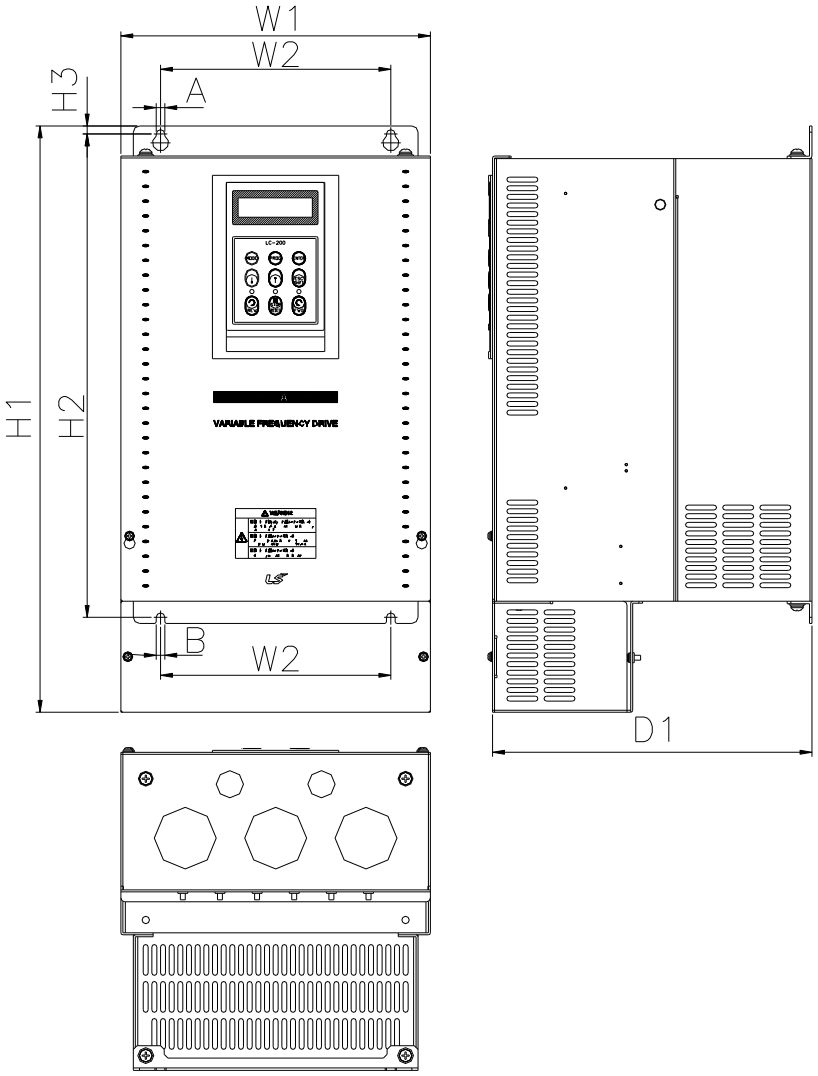
4) SV150 ~ SV300 iP5A (400V Class) – Built-in DCL Type



mm (inches)

Model	W1	W2	H1	H2	H3	D1	A	B	Enclosure Type
SV150, 185 iP5A-4L (Built-in DCL)	250 (9.84)	186 (7.32)	403.5 (15.88)	392 (15.43)	6.5 (0.25)	261.2 (10.28)	7 (0.27)	7 (0.27)	IP00 UL Type 1
SV220, 300 iP5A-4L (Built-in DCL)	260 (10.23)	220 (8.66)	480 (18.89)	468.5 (18.44)	6.5 (0.25)	268.6 (10.57)	7 (0.27)	7 (0.27)	IP20 UL Type 1

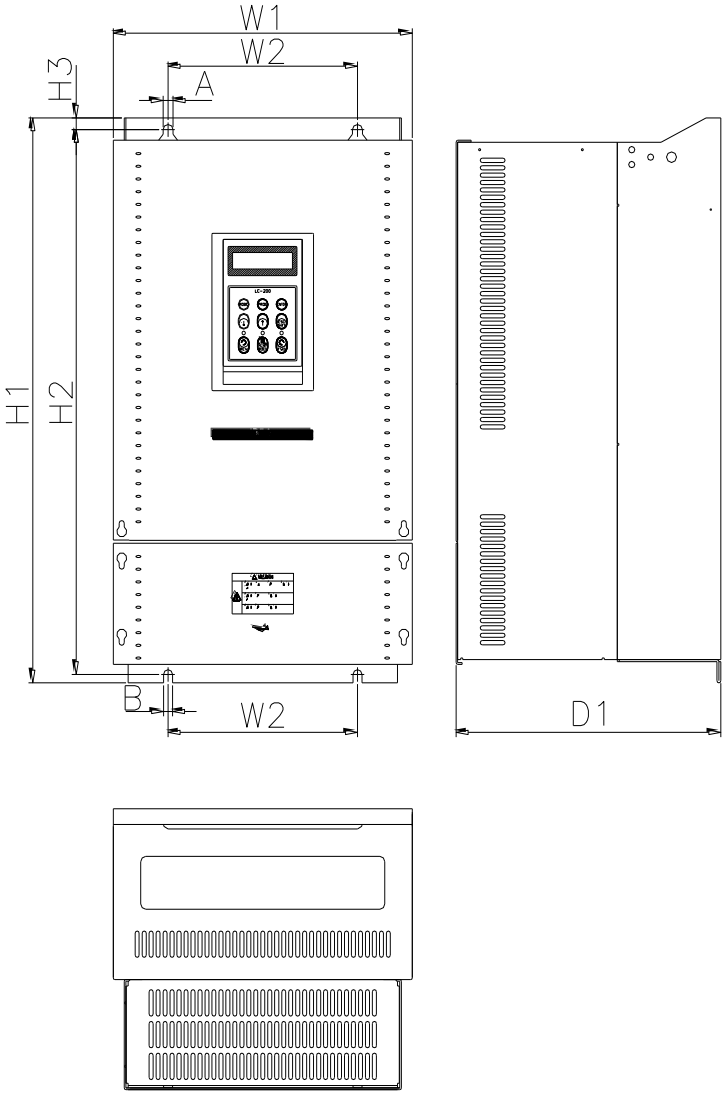
5) SV150 ~ SV300 iP5A (Built-in DCL Type, UL Type 1 or UL Open Type with Conduit Option used, 400V Class)



mm (inches)

Model	W1	W2	H1	H2	H3	D1	A	B	Enclosure Type
SV150, 185iP5A-4L (Built-in DCL Type)	250 (9.84)	186 (7.32)	475.5 (18.72)	392 (15.43)	6.5 (0.25)	261.2 (10.28)	7 (0.27)	7 (0.27)	IP20 UL Type 1
SV220, 300iP5A-4L (Built-in DCL Type)	260 (10.23)	220 (8.66)	552 (21.73)	468.5 (18.44)	6.5 (0.25)	268.6 (10.57)	7 (0.27)	7 (0.27)	IP20 UL Type 1

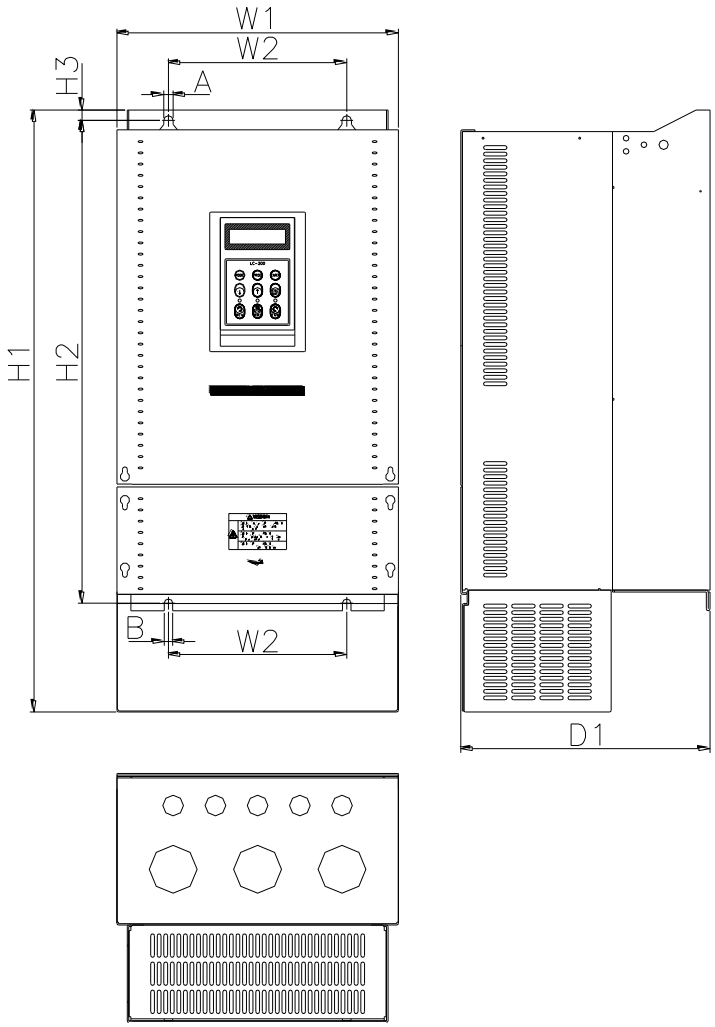
6) SV370 ~ SV550iP5A (400V Class)



mm (inches)

Model	W1	W2	H1	H2	H3	D1	A	B	Enclosure Type
SV370, 450 iP5A-4	300 (11.81)	190 (7.48)	534 (21.02)	515 (20.28)	11 (0.43)	265.6 (10.46)	10 (0.39)	9 (0.35)	IP00 UL Open
SV550iP5A-4	300 (11.81)	190 (7.48)	534 (21.02)	515 (20.28)	11 (0.43)	292.6 (11.52)	10 (0.39)	9 (0.35)	IP00 UL Open
SV370, 450 iP5A-4L (Built-in DCL)	300 (11.81)	190 (7.48)	684 (26.92)	665 (26.18)	11 (0.43)	265.6 (10.46)	10 (0.39)	9 (0.35)	IP00 UL Open
SV550 iP5A-4L (Built-in DCL)	300 (11.81)	190 (7.48)	684 (26.92)	665 (26.18)	11 (0.43)	292.6 (11.52)	10 (0.39)	9 (0.35)	IP00 UL Open

7) SV370~550iP5A (UL Type 1 or UL Open Type with Conduit Option Used, 400V Class)

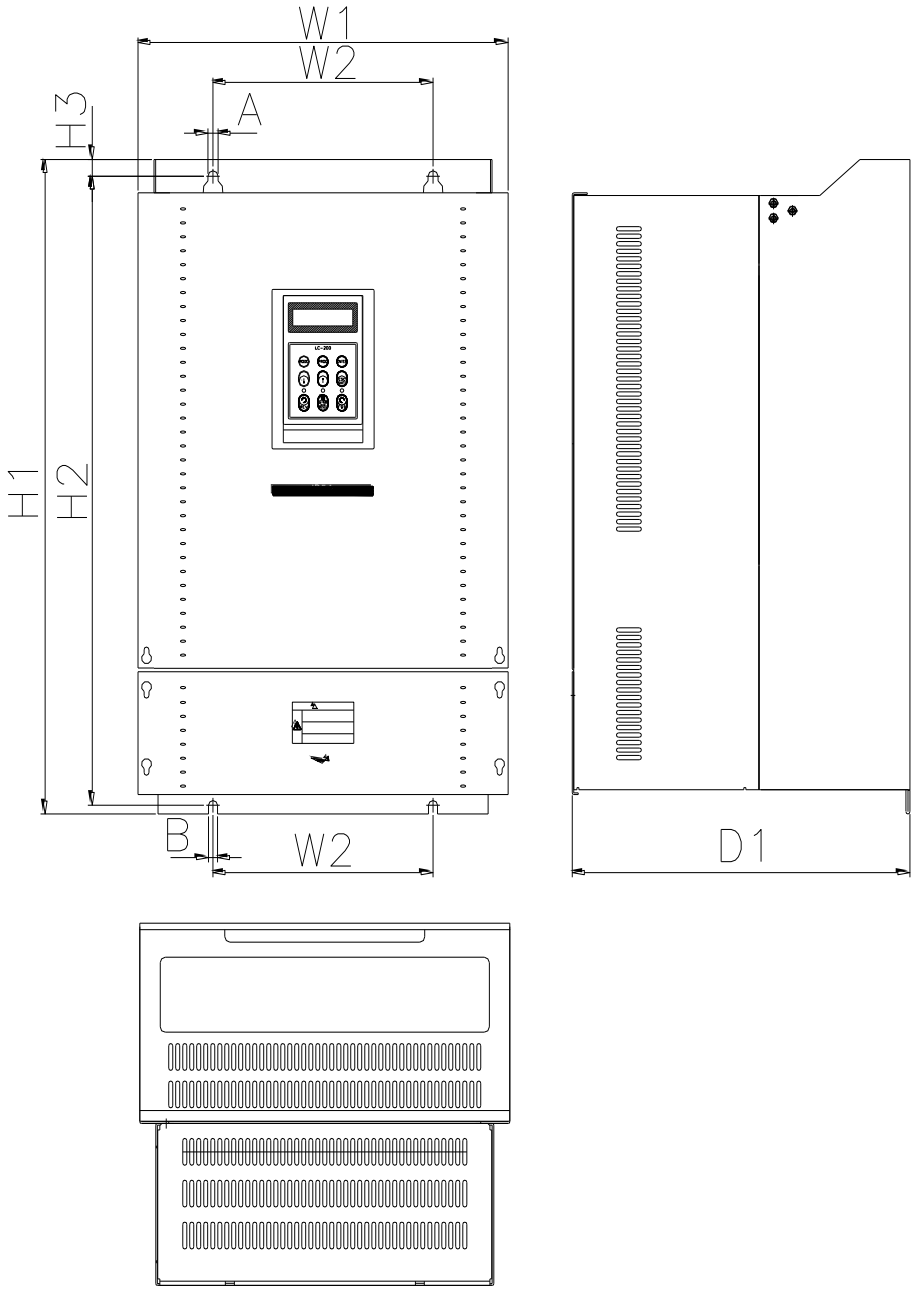


mm (inches)

Model	W1	W2	H1	H2	H3	D1	A	B	Enclosure Type
SV370, 450 iP5A-4	300 (11.81)	190 (7.48)	642 (25.28)	515 (20.28)	11 (0.43)	265.6 (10.46)	10 (0.39)	9 (0.35)	IP20 UL Type 1
SV550iP5A-4	300 (11.81)	190 (7.48)	642 (25.28)	515 (20.28)	11 (0.43)	292.6 (11.52)	10 (0.39)	9 (0.35)	IP20 UL Type 1
SV370, 450 iP5A-4L (Built-in DCL)	300 (11.81)	190 (7.48)	792 (31.18)	665 (26.18)	11 (0.43)	265.6 (10.46)	10 (0.39)	9 (0.35)	IP20 UL Type 1
SV550iP5A-4L (Built-in DCL)	300 (11.81)	190 (7.48)	792 (31.18)	665 (26.18)	11 (0.43)	292.6 (11.52)	10 (0.39)	9 (0.35)	IP20 UL Type 1

Note) Mounting NEMA 1 conduit option to the 15~90Kw(20~125HP) Open Type meets NEMA 1 but does not comply with UL Enclosed Type 1. To that end, please purchase UL Type 1 product.

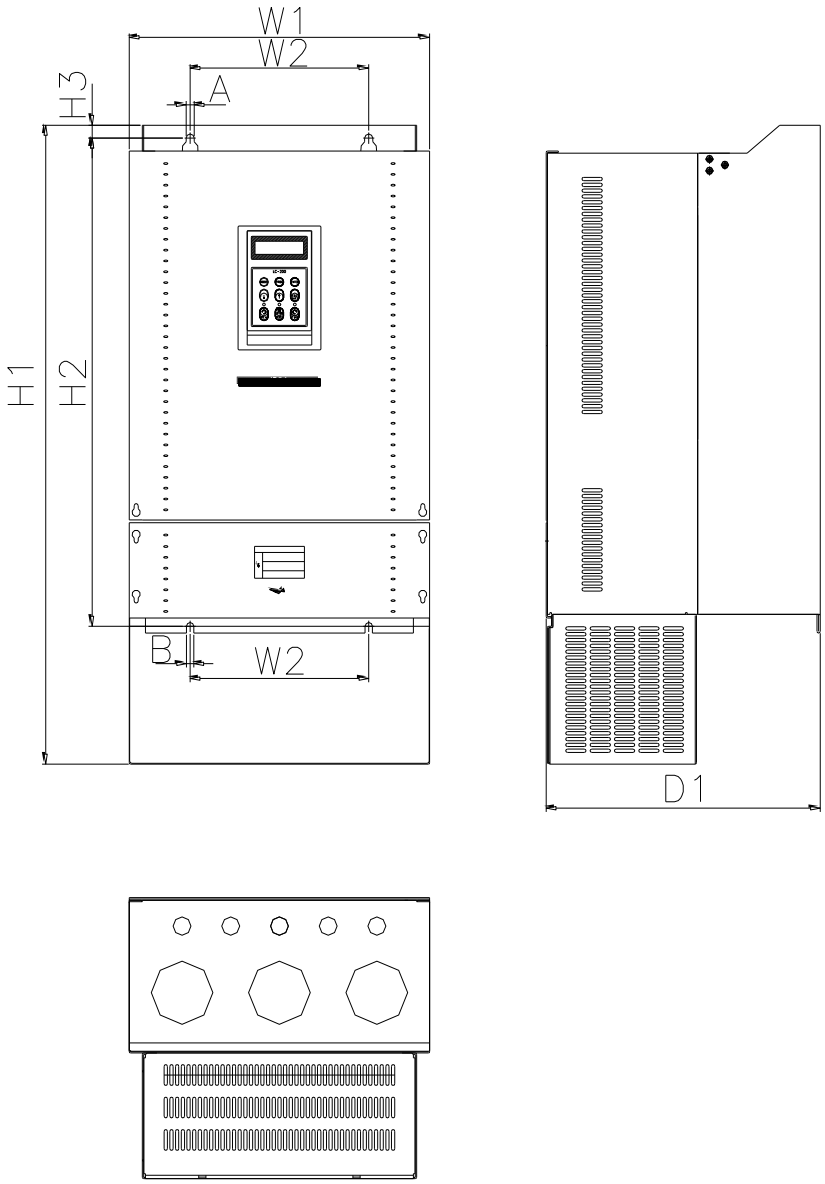
8) SV750, 900iP5A (400V Class)



mm (inches)

Model	W1	W2	H1	H2	H3	D1	A	B	Enclosure Type
SV750, 900iP5A-4	370 (14.57)	220 (8.66)	610 (24.02)	586.5 (23.09)	15.5 (0.61)	337.6 (13.29)	10 (0.39)	9 (0.35)	IP00 UL Open
SV750, 900iP5A-4L (Built-in DCL)	370 (14.57)	220 (8.66)	760 (29.92)	736.6 (28.99)	15.5 (0.61)	337.6 (13.29)	10 (0.39)	9 (0.35)	IP00 UL Open

9) SV750, 900iP5A (UL Type 1 or UL Open Type with Conduit Option used, 400V Class)

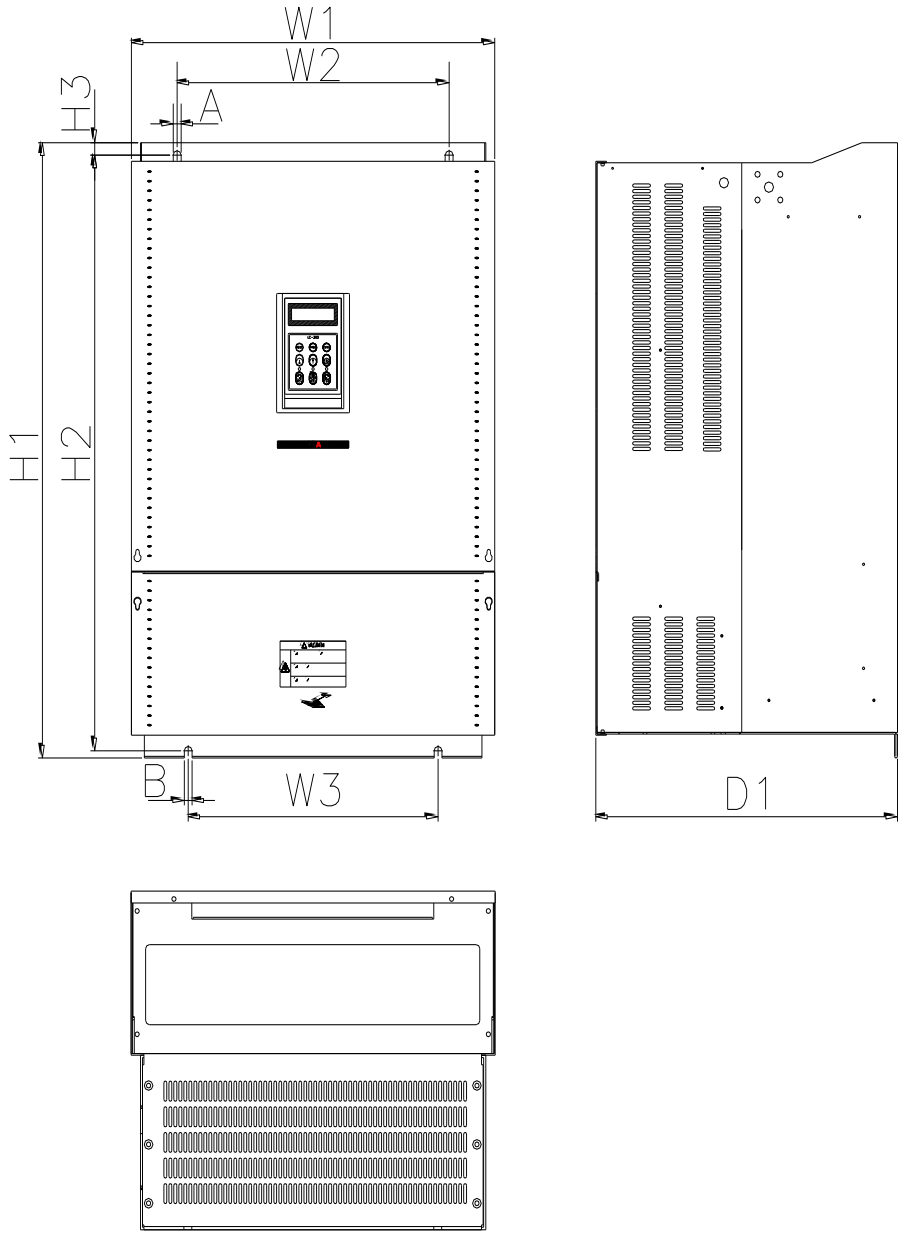


mm (inches)

Model	W1	W2	H1	H2	H3	D1	A	B	Enclosure Type
SV750,900iP5A-4	370 (14.57)	220 (8.66)	767.5 (30.22)	586.5 (23.09)	15.5 (0.61)	337.6 (13.29)	10 (0.39)	9 (0.35)	IP20 UL Type 1
SV750, 900iP5A-4L (Built-in DCL)	370 (14.57)	220 (8.66)	917.5 (36.12)	736.5 (28.99)	15.5 (0.61)	337.6 (13.29)	10 (0.39)	9 (0.35)	IP20 UL Type 1

Note) Mounting NEMA 1 conduit option to the 15~90Kw(20~125HP) Open Type meets NEMA 1 but does not comply with UL Enclosed Type 1. To that end, please purchase UL Type 1 product.

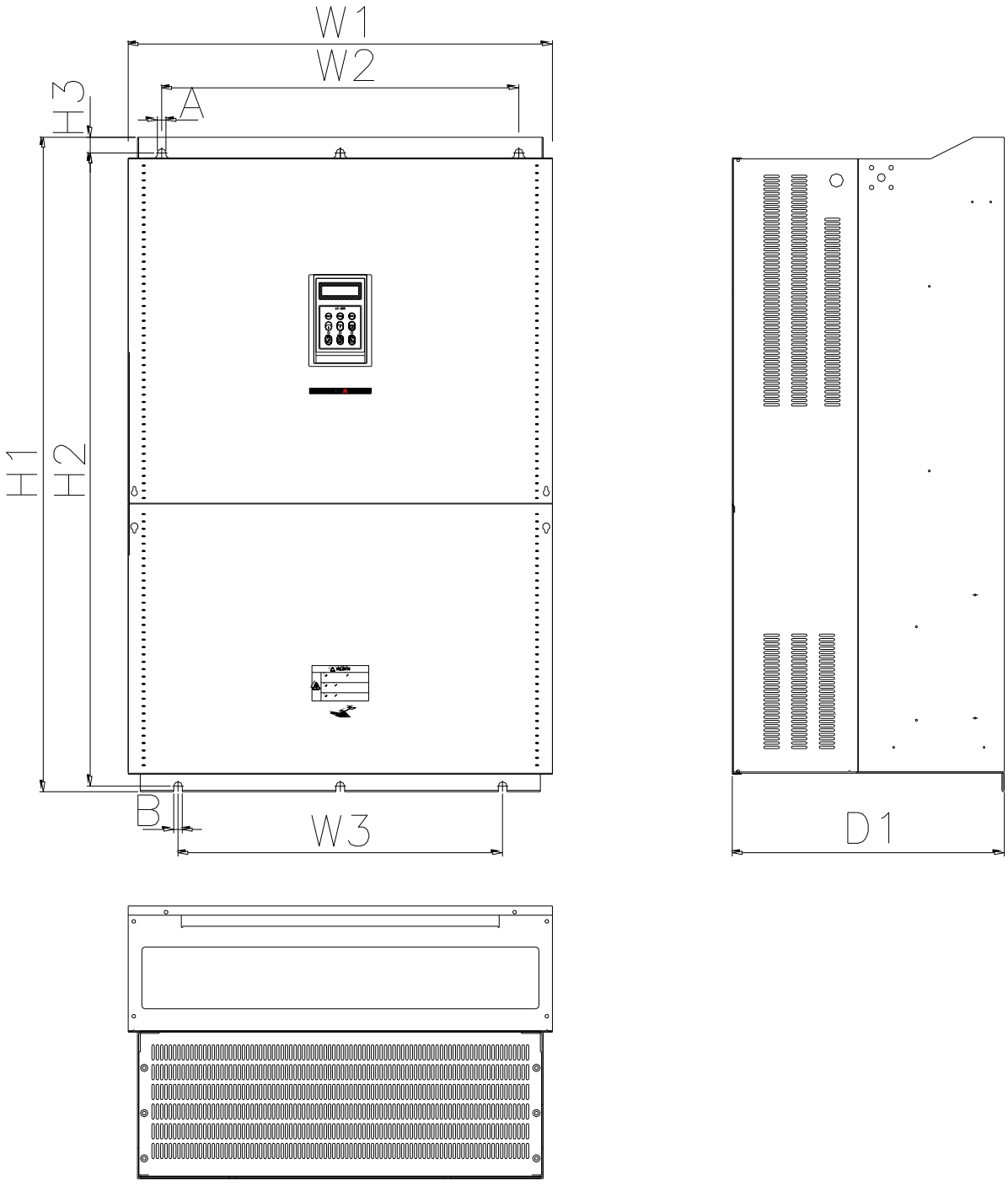
10) SV1100, 1600iP5A (400V Class)



mm(inches)

Model	W1	W2	W3	H1	H2	H3	D1	A	B	Enclosure Type
SV1100, 1320iP5A-4L	510 (20.08)	381 (15.00)	11 (0.43)	783.5 (30.85)	759 (29.88)	15.5 (0.61)	422.6 (16.64)	11 (0.43)	11 (0.43)	IP00 UL Open
SV1600iP5A-4L	510 (20.08)	381 (15.00)	11 (0.43)	861 (33.90)	836.5 (32.93)	15.5 (0.61)	422.6 (16.64)	11 (0.43)	11 (0.43)	IP00 UL Open

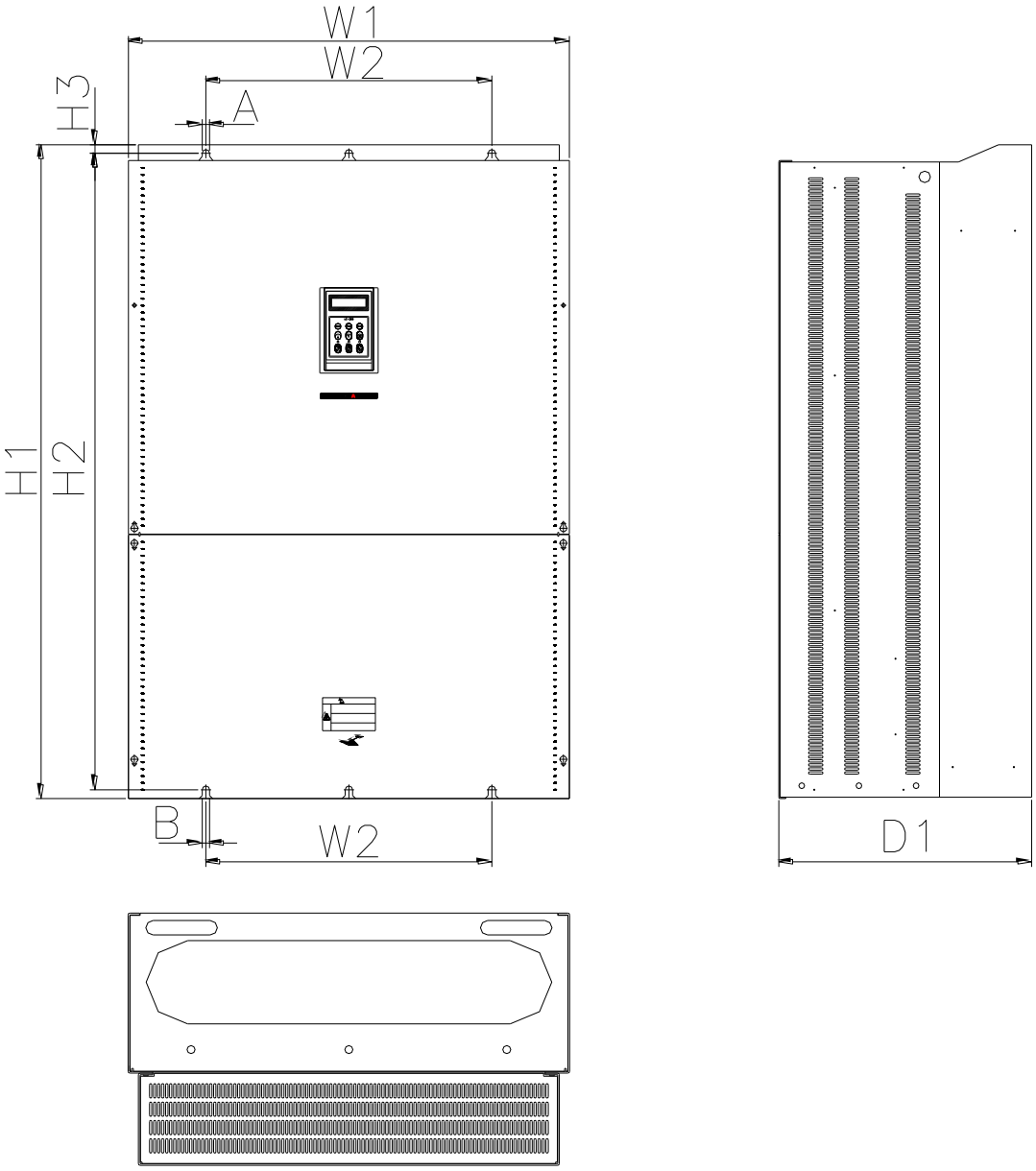
11) SV2200, 2800iP5A (400V Class)



mm (inches)

Model	W1	W2	W3	H1	H2	H3	D1	A	B	Enclosure Type
SV2200, 2800 iP5A-4L	690 (27.17)	581 (22.87)	14 (0.55)	1063 (41.85)	1043.5 (41.08)	25.5 (1.00)	449.6 (17.70)	14 (0.55)	14 (0.55)	IP00 UL Open

12) SV3150, 4500iP5A (400V Class)



mm (inches)

Model	W1	W2	H1	H2	H3	A	B	D1	Enclosure Type
SV3150iP5A-4	772 (30.39)	500 (19.69)	1140.5 (44.90)	1110 (43.70)	15 (0.59)	13 (0.51)	13 (0.51)	442 (17.40)	IP00 UL Open
SV3750, 4500iP5A-4	922 (36.30)	580 (22.83)	1302.5 (51.28)	1271.5 (50.06)	15.5 (0.61)	14 (0.55)	14 (0.55)	495 (19.49)	IP00 UL Open

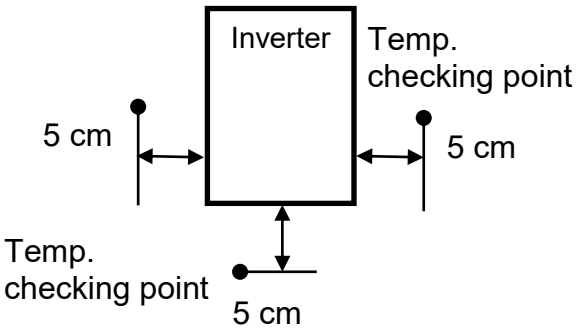
CHAPTER 3 - INSTALLATION

3.1 Installation precautions

1) Handle the inverter with care to prevent damage to the plastic components. Do not hold the inverter by the front cover.

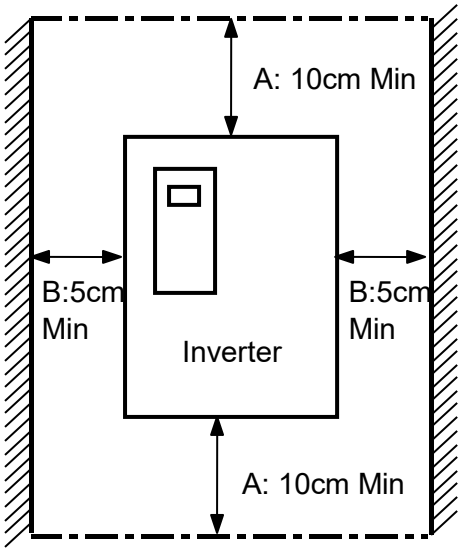
2) Do not mount the inverter in a location where excessive vibration (5.9 m/sec^2 or less) is present such as installing the inverter on a press or other moving equipment.

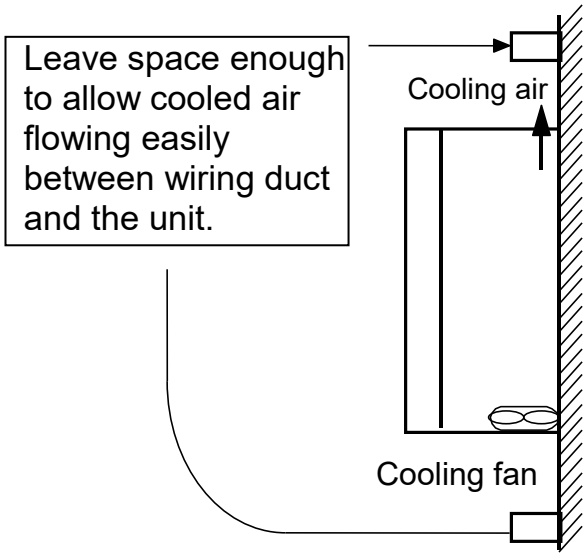
3) Install in a location where temperature is within the permissible range (-10~40°C).



4) The inverter will be very hot during operation. Install it on a non-combustible surface.

5) Mount the inverter on a flat, vertical and level surface. Inverter orientation must be vertical (top up) for proper heat dissipation. Also leave sufficient clearances around the inverter. However, A = Over 500mm and B = 200mm should be obtained for inverters rated 30kW and above.

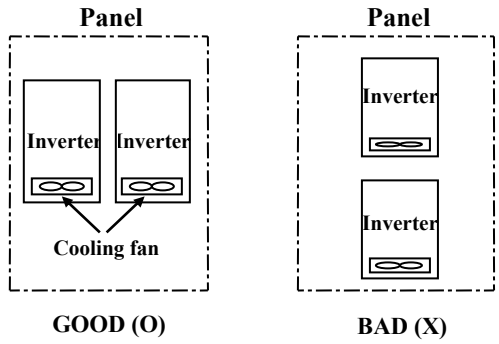




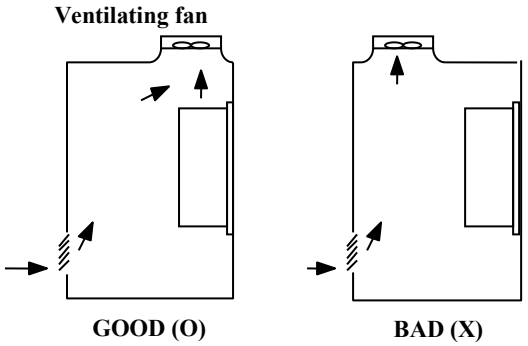
6) Do not mount the inverter in direct sunlight or near other heat sources.

7) The inverter shall be mounted in a Pollution Degree 2 environment. If the inverter is going to be installed in an environment with a high probability of dust, metallic particles, mists, corrosive gases, or other contaminates, the inverter must be located inside the appropriate electrical enclosure of the proper NEMA or IP rating.

8) When two or more inverters are installed or a ventilation fan is mounted in inverter panel, the inverters and ventilation fan must be installed in proper positions with extreme care taken to keep the ambient temperature of the inverters below the permissible value. If they are installed in improper positions, the ambient temperature of the inverters will rise.



[When installing several inverters in a panel]



[When installing a ventilating fan in a panel]

9) Install the inverter using screws or bolts to insure the inverter is firmly fastened.

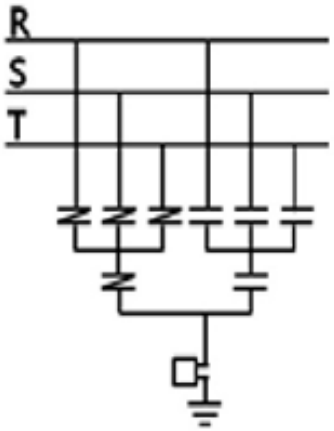
10) IP5A Series Drives contain protective MOVs and common mode capacitors that are referenced to ground. To guard against drive damage or operation problems, these devices must be properly configured according to below table

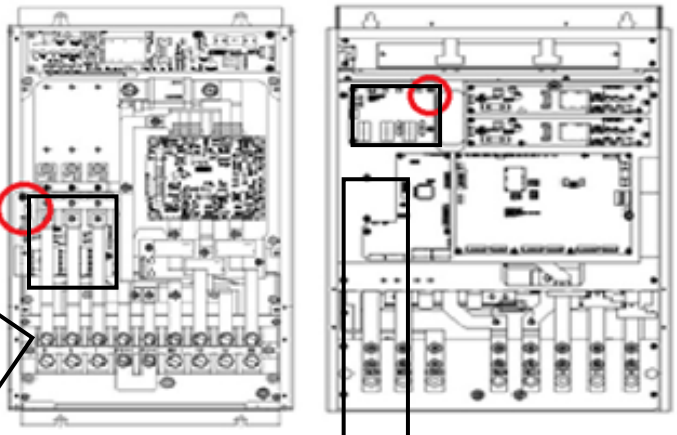
Power Source Type	MOV Input Filter Caps	Benefits
3-Phase AC grounded system	Connected	Reduced electrical noise, Most stable operation, Reduced voltage stress on components and motor bearings
3-Phase AC ungrounded system Impedance grounded	Disconnected	Helps avoid severe equipment damage when ground fault occurs

Note: 5.5~30kW and 575V Series are not supported.

⚠ To avoid drive's damage or electric shock, disconnect switch, When Drive's capacitors are discharged completely

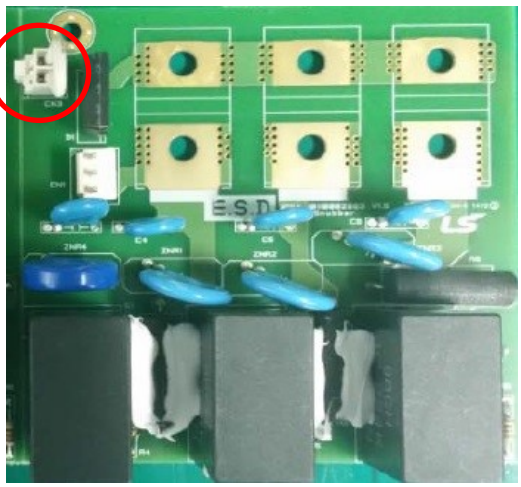
⚠ In case of surge and lighting don't flow in the grounded system , you can disconnect the switch.



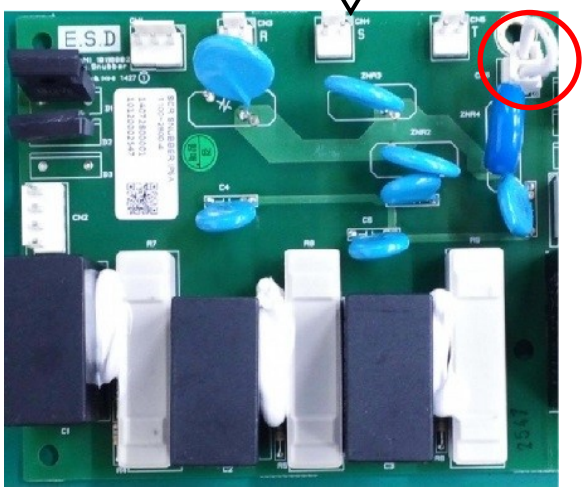


<MOV and AC EMI Capacitor Phase to Ground >

< Example of 37~90kW-4 >



< Example of 110~450kW-4 >

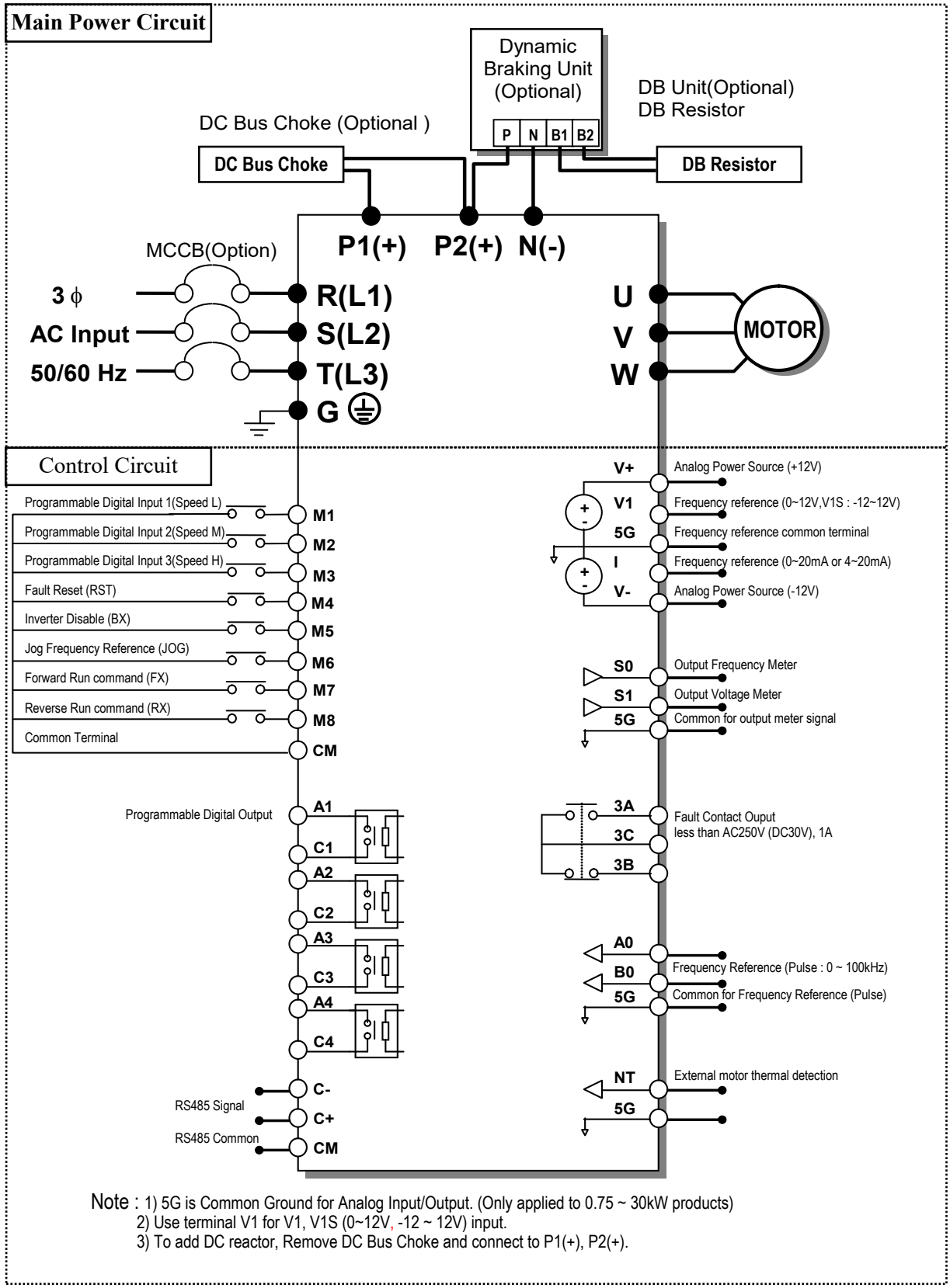


⚠ CAUTION	
	■ **Risk of Electric Shock** More than one disconnect switch may be required to de-energize the equipment before servicing.

3.2 Wiring

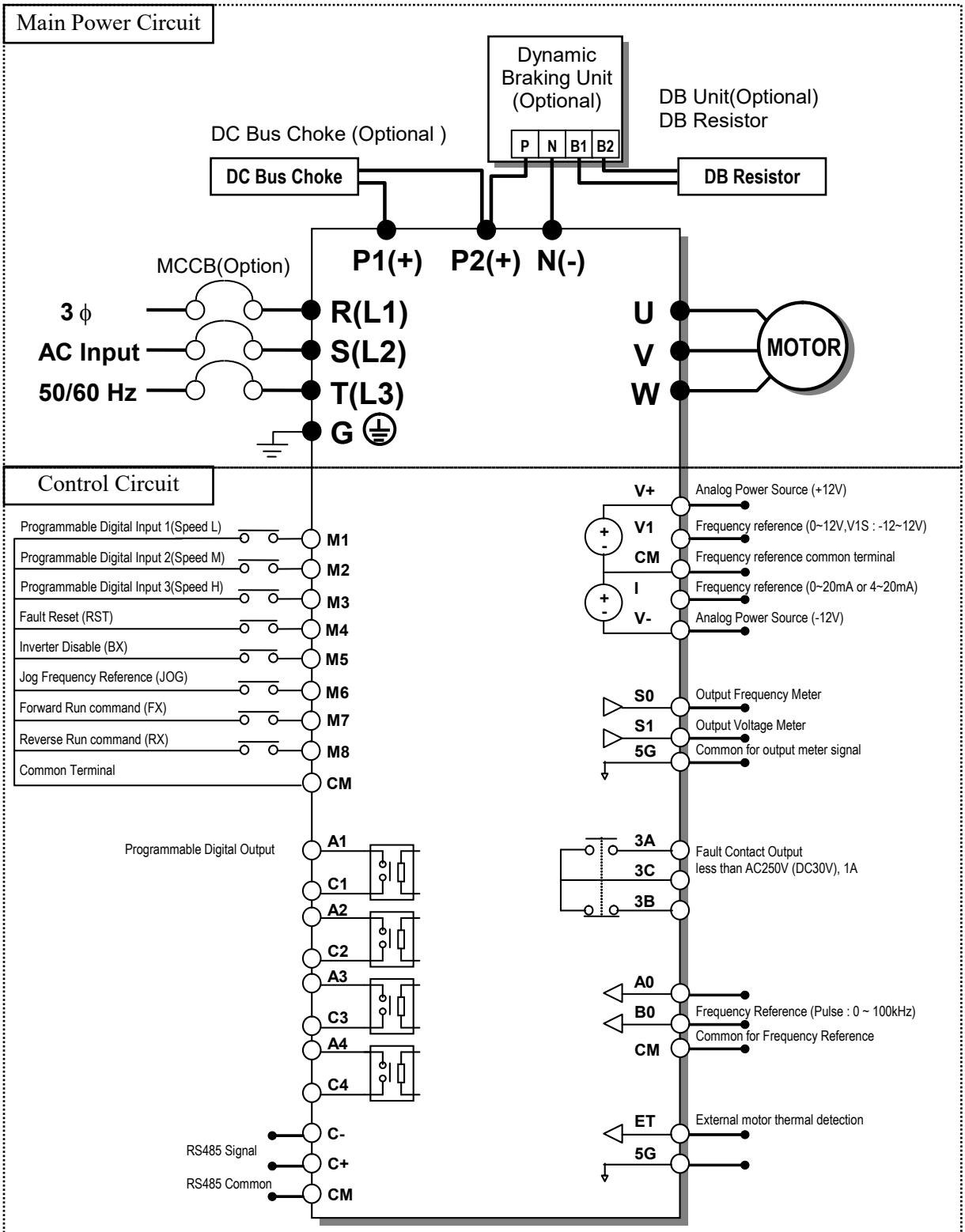
3.2.1 Basic wiring

1) For 0.75~30kW (1~40HP)



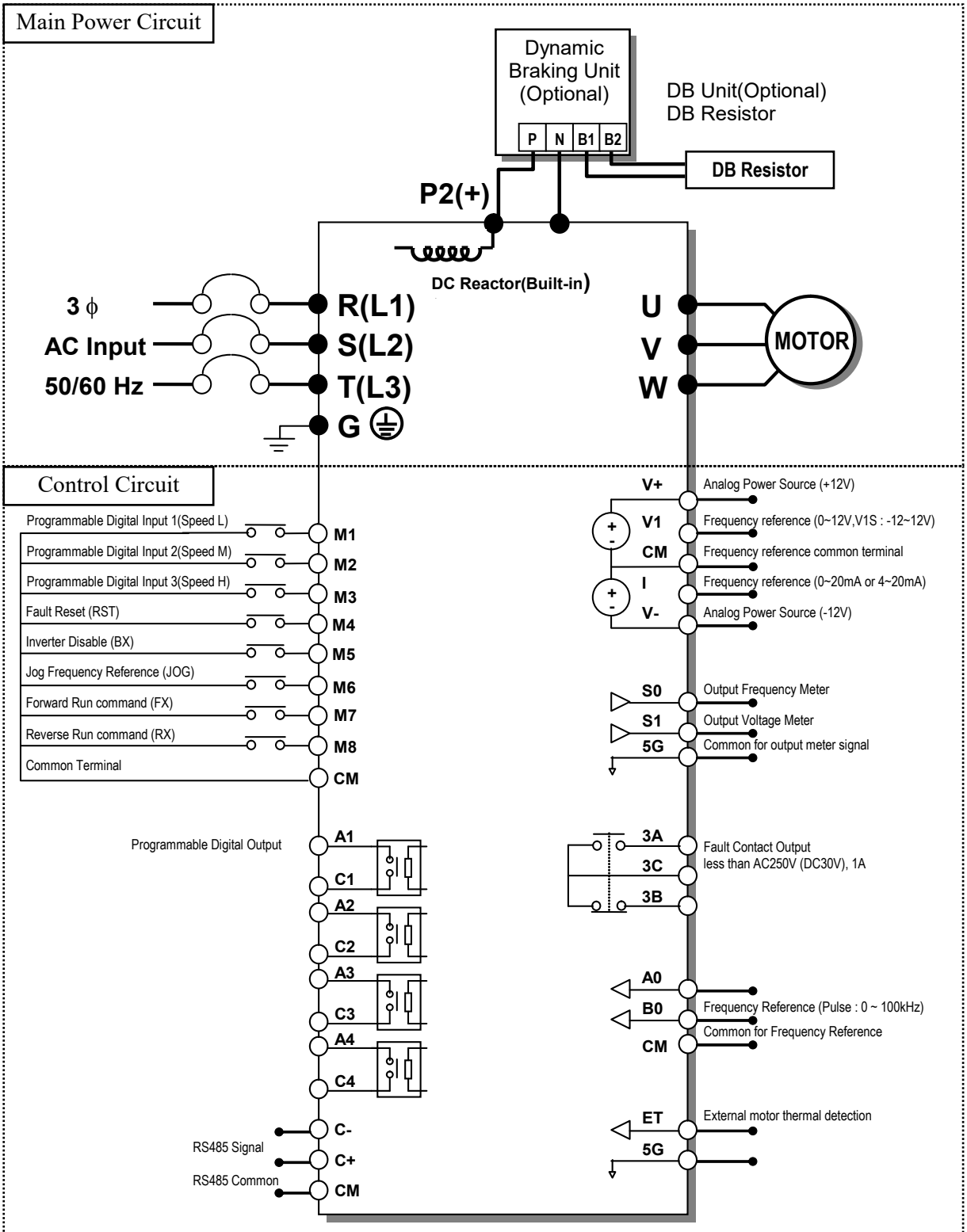
Note : 1) 5G is Common Ground for Analog Input/Output. (Only applied to 0.75 ~ 30kW products)
2) Use terminal V1 for V1, V1S (0~12V, -12 ~ 12V) input.
3) To add DC reactor, Remove DC Bus Choke and connect to P1(+), P2(+).

2) For 37~90kW (50~125HP) / 315~450(500~700HP)



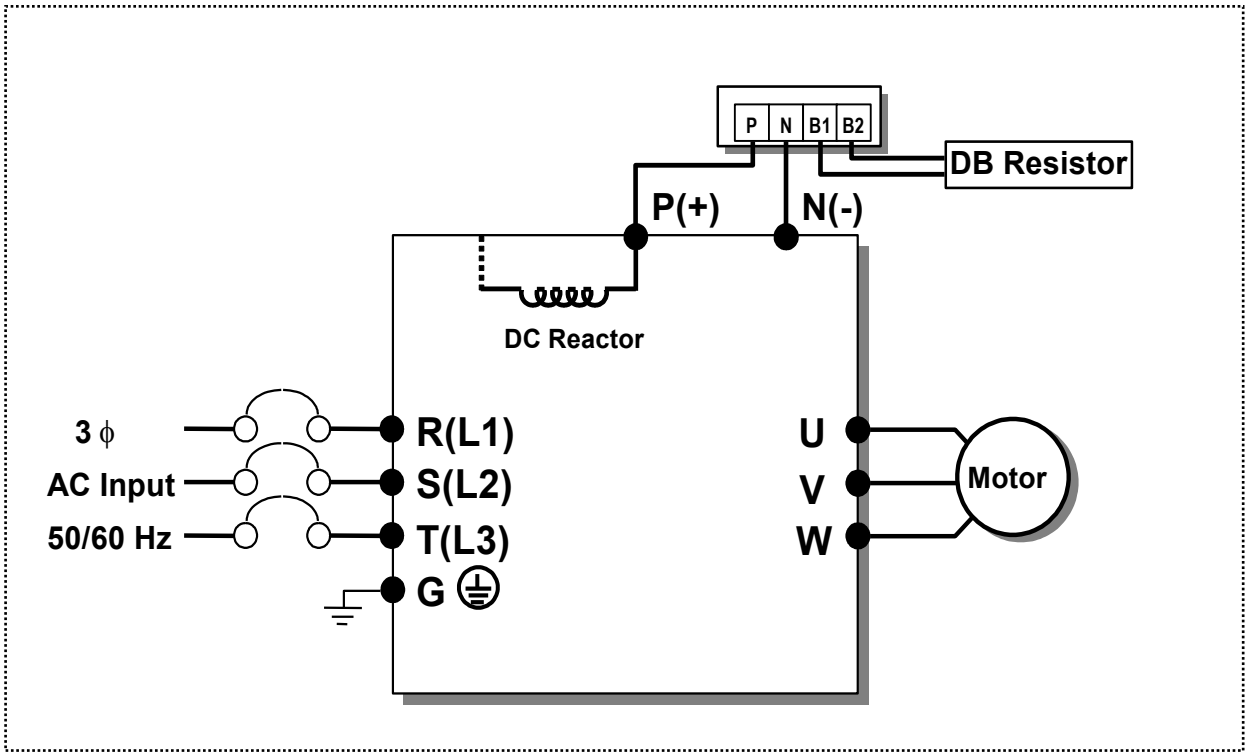
Note : 1) 5G is Common Ground for Analog Meter Output(SO,S1) and External motor thermal detection(ET).
CM is Common Ground for Analog input.
2) Use terminal V1 for V1, V1S (0~12V, -12 ~ 12V) input.
3) To add DC reactor, remove DC Bus Choke and connect to P1(+), P2(+).

3) For 110~450kW (150~700HP)

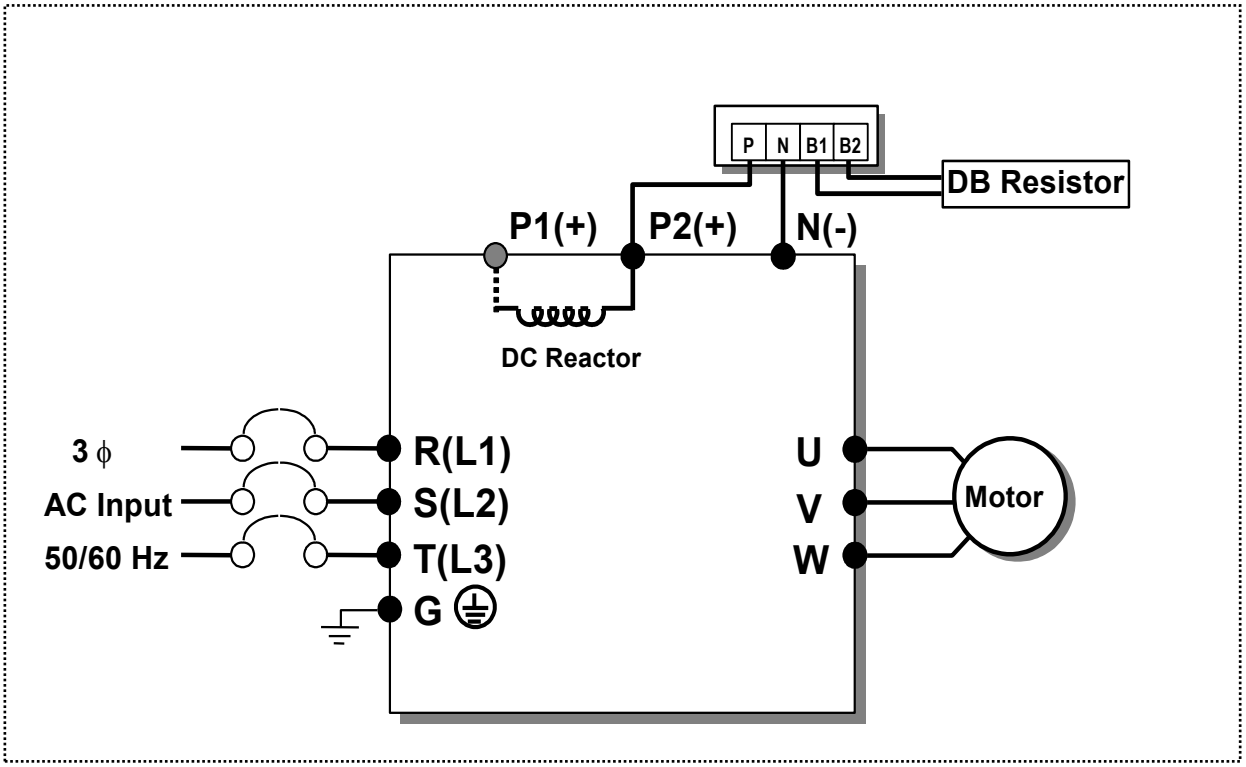


Note : 1) 5G is Common Ground for Analog Meter Output(SO,S1) and External motor thermal detection(ET).
CM is Comon Ground for Analog Input.
2) Use terminal V1 for V1, V1S (0~12V, -12 ~ 12V) input.
3) DC Reactor is built basically in the inverters for 110~280kW(150~350HP).

4) For 15~30kW (20~40HP) Built-in DCL Type



5) For 37~90kW (50~125HP) Built-in DCL Type



☞ Note : P1(+) is not provided for wiring.

6) Power Terminals:

(1) 0.75 ~ 30 kW (200V/400V Class)

R(L1)	S(L2)	T(L3)	G	P1(+)	P2(+)	N(-)	U	V	W

Jumper

(2) 37~90kW (50~125HP) / 315~450kW (500~700HP) <400V Class>

R(L1)	S(L2)	T(L3)	P1(+)	P2(+)	N(-)	U	V	W

Jumper

(3) 15~18.5kW (20~25HP) <Built-in DC Reactor Type, 400V Class>

G ⏚	R(L1)	S(L2)	T(L3)	P(+)	N(-)	U	V	W	G ⏚

(4) 22~30kW (30~40HP) <Built-in DC Reactor Type, 400V Class>

R(L1)	S(L2)	T(L3)	P(+)	N(-)	U	V	W

(5) 37~90kW (50~125HP) / 110 ~280kW (150~350HP) <Built-in DC Reactor Type, 400V Class>

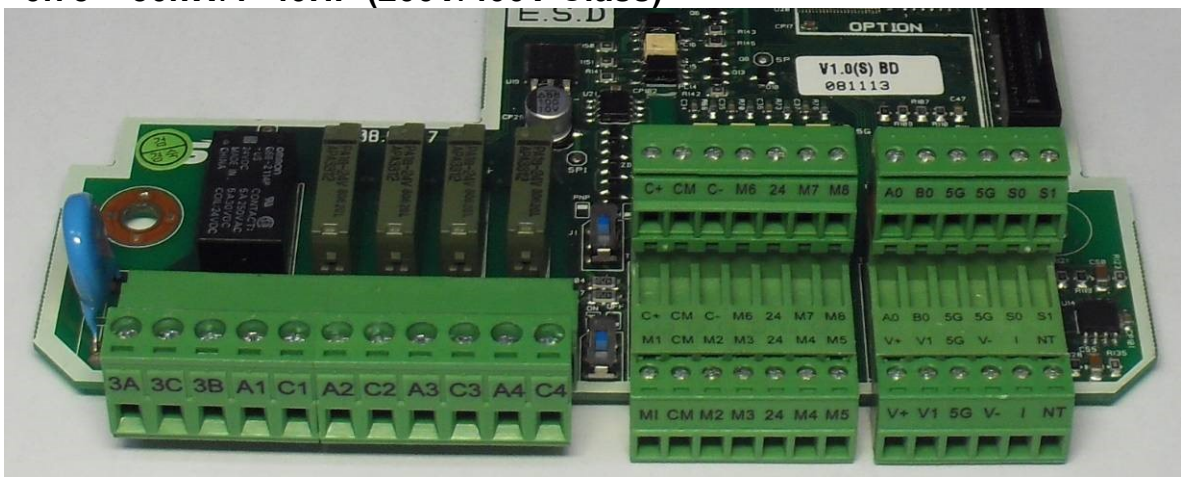
R(L1)	S(L2)	T(L3)		P2(+)	N(-)	U	V	W

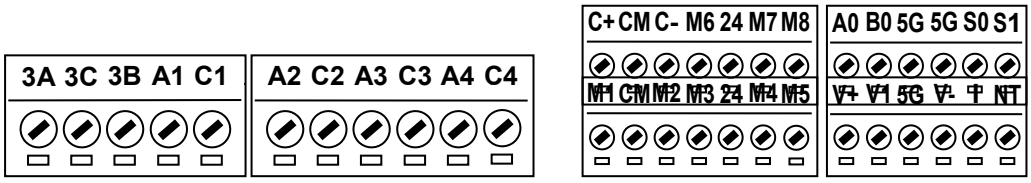
☞ Note : P1(+) is not provided for wiring.

Symbol	Description
R(L1), S(L2), T(L3)	AC Line Voltage Input
G	Earth Ground
P1(+), P2(+)	External DC Reactor (P1(+)-P2(+)) Connection Terminals (Jumper must be removed).
P2(+) ,N(-) or P(+), N(-)	DB Unit (P2(+)-N(-)) Connection Terminals
U, V, W	3 Phase Power Output Terminals to Motor

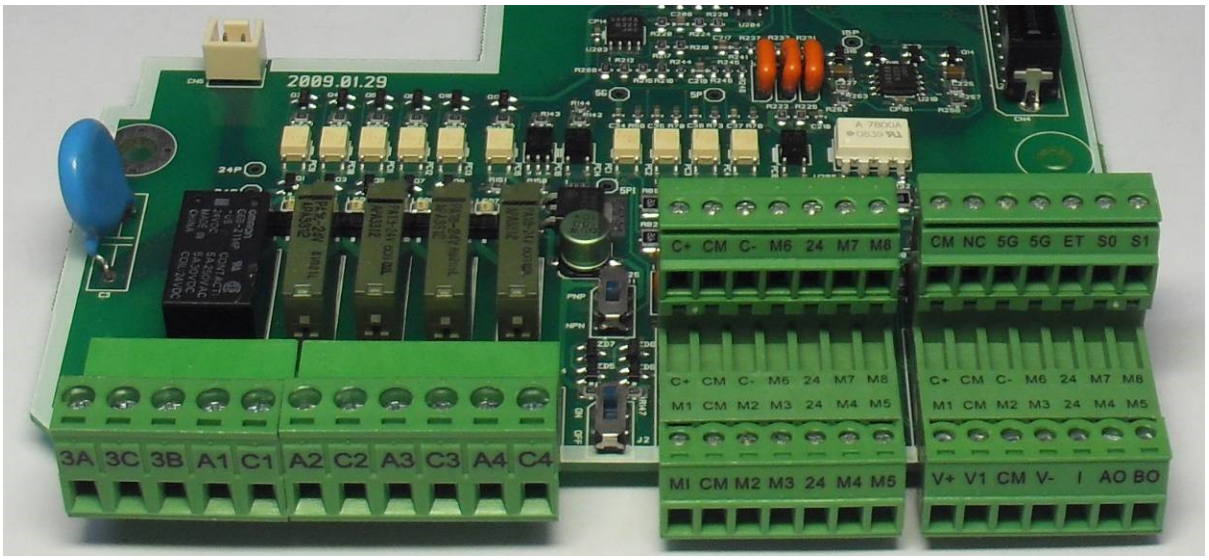
7) Control circuit terminal

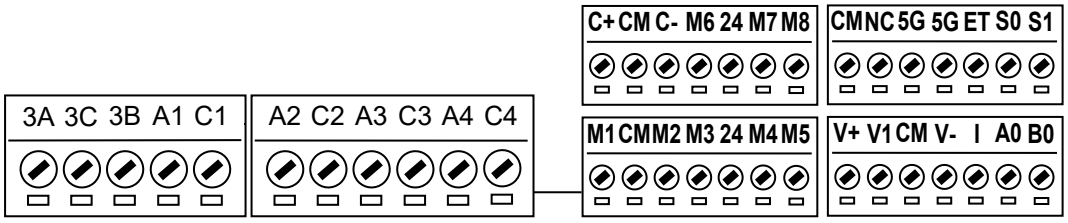
0.75 ~ 30kW/1~40HP (200V/400V Class)





37 ~ 450 kW/ 50~700HP (400V Class)





Note) The terminal specification is subject to change according to decision of manufacturer.

Type		Symbol	Name	Description
Input signal	Starting Contact Function Select	M1, M2, M3	Programmable Digital Input 1, 2, 3	Defines Programmable Digital Inputs. (Factory setting : Multi-Step Frequency 1, 2, 3)
		FX [M7]	Forward Run Command	Forward Run When Closed and Stopped When Open.
		RX [M8]	Reverse Run Command	Reverse Run When Closed and Stopped When Open.
		JOG [M6]	Jog Frequency Reference	Runs at Jog Frequency when the Jog Signal is ON. The Direction is set by the FX (or RX) Signal.
		BX [M5]	Emergency Stop	When the BX Signal is ON the Output of the Inverter is Turned Off. When Motor uses an Electrical Brake to Stop, BX is used to Turn Off the Output Signal. Take caution when BX Signal is OFF (Not Turned Off by Latching) and FX Signal (or RX Signal) is ON. If so, motor continues to Run.
		RST [M4]	Fault Reset	Used for Fault Reset.
		CM	Sequence Common (NPN)	Common terminal for NPN contact.
		24	Sequence Common (PNP)	Common 24V terminal for PNP contact input. (maximum output : +24V, 100mA)
	Analog frequency setting	V+, V-	Analog Power Source (+12V,-12V)	Power supply for Analog Frequency Setting. Maximum Output: +12V, 100mA, -12V, 100mA.
		V1	Frequency Reference (Voltage)	Used by a DC 0-12V or –12~ 12 V input to set the frequency reference. (Input impedance is 20 kΩ)
		I	Frequency Reference (Current)	Used by a 0-20mA input to set the frequency reference. (Input impedance is 249Ω)
		A0, B0	Frequency Reference (Pulse)	Used by a pulse input to set the frequency reference.
		5G (~30kW) CM(37kW~)	Frequency Reference Common Terminal	Common Terminal for Analog Frequency Reference Signal.
	External motor thermal detection	NT (~30kW) ET (37kw ~)	External motor thermal detection	Motor thermal sensor input. Used to prevent motor from overheating by using a NTC or PTC thermal sensor.
		5G	Common for NT (or ET)	Common Terminal for External motor thermal detection.
Built-in RS485 terminal		C+, C-	RS485 signal High,Low	RS485 signal
		CM	RS485 common	Common Ground. Terminal for RS485 interface.
Output signal	Analog Output	S0, S1	Programmable Voltage Output	Voltage output for one of the following: Output Frequency, Output Current, Output Voltage, DC Link Voltage. Default is set to Output Frequency. (Maximum Output Voltage and Output Current are 0-12V and 1mA).
		5G	Analog Common Terminal	Common Terminal for Analog Output (S0, S1).
	Contact	3A, 3C, 3B	Fault Contact Output	Energizes when a fault is present. (AC250V, 1A; DC30V, 1A) Fault : 3A-3C Closed (3B-3C Open) Normal : 3B-3C Closed (3A-3C Open)
		A1~4, C1~4	Programmable Digital Output	Defined by Programmable Digital Output terminal settings. (AC250V, 1A or less; DC30V, 1A or less)

Note) M1~M8 terminals are User Programmable. NC terminal is unavailable.

3.2.2 Wiring power terminals

◈ **Wiring Precautions**

1) The internal circuits of the inverter will be damaged if the incoming power is connected and applied to output terminals (U, V, W).
2) Use ring terminals with insulated caps when wiring the input power and motor wiring.
3) Do not leave wire fragments inside the inverter. Wire fragments can cause faults, breakdowns, and malfunctions.
4) For input and output, use wires with sufficient size to ensure voltage drop of less than 2%.
5) Motor torque may drop of operating at low frequencies and a long wire run between inverter and motor.
6) The cable length between inverter and motor should be less than 150m (492ft). Due to increased leakage capacitance between cables, overcurrent protective feature may operate or equipment connected to the output side may malfunction. The total cable length should be less than 150 m (492ft) in case the many motors are connected. Do not use the 3-core cable in the wiring for long distance. In the wiring for long distance, lower the carrier frequency and use the output circuit filter.

Distance between Motor and inverter	50m	100m	Above 100m
Max. permissible carrier freq.	15kHz	5kHz	Below 2kHz

(But for products of less than 11kW, tha cable lentgh should be less than 100m.)

7) The main circuit of the inverter contains high frequency noise, and can hinder communication equipment near the inverter. To reduce noise, install line noise filters on the input side of the inverter.
8) Do not use power factor capacitor, surge killers, or RFI filters on the output side of the inverter. Doing so may damage these componentss.
9) Always check whether the LCD and the charge lamp for the power terminal are OFF before wiring terminals. The charge capacitor may hold high-voltage even after the power is disconnected. Use caution to prevent the possibility of personal injury.
10) Do not connect with MC at output pare of inverter and make MC On/Off during operation. It can cause the Trip or damage of inverter.

◈ **Grounding** 

1) The inverter is a high switching device, and leakage current may flow. Ground the inverter to avoid electrical shock. Use caution to prevent the possibility of personal injury. The ground impedance for 200V class is 100 ohm with 400V class 10ohm. (Protective Class : I)
2) Connect only to the dedicated ground terminal of the inverter. Do not use the case or the chassis screw for grounding.
3) The protective earth conductor must be the first one in being connected and the last one in being disconnected.
4) As a minimum, grounding wire should meet the specifications listed below. Grounding wire should be as short as possible and should be connected to the

ground point as near as possible to the inverter.

Inverter Capacity		Grounding Wire Sizes, AWG or kcmil (mm²)	
kW	HP	200V Class	400V Class
5.5 ~ 7.5	7.5 ~ 10	10	4
11 ~ 15	15 ~ 20	16	10
18.5 ~ 30	25 ~ 40	35	16
37 ~ 55	50 ~ 75	-	25
75 ~ 90	100 ~ 125	-	35
110 ~132	150 ~ 200	-	70
160 ~ 280	250 ~ 350	-	150
315 ~ 375	400 ~ 600	-	240
450	700	-	240

3.2.3 Wires and terminal lugs

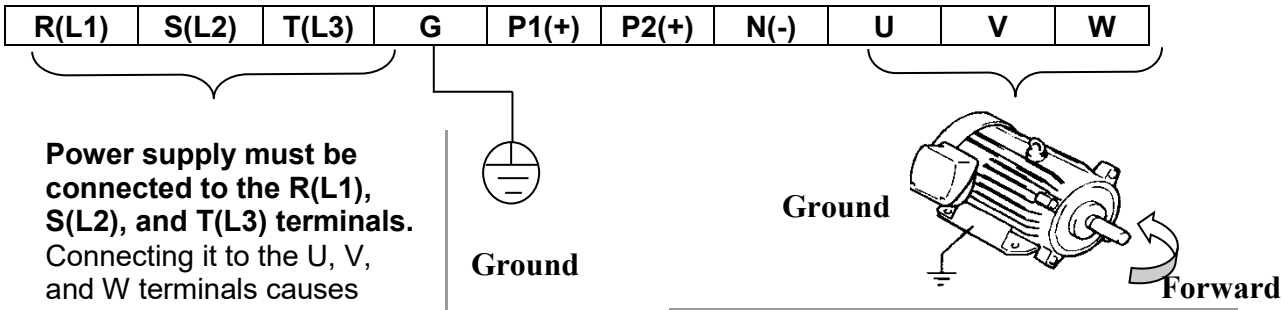
Refer to below for wires, terminal lugs, and screws used to connect the inverter power input and output.

Inverter Capacity		Terminal Screw Size	Screw Torque		Wire Size			
					R(L1), S(L2), T(L3)		U, V, W	
			kgf · cm	lb · in	mm²	AWG or kcmil	mm²	AWG or kcmil
200V	0.75kW (1HP)	M4	7.1 ~ 12.2	6.2 ~ 10.6	2.5	14	2.5	14
	1.5kW (2HP)							
	2.2kW (3HP)							
	3.7kW (5HP)				4	12	4	12
	5.5kW (7.5HP)				6	10	6	10
	7.5kW (10HP)	M5	24.5 ~ 31.8	21.2~27.6	10	8	10	8
	11kW (15HP)				16	6	16	6
	15kW (20HP)	M6	30.6 ~ 38.2	26.6~33.2	25	4	25	4
	18.5kW (25HP)				35	2	35	2
	22kW (30HP)	M8	61.2 ~ 91.8	53.1~79.7	50	2	50	2
	30kW (40HP)				70	1/0	70	1/0
400V	0.75kW (1HP)	M4	7.1 ~ 12.2	6.2 ~ 10.6	2.5	14	2.5	14
	1.5kW (2HP)							
	2.2kW (3HP)							
	3.7kW (5HP)							
	5.5kW (7.5HP)				4	12	4	12
	7.5Kw (10HP)							
	11 kW (15HP)				6	10	6	10
	15 kW (20HP)	M6	30.6~38.2	26.6~33.2	10	8	10	8
	18.5kW (25HP)				16	6	16	6
	22~30kW (30~40HP)	M8	61.2~91.8	53.1~79.7	25	4	25	4
	37~55kW (50~75HP)				35	2	35	2
	75~90kW(100~125HP)	M10	89.7~122.0	77.9 ~105.9	70	1/0	70	1/0
	110~132kW (150~200HP)	M12	182.4~215.0	158.3 ~186.6	120	4/0	120	4/0
	160kW (250HP)	M12			150	300	150	300

Inverter Capacity	Terminal Screw Size	Screw Torque		Wire Size			
				R(L1), S(L2), T(L3)			U, V, W
		kgf · cm	lb · in	mm^2	AWG or kcmil	mm^2	AWG or kcmil
220kW (350HP)				240	400	240	400
280kW (400HP)				240	500	240	500
315kW (500HP)				300	700	300	700
375kW(600HP)				2×240	2×400	2×240	2×400
450kW (700HP)				2×240	2×500	2×240	2×500

* Apply the rated torque to terminal screws.
* Loose screws can cause of short circuit or malfunction. Tightening the screw too much can damage the terminals and cause a short circuit or malfunction.
* Use copper wires only with 600V, 75℃ ratings. For 7.5~11kW 240V type inverters, R(L1), S(L2), T(L3) and U, V, W terminals are only for use with insulated ring type connector.

Power and Motor Connection Example (5.5~30kW inverters)



Power supply must be connected to the R(L1), S(L2), and T(L3) terminals.
Connecting it to the U, V, and W terminals causes internal damages to the inverter. Arranging the phase sequence is not necessary

Les câblages de l'alimentation électrique doivent être connectés aux bornes R, S et T. Leur connexion aux bornes U, V et W provoque des dommages internes à l'onduleur. Le moteur doit être raccordé aux bornes U, V et W. L'arrangement de l'ordre de phase n' est pas nécessaire.

Motor should be connected to the U, V, and W terminals.
If the forward command (FX) is on, the motor should rotate counter clockwise when viewed from the load side of the motor. If the motor rotates in the reverse, switch the U and V terminals.

Si la commande avant (Fx) est activée, le moteur doit tourner dans le sens anti-horaire si on le regarde côté charge du moteur. Si le moteur tourne dans le sens inverse, inverser les câbles aux bornes U et V.

3.2.4 Control circuit wiring

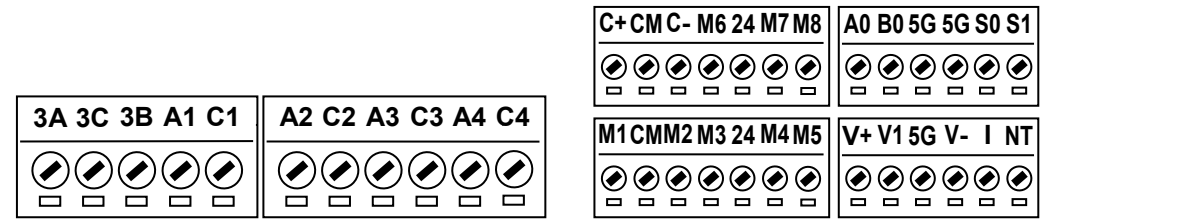
1) Wiring Precautions

CM and 5G terminals are insulated each other. Do not connect these terminals together or to the power ground.

Use shielded wires or twisted wires for control circuit wiring, and separate these wires from the main power circuits and other high voltage circuits (200V relay sequence circuit).

It is recommended to use the cables of 0.0804mm^2 (28 AWG) ~ 1.25mm^2 (16 AWG) for TER1, TER2 control terminals and the cables of 0.33mm^2 (22 AWG) ~ 2.0mm^2 (14 AWG) for TER3, TER4 control terminals.

2) Control terminal layout



0.33mm^2 (22 AWG) ~ 2.0mm^2 (14 AWG) **0.0804mm2 (28 AWG) ~ 1.25mm2 (16 AWG)**

3) Sink mode (NPN mode) / Source mode (PNP mode)

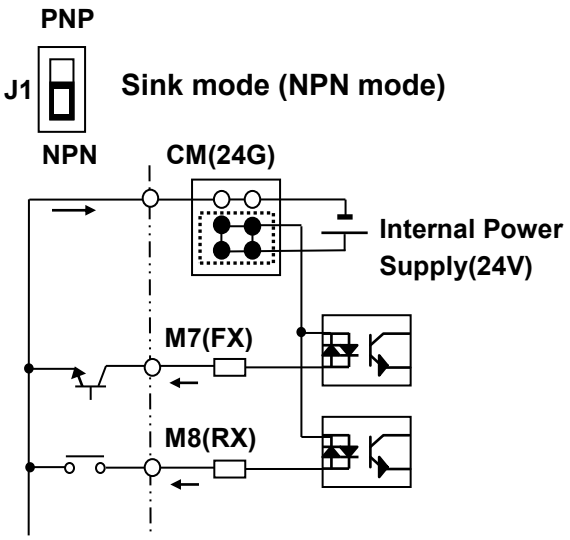
SV-iP5A provides Sink / Source (NPN/PNP) modes for sequence input terminal on the control circuit.

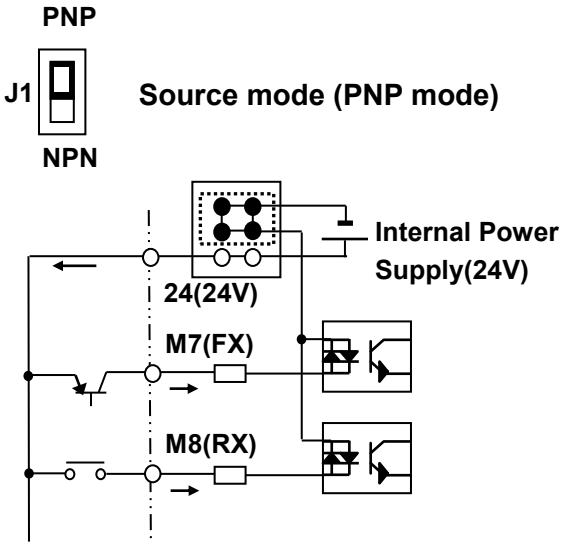
The logic of the input terminal is setable to Sink mode (NPN mode) / Source mode (NPN mode) by using the J1 switch. Connection method is as shown below.

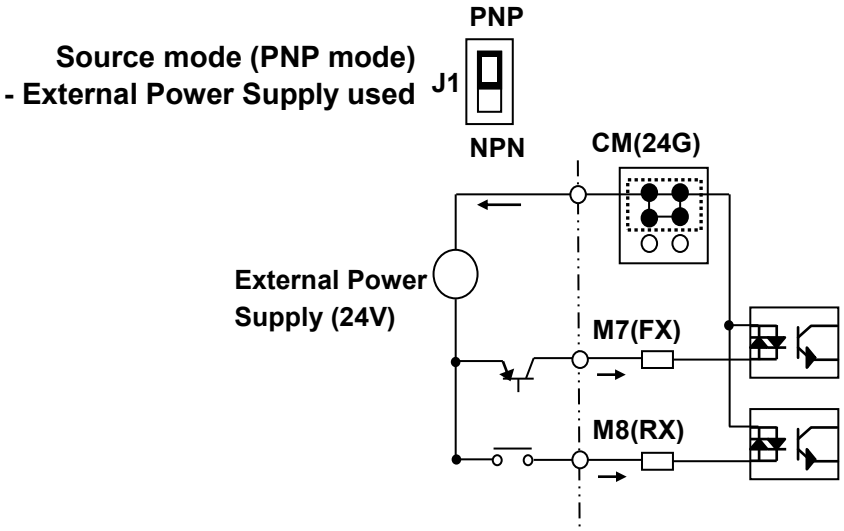
(1) Sink mode (NPN mode)
- Put J1 switch down to set to Sink mode (NPN mode). CM terminal (24V GND) is common terminal for contact signal input.
- The factory default is Sink mode (NPN mode).

(2) Source mode (PNP mode) - Internal Power Supply used
- Put J1 switch up to set to Source mode (PNP mode). Terminal 24 (24V Power Supply) is common terminal for contact input signal.

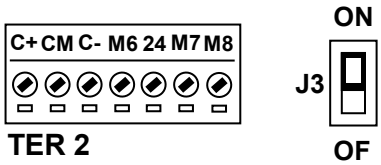
(3) Source mode (PNP mode) - External Power Supply used
- Put J1 switch up to set to Source mode (PNP mode).
- To use external 24V Power Supply, make a sequence between external Power Supply (-) terminal and CM (24V GND) terminal.


PNP
J1
Sink mode (NPN mode)
NPN
CM(24G)
Internal Power
Supply(24V)
M7(FX)
M8(RX)


PNP
J1
Source mode (PNP mode)
NPN
Internal Power
Supply(24V)
24(24V)
M7(FX)
M8(RX)


Source mode (PNP mode)
- External Power Supply used
PNP
J1
NPN
CM(24G)
External Power
Supply (24V)
M7(FX)
M8(RX)

3.2.5 RS485 circuit wiring



Use C+ (RS485 signal High), C- (RS485 signal LOW) in TER 2. Turn the J3 switch ON (Upward) to connect the termination resistor (120 ohm). J3 switch is On the left side of the TER2.

Item	Specification
Transmission type	Bus method, Multi drop Link System
Applicable inverter	SV-iP5A series
Number of inverters	Max.31
Transmission distance	Within 1200m Max. (700m desired)
Recommendable cable	0.75mm^2(18AWG), Shield Type Twisted-pair Wire
Installation	C+, C-, CM terminals on the control terminal block
Power supply	Insulated from the inverter power supply

3.2.6 Check points on wiring

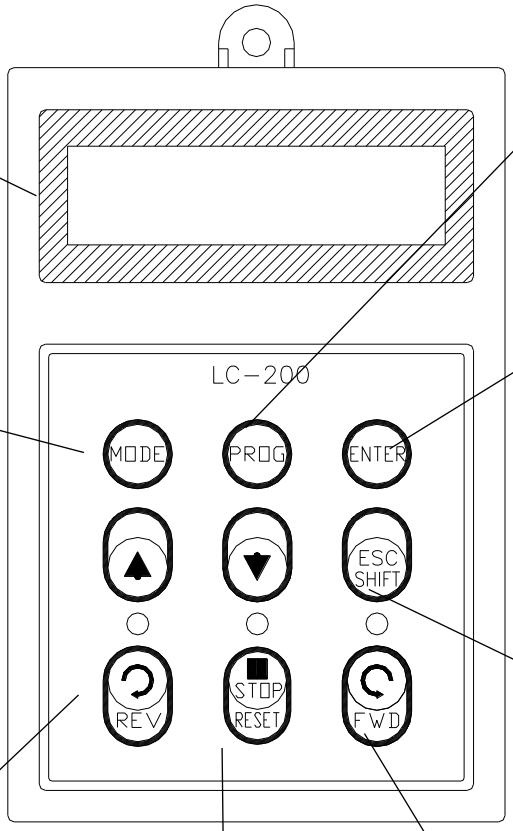
1) Electrical or mechanical interlock of MC1 and MC2 is required for Inverter Bypass Operation. Otherwise, chattering may occur or input power may flow to inverter output, damaging the inverter.
2) Make the sequence to disable the Auto restart after power failure if required. Otherwise, inverter will be automatically restarted.
3) Do not apply the voltage directly to control circuit input terminals such as FX, RX .

CHAPTER 4 - OPERATION

4.1 Programming Keypads

4.1.1 LCD Keypad

LCD keypad can display up to 32 alphanumeric characters, and various settings can be checked directly from the display. The following is an illustration of the keypad.



32 character, background light, LCD display. The background tone is adjustable.

The Mode Button moves you through the seven program groups: **DRV →[Mode] → FU1→ [ENT]→DRV**

Reverse Run Button
The Reverse Run LED blinks when the drive Accels or Decels.

The Program Button is used to go into programming mode to change data.

The Enter Button is used to enter changed data within a parameter. **DRV→ [ENT]→ APP→ [MODE]**

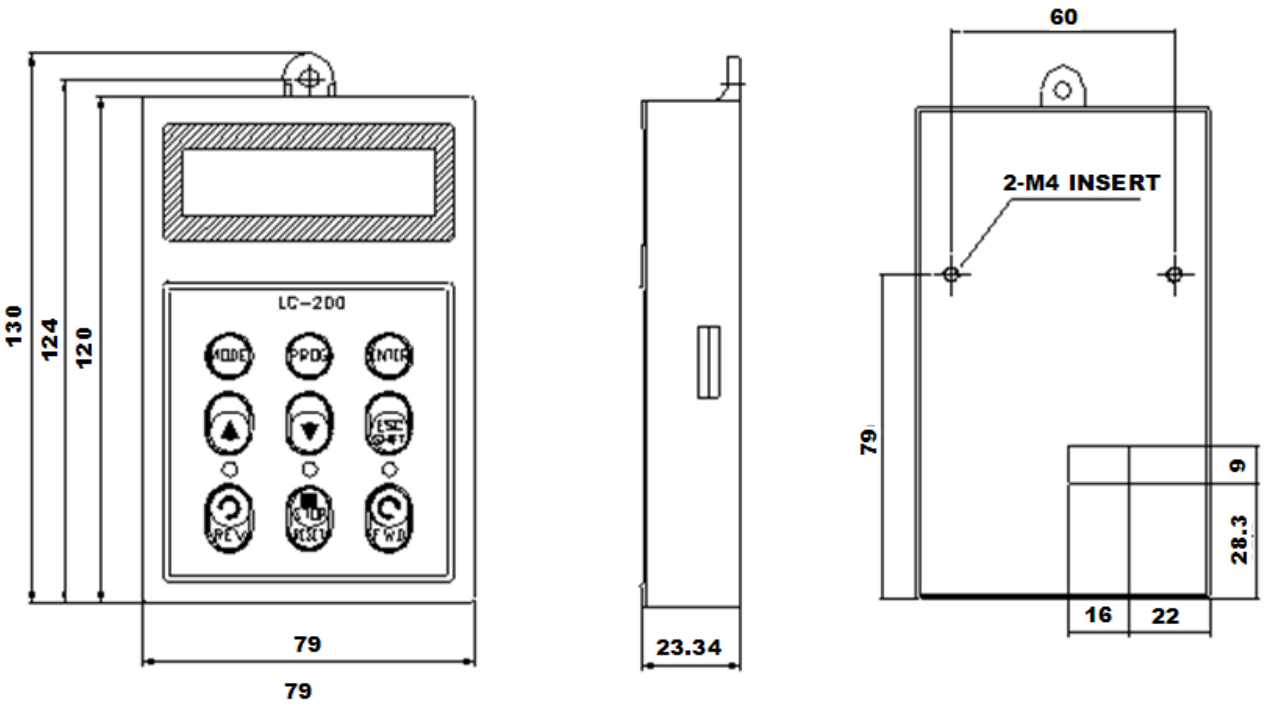
[SHIFT] This button is used to move cursor across display in programming mode.
[ESC] This button is used to move the program code to DRV 00 form any program code.

Forward Run Button
The Forward Run LED blinks when the drive Accels or Decels.

Stop Button is used to stop the drive from running.
(It has the priority over the parameter setting.)
Reset Button is used to reset Faults.
LED blinks when there is a fault.

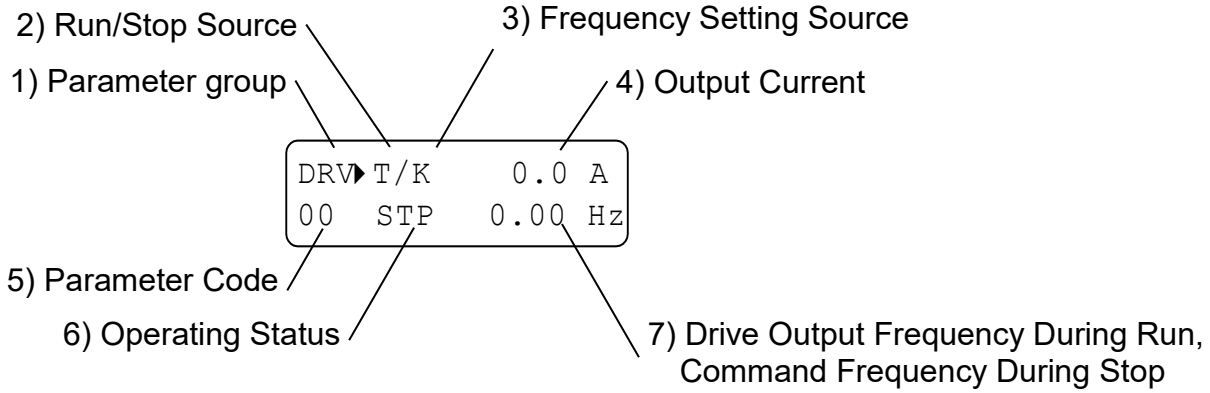
1) Keypad dimension

Unit : mm



4.1.2 2) Detail description

(1) LCD Keypad Display



Displays	Description
1) Parameter Group	Displays the parameter group. There are DRV, FU1, FU2, I/O, EXT, COM, APP groups.
2) Run/Stop Source	Displays the source of motor Run and Stop. **K**: Run/Stop using FWD, REV buttons on keypad **T**: Run/Stop using control terminal input FX, RX **R**: Run/Stop using RS485 **O**: Run/Stop via option board
3) Frequency Setting Source	Displays the source of command frequency setting. **K**: Frequency setting using keypad **V**: Frequency setting using V1 (0 ~12V) or V1 + I terminal

Displays	Description
	W: Analog frequency reference (V1S: -12 ~ 12V) **I :** Frequency setting using I (4 ~ 20mA) terminal **P**: Frequency setting using Pulse input **R**: Frequency setting using RS485 **U**: Up terminal input when Up/Down operation is selected **D**: Down terminal input when Up/Down operation is selected **S**: Stop status when Up/Down operation is selected **O**: Frequency setting via Option board **X**: Frequency setting via Sub board **J**: Jog terminal input **1 ~ 15**: Step frequency operation (except Jog)
4) Output Current	Displays the Output Current during operation.
5) Parameter Code	Displays the code of a group. Use the ▲(Up), ▼(Down) key to move through 0~99 codes.
6) Operating Status	Displays the operation information. **STP**: Stop Status **FWD**: During Forward operation **REV**: During Reverse operation **DCB**: During DC Braking **LOP**: Loss of Reference from Option Board (DPRAM fault) **LOR**: Loss of Reference from Option Board (Communication network fault) **LOV**: Loss of Analog Frequency Reference (V1: 0~12V, -10~12V) **LOI**: Loss of Analog Frequency Reference (I: 4~20mA) **LOS**: Loss of Reference from Sub-Board
7) Inverter Output Frequency / Command Frequency	Displays the Output Frequency during run. Displays the Command Frequency during stop.

4.1.3 Parameter setting and changing

1) Press **[MODE]** key until the desired parameter group is displayed.

2) Press **[▲]** or **[▼]** keys to move to the desired parameter code. If you know the desired parameter code, you can set the code number of each parameter group in “Jump code”, except DRV group.

3) Press **[PROG]** key to go into the programming mode, the cursor starts blinking.

4) Press **[SHIFT/ESC]** key to move the cursor to the desired digit.

5) Press **[▲]** or **[▼]** keys to change the data.

6) Press **[ENT]** key to enter the data. The cursor stops blinking.

Note: Data cannot be changed when 1) the parameter is not adjustable during the inverter is running (see the function list), or 2) Parameter Lock function FU2-94 [Parameter Lock] is activated.

EX) Changing Accel time from 10 sec to 15 sec

1) LCD keypad

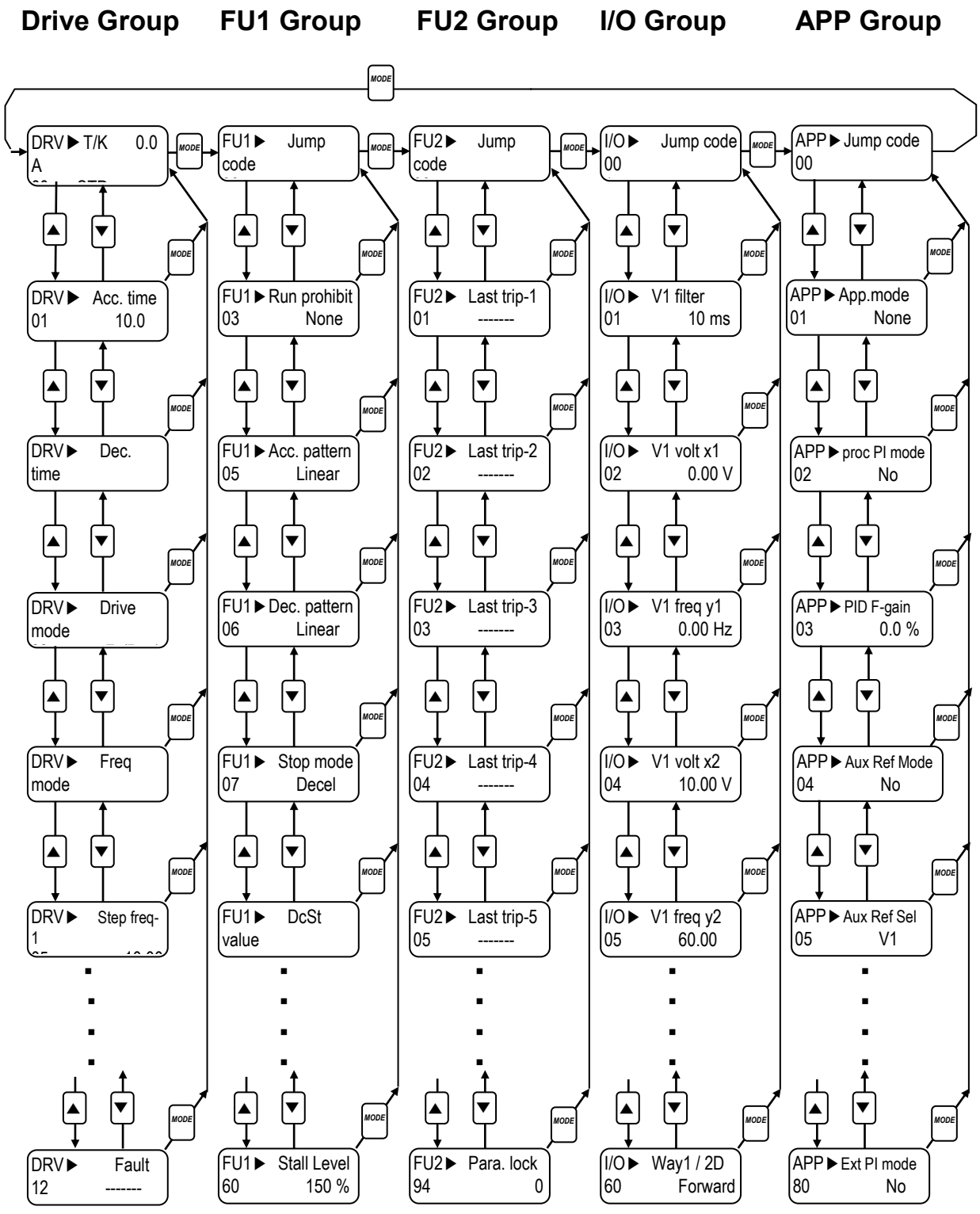
DRV▶ Acc. time 01 10.0 sec	Move to the desired code to change.
DRV▶ Acc. time 01 1■.0 sec	Press the **[PROG]** key. A Cursor (■) will appear.
DRV▶ Acc. time 01 1[0].0 sec	Use the **[SHIFT]** key to move the cursor.
DRV▶ Acc. time 01 1[5].0 sec	Change the data using **[▲]**, **[▼]** keys.
DRV▶ Acc. time 01 15.0 sec	Press the **[ENT]** key to save the value into memory. The Cursor will disappear.

4.1.4 Parameter groups

The iP5A series inverter has 5 parameter groups separated according to their applications as indicated in the following table.
The iP5A series inverter provides two kinds of keypad. One is 32-character alphanumeric LCD keypad and the other is 7-Segment LED keypad.

Parameter Group	LCD Keypad	Description
Drive Group	DRV	Command Frequency, Accel/Decel Time etc. Basic function Parameters
Function 1 Group	FU1	Max. Frequency, Amount of Torque Boost etc. Parameters related to basic functions
Function 2 Group	FU2	Frequency Jumps, Max./Min. Frequency Limit etc. Basic Application Parameters
Input / Output Group	I/O	Programmable Digital Input/Output Terminal Setting, Auto Operation etc. Parameters needed for Sequence Operation
Application Group	APP	PID, MMC (Multi-Motor Control), 2nd motor operation etc. Parameters related to Application function

1) Parameter Navigation (LCD Keypad)
The parameter group moves directly to DRV group by pressing [**SHIFT**] key in any parameter code.



☞ **Note:** This figure shows the group and code navigation through LCD display keypad. It can be different from the actual display due to the group addition or code change.

4.2 Operating Example

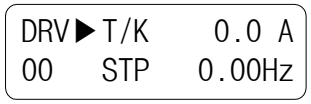
4.2.1 Easy Start Operation

Easy Start Operation is activated by pressing STOP key on the Keypad for 2~3 seconds and inverter begins operation via Keypad (FWD/REV RUN/STOP).
Drive mode is preset to V/F and reference frequency to JOG.

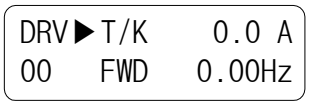
4.2.2 Operation via Control terminal + Keypad

Setting: DRV-03 [Drive Mode (Run/Stop method)] = **Fx/Rx-1**
DRV-04 [Frequency Mode (Freq. setting method)] = **Keypad**
With above setting, Freq setting via terminal & Run/Stop via Keypad disabled

1) Check the LCD display when Power ON. Otherwise, change the setting correctly as shown above.



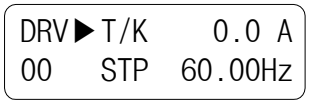
2) Turn the FX (or RX) terminal ON. Then FWD (or REV) LED will be lit.



3) When setting the Ref. Freq to 60 Hz using **PROG/ENT/SHIFT**, ▲ keys, the motor will rotate at 60Hz. FWD (or REV) LED will be flickering during Acceleration / Deceleration.



4) Turn the FX (or RX) terminal Off. Then Stop LED will be lit.



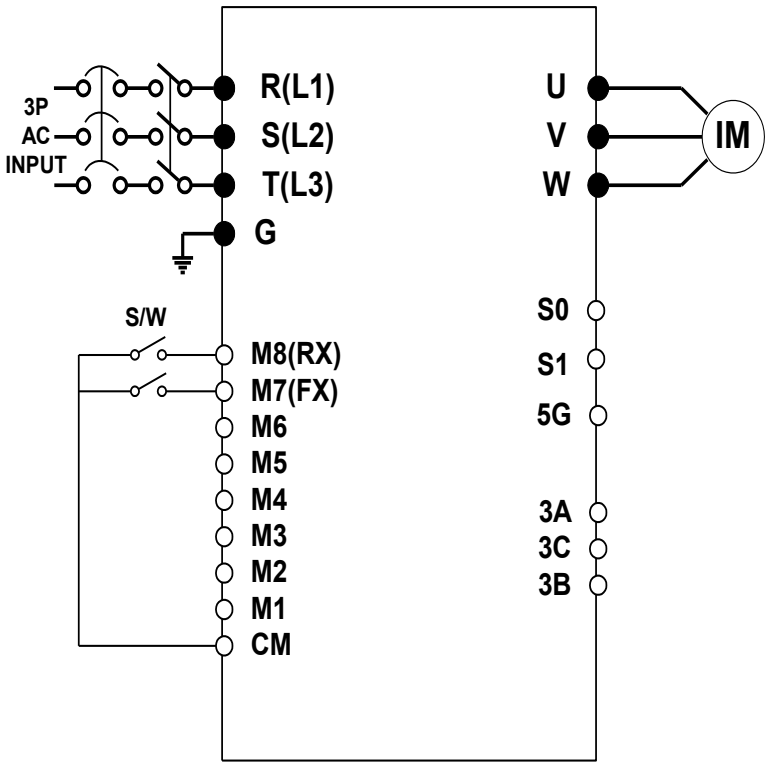
Note) To enable Run/Stop via keypad and Freq setting via control terminal,
Setting : DRV-03 [Drive Mode (Run/Stop method)] = Keypad
DRV-04 [Frequency Mode (Freq. setting method)] = V1, V1S or I

Operation Example (1)	Freq Setting via Keypad + Run/Stop via Terminal (FX/RX)

[Operation condition]

-. Control mode : V/F control
-. Ref. Frequency : 50[Hz] setting via keypad
-. Accel/Decel time : Accel – 10 [sec], Decel – 20 [sec]
-. Drive mode : Run/Stop via FX/RX terminal, Control terminal : NPN mode

[Wiring]



Step	Parameter setting	Code	Description
1	Drive Mode	DRV-3	Set it to 1 FX/RX-1.
2	Frequency Mode	DRV-4	Set it to 0 Keypad-1.
3	50[Hz] freq command setting	DRV-0	Set freq command 50[Hz] via Keypad.
4	Accel/Decel time	DRV-1 DRV-2	Set Accel time to 10 [sec] in DRV-1. Set Decel time to 20 [sec] in DRV-2.
5	Terminal FX (M7)	I/O-26	Motor starts to rotate in Forward direction at 50Hz with Accel time 10 [sec] when FX terminal is turned ON. Motor decelerates to stop with Decel time 20[sec] when FX terminal is turned OFF.
6	Terminal RX (M8)	I/O-27	When RX terminal is turned ON motor starts to rotate in Reverse direction at 50[Hz] with Accel time 10 [sec]. When it is OFF, motor decelerates to stop with Decel time 20 [sec].

4.2.3 Operation via Control Terminal

Setting: **DRV-03** [Drive Mode (Run/Stop method)] = **1 (Fx/Rx-1)**
DRV-04 [Frequency Mode (Freq. setting method)] = **2 (V1)**

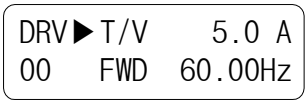
1) Check the LCD display when Power ON. Otherwise, change the setting correctly as shown above.



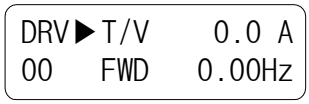
2) Turn the FX (or RX) terminal ON. Then FWD (or REV) LED will be lit.



3) Set the frequency using V1 (Potentiometer), Output freq (60Hz). Rotating direction (FWD or REV) and output current (5A) will be displayed on the LCD.



4) Output freq value is decreasing when turning the potentiometer counterclockwise. Inverter output stops at 0.00Hz and motor is stopped.



5) Turn FX (or RX) terminal OFF.

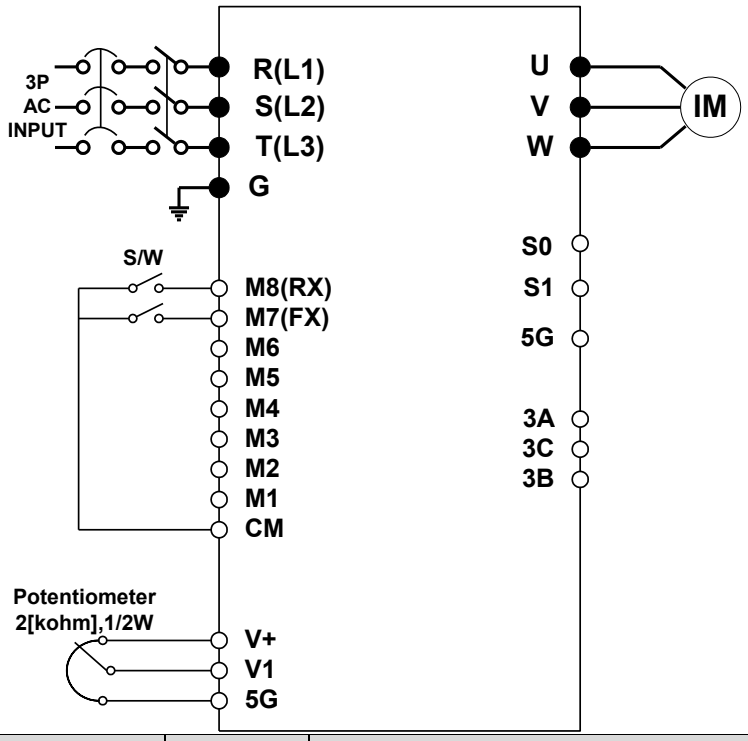


Operation Example (2)	Analog Voltage Input (V1) + Operation via Terminal (FX/RX)

[Operation condition]

-. Control mode : V/F control
-. Reference Frequency : 50[Hz] analog input via V1 (Potentiometer)
-. Accel/Decel time : Accel – 10 [sec], Decel – 20 [sec]
-. Drive mode : Run/Stop via FX/RX terminal, Control terminal : NPN mode

[Wiring]



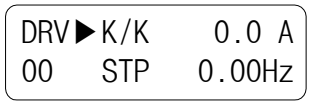
Step	Parameter setting	Code	Description
1	Drive Mode	DRV-3	Set it to 1 Fx/Rx-1.
2	Frequency Mode	DRV-4	Set it to 2 V1 Analog input.
3	50[Hz] freq command setting	DRV-0	Set freq command 50[Hz] via V1 (potentiometer).
4	Accel/Decel time	DRV-1 DRV-2	Set Accel time to 10 [sec] in DRV-1. Set Decel time to 20 [sec] in DRV-2.
5	Terminal FX (M7)	I/O-26	Motor starts to rotate in Forward direction at 50Hz with Accel time 10 [sec] when FX terminal is turned ON. Motor decelerates to stop with Decel time 20[sec] when FX terminal is turned OFF.
6	Terminal RX (M8)	I/O-27	When RX terminal is turned ON motor starts to rotate in Reverse direction at 50[Hz] with Accel time 10 [sec]. When it is OFF, motor decelerates to stop with Decel time 20 [sec].

☞ 0.75 ~ 30 kW products: Common terminal of frequency setting is 5G terminal.
☞ 37 ~ 450 kW products: Common terminal of frequency setting is CM terminal.

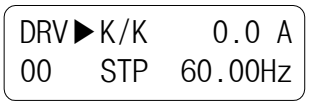
4.2.4 Operation via Keypad

Setting : DRV-03 [Drive Mode (Run/Stop method)] = **0 (Keypad)**
DRV-04 [Frequency Mode (Freq. setting method)] = **0 (Keypad-1)**

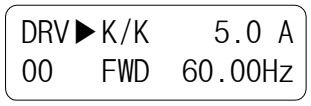
1) Check the LCD display when Power ON. Otherwise, change the setting as shown above.



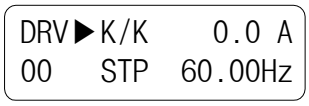
2) Set the Ref. Freq to 60 Hz using **PROG/ENT/SHIFT**, ▲ keys. Set freq is displayed during stop.



3) When pressing **FWD/REV** key, motor starts running and output freq and output current are displayed.



4) Press **STOP/RESET** key. Then motor decelerates to stop. Set freq 60Hz is displayed.



4.3 Various function setting and Description

4.3.1 Basic function parameter setting

It is the basic function setting. All settings are factory defaults unless users make change. It is recommended to use factory setting value unless the parameter change is necessary.

1) Common parameter setting

The following table shows common parameter setting that should be checked before use regardless of control mode.

Parameter Name	Code	Description
Line Freq.	FU1-29	Sets a freq of the inverter input power source.
Base Frequency	FU1-31	Sets the Motor Base Frequency[1)].
Motor Rated Voltage	FU1-50	Sets the Motor Rated Voltage[1)].
Motor Selection	FU2-40	Selects motor and voltage rating suitable to the desired inverter.
Motor Parameters	FU2-41 ~ 46	Basic parameter value setting when selecting the motor rating. Note : If there is any discrepancy between parameter preset value and the actual motor parameter value, change the parameter value according to the actual motor.
Drive Mode	DRV-3	Operation via Keypad, Fx/Rx-1, Fx/Rx-2 and Int 485 setting.
Frequency Mode	DRV-4	Frequency reference source setting parameter
Accel/Decel Time Setting	DRV-1 DRV-2	Accel/Decel time setting

1) If FU1-31 and FU1-50 are set higher than motor nameplate value, it may cause motor overheat and if it is set smaller than that, it may cause Over voltage trip during deceleration. Make sure to enter the actual motor value.

2) V/F control

FU2-60 [Control mode] is set to 0 “V/F” as factory setting. Operation via V/F control is activated after the above common parameter setting is done and the followings are set.

Parameter Name	Code	Description
Starting freq.	FU1-32	Set frequency to start the motor.
Torque boost	FU2-67	Manual or Auto torque boost settable in this parameter.
Torque boost value	FU2-68 FU2-69	If FU1-67 [torque boost] is set to “manual”, user sets the desired value and the direction in code FU1-68 and 69.

3) Slip compensation

Operation is done via Slip compensation if FU2-60 is set to 1 {Slip compen}. This control keeps motor speed constant regardless of load change.

4) Sensorless vector control

Set FU2-60 to “Sensorless” to enable Sensorless vector control. It is strongly recommended to perform **Auto-tuning** before starting Sensorless control in order to maximize performance.

Parameter Name	Code	Description
Control method selection	FU2-60	Select Sensorless.
P, I gain for sensorless control	FU2-65, FU2-66	Set gain for Sensorless.
Starting freq	FU1-32	Starting freq of the motor

Note) No-load current for Sensorless control is not entered by auto-tuning. Therefore enter the no-load current value in V/F operation. When other than LS standard motor is used, set this value according to the motor in use for better performance.

5) Auto-tuning of motor constant

This parameter enables auto-tuning of the motor constants. If FU2-61 is set to Yes and press the enter key, **Rs, Lsigma** values begin tuning with the motor stopped. Refer to motor nameplate for the rest of other parameters.

Parameter Name	Code	Description
Auto-tuning	FU2-61	No, Yes

Note) Motor no-load current and slip freq should be set correctly for safe and better performance. Be sure to check these values and set them properly.
Refer to Chapter 5, FU2-40~66 for more.

4.3.2 Advanced function setting

SV-iP5A inverter features advanced function parameters to maximize efficiency and performance of the motor. It is recommended to use the factory setting unless parameter value change is inevitable.

1) V/F control

Parameter Name	Code	Description
V/F Pattern	FU1-40	Use it according to load characteristics. If User V/F is selected, user can select the optimum output V/F characteristic for the application and load characteristics in [FU1-41]~[FU1-48].
Dwell operation	FU2-07 FU2-08	Used to output torque in an intended direction. Inverter stops acceleration for the preset [FU2-08] Dwell time while running at Dwell frequency [FU2-07] and starts acceleration at commanded frequency. Setting [FU2-08] Dwell time to 0 disable the Dwell operation.
Jump Frequency	FU2-10 FU2-1~16	When it is desired to avoid resonance attributable to the natural frequency of a mechanical system, these parameters allow resonant frequencies to be jumped. Up to three areas can be set, with the jump frequencies set to either the top or bottom point of each area. To enable the function, set [FU2-10] to ‘Yes’ and set the value in [FU2-11]~[FU2-16].
Accel/Decel pattern S-curve	FU1-2, 3 FU1-4, 5	This pattern has an effect on the prevention of cargo collapse on conveyor etc. and reduction in an acceleration/ deceleration shock.

2) Sensorless vector control

Related parameters for starting in **Sensorless vector control** when FU2-60 [Control Mode Selection] is set to Sensorless.

Parameter Name	Code	Description
When starting	FU2-64	Pre-excitation time setting
	I/O-20~27	Programmable Digital Input terminals define

3) Parameters to monitor motor and inverter status

Parameter Name	Code	Description
Output current/ motor speed	DRV-8~9	Displays output current and motor rpm.
DC link voltage	DRV-10	Displays DC link voltage.
User display selection (Voltage and watt)	DRV-11 FU2-81	Either output voltage or power selected in FU2-81 is displayed in DRV-11.
Fault display	DRV-12	Displays the current inverter fault.
TAR / OUT Freq. display	DRV-14	Displays Target freq. for Accel/Decel and Output freq during Accel/Decel.
REF/FBK display	DRV-15	Displays PID Reference/ Feedback frequency display.
Speed (Hz / Rpm) selection	DRV-16	Selects inverter output speed unit [Hz or Rpm].
PID parameter	DRV-18	Displays related parameters of PID controller.
AD parameter	DRV-19	Displays inverter analog input value to AD value.
EXT - PID parameter	DRV-20	Displays related parameters of EXT–PID controller.

Note) DRV-15, DRV-18 only displayed when APP-02 [proc PI mode] is set to "Yes." DRV-20 only displayed when APP-80 [Ext PI mode] is set to "Yes."

4) Parameter initialize

Parameter Name	Code	Description
Software version	FU2-82	Displays the inverter software version.
Parameter Read/Write/ Initialize/Lock	FU2-91 FU2-92 FU2-93 FU2-94 FU2-95	[FU2-91], [FU2-92] : Copying parameters from other inverter [FU2-93] : Initializing parameters to factory setting values [FU2-94] : Parameter write disabled [FU2-95] : Parameter save

Note: Motor parameters (FU2-40~46, FU2-62~63) returned to factory setting once Parameter Read/Write is executed.

5) Protection and Trip level setting

Parameter Name	Code	Description
Electronic thermal	FU1-60 FU1-61 FU1-62 FU1-63	Protection of the motor from overheating without the use of external thermal relay. Refer to parameter descriptions for more detail.
Overload alarm and trip	FU1-64 FU1-65 FU1-66 FU1-67 FU1-68	Warning alarm outputs and displays the trip message when overcurrent above the threshold value keeps on.
Stall prevention	FU1-70 FU1-71	Set the output current level at which the output freq will be adjusted to prevent the motor from stopping due to over-current etc. It activates during accel/ constant speed/decel to prevent the motor stall.

6) Starting / Accel / Decel / Stopping pattern setting

Parameter Name	Code	Description
Accel/Decel pattern	FU1-02 FU1-03	2 types of Accel/Decel pattern: ‘S-curve’, ’U-curve’ settable according to application and load characteristic. If ‘S-curve’ is selected, the desired value of [FU1-4], [FU1-5] is settable.
Starting/Stopping method	FU1-20 FU1-23	4 types of stopping method ‘Decel’, ‘DC-brake’, ‘Free-run’, ‘Flux Brake’ selectable. If ‘DC-brake’ is selected, the desired value of [FU1-21, 22], [FU1-24]~ [FU1-27] is settable. See function description of chapter 5 for more details.
Frequency Limit selection	FU1-33 FU1-34 FU1-35	Limits the active frequency. Inverter operates at the freq range between upper freq limit [FU1-35] and bottom freq limit [FU1-34] and higher/ lower freq value is entered, it is automatically replaced by limit value. Setting range: [FU1-30] Maximum freq to [FU1-32] starting freq.

7) Operation-starting method

Parameter Name	Code	Description
Starting Method	FU2-20 FU2-21 FU2-25 FU2-26	Motor starting method: [FU2-20] Power-on run [FU2-21] Restart after Fault Reset [FU2-25] Number of Auto Restart Attempt [FU2-26] Delay Time Before Auto Restart
Speed Search Selection	FU2-22 FU2-23 FU2-24	Speed search function is available during Accel, trip, instant power failure, restart after fault reset and Speed search at auto restart.

4.3.3 Application function setting

1) PID operation

Inverter can be used to exercise process control, e.g. flow rate, air volume or pressure via PID feedback control.

Parameter Name	Code	Description
PID control setting	APP-02 ~ APP-17	Parameters for PID control setting

2) Ext PID operation

It is used for External PID feedback control.

Parameter Name	Code	Description
ExtPID setting	APP-80 ~ APP-97	Parameters for Ext PID

3) Pre PID operation

It helps to begin smooth start of the PID control.

Parameter Name	Code	Description
PrePID setting	APP-74 ~ APP-76	Parameters for Pre PID operation

4) MMC operation

Inverter controls a whole system by controlling Main motor connected directly to the inverter and Aux motors connected to the inverter relays and operated via relay On/Off.

Parameter Name	Code	Description
MMC setting	APP-40 ~ APP-71 I/O-20 ~ I/O-27	Parameters for MMC operation

5) Jog and Multi-speed operation

Parameter Name	Code	Description
Multi function input terminal setting	I/O-20 ~27	If I/O-20 ~27 are set to Speed-H, Speed-M, Speed-L, multi- speed operation up to speed 17 is available.
Filter time constant for input terminal	I/O-29	Effective for eliminating noise in the freq. Setting circuit
Speed reference value	DRV-05 ~07 I/O-31 ~ I/O-42	Speed reference value for each step setting

Parameter Name	Code	Description
Accel/Decel time setting for each step	I/O-50 ~ 63	Accel/Decel time for each step setting
Jog freq.	I/O-30	jog freq for jog operation setting

Speed-X	Speed-H	Speed-M	Speed-L	JOG	Speed Command	Parameter value
0	0	0	0	0	Speed 0	DRV-00
0	X	X	X	1	Jog freq.	I/O-20
0	0	0	1	0	Speed –1	DRV-05
0	0	1	0	0	Speed –2	DRV-06
..	..	..	..	..	..	..
..	..	..	..	..	..	..
1	1	0	1	0	Speed –13	I/O-40
1	1	1	0	0	Speed –14	I/O-41
1	1	1	1	0	Speed –15	I/O-42

6) 2nd motor operation

2nd function setting is required to run the two motors by one inverter by exchange. If the terminal defined for 2nd function signal input is turned ON, 2nd motor operation is valid.

Parameter Name	Code	Description
Programmable Digital Input terminals setting	I/O-20 ~27	2nd motor operation is available with Programmable Digital Input terminals M1 ~ M8 set to 7 {2nd Func}.
Parameter setting for 2nd motor operation	APP-20 ~ APP-29	Setting parameters necessary to operate 2nd motor such as base freq., Accel/Decl time, Stall.

7) Energy-saving operation

FU1-51 [Energy Save Level] tunes the inverter output voltage to minimize the inverter output voltage during constant speed operation. Appropriate for energy-saving applications such as fan, pump and HVAC.

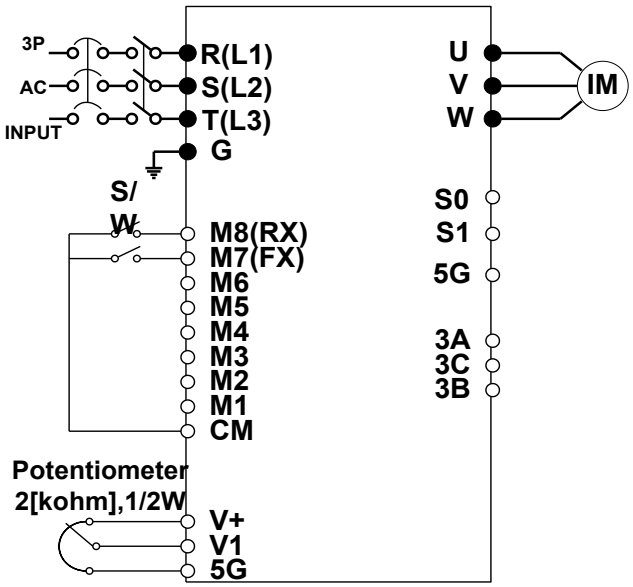
4.4 Operation Example

Operation Example (1)	V/F Control + Analog Voltage Input (V1) + Operation via Terminal (FX/RX)

[Operation condition]

-. Control mode : V/F control
-. Frequency command : 50[Hz] analog input via V1 terminal
-. Accel/Decel time : Accel – 15 [sec], Decel – 25 [sec]
-. Drive mode : Run/Stop via FX/RX terminal, Control terminal : NPN mode

[Wiring]



Step	Parameter setting	Code	Description
1	Control Mode Selection	FU2-60	Set it to 0 {V/F}.
2	Drive Mode	DRV-3	Set it to Fx/Rx-1.
3	Frequency Mode	DRV-4	Set V1 Analog input value in frequency mode.
4	50[Hz] freq command setting	DRV-0	Set freq command 50[Hz] via V1 (potentiometer).
5	Accel/Decel time	DRV-1 DRV-2	Set Accel time to 15 [sec] in DRV-2. Set Decel time to 25 [sec] in DRV-3.
6	Terminal FX	I/O-26	Motor starts to rotate in Forward direction at 50Hz with Accel time 15 [sec] when FX terminal is turned ON. Motor decelerates to stop with Decel time 25[sec] when FX terminal is turned OFF.
7	Terminal RX	I/O-27	When RX terminal is turned ON motor starts to rotate in Reverse direction at 50[Hz] with Accel time 15 [sec]. When it is OFF, motor decelerates to stop with Decel time 25 [sec].

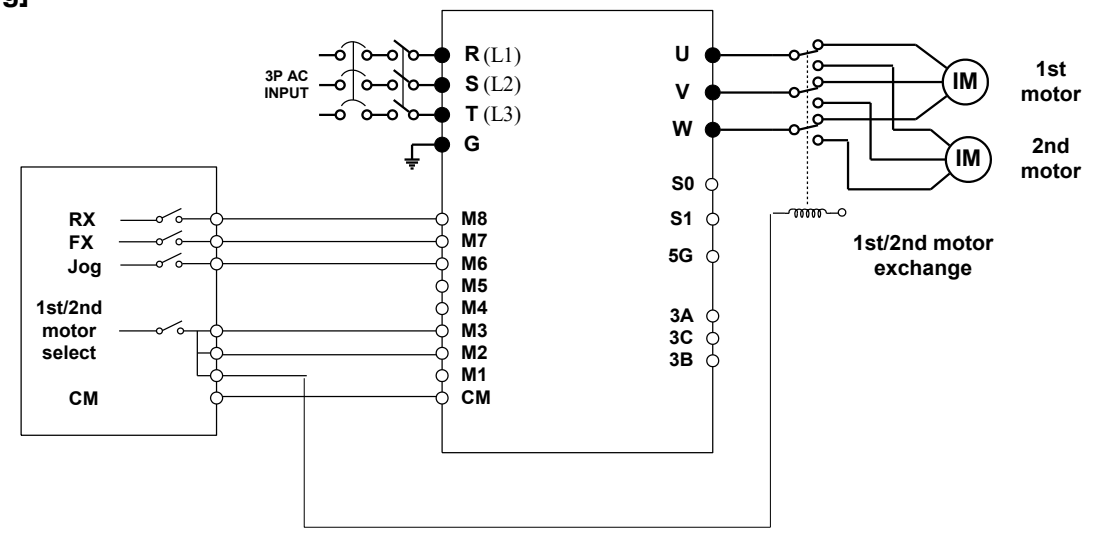
☞ 0.75 ~ 30 kW products: Common terminal of frequency setting is 5G terminal.
☞ 37 ~ 450 kW products: Common terminal of frequency setting is CM terminal.

Operation Example (2)	2nd motor operation

[Operation condition]

-. Control mode : V/F control
-. 1st motor + 2nd motor Operation by exchange using [2nd Func] (Set Value different)
-. Frequency command : Using Multi-step operation 1st motor --- 50[Hz] as main speed
2nd motor --- 20[Hz] with M1 terminal set as multi- step operation)
-. Accel/Decel time : 1st motor --- Accel time : 15[sec], Decel time : 25 [sec]
2nd motor --- Accel time : 30[sec], Decel time : 40 [sec]
-. Drive mode : Run/Stop via FX/RX, Control terminal : NPN mode

[Wiring]



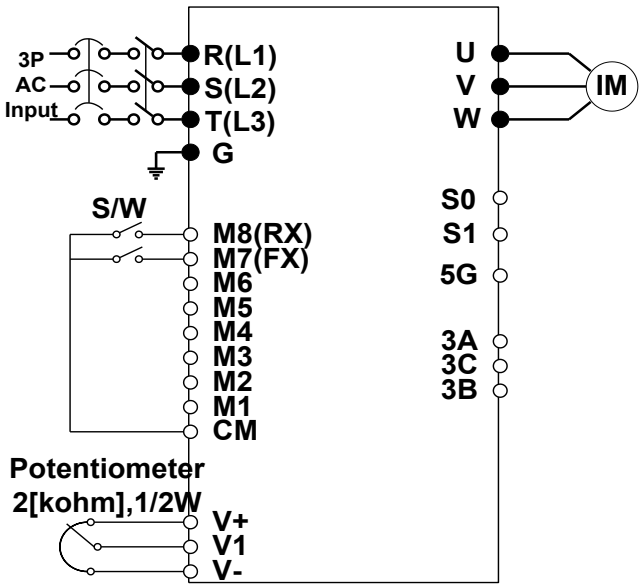
Step	Parameter setting	Code	Description
1	Control Mode Selection	FU2-60	Set it to 0 {V/F}.
2	Drive mode	DRV-3	Set it to Fx/Rx-1.
3	Frequency Mode setting	DRV-4	Set it to 0 {keypad-1}. 1st motor freq setting
4	Programmable digital input terminal M1	I/O-20	Set M1 to 2nd Func.
5	Programmable digital input terminal M2	I/O-21	Set M2 to Speed-L. 2nd motor freq setting.
6	Freq setting for 1st motor	DRV-0	Set it to 50[Hz].
7	Accel/Decel time setting for 1st motor	DRV-1 DRV-2	Set Accel/Decel time to 15[sec]/25[sec].
8	Freq setting for 2nd motor	DRV-5	Set it to 10[Hz].
9	Accel/Decel time setting for 2nd motor	APP-20 APP-21	Set Accel/Decel time to 30[sec]/50[sec].
10	1st motor operation	-	Set it as main motor by turning M1, M2, Output relay OFF. Run the motor in FWD/REV direction using FX/RX terminal.
11	2nd motor operation	-	Set 2nd motor parameters by turning terminal M1 ON. Change the freq setting to 20[Hz] by turning terminal M2 ON. Change to 2nd motor terminal by turning output relay ON. Run the motor in FWD/REV direction by terminal FX/RX.

Operation Example (3)	V/F control + Analog input (V1S) + Operation via terminal FX/RX

[Operation condition]

-. Control mode : V/F control
-. Frequency command : Setting 50[Hz] via Analog input (V1S)
-. Accel/Decel time : Accel time 15 [sec], Decel time 25 [sec]
-. Drive mode : Run/Stop via FX/RX, Control terminal: NPN mode

[Wiring]

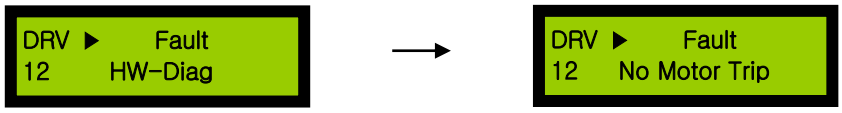


Step	Parameter setting	Code	Description
1	Control mode selection	FU2-60	Set it to 0 {V/F}.
2	Drive mode	DRV-3	Set it to 1 {Fx/Rx-1}.
3	Frequency mode	DRV-4	Set it to 3 {V1S}.
4	Operating frequency command 50[Hz] setting	DRV-0	Set 50[Hz] via potentiometer (V1S).
5	Accel/Decel time setting	DRV-1 DRV-2	Set Accel. time to 15[sec] in DRV-1 with Decal. time to 25[sec] in DRV-2.
6	FX terminal (M7)	IO-26	When FX terminal is turned ON, motor rotating in forward direction starts running at 50[Hz] for 15 [sec]. When FX terminal is turned OFF, motor decelerates to stop for 25[sec].
7	RX terminal (M8)	IO-27	When RX terminal is turned ON, motor rotating in reverse direction starts running at 50[Hz] for 15[sec]. When RX terminal is turned OFF, motor decelerates to stop for 25 [sec].

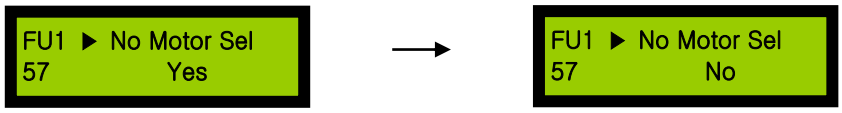
☞ **Note: V1S mode enables Forward/Reverse rotation using ±12V power via Analog input command.**

☞ **Note: Use V1 instead of V1S mode when FWD/REV Run Prevention is active. V1S mode enables the motor to run both FWD/REV directions.**

☞ **Note: If the inverter is operated without wiring a motor, trip occurs as below because the protection function is active automatically. In this case, refer to the related parameters(FU1 57 ~ 59). Trip is reset if the inverter is powered down and up once again.**



In case that a simple trial run is needed such as a check on basic operation state without a wiring a motor, FU1-57(No Motor Sel) should be set to [No].



CHAPTER 5 - PARAMETER LIST

5.1 Parameter groups

The parameters of SV-IP5A Series are divided into 5 function groups in accordance with the application.
Their names, principal contents and LCD keypad displays are shown below.

Name of Group	LCD Keypad Display	Description
Drive Group [DRV]		Target frequency and Accel/ Decel Time, etc. Basic parameters
Function1 Group [FU1]		Maximum Frequency and Protection, etc. Parameters regarding basic functions
Function2 Group [FU2]		Frequency Jump and Frequency Limit, etc Parameters regarding application functions
Input/Output Group [I/O]		Programmable Digital terminal Define and Analog Command, etc Parameters necessary for sequence configuration
Application Group [APP]		PID, MMC, and 2nd motor, etc. Parameters regarding application functions

5.2 Parameter list

* The number of page is for User's manual uploaded at LS ELECTRIC website. You can download the User's manual which is described detailed function of parameter from website. (http://www.lselectric.co.kr)

[DRV Group]

CODE	Comm. Addr	Description		LCD Keypad Display	Setting Range	Factory Default	Adj. During Run	Page
DRV-00 (1)	9100	Command Frequency *(Output Frequency during motor run, Reference Frequency during motor stop),* Output Current (LCD)		Cmd. freq	0 to FU1-30[Hz]	0 [Hz]	O	6-1
DRV-01	9101	Acceleration Time	0.75~90kW (1~125HP)	Acc. Time	0 to 6000 [sec]	20 [sec]	O	6-2
			110~450kW (150~700HP)			60 [sec]		
DRV-02	9102	Deceleration Time	0.75~90kW (1~125HP)	Dec. time	0 to 6000 [sec]	30 [sec]	O	6-2
			110~450kW (150~700HP)			90 [sec]		
DRV-03	9103	Drive Mode (Run/Stop Method)		Drive mode	0 (Keypad) 1 (Fx/Rx-1) 2 (Fx/Rx-2) 3 (Int. 485)	1 (Fx/Rx-1)	X	6-3
DRV-04	9104	Frequency Mode (Frequency setting method)		Freq mode	0 (Keypad-1) 1 (Keypad-2) 2 (V1) 3 (V1S) 4 (I) 5 (V1+I) 6 (Pulse) 7 (Int. 485) 8 (Ext. PID)	0 (Keypad -1)	X	6-3
DRV-05	9105	Step Frequency 1		Step freq-1	0 to FU1-30[Hz]	10 [Hz]	O	6-3
DRV-06	9106	Step Frequency 2		Step freq-2		20 [Hz]	O	
DRV-07	9107	Step Frequency 3		Step freq-3		30 [Hz]	O	
DRV-08	9108	Output Current		Current	* [A]	* [A]	*	6-4
DRV-09	9109	Motor Speed		Speed	* [rpm]	* [rpm]	*	6-4
DRV-10	910A	DC link Voltage		DC link Vtg	* [V]	* [V]	*	6-4
DRV-11	910B	User Display Selection		User disp	-	Output voltage [V]	*	6-4
DRV-12	910C	Current Trip Display		Fault	*	*	*	6-4
DRV-14(2)	910E	Target/Output Frequency Display		Tar. Out. Freq.	* [Hz]	* [Hz]	*	6-5
DRV-15(2)	910F	Reference/Feedback Frequency Display		Ref. Fbk. Freq.	* [Hz]	* [Hz]	*	6-5

CODE	Comm. Addr	Description	LCD Keypad Display	Setting Range	Factory Default	Adj. During Run	Page
DRV-16	9110	Speed Unit Selection	Hz/Rpm Disp	Hz or Rpm	Hz	O	6-6
DRV-18 (2)	9112	PID Parameter	R T F O	* [Hz]	* [Hz]	X	6-6
DRV-19	9113	AD Parameter	V1 V2 V1S I	*	*	X	6-6
DRV-20 (3)	9114	EXT-PID Parameter	R T F O	%	%	X	6-6
DRV-22	9116	Local/Remote Key	LocalRemKey	0.(2nd Source) 1 (Cntl&RefStop) 2 (Control Stop) 3 (Ref Only) 4 (Cntl&Ref Run) 5 (Control Run) 6 (Disable)	1 (Cntl&RefStop)	O	6-6
DRV-23	9117	Keypad Mode	Key Ref Mode	0 (Minimum Spd) 1 (Last Spd) 2 (Preset Spd 1) 3 (Stop) 4 (Fault) 5 (Disable)	5 (Disable)	O	6-7
DRV-91 (4)	915B	Drive mode 2	Drive mode2	0 (Keypad) 1 (Fx/Rx-1) 2 (Fx//Rx-2)	1 (Fx/Rx-1)	X	-
DRV-92	915C	Frequency mode 2	Freq mode2	0 (Keypad-1) 1 (Keypad-2) 2 (V1) 3 (V1S) 4 (I) 5 (V1+I) 6 (Pulse)	0 (Keypad-1)	X	-

* ▭ The gray-highlighted codes are hidden parameters and will appear when the related functions are to be set.

(1) The speed unit is changed from [Hz] to [%] when DRV-16 is set to [Rpm]. Only User Unit will be displayed when APP-02 is set to [Yes] and when APP-06 is set to either I, V1 or Pulse and when one of I/O-86~ I/O-88 is set to either [Speed] (Hz or Rpm), [Percent], [Bar], [mBar], [kPa] or [Pa].
Output Frequency (Hz or Rpm; Unit of outupt speed) is displayed in DRV-00 during the Inverter is running. User Unit reference (Unit of PID controller selected) is displayed in DRV-00 during the Inverter is not running.

(2) DRV-15, DRV-18 will appear when APP-02 [Process PI Mode] is set to “Yes”. Also User Unit is displayed when one of I/O-86~ I/O-88 is set to either [Speed](Hz or Rpm), [Percent], [Bar], [mBar], [kPa] or [Pa].

(3) DRV-20 will appear when APP-80 [ExtProcess PI Mode] is set to “Yes”.

(4) DRV-91/92 will appear only when DRV-22 is set to [2nd Source].

[FU1 GROUP]

CODE	Comm. Addr	Description	LCD Keypad Display	Setting Range	Factory Default	Adj. During Run	Page
FU1-00	9200	Jump to Desired Code #	Jump code	1 to 74 (Use Only LCD Keypad)	1	O	6-8
FU1-01	9201	Run Prevention	Run prevent	0 (None) 1 (Fwd prev) 2 (Rev prev)	0 (None)	X	6-8
FU1-02	9202	Acceleration Pattern	Acc. Pattern	0 (Linear) 1 (S-curve) 2 (U-curve)	0 (Linear)	X	6-8
FU1-03	9203	Deceleration Pattern	Dec. Pattern	0 (Linear) 1 (S-curve) 2 (U-curve)	0 (Linear)	X	6-8
FU1-04 (5)	9204	Start Curve for S-Curve Accel/Decel Pattern	Start SCurve	0 to 100 [%]	50 [%]	X	6-8
FU1-05	9205	End Curve for S-Curve Accel/Decel Pattern	End SCurve	0 to 100 [%]	50 [%]	X	
FU1-10	920A	Pre-Heat	Pre-Heat mode	0 (No) 1 (Yes)	0 (No)	X	6-9
FU1-11	920B	Pre-Heat Value	Pre Heat level	1 to 50 [%]	30 (%)	X	
FU1-12	920C	Pre-Heat Duty	Pre Heat Perc	1 to 100 [%]	50 (%)	X	
FU1-20	9214	Start Mode	Start mode	0 (Accel) 1 (Dc-start) 2 (Flying-start)	0 (Accel)	X	6-10
FU1-21 (6)	9215	Starting DC Injection Braking Time	DcSt time	0 to 60 [sec]	0.1 [sec]	X	6-10
FU1-22	9216	Starting DC Injection Braking Value	DcSt value	0 to 150 [%]	50 [%]	X	
FU1-23	9217	Stop Mode	Stop mode	0 (Decel) 1 (Dc-brake) 2 (Free-run) 3 (Flux-brake)	0 (Decel)	X	6-10
FU1-24 (7)	9218	DC Injection Braking On-delay Time	DcBlk Time	0.1 to 60 [sec]	0.1 [sec]	X	6-11
FU1-25	9219	DC Injection Braking Frequency	DcBrk freq	0.1 to 60 [Hz]	5 [Hz]	X	
FU1-26	921A	DC Injection Braking Time	DcBr time	0 to 60 [sec]	1 [sec]	X	
FU1-27	921B	DC Injection Braking Value	DcBr value	0 to 200 [%]	50 [%]	X	

CODE	Comm. Addr	Description	LCD Keypad Display	Setting Range	Factory Default	Adj. During Run	Page
FU1-28	921C	Safety Stop	Safety Stop	0 (No) 1 (Yes)	0 (No)	X	6-12
FU1-29	921D	Power Source Freq	Line Freq	40 to 120 [Hz]	60.00 [Hz]	X	6-12
FU1-30	921F	Max Frequency	Max Freq	30 - 120 [Hz]	60.00 [Hz]	X	6-12
FU1-31	9220	Base Frequency	Base Freq	30 - 120 [Hz]	60.00 [Hz]	X	6-12
FU1-32	9220	Starting Frequency	Start Freq	0.01 to 10 [Hz]	0.50 [Hz]	X	6-12
FU1-33	9221	Frequency Limit selection	Freq limit	0 (No) 1 (Yes)	0 (No)	X	6-13
FU1-34 (8)	9222	Freq Lower Limit	Lim Lo Freq	0 – FU1-35	0.50 [Hz]	○	6-13
FU1-35	9223	Freq Upper Limit	Lim Hi Freq	FU1-34 – FU1-30	60.00 [Hz]	X	6-13
FU1-40	9228	Volts/Hz Pattern	V/F Pattern	0 (Linear) 1 (Square) 2 (User V/F)	0 (Linear)	X	6-14
FU1-41 (9)	9229	User V/F – Frequency 1	User freq 1	0 to FU1-30	15.00 [Hz]	X	6-14
FU1-42	922A	User V/F – Voltage 1	User volt 1	0 to 100 [%]	25 [%]	X	
FU1-43	922B	User V/F – Frequency 2	User freq 2	0 to FU1-30	30.00 [Hz]	X	
FU1-44	922C	User V/F – Voltage 2	User volt 2	0 to 100 [%]	50 [%]	X	
FU1-45	922D	User V/F – Frequency 3	User freq 3	0 to FU1-30	45.00 [Hz]	X	
FU1-46	922E	User V/F – Voltage 3	User volt 3	0 to 100 [%]	75 [%]	X	
FU1-47	922F	User V/F – Frequency 4	User freq 4	0 to FU1-30	60.00 [Hz]	X	
FU1-48	9230	User V/F – Voltage 4	User volt 4	0 to 100 [%]	100[%]	X	
FU1-49	9231	Input voltage adjustment	VAC voltage	73 to 115.0 [%]	86.4 [%]	X	6-15
FU1-50	9232	Motor Rated Voltage	Motor Volt	0 to 600 [V]	380 [V]	X	6-15
FU1-51	9233	Energy Save	Energy save	0 (None) 1 (Manual) 2 (Auto)	0 (None)	X	6-15
FU1-52 (10)	9234	Energy Save %	Manual save%	0 to 30 [%]	0 [%]	O	
FU1-54 (13)	9236	Integrating Wattmeter	KiloWattHour	M kWh	*	X	6-16
FU1-55	9237	Inverter Temperature	Inv. Temp.	0 to 160 [degree]	*	X	6-16
FU1-56	9238	Motor Temperature	Motor Temp.		*	X	6-16
FU1-57	9239	No Motor Selection	No Motor Sel	0 (No) 1 (Yes)	0 (No)	X	6-16
FU1-58	923A	Trip Current Level	No Motor Level	5 to 100 [%]	5 [%]	X	6-16
FU1-59	923B	Trip Time Setting	No Motor Time	0.5 to 10.0 [sec]	3.0 [sec]	X	6-16
FU1-60	923C	Electronic Thermal	ETH select	0 (No)	1 (Yes)	O	6-17

CODE	Comm. Addr	Description	LCD Keypad Display	Setting Range	Factory Default	Adj. During Run	Page
		Selection		1 (Yes)			
FU1-61 (11)	923D	Electronic Thermal Level for 1 Minute	ETH 1min	FU1-62 to 200 [%]	150 [%]	O	6-17
FU1-62	923E	Electronic Thermal Level for Continuous	ETH Cont	50 to FU1-61 (Maximum 150%))	120 [%]	O	6-17
FU1-63	923F	Characteristic Selection (Motor Type)	Motor type	0 (Self-cool) 1 (Forced-cool)	0 (Self-cool)	O	6-17
FU1-64	9240	Overload Warning Level	OL level	30 to 110 [%]	110 [%]	O	6-18
FU1-65	9241	Overload Warning Time	OL time	0 to 30 [sec]	10 [sec]	O	6-18
FU1-66	9242	Overload Trip Selection	OLT select	Yes / No	No	O	6-18
FU1-67 (12)	9243	Overload Trip Level	OLT level	30 to 150 [%]	120[%]	O	6-18
FU1-68	9244	Overload Trip Delay Time	OLT time	0 to 60 [sec]	60 [sec]	O	6-18
FU1-69	9245	Input/Output Phase Loss Protection	Trip select	000 to 111 (Bit Set)	100	O	6-19
FU1-70	9246	Stall Prevention Selection	Stall Mode.	Yes / No	No	X	6-19
FU1-71	9247	Stall Prevention Level	Stall level	30 to 200 [%]	120[%]	X	6-19
FU1-72	9248	Accel/Decel Change Frequency	Acc/Dec ch F	0 to FU1-30	0 [Hz]	X	6-19
FU1-73	9249	Reference Frequency for Accel and Decel	Acc/Dec freq	0 (Max freq) 1 (Delta freq)	0 (Max freq)	X	6-20
FU1-74	924A	Accel/Decel Time Scale	Time scale	0 (0.01 sec) 1 (0.1 sec) 2 (1 sec)	1 (0.1 sec)	O	6-20
FU1-75	924B	Up Down Save Mode	UpDnSaveMode	Yes / No	0 (No)	X	6-20
FU1-76 (31)	924C	Up Down Save Freq	UpDnSaveFreq	startFreq to 120[Hz]	0.00Hz	O	6-20
FU1-80 (32)	9250	Voltage Suppression	Suppression	Yes / No	Yes	O	6-20
FU1-81	9251	Fan Fault Mode	Fan Fault Mode	None FanWarning Fan Trip	Yes	O	6-20

* The gray-highlighted codes are hidden parameters and will appear when the related functions are to be set.

(5) Only displayed when FU1-02, FU1-03 is set to [S-Curve].

(6) Only displayed when FU1-20 is set to [DC-start]. (7) Only displayed when FU1-23 is set to [DC-brake].

(8) Only displayed when FU1-33 is set to [Yes]. (9) FU1-41~48 Only displayed when FU1-40 is set to [User V/F].

(10) Only displayed when FU1-51 is set to [Manual]. (11) Only displayed when FU1-60 is set to [Yes].

(12) Only displayed when FU1-66 is set to [Yes].

(13) It isn't proper measuring Input power because some error.can be occured by Kinds of Motor, Load, Output Freq etc.

(31) Only displayed when FU1-75 is set to [Yes].

(32) If you do not want to suppress output voltage, Set this parameter to NO

[FU2 GROUP]

CODE	Comm. Addr	Description	LCD Keypad Display	Setting Range	Factory Default	Adj. During Run	Page
FU2-00	9300	Jump to desired code #	Jump code	1 to 95 (Use Only LCD Keypad)	40	O	6-21
FU2-01	9301	Last trip 1	Last trip-1	By pressing [ENTER] and [SEL] key, the frequency, current, and operational status at the time of fault can be seen.	0 (None)	*	6-21
FU2-02	9302	Last trip 2	Last trip-2			*	6-21
FU2-03	9303	Last trip 3	Last trip-3			*	6-21
FU2-04	9304	Last trip 4	Last trip-4			*	6-21
FU2-05	9305	Last trip 5	Last trip-5			*	6-21
FU2-06	9306	Erase trips	Erase trips	0 (No) 1 (Yes)	0 (No)	O	6-21
FU2-07	9307	Dwell Frequency	Dwell time	0 to 10 [sec]	0 [sec]	X	6-21
FU2-08 (12)	9308	Dwell Frequency	Dwell freq	FU1-32 to FU1-30	5 [Hz]	X	6-21
FU2-10	930A	Frequency Jump Selection	Jump Freq	0 (No) 1 (Yes)	0 (No)	X	6-21
FU2-11 (13)	930B	Jump Frequency 1 Low	jump lo 1	0 to FU2-12	10 [Hz]	O	6-21
FU2-12	930C	Jump Frequency 1 High	jump Hi 1	FU2-11 to FU1-30	15 [Hz]	O	
FU2-13	930D	Jump Frequency 2 Low	jump lo 2	0 to FU2-14	20 [Hz]	O	
FU2-14	930E	Jump Frequency 2 High	jump Hi 2	FU2-13 to FU1-30	25 [Hz]	O	
FU2-15	930F	Jump Frequency 3 Low	jump lo 3	0 to FU2-16	30 [Hz]	O	
FU2-16	9310	Jump Frequency 3 High	jump Hi 3	FU2-15 to FU1-30	35 [Hz]	O	
FU2-20	9314	Power ON Start Selection	Power-on run RST restart	0 (No) 1 (Yes)	0 (No)	O	6-22
FU2-21	9315	Restart after Fault Reset	RST restart	0 (No) 1 (Yes)	0 (No)	O	
FU2-22	9316	Start After Interrupt Power Fault Selection	IPF Mode	0 (No) 1 (Yes)	0(No)	X	6-23
FU2-23	9317	Speed Search Type Selection	Search Type	estmated SS	estmated SS	O	6-23
FU2-24	9318	Retry mode	Retry mode	NO/YES	0 (No)	O	6-24
FU2-25	9319	Number of Auto Retry	Retry number	0 to 10	0	O	6-24
FU2-26 (15)	931A	Delay Time Before Auto Retry	Retry delay	0 to 60 [sec]	1 [sec]	O	6-24
FU2-27	931B	Speed Search Limit	Flying Perc	30 to 160	70%	X	6-23

CODE	Comm. Addr	Description	LCD Keypad Display	Setting Range	Factory Default	Adj. During Run	Page
FU2-40	9328	Motor Capacity selection Inverter (5.5 ~ 450 kW)	Motor select	0 (0.75kW) 1 (1.5kW) 2 (2.2kW) 3 (3.7kW) 4 (5.5kW/) 5 (7.5kW/) 6 (11.0kW) 7 (15.0kW) 8 (18.5kW) 9 (22.0kW) 10 (30.0kW) 11 (37.0kW) 12 (45.0kW) 13 (55.0kW) 14 (75.0kW) 15 (90.0kW) 16 (110.0kW) 17 (132.0 kW) 18 (160.0 kW) 18 (220.0 kW) 20 (280.0 kW) 21 (315.0 kW) 22 (375.0 kW) 23 (450.0 kW)	Depending on the inverter capacity	X	6-25
		* A motor rating same as inverter capacity is automatically set. If different, set the correct value.					
FU2-41	9329	Number of Motor Poles	Pole number	2 to 12	4	X	6-25
FU2-42	932A	Motor Slip	Rate-Slip	0.00 to 10.00	Depending on the motor capacity *Refer to Table2	X	6-25
FU2-43	932B	Rated Current of Motor (rms)	Rated-Curr	1.0 to 999.9[A]		X	
FU2-44	932C	No Load Motor Current (rms)	Noload-Curr	0.1 to 999.9		X	
FU2-46	932E	Load Inertia	Inertia rate	0 to 40	10	X	
FU2-47	932F	Gain for Motor Speed Display	RPM DisplayGn	1 to 1000 [%]	100 [%]	O	
FU2-48	9330	Carrier Frequency	Carrier freq	5.5~22kW: 0.7~15 [kHz] 30kW: 0.7~10 [kHz]	5.0 [kHz]	O	6-26
				37~75kW: 0.7~4 [kHz]	4.0 [kHz]		
				90~280kW: 0.7~3 [kHz]	3.0 [kHz]		
				315~450kW: 0.7~2[kHz]	2.0 [kHz]		
FU2-49	9331	PWM Type Selection	PWM Technique	0 (Normal) 1 (Low leakage)	0 (Normal)	X	6-26
FU2-52	9334	Safety Stop Dec. Rate	Dec Rate	1.0 - 100.0 [sec]	100.0 [sec]	-	6-26
FU2-53	9335	Safety Stop Output Dec. Rate	safety_perc	2 - 500	21	-	6-26
FU2-60	933C	Control Mode Selection	Control Mode	0 (V/F) 1 (Slip compen) 2 (Sensorless)	0 (V/F)	X	6-27
FU2-61	933D	Auto Tuning Selection	AutoTuneEnbl	0 (No) 1 (Static)	0 (No)	X	6-28

CODE	Comm. Addr	Description	LCD Keypad Display	Setting Range	Factory Default	Adj. During Run	Page
FU2-62	933E	Stator Resistance of Motor	%Rs	0.01-20 [%]	4 [%]	X	6-28
FU2-63	933F	Leakage Inductance of Motor	%Lsigma	0.01-100[%]	12 [%]	X	6-28
FU2-64 (16)	9340	Pre-excitation Time	PreEx time	0 to 60 [sec]	1 [sec]	X	6-28
FU2-67	9343	Manual/Auto Torque Boost Selection	Torque boost	0 (Manual) 1 (Auto)	0 (Manual)	X	6-29
FU2-68	9344	Torque Boost in Forward Direction	Fwd boost	0.75~90kW: 0 to 15 [%] 110~450kW: 0 to 15 [%]	2.0 [%] 1.0 [%]	X	
FU2-69	9345	Torque Boost in Reverse Direction	Rev boost	0.75~90kW: 0 to 15 [%] 110~450kW: 0 to 15 [%]	2.0 [%] 1.0 [%]	X	
FU2-80	9350	Power On display	PowerOn Disp	0 to 12	0	O	6-30
FU2-81	9351	User Select	User Disp	Voltage Watt	Voltage	O	6-30
FU2-82	9352	Software Version	iP5A S/W Ver	Ver X.X	Ver X.X	*	6-30
FU2-83	9353	Last Trip Time	LastTripTime	X:XX:XX:XX:XX:X	*	X	6-30
FU2-84	9354	Power On Time	On-time		*	X	
FU2-85	9355	Run-time	Run-time		*	X	
FU2-87	9357	Power Set	Power Set	0.1~400 %	100	O	6-31
FU2-90	935A	Parameter Display	Para. disp	0 Default 1 (All Para) 2 (Diff Para)	0 (Default)	O	6-31
FU2-91	935B	Read Parameter	Para. Read	0 (No) 1 (Yes)	0 (No)	X	6-31
FU2-92	935C	Write Parameter	Para. Write	0 (No) 1 (Yes)	0 (No)	X	6-31
FU2-93	935D	Initialize Parameters	Para. Init	0 (No) 1 (All Groups) 2 (BAS) 3 (DRV) 4 (FU1) 5 FU2) 6 (I/O) 7 (EXT) 8 (COM) 9(APP)	0 (No)	X	6-31
FU2-94	935E	Parameter Write Protection	Param. Lock	0 to 9999	0	O	6-32
FU2-95	935F	Parameter Save	Param. save	0 (No) 1 (Yes)	0 (No)	X	6-32

* ▭ The gray-highlighted codes are hidden parameters and will appear when the related functions are to be set.
(12) FU2-8 is displayed when FU2-07 is set to [1~10 sec].
(13) FU2-11 is displayed when FU2-10 is set to [Yes].
(15) FU2-26 is displayed when FU2-25 [Retry number] is set to [1~10].
(16) FU2-64 is displayed when FU2-60 is set to [Sensorless].
Table 1) Switching frequency and fatory default value for each inverter capacity

Inverter Capacity	Setting Range	Factory Default
0.75 ~ 22 kW	0.7 ~ 15 [kHz]	5.0 [kHz]
30 kW	0.7 ~ 10 [kHz]	
37 ~ 75 kW	0.7 ~ 4 [kHz]	4.0 [kHz]
110~280 kW	0.7 ~ 3 [kHz]	3.0 [kHz]
90kW / 315 ~ 450 kW	0.7 ~ 2 [kHz]	2.0 [kHz]

Table 2) Initial value of motor Spec

Capacity (kW)	200V Motor ratedCurrent (A)	400V Motor ratedCurrent (A)	600VMotor ratedCurrent (A)	200V No Load Current (A)	400V No Load Current (A)	600V No Load Current (A)	200/400V Slip Frequency (Hz)	600V Slip Frequency (Hz)
0.8	3.6	2.0	2.0	1.6	0.8	0.8	30	30
1.5	6.1	3.1	3.1	2.8	1.4	1.4	23.4	23.4
2.2	8.6	4.0	4	3.5	2.6	2.6	20	20
3.7	12.9	6.5	6.5	4.9	3.3	3.3	23.4	23.4
5.5	22.0	11.0	8	6.6	3.9	4.2	23.4	10
7.5	28.0	14.0	10.1	9.0	5.7	4.5	23.4	13.3
11.0	42.0	21.0	14.8	12.5	7.5	6.6	13.3	11.7
15.0	54.0	27.0	19.2	17.5	10.1	7.5	16.7	11.7
18.5	68.0	34.0	23.9	19.4	11.6	7.9	13.3	10
22.0	80.0	40.0	29	25.3	13.6	9.6	13.3	10
30.0	104.0	52.0	36.8	33.6	19.3	12.1	13.3	8.3
37.0	122.0	65.0	45.6	40.6	23.3	15	13.3	8.3
45.0	150.0	77.0	55	50.0	28.6	18.2	13.3	6.7
55.0	190.0	96.0	69.2	63.3	35.3	22.8	13.3	6.7
75.0	250.0	124.0	87	83.3	46.3	28.7	13.3	6.7
90.0	250.0	156.0	112	83.3	42.0	37	13.3	6.7
110.0	300.0	180.0	134.4	121.9	67.7	44.4	13.3	6.7
132.0	350.0	240.0	161.3	146.3	81.2	53.2	13.3	6.7
160.0	370.0	302.0	192.6	173.3	98.4	63.6	13.3	6.7
220.0	490.0	361.0	268.8	238.3	135.3	88.7	13.3	6.7
260.0	490.0	414.0	313.6	238.3	135.3	103.5	13.3	6.7
280.0	600.0	477.0	336	303.3	172.2	110.9	13.3	6.7
315.0	675.0	590.0	380.8	341.2	193.7	125.7	13.3	6.7
375.0	803.5	731.0	448	406.2	230.6	147.8	13.3	6.7
450.0	964.2	864.0	537.6	487.4	276.7	177.4	13.3	6.7

[I/O GROUP]

CODE	Comm. Addr	Description	LCD Keypad Display	Setting Range	Factory Default	Adj. During Run	Page
I/O-00	9400	Jump to desired code	Jump code	1 to 98	1	O	6-33
I/O-01 (17)	9401	Filtering Time Constant for V1 Signal Input	V1 Filter	0 to 9999 [msec]	10 [msec]	O	6-33
I/O-02	9402	V1 Input Minimum Voltage	V1 volt x1	0 to 12[V]	0.00 [V]	O	
I/O-03	9403	Frequency Corresponding to V1 Input Minimum Voltage	V1 Freq y1	0 to FU1-30 [Hz] 0 to 100.00 [**](18)	0.00 [Hz]	O	
I/O-04	9404	V1 Input Minimum Voltage	V1 volt x2	0 to 12[V]	10 [V]	O	
I/O-05	9405	V1 Input Maximum Voltage	V1 Freq y2	0 to FU1-30 [Hz] 0 to 100.00 [**] (18)	60.00 [Hz]	O	
I/O-06	9406	Filtering Time Constant for I Signal Input	I Filter	0 to 9999 [msec]	10 [msec]	O	6-33
I/O-07	9407	I Input Minimum Current	I curr x1	0 to 20 [mA]	4 [mA]	O	
I/O-08	9408	Frequency Corresponding to I Input Minimum Current	I Freq y1	0 to FU1-30 [Hz] 0 to 100.00 [**](18)	0.00 [Hz]	O	
I/O-09	9409	Filtering Time Constant for I Signal Input	I curr x2	0 to 20 [mA]	20 [mA]	O	
I/O-10	940A	Frequency Corresponding to I Input Maximum Current	I Freq y2	0 to FU1-30 [Hz] 0 to 100.00 [**](18)	60.00 [Hz]	O	
I/O-11	940B	Pulse input method	P Pulse set	0 (A+B) 1 (A)	1 (A)	O	6-34
I/O-12	940C	Pulse input filter	P filter	0 to 9999 [msec]	10 [msec]	O	
I/O-13	940D	Pulse input Minimum frequency	P pulse x1	0 to 10 [kHz]	0 [kHz]	O	
I/O-14	940E	Frequency corresponding to I/O-13 Pulse input Minimum frequency	P freq y1	0 to FU1-30 [Hz] 0 to 100.00 [**](18)	0 [Hz]	O	
I/O-15	940F	Pulse input Minimum frequency	P pulse x2	0 to 100 [kHz]	10 [kHz]	O	
I/O-16	9410	Frequency corresponding to I/O-15 Pulse input Maximum frequency	P freq y2	0 to FU1-30 [Hz] 0 to 100.00 [**](18)	60.00 [Hz]	O	
I/O-17	9411	Criteria for Analog Input Signal Loss	Wire broken	0 (None) 1 (half of x1) 2 (below x1)	0 (None)	O	6-35
I/O-18	9412	Operating selection at Loss of Freq. Reference	Lost command	0 (None) 1 (FreeRun) 2 (Stop) 3 (Protection)	0 (None)	O	
I/O-19	9413	Waiting Time after Loss of Freq. Reference	Time out	0.1 to 120 [sec]	1.0 [sec]	O	
I/O-20	9414	Programmable Digital Input Terminal	M1 Define	0 (Speed-L)	0 (Speed-	O	6-36

CODE	Comm. Addr	Description	LCD Keypad Display	Setting Range	Factory Default	Adj. During Run	Page
		'M1' Define		1 (Speed-M) 2 (Speed-H) 3 (XCEL-L) 4 (XCEL-M) 5 (XCEL-H) 6 (Dc-brake) 7 (2nd Func) 8 (Exchange) 9 (- Reserved -) 10 (Up) 11 (Down) 13 (Ext Trip) 14 (Pre-Heat) 15 (iTerm Clear) 16 (Open-loop) 17 (LOC/REM) 18 (Analog hold) 19 (XCEL stop) 20 (P Gain2) 21 -Reserved- 22 (Interlock1) 23 (Interlock2) 24 (Interlock3) 25 (Interlock4) 26 (Speed_X) 27 (RST) 28 (BX) 29 (JOG) 30 (FX) 31 (RX) 32 (ANA_CHG) 33 (Ext PID Run) 34 (Up/Dn Clr)	L)		
I/O-21	9415	Programmable Digital Input Terminal 'M2' Define	M2 define	Same as I/O-20	1 (Speed-M)	O	
I/O-22	9416	Programmable Digital Input Terminal 'M3' Define	M3 define		2 (Speed-H)	O	
I/O-23	9417	Programmable Digital Input Terminal 'M4' Define	M4 define		27 (RST)	O	
I/O-24	9418	Programmable Digital Input Terminal 'M5' Define	M5 define		12 (Stop/ 3-wire)	X	
I/O-25	9419	Programmable Digital Input Terminal 'M6' Define	M6 define		29 (JOG)	O	
I/O-26	941A	Programmable Digital Input Terminal 'M7' Define	M7 define		30 (FX)	O	6-36

CODE	Comm. Addr	Description	LCD Keypad Display	Setting Range	Factory Default	Adj. During Run	Page
I/O-27	941B	Programmable Digital Input Terminal 'M8' Define	M8 define	Same as I/O-20	31 (RX)	O	
I/O-28	941C	Terminal Input Status	In status	00000000000/ 11111111111	0000000 0000	*	
I/O-29	941D	Filtering Time Constant for Programmable Digital Input Terminals	Ti Filt Num	2 to 1000 [msec]	15	O	
I/O-30 (19)	941E	Jog Freq-uency Setting	Jog Speed	0 to FU1-30	10 [Hz]	O	6-39
I/O-31	941F	Step Frequency 4	PresetSpd-4		40 [Hz]	O	
I/O-32	9420	Step Frequency 5	PresetSpd-5		50 [Hz]	O	
I/O-33	9421	Step Frequency 6	PresetSpd-6		40 [Hz]	O	
I/O-34	9422	Step Frequency 7	PresetSpd-7		30 [Hz]	O	
I/O-35	9423	Step Frequency 8	PresetSpd-8		20 [Hz]	O	
I/O-36	9424	Step Frequency 9	PresetSpd-9		10 [Hz]	O	
I/O-37	9425	Step Frequency 10	PresetSpd-10		20 [Hz]	O	
I/O-38	9426	Step Frequency 11	PresetSpd-11		30 [Hz]	O	
I/O-39	9427	Step Frequency 12	PresetSpd-12		40 [Hz]	O	
I/O-40	9428	Step Frequency 13	PresetSpd-13		50 [Hz]	O	
I/O-41	9429	Step Frequency 14	PresetSpd-14		40 [Hz]	O	
I/O-42	942A	Step Frequency 15	PresetSpd-15		30 [Hz]	O	
I/O-50	9432	Acceleration Time 1 (for Step speed)	Acc time-1	0 to 6000 [sec]	20 [sec]	O	6-40
I/O-51	9433	Deceleration Time 1 (for Step speed)	Dec time-1			O	
I/O-52 (20)	9434	Acceleration Time 1 (for Step speed)	Acc time-2	0 to 6000 [sec]	30 [sec]	O	
I/O-53	9435	Deceleration Time 2	Dec time-2			O	
I/O-54	9436	Acceleration Time 3	Acc time-3		40 [sec]	O	
I/O-55	9437	Deceleration Time 3	Dec time-3			O	
I/O-56	9438	Acceleration Time 4	Acc time-4		50 [sec]	O	
I/O-57	9439	Deceleration Time 4	Dec time-4			O	
I/O-58	943A	Acceleration Time 5	Acc time-5		40 [sec]	O	
I/O-59	943B	Deceleration Time 5	Dec time-5			O	
I/O-60	943C	Acceleration Time 6	Acc time-6		30 [sec]	O	
I/O-61	943D	Deceleration Time 6	Dec time-6			O	
I/O-62	943E	Acceleration Time 7	Acc time-7		20 [sec]	O	
I/O-63	943F	Deceleration Time 7	Dec time-7			O	
I/O-70	9446	S0 output selection	S0 mode	0 (Frequency) 1 (Current) 2 (Voltage) 3 (DC link Vtg) 4 (Ext PID Out)	0 (Frequen -cy)	O	6-41
I/O-71	9447	S0 output adjustment	S0 adjust	10 to 200 [%]	100 [%]	O	6-41
I/O-72	9448	S1 output selection	S1 mode	Same as I/O-70	2 (Voltage)	O	

CODE	Comm. Addr	Description	LCD Keypad Display	Setting Range	Factory Default	Adj. During Run	Page
I/O-73	9449	S1 output adjustment	S1 adjust	10 to 200 [%]	100 [%]	O	
I/O-74	944A	Frequency Detection Level	FDT freq	0 to FU1-30 [Hz]	30.00 [Hz]	O	6-42
I/O-75	944B	Frequency Detection Bandwidth	FDT band		10.00 [Hz]	O	6-42
I/O-76	944C	Programmable Digital Output Terminal Define (Aux terminal)	RlyOut 1 Def	0 (NONE) 1 (FDT-1) 2 (FDT-2) 3 (FDT-3) 4 (FDT-4) 5 (FDT-5) 6 (OL) 7 (IOL) 8 (Stall) 9 (OV) 10 (LV) 11 (OH) 12 (Lost Command) 13 (Run) 14 (Stop) 15 (Steady) 16 (INV line) 17 (COMM line) 18 (SpeedSearch) 19 (Ready) 20 (MMC) 21 (Fan Warning) 22 (RUN2)	0 (NONE)	O	6-42
I/O-77	944D	Programmable Digital Output Terminal Define	Aux mode2	Same as I/O-76	0 (NONE)	O	
I/O-78	944E	Programmable Digital Output Terminal Define	Aux mode3			O	
I/O-79	944F	Programmable Digital Output Terminal Define	Aux mode4			O	
I/O-80	9450	Fault Output Relay Setting (3A, 3B, 3C)	Relay mode	000 to 111 [bit]	010 [bit]	O	6-46
I/O-81	9451	Terminal Output Status	Out status	00000000/ 11111111	00000000	*	6-46
I/O-82	9452	Waiting time after Fault Output Relay On	Relay On	0 to 9999	0	X	6-47
I/O-83	9453	Waiting time after Fault Output Relay Off	Relay Off			X	
I/O-84	9454	Fan Con Sel (37 ~ 90kW)	Fan Con. Sel	0 (Power On Fan) 1 (Run Fan) 2 (Temper-Fan)	0 (Power On Fan)	X	6-47
I/O-85	9455	Fan Temp (37 ~ 90kW)	Fan Temp	0 to 70 [℃]	70 [℃]	O	6-47

CODE	Comm. Addr	Description	LCD Keypad Display	Setting Range	Factory Default	Adj. During Run	Page
I/O-86	9456	Input User Unit Selection	Unit Sel	0 (Percent) 1 (Bar) 2 (mBar) 3 (kPa) 4 (PSI) 5 (Pa)	0 (Percent)	X	6-47
I/O-87	9457	Unit Maximum Selection	Unit Max Val	1.0 to 999.9[%]	100[%]	X	
I/O-90	945A	Inverter Number	Inv No.	1 to 250	1	O	6-48
I/O-91 (22)	945B	Baud Rate Selection	Baud rate	0 (1200 bps) 1 (2400 bps) 2 (4800 bps) 3 (9600 bps) 4 (19200 bps) 5 (38400 bps)	3 (9600 bps)	O	6-37
I/O-92	945C	Operating method at loss of freq. reference	COM Lost Cmd	0 (None) 1 (FreeRun) 2 (Stop) 3 (Lost Preset)	0 (None)	O	6-48
I/O-93	945D	Waiting time after loss of freq. reference	COM Time Out	0.1 to 120 [sec]	1.0 [sec]	O	
I/O-94	945E	Communication Response Delay time	Delay Time	2 to 1000 [msec]	5 [msec]	O	6-48
I/O-95	945F	A or B contact	In No/Nc Set	00000000000 /11111111111	0000000 0000	X	6-49
I/O-96	9460	Input time	In CheckTime	1 to 1000	1 [msec]	X	6-49
I/0-97	9461	Overheat trip selection	OH Trip Sel	000 to 111 [bit]	010 [bit]	X	6-49
I/0-98	9462	Motor overheat trip temperature	MotTripTemp	0 to 255 [℃]	110 [℃]	X	
I/0-98 (23)	9463	Lost Cmd Pre freq Setting	Lost Preset	0 to 60 [Hz]	0	O	6-50

* The gray-highlighted codes are hidden parameters and will appear when the related functions are to be set.

(17) When DRV-04 is set to either V1, V1S, I or V1+I or Pulse, only selected item codes are displayed in I/O-1~I/O-19.
(18) I/O-3,5,8,10,14,16 is displayed 0~100.00 [**] when App-02 is set to [proc PI mode] or APP-80 is set to [Ext PI mode] and APP-06 PID Feedback Signal Selection is set to one of I, VI, Pulse, after then, one of I/O-86 ~I/O-88 is set to percentage, Bar, mBar, kPa, Pa except for Speed. Unit will be changed to selected unit.
Only user unit displayed when APP-02 or APP-80 is set to [Yes], after APP-06 is set to one of I, V, Pulse, after then one of I/O-86 ~I/O-88 is set to either speed, percentage, Bar, mBar, kPa, Pa.
(19) I/O-30 ~ I/O-34 displayed only when one of I/O-20 ~ I/O-27 is set to either JOG, Speed_L, Speed_M, Speed_H.
I/O-35 ~ I/O-42 displayed only when one of I/O-20 ~ I/O-27 is set to Speed_X.
(20) I/O-52 ~ I/O-63 displayed only when one of I/O-20 ~ I/O-27 is set to either XCEL_L, XCEL_M, XCEL_H.
(22) 38400 bps can be set only when the external communication option card is installed.
(23) I/O-99 displayed only when one of DRV-04 is set to [V1, V1S, I, V1+I, Pulse].

CODE	Comm. Addr	Description	LCD Keypad Display	Setting Range	Factory Default	Adj. During Run	Page

[APP GROUP]

CODE	Comm. Addr	Description	LCD Keypad Display	Setting Range	Factory Default	Adj. During Run	Page
APP-00	9700	Jump to Desired Code #	Jump code	1 to 80	1	O	6-51
APP-01	9701	Application Mode Selection	App mode	0 (None) 1 (MMC)	0 (None)	X	6-51
APP-02	9702	PID Operation Selection	Proc PI mode	0 (No) 1 (Yes)	0 (No)	X	6-51
APP-03 (25)	9703	PID F Gain Selection	PID FFwd-Gn	0 to 999.9[%]	0.0 [%]	O	6-57
APP-04 (26)	9704	PID Auxiliary Reference Mode Selection	Aux Ref Enbl	0 (No) 1 (Yes)	0 (No)	X	6-57
APP-05 (27)	9705	PID Auxiliary Reference Signal Selection	Aux Ref Sel	0 (Keypad-1) 1 (Keypad-2) 2 (V1) 3 (V1S) 4 (I) 5 (V1+I) 6 (Pulse) 7 (Int. 485) 8 (Ext. PID)	2 (V1)	X	6-57
APP-06	9706	PID Feedback Signal Selection	PID Fbk Src	0 (I) 1 (V1) 2 (Pulse)	0 (I)	X	6-57
APP-07	9707	Meter I Maximum Value	Meter I Max	0 to 20.00 mA	20.00 mA	O	6-57
APP-08	9708	Meter V Maximum Value	Meter V Max	0 to 12.00 V	10.00V	O	6-57
APP-09	9709	Meter P Maximum Value	Meter P Max	0 to100.0kHz	100.0kHz	O	6-57
APP-11	970B	P Gain for PID Control	PID P Gain	0 to 999.9 [%]	1.0 [%]	O	6-58
APP-12	970C	I Time for PID Control	PID I Time	0 to 32.0 [sec]	10.0 [sec]	O	6-58
APP-13	970D	D Time for PID Control	PID D Time	0 to100 [msec]	0.0 [msec]	O	6-58
APP-14	970E	High Limit Frequency for PID Control	PID Hi Limit	0.00 to FN1-30	60 .00[Hz]	O	6-58
APP-15	970F	Low Limit Frequency for PID Control	PID LowLimit	FN1-32 to APP-10	0.5 [Hz]	O	
APP-16	9710	PID Output Gain	PID OutScale	0.0 to 999.9 [%]	100.0 [%]	X	
APP-17	9711	PID P2 Gain	PID P2 Gain			X	
APP-18	9712	P Gain Scale	P Gain Scale	0.0 to 100.0 [%]		X	6-58
APP-19	9713	PID Output Inverse	PID OutInvrt	0 (No) 1 (Yes)	0 (No)	X	6-58
APP-20	9714	PID U curve feedback select	PID U Fbk	0 (No) 1 (Yes)	0 (No)	X	6-58
APP-23	9717	PrePID Reference Frequency	PrePID Freq	0 to FU1-30	0	O	6-59
APP-24	9718	PrePID Exit Level	PrePID Exit	0 to 100.0%	0	O	
APP-25	9719	PrePID Stop delay	PrePID Dly	0 to 9999	600	O	

CODE	Comm. Addr	Description	LCD Keypad Display	Setting Range	Factory Default	Adj. During Run	Page
APP-26	971A	Pipe Broken	Pipe Broken	0 (No) 1 (Yes)	0 (No)	X	
APP-27	971B	Sleep Delay Time	Sleep Delay	0.0 to 9999 [sec]	60.0 [sec]	O	6-59
APP-28	971C	Sleep Frequency	Sleep Freq	0 to FU1-30 [Hz]	0.00 [Hz]	O	
APP-29	971D	Wake-Up Level	WakeUp level	0.0 to 100.0 [%]	2 .0[%]	O	
APP-30 (28)	971E	2nd Acceleration Time	2nd Acc Time	0 to 6000 [sec]	5 [sec]	O	6-60
APP-31	971F	2nd Deceleration Time	2nd Dec Time		10 [sec]	O	6-60
APP-32	9720	2nd Base Frequency	2nd BaseFreq	30 to FN1-30 [Hz]	60 [Hz]	X	6-60
APP-33	9721	2nd V/F Pattern	2nd V/F	0 (Linear) 1 (Square) 2 (User V/F)	0(Linear)	X	6-60
APP-34	9722	2nd Forward Torque Boost	2nd F-Boost	0.0 to 15.0 [%]	2.0 [%]	X	6-60
APP-35	9723	2nd Reverse Torque Boost	2nd R-Boost	0.0 to 15.0 [%]	2.0 [%]	X	6-60
APP-36	9724	2nd Stall Prevention Level	2nd Stall	30 to 150 [%]	100 [%]	X	6-60
APP-37	9725	2nd Electronic Thermal Level for 1 minute	2nd ETH 1min	FU2-28 to 200 [%]	130[%]	O	6-60
APP-38	9726	2nd Electronic Thermal Levl for continuous	2nd ETH Cont	50 to FU2-27 (Max 150%)	120[%]	O	6-60
APP-39	9727	2nd Rated Motor Current	2nd R-Curr	1 to 200 [A]	3.6[A]	X	6-60
APP-40 (29)	9728	Number of Auxiliary Motor Run Display	Aux Mot Run	*	*	*	6-60
APP-41	9729	Aux. Motor Start Selection	Starting Aux	1 to 4	1	O	6-62
APP-42	972A	Operation Time Display on Auto Change	Auto Op Time	*	*	*	6-63
APP-43	972B	The Number of Aux Motor	Nbr Aux`s	0 to 7	4	O	6-63
APP-44	972C	Aux.Motor Stop sequence	F-in L-Out	0 (No) 1 (Yes)	1 (Yes)	X	6-63
APP-45	972D	How to stop Aux. Motor	ALL Stop	0 (No) 1 (Yes)	1 (Yes)	X	6-60
APP-47	972F	Start Frequency of Aux. Motor 1	Start freq 1	0 to FU1-30	49.99 [Hz]	O	6-63
APP-48	9730	Start Frequency of Aux. Motor 2	Start freq 2			O	
APP-49	9731	Start Frequency of Aux. Motor 3	Start freq 3			O	
APP-50	9732	Start Frequency of Aux. Motor 4	Start freq 4			O	
APP-51	9733	Stop Frequency of Aux. Motor 1	Stop freq 1		20.00 [Hz]	O	6-63
APP-52	9734	Stop Frequency of Aux. Motor 2	Stop freq 2			O	
APP-53	9735	Stop Frequency of Aux. Motor 3	Stop freq 3			O	
APP-54	9736	Stop Frequency of Aux. Motor 4	Stop freq 4			O	
APP-58	973A	Delay Time before Operating Aux Motor	Aux start DT	0.0 to 999.9 [sec]	5.0 [sec]	O	6-63

CODE	Comm. Addr	Description	LCD Keypad Display	Setting Range	Factory Default	Adj. During Run	Page
APP-59	973B	Delay Time before Stopping Aux Motor	Aux stop DT	0.0 to 999.9 [sec]	5.0 [sec]	O	6-63
APP-60	973C	Accel time when the number of pump decreases	Pid AccTime	0 to 600.0 [sec]	2.0 [sec]	O	6-63
APP-61	973D	Decel time when the number of pump increases	Pid DecTime			O	6-64
APP-62	973E	PID Bypass Selection	Regul Bypass	0 (No) 1 (Yes)	0 (No)	X	6-64
APP-66	9742	Auto Change Mode Selection	AutoCh_Mode	0(EXCH_NONE), 1 (AUX_EXCH), 2 (MAIN_ EXCH)	0(EXCH_ NONE)	O	6-65
APP-67	9743	Auto Change Time	AutoEx-intv	00:00 to 99:00	72:00	O	6-65
APP-68	9744	Auto Change Freq	AutoEx-Freq	FN1-32 to FN1-30 [Hz]	20.0 [Hz]	O	6-65
APP-69	9745	Inter-Lock Selection	Inter-lock	0 (No)	0 (No)	O	6-66
APP-71	9747	Pressure difference for Aux motor Start	Aux Stt Diff	0 to100%	2[%]	O	6-68
APP-72	9748	Pressure difference for Aux motor Stop	Aux Stp Diff			O	6-68
APP-80	9750	Ext PID Operation Selection	Ext PI Mode	0 (No) 1 (Yes)	0 (No)	X	6-68
APP-81 (30)	9751	Ext PID Reference Signal Selection	ExtPI RefSel	0(I) 1 (V1) 2 (Pulse) 3(Keypad)	3(Keypad)	X	6-68
APP-82	9752	Ext PID Reference Level	Ext PI Ref %	0 to 100.00 [%]	50.00 [%]	X	6-68
APP-83	9753	Ext PID Feedback Signal Selection	ExtPI FbkSel	0 (I) 1 (V1) 2 (Pulse)	0 (I)	X	6-68
APP-85	9755	P Gain for ExtPID	ExtPID Pgain	0 to 999.9 [%]	1.0 [%]	X	6-68
APP-86	9756	I Time for ExtPID	ExtPID Itime	0 to 32.0 [sec]	10.0 [sec]	X	6-68
APP-87	9757	D Time for ExtPID	ExtPID Dtime	0 to 2000 [msec]	0 [msec]	X	6-68
APP-88	9758	High Limit Frequency for ExtPID Control	ExtPID Lmt-H	0 to 100.00 [%]	100.00 [%]	X	6-68
APP-89	9759	Low Limit Frequency for ExtPID Control	ExtPID Lmt-L	0 to 30.00 [%]	0 [%]	X	6-68
APP-90	975A	ExtPID Output Scale	ExtPID Scale	0 to 999.9	100.0 [%]	X	6-68
APP-91	975B	ExtPID P2 Gain	ExtPI P2Gain			X	6-68
APP-92	975C	ExtPID P Gain Scale	ExtPI PScale	0 to 100.0		X	6-68
APP-93	975D	ExtPID F Gain	ExtPID F-gain	0 to 999.9 [%]	0.0 [%]	O	6-68
APP-95	975F	ExtPID Output Inverse	ExtPI OutInv	0 (No) 1 (Yes)	0 (No)	X	6-68

CODE	Comm. Addr	Description	LCD Keypad Display	Setting Range	Factory Default	Adj. During Run	Page
APP-97	9761	ExtPID Loop Time	ExtPI LoopTm	50 to 200 [msec]	100 [msec]	X	6-68

* The gray highlighted codes are hidden parameters and will appear when the related functions are to be set.

(25) Only APP-03 ~ APP-17 and APP-63 ~ APP-65 displayed when APP-2 is set to [Yes].
(26) If APP-04 Aux Ref Mode is set to [No], DRV-04 setting will be reference of process PID and APP -05 setting will be ignored.
(27) If APP-02 is set to [Yes], APP-04 will appear and APP -05 setting value will be reference of process PID, DRV-04 setting will be ignored.
(28) Only APP-30 ~ APP-39 displayed only when one of I/O-20 ~ I/O-27 is set to either "2nd Func".
(29) Only APP-40 ~ APP-71 displayed when APP-01 is set to [MMC].
(30) Only APP-81 ~ APP-97 displayed when APP-80 Ext PI mode is set to [Yes].

[EXT GROUP]

CODE	Comm. Addr	Description	LCD Keypad Display	Setting Range	Factory Default	Adj. During Run	Page
EXT-00	9500	Jump Code	Jump code	1 to 45	1	O	Refer to the correspon-ding option manual
EXT-01	9501	Type of SUB Board	Sub B/D	Sub-E	*	*	
EXT-40	9528	Current Output Terminal 1(CO1) Selection	AM1 mode	Frequency Current Voltage DC link Vtg Ext PID Out	Frequency	O	
EXT-41	9529	Adjust Gain of Current Output Terminal 1(CO1)	AM1 adjust	10 – 200 [%]	100 [%]	O	
EXT-42	952A	Adjust Offset of Current Output Terminal 1(CO1)	AM1 Offset	0 – 100 [%]	0 [%]	O	
EXT-43	952B	Current Output Terminal 2(CO2) Selection	AM2 mode	Frequency Current Voltage DC link Vtg Ext PID Out	DC link Vtg	O	
EXT-44	952C	Adjust Gain of Current Output Terminal 2(CO2)	AM2 adjust	10 – 200 [%]	100 [%]	O	
EXT-45	952D	Adjust Offset of Current Output Terminal 2(CO2)	AM2 Offset	0 – 100 [%]	0 [%]	O	

* Only the above EXT group displayed when the corresponding option board is installed.
* Refer to the SUB board option manual for details.

[COM GROUP]

CODE	Comm. Addr	Description	LCD Keypad Display	Setting Range	Factory Default	Adj. During Run	Page
COM-00	9600	Jump Code	Jump code	1 to 60	1	O	Refer to the corres-pondi-ng option manual
COM-01	9601	Type of SUB Board	Opt B/D	RS485 DeviceNet Profibus BACnet LonWork	*	*	
COM-02	9602	Option Mode	Opt mode	None Command Freq Cmd + Freq	None	X	
COM-03	9603	Option Version	Opt Version	Ver X.X	Ver X.X	*	
COM-04	9604	SWAP Select	SWAP SEL	YES/No	NO	O	
COM-13	960D	Device Net Input Instance	In Instance	70 71 110 111	70	X	
COM-17	9611	PLC Station ID	Station ID	0 to 63	1	O	
COM-20	9614	Profi MAC ID	Profi MAC ID	1 to 127	1	O	
COM-30	961E	Output Num	Output Num	0 to 8	3	O	
COM-31	961F	Output 1	Output 1	0000 – FFFF (HEX)	000A(HEX)	O	
COM-32	9620	Output 2	Output 2			O	
COM-33	9621	Output 3	Output 3			O	
COM-34	9622	Output 4	Output 4			O	
COM-35	9623	Output 5	Output 5			O	
COM-36	9624	Output 6	Output 6			O	
COM-37	9625	Output 7	Output 7			O	
COM-38	9626	Output 8	Output 8			O	
COM-40	9628	Input Num	Input Num	0 to 8	2	O	
COM-41	9629	Input 1	Input 1	0000 – FFFF (HEX)	0005(HEX)	O	
COM-42	962A	Input 2	Input 2		0006(HEX)	O	
COM-43	962B	Input 3	Input 3		0000(HEX)	O	
COM-44	962C	Input 4	Input 4			O	
COM-45	962D	Input 5	Input 5			O	
COM-46	962E	Input 6	Input 6			O	
COM-47	962F	Input 7	Input 7			O	
COM-48	9630	Input 8	Input 8			O	
COM-60	963C	Parity/Stop	Parity/Stop	8None/1Stop 8None/2Stop 8Even/1Stop 8Odd/1Stop	8None/1Stop	O	

CODE	Comm. Addr	Description	LCD Keypad Display	Setting Range	Factory Default	Adj. During Run	Page
COM-61	963D	Opt Para-1	Opt Para-1	0 to FFFF	0	O	
COM-62	963E	Opt Para-2	Opt Para-2			O	
COM-63	963F	Opt Para-3	Opt Para-3			O	
COM-64	9640	Opt Para-4	Opt Para-4			O	
COM-65	9641	Opt Para-5	Opt Para-5			O	
COM-66	9742	Opt Para-6	Opt Para-6			O	
COM-67	9743	Comm UpDate	Comm UpDate	0 (No) 1 (Yes)	0 (No)	X	

* Only the above COM group displayed when the corresponding option board is installed.
* COM-61~66 parameter is used to LonWorks and BACnet communication.

CHAPTER 6 - TROUBLESHOOTING AND MAINTENANCE

6.1 Fault Display

When a fault occurs, the inverter turns off its output and displays the fault status in DRV-12. The last 5 faults are saved in FU2-01 through FU2-05 with the operation status at the instance of fault. Reset the inverter when a fault occurs.

Keypad Display	Protective Function	Description
Over Current Over Current 1	Over Current Protection	The inverter turns off its output when the output current of the inverter flows more than 200% of the inverter rated current. This may cause danger or damage the drive so it requires double protection.
Ground Fault	Ground Fault Protection	The inverter turns off its output when a ground fault occurs and the ground fault current is more than the internal setting value of the inverter. Over current trip function may protect the inverter when a ground fault occurs due to a low ground fault resistance.
Over Voltage	Over voltage protection	The inverter turns off its output if the DC voltage of the main circuit increases higher than the rated value when the motor decelerates or when regenerative energy flows back to the inverter due to a regenerative load. This fault can also occur due to a surge voltage generated at the power supply system.
Over Load	Current Limit Protection (Overload Protection)	The inverter turns off its output if the output current of the inverter flows at 120% of the inverter rated current.
Over Heat	Inverter Over Heat	The inverter turns off its output if the heat sink is over heated due to a damaged cooling fan or an foreign substance in the cooling fan.
E-Thermal	Electronic Thermal	The internal electronic thermal of the inverter determines the over heating of the motor. If the motor is overloaded the inverter turns off the output. The inverter cannot protect the motor when driving a multi-pole motor or when driving multiple motors, so consider thermal relays or other thermal protective devices for each motor. Overload capacity: 130% for 1 min
Ext. Trip	External Trip	Use this function if the user needs to turn off the output by an external trip signal. (Normal Open Contact) Inverter blocks the output to protect motor overload by detecting through this terminal.
Low Voltage	Low Voltage Protection	The inverter turns off its output if the DC voltage is below the detection level because insufficient torque or over heating of the motor can occurs when the input voltage of the inverter drops.
Over Current 2	IGBT Short	The inverter turns off the output if an IGBT short through or an output short occurs.

Keypad Display	Protective Function	Description
Output Phase Open	Output Phase open	The inverter turns off its output when the one or more of the output (U, V, W) phase is open. The inverter detects the output current to check the phase open of the output.
Input Phase Open	Input Phase Open	The inverter turns off its output if the one or more of the input (R, S, T) phase is open. The inverter detects the intput current to check the phase open of the input. If smaller load is used, it can not be detected.
BX	BX Protection (Instant Cut Off)	Used for the emergency stop of the inverter. The inverter instantly turns off the output when the BX terminal is turned ON, and returns to regular operation when reset button is pressed and the BX terminal is turned OFF. Take caution when using this function.
HW-Diag	Inverter H/W Fault	A fault signal is output when an error occurs to the control circuitry of the inverter. There are the Wdog error, the EEP error, Input phase open, NTC open and the ADC Offset for this fault.
COM Error CPU Error	Comm. Error	This fault is displayed when the inverter cannot communicate with the keypad.
Inv. OLT	Inverter Overload	The inverter turns off its output when the output current of the inverter flows more than the rated level (110% for 1 minute, 130% for 4 seconds).
NTC open	NTC Open	This fault is displayed when inverter internal NTC is opened.
LOP LOR LOV LOI LOX	Operating Method when the Frequency Reference is Lost	According to the I/O-92 [Operating method at loss of freq. reference] setting, there are three modes: None (continuous operation), Stop (decelerate to stop), and Free Run (free run to stop), LOP: Displayed when option frequency reference is lost. (DPRAM time out) LOR: Displayed when option frequency reference is lost. (Communication network fault) LOV: Displayed when 'V1' analog frequency reference is lost. LOI: Displayed when 'I' analog frequency reference is lost. LOX: Displayed when sub-board (V2, ENC) analog frequency reference is lost.
Lost cmd		This fault is diaplayed when I/O -18 sets to Protection.
Fuse Open	Fuse Open	This fault is displayed when inverter internal fuse is opened by over current. (applied above 37 kW products)
Output Fault Trip	No Motor Trip	Trip has occurred according to setting of FU1 - 57~59.
Keypad Open	Keypad FLT	Indicats wire is separated from keypad. It is displayed only DRV-23 set to Fault.

To reset fault, Press **RESET** key, close RST-CM terminals or cycle the input power.

If a problem keep occur, please contact the factory or your local distributor.

6.1.1 Operation methods and fault display in case of frequency loss

- I/O-18 <Lost Command> is as below description.

I/O-18 set data	Description
None	Keep the operation because frequency command is lost. (Factory default)
FreeRun	Free Run to stop because frequency command is lost.
Stop	Deceleration to stop because frequency command is lost.
Protection	Lost Cmd Trip because frequency command is lost.

- Load display when command is lost

LCD display	Description
LOP	Displayed when option command is lost. (DPRAM Time out)
LOR	Displayed when option command is lost. (Abnormal communication network)
LOV	Displayed when V1 analog frequency command is lost.
LOI	Displayed when I analog frequency command is lost.
LOX	Displayed when sub board (V2, ENC) frequency is lost.

6.1.2 If you want to check the previous state of inverter trip occurred and inverter trip description

- Current faulty description

Code	Display	Description
DRV-7	Over Current	Displayed the current trip message. (Over current)

Use the **PROG**, ▲ and ▼ key before pressing the **RESET** key to check the fault content(s) such as output frequency, output current, and whether the inverter was accelerating, decelerating, or in constant speed at the time of the fault occurred. Press the **ENT** key to escape.
Press the **RESET** key to save the trip history in FU2-01~05.

- Last fault history

1) This code displays up to five previous fault (trip) status of the inverter. The lowest numbered fault such as “Last trip 1” is the most recent. Previous state of inverter trip occurred and inverter trip description can be checked.
2) FU2-06 [Erase trips] initializes the FU2-01~05 [Last trip-x]. It becomes the value of factory default.

Code	LCD display	Description
FU2-01	Last trip-1	Trip history 1
FU2-02	Last trip-2	Trip history 2
FU2-03	Last trip-3	Trip history 3
FU2-04	Last trip-4	Trip history 4

FU2-05	Last trip-5	Trip history 5

6.1.3 Reset the trip (Abnormal inverter state)

There are 3 kinds of reset methods. Auto-restart number is initialized after reset the inverter.

1. Reset by [RESET] key in loader.
2. Cut off the RST-CM of terminal block of inverter control circuit.
3. Turn off the inverter power and turn on the inverter.

Protection furnction	LCD display	Description
Over Current 1 Protection	Over Current Over Current1	Inverter output cuts off when the inverter output exceeds 200% of th rated current. It must be double protected because it can be damaged by Over Current.
Ground Fault Current Protection	Ground Fault	Inverter output cuts off when current above the prescribed amount flows due to earth in the inverter outputu part. Ground fault due to low ground resistor can be protective by over current trip.
Over Voltage Protection	Over Voltage	Inverter output cutss off when the DC current above the prescribed amount flows due to deceleration or regenerative energy. It can be occurred due to surge voltage from power system.

Fault Remedy

Protective Function	Cause	Remedy
Over Current Protection 1	1)Acceleration/Deceleration time is too short compared to the GD² of the load. 2) Load is larger than the inverter rating. 3) Inverter turns output on when the motor is free running. 4) Output short or ground fault has occurred. 5) Mechanical brake of the motor is operating too fast. 6) Components of the main circuit have overheated due to a faulty cooling fan.	1) Increase Accel/Decel time. 2) Increase inverter capacity. 3) Operate after motor has stopped. 4) Check output wiring. 5) Check mechani cal brake operation. 6) Check cooling fan. **(Caution)** Operating inverter prior to correcting fault may damage the IGBT.
Ground Fault Current Protection	1) Ground fault has occurred at the output wiring of inverter. 2) The insulation of the motor is damaged due to heat.	1) Investigate the output wiring of inverter. 2) Exchange motor.
Over Voltage Protection	1) Acceleration time is too short compared to the GD²of load. 2) Regenerative load at the output 3) Line voltage is high.	1) Increase deceleration time. 2) Use regenerative resistor option. 3) Check line voltage.
Current Limit Protection (Overload Protection)	1) Load is larger than the inverter rating. 2) Incorrect inverter capacity selected. 3) Set incorrect V/F pattern.	1) Increase capacity of motor and inverter. 2) Select correct inverter capacity. 3) Select correct V/F pattern.
Inverter Overheat	1) Cooling fan damaged or an foreign substance inserted. 2) Cooling system has faults. 3) Ambient temperature high.	1) Exchange cooling fans and/or eliminate foreign substance. 2) Check for foreign substances in the heat sink. 3) Keep ambient temperature under 40 ℃.
Electronic Thermal	1) Motor has overheated. 2) Load is larger than inverter rating. 3) ETH level too low. 4) Incorrect inverter capacity selected. 5) Set incorrect V/F pattern. 6) Operated too long at low speeds.	1) Reduce load and/or running duty. 2) Increase inverter capacity. 3) Adjust ETH level to an appropriate level. 4) Select correct inverter capacity. 5) Select correct V/F pattern. 6) Install a cooling fan with a separate power supply.

Protective Function	Cause	Remedy
External Trip	External Trip has occurred.	Eliminate Trip at circuit connected to external trip terminal or remove external trip input.
Low Voltage Protection	1) Line voltage low. 2) Load larger than line capacity is connected to line. (welding machine, motor with high starting current connected to the commercial line) 3) Faulty magnetic switch at the input side of the inverter.	1) Check line voltage. 2) Increase line capacity. 3) Exchange magnetic switch.
Over Current 2	1) Short has occurred between the upper and lower IGBT. 2) Short has occurred at the output of the inverter. 3) Acceleration/Deceleration time is too short compared to the GD² of load.	1) Check IGBT. 2) Check output wiring of inverter. 3) Increase acceleration time.
Output Phase Open	1) Faulty contact of magnetic switch at output. 2) Faulty output wiring	1) Check magnetic switch at output of inverter. 2) Check output wiring.
H/W Fault	1) Wdog error (CPU fault) 2) EEP error (memory fault) 3) ADC Offset (current feedback circuit fault)	1) Exchange inverter. 2) Check the input power wiring.
Communication Fault	1) Faulty connection between inverter and keypad 2) Inverter CPU malfunction	1) Check connector. 2) Exchange inverter.
Operating Method when the Speed Reference is Lost	LOP (Loss of reference from the Option), LOR (Remote) LOV (V1), LOI (I), LOX (Sub-V2, ENC)	Eliminate cause of fault.
Inverter Overload	1) Load is larger than inverter rating. 2) Incorrect inverter capacity selected.	1) Increase motor and/or inverter capacity. 2) Select correct inverter capacity.

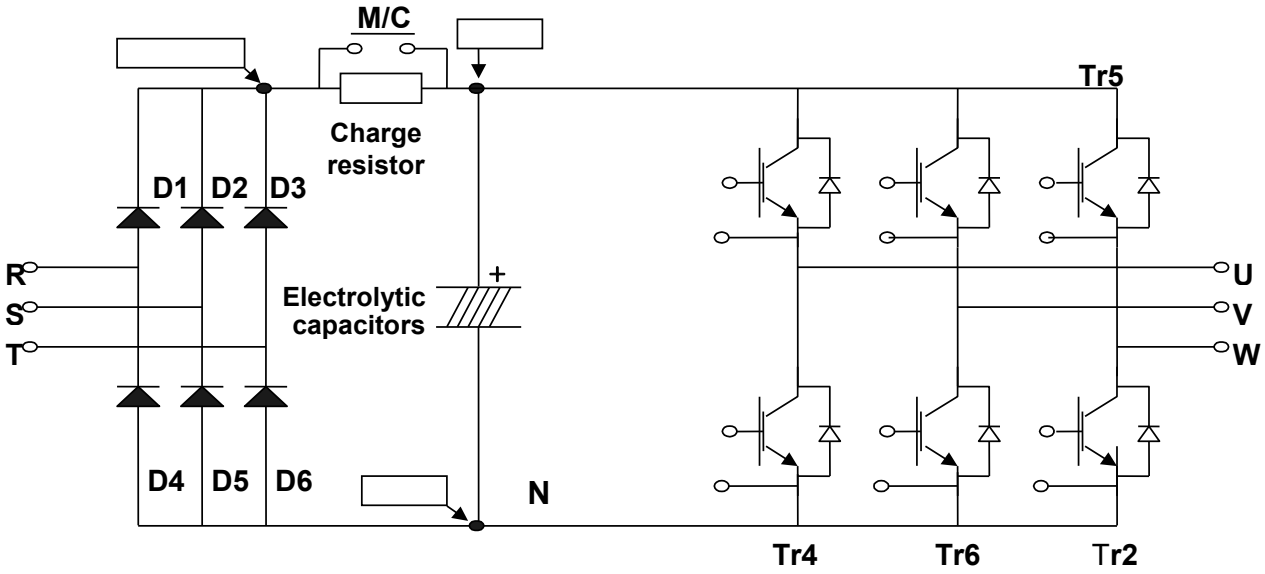
6.2 Troubleshooting

Condition	Checking Point
The motor does not rotate.	1) Main circuit inspection : - Is the input (line) voltage normal? (Is the LED in the inverter is lit?) - Is the motor connected correctly? 2) Input signal inspection : - Check the operating signal input to the inverter. - Check the forward and the reverse signal input simultaneously to the inverter? - Check the command frequency signal input to the inverter. 3) Parameter setting inspection : - Is the reverse prevention (FU1-01) function set? - Is the Drive mode (DRV-03) set correctly? - Is the command frequency set to 0? 4) Load inspection : - Is the load too large or is the motor jammed? (Mechanical brake) 5) Other : - Is the alarm displayed on the keypad or is the alarm LED lit? (STOP LED blinks)
The motor rotates in opposite directions.	- Is the phase sequence of the output terminal U, V, W correct? - Is the starting signal (forward/reverse) connected correctly?
The difference between the rotating speed and the reference is too large.	- Is the frequency reference signal correct? (Check the level of the input signal) - Is the following parameter setting is correct? - Lower Limit Frequency (FU1-34), Upper Limit Frequency (FU1-35), Analog Frequency Gain (I/O-1~10) - Is the input signal line influenced by external noise? (Use a shielded wire)
The Inverter does not accelerate or decelerate smoothly.	- Is the acceleration/deceleration time is set too short a period of time? - Is the load too large? - Is the Torque Boost (FU2-68, 69) value is too high that the current limit function and the stall prevention function do not operate?
The motor current is too high.	- Is the load too large? - Is the Torque Boost Value (manual) too high?
The rotating speed does not increase.	- Is the Upper Limit Frequency (FU1-35) value correct? - Is the load too large? - Is the Torque Boost (FU1-68, 69) value too high that the stall prevention function (FU1-71) does not operate?
The rotating speed oscillates when the inverter is operating.	1) Load inspection : - Is the load oscillating? 2) Input signal inspection : - Is the frequency reference signal oscillating? 3) Other : - Is the wiring too long when the inverter is using V/F control? (over 500m)

6.3 How to Check Power Components

1) Diode module and IGBT module check (5.5~ 30kW)

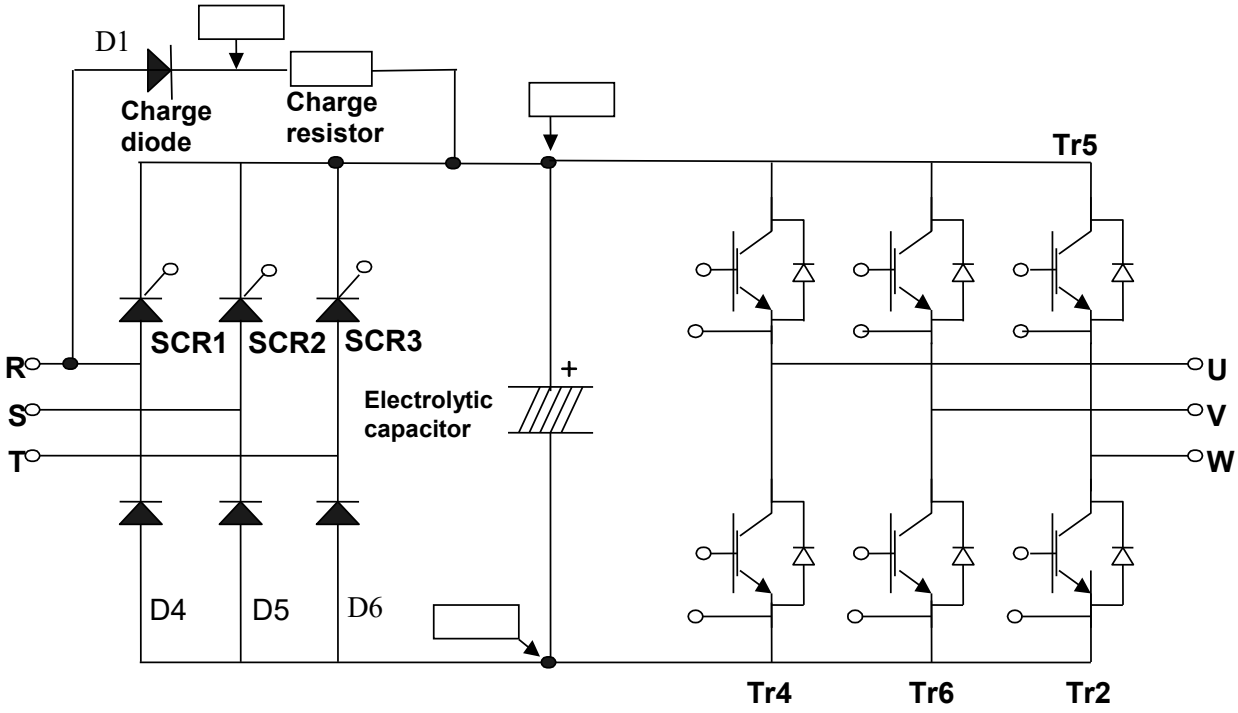
Before checking the power components, be sure to disconnect AC Input supply and wait until the Main Electrolytic Capacitors (DCP-DCN) is discharged.



- Turn the power off and disconnect RST/UVW wiring.
- Determine whether inverter terminals (R,S,T, U, V, W, P1(or P2),N) are energized or not using a tester.
- Wait until the Main Electrolytic Capacitors (DCP-DCN) is discharged to a safe level.
- Enormous amount of value such as Mega will be displayed when Open. When closed, the resistance value ranges from a few ohms to tens of Ω. Sometimes, it seems to be closed due to electrolytic capacitors but soon to be displayed mega value resistance.
- The displayed value is not always the same according to modules and tester types but should be similar.
- Modules number and checking point

Module		Test polarity		Check value	Number	Test polarity		Check value
		+	-			+	-	
Diode	D1	R	DCP+	Closed	D4	R	N	Open
		DCP+	R	Open		N	R	Closed
	D2	S	DCP+	Closed	D5	S	N	Open
		DCP+	S	Open		N	S	Closed
	D3	T	DCP+	Closed	D6	T	N	Open
		DCP+	T	Open		N	T	Closed
IGBT	Tr1	U	DCP	Closed	Tr4	U	N	Open
		DCP	U	Open		N	U	Closed
	Tr3	V	DCP	Closed	Tr6	V	N	Open
		DCP	V	Open		N	V	Closed
	Tr5	W	DCP	Closed	Tr2	W	N	Open
		DCP	W	Open		N	W	Closed

2) Diode module and IGBT module check (37~ 90kW)



- Turn the power off and disconnect RST/UVW wiring.
- Determine whether inverter terminals (R,S,T, U, V, W, P1(or P2),N) are energized or not using a tester.
- Wait until the Main Electrolytic Capacitors (DCP-DCN) is discharged to a safe level.
- Enormous amount of value such as Mega will be displayed when Open. When closed, the resistance value ranges from a few ohms to tens of Ω. Sometimes, it seems to be closed due to electrolytic capacitors but soon to be displayed mega value resistance.
- The displayed value is not always the same according to modules and tester types but should be similar.
- Modules number and checking point

Module		Test polarity		Check value	Number	Test polarity		Check value
		+	-			+	-	
Diode	D1	R	DCP+	Closed	D4	R	N	Open
		DCP+	R	Open		N	R	Closed
	D5	S	N	Open	D6	T	N	Open
		N	S	Closed		N	T	Closed
IGBT	Tr1	U	DCP	Closed	Tr4	U	N	Open
		DCP	U	Open		N	U	Closed
	Tr3	V	DCP	Closed	Tr6	V	N	Open
		DCP	V	Open		N	V	Closed
	Tr5	W	DCP	Closed	Tr2	W	N	Open
		DCP	W	Open		N	W	Closed

6.4 Maintenance

The iP5A series is an industrial electronic product with advanced semiconductor elements. However, temperature, humidity, vibration and aging parts may still affect it. To avoid this, it is recommended to perform routine inspections.

6.4.1 Precautions

- ☞ Be sure to remove the drive power input while performing maintenance.
- ☞ Be sure to perform maintenance only after checking that the bus has discharged (The voltage between terminal P1-N (or P2-N) should be less than DC 30V). The bus capacitors in the electronic circuit can still be charged even after the power is turned off.
- ☞ The correct output voltage can only be measured by using a rectifier voltage meter. Other voltage meters, including digital voltage meters, are likely to display incorrect values caused by the high frequency PWM output voltage of the drive.

6.4.2 Routine Inspection

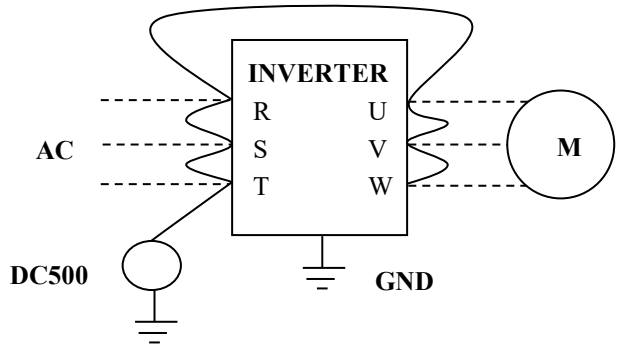
- ☞ Be sure to check the following before operation
- ☞ The conditions of the installation location
- ☞ The conditions of the drive cooling
- ☞ Abnormal vibration or loud noise
- ☞ Abnormal heating or discoloration

6.4.3 Periodic Inspection

- ☞ Are there any loose bolt, nut or rust caused by surrounding conditions? If so, tighten them up or replace them.
- ☞ Are there any deposits inside the drive-cooling fan? If so, remove using air gun.
- ☞ Are there any deposits on the drive's PCB (Printed Circuit Boards)? If so, remove using air.
- ☞ Are there any abnormalities in the various connectors of the drive's PCB? If so, check the condition of the connector in question.
- ☞ Check the rotating condition of the cooling fan, the size and condition of the capacitors and the connections with the magnetic contactor. Replace them if there are any abnormalities.

6.4.4 Megger/Withstanding Voltage Test

Perform megger test after inverter wiring is disconnected. Test voltage should not be applied to the inverter. Megger test should be conducted only for the main circuit, not the control circuit. Use DC 500V megger. Dielectric test should not be conducted to the inverter. Otherwise, IGBT may be damaged.



6.4.5 Daily and Periodic Inspection Items

Inspection Location	Inspection Item	Inspection	Period			Inspection Method	Criterion	Measuring Instrument
			Daily	1 year	2 year			
All	Ambient Environ-ment	Is there any dust? Is the ambient temperature and humidity adequate?	O			Refer to the precautions.	Temperature: -10~+40 no freezing. Humidity: Under 50% no dew	Thermo-meter, Hygro-meter, Recorder
	Equipment	Is there any abnormal oscillation or noise?	O			Use sight and hearing.	No abnormality	-
	Input Voltage	Is the input voltage of the main circuit normal?	O			Measure the voltage between the terminals R, S, T.	-	Digital Multi-Meter/ Tester
Main Circuit	All	1) Megger check (between the main circuit and the ground) 2) Are any fixed parts removed? 3) Are there any traces of overheating at each component's cleaning?		O O O	O	1) Undo the inverter connections short the terminals R, S, T, U, V, W and measure between these parts and the ground. 2) Tighten the screws. 3) Visual check.	1) Over 5MΩ 2), 3) No fault	DC 500V class Megger
	Conducto -r/Wire	1) Is the conductor rusty? 2) Is the wire coating damaged?		O O		Visual check	No fault	-
	Terminal	Is there any damage?		O		Visual check	No fault	-
	IGBT Module /Diode Module	Check the resistance between each of the terminals.			O	Undo the inverter connection and measure the resistance between R, S, T ⇔ P, N and U, V, W ⇔ P, N with a tester.	(Refer 'How to Check Power Components')	Digital Multi-Meter/ Analog Tester

Inspection Location	Inspection Item	Inspection	Period			Inspection Method	Criterion	Measuring Instrument
			Daily	1 year	2 year			
	Smoothing Capacitor	1) Is there any liquid coming out? 2) Is the safety pin out, and is there any swelling? 3) Measure the capacitance.	O O	 O		1), 2) Visual check 3) Measure with a capacitance-measuring device.	1), 2) No fault 3) Over 85% of the rated capacity	Capaci-tance Measu-ring device
	Relay	1) Is there any chattering noise during operation? 2) Is there any damage to the contact?		O O		1) Auditory check 2) Visual check	No fault	-
	Resistor	1) Is there any damage to the resistor insulation? 2) Is the wiring in the resistor damaged (open)?		O O		1) Visual check 2) Disconnect one of the connections and measure with a tester.	1) No fault 2) Error must be within ±10% the displayed resistance.	Digital Multi-Meter/ Analog Tester
Control Circuit Protective Circuit	Operation Check	1) Is there any unbalance between each phases of the output voltage? 2) Nothing must be wrong with display circuit after executing the sequence protective operation.		O O		1) Measure the voltage between the output terminals U, V and W. 2) Short and open the inverter protective circuit output.	1) The voltage balance between the phases for 200V (400V) class is under 4V (8V). 2) The fault circuit operates according to the sequence.	Digital Multi-Meter/ Rectifying Voltmeter
Cooling System	Cooling Fan	1) Is there any abnormal oscillation or noise? 2) Is the connection area loose?	O	 O		1) Turn OFF the power and turn the fan by hand. 2) Tighten the connections.	1) Must rotate smoothly. 2) No fault	-

Inspection Location	Inspection Item	Inspection	Period			Inspection Method	Criterion	Measuring Instrument
			Daily	1 year	2 year			
Display	Meter	Is the displayed value correct?	O	O		Check the meter reading at the exterior of the panel.	Check the specified and management values.	Voltmeter/ Ammeter etc.
Motor	All	1) Are there any abnormal vibrations or noise? 2) Is there any unusual odor?	O O			1) Auditory, sensory, visual check. 2) Check for overheat and damage.	No fault	-
	Insulation Resistor	Megger check (between the output terminals and the ground terminal)			O	Undo the U, V and W connections and tie the motor wiring.	Over 5MΩ	500V class Megger

Note: Values in ( ) is for the 400V class inverters.

Note: Life cycle of the Main components indicated above is based on continuous operation with rated load. It may vary with surrounded environment.

6.4.6 Parts replacement

Part name	Period	Comments
Cooling fan	2-3 years	Exchange for a new part after consulting LS customer service center.
Electrolytic capacitor	5 years	Check for the periodic inspection for 1 year. Exchange for a new part after consulting LS customer service center. The Recommended level to exchange a capacitor in main/control circuit is 85% or less of the initial value.
Relays	-	Exchange for a new part after consulting LS customer service center.

The life expectancy of a part depends on the type of part, the environment, and operating condition.

CHAPTER 7 - OPTIONS

7.1 OPTION LIST

iP5A series is available to connect below option device.

External	Keypad	LCD	32 character display keypad Download and Upload available	All units
	Remote	Remote cable	2m, 3m and 5m long keypad cable enables users to control the inverter from a distant area.	Optional
	Dynamic braking	DB resistor	To enhance the regenerative braking performance, it makes the inverter to accelerate/decelerate rapidly.	According to inverter capacity
		DB unit	If it need a regenerative braking, it is used with DB resistor.	
	Conduit option	Conduit for NEMA TYPE 1	Install it to fit for NEMA TYPE 1 Enclosure or IP20.	15~90kW (20~125HP)
	Comm. option card	DEVICENET	DEVICENET optional communication card	All series (Above S/W V1.0)
		PROFIBUS	PROFIBUS optional communication card.	
		LS485 /MODBUS_RTU	LS485/MODBUS_RTU optional communication card	
		Lonworks	Lonworks optional communication card	
		BACNet	BACNet optional communication card	
		MODBUS_TCP	MODBUS_TCP optional communication card	
		Metasys_N2	Metasys_N2 optional communication card.	
		CCLink	CCLink optional communication card.	

Note) Refer to Option manuals for details.

MEMO

CHAPTER 8 - RS485 COMMUNICATION

8.1 Introduction

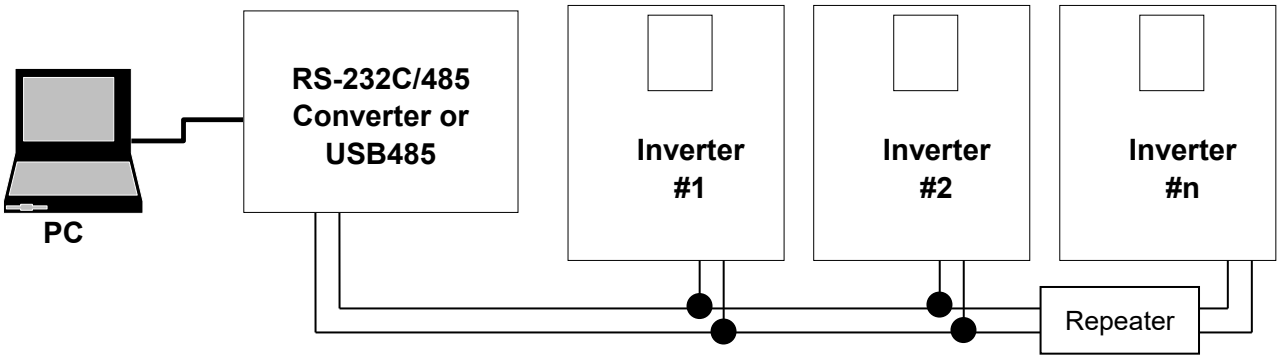
Inverter can be controlled and monitored by the sequence program of the PLC or other master module.
Drives or other slave devices may be connected in a multi-drop fashion on the RS-485 network and may be monitored or controlled by a single PLC or PC. Parameter setting and change are available through PC.

8.1.1 Features

Inverter can be easily applied for Factory automation because Operation and monitoring is available by User-program.

* Parameter change and monitoring is available via computer.
  (Ex: Accel/Decel time, Freq. Command etc.)
* Interface type of RS485 reference:
  1) Allows the drive to communicate with any other computers.
  2) Allows connection of up to 31 drives with multi-drop link system.
  3) Noise-resistant interface.

8.1.2 Connection guide for RS485 communication with PC , PLC and RS232/485



* REPEATER is not a required item but helps communication in long-distance communication or high noise environment.

8.1.3 Before installation

Before installation and operation, this should be read thoroughly. If not, it can cause personal injury or damage to other equipment.

8.2 Specification

8.2.1 Performance specification

Item	Specification
Transmission form	Bus method, Multi-drop Link System
Applicable inverter	SV-iP5A series
Connectable drives	Max. 31
Transmission distance	Max. 1,200m (Within 700m Recommended)
Recommended wire	0.75mm^2(12AWG), Shielded Twisted-Pare Wire

8.2.2 Hardware specification

Item	Specification
Installation	Use C+, C-,CM terminals on control terminal block
Power supply	Use Insulated power from the inverter power supply

8.2.3 Communication specification

Item	Specification
Communication speed	19,200/9,600/4,800/2,400/1,200 bps selectable
Communication system	Half duplex system
Character system	ASCII (8 bit)
Stop bit length	1 bit
Sum check (CRC16)	2 bytes
Parity bit	None
Protocol supported	Parameter Read/Write, Monitoring parameter register/execution Broadcasting

8.2.4 Installation

▣ Connecting the communication line

1) Connect the RS485 communication line to the inverter's (C+), (C-) and CM terminals of the control terminals.
2) Connect the CM terminal among inverters for stable communication.
3) Check the connection and turn ON the inverter.
4) If the communication line is connected correctly set the communication-related parameters as the following.
5) Install a repeater to upgrade the communication speed or longer than 1200mm communication line is used.
   Repeater is required for upgrading communication quality in the noise-high environment.

▣ **Communication parameters**

Code	Display	Name	Set value	Unit	Default
DRV_03	Drive mode	Drive mode	Int. 485	-	Fx/Rx-1
DRV_04	Freq mode	Freq mode	Int. 485	-	KeyPad-1
DRV_91	Drive mode2	Drive mode 2	KeyPad Fx/Rx-1 Fx/Rx-2	-	Fx/Rx-1
DRV_92	Freq mode2	Freq mode 2	KeyPad-1 KeyPad-2 V1 V1S I V1+I Pulse	-	KeyPad-1
I/O_20~27	M1 ~ M8	Programmable Digital Inputs	Main-drive	-	
I/O_90	Inv No	Inverter number	1~250	-	1
I/O_91	Baud rate	Communicatio-n speed	1200 bps 2400 bps 4800 bps 9600 bps 19200 bps	-	9600 bps
I/O_92	COM Lost Cmd	Operating mode when communication signal is lost	None FreeRun Stop	-	None
I/O_93	COM Time Out	Time to determine whether Communication signal is lost.	0.1~120.0	sec	1.0
I/O_94	Delay Time	Delay time of communication response	1 ~ 1200	msec	5

8.3 Operation

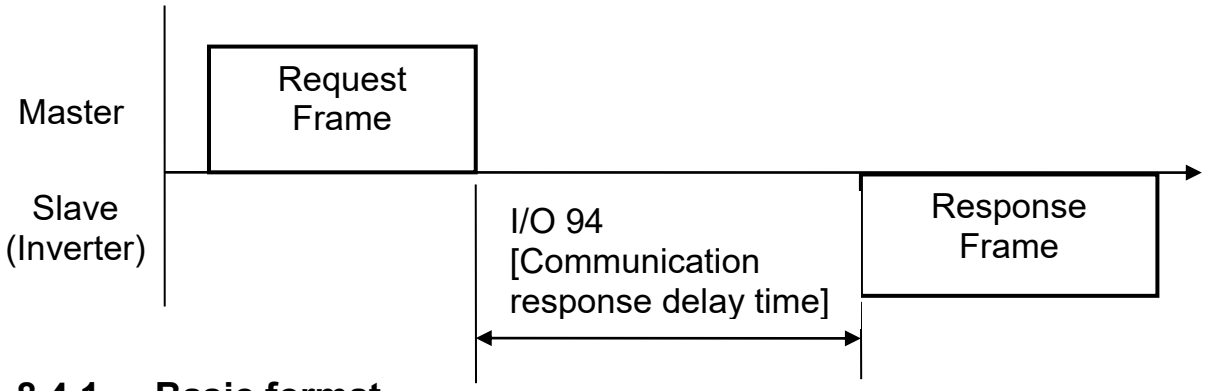
8.3.1 Operating steps

1) Check whether the computer and the inverter are connected correctly.
2) Turn ON the inverter. But, do not connect the load until stable communication between the computer and the inverter is verified. Start the operating program for the inverter from the computer.

3) If computer is a master, RS232-485 converter is needed to communicate because computer does not have RS485 port.
   The communication is delayed at transmitting/receiving when the RS232-485 converter is used. If delay is happened, retry the communication by increasing the I/O-94 [Delay Time].
4) Operate the inverter using the operating program for the inverter.
5) Refer to 'Chapter 6. Trounbleshooting and Maintenance' if the communication is not operating normally.
6) User program or the 'DriveView 7' program supplied from LS ELECTRIC can be used as the operating program for the inverter.
7) Turn the inverter J3 switch ON to connect the terminating resistor for the end of network.
   * Connect to C+,C-,CM terminal on the control terminal. Be careful for the polarity(+, -).
   * Maximum connectable inverter are 31.

8.4 Communication protocol (RS485)

The configuration of RS485 is that PC or PLC is the Master and Inverter Slave. Inverter responds the Master's Read/Write Requests.
When master sends Write Request to Inverter address # 255, all inverters perform Write action but do not return a Acknowledge response. This is used to drive multiple inverters at the same time via RS485.



8.4.1 Basic format

1) Command message (Request):

ENQ	Inverter No.	CMD	Data	SUM	EOT
1 byte	2 bytes	1 byte	n bytes	2 bytes	1 byte

* Normal response (Acknowledge Response):

ENQ	Inverter No.	CMD	Data	SUM	EOT
1 byte	2 bytes	1 byte	n * 4 bytes	2 bytes	1 byte

* Negative response (Negative Acknowledge Response):

ENQ	Inverter No.	CMD	Data	SUM	EOT
1 byte	2 bytes	1 byte	2 bytes	2 bytes	1 byte

2) Description :
* Request starts with “ENQ” and ends with “EOT”.
* Acknowledge Response starts with “ACK” and ends with “EOT”.
* Negative Acknowledge Response starts with ”NAK” and ends with “EOT”.
* “Inverter Number” is the number of Inverters used and indicated in 2 bytes ASCII-HEX. (ASCII-HEX : Hexadecimal consists of ‘0’ ~ ‘9’, ‘A’ ~ ‘F)

* CMD : Capital letter (“IF Error” when small letter is used.)

Character	ASCII-HEX	Command
‘R’	52h	Read
‘W’	57h	Write
‘X’	58h	Request for monitoring registration
‘Y’	59h	Execution for monitoring registration

- Data : ASCII-HEX
  Ex) when data value is 3000 : 3000 (dec) → ‘0’ ’B’ ’B’ ’8’h → 30h 42h 42h 38h
- Error code : ASCII (20h ~ 7Fh)
- Receive/Send buffer size : Receive= 39 bytes, Send=44 bytes
- Monitor register buffer : 8 Word
- SUM : to check the communication error
  SUM= ASCII-HEX format of lower 8 bit of (Inverter No. + CMD + DATA)
  Ex) Command Message (Request) for reading one address from address “9000”

ENQ	Inverter No.	CMD	Address	Number of address to read	SUM	EOT
05h	“01”	“R”	“9000”	“1”	“AD”	04h
1 byte	2 bytes	1 byte	4 bytes	1 byte	2 bytes	1 byte

SUM = ‘0’ + ‘1’ + ’R’ + ‘9’ + ‘0’ + ‘0’ + ‘0’ + ‘1’
= 30h + 31h + 52h + 39h + 30h + 30h + 30h + 31h
= 1ADh (except for ENA/ACK/EOT value)

8.4.2 Detail communication protocol

1) Request for Read: Request for read successive ‘N’ numbers of WORD from address “XXXX”

ENQ	Inv. No.	CMD	Address	Number of Address	SUM	EOT
05h	“01” ~ “FA”	“R”	“XXXX”	“1” ~ “8” = n	“XX”	04h
1 byte	2 bytes	1 byte	4 bytes	1 byte	2 bytes	1 byte

Total bytes = 12
The quotation marks (“ ”) mean character.

1.1) Acknowledge Response :

ACK	Inv No	CMD	Data	SUM	EOT
06h	“01” ~ “FA”	“R”	“XXXX”	“XX”	04h
1 byte	2 bytes	1 byte	N * 4 bytes	2 bytes	1 byte

Total bytes = 7 * n * 4 = Max. 39

1.2) Negative Acknowledge Response :

NAK	Inv No	CMD	Error code	SUM	EOT
15h	“01” ~ “FA”	“R”	“**”	“XX”	04h
1 byte	2 bytes	1 byte	2 bytes	2 bytes	1 byte

Total bytes = 9

2) Request for Write :

ENQ	Inverter No	CMD	Address	Number of Address	SUM	EOT	EOT
05h	“01” ~ “FA”	“W”	“XXXX”	“1” ~ “8” = n	“XXXX…”	“XX”	04h
1 byte	2 bytes	1 byte	4 bytes	1 byte	n * 4 bytes	2 bytes	1 byte

Total bytes = 12 + n * 4 = Max. 44

2.1) Acknowledge response :

ACK	Inverter No.	CMD	Data	SUM	EOT
06h	“01” ~ “FA”	“W”	“XXXX…”	“XX”	04h
1 byte	2 bytes	1 byte	n * 4 bytes	2 bytes	1 byte

Total bytes = 7 + n * 4 = Max. 39

Note) When Request for Write and Acknowledge Response is exchanged between PC and Inverter for the first time, previous data is returned. From the second time of transmission, the current data will be received.

2.2) Negative response :

NAK	Inverter No.	CMD	Error code	SUM	EOT
15h	“01” ~ “FA”	“W”	“**”	“XX”	04h
1 byte	2 bytes	1 byte	2 bytes	2 bytes	1 byte

Total bytes = 9

3) Request for Monitor Register : This is useful when constant parameter monitoring and data updates are required.
Request for Register of ‘n’ numbers of Address. (non-successive)

ENQ	Inverter No.	CMD	Number of Address	Address	SUM	EOT
05h	“01” ~ “FA”	“X”	“1” ~ “8”=n	“XXXX…”	“XX”	04h
1 byte	2 bytes	1 byte	1 byte	n * 4 bytes	2 bytes	1 byte

Total bytes = 8 + n * 4 = Max 40

3.1) Acknowledge Response :

ACK	Inverter No.	CMD	SUM	EOT
06h	“01” ~ “FA”	“X”	“XX”	04h
1 byte	2 bytes	1 byte	2 bytes	1 byte

Total bytes = 7

3.2) Negative Acknowledge Response:

NAK	Inverter No.	CMD	Error code	SUM	EOT
15h	“01” ~ “FA”	“X”	“**”	“XX”	04h
1 byte	2 bytes	1 byte	2 bytes	2 bytes	1 byte

Total bytes = 9

4) Execution Request for monitor register: Request for read of address registered by monitor register.

ENQ	Inverter No.	CMD	SUM	EOT
05h	“01” ~ “FA”	“Y”	“XX”	04h
1 byte	2 bytes	1 byte	2 bytes	1 byte

Total bytes = 7

4.1) Acknowledge response:

ACK	Inverter No.	CMD	Data	SUM	EOT
06h	“01” ~ “FA”	“Y”	“XXXX…”	“XX”	04h
1 byte	2 bytes	1 byte	n * 4 bytes	2 bytes	1 byte

Total bytes = 7 + n * 4 = Max 39

4.2) Negative response:

NAK	Inverter No.	CMD	Error code	SUM	EOT
15h	“01” ~ “FA”	“Y”	“**”	“XX”	04h
1 byte	2 bytes	1 byte	2 bytes	2 bytes	1 byte

Total bytes = 9

* Request for Monitor Register should be made before Execution Request for monitor register. If inverter power is turned off, monitor register is cleared so redo the request for monitor register when Power ON.

5) Error code

Error code	Description
IF	ILLEGAL FUNCTION When master is sending codes other than Function code (R, W, X, Y).
IA	ILLEGAL ADDRESS - When parameter address does not exist.
ID	ILLEGAL VALUE - When Data contains an out of range value for an inverter parameter during ‘W’ (Write).
WM	WRITE MODE ERROR - When the requested data cannot be changed (written) during ‘W’ (Write) such as Read Only, Not adjustable during Run parameters.

8.5 Parameter code list

<Common area> : Area accessible regardless of inverter models (Note 3)

Address	Parameter	Scale	Unit	R/W	Data value
0x0000	Inverter model	-	-	R	9 : SV-iP5A
0x0001	Inverter capacity	-	-	R	0 : 0.75kW(1HP) 1 : 1.5kW(2HP) 2 : 2.2kW(3HP) 3 : 3.7kW(5HP) 4 : 5.5kW(7.5HP), 5 : 7.5kW(10HP), 6 : 11kW(15HP), 7 : 15kW(20HP), 8 : 18.5kW(25HP), 9 : 22kW(30HP), A : 30kW(40HP), B : 37kW(50HP), C : 45kW(60HP), D : 55kW(75HP), E : 75kW(100HP) F : 90kW(125HP) 10 : 110kW(150HP) 11 : 132kW(200HP) 12 : 160kW(250HP) 13 : 220kW(350HP) 14 : 280kW(400HP) 15 : 315kW(500HP) 16 : 375kW(600HP) 17 : 450kW(700HP)
0x0002	Inverter Input Voltage	-	-	R	0 : 220V Class 1 : 400V Class
0x0003	S/W Version	-	-	R	(Ex) 0x0100 : Version 1.00 0x0101 : Version 1.10
0x0005	Frequency Reference	0.01	Hz	R/W	-
0x0006	Run Command (Option) (Note 1)	-	-	R/W	BIT 0 : Stop (S) BIT 1 : Forward run (F) BIT 2 : Reverse run (R) BIT 3 : Fault reset (0->1) BIT 4 : Emergency stop BIT 5 : Not used
				R	BIT 6, BIT 7 : Run/Stop command source 0(Terminal), 1(Keypad), 2(Option), 3(Int. 485) BIT 8 ~14 : Freq. reference BIT 0 ~ 16 : Multi-step speed freq. (0, 2~16) BIT 17 ~ 19 : UpDown (Up, Down, UD Zero) BIT 20 ~ 21 : Reserved BIT 22 ~ 25 : Analog (V1, V1S, I, V1I) BIT 26 : Pulse, BIT 27 : Sub, BIT 28: Int. 485 BIT 29 : Option, BIT 30 : Jog BIT, 31 : PID
					BIT 15 : Set when network error
0x0007	Acceleration Time	0.1	sec	R/W	-
0x0008	Deceleration Time	0.1	sec	R/W	-

Address	Parameter	Scale	Unit	R/W	Data value
0x0009	Output Current	0.1	A	R	-
0x000A	Output Frequency	0.01	Hz	R	-
0x000B	Output Voltage	1.0	V	R	-
0x000C	DC Link voltage	1.0	V	R	-
0x000D	Output power	0.1	kW	R	-
0x000E	Operating status of Inverter	-	-	R	BIT 0 : Stop BIT 1 : Forward running BIT 2 : Reverse running BIT 3 : Fault (Trip) BIT 4 : Accelerating BIT 5 : Decelerating BIT 6 : speed arrival
0x000E	Operating status of Inverter			R	BIT 7 : DC Braking BIT 8 : Stopping BIT 9 : not Used BIT10 : Brake Open BIT11 : Forward run command BIT12 : Reverse run command BIT13 : REM. R/S (Int. 485, OPT) BIT14 : REM. Freq. (Int. 485, OPT)
0x000F	Trip information	-	-	R	BIT 0 : OCT1 BIT 1 : OV BIT 2 : EXT-A BIT 3 : BX BIT 4 : LV BIT 5 : RESERVE BIT 6 : GF (Ground Fault) BIT 6 : OHT (Inverter overheat) BIT 7 : ETH (Motor overheat) BIT 8 : OLT (Overload trip) BIT10 : HW-Diag BIT11 : RESERVE BIT12 : OCT2 BIT13 : OPT (Option error) BIT14 : PO (Phase Open) BIT15 : IOLT
0x0010	Input terminal status	-	-	R	BIT 0 : M1 BIT 1 : M2 BIT 2 : M3 BIT 3 : M4 BIT 4 : M5 BIT 5 : M6 BIT 6 : M7 BIT 7 : M8 BIT 8 : -

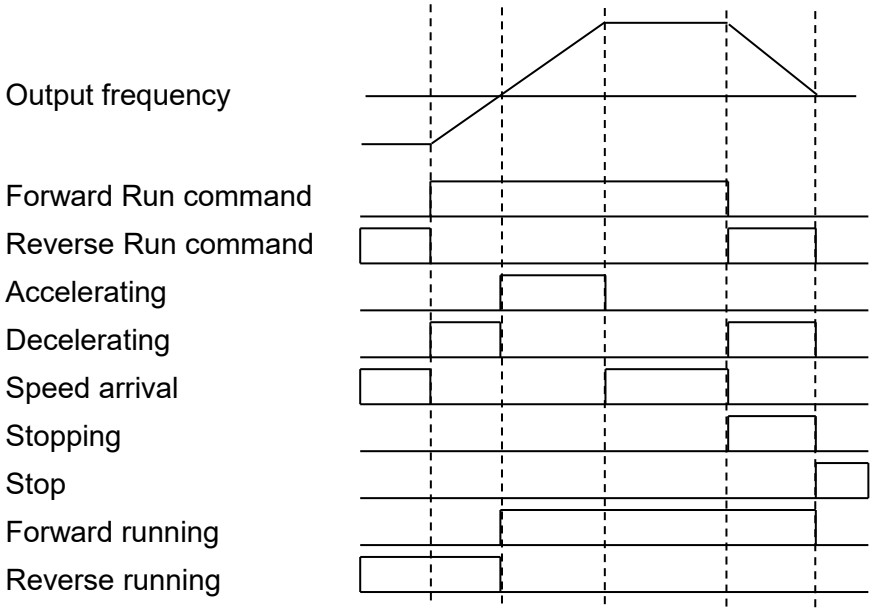
Address	Parameter	Scale	Unit	R/W	Data value
					BIT 9 : - BIT 10 : -
0x0011	Output terminal status	-	-	R	BIT 0 : AUX1 BIT 1 : AUX2 BIT 2 : AUX3 BIT 3 : AUX4 BIT 4 : - BIT 5 : - BIT 6 : - BIT 7 : 30AC
0x0012	V1	0~10V	-	R	-
0x0013	V2	0~10V	-	R	-
0x0014	I	0~20mA	-	R	-
0x0015	RPM	-	-	R	-
0x001A	Unit display	-	-	R	0 : Hz, 1 : Rpm
0x001B	Pole number	-	-	R	-
0x001C	Custom Version	-	-	R	-

Note 1) Detail description on Common area address 0x0006

Bit	Value	R/W	Name	Description
0	0x01	R/W	Stop	Issue a Stop command via communication (0->1)
1	0x02	R/W	Forward run	Issue a Forward run command via communication (0->1)
2	0x04	R/W	Reverse run	Issue a Reverse run command via communication (0->1)
3	0x08	R/W	Fault reset	Issue a Fault reset command via communication (0->1)
4	0x10	R/W	Emergency stop	Issue a Emergency stop command via communication (0->1)
5	-	-	Not used	Not Used
6~7	-	R	Operating command	0 (Terminal), 1 (keypad), 2 (option), 3 (Int. 485)
8~14	-	R	Frequency command	A. When operating command is issued via Terminal, Keypad or Option 0 : DRV-00, 1 : Not used, 2 : Multi-step speed 1, 3 : Multi-step speed 2, 4 : Multi-step speed 3, 5 : Multi-step speed 4, 6 : Multi-step speed 5, 7 : Multi-step speed 6 8 : Multi-step speed 7, 9 : Multi-step speed 8, 10 : Multi-step speed 9, 12 : Multi-step speed 11, 11 : Multi-step speed 10, 13 : Multi-step speed 12 14 : Multi-step speed 13, 15 : Multi-step speed 14 , 16 : Multi-step speed 15, 17 :Up, 18 : Down, 19 : Up/Down Zero 20~21 : RESERVE, 22 : V1, 23 : V1S,

Bit	Value	R/W	Name	Description
				24 : I, 25 : V1+I, 26 : Pulse 27 : Sub, 28 : Int. 485, 29 : Option 30 : Jog, 31 : PID
15	0x8000	R	Network error	Network malfunction

8.5.1 iP5A operating status in Address E, Common area



< iP5A Address usage area by groups >

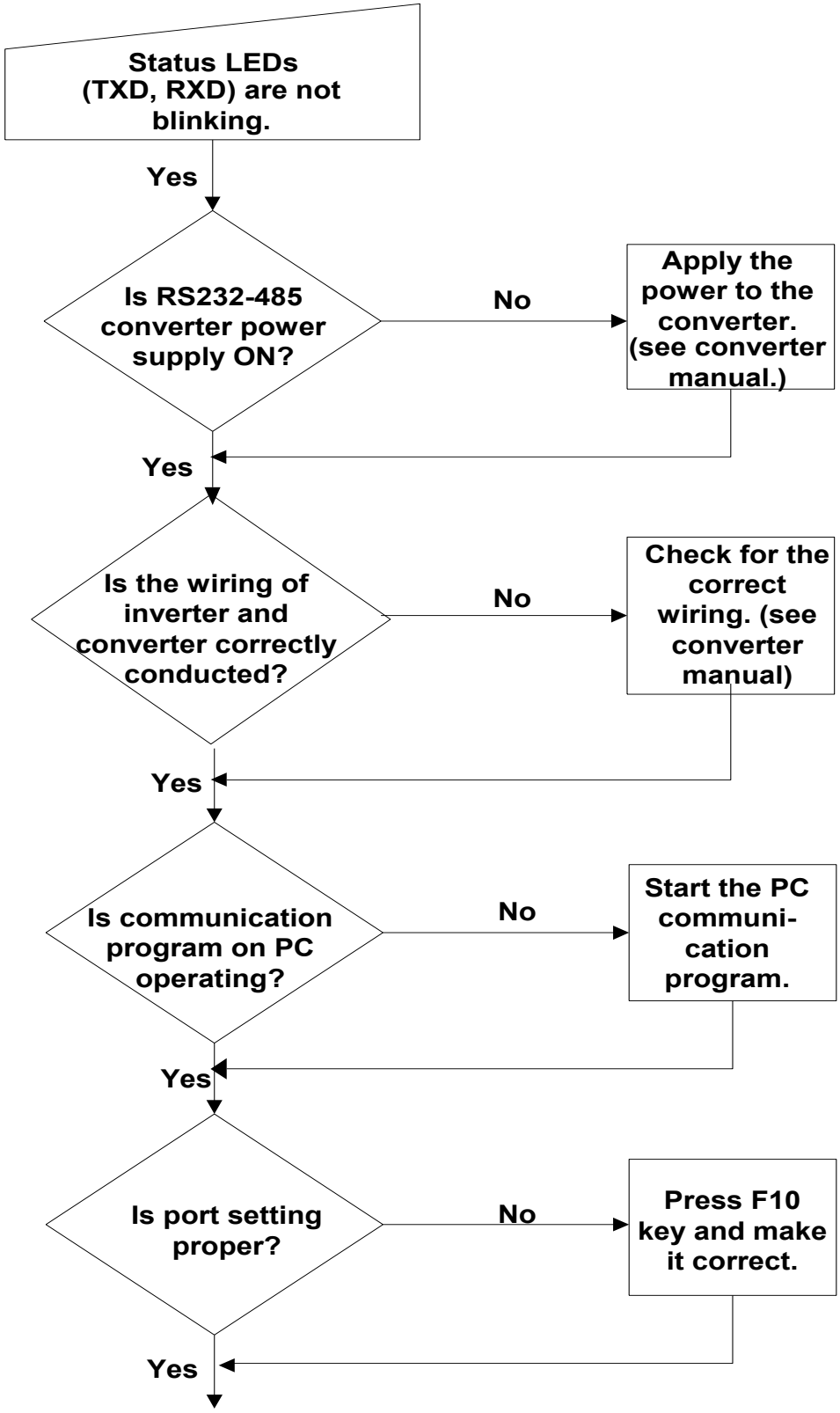
DRV	9100 - 91FF
FU1	9200 – 92FF
FU2	9300 – 93FF
I/O	9400 - 94FF
EXT	9500 - 95FF
COM	9600 - 96FF
APP	9700 - 97FF

Address setting method to access the parameter using RS485 : Area assigned by inverter + Address usage area by groups + Code no. (Hex).

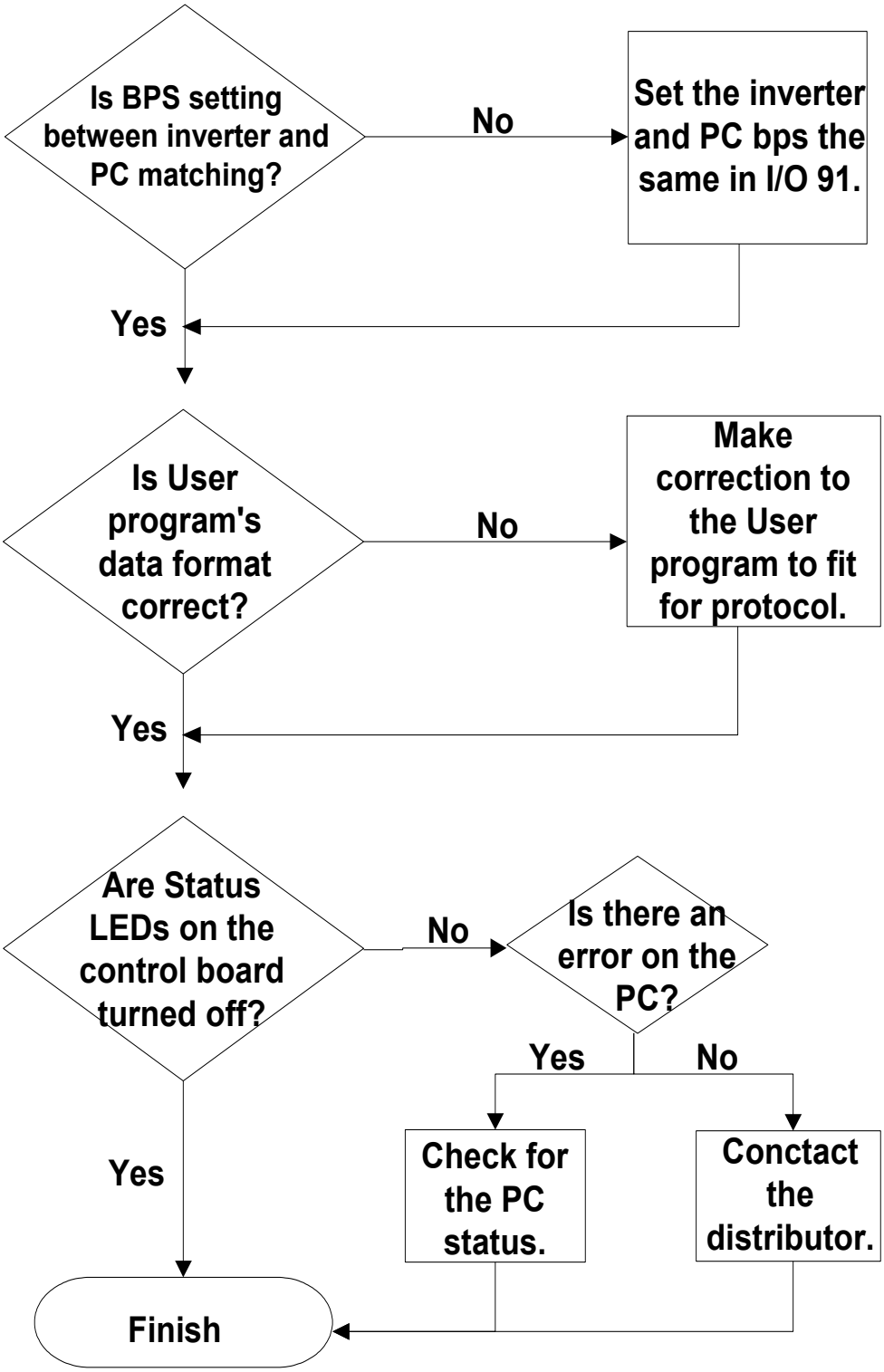
Ex) To check the content of I/O-93 [COM Time Out], perform Read or Write the address 0x945D.

8.6 Troubleshooting

Refer to the below chart when RS485 communication error occurs.



(Continued from previous page)



8.7 ASCII Code List

Character	Hex	Character	Hex	Character	Hex
A	41	q	71	@	40
B	42	r	72	[	5B
C	43	s	73	\	5C
D	44	t	74	]	5D
E	45	u	75		5E
F	46	v	76		5F
G	47	w	77		60
H	48	x	78	{	7B
I	49	y	79	|	7C
J	4A	z	7A	}	7D
K	4B	0	30	~	7E
L	4C	1	31	BEL	07
M	4D	2	32	BS	08
N	4E	3	33	CAN	18
O	4F	4	34	CR	0D
P	50	5	35	DC1	11
Q	51	6	36	DC2	12
R	52	7	37	DC3	13
S	53	8	38	DC4	14
T	54	9	39	DEL	7F
U	55	space	20	DLE	10
V	56	!	21	EM	19
W	57	"	22	ACK	06
X	58	#	23	ENQ	05
Y	59	$	24	EOT	04
Z	5A	%	25	ESC	1B
A	61	&	26	ETB	17
B	62	'	27	ETX	03
C	63	(	28	FF	0C
D	64	)	29	FS	1C
E	65	*	2A	GS	1D
F	66	+	2B	HT	09
G	67	,	2C	LF	0A
H	68	-	2D	NAK	15
I	69	.	2E	NUL	00
J	6A	/	2F	RS	1E
K	6B	:	3A	S1	0F
L	6C	;	3B	SO	0E
M	6D	<	3C	SOH	01
N	6E	=	3D	STX	02
O	6F	>	3E	SUB	1A
P	70	?	3F	SYN	16
				US	1F
				VT	0B

CHAPTER 9 - APPLYING DRIVES TO SINGLE-PHASE INPUT APPLICATION

9.1 Introduction

SV-IP5A is a three-phase standard variable frequency drive(VFD). When applying single-phase power to a three-phase VFD, there are several constraints that need to be considered. Standard Pulse-Width-Modulated (PWM) VFDs use a 6-pulse diode rectifier. The 6-pulse rectification results in 360 Hz DC bus ripple when used with a three-phase 60 Hz supply. However, under single-phase use, the DC bus ripple becomes 120 Hz and the VFDs DC bus circuit is subject to higher stress in order to deliver equivalent power.
Additionally, input currents and harmonics increase beyond those encountered with three-phase input. Input current distortion of 90% THD and greater can be expected under single-phase input, compared to approximately 40% with three-phase input as indicated in Figure 2. Therefore, single-phase use requires the three-phase VFD power rating be reduced (derated) to avoid over stressing the rectifier and DC link components.

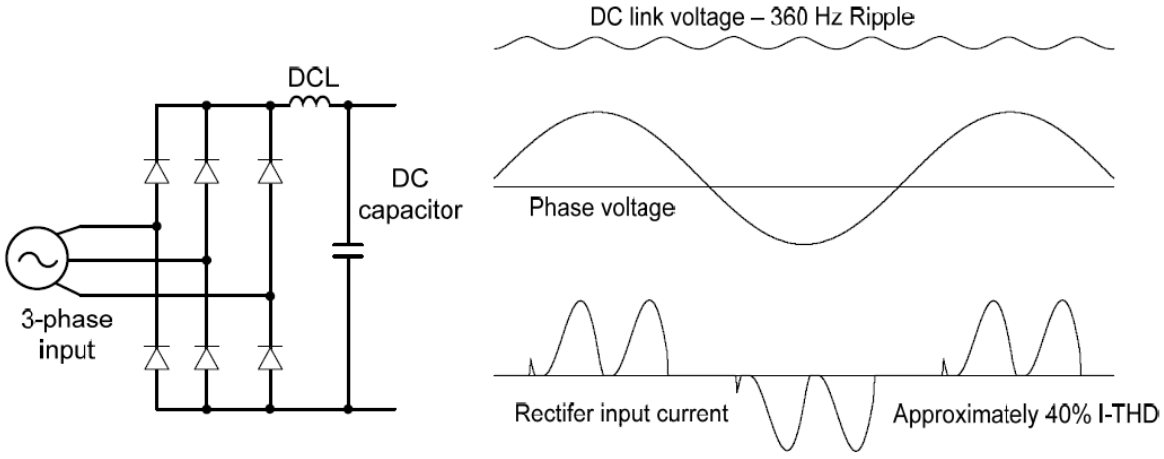


Figure-1 Typical Three-Phase Configuration

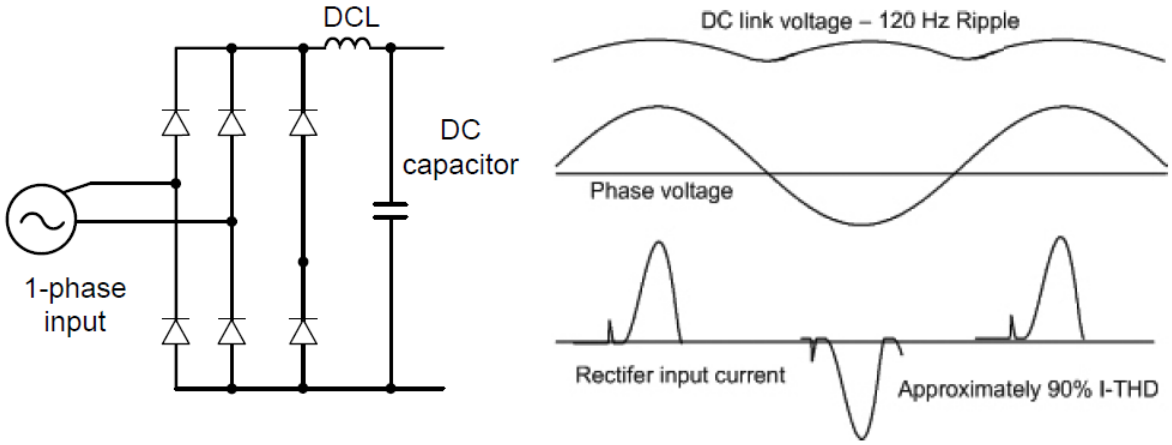


Figure-2 Typical Single-Phase Configuration

9.2 Power(HP), Input Current and Output Current

When using a three-phase VFD with single-phase input, derating the drive's output current and horsepower will be necessary because of the increase in DC bus ripple voltage and current. In addition, the input current through the remaining two phases on the diode bridge converter will approximately double, creating another derating consideration for the VFD. Input current harmonic distortion will increase beyond that with a three-phase supply making the overall input power factor low. Input current distortion over 100% is likely under single-phase conditions without a Reactor. Therefore, the Reactor is always required. When using a motor that is selected by the three-phase drive rating criteria when using single-phase input, it may result in poor performance, premature drive failure.
The selected drive of single-phase current ratings must meet or exceed the motor current ratings as indicated in Table 1.

9.3 Input Frequency and Voltage Tolerance

The drive ratings in Table 1 are valid for 60Hz input only. Operation at input frequencies other than 60Hz will require further review by LS ELECTRIC.
The AC supply voltage must be within the required voltage range of 240/480Vac +10% to –5% to maximize motor power production. Standard product with three-phase voltage input as an allowable range of +10% to –15%. Therefore, a stricter input voltage tolerance of +10 to –5% applies when using the drive with a single-phase supply.
The average bus voltage with single-phase input is lower than the equivalent of a three-phase input. Therefore, the maximum output voltage (motor voltage) will be lower with a single-phase input The minimum input voltage must be no less than 228Vac for 240 volt models and 456Vac for 480 volt models, to ensure motor voltage production of 207Vac and 415Vac, respectively. Thus, if full motor torque must be developed near base speed (full power) it will be necessary to maintain a rigid incoming line voltage so that adequate motor voltage can be produced. Operating a motor at reduced speed (reduced power), or using a motor with a base voltage that is lower than the incoming AC supply rating (ex. 208Vac motor with a 240Vac supply), will also minimize the effect of voltage deprivation.
(240VAC Input →208V motor, 480VAC Input → 400V motor)

9.4 Wiring and Peripheral Device

It is important that input wiring and branch circuit protection be selected based on the drive's single-phase input current rating indicated in Table 1-2.
The single-phase input current after derating differs from the three-phase input indicated on the VFD nameplate. Connect single-phase AC input wiring below Figure-3 (R(L1)-T(L3)).

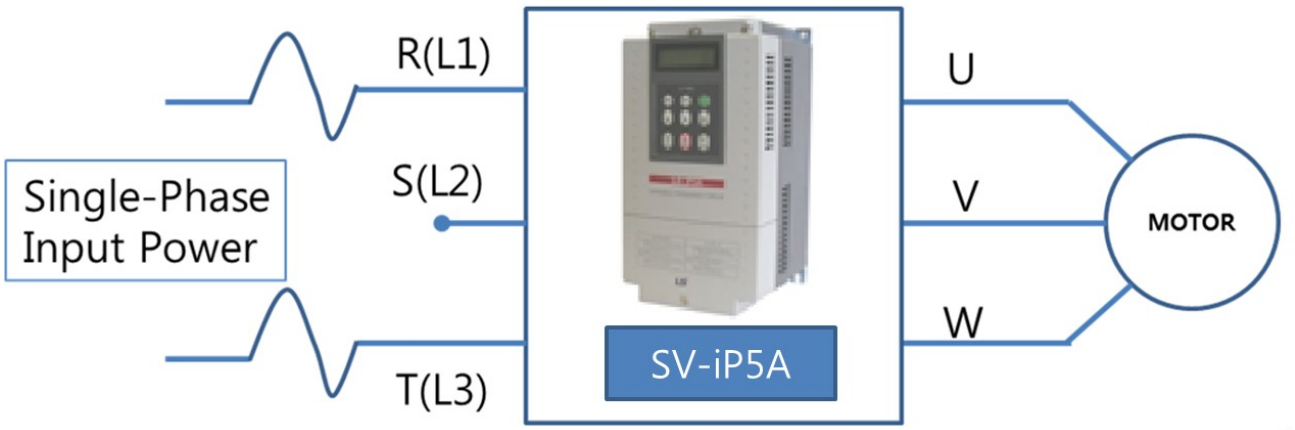


Figure-3 Terminal Wiring Diagram

Single-Phase Rating (240V/60Hz)											
[kW]	[HP]	Single-Phase Current Rating				Wire Seletion		FUSE		MCCB	Electronic Contactor
		Input Amp		Output Amp		AWG					
		HD [A]	ND [A]	HD [A]	ND [A]	R,S,T	U,V,W	[A]	[V]	LSIS(UL Type)	
5.5kW	7.5	20	25	8.5	12	10	10	40	500V	UTS150/50A	MC-32a
7.5kW	10	26	33	12	16	8	8	60		UTS150/60A	MC-40a
11kW	15	38	47	17	24	6	6	80		UTS150/100A	MC-50a
15kW	20	46	62	23	31	4	4	100		UTS150/125A	MC-65a
18.5kW	25	55	76	28	38	2	2	125		UTS150/150A	MC-100a
22kW	30	70	90	35	46	2	2	150		UTS250/175A	MC-130a
30kW	40	86	117	43	59	1/0	1/0	200		UTS250/225A	MC-150a

Table 1. Single_Phase Rating(240V/60Hz)

Single-Phase Rating (480V/60Hz)											
[kW]	[HP]	Single-Phase Current Rating				Wire Seletion		FUSE		MCCB	Electronic Contactor
		Input Amp		Output Amp		AWG					
		HD [A]	ND [A]	HD [A]	ND [A]	R,S,T	U,V,W	[A]	[V]	LSIS(UL Type)	
5.5kW	7.5	9	13	4.8	6.6	12	12	20	500V	UTE100/30A	MC-22b
7.5kW	10	13	17	6.7	8.9	12	12	30		UTE100/30A	MC-22b
11kW	15	20	25	9.1	14	10	10	40		UTS150/50A	MC-40a
15kW	20	26	32	12	16	8	8	60		UTS150/60A	MC-50a
18.5kW	25	33	41	15	20	6	6	70		UTS150/60A	MC-50a
22kW	30	40	47	20	23	4	4	80		UTS150/100A	MC-65a
30kW	40	51	63	23	32	4	4	100		UTS150/125A	MC-75a
37kW	50	57	90	31	39	2	2	125		UTS150/150A	MC-105a
45kW	60	69	109	39	47	2	2	150		UTS250/200A	MC-130a
55kW	75	83	123	47	57	2	2	175		UTS250/250A	MC-150a
75kW	100	113	162	57	78	1/0	1/0	250		UTS400/300A	MC-185a
90kW	120	136	195	79	95	1/0	1/0	300		UTS400/350A	MC-225a
110kW	150	174	237	95	116	4/0	4/0	350	700V	UTS400/400A	MC-330a
132kW	180	206	281	113	134	4/0	4/0	400		UTS600/500A	MC-400a
160kW	225	255	346	135	166	300	300	450		UTS600/600A	MC-400a

Table 2. Single-Phase Rating(480V/60Hz)

9.5 Considerations When Using a Three-Phase Drive with Single-Phase Input

Depending on the increased DC ripple, sensorless mode may result in poor performance, If phase open trip occurs, cancel the input phase open protection bit setting (FU1-69)

When applying single-phase power to a three-phase VFD, you can not limit the current to exceed the single-phase rating. Therefore, motor capacity, motor overload trip and E-thermal function must be set to protect motor.

The Reactor is always required. Therefore, Please purchase a built-in DC reactor product. IP5A 200V 5.5 ~ 30kW, 400V 5.5 ~ 11kW capacity products does not have a built-in DC reactor. The product does not have a built-in DC reactor, install an external AC reactor because it can not be equipped with a DC reactor.

APPENDIX A- UL MARKING

1. SHORT CIRCUIT RATING

Maximum allowed prospective short-circuit current at the input power connection is defined in IEC 60439-1 as 100 kA. The drive is suitable for use in a circuit capable of delivering not more than **100 kA RMS** at the drive's maximum rated voltage.

Le courant maximum de court-circuit présumé autorisé au connecteur d'alimentation électrique est défini dans la norme CEI 60439-1 comme égal à 100 kA. L'entraînement convient pour une utilisation dans un circuit capable de délivrer pas plus de 100 kA RMS à la tension nominale maximale de l'entraînement.

2. SHORT CIRCUIT FUSE/BREAKER

Use Class H or K5 UL Listed Input Fuse and UL Listed Breaker Only. See the table below for the Voltage and Current rating of the fuses and the breakers.

Input Voltage	Motor [kW]	Inverter	External Fuse		Breaker		Internal Fuse			
			Current [A]	Voltage [V]	Current [A]	Voltage [V]	Current [A]	Voltage [V]	Manufacturer	Model Number
200V Class	5.5	SV055iP5A-2	40	500	50	230				
	7.5	SV075iP5A-2	60	500	60	230				
	11	SV110IP5A-2	80	500	100	230				
	15	SV150iP5A-2	100	500	100	230				
	18.5	SV185iP5A-2	125	500	225	230				
	22	SV220iP5A-2	150	500	225	230				
	30	SV300iP5A-2	200	500	225	230				
400V Class	5.5	SV055iPS5-4	20	500	30	460				
	7.5	SV075iP5A-4	30	500	30	460				
	11	SV110iPS5-4	40	500	50	460				
	15	SV150iP5A-4	60	500	60	460				
	18.5	SV185iP5A-4	70	500	75	460				
	22	SV0220iP5A-4	80	500	100	460				
	30	SV0300iP5A-4	100	500	125	460				
	37	SV0370iP5A-4	125	500	125	460	160	660	Hinode	660GH-160SUL
	45	SV0450iP5A-4	150	500	150	460	160	660	Hinode	660GH-160SUL
	55	SV0550iP5A-4	175	500	175	460	200	660	Hinode	660GH-200SUL
	75	SV0750iP5A-4	250	500	225	460	250	660	Hinode	660GH-250SUL
	90	SV0900iP5A-4	300	500	300	460	315	660	Hinode	660GH-315SUL
	110	SV01100iP5A-4	350	700	400	460	200×2P	660	Hinode	660GH-200SUL×2P
	132	SV01320iP5A-4	400	700	500	460	250×2P	660	Hinode	660GH-250SUL×2P
	160	SV01600iP5A-4	450	700	600	460	315×2P	660	Hinode	660GH-315SUL×2P
	220	SV02200iP5A-4	700	700	800	460	250×3P	660	Hinode	660GH-250SUL×3P
	280	SV02800iP5A-4	800	700	1000	460	315×3P	660	Hinode	660GH-315SUL×3P
	315	SV03150iP5A-4	900	700	1000	460	800	690	Ferraz	6.9URD32TTF0800
	375	SV03750iP5A-4	1000	700	1200	460	900	690	Ferraz	6.9URD32TTF0900
	450	SV04500iP5A-4	1200	700	1200	460	1000	690	Ferraz	6.9URD32TTF1000

Use Class H or RK5 UL listed Input fuses and UL listed breakers ONLY. See the table above for the voltage and current ratings for the fuses and breakers.

Utiliser UNIQUEMENT des fusibles d'entrée homologués de Classe H ou RK5 UL et des disjoncteurs UL . Se reporter au tableau ci-dessus pour la tension et le courant nominal des fusibless et des disjoncteurs.

3. OVER LOAD PROTECTION

IOLT : IOLT (inverter Overload Trip) protection is activated at 110% of the inverter rated current for 1 minute and greater.

OLT : Inverter shuts off its output when inverter output current exceeds its overload trip level for overload trip time. OLT is selected when FU1-66 [Overload Trip Selection] is set to "Yes" and activated at 120% of FU1-67 [Overload Trip Level] for 60 sec set in FU1-68 [Overload Trip Delay Time].

4. OVER SPEED PROTECTION

Not Provided With Overspeed Protection.

5. FIELD WIRING TERMINAL

Apply rated torques to the terminal screws. Loose screws may cause short circuits and malfunctions. Tightening the screw too much may damage the terminals and cause short circuits and malfunctions.

Use copper wires only with 600V, 90℃ rating for the power terminal wiring, and 300V, 75℃rating for the control terminal wiring.

Power supply wirings must be connected to the R, S, and T terminals. Connecting them to the U, V, W terminals causes internal damages to the inverter. Motor should be connected to the U, V, and W Terminals. Arrangement of the phase sequence is not necessary.

Appliquer des couples de marche aux vis des bornes. Des vis desserrées peuvent provoquer des courts-circuits et des dysfonctionnements. Ne pas trop serrer la vis, car cela risque d'endommager les bornes et de provoquer des courts-circuits et des dysfonctionnements.

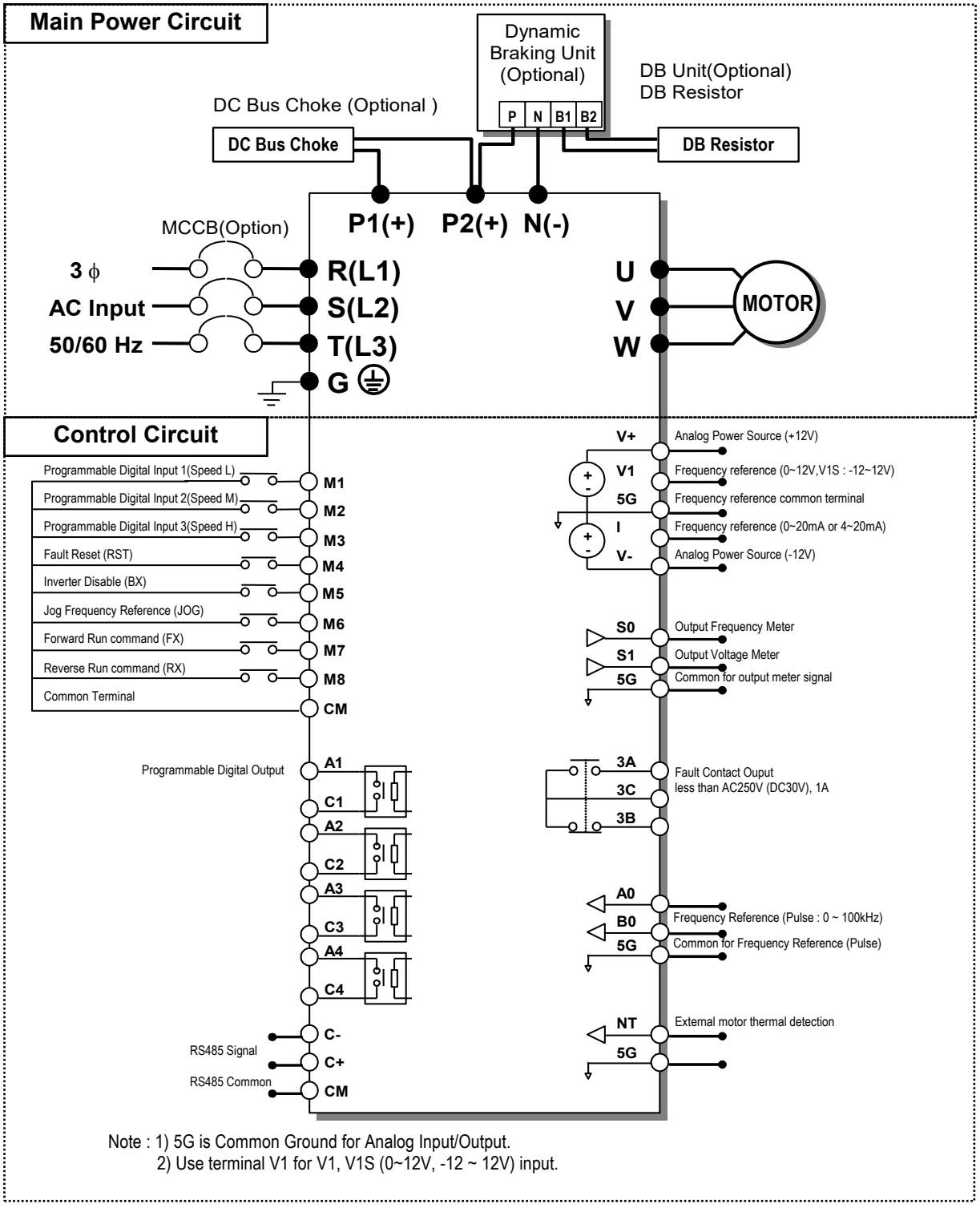
Utiliser uniquement des fils de cuivre avec une valeur nominale de 600 V, 90 ℃ pour le câblage de la borne d' alimentation, et une valeur nominale de 300 V, 75 ℃ pour le câblage de la borne de commande.

Les câblages de l'alimentation électrique doivent être connectés aux bornes R, S et T. Leur connexion aux bornes U, V et W provoque des dommages internes à l'onduleur. Le moteur doit être raccordé aux bornes U, V et W. L'arrangement de l'ordre de phase n' est pas nécessaire.

Inverter Capacity [kW]		Terminal Screw Size	Screw Torque[1]		Wire[2]			
			Kgf·cm	lb-in	mm²		AWG or kcmil	
					R,S,T	U,V,W	R,S,T	U,V,W
200V Class	5.5	M4	7.1 ~ 12.2	6.2~10.6	5.5	5.5	10	10
	7.5	M5	24.5 ~ 31.8	21.2~27.6	8	8	8	8
	11	M5			14	14	6	6
	15	M6	30.6 ~ 38.2	26.6~33.2	22	22	4	4
	18.5	M6			38	38	2	2
	22	M8	61.2 ~ 91.8	53.1~79.7	38	38	2	2
	30	M8			60	60	1/0	1/0
400V Class	5.5	M4	7.1 ~ 12.2	6.2~10.6	3.5	3.5	12	12
	7.5	M4			3.5	3.5	12	12
	11	M4			5.5	5.5	10	10
	15	M6	30.6~38.2	26.6~33.2	8	8	8	8
	18.5	M6			14	14	6	6
	22	M8	61.2~91.8	53.1~79.7	22	22	4	4
	30	M8			22	22	4	4
	37	M8	67.3~87.5	58.4~75.9	38	38	2	2
	45	M8			38	38	2	2
	55	M8			38	38	2	2
	75	M10	89.7~122.0	77.9~105.9	60	60	1/0	1/0
	90	M10			60	60	1/0	1/0
	110	M12	182.4~215.0	158.3~186.6	100	100	4/0	4/0
	132	M12			100	100	4/0	4/0
	160	M12			150	150	300	300
	220	M12			200	200	400	400
	280	M12	182.4~215.0	158.3~186.6	250	250	500	500
	315	M12			325	325	700	700
	375	M12			2×200	2×200	2×400	2×400
	450	M12			2×250	2×250	2×500	2×500

For 7.5~11kW 240V type inverters, Input and motor output terminal blocks are intended only for use with ring type connectors.

6. BASIC WIRING (Refer to 3.2 Wiring)



Note : 1) 5G is Common Ground for Analog Input/Output.
2) Use terminal V1 for V1, V1S (0~12V, -12 ~ 12V) input.

⚠ CAUTION	
	■ **Risk of Electric Shock** • Read the manual carefully and follow the safety Instructions before installing or using the device. • Before opening the cover, disconnect all power sources and wait for at least 10 minutes. ■ **Risque de blessure ou de choc électrique** • Avant d'installer ou d'utiliser l'appareil, vous devez lire attentivement le manuel et suivre les consignes de sécurité. • Avant d'ouvrir le capot, débrancher toutes les sources d'alimentation et attendre au moins 10 minutes.

7. Maximum Temperature

SV008IP5A~SV900IP5A : Maximum Ambient Temperature – 40°C.

SV1100IP5A~SV4500IP5A : Maximum Surrounding Air Temperature – 40°C.

SV150IP5A~SV300IP5A - L : Maximum Ambient Temperature – 40°C.

SV370IP5A~SV900IP5A - L : Maximum Ambient Temperature – 50°C.

UL mark

The UL mark applies to products in the United States and Canada. This mark indicates that UL has tested and evaluated the products and determined that the products satisfy the UL standards for product safety. If a product received UL certification, this means that all components inside the product had been certified for UL standards as well.

CE mark

The CE mark indicates that the products carrying this mark comply with European safety and environmental regulations. European standards include the Machinery Directive for machine manufacturers, the Low Voltage Directive for electronics manufacturers and the EMC guidelines for safe noise control.

Low Voltage Directive

We have confirmed that our products comply with the Low Voltage Directive (EN 61800-5-1).

EMC Directive

The Directive defines the requirements for immunity and emissions of electrical equipment used within the European Union. The EMC product standard (EN 61800-3) covers requirements stated for drives.

EAC mark

The EAC (EurAsian Conformity) mark is applied to the products before they are placed on the market of the Eurasian Customs Union member states.
It indicates the compliance of the products with the following technical regulations and requirements of the Eurasian Customs Union:

Technical Regulations of the Customs Union 004/2011 “On safety of low voltage equipment”
Technical Regulations of the Customs Union 020/2011 “On electromagnetic compatibility of technical products”

APPENDIX B- PERIPHERAL DEVICES

1. MCCB(Molded Case Circuit Breaker) and MC(Magnetic Contector)

Voltage	CAP. [kW]	MCCB				ELCB		MC	
		Model	Rating (A)	Model	Rating (A)	Model	Rating (A)	Model	Rating (A)
200V Class	0.75	UTE100N	15	ABS33c	15	EBS33c	10	MC-9b	11
	1.5		15		15		15	MC-9b	11
	2.2		30		30		30	MC-12b	13
	3.7		30		30		30	MC-18b	18
	5.5	UTS150L	50	ABS53c	50	EBS53c	50	MC-32a	32
	7.5		60	ABS63c	60	EBS63c	60	MC-40a	40
	11		100	ABS103c	100	EBS103c	100	MC-50a	55
	15		125		125	EBS203c	125	MC-65a	65
	18.5		150	ABS203c	150		150	MC-100a	105
	22	UTS250L	175		175		175	MC-130a	130
	30		225		225		225	MC-150a	150
400V Class	0.75	UTE100N	15	ABS33c	15	EBS33c	15	MC-9b	9
	1.5		15		15		15		9
	2.2		15		15		15		9
	3.7		15		15		15	MC-12b	12
	5.5		30		30		30	MC-22b	22
	7.5		30		30		30		22
	11	UTS150L	50	ABS53c	50	EBS53c	50	MC-40a	40
	15		60	ABS63c	60	EBS63c	60	MC-50a	50
	18.5		60		60	EBS103c	60		50
	22		100	ABS103c	100		100	MC-65a	65
	30		125	ABS203c	125	EBS203c	125	MC-75a	75
	37		150		150		150	MC-100a	105
	45	UTS250L	200		200		200	MC-130a	130
	55		250		250		250	MC-150a	150
	75	UTS400L	300	ABS403c	300	EBS403c	300	MC-185a	185
	90		350		350		350	MC-225a	225
	110		400		400		400	MC-330a	330
	132	UTS600L	500	ABS603c	500	EBS603c	500		400
	160		600		630		630	MC-400a	400
	220	UTS800L	800	ABS803c	800	EBS803c	800	MC-630a	630
	280	UTS1200L	1000	ABS1003b	1000	EBS1003c	1000		630
	315		1200	ABS1203b	1200	EBS1203c	1200	MC-800a	800
	375	1400A	1400	1400A	1400	1400A	1400	900A	900
	450	1600A	1600	1600A	1600	1600A	1600	1000A	1000

2. AC Input Fuse and AC / DC Reactor

Voltage	Motor [kW]	Inverter Model	AC Input Fuse [A]	AC Reactor		DC Reactor	
				[mH]	[A]	[mH]	[A]
200V Class	0.75	SV008iP5A-2	10	2.13	5.7	4	8.7
	1.5	SV015iP5A-2	15	1.2	10	3	13
	2.2	SV022iP5A-2	20	0.88	14	2	19
	3.7	SV037iP5A-2	30	0.56	20	1.5	27
	5.5	SV055iP5A-2	40	0.39	30	1.37	29
	7.5	SV075iP5A-2	60	0.28	40	1.05	38
	11	SV110iP5A-2	80	0.20	59	0.74	56
	15	SV150iP5A-2	100	0.15	75	0.57	71
	18.5	SV185iP5A-2	125	0.12	96	0.49	91
	22	SV220iP5A-2	150	0.10	112	0.42	107
	30	SV300iP5A-2	200	0.07	160	0.34	152
400V Class	0.75	SV008iP5A-4	10	8.63	2.8	16	4.5
	1.5	SV015iP5A-4	10	4.81	4.8	12	7
	2.2	SV022iP5A-4	10	3.23	7.5	8	9
	3.7	SV037iP5A-4	15	2.34	10	6.4	12
	5.5	SV055iP5A-4	20	1.22	15	5.34	14
	7.5	SV075iP5A-4	30	1.14	20	4.04	19
	11	SV110iP5A-4	40	0.81	30	2.76	29
	15	SV150iP5A-4	60	0.61	38	2.18	36
	18.5	SV185iP5A-4	70	0.45	50	1.79	48
	22	SV220iP5A-4	80	0.39	58	1.54	55
	30	SV300IP5A-4	100	0.287	80	1.191	76
	37	SV370iP5A-4	125	0.232	98	0.975	93
	45	SV450iP5A-4	150	0.195	118	0.886	112
	55	SV550iP5A-4	175	0.157	142	0.753	135
	75	SV750iP5A-4	250	0.122	196	0.436	187
	90	SV900iP5A-4	300	0.096	237	0.352	225
	110	SV1100iP5A-4	350	0.081	289	Built-in	
	132	SV1320iP5A-4	400	0.069	341		
	160	SV1600iP5A-4	450	0.057	420		
	220	SV2200iP5A-4	700	0.042	558		
	280	SV2800iP5A-4	800	0.029	799		
	315	SV3150iP5A-4	900	0.029	799	0.090	836
	375	SV3750iP5A-4	1000	0.024	952	0.076	996
	450	SV4500iP5A-4	1200	0.024	952	0.064	1195

* Use circuit breaker 1.5 ~ 2 time to output rated current of inverter

APPENDIX C- RELATED PARAMETERS

Use	Related parameter codes
Adjusting Accel/Decel time and pattern	DRV-01 [Acceleration Time], DRV-02 [Deceleration Time], FU1-02 [Acceleration Pattern], FU1-03 [Deceleration Pattern]
Reverse rotation prevention	FU1-01 [Run Prevention (Forward/Reverse Prevention)]
Accel/Decel at continuous rating range	FU1-02 [Acceleration Pattern], FU1-03 [Deceleration Pattern]
Adjusting braking operation	FU1-20 [Start Mode], FU1-21~22 [DC Injection Braking Time and Value at Starting], FU1-23 [Stop Mode], FU1-24~27 [DC Injection Braking On-delay Time, Frequency, Time and Value]
Operations at freq. over 60 Hz	FU1-30 [Max. Frequency], FU1-35 [High Limit Frequency], I/O-05 [V1 Input Maximum Voltage], I/O-10 [Frequency Corresponding to I Input Max. Current], I/O-16 [Frequency Corresponding to Pulse Input Max. Freq.]
Selecting an appropriate output characteristics for the load	FU1-30 [Max. Frequency], FU1-31 [Basic Frequency]
Adjusting motor output torque	FU1-32 [Starting Frequency], FU1-71[Stall Prevention Level], FU2-67~69 [Torque Boost], FU2-40 [Motor Capacity Selection]
Output frequency limit	FU1-33~35[Frequency Limit selection, Hihg/Low Limit Freq.], I/O-01~16 [Analog Frequency Setting]
Motor overheat protection	FU1-60~62 [Electronic Thermal Selection and Level], FU2-40 [Motor Capacity Selection], I/O-97, 98 [Overheat trip selection and Motor overtheat trip temperature]
Multi-step operation	I/O-20~27 [Programmable Digital Input Terminal Define], DRV-00 [Command Frequency], 05~07,I/O-31~42 [Multi-step Frequency], FU1-34~35 [Hihg/Low Limit Freq.]
Jog operation	I/O-30 [Jog Frequency Setting]
Frequency jump operation	FU2-10 [Frequency Jump Selection] , FU2-11~16 [Jump Frequency High/Low Limit]
Electronic brake operation Timing	I/O-74,75 [Frequency Detection Level and Bandwidth], I/O-76~79 [Programmable Digital Output Terminal Define]
Display of rotating speed etc.	DRV-09 [Motor Speed (Rpm)], FU2-47 [Gain for Motor Speed Display]
Function change prevention	FU2-94 [Parameter Lock]
Energy saving	FU1-51~52 [Energy Save]
Auto-restart operation after alarm stop	FU2-20 [Power ON Start Selection], FU2-21 [Restart after Fault Reset]
2nd motor operation	APP-20~29 [2nd Function]
PID feedback operation	APP-02~25 [PID Operation]
Adjusting frequency reference and output	I/O-01~16 [Analog Frequency Setting]
Switchover operation between Commercial Line and Inverter	I/O-20~27 [Programmable Digital Input Terminal Define], I/O-76~79 [Programmable Digital Output Terminal Define]
Frequency Meter Calibration	I/O-70~73 [S0/S1 Analog Output]
Operation via Communication with a PC	I/O-90 [Inverter Number], I/O-91 [Baud Rate Selection], I/O-92 [Operation method at loss of freq. reference], I/O-93 [Wating time after loss of freq. reference]

EC DECLARATION OF CONFORMITY

We, the undersigned,

Representative:	**LS ELECTRIC Co., Ltd.**
Address:	**LS Tower, 127, LS-ro, Dongan-gu, Anyang-si, Gyeonggi-do, Korea**
Manufacturer:	**LS ELECTRIC Co., Ltd.**
Address:	**56, Samsung 4-gil, Mokchon-Eup, Dongnam-gu, Chungcheongnam-do, Korea**

Certify and declare under our sole responsibility that the following apparatus:

Type of Equipment:	**Inverter (Power Conversion Equipment)**
Model Name:	**SV-IP5A series**
Trade Mark:	**LS ELECTRIC Co., Ltd.**

Conforms with the essential requirements of the directives:

2014/35/EU Directive of the European Parliament and of the Council on the harmonisation of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits

2014/30/EU Directive of the European Parliament and of the Council on the harmonisation of the laws of the Member States relating to electromagnetic compatibility

Based on the following specifications applied:

EN 61800-3:2004/A1:2012
EN 61800-5-1:2007

and therefore complies with the essential requirements and provisions of the 2014/35/CE and 2014/30/CE Directives.

Place: **Chonan, Chungnam, Korea**

문상천 2016.1.13 (Signature / Date)

Mr. Sang Chun Moon / General Manager
(Full name / Position)

EMI / RFI POWER LINE FILTERS

LS inverters, iP5A series

RFI FILTERS

THE LS RANGE OF POWER LINE FILTERS FF (Footprint) - FE (Standard) SERIES, HAVE BEEN SPECIFICALLY DESIGNED WITH HIGH FREQUENCY LS INVERTERS. THE USE OF LS FILTERS, WITH THE INSTALLATION ADVICE OVERLEAF HELP TO ENSURE TROUBLE FREE USE ALONG SIDE SENSITIVE DEVICES AND COMPLIANCE TO CONDUCTED EMISSION AND IMMUNITY STANDARS TO EN 50081 -> EN61000-6-3:02 and EN61000-6-1:02

CAUTION

IN CASE OF A LEAKAGE CURRENT PROTECTIVE DEVICES IS USED ON POWER SUPPLY, IT MAY BE FAULT AT POWER-ON OR OFF. IN AVOID THIS CASE, THE SENSE CURRENT OF PROTECTIVE DEVICE SHOULD BE LARGER THAN VALUE OF LEAKAGE CURRENT AT WORST

RECOMMENDED INSTALLATION INSTRUCTIONS

To conform to the EMC directive, it is necessary that these instructions be followed as closely as possible. Follow the usual safety procedures when working with electrical equipment. All electrical connections to the filter, inverter and motor must be made by a qualified electrical technician.

1-) Check the filter rating label to ensure that the current, voltage rating and part number are correct.

2-) For best results the filter should be fitted as closely as possible to the incoming mains supply of the wiring enclousure, usually directly after the enclousures circuit breaker or supply switch.

3-) The back panel of the wiring cabinet of board should be prepared for the mounting dimensions of the filter. Care should be taken to remove any paint etc... from the mounting holes and face area of the panel to ensure the best possible earthing of the filter.

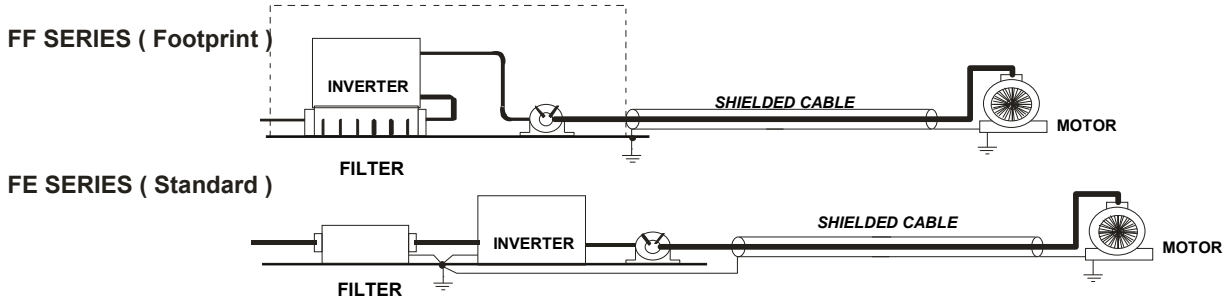
4-) Mount the filter securely.

5-) Connect the mains supply to the filter terminals marked LINE, connect any earth cables to the earth stud provided. Connect the filter terminals marked LOAD to the mains input of the inverter using short lengths of appropriate gauge cable.

6-) Connect the motor and fit the ferrite core (output chokes) as close to the inverter as possible. Armoured or screened cable should be used with the 3 phase conductors only threaded twice through the center of the ferrite core. The earth conductor should be securely earthed at both inverter and motor ends. The screen should be connected to the enclousure body via and earthed cable gland.

7-) Connect any control cables as instructed in the inverter instructions manual.

IT IS IMPORTANT THAT ALL LEAD LENGHTS ARE KEPT AS SHORT AS POSSIBLE AND THAT INCOMING MAINS AND OUTGOING MOTOR CABLES ARE KEPT WELL SEPARATED.



iP5A series / Footprint Filters

INVERTER	POWER	CODE	CURRENT	VOLTAGE	LEAKAGE CURRENT NOM. MAX.	DIMENSIONS L W H	MOUNTING Y X	WEIGHT	MOUNT	OUTPUT CHOKES
THREE PHASE										
SV008iP5A-2	0.75kW	**FFP5-T012-3**	12A	250VAC	0.3mA, 18mA	329x149.5x50	315x120	1.6 Kg.	M5	**FS – 1**
SV015iP5A-2	1.5kW									
SV022iP5A-2	2.2kW	**FFP5-T020-3**	20A	250VAC	0.3mA 18mA	329x149.5x50	315x120	1.8 Kg.	M5	**FS – 2**
SV037iP5A-2	3.7kW									
SV055iP5A-2	5.5kW	**FFP5-T040-3**	40A	250VAC	0.3mA 18mA	329x149.5x50	315x120	2.2 Kg.	M5	**FS – 2**
SV075iP5A-2	7.5kW	**FFP5-T050-3**	50A	250VAC	0.3mA 18mA	329x199.5x60	315x160	2.5 Kg.	M5	**FS – 2**
SV110iP5A-2	11kW									
SV150iP5A-2	15kW									
SV185iP5A-2	18kW									
SV220iP5A-2	22kW									
SV300iP5A-2	30kW									
SV008iP5A-4	0.75kW	**FFP5-T006-3**	6A	480VAC	0.3mA 18mA	329x149.5x50	315x120	1.6 Kg.	M5	**FS – 1**
SV015iP5A-4	1.5kW									
SV022iP5A-4	2.2kW	**FFP5-T012-3**	12A	480VAC	0.3mA 18mA	329x149.5x50	315x120	1.6 Kg.	M5	**FS – 1**
SV037iP5A-4	3.7kW									
SV055iP5A-4	5.5kW	**FFP5-T030-3**	30A	480VAC	0.5mA 27mA	329x149.5x50	315x120	2 Kg.	M5	**FS – 2**
SV075iP5A-4	7.5kW	**FFP5-T031-3**	31A	480VAC	0.5mA 27mA	329x199.5x60	315x160	2.5 Kg.	M5	**FS – 2**
SV110iP5A-4	11kW	**FFP5-T050-3**	50A	480VAC	0.5mA 27mA	329x199.5x60	315x160	2.5 Kg.	M5	**FS – 2**
SV150iP5A-4	15kW	**FFP5-T060-3**	60A	480VAC	0.5mA 27mA	466x258x65	440.5x181	2.8 Kg.	M5	**FS – 2**
SV185iP5A-4	18kW									
SV220iP5A-4	22kW	**FFP5-T070-3**	70A	480VAC	0.5mA 27mA	541x312x65	515.5x235.3	6.1 Kg.	M8	**FS – 2**
SV300iP5A-4	30kW									

iP5A series / Standard Filters

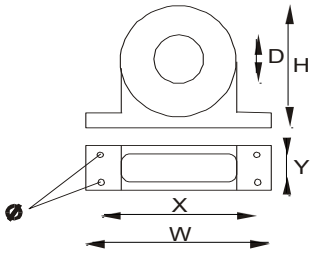
INVERTER	POWER	CODE	CURRENT	VOLTAGE	LEAKAGE CURRENT NOM. MAX.	DIMENSIONS L W H	MOUNTING Y X	WEIGHT	MOUNT	OUTPUT CHOKES
THREE PHASE										
SV008iP5A-2	0.75kW	**FE-T012-3**	12A	250VAC	0.5mA 27mA	250x110x60	238x76	1.6 Kg.	---	**FS – 1**
SV015iP5A-2	1.5kW									
SV022iP5A-2	2.2kW	**FE-T020-3**	20A	250VAC	0.5mA 27mA	270x140x60	258x106	2.4 Kg.	---	**FS – 2**
SV037iP5A-2	3.7kW									
SV055iP5A-2	5.5kW	**FE-T050-3**	50A	250VAC	0.5mA 27mA	270x140x90	258x106	3.2 Kg.	---	**FS – 2**
SV075iP5A-2	7.5kW									
SV110iP5A-2	11kW	**FE-T100-3**	100A	250VAC	1.3mA 150mA	420x200x130	408x166	13.8 Kg.	---	**FS – 3**
SV150iP5A-2	15kW									
SV185iP5A-2	18kW	**FEP-T150**	150A	480VAC	1.3mA 150mA	332x170x120	115x155	8 Kg.	---	**FS – 3**
SV220iP5A-2	22kW									
SV300iP5A-2	30kW	**FEP-T180**	180A	480VAC	1.3mA 150mA	332x170x120	115x155	8.4 Kg.	---	**FS – 3**
SV008iP5A-4	0.75kW	**FE-T006-3**	6A	480VAC	0.5mA 27mA	250x110x60	238x76	1.6 Kg.	---	**FS – 2**
SV015iP5A-4	1.5kW									

iP5A series / Standard Filters

INVERTER	POWER	CODE	CURRENT	VOLTAGE	LEAKAGE CURRENT NOM. MAX.	DIMENSIONS L W H	MOUNTING Y X	WEIGHT	MOUNT	OUTPUT CHOKES
THREE PHASE										
SV022iP5A-4	2.2kW	**FE-T012-3**	12A	480VAC	0.5mA 27mA	250x110x60	238x76	1.6 Kg.	---	**FS – 2**
SV037iP5A-4	3.7kW									
SV055iP5A-4	5.5kW	**FE-T030-3**	30A	480VAC	0.5mA 27mA	270x140x60	258x106	2.4 Kg.	---	**FS – 2**
SV075iP5A-4	7.5kW									
SV110iP5A-4	11kW	**FE-T050-3**	50A	480VAC	0.5mA 27mA	270x140x90	258x106	3.2 Kg.	---	**FS – 2**
SV150iP5A-4	15kW									
SV185iP5A-4	18kW	**FE-T070-3**	70A	480VAC	0.5mA 27mA	350x180x90	338x146	7.5 Kg.	---	**FS – 3**
SV220iP5A-4	22kW									
SV300iP5A-4	30kW	**FE-T100-3**	100A	480VAC	1.3mA 150mA	420x200x130	408x166	13.8 Kg.	---	**FS – 3**
SV370iP5A-4	37kW									
SV450iP5A-4	45kW	**FEP-T150**	150A	480VAC	1.3mA 150mA	332x170x120	115x155	8 Kg.	---	**FS – 3**
SV550iP5A-4	55kW									
SV750iP5A-4	75kW	**FEP-T180**	180A	480VAC	1.3mA 150mA	332x170x120	115x155	8.4 Kg.	---	**FS – 3**
SV900iP5A-4	90kW	**FEP-T250**	250A	480VAC	1.3mA 150mA	392x190x116	240x165	9.1 Kg.	---	**FS – 4**
SV1100iP5A-4	110kW	**FEP-T400**	400A	480VAC	1.3mA 150mA	392x260x116	240x235	10.3 Kg.	---	**FS – 4**
SV1320iP5A-4	132kW									
SV1600iP5A-4	160kW	**FEP-T600**	600A	480VAC	1.3mA 150mA	392x260x116	240x235	11 Kg.	---	**FS – 4**
SV2200iP5A-4	220kW									
SV2800iP5A-4	280kW	**FEP-T1000**	1000A	480VAC	1.3mA 150mA	460x280x166	290x255	18 Kg.	---	**FS – 4**
SV3150iP5A-4	315kW									
SV3750iP5A-4	375kW									
SV4500iP5A-4	450kW	**FEP-T1600**	1600A	480VAC	1.3mA 150mA	592x300x166	340x275	27 Kg.	---	**FS – 4**

SV008~037 iP5A-2/4	**EN 55011**	**CLASS B**	**GROUP 1**	**IEC/EN 61800-3**	**C1**
SV055~075 iP5A-2/4	**EN 55011**	**CLASS A/B**	**GROUP 1**	**IEC/EN 61800-3**	**C1/C2**
SV110~220 iP5A-2/4	**EN 55011**	**CLASS A**	**GROUP 1/2**	**IEC/EN 61800-3**	**C2/C3**
SV300~4500 iP5A-24	**EN 55011**	**CLASS A**	**GROUP 2**	**IEC/EN 61800-3**	**C3**

FS SERIES (output chokes)

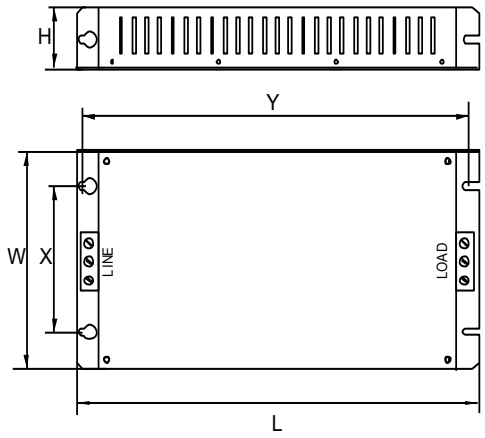


CODE	D	W	H	X	Ø
FS – 1	21	85	46	70	5
FS – 2	28.5	105	62	90	5
FS - 3	48	150	110	125 x 30	5
FS - 4	58	200	170	180 x 45	5

DIMENSIONS

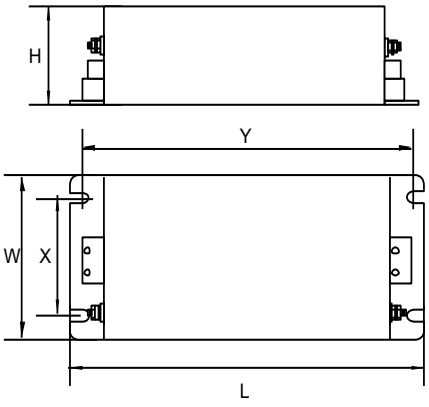
FF SERIES (Footprint)

FFP5-T006-3 ~ FFP5-T070-3

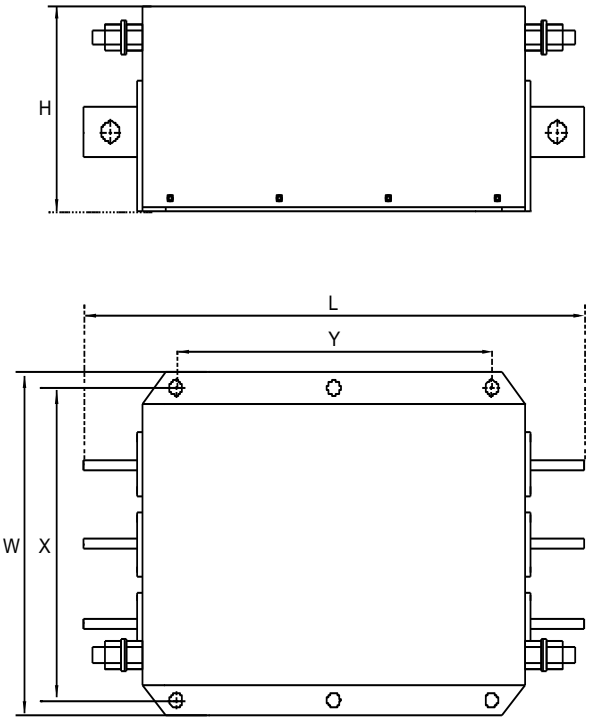


FE SERIES (Standard)

FE-T006-2 ~ FE-T100-2



FEP-T150 ~ FEP-T1600



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Warrant

Maker	LS ELECTRIC Co., Ltd.		**Installation (Start-up) Date**	
Model No.	**SV-iP5A**		**Warranty Period**	
Customer Information	Name			
	Address			
	Tel.			
Sales Office (Distributor)	Name			
	Address			
	Tel.			

Warranty period is 12 months after installation or 18 months after manufactured when the installation date is unidentified. However, the guarantee term may vary on the sales term.

■ **IN-WARRANTY service information**

If the defective part has been identified under normal and proper use within the guarantee term, contact your local authorized LS distributor or LS Service center.

■ **OUT-OF WARRANTY service information**

The guarantee will not apply in the following cases, even if the guarantee term has not expired.

- Damage was caused by misuse, negligence or accident.
- Damage was caused by abnormal voltage and peripheral devices' malfunction (failure).
- Damage was caused by improper repair or altering by other than LS authorized distributor or service center.
- Damage was caused by an earthquake, fire, flooding, lightning, or other natural calamities.
- When LS nameplate is not attached.
- When the warranty period has expired.

Revision History

No.	Date	Edition	Changes
1	October, 2004	First Release	-
2	June, 2005	2 nd Edition	CI changed
3	June, 2006	3 rd Edition	Revised for new kW(HP) ratings
4	November, 2006	4 th Edition	S/W Version up (V0.4)
5	December, 2006	5th Edition	Contents added and revised
6	June, 2008	6th Edition	Contents added and revised
7	April, 2009	7th Edition	New Controller contents added
8	Dec, 2010	8th Edition	EMI / RFI power line filters changed
9	Dec 2011	9th Edition	UL Making Changed
10	Dec 2014	10th Edition	SW Version Up 2.3 & error revised .
11	Aug 2015	11th Edition	Single-Phase input application and UL/CE/EAC Mark added.
12	JAN 2016	12th Edition	CE Doc revised
13	JUL 2016	13th Edition	SW Version Up 2.4 & error revised
14	JAN,2018	14th Edition	Error revised
15	MAY,2018	15th Edition	HP revised
16	JUNE,2020	16th Edition	Change Company Name LSIS -> LS ELECTRIC

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