

SOHO POWER REGENERATIVE UNIT

Energy Saving & Conversion

Warning

1. Please read the manual before using the SOHO SLU-P unit for the safety
2. Experts at the electric construction and wiring work must handle for the safety

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Dealer

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POWER REGENERATIVE UNIT
Energy Saving & Conversion

SOHO SLU-P Manual

◆ 7.5 ~ 800 kW / 400V



Safety

- ◆ For safe use, please read carefully " safety " and " General " before use.
- ◆ Put this manual in the place out of user ' s range of vision

 **SEOHO**
ELECTRIC

SAFETY

- Please read carefully Chapter 1 SAFETY, to prevent from accidents or jeopardizes.
- The meaning of signals is below.



= Caution to electric shock



= Caution to jeopardize


- Put this manual in user's range of vision.

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1. SAFETY

	ONLY A COMPETENT ELECTRICIAN SHOULD CARRY OUT THE ELECTRICAL INSTALLATION.
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1.1 Warnings

	1	Internal Components and circuit boards (excepting the isolated I/O terminals) apply an electric current when SOHO SLU-P is connected to the main voltage. This voltage is extremely dangerous and may cause death or severe injury if you come in contact with it.
	2	When SOHO SLU-P is connected to the main power, the current is flowing in DC-Link(P, N) and U, V, W terminals even if the SOHO SLU-P is not operating.
	3	SOHO SLU-P has a large capacitive leakage current.
	4	The control I/O terminals are isolated from the I/O voltage but the relay outputs and other I/Os may have dangerous voltage connected even if the power is disconnected from SOHO SLU-P
	5	User should install Fuse which can be blown fast between U, V, W terminals and main power source of SOHO SLU-P
	6	Spare part can be delivered only by Seoho Electric Co., Ltd.

1.2 Safety Instructions

	1	Do NOT make any connections when SOHO SLU-P is connected to main voltage.
	2	Do NOT make any measurements when SOHO SLU-P is connected to main voltage.
	3	After disconnecting main power, wait until the cooling fan stops and the indicator on display goes out. Wait a further 5 minutes before doing any work on SOHO SLU-P connections. Do NOT open even the cover within this time.
	4	Do NOT make any voltage withstand tests on any parts of SOHO SLU-P
	5	Make sure that the cover of SOHO SLU-P is closed before connecting main voltage.

Ground

The ground terminal of **SOHO SLU-P**



has to contact with ground wire.

Ground of SOHO SLU-P prevent high voltage accidents that are caused by switching

Warning Sign

Please be more cautious for the following warning signs for user's safety




= Dangerous Voltage



= General Warning

1.3 Wiring

	1	Do NOT supply overvoltage which is over permissible voltage level for U, V, W terminals of SOHO SLU-P .
	2	Connect U, V, W to terminals SOHO SLU-P in exact order.
	3	Only a competent electrician should perform wiring and inspection

This manual explains specifications, installation, operation, features and maintenance of SOHO SLU-P. This is a manual for users who have prior experience with SLU-P.

Please read this manual certainly before operating SOHO SLU-P. Retain it for future reference.

2. Receiving Products

2.1 Checking

This **SOHO SLU-P** has been subjected to demanding factory tests before shipment. After unpacking, check the appearance of shipped product and that there is any missing parts. (Refer to the SLU-P Label in Figure 2.1-1 and SLU-P Type in Figure 2.2-1.)

In the event of damage, please contact the insurance company involved or the supplier. If the delivery is not in compliance with the order, please contact the supplier immediately.


TYPE	SOHO160SLU-P4N	SLU-P Model
Serial No.	1701001P	Serial Number
Power Rating	160[kW], 25[%ED]	SLU-P Rated Power
INPUT	DC513~650V, DC304A(AVG)	SLU-P Rated Input
OUTPUT	3Φ, AC380~480Vrms, 50/60Hz, AC 286Arms 100s	SLU-P Rated Output
 Seoho Electric		SEOHO Electric Logo

Figure 2.1-1 SLU-P Label (This is attached the side of SLU-P.)

2.2 SOHO SLU-P Type

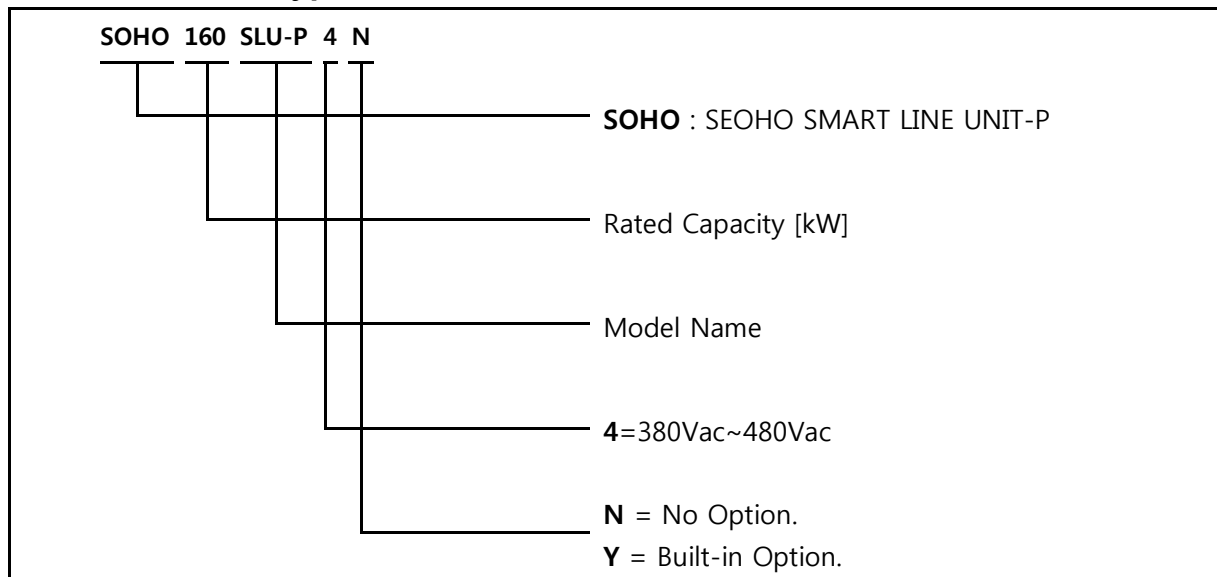


Figure 2.2-1 SLU-P Type

2.3 Storing and Warranty

Check the ambient conditions in the storage room before the first commissioning (temperature : -25°C~+55°C, relative humidity : 5~95%, condensation is not allowed).

Seoho Electric Co., Ltd. will NOT be responsible for the damage caused by ambient conditions.

The period of manufacturer's warranty is 12 months from the date of delivery.

The local distributor may have a different warranty period, which is specified in their terms and conditions and warranty terms.

If any queries concerning the warranty arise, please contact your distributor.

2.4 Power rating

P=Rated power, In_dc =Rated output DC current, In =Rated input AC current,

Pmax = Maximum power, Imax_dc = Maximum output DC current, Imax = Maximum input AC current

Main 380V - 480V, 50/60Hz SLU-P Series							
SOHO SLU-P Type	Rated Power & Rated In/Out current				Size	Dimension W×H×D (mm)	Weight (kg)
	P[kW]	Id[Aavg]	In[Arms]	Ic[Arms]			
SOHO 7.5 SLU-P 4N	7.5	15	14	11.2	KE2SP	Require KE2SP to headquarter	-
SOHO 11 SLU-P 4N	11	22	20	16			
SOHO 15 SLU-P 4N	15	29	27	21.6			
SOHO 18.5 SLU-P 4N	18.5	37	34	27.2	KE3SP	Require KE3SP to headquarter	-
SOHO 22 SLU-P 4N	22	43	40	32			
SOHO 30 SLU-P 4N	30	58	54	43.2	KE4SP	Require KE4SP to headquarter	-
SOHO 37 SLU-P 4N	37	72	67	53.6	K4SP	285×490×260	25
SOHO 45 SLU-P 4N	45	87	81	64.8			
SOHO 55 SLU-P 4N	55	106	99	79.2			
SOHO 75 SLU-P 4N	75	144	135	108	K6SP	252×640×330	32
SOHO 90 SLU-P 4N	90	172	161	128.8			
SOHO 110 SLU-P 4N	110	210	197	157.6			
SOHO 132 SLU-P 4N	132	251	236	188.8			
SOHO 160 SLU-P 4N	160	304	286	228.8	K7SP	262×780×370	41
SOHO 200 SLU-P 4N	200	381	358	286.4			
SOHO 250 SLU-P 4N	250	475	447	357.6	K8SP	462×750×380	-
SOHO 315 SLU-P 4N	315	600	564	451.2			
SOHO 355 SLU-P 4N	355	675	635	507	K9SP	Require K9SP to headquarter.	-
SOHO 400 SLU-P 4N	400	760	715	570	K10SP	554×1052×403.5	-
SOHO 500 SLU-P 4N	500	950	894	713			
SOHO 710 SLU-P 4N	710	1350	1270	1013	K11SP	Require K11SP to headquarter	-
SOHO 800 SLU-P 4N	800	1520	1430	1141			

Table 2.4-1 400V series SLU-P Power ratings and dimensions

2.5 External Dimension

SOHO SLU-P should be mounted in a vertical position on the wall or on the back plane of a cubicle. Follow the requirement for cooling. See chapter 3.2 for dimensions.

To ensure a safe installation, make sure that the mounting surface is relatively flat.

Fixing is done with four or more screws or bolts depending on the size of the unit. See Figure 2.5-1 ~ 2.5-5.

2.5.1 K4SP

Class	Model
400V	37 SLU-P 4N
	45 SLU-P 4N
	55 SLU-P 4N

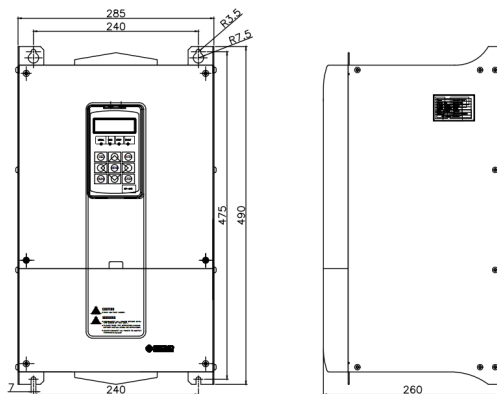


Figure 2.5-1 K4SP Mounting dimension

2.5.2 K6SP

Class	Model
400V	75 SLU-P 4N
	90 SLU-P 4N
	110 SLU-P 4N
	132 SLU-P 4N

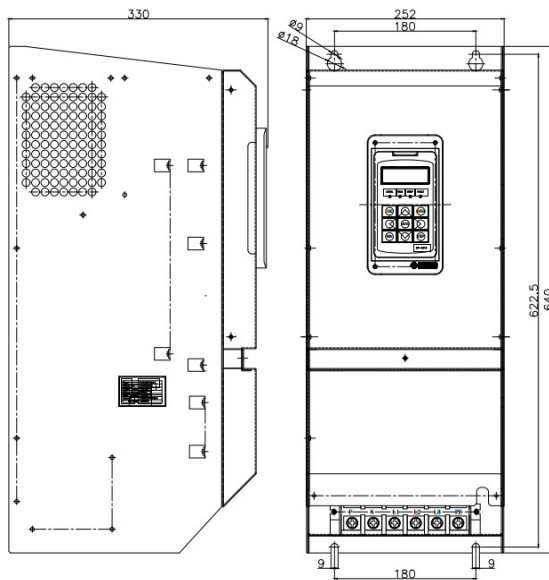


Figure 2.5-2 K6SP Mounting dimension

2.5.3 K7SP

Class	Model
400V	160 SLU-P 4N
	200 SLU-P 4N

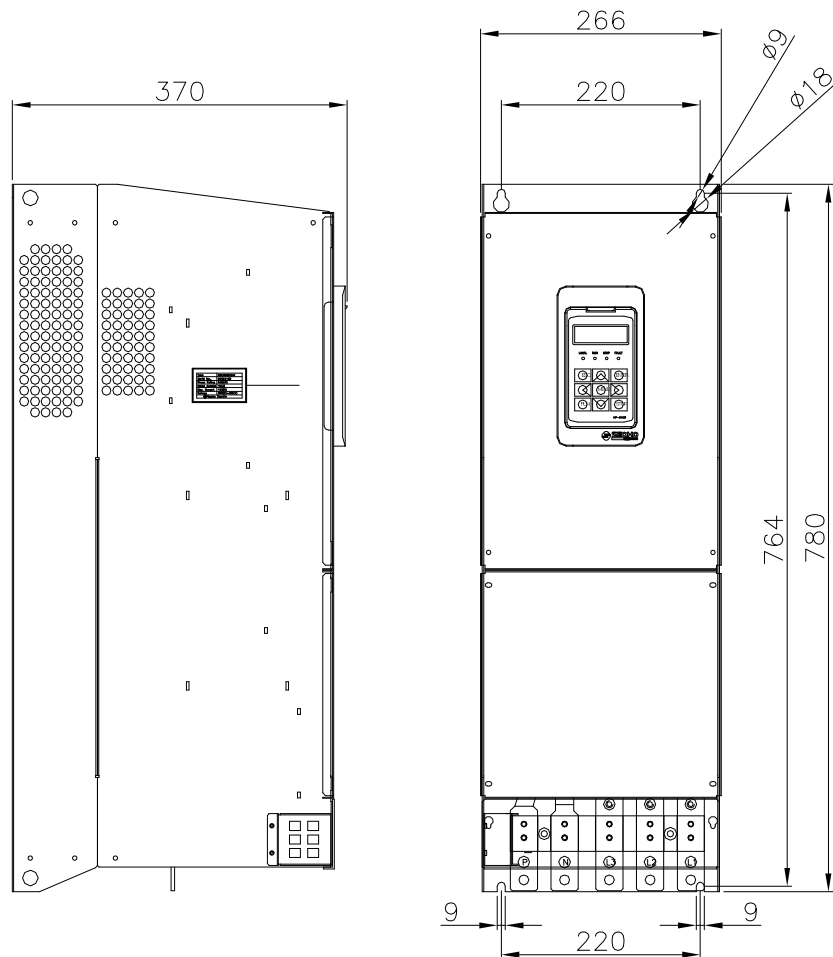


Figure 2.5-3 K7SP Mounting dimension

2.5.4 K8SP

Class	Model
400V	250 SLU-P 4N
	315 SLU-P 4N

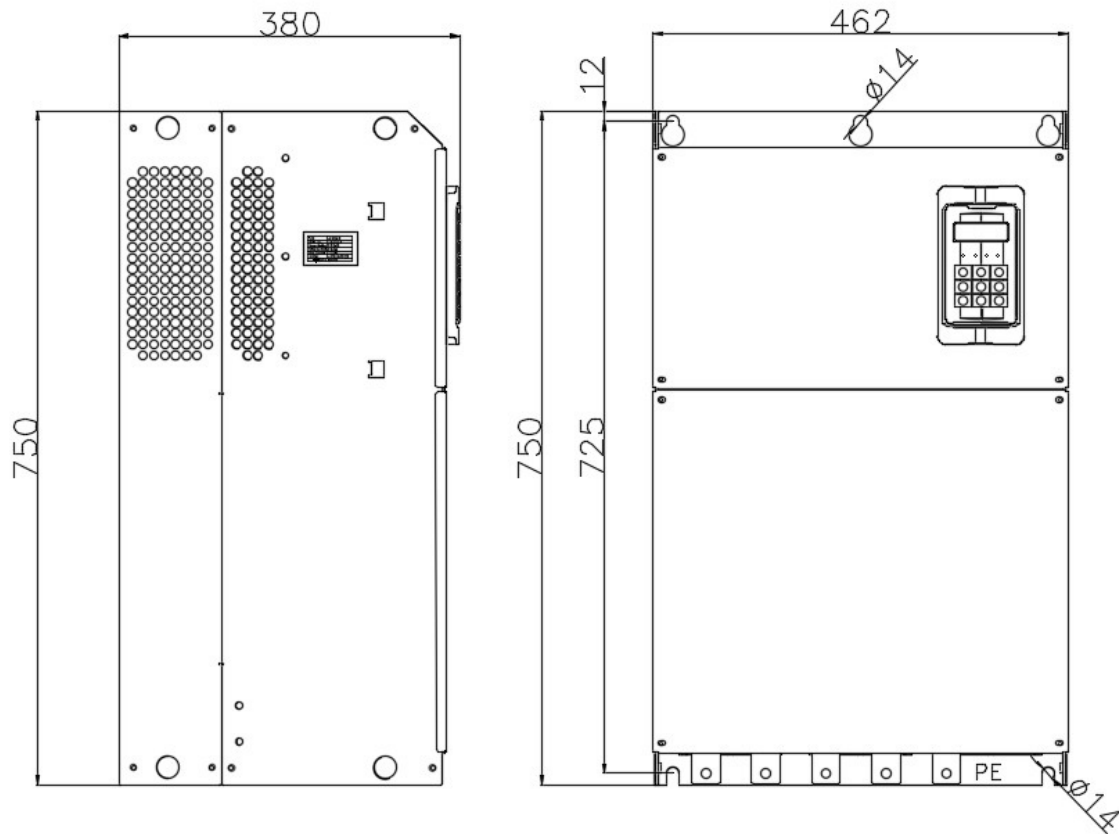


Figure 2.5-4 K8SP Mounting dimension

2.5.5 K10SP

Class	Model
400V	400 SLU-P 4N
	500 SLU-P 4N

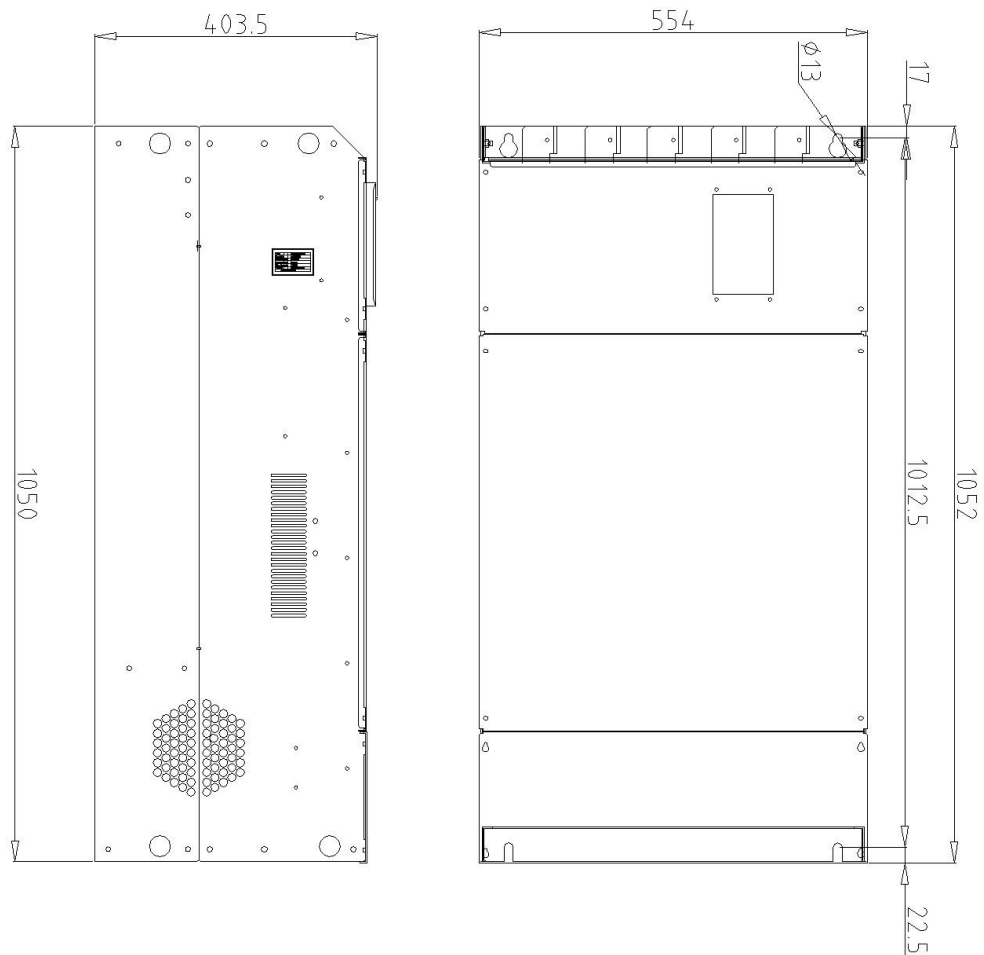


Figure 2.5-5 K10SP Mounting dimension

2.6 Specification

Main Connection	Output (AC Source)	(U, V, W) 3phase 380V _{ac} ~480V _{ac} , 50/60Hz (±3Hz)
		allowable voltage fluctuation ±10%
		allowable imbalance rate between phase ≤2%
	Input (DC Source)	AC line voltageX1.414 (depends on load condition)
Rated Output	Braking Torque	150% 30s, 100% 60s, 50% Continuous Rating
	%ED Rated	25%ED
Terminal Characteristics	Control Method	120° Current Conduction
	Input Signal	5.5kW~132kW: Run/ Enable/ Ex. Fault/ Fault Reset 160kW~355kW: Fault Reset
	Healthy and Warning Relay output	AC 250V, 1A or DC 30V, 1A / N.O/N.C Output
Protection Function	Instantaneous Over current	Stops at approx, 200% of the current on power side (Protected by Software)
	Short circuit protection	Short circuit status is detected by hardware
	Overvoltage (DC)	Stops at approx, 800 VDC
	Over Load	Stops after 100% for 100sec, 150% for 30sec
	Current Limitation	Stops at 150% of rated current operating condition
	Over Heat	Protected by thermistor at overheat condition(85°C)
	AC Line Open Phase	If the AC Power line is connected to protect the disabled - SLU-P Regenerative operation is maintained when only one phase of U, V, W is lost during regenerative operation. In case of phase failure of two or more of U, V, W, defect occurs immediately.
Environmental Conditions	Location	Indoor (Protected from corrosive gases and dust)
	Ambient Temperature	-10°C ~ +40°C (operating temperature), -20°C ~ +65°C (storage temperature)
	Humidity	< 90%, (non-condensing)
	Vibration	Up to 9.8 m/s ² (1G), less than 15Hz, up to 1.96 m/s ² (0.2G) at 15 to 60Hz


***Caution:**

1. SOHO SLU-P cannot be used with single-phase power supply. Use three-phase power supply.
2. For the SOHO SLU-P capacity, select the same capacity as the motor used.

3. Installation

3.1 Installation Condition

Please install the **SOHO SLU-P** on the places satisfying the following conditions.

	1	Avoid rain, hot temperature and high humidity place.
	2	Avoid the direct sunlight.
	3	The place should be protected from dirt, metal dust, and welding flame.
	4	Install so as to be bearable to the vibration.
	5	Defective main power may cause the SLU-P damages. - Using the same power source with welding machine. - Using a generator as the power source. - Sudden changes in the main voltage.
	6	Keep away from flammables.
	7	Install on the nonflammable materials as street.

3.2 Cooling

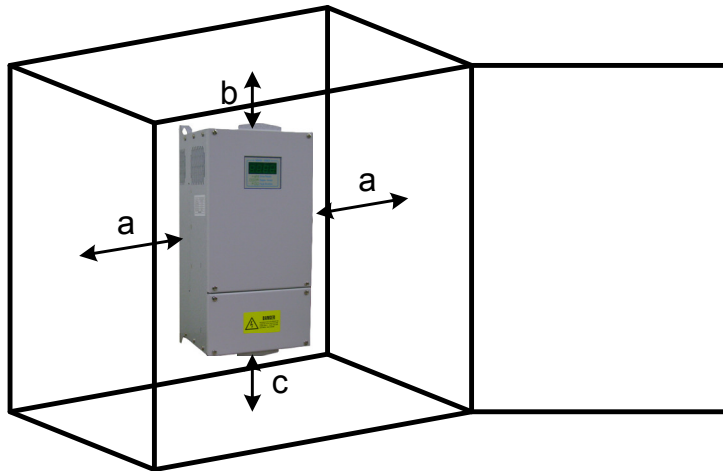


Figure 3.2-1 Installation space

The specified space around the **SOHO SLU-P** ensures proper cooling air circulation. See table 3.2-1 for dimensions. If multiple units are to be installed above each other, the distance between the units must be $b+c$ and air from the outlet of the lower unit must be directed away from the inlet of the upper unit.


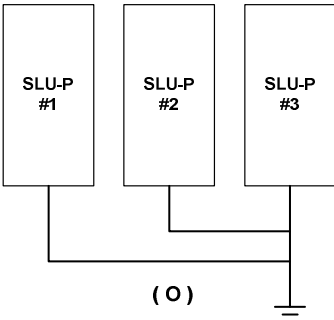
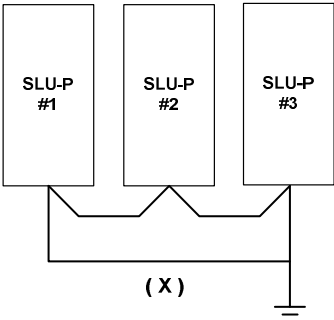
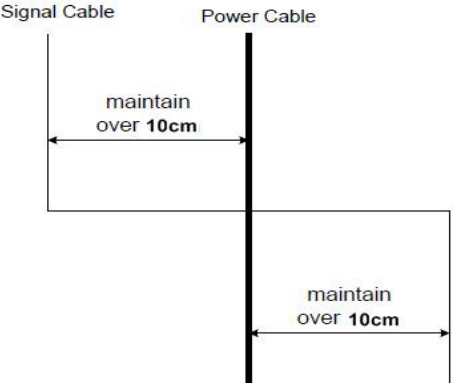
Size	Distance (mm)			
	a	a2	b	c
KE2SP / KE3SP/ KE4SP / K4SP	30	10	160	80
K6SP/K7SP	75	75	300	100
K8SP / K9SP / K10SP	250	75	300	-

Table 3.2-1 Installation space dimension

a2 = distance from the SLU-P to other SLU-P

4. Wiring

4.1 Cautions in wiring

	<div>1</div> <div>2</div> <div>3</div> <div>4</div> <div>5</div>	<p>Connect the ground cable surely. If multiple units are to be installed, The ground cable should not be installed to form of closed loop.</p> <div style="display: flex; justify-content: space-around; align-items: flex-end;"> <div style="text-align: center;">  <p>(O)</p> <p><i>(a) Good</i></p> </div> <div style="text-align: center;">  <p>(X)</p> <p><i>(b) Not good</i></p> </div> </div>
		Only a competent electrician should carry out the wiring.
		Make sure that the input main voltage is switched off.
		Fasten the terminal screws to the relevant torque value and make sure that there are not loose terminals.
		<p>The signal cables must be isolated from the power cables. For an unavoidable case, install perpendicular to each other as shown below.</p> <div style="text-align: center;">  </div>

4.2 Wiring Diagram

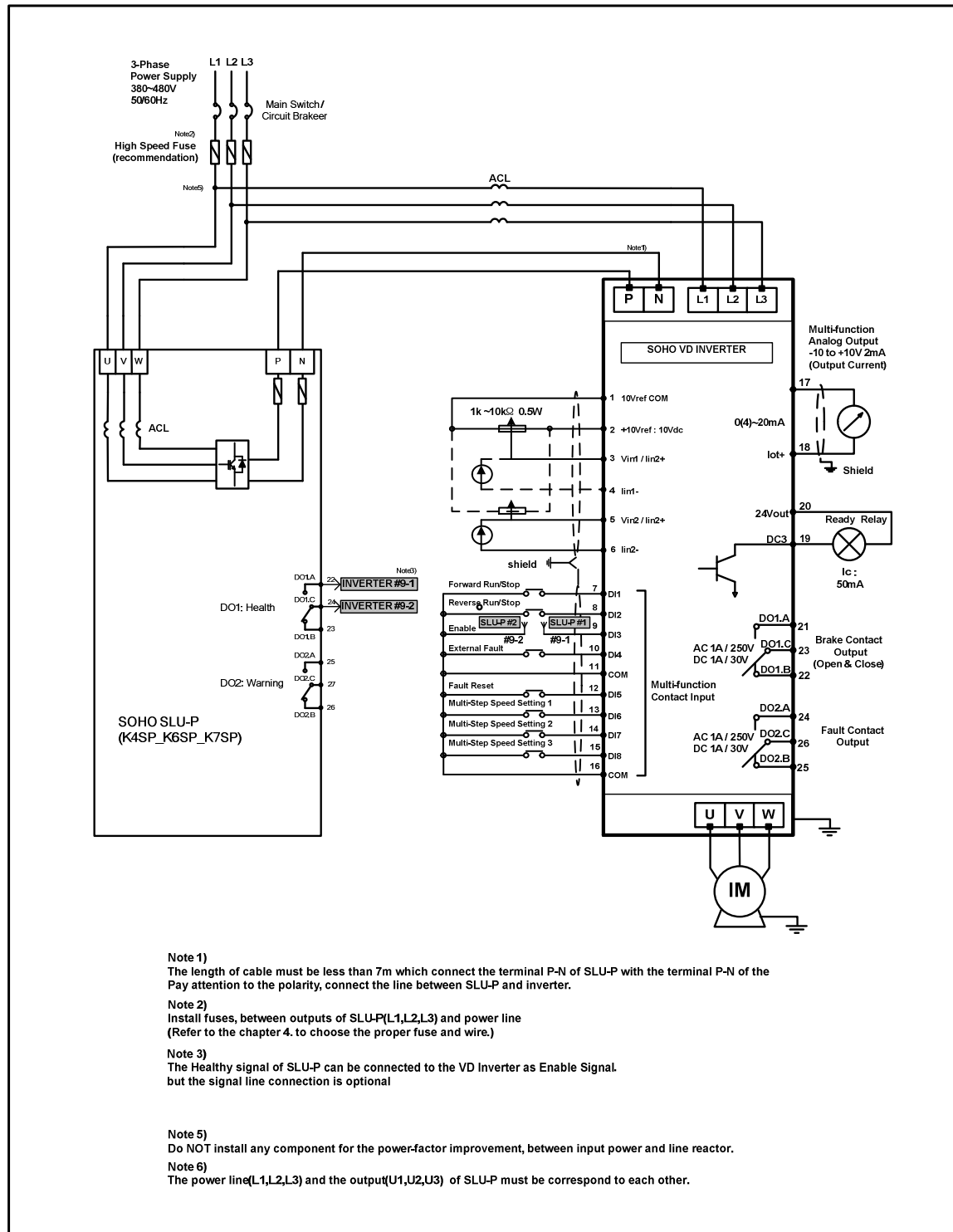


Figure 4.2-1 SOHO SLU-P(K4_6_7SP) typical wiring diagram

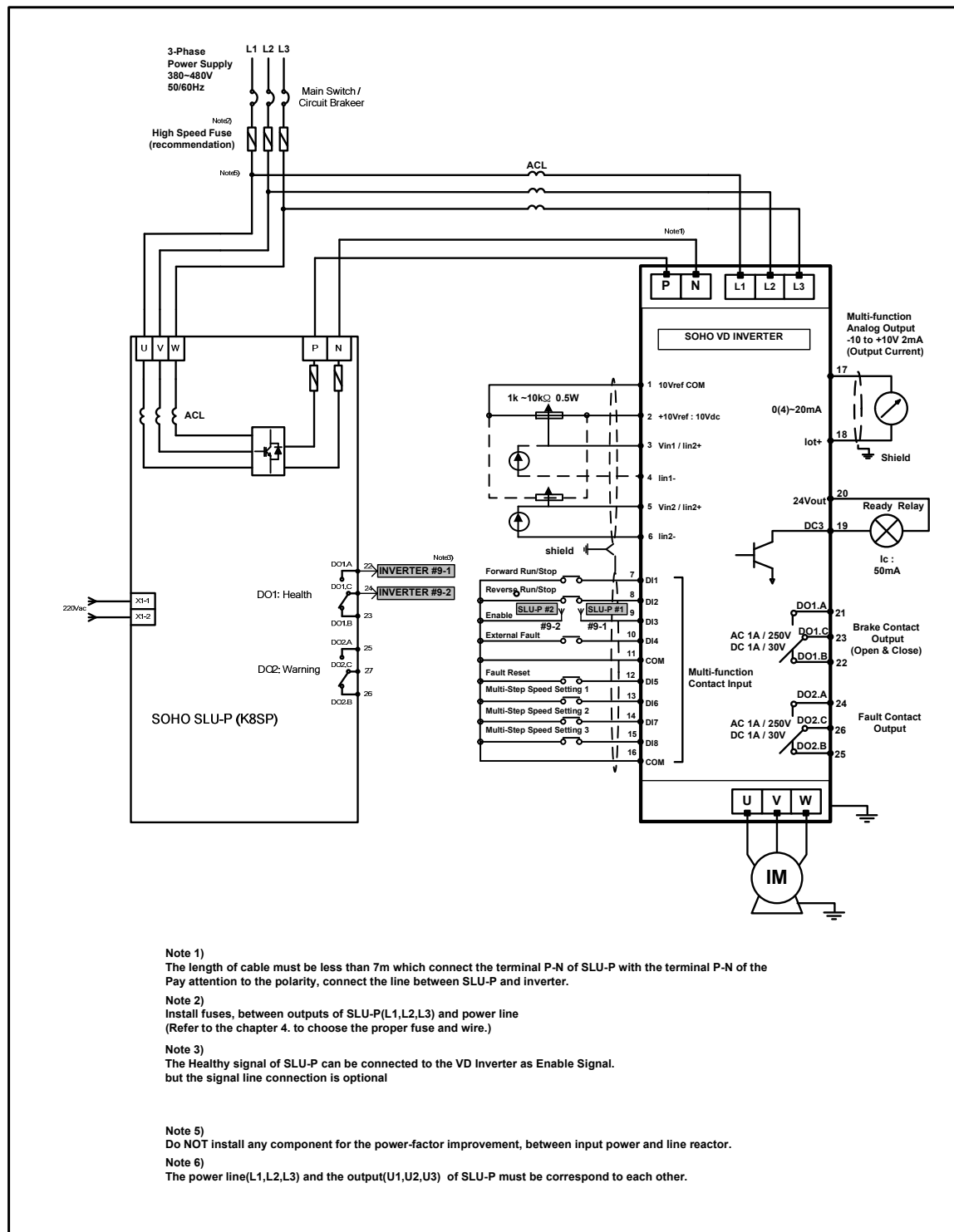


Figure 4.2-2 SOHO SLU-P(K8SP) typical wiring diagram

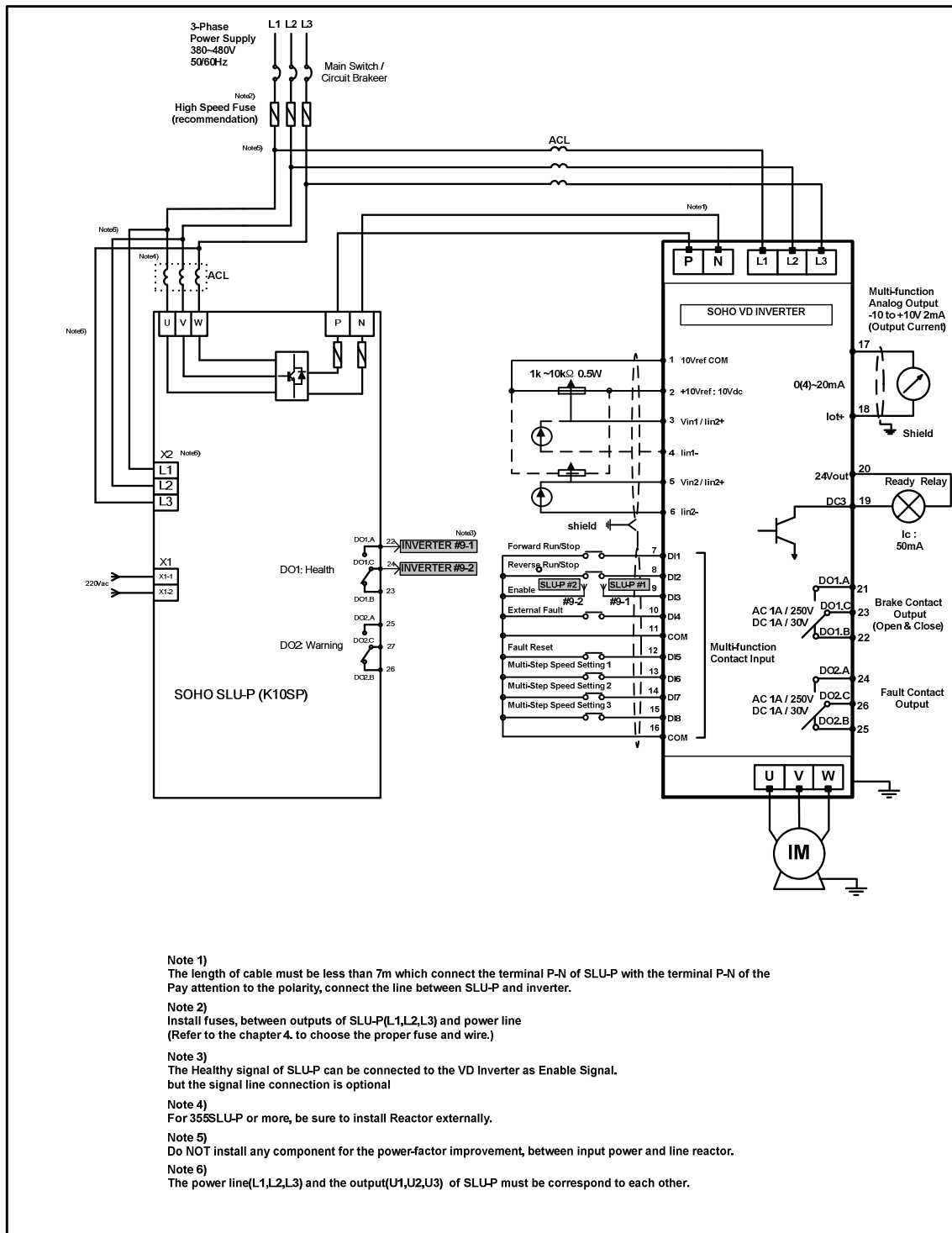


Figure 4.2-3 SOHO SLU-P(K10SP) typical wiring diagram

4.3 Control terminal specific

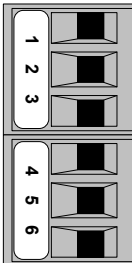
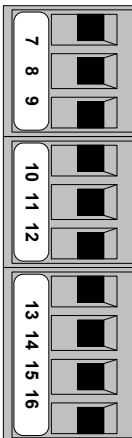
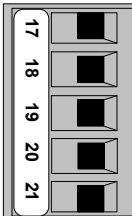
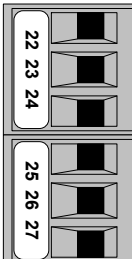
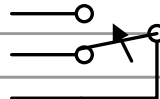
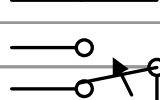
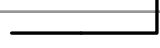
No	Terminal	Signal	Wiring	Description		
	1	Vref. COM	Voltage Ref. (Commom Terminal)	0	Delta-Y Trans. Output GND (At the point of shipment, the wiring has been completed)	
	2					
	3	AIN 1. P	Vref(+) Input	O	Delta-Y Trans. Output U (At the point of shipment, the wiring has been completed)	
	4					
	5	AIN 2. P	Vref(+) Input	O	Delta-Y Trans. Output V (At the point of shipment, the wiring has been completed)	
	6					
	7	DI. 01	Contact Input 1		Open: SLU-P mode Close: Stop mode	
	8					
	9	DI. 03	Contact Input 3		Open: Auto Reset Close: Manual Reset	
	10	DI. 04	Contact Input 4	O	Main MC Feedback(active: GND)	
	11	DI. COM	Common Terminal	O	GND	
	12	DI. 05	Contact Input 5		External Fault (active: GND)	
	13					
	14					
	15					
	16	DI. COM	Common Terminal		GND	
	17					
	18					
	19					
	20	DO3. OC	Contact Output 3		GND for DO3.+24V	
	21	DO3. +24V			+24Vdc	
	22	DO1. A	Contact Output 1 (a-contact)			Health
	23	DO1. B	Contact Output 1 (b-contact)			Health
	24	DO1. C	Contact Output 1 Common			Health
	25	DO2. A	Contact Output 2 (a-contact)			Warning
	26	DO2. B	Contact Output 2 (b-contact)			Warning
	27	DO2. C	Contact Output 2 Common			Warning

Figure 4.3-1 SOHO SLU-P Control terminal specific

Refer to figure 4.2-1 for basic connection.

The control cables should be at least 0.5mm² shielded cables. The maximum wire size fitting in the terminals is 2.5mm².

4.4 Terminal block and Screw Type (According to Mounting Dimension)



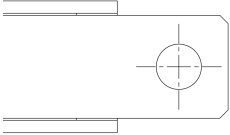
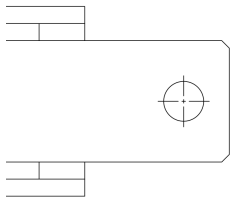
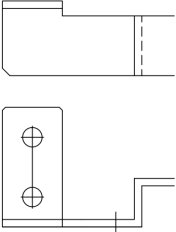
Frame	Input-Output Wiring				Ground Wiring		
	Terminal	Terminal width (internal)	Bolt size	Torque for tightened (N·m)	Bolt size	Place for the tightened	Torque for tightened (N·m)
K4SP		20mm	M8	5.5~6.6	M8	Terminal	5.5~6.6
K6SP		27mm	M8	5.5~6.6	M8	Terminal	5.5~6.6
K7SP	Bus-bar 	25mm	M10	18~23	M6	External	5.5~6.6
K8SP	Bus-bar 	32mm	M12	32~40	M8	External	9~11
K10SP	Bus-bar 	80mm	M12*2	32~40	M10	External	18~23

Figure 4.4-1 Terminal and bolt classified by external on 400V SLU-P

4.5 Power Line and Fuse's Connection

Use the power lines which can endure 600V, +75°C. Power lines (copper) and accordingly Fuse capacity must be determined by the size of copper wire and rated output current of SLU-P.

Please refer to Table 4.5-1 for the minimum size of power lines (copper) and following fuse capacity.

When three or more parallel wires are used, please pay attention to avoid overloading.

Capa city [kW]	I/O cable [mm ²]	Ground cable [mm ²]	FUSE [A]	
			P , N (800V _{dc})	R , S , T (500V _{ac})
7.5	6	6	20	
11	16	10	32	
15	16	10	40	
18.5	16	10	50	
22	16	10	63	
30	25	16	80	
37	25	16	100	
45	35	25	125	
55	50	50	160	
75	50	50	200	
90	70	50	250	

Capa city [kW]	I/O cable [mm ²]	Ground cable [mm ²]	FUSE [A]	
			P , N (800V _{dc})	R , S , T (500V _{ac})
110	70	70	315	
132	70	70	350	
160	120	95	450	
200	150	95	500	
250	95*(2)	150	630	
315	120*(2)	150	800	
355	150*(2)	150	1000	
400	185*(2)	150	1250	
500	240*(2)	150	800*(2)	
710	185*(3)	185	1000*(2)	
800	240*(3)	240	1250*(2)	

Table 4.5-1 Wire, according to capacity and Fuse recommendation

**C
A
U
T
I
O
N
S**

- 1) Use the copper wire which can endure 600V, 75°C
- 2) Use the fuse which can be blown fast
- 3) MCCB(Molded Case Circuit Breaker) can be used in AC side (Prohibit using the circuit breaker)

5. Operation

5.1 Structure of SLU-P's menu

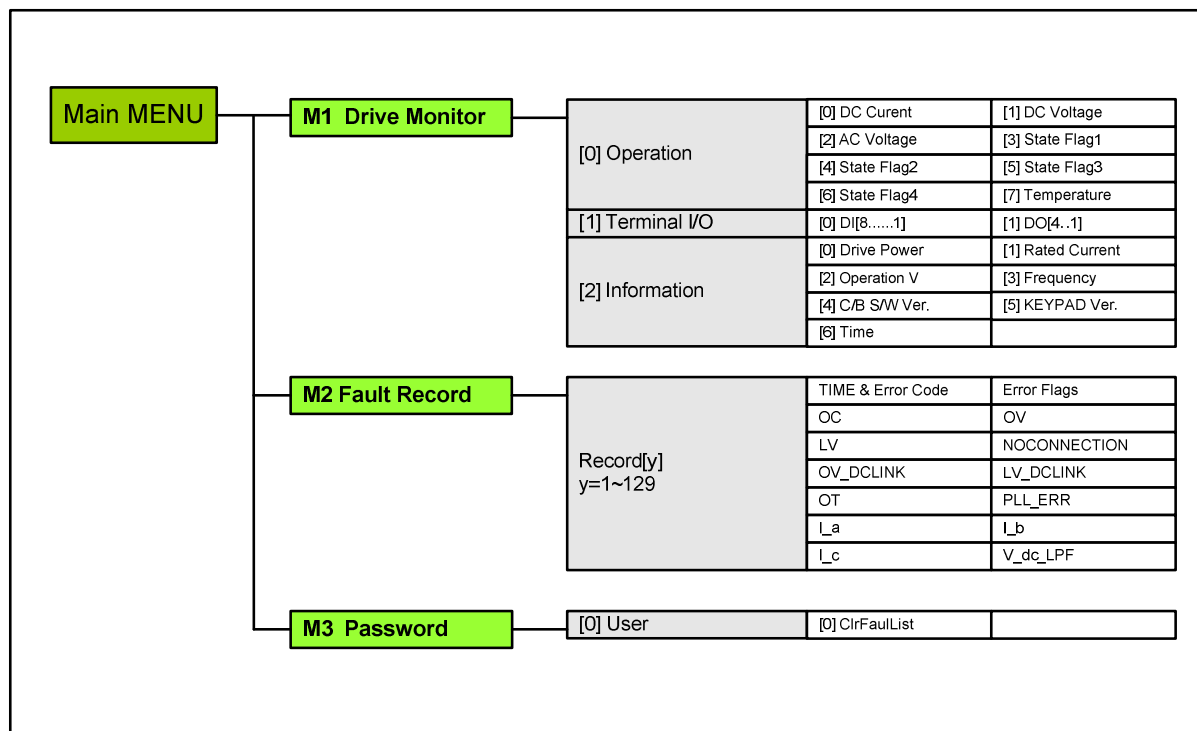


Figure 5.1-1 Structure of SLU-P main menu

5.2 Keypad Description

The keypad of SOHO SLU-P is composed with 9 keys, (ESC, ENTER, RUN, STOP, MENU, Left, Right, UP and Down scroll key). Users can set up parameters and monitor the operation status. See figure 5.2-1

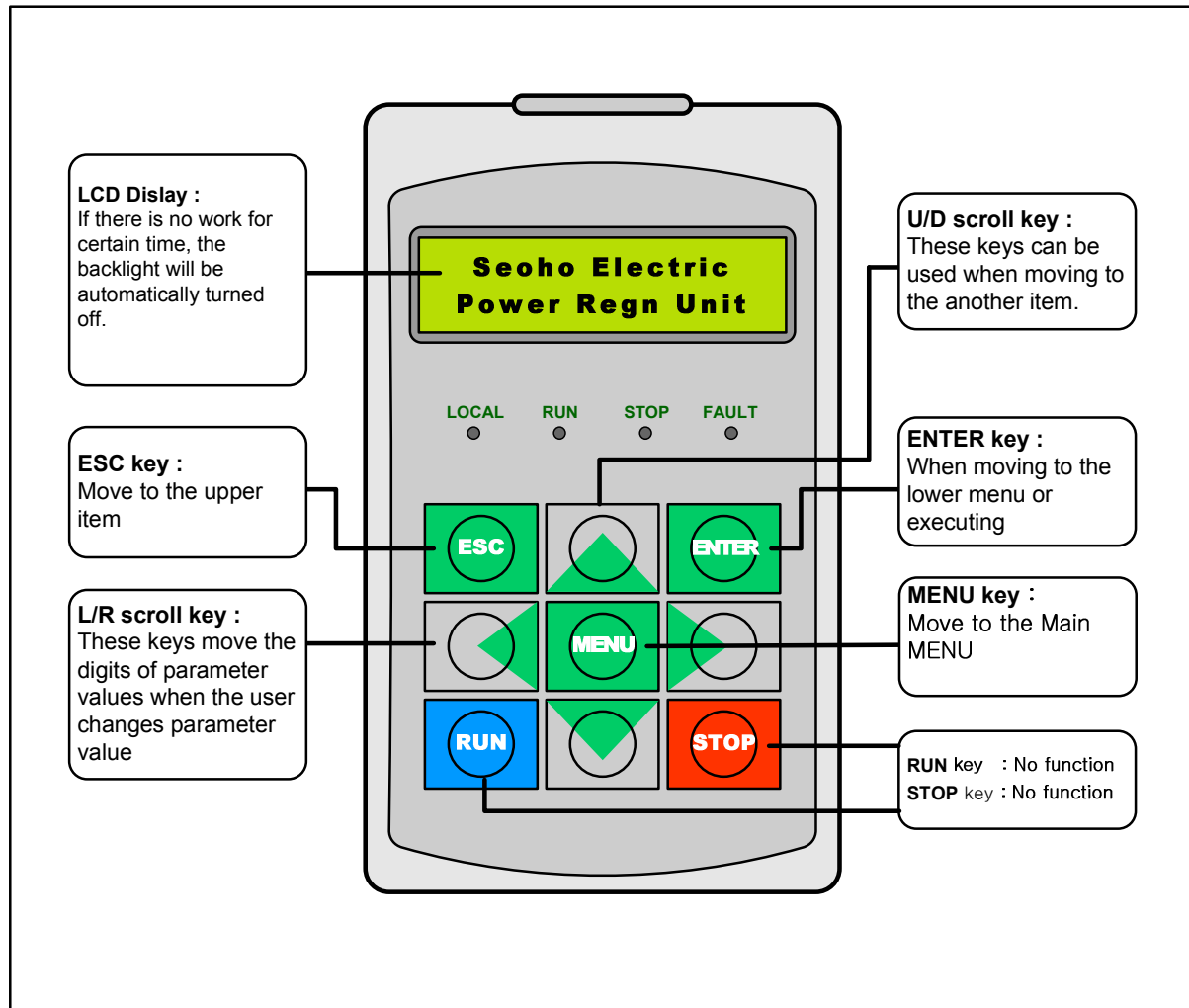




Figure 5.2-1 KEYPAD

5.3 Keypad Operation

The menu in the keypad is composed with Main Menu and Sub menus as Figure 5.3-1. Push the ENTER to move from Main Menu to Sub Menu. Press the ESC to return to the Main Menu. Use the   button to go to another item in the submenu. The detailed usage can be referred from chapter 5.3.1 ~ 5.3.3.

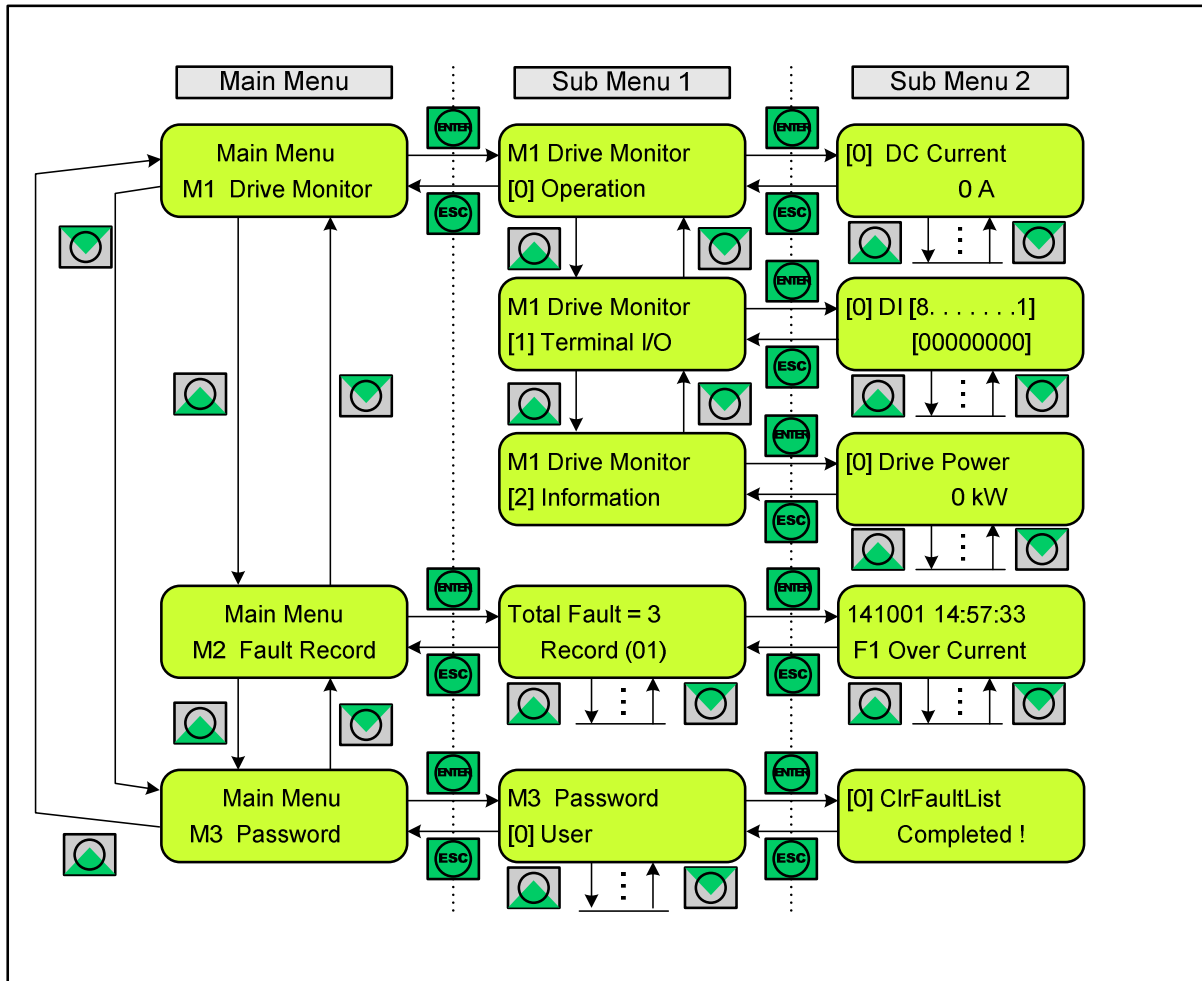


Figure 5.3-1 KEYPAD usage

5.3.1 Main Menu [1] Drive Monitor

In M1 Drive Monitor Page, it allows to monitor the operational status of SLU-P, I/O reference status and setting information. Refer to Figure 5.3-2 for the setting instruction and usage of KEYPAD.

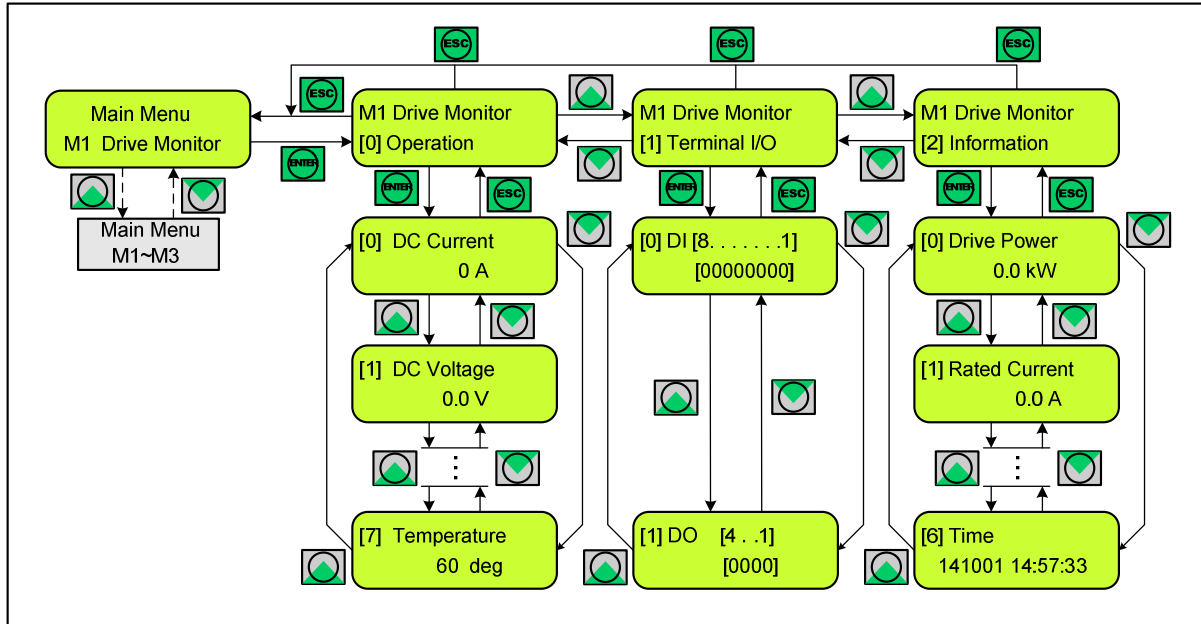


Figure 5.3-2 "M1 Drive Monitor" Menu Page

M1 Drive Monitor Menu Page			
Sub Menu	Item	Unit	Description
[0] Operation	[0] DC Current	[A]	DC Link current
	[1] DC Voltage	[V]	DC Link voltage
	[2] AC Voltage	[Vrms]	Input voltage
	[3] State Flag 1		Operation status 1
	[4] State Flag 2		Operation status 2
	[5] State Flag 3		Operation status 3
	[6] State Flag 4		Operation status 4
	[7] Temperature	[°C]	Heat sink temperature
[1] Terminal I/O	[0] DI[8.....1]		Status of digital input
	[1] DO[4..1]		Status of digital output
[2] Information	[0] Drive Power	[kW]	SLU-P Rated Power
	[1] Rated Current	[A]	SLU-P Rated Current
	[2] Operation V	[V]	SLU-P Rated input voltage range
	[3] Frequency	[Hz]	Grid Frequency
	[4] C/B S/W Ver.		Firmware Version of SLU-P

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M1 Drive Monitor Menu Page			
Sub Menu	Item	Unit	Description
[2] Information	[5] KEYPAD Ver.		Firmware version of Keypad
	[6] Time		Display date & time

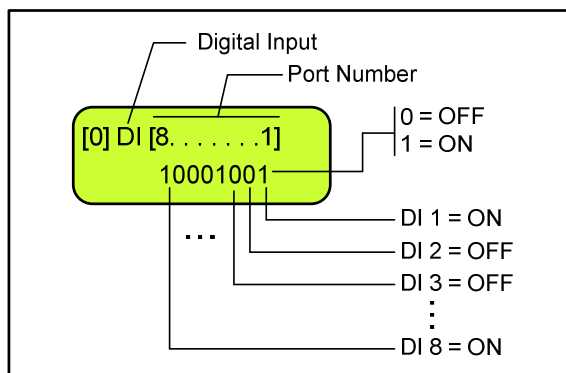


Figure 5.3.-3(a) Status of Digital input

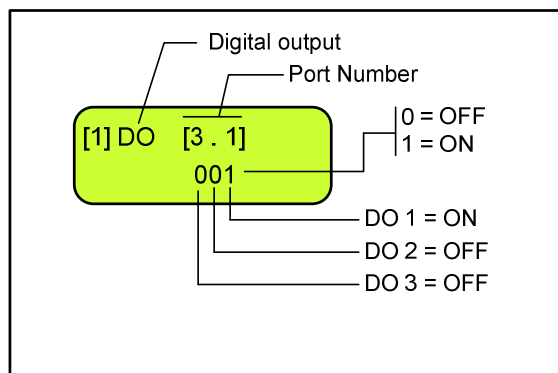


Figure 5.3-3(b) Status of Digital Output

5.3.2 Main Menu [2] Fault Record

In the 'M2 Fault Record', the user can monitor the number of faults and Fault code and operation's status when it occurs. Total 129 faults can be saved. If faults are occurred more than 129, the oldest fault record is erased.

Refer to Figure 5.3-4 for KEYPAD usage and the setting instruction in M2 Parameter Edit page.

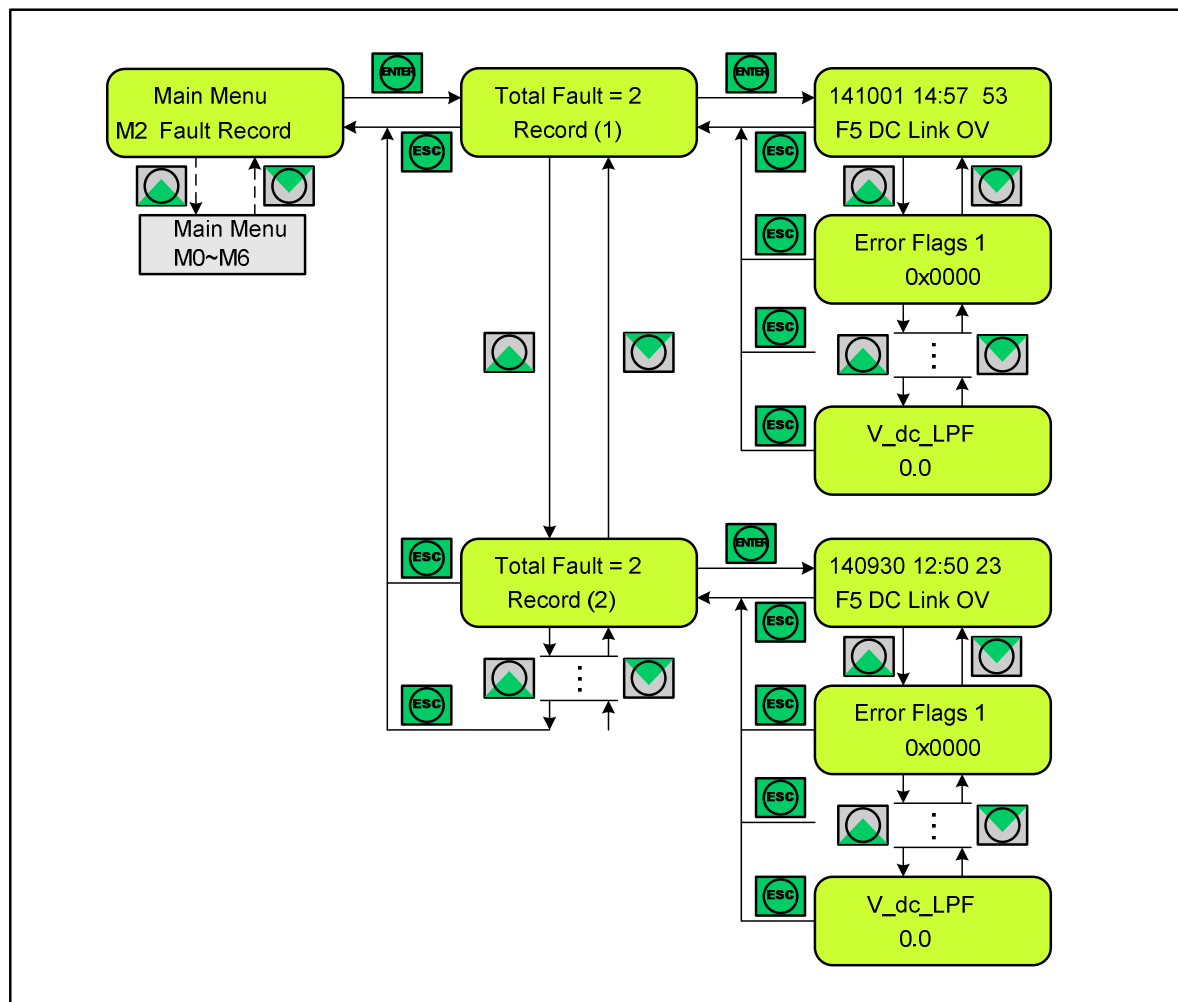


Figure 5.3-4 M2 Fault Record

M2 Fault Record	No	Unit	Description
Total = x (x : Total number of faults)	Error Flags		Error Flags when a fault occurs
	Time & Error Code		Time & Error Code information
	OC	[A]	Current value at the time of over-current occurs
	OV	[V]	Voltage value at the time of over-voltage occurs
	LV	[V]	Voltage value at the time of low-voltage occurs
Record (y) y : occurred order y=1~129	NOCONNECTION	[radian]	Grid Freq's Radian Value at the time of fault occurs

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M2	Fault Record	No	Unit	Description
1 = Fault that occurred in the first		OV_DCLINK	[V]	DC link voltage value at the time of over-voltage occurs
		LV_DCLINK	[V]	DC link voltage value at the time of low-voltage occurs
		OT	[°C]	Temp. value at the time of over-temperature occurs
		PLL_ERR	[radian]	PLL err value at the time of PLL-error occurs
		I_a	[A]	A phase current value at the time of fault occurs.
		I_b	[A]	B phase current value at the time of fault occurs.
		I_c	[A]	C phase current value at the time of fault occurs.
		V_dc_LPF	[V]	DC link voltage value at the time of fault occurs

5.3.3 Main Menu [3] Password

In the 'M3 Password', users can erase the Fault List and set the date & time.

Refer to Figure 5.3-5 for KEYPAD usage and the setting instruction.

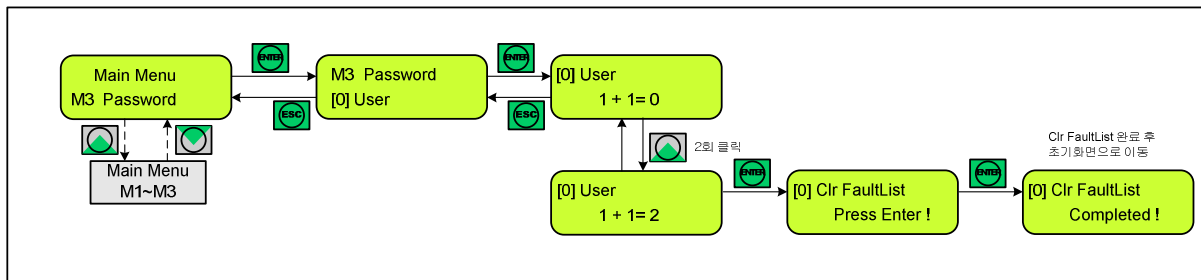


Figure 5.3-5 "M3 FPassword" Menu Page

No	M3 Password	Description
[0]	User	[0] ClrFaultList

5.4. Protection

5.4.1 Fault

Indication	Type	Specification
F1 Over Current	Over Current	Input overcurrent occur.
F2 Grid OV	Over Grid Voltage	Grid overvoltage occur.
F3 Grid LV	Grid Low Voltage	Grid low-voltage occur.
F4 Noconnection	Grid noconnection	Power line is not properly connected in order.
F5 DC Link OV	DC Link Over Voltage	DC Link overvoltage occur.
F6 DC Link LV	DC Link Low Voltage	DC Link low-voltage occur
F7 Zero_Seq_Curr	Zero Sequence Current	Zero Sequence Current occur
F8 Device Short	IGBT device short	There is a problem with a switching device
F9 Grid Loss	Grid Loss	Failed to find the proper sector.
F10 Over Temp	Over Temperature	Over-Temperature occur
F11 Over Load	Over Load	Over-Load occur
F12 Unbalance V	Unbalanced Grid Voltage	Negative sequence voltage occur
F13 Sensor Error	Current Sensor Error	Current sensor is something wrong.
F14 Ctrl Vol Err	Control Voltage Error	Input voltage of power board is wrong
F15 Charging Err	Pre Charging Logic Error	The pre-charge is not completely or properly
F16 PLL Error	PLL Logic Error	PLL angle error occur

6. Check for Maintenance

Check Part	Check Item	Check Point	Check Period		Check Method	Standards of judgment
			Daily	Regular		
The Whole	Ambient Environment	Ambient temperature, Humidity, Dust, Hazardous gases, Oil residue Etc.	○		seeing tasting thermometer hygrometer	freezing is not allowed (ambient temperature range : -10~40℃) condensation is not allowed at RH (ambient humidity : 20~90 %)
	The Whole Equipment	Strange vibration, Strange Sound	○		light sense auditory sense	No problem
	Voltage Source	Voltage fluctuations and Voltage drop	○		Inverter Input voltage measurement	Within $\pm 10\%$ of rated voltage
Main Circuit	Overall Point	Insulated resistance		○	Main Circuit Terminal to Ground Terminal (500V-Mega use)	No problem
		Screw extracting		○	Seeing	
		Sign of overheating		○	Seeing	
	Terminal Block	Damage		○	Seeing	No damage
	Smoothing Condenser	Leaking, Strain	○		Seeing, Hearing	
	Relay	Trembling phenomenon		○	Hearing	
	Resistor	Crack, Discoloration		○	Seeing	

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Check Part	Check Item	Check Point	Check Period		Check Method	Standards of judgment
			Daily	Regular		
Main Circuit	Cooling Fan	Vibration Strange sound	○		Hearing	
	Cooling System	Dust, Stink		○	Seeing	
	Wire	Strain peeled		○	Seeing	
	SLU-P input	3phase input		○	TESTER Voltmeter	3phase input within variation allowed
Control Circuit	Operation	Protection Circuit		○	Random behavior	No problem
	Connection	Captive state		○	Seeing Touching	No problem
	KEYPAD	Display, Operation state		○	Seeing Touching	No problem