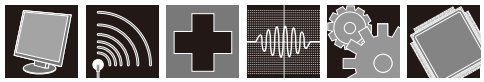
Alpha Ⅱ SERIES Multiple outputs 450W/650W

UL60950-1 CSA C22.2 60950-1 · EN60950-1 · CE marking · EN60601-1 option · UL60601-1 CSA-C22.2 No.601.1-M90 option · 3 YEARS warranty

■ Features

- Lineup of two types of 450W/650W (Both adaptable 700W peak capacity)
- Up to 5 slots and 10 channels are available
- New output modules: 14 types
  Single output modules: 8 types (3.3-24V modules)
  Dual-output modules: 6 types (insulated between outputs)
- EMI: VCCI-Class B
- Terminal type is selectable from Fast-on and Screw
  [Note]
  The dual-output module : Fast-on type only
  Two slot module : Screw type only
- Overall output on/off control (all outputs together)
  (Energy saving design by linking the FAN/PFC circuit to the on/off)
- AUX (auxiliary) power supply (two types): 5V 500mA, 12V 650mA
  (Overall output on/off control does not link to the on/off of the AUX power supply.)
- AC Fail signal
- Fan alarm signal
- Individual CH output on/off control and remote sensing
- Low Voltage signal
- LED output indicators

■ Usage



■ Conformity to RoHS Directive

This means that, in conformity with EU Directive 2002/95/EC, lead, cadmium, mercury, hexavalent chromium, and specific bromine-based flame retardants, PBB and PBDE, have not been used, except for exempted applications.

■ Product lineup

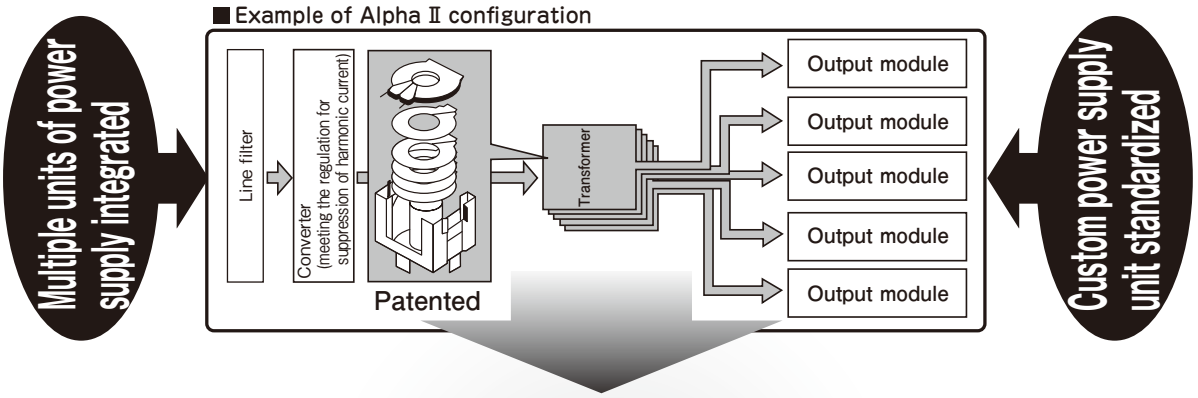
Model	Alpha Ⅱ-450P	Alpha Ⅱ-650
Total output power	450W (with AC100/200V input power)	650W (with AC200V input power) / 600W (with AC100W input power)
Total peak output power	700W (with AC100/200V input power)	700W (with AC100/200V input power)
Maximum output channels	5 slots 10 ch. max.	5 slots 10 ch. max.
Input voltage range	AC85～265V (47 - 63 Hz) Continuous input (AC90 - 265V: 100%)	
Ambient temperature in operation	-20 - +65℃ (-20 - +50℃: 100%) / Forced air cooling	
Preset functions	Overall output On/Off control, Individual output On/Off control, Auxiliary power supply (5V 500m or 12V 650mA), AC fail signal, Fan alarm signal, Low output voltage signal, LED indication of output	
Dimensions (W x H x D mm)	126.5×63×273	

Modular watt box

The power supply unit has been supporting the evolving/expanding electronics industry. There are mainly two types of power supply units: "custom power supply unit" and "standard power supply unit", either of which is to be selected appropriately according to the conditions. Densei-Lambda has been providing products to meet the needs of every generation, as well as to meet the future needs. Densei-Lambda has focused on providing the standard switching power supply unit and has received support from a lot of customers. Based on this achievement, the company launched the "Alpha series" in 1998, the modular watt box that was the first one developed by a domestic manufacturer. This Alpha series is a totally new concept in power supply that offers various custom specifications in power supply conveniently in a similar way to the standard power supply. The Alpha series has pioneered and established the current semi-custom power supply sector. The "Alpha II series" has been developed by evolving the Alpha series to adapt various requests for modification to it.

If you have any problems in multiple-output power supply...

- ●We want a prototype to be prepared within a short time after specifications have been decided.
- ●We want a multiple-output power supply unit in one package.
- ●We want to reduce the cost of designing power supply and other initial costs.
- ●Requesting approval of safety standards is troublesome in time and cost every time.
- ●The operations related to the CE marking, necessary for export to Europe, are complicated.
- ●We want to focus on designing devices rather than designing power supply.
- ●We want to promote standardization of power supply.



One transformer system

A wide variety of output modules

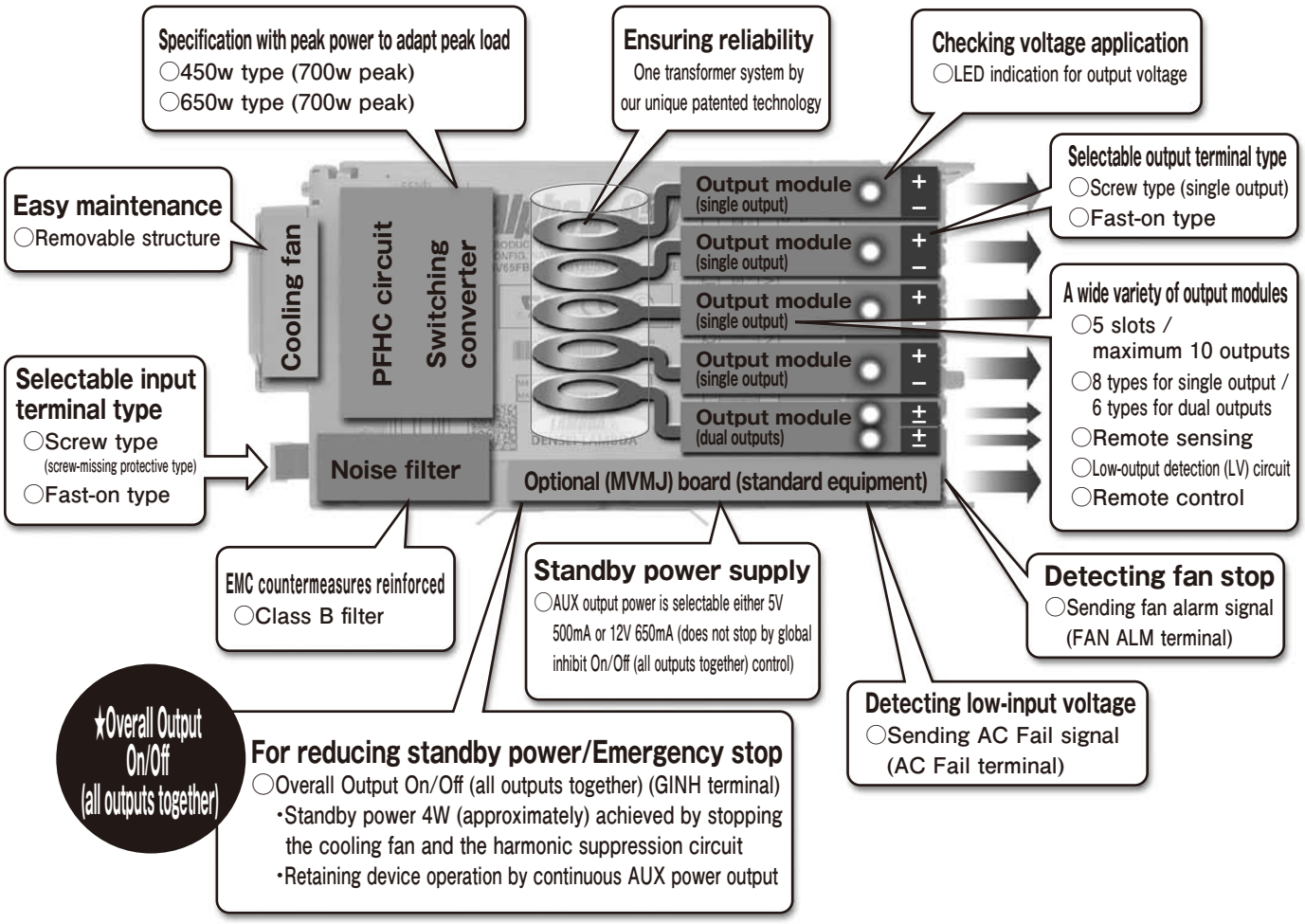
Flexible multiple output power supply

		AlphaII Series	Custom power supply
1	Delivery period of power supply prototype	◎ Usually about 2 weeks or more *	Δ Usually about 3 - 4 months
2	Initial costs	◎	Δ
	Design costs	No need	Costs incurred every time (about 3 million yen or over)
	Costs for acquiring approval of safety standards	No need	Costs incurred every time (about 4 million yen or over)
	Molding costs	No need	Costs incurred every time (about 4 million yen or over)
3	Requesting approval of safety standards	◎ Approved by UL / C-UL / SEMKO, Compliant with CE mark	Δ Operation needed every time
4	Suppressing harmonic current	◎ Built-in PFHC (meeting EN61000-3-2)	Δ Special circuit design needed
5	Space for power supply	◎ Can be decided in the stage of framework design	Δ Cannot be decided until the last stage of design
6	Production number of units	○ Even one unit order is acceptable	Δ Control of production number of unit, delivery period, and inventory is necessary

* It may take a longer period depending on the modules to be used.

Feature

All in one package!



Safety and reliability

○Safety standards

Low Voltage Directive | UL60950-1 CSA60950-1 | EN60950-1 | Option: UL60601-1 CSA60601-1, EN60601-1

○Lead-free

Removable cooling fan, easy for maintenance

LED indication for checking output

Two types for input/output terminals

Input terminal

Fast-on type | Screw type

Output terminal

Fast-on type (except in modules R, A, F, and G) | Screw type (except in modules K, E, P, J, and L)

Ask us to change the fan. Replacing the fan will be a charged service. If you change the fan by yourself, note the following.

*1. Be careful when handling the fan unit not to drop or bump it.
*2. Shut down the input power before changing the unit.
*3. Check that there are no loose connectors or pinch of harnesses.
*4. Compliance with safety standards (UL, CE, etc.) are void.

■ Options

Cooling fan -- Low speed fan, fan in reverse direction

Output module -- Compliance with LPS

- LPS: Compliance with the standards of the Limited Power Source in the item UL60950-1 2.5

Safety standard -- Complying the standards for electronic medical equipment, compliance with UL60601-1, EN60601-1

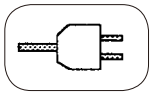
■ Output module lineup

Single output module		Q	B	C	D	R	A	F	G
Number of slots	–	1	1	1	1	2	2	2	2
Nominal output voltage	V	3.3	5	12	24	3.3	5	12	24
Maximum output current	A	26	26	13	10	60	60	33	25
Maximum output power	W	98.8	234	210.6	280	228	480	534.6	620
Voltage adjustable range (lower limit)	V	1.8	5	9.1	21.6	1.8	3.8	8	16.2
Voltage adjustable range (upper limit)	V	3.8	9	16.2	28	3.8	8	16.2	28

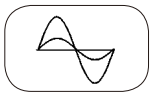
Dual output module		K		E		P		H		J		L	
Number of slots	–	1		1		1		1		1		1	
Nominal output voltage	V	3.3	5	12	12	12	24	24	24	5	24	5	12
Maximum output current	A	10	10	10	10	10	5	5	5	10	5	10	10
Maximum output power	W	33	55	162	162	162	140	140	140	55	140	55	162
Voltage adjustable range (lower limit)	V	1.8	1.8	9.1	9.1	9.1	16.2	16.2	16.2	1.8	16.2	1.8	9.1
Voltage adjustable range (upper limit)	V	5.5	5.5	16.2	16.2	16.2	28	28	28	5.5	28	5.5	16.2

* Each channel is insulated from each other.

WORLDWIDE



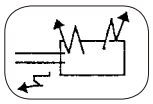
(1) Input voltage range
Universal input range from 85V to 265VAC worldwide commercial input.
(For cases where conformance to various safety specs are required, input voltage range will be 100-240VAC (50/60Hz).



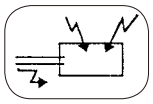
(2) Harmonics current control
AlphaⅡ has unique active filter for compliance with IEC61000-3-2 harmonics limitation.

(3) Compliant to international safety standards
MV450P-**S* / MV650-**S*
Approved by UL60950-1 (UL),
Approved by EN60950-1 (SEMKO), Built to meet DENAN. (Input voltage: AC100V)
MV450P-**M*/MV650-**M*
Approved by UL60601-1 (UL), approved by EN60601-1 (SEMKO), Built to meet DENAN. (Input voltage: AC100V)

(4) Conformed with CE marking
CE mark represents the satisfaction of the quality standard in the EU area.
AlphaⅡ is conformed with "Low-Voltage Directive" of the CE-Marking and indicated.



(5) EMI (Conducted EMI/Radiated RFI)
MV450P-**S* / MV650-**S*
AlphaⅡ is met the EMI standard CISPR22-B.
MV450P-**M*/MV650-**M*
AlphaⅡ is met the EMI standard CISPR22-A.
AlphaⅡ will be met CISPR22-B using Densei-Lambda noise filters.
* Need to consider te leakage current.

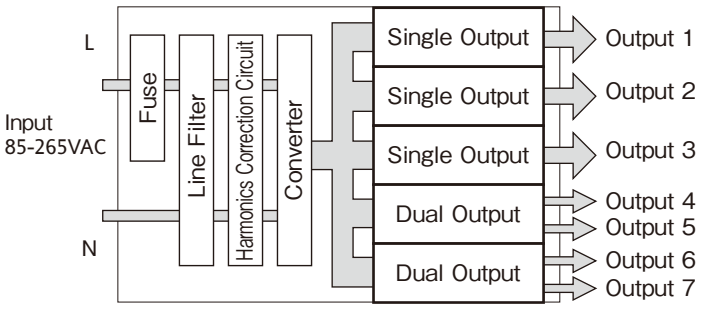


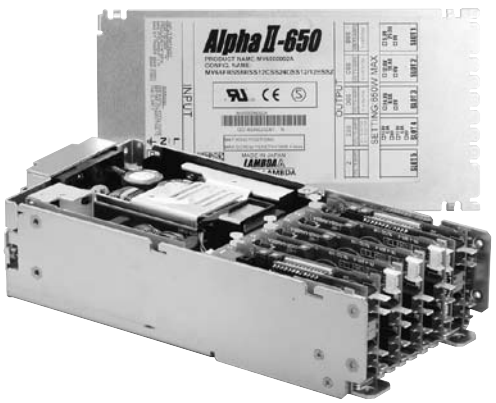
(6) EMS (immunity)
Compliance to IEC61000-4 series (EN61000-4 series). (About level, it is based on IEC61000-6-2.)
IEC 61000-4-2: Electrostatic discharge
IEC 61000-4-3: Radiated electromagnetic radio frequency
IEC 61000-4-4: Fast transient/burst
IEC 61000-4-5: Surge immunity
IEC 61000-4-6: Conducted disturbance induced by radio-frequency fields
IEC 61000-4-8: Power frequency magnetic field
IEC 61000-4-11: Voltage dips and short interruptions

(7) 3 years warranty

Example of configuration

【 AlphaⅡ 450P/650 】





(1)AlphaⅡ 450P/650 have 5 slots for the output modules that can be configured the outputs.
(2)The total output wattage of the AlphaⅡ 450P is maximum 450W. (Peak 700W)
(3)The total output wattage of AlphaⅡ 650 is 650W maximum, 600W at input 100VAC. (Peak 700W)
(4)Each specified output wattage of the output module derating is depend on arrangement of position in the slots, output voltage setting and ambient temperature.
(5) Internal input fuses
AlphaⅡ450P/650: 250V20A
(6) Harmonics current correction circuit switching frequency
AlphaⅡ450P/650: 100kHz (fixed: typ)
(7) Converter switching frequency
AlphaⅡ450P/650: 200kHz (fixed: typ)

AlphaII Specifications

■ AlphaII 450P/650 Common specifications (Read instruction manual carefully, before using the power supply unit.)

	MV450P(Standard type)	MV650(Standard type)	MV450P(Medical type)	MV650(Medical type)
1. Number of Slots	5 (Max 10 channels)			
2. Input Voltage Range(*1)	85-265VAC (47-63Hz) need derating at 85 to 90VAC			
3. Maximum Output Power (W)	450W	600W/650W (100VAC/200VAC)	450W	600W/650W (100VAC/200VAC)
4. Peak Output Power	700W			
5. Maximum Output Power (AT)	160AT	220AT	160AT	220AT
6. Input Current (typ)	100VAC: 6.6A / 200VAC: 3.4A	100VAC, 600W: 8.8A / 200VAC, 650W: 4.5A	100VAC: 6.6A / 200VAC: 3.4A	100VAC, 600W: 8.8A / 200VAC, 650W: 4.5A
7. Inrush Current (*2)	40A			
8. PFHC	Built to meet IEC61000-3-2 (PFHC Range: 85-255VAC)			
9. Power Factor (typ)	100VAC, 450W: 0.99 / 230VAC, 450W: 0.95	100VAC, 600W: 0.99 / 230VAC, 650W: 0.95	100VAC, 450W: 0.99 / 230VAC, 450W: 0.95	100VAC, 600W: 0.99 / 230VAC, 650W: 0.95
10. Efficiency (typ)	76% (depends on configuration)			
11. Output Over Voltage Protection	More than 160AT	More than 220AT	More than 160AT	More than 220AT
12. Hold-up Time (typ)	20ms	16ms	20ms	16ms
13. Leakage Current	Less than 0.95mA (100/200VAC)		Less than 0.5mA (100/200VAC)	
14. Operating Temperature	-20～+65℃ (-20～+50℃: 100% , +65℃: 75%)			
15. Operating Humidity	30-90%RH (No condensing)			
16. Storage Temperature	-30～+85℃			
17. Storage Humidity	10-95%RH(No condensing)			
18. Cooling	Forced air by blower fan			
19. Withstand Voltage	Input - FG: 1.5kVAC(20mA for 1 min) Input - Output: 3.0kVAC(20mA for 1 min)		Input - FG: 2.0kVAC(20mA for 1 min) Input - Output: 4.0kVAC(20mA for 1 min)	
20. Isolation Resistance	More than 100Mohm (Output, Signal - FG: 500VDC, 25℃, 70%RH)			
21. Vibration	At no operating, 10-55Hz (sweep for 1 minute) 19.6m/s^2 constant X, Y, Z, 1hour each			
22. Shock	At no operating, less than 196.1m/s^2			
23. Safety Standards	Approved by UL60950-1, EN60950-1. Built to meet DENAN (upto 125VAC).		Approved by UL60601-1, EN60601-1. Built to meet DENAN (upto 125VAC).	
24. Conducted Emission	Built to meet CISPR 22-B (EN55022-B, VCCI-B, FCC-B)		Built to meet CISPR 22-A (EN55022-A, VCCI-A, FCC-A)	
25. Radiated Emission	Built to meet CISPR 22-B(EN55022-B, VCCI-B), FCC-B		Built to meet CISPR 22-A(EN55022-A, VCCI-A), FCC-A	
26. Immunity	Built to meet IEC61000-4-2, IEC61000-4-3, IEC61000-4-4, IEC61000-4-5, IEC61000-4-6, IEC61000-4-8, IEC61000-4-11 (For level : complying with IEC61000-6-2)			
27. Input Low Voltage	Built to meet SEMI-F47 (at 170 to 265VAC)			
28. Weight (typ)	2,200g			
29. Size (W×H×D)	126.5 x 62.8 x 273 mm (Refer to outline drawing)			
30. Global ON/OFF Control for All Outputs (GINH)	Built-in as standard equipment			
31. Auxiliary Power Supply (*3)	MVMJ-S: 5V, 500mA MVMJ-A: 12V, 650mA			
32. AC Fail/OTP	Built-in as standard equipment			
33. Fan Alarm	Built-in as standard equipment			

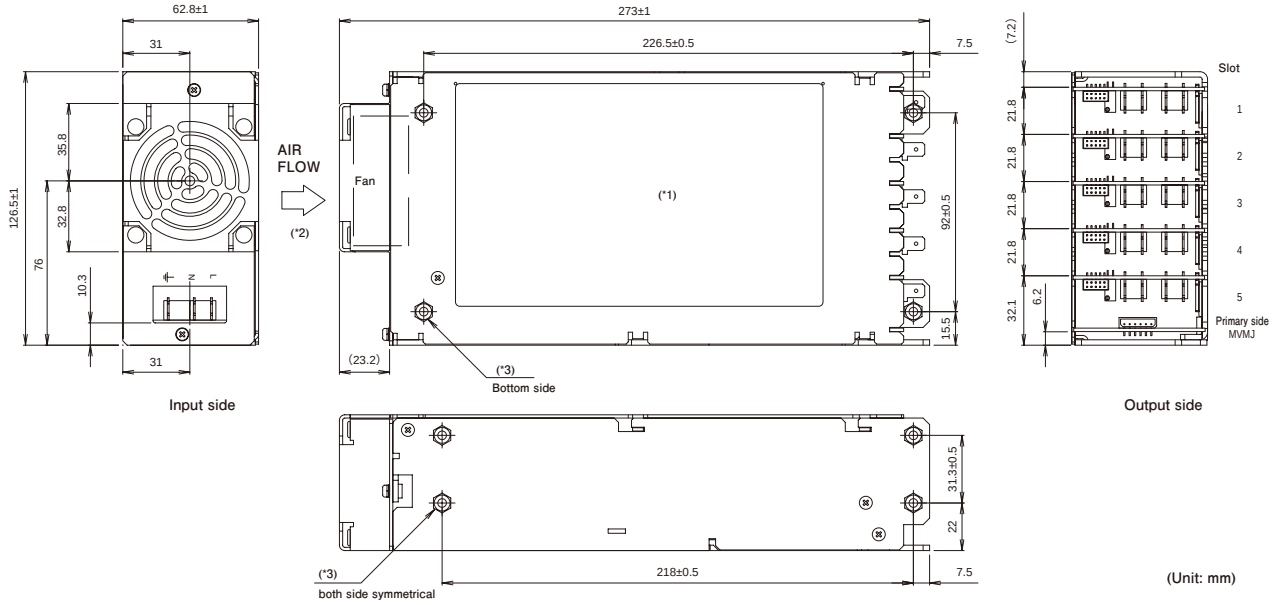
■ AlphaII 450P/650 Specifications for Output Modules (Output voltage above 28V is possible by series connection of each module.)

Slot types / Specification items			Single Output 1 slot				Dual Output 1 slot												Single Output 2 slots			
			Q	B	C	D	K		E		P		H		J		L		R	A	F	G
							CH1	CH2	CH1	CH2	CH1	CH2	CH1	CH2	CH1	CH2	CH1	CH2				
1. Nominal Output Voltage		V	3.3	5	12	24	3.3	5	12	12	12	24	24	24	5	24	5	12	3.3	5	12	24
2. Maximum Output Current(*3)		A	26	26	13	10	10	10	10	10	10	5	5	5	10	5	10	10	60	60	33	25
3. Nominal Output Power		W	85.8	130	156	240	33	50	120	120	120	120	120	120	50	120	50	120	198	300	396	600
4. Output Voltage Range	Minimum	V	1.8	5	9.1	21.6	1.8	1.8	9.1	9.1	9.1	16.2	16.2	16.2	1.8	16.2	1.8	9.1	1.8	3.8	8	16.2
	Maximum	V	3.8	9	16.2	28	5.5	5.5	16.2	16.2	16.2	28	28	28	5.5	28	5.5	16.2	3.8	8	16.2	28
5. Maximum Output Power(*3)		W	98.8	234	210.6	280	55	55	162	162	162	140	140	140	55	140	55	162	228	480	534.6	620
6. Maximum Line Regulation(*4)		mV	25	25	48	96	25	25	48	48	48	96	96	96	25	96	25	48	25	25	48	96
7. Maximum Load Regulation(*5)		mV	100	100	240	480	100	100	240	240	240	480	480	480	100	480	100	240	100	100	240	480
8. Temperature Coefficient		-	1mV/℃ or 0.02%/℃ whichever is greater.																			
9.Maximum Ripple & Noise	-20-0℃	mV	150	150	360	720	150	150	360	360	360	720	720	720	150	720	150	360	150	150	360	720
(*6)	0-50℃	mV	100	100	240	480	100	100	240	240	240	480	480	480	100	480	100	240	100	100	240	480
10. Over Voltage Protection(*7)		-	(Tracking OVP) 105% to 150% of the setting output voltage and 135% (typ) of max output voltage.																			
11. Over Current Protection(*8)		-	More than 105% of the maximum output current.																			
12. Remote Sensing		-	Available (Total line drop < 0.75V)																			
13. Remote Programming		-	Not available																			
14. Parallel Operation		-	Available (Refer to instruction manual.)																			
15. Series Operation		-	Available																			
16. ON/OFF Control		-	Built-in as standard (Refer to instruction manual.)																			
17. Output Low Voltage Signal		-	Built-in as standard (Refer to instruction manual.)																			
18. Operating Temperature			-20℃ - 65℃ -20℃ - 50℃: 100%, 65℃: 75%																			

(*1) For cases where conformance to various safety specs are required, input voltage range will be 100-240VAC (50/60Hz).
(*2) Primary inrush current at input voltage 100/200VAC and full-load.
First inrush current. Not applicable for the inrush current to noise filter less than 0.2ms.
(*3) -20℃- +65℃ (-20℃ - +50℃: 100%, +65℃: 75%)
(*4) Input voltage 85 265VAC at constant load.
(*5) No-load to full-load at constant input voltage. (When using the remote sensing, the level will be the same as the line regulation.)
(*6) 100MHz(Measured by the Japanese standard JEITA RC-9131A.)
(*7) Shut down method with manual reset. (Restart the input to be reset or reset with global inhibit.)
(*8) Constant current auto-reset (factory fixed).

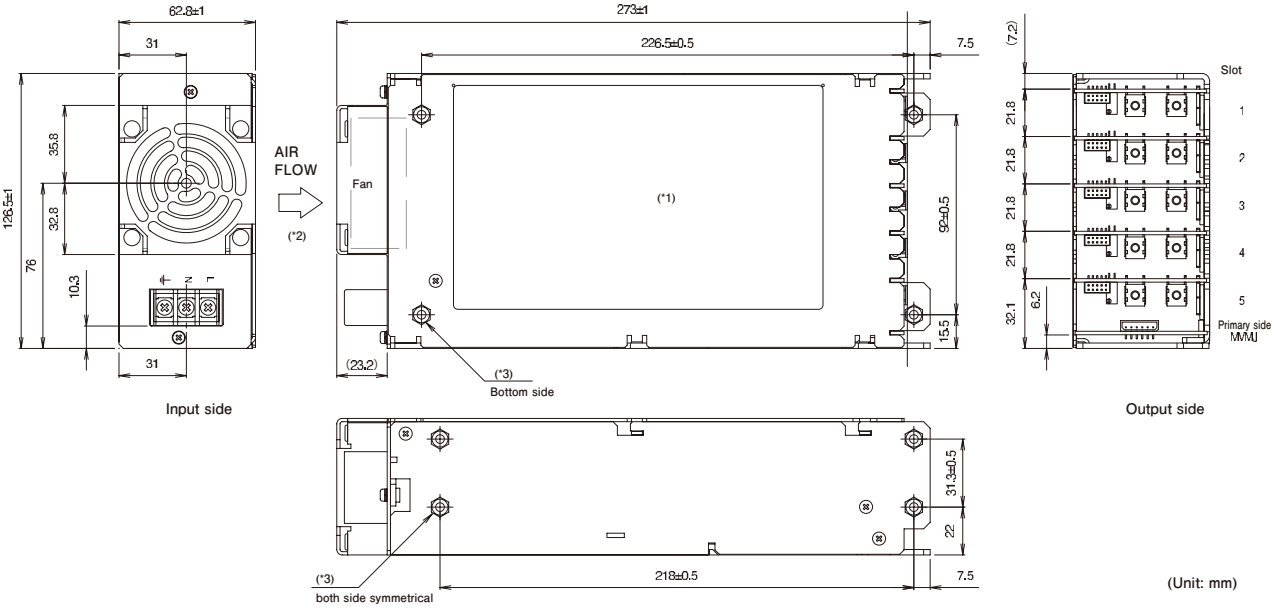
Outline Drawing

[AlphaII 450P/650] Fast-on terminal type



(*1) Name plate (product name, input/output specifications, and other information are indicated.)
(*2) Please keep the space more than 50mm for airflow. (both sides)
(*3) 12-M4 mounting tap (The length of screws inserted inside the unit should be within 4.5mm, the recommended thickness of the mounting plate is 1.5mm or more, and the M4 recommended torque is 1.47Nm.)

[AlphaII 450P/650] Screw terminal type



(*1) Name plate (product name, input/output specifications, and other information are indicated.)
(*2) Please keep the space more than 50mm for airflow. (both sides)
(*3) 12-M4 mounting tap (The length of screws inserted inside the unit should be within 4.5mm, the recommended thickness of the mounting plate is 1.5mm or more, and the M4 recommended torque is 1.47Nm.)

Alpha Ⅱ Series Instruction Manual

BEFORE USING THE POWER SUPPLY UNIT

Be sure to read this instruction manual thoroughly before using this product.
Pay attention to all cautions and warnings before using this product.
Incorrect usage could lead to an electric shock, damage to the unit or a fire hazard.

⚠ DANGER

- Never use this product in locations where flammable gas or ignitable substances are present.

⚠ WARNING

- Do not make unauthorized changes to this product, otherwise you may receive an electric shock and void your warranty.
- Do not touch this product or its internal components while it is in operation, or within 5 seconds from shut down. There may be high voltage or high temperature present and you may receive an electric shock or burn.
- When the product is operating, keep your hands and face away from it as you may be injured by flying debris in the event of a fault.
- Do not use this product in the event of the emission of smoke or abnormal smell and sound etc. It might lead to fire and/or electric shock. In such cases, please contact us. Do not attempt to repair by yourself, as it is dangerous for the user.
- Do not drop or insert anything into the product. It might lead to a failure, fire and/or electric shock.
- Do not operate these products in the presence of condensation. It might lead to fire and/or electric shock.

⚠ CAUTION

- This power supply is designed for use within an end product such that it is accessible to SERVICE ENGINEERS only. Attach the warning label to the product and insert the notes in the instruction manual.
- This product has a built-in fan for air-cooling. Do not block the air intake and exhaust as this might lead to fire.
- Input voltage, output current, output power, ambient temperature and ambient humidity should be kept within specifications, otherwise the product will be damaged.
- Connect the protective earth terminal (⏚) of this unit to the main protective earth terminal of the device, for safety and noise reduction.
  Failure to do so can cause electric shock hazard.
- For applications which require very high reliability (Nuclear related equipment, traffic control equipment, medical equipment, etc.), it is necessary to provide a fail safe mechanism in the end equipment.
- Confirm connections to input/output terminals and signal terminals are correct as indicated in the instruction manual before switching on.
- Do not use this product in environments with a strong electromagnetic fields, corrosive gas or conductive substances.
- The output of this product (modules A, D, F, and G) is considered to be a hazardous energy level. (The voltage is 2V or more and the power is 240VA or more.) It must not be made accessible to users. Protection must be provided for service engineers against indirect contact with the output terminals and/or to prevent tools being dropped across them. While working on this product, the AC input power must be switched off and the input and output voltage should be zero.
- Do not inject abnormal voltages into the output or signal of this product. The injection of reverse voltage or over voltage exceeding nominal output voltage into the output or signal terminals might cause damage to internal components.
- Never operate the product under over current or short circuit conditions for more than 30 seconds, or outside its specified input voltage range. Insulation failure, smoking, burning or other damage may occur.
- The information in this document is subject to change without prior notice. Please refer to the latest version of the data sheet, etc., for the most up-to-date specifications of the product
- No part of this document may be copied or reproduced in any form without prior written consent of Densei-Lambda.

Note: CE MARKING

CE Marking, when applied to a product covered by this handbook, indicates compliance with the low voltage directive (2006/95/EC) which complies with EN60950-1.

1. Design rules

1 How to select output module

[Alpha Ⅱ 450P/650 Design flow]

Study 1: Number of outputs
[Alpha Ⅱ 450P/650: Up to 10 outputs

↓

Study 2: Selecting output modules and number of slots
Select output modules. Total number of slots should be 5 or less.

↓

Study 3: Arranging the order of output modules

↓

Study 4: Output derating
(1) Locations of output module slots (2) Voltage set for output modules (3) Input voltage range (4) Range of ambient temperature in operation (5) Type of fan and direction of the air flow (inhale or exhale)

↓

Study 5: Checking the total output power and ampere-turn
Calculate the total output power of all the output modules and the ampere-turn.

↓

Deciding the configuration of output modules

Study 1. Number of outputs

Up to 10 multiple outputs are supported.

Study 2. Selecting output modules and number of slots

Up to 5 output slots are available for both the Alpha Ⅱ 450P and Alpha Ⅱ 650.

If the required number of slots is less than 5, blank panels are to be mounted when shipped.

For details, refer to "1-2. Output module list".

The output voltage can be set as desired in the factory when shipping. The output voltage is labeled on the main unit. The output voltage is also indicated in the name of the product configuration.

Refer to "2. About product name" for details.

Study 3. How to arrange the order of output modules

Arrange the module from the one with large output current in order of slot 1, 5, 4, 2,and 3.

Study 4. Output derating

The current of the output modules needs to be derated due to the following factors.

(1) Locations of output module slots

The cooling effect differs depending on the location of the slot, due to the forced air cooling method.

For details, refer to "1-2. Output module list".

(2) Voltage set for output modules

For details, refer to "1-2. Output module list".

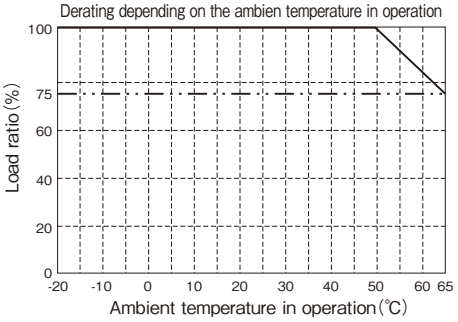
(3) Input voltage

Derating is needed depending on the input voltage. In the 85-90VAC, set the total output power, and the maximum output current/ampere-turn of each output module, to within 90 %.

For details, refer to "4-4. Input voltage and harmonics current correction".

(4) Ambient temperature in operation

Derating is needed in the condition where the ambient temperature in operation is 50° C or higher. Derate the total output power, and the maximum output current/ ampere-turn of each output module, to the following values (within 75% at 65° C).



(5) Fan

Derate the total output power/ampere-turn, and the maximum output current of each output module, depending on the type of the fan and its direction.

- Standard type of fan/inhale direction: no derating
- Standard type of fan/exhale direction: within 80%
- Low speed fan/inhale direction: within 80%
- Low speed fan/exhale direction: within 60%

Study 5. Total output power and ampere-turn

For Alpha Ⅱ, there are regulation values in the total output power of all channels and in the ampere-turn which is calculated from the number of turns and output current of the secondary transformer.

These values are the absolute maximum ratings for the use of Alpha Ⅱ, and use beyond these values is not allowed.

	AC100V	AC200V	Ampere-turn
AlphaⅡ 450P	450W	450W	160AT
AlphaⅡ 650	600W	650W	220AT

2 Output module list

Module	Number of outputs	Variable range in output voltage (V)	Maximum output current (A)	Number of turns	Number of slots	Maximum output current by the location of slots (A)				
						Slot 1	Slot 2	Slot 3	Slot 4	Slot 5
A	1	3.8-8.0	60	2	2	60	48	48	60	
B	1	5.0-9.0	26	2	1	26	26	26	26	26
C	1	9.1-16.2	13	3	1	13	13	13	13	13
D	1	21.6-28.0	10	5	1	10	10	10	10	10
E	2	9.1-16.2	10	3	1	10	8	8	10	10
		9.1-16.2	10	3		10	8	8	10	10
F	1	8.0-16.2	33	3	2	33	27	27	33	
G	1	16.2-28.0	25	5	2	25	20	20	25	
H	2	16.2-28.0	5	5	1	5	4.5	4.5	5	5
		16.2-28.0	5	5		5	4.5	4.5	5	5
J	2	1.8-5.5	10	1	1	10	8	8	10	10
		16.2-28.0	5	5		5	4.5	4.5	5	5
K	2	1.8-5.5	10	1	1	10	8	8	10	10
		1.8-5.5	10	1		10	8	8	10	10
L	2	1.8-5.5	10	1	1	10	8	8	10	10
		9.1-16.2	10	3		10	8	8	10	10
P	2	9.1-16.2	10	3	1	10	8	8	10	10
		16.2-28.0	5	5		5	4.5	4.5	5	5
Q	1	1.8-3.8	26	1	1	26	26	26	26	26
R	1	1.8-3.8	60	1	2	60	48	48	60	

* In 7V or higher for module B, the output current is to be 20A or less.
* In 26V or higher for module G, the output current is to be 22A or less.
* In 14.5V or higher for module F, the output current is to be 22A or less.

3 How to select output module (example)

Required specifications of power supply by a customer

Input voltage range: 85V - 265VAC
Ambient temperature range in operation: -20°C - +50°C
Output voltage, output current

Outputs	Required output voltage	Required output current	Number of outputs
Output 1	5V	30A	4
Output 2	12V	5A	
Output 3	12V	5A	
Output 4	24V	5A	

Type of fan: Standard type of fan / exhale direction

Study 1. Checking the number of outputs

Number of outputs: 4 (Alpha Ⅱ specification: up to 10 outputs)

Study 2. Selecting output modules and checking the number of slots

Select output modules from "1-2. Output module list".

Outputs	Output modules	Number of slots	Total number of slots
Output 1	Module A	2	4
Output 2	Module E	1	
Output 3			
Output 4	Module D	1	

(Alpha Ⅱ specification: up to 5 slots)

Study 3. Arranging the order of output modules

Arrange the module from the one with large output current in order of slot 1, 5, 4, 2, and 3.

Slots	Output modules
1	Module A
2	
3	Z (Blank panel)
4	Module D
5	Module E

Study 4. Checking the output derating

(1) Derating depending on the location of the slot
Refer to "1-2. Output module list".
(2) Derating depending on the voltage set for the output module
No applicable modules are found by referring to "1-2. Output module list".
(3) Input voltage range
Derating for input of AC 85V: 90% or less
(4) Ambient temperature in operation
Use at 50°C or lower: No derating
(When considering the use at 65°C: Derating to 75% or less)
(5) Type of fan and its direction
Standard type of fan / exhale direction: Derating to 80% or less

Slots	Output modules	Required specifications		Alpha Ⅱ output modules specifications					
				Output derating					Maximum output current of each module with consideration of the output derating
		Output voltage	Output current	Study 4					
				(1)	(2)	(3)	(4)	(5)	
1, 2	Module A	5V	30A	60A max.	N/A	×0.9	×1.0	×0.8	43.2A max.
3	Z (Blank panel)	-	-	-	-	-	-	-	-
4	Module D	24V	5A	10A max.	N/A	×0.9	×1.0	×0.8	7.2A max.
5	Module E	12V	5A	10A max.	N/A	×0.9	×1.0	×0.8	7.2A max.
		12V	5A	10A max.	N/A	×0.9	×1.0	×0.8	7.2A max.

Study 5. Checking total output power and ampere-turn

Also for the total output power and ampere-turn, the derating as in (3), (4) and (5) of Study 4 is needed.

Results of checking the total output power and ampere-turn

[Alpha Ⅱ 450P specifications

	Required specifications	Alpha Ⅱ 450P specifications
Total output power	390W	450×0.9×1.0×0.8 = 324W or lower
Total ampere-turn	115AT	160×0.9×1.0×0.8 = 115.2AT or lower

[Alpha II 650 specifications

	Required specifications	Alpha Ⅱ 650 specifications
Total output power	390W	600×0.9×1.0×0.8 = 432W or lower
Total ampere-turn	115AT	220×0.9×1.0×0.8 = 158.4AT or lower

Required specifications of power supply by the customer are:

Total output power = 5×30 + 12×5 + 12×5 + 24×5
= 390W

Total ampere-turn = 30×2 + 5×3 + 5×3 + 5×5
= 115AT

Accordingly, Alpha Ⅱ 650 can be used.

2.About product name

Each unit of the Alpha Ⅱ series is to be designed and manufactured individually with various combinations of the output modules, to meet the requirement of each customer. And the product name is given by DENSEI-LAMBDA in a serial number system.

This MV number is to be the product name in transaction procedures.

The Alpha Ⅱ internal configuration of modules and options is to be labeled on the product as the name of the product configuration (CONFIG. NAME). When requesting approval of safety standards, use this "CONFIG. NAME".

1 Indication of the product name (PRODUCT NAME)

MV450	0001A
MV650	0001A
Output power	Registered number (sequentially assigned)

2 Indication of the configuration name (CONFIG. NAME)

(Example) For Alpha Ⅱ 650 power supply unit with 6 multiple outputs

(1) SLOT 1: Module B (5V 26A)
(2) SLOT 2: Module H (24V 5A/24V 4.5A)
(3) SLOT 3: Z (Blank panel)
(4) SLOT 4: Module C (12V 13A)
(5) SLOT 5: Module E (12V 10A/12V 10A)

MV65FFSS	5BFS	24/24HFS	Z	12CFS	12/12EFS
Converter	SLOT 1	SLOT 2	SLOT 3	SLOT 4	SLOT 5
	Output modules				

・Converter configuration name

Series name	Output power	Cooling	Shapes of input terminals	Safety standards	Functions of primary side
MV	65	F	F	S	S

Output power

450W	45
650W	65

Cooling

Standard type of FAN (inhale)	F
Low speed FAN (inhale)	Q
Standard type of FAN (exhale)	R
Low speed FAN (exhale)	P

input terminals

Fast on terminal	F
Screw terminal	B

Safety standards

Standard 950 approval EMI B	S
Medical 601 approval EMI A	M

When requesting approval of safety standards, use the"CONFIG. NAME". Also refer to "6. Note on requesting approval of safety standards".

Primary Function

Standard(＊1)	S
AUX (12V 0.65A) Others are same as standard	A
Not Fitted	N

(＊1) Standard functions of primary side: Output On/Off (all outputs together), AC fail, Fan alarm, AUX (5V 0.5A)

・Output module configuration name

(Example) For Alpha Ⅱ 650 power supply unit with 6 multiple outputs

	Required voltage	Module names	Shapes of output terminals	Functions of secondary side
SLOT 1	5	B	F	S
SLOT 2	24/24	H	F	S
SLOT 3	-	Z	-	-
SLOT 4	12	C	F	S
SLOT 5	12/12	E	F	S

Types	Output voltage adjustable range (V)	Maximum output current (A)	Module name	Shapes of output terminals		Functions of secondary side			
				Fast on terminal	Screw terminal	Standard (＊2)	Standard + LPS (＊3)	ON/OFF control, relay control (＊4)	Standard + Current balance function (＊5)
1 slot / single output	1.8-3.8	26	Q	F	S	S	-	R	-
	5.0-9.0	26	B	F	S	S	L	R	-
	9.1-16.2	13	C	F	S	S	L	R	-
	21.6-28.0	10	D	F	S	S	L	R	-
1 slot / dual outputs	1.8-5.5	10	K	F	-	S	-	R	-
	1.8-5.5	10							
	9.1-16.2	10	E	F	-	S	L	R	-
	9.1-16.2	10							
	1.8-5.5	10	J	F	-	S	L	R	-
	16.2-28.0	5							
	9.1-16.2	10	P	F	-	S	L	R	-
	16.2-28.0	5							
	16.2-28.0	5	H	F	-	S	L	R	-
	16.2-28.0	5							
	1.8-5.5	10	L	F	-	S	L	R	-
	9.1-16.2	10							
2 slots / single output	1.8-3.8	60	R	-	S	S	-	R	C
	3.8-8.0	60	A	-	S	S	-	R	C
	8.0-16.2	33	F	-	S	S	-	R	C
	16.2-28.0	25	G	-	S	S	-	R	C
Blank panel	-	-	Z	-	-	-	-	-	-

(＊2) Standard functions of secondary side: On/Off control (control of voltage application), LV, Remote sensing, LED indication

(＊3) LPS: Conforming to the Limited Power Source in the UL60950-1_2.5 item. (An external fuse is needed for output.) The modules Q and K conform to LPS by default.

(＊4) On/Off relay control: The other functions are the same as standard. The ground of the control and the output 0V are connected inside the power supply unit. Serial/parallel connection of the control terminals is not possible.

(＊5) This is the current balance function when in parallel operation.

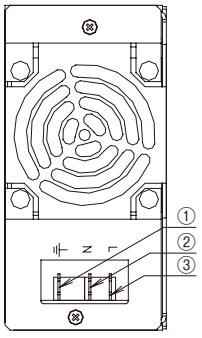
3. Terminals

Be careful when making connections. Wrong connections can cause failure in the power supply unit.

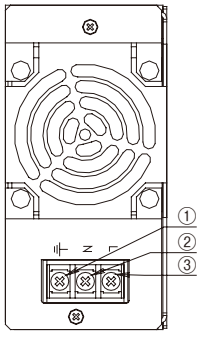
1 Alpha Ⅱ 450P / 650 terminals

Input side

6.35 mm fast on teminal



Screw terminal
(with preventive mechanism against screw loss)



∗Use the crimp-type terminal
with 8ϕ or less external diameter.

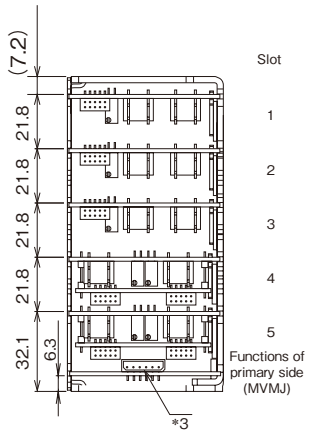
(1) ⏚ : Protective earth terminal
(2) AC input terminal N: Neutral line
(3) AC input terminal L: Live line (A fuse is set inside)

∗Recommended input terminal (not included in this product)
Fast on terminal #250 (6.3 × 0.8mm)
The following products, which are easy to connect/disconnect, are recommended for use.

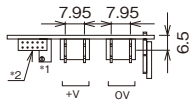
- JST (J.S.T. Mfg. Co., Ltd.): PS connector 250 series
  (Crimp tools: SPS-21T-250, YC-780 / SPS-61T-250, YC-720/721)
- NICHIFU Co., Ltd.: Easy Lock Connector 250 series
  (Crimp tool: NCM3)

Output side

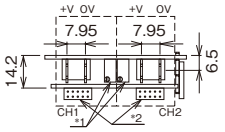
6.35 mm Fast on terminal type



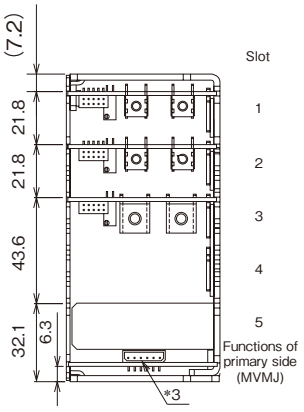
1-slot module (single output)



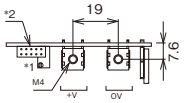
1-slot module (dual outputs)



Screw terminal type

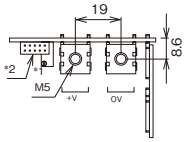


1-slot module (single output)



∗ Use a crimping terminal with 8ϕ
or less external diameter
∗ M4 recommended torque: 1.27Nm

2-slot module (single output)

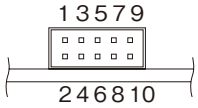


∗ Use a crimping terminal with 12ϕ
or less external diameter
∗ M5 recommended torque: 2.5Nm

∗1: Output voltage trimmer (Output voltage increases in a clockwise direction.)
∗2, 3: Refer to "3-2. MVMJ-∗ connector pin location and function for output module".

2 MVMJ-＊ connector pin location and function for output module

・Connectors for output modules (＊2)



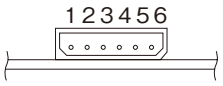
Applicable housing pin

Parts	Model name	Manufacturer
Connector in use (pin header)	S10B-PHDSS-B(LF)(SN)	JST
Applicable housing (socket housing)	PHDR-10VS	JST
Terminal pin	SPHD-001T-P0.5 BPHD-001T-P0.5	JST
Crimp tool	YC-610R	JST

Pin No.	Pin location	Function
1	+S	Remote sensing terminal for "+" output side (Remote sensing function to compensate for voltage drop by wiring from the output terminal to the load terminal)
2	-S	Remote sensing terminal for "-" output side (Remote sensing function to compensate for voltage drop by wiring from the output terminal to the load terminal)
3	NC (PC)＊	Output current balance (PC) terminal (Balanced supply of output current when in parallel operation)
4	NC (PC GND)＊	Ground terminal of the output current balance (PC) terminal (Balanced supply of output current when in parallel operation)
5	NC (PC)＊	Output current balance (PC) terminal (Balanced supply of output current when in parallel operation)
6	NC (PC GND)＊	Ground terminal of the output current balance (PC) terminal (Balanced supply of output current when in parallel operation)
7	LV	Low-output detection terminal (Output voltage monitoring function that detects reduction of the output voltage and emits the monitoring signal)
8	TOG	Ground terminal of LV signal
9	+R	Remote On/Off control terminal
10	-R	

＊PC terminal : (＊2) This is to be applied to the 2-slot single output modules with the current balance function.

・ MVMJ-＊ connector (＊3)



Applicable housing pin

Parts	Model name	Manufacturer
Connector in use (pin header)	5268-06A	MOLEX
Applicable housing (socket housing)	5264-06	MOLEX
Terminal pin	5263PBT	MOLEX
Crimp tool	JHTR5974	MOLEX

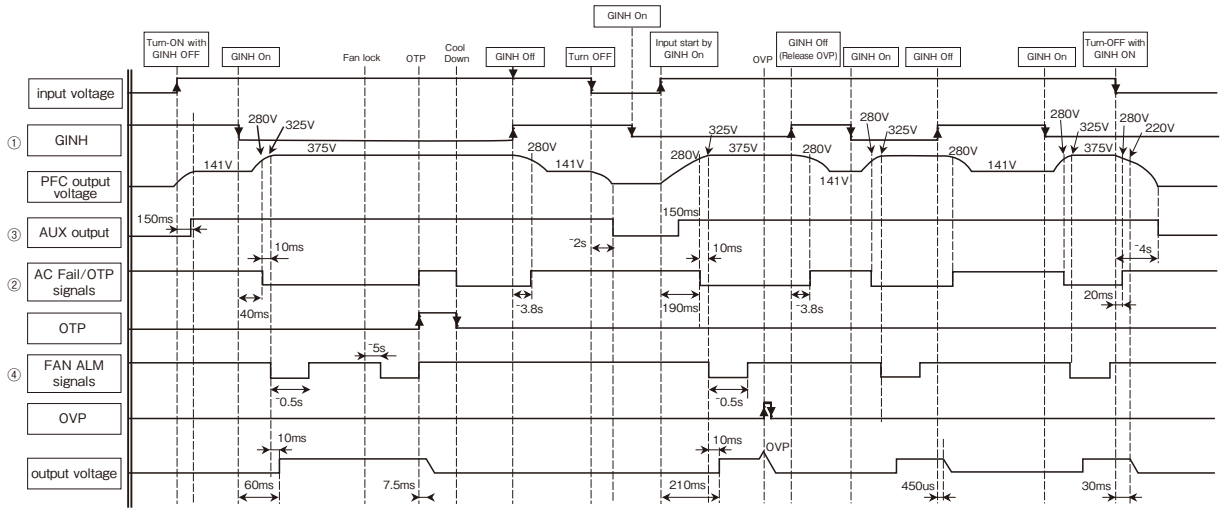
Pin No.	Pin location	Function
1	AC Fail / OTP Collector	AC Fail / OTP collector terminal
2	AC Fail / OTP Emitter	AC Fail / OTP emitter terminal
3	0V AUX	Built-in auxiliary power supply 0V terminal
4	AUX	Built-in auxiliary power supply output terminal
5	FAN ALM	Fan monitoring signal terminal
6	Global Inhibit	Output On/Off (all outputs together), control terminal (Output On by 0V AUX and short)

For details of functions, refer to "4. Explanation of functions and notes".

4. Explanation of functions and notes

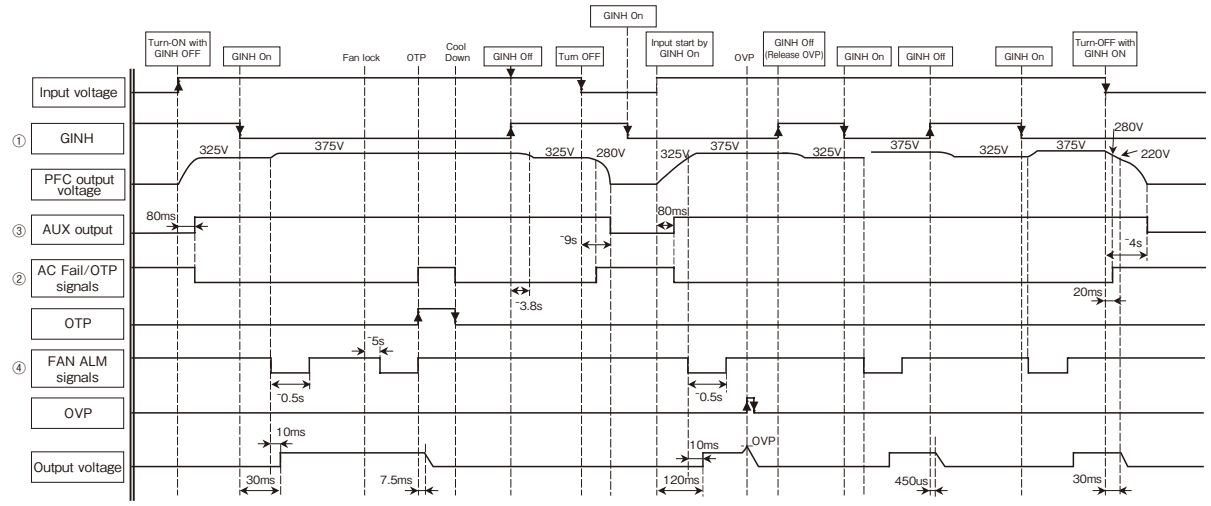
1 Input/output time chart for signals of primary side

● **100V (100VAC) Condition: Use of external power supply**



(Typical values are used for time and voltage.)

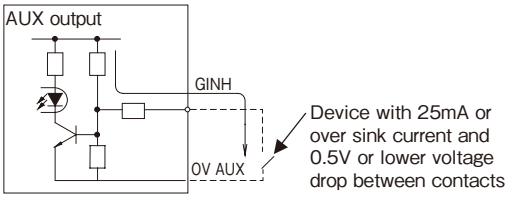
● **200V (230VAC) Condition: Use of external power supply**



(Typical values are used for time and voltage.)

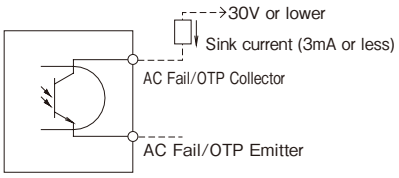
(1) Remote ON/OFF Control (for all the output) Global Inhibit Control
All outputs can be controlled together. (This does not function when the AUX output is low.)

Status	GINH level for 0V AUX
ON	Low: Short (sink current is 25mA or over, 0.5V or lower)
OFF	High: Open (Applied voltage when off is up to the AUX output voltage.)



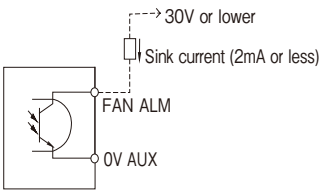
(2) AC Fail / OTP signals
When the built-in active filter voltage is 208VDC or lower, the open collector signals are given (floating output).

Status	AC Fail / OTP Collector level for AC Fail / OTP Emitter
Normal operation	Low: 0.8V or lower (The maximum sink current is 3mA or less.)
Signal activated	High: The maximum applied voltage is 30V or lower.



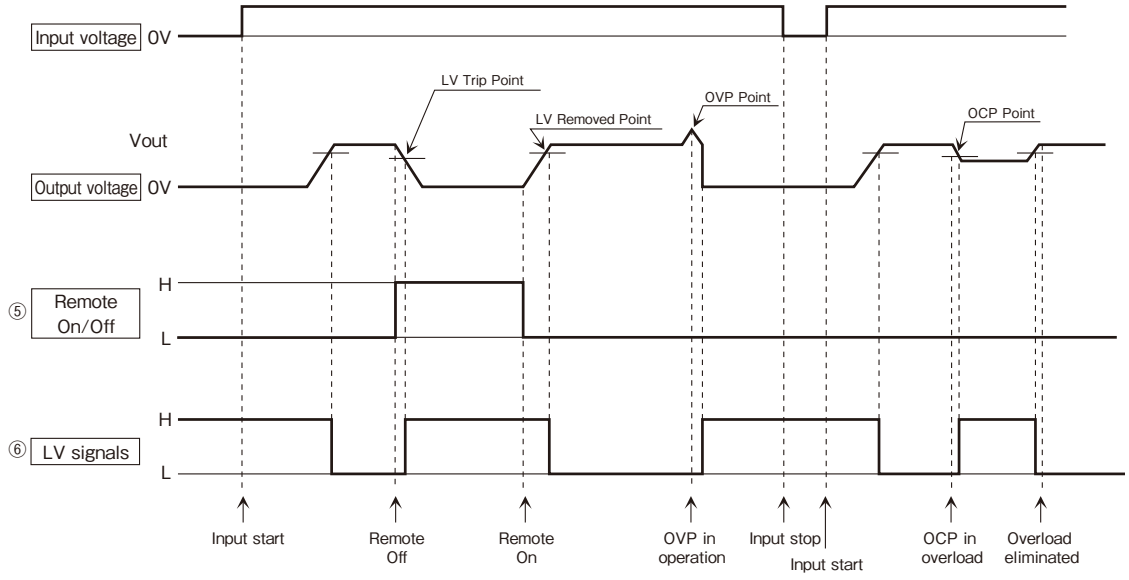
(3) Built-in auxiliary power supply (AUX)
An independent auxiliary power supply, isolated from input/output, is built into the unit.
MVMJ-S: 5V ± 5%, 500mA at maximum, load regulation 1%, with over current protection
MVMJ-A: 12V ± 5%, 650mA at maximum, load regulation 1%, with over current protection

(4) The fan lock detection system moves the fan monitoring signals to "L" level, and notifies about the unusual conditions of the fan. The signal level is "H" when the fan is in usual operation. The fan monitoring signals are isolated from input/output terminals, and by the open collector system. The specifications are as follows.
Note that there is a delay time in the detection circuit when the fan is started and an unusual condition of the fan is detected.



Status	ALM level for 0V AUX
Normal operation	High: The maximum applied voltage is 30V or lower.
Signal activated	Low: 1.0V or lower (The maximum sink current is 2mA or less.)

2 Sequence time chart for secondary module



(5) Remote On/Off control (for each output)

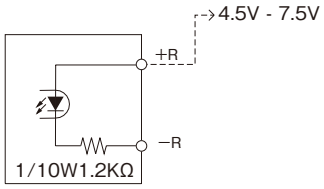
On/Off control for each individual output is possible. This control is to be operated under the following conditions.

・Function of output module secondary side S type

The ground of control signals is in floating condition.

Status	+R level for -R level
On	Low: 0.8V or lower, or short, open
Off	High: Between 4.5V and 7.5V

Voltage application control type



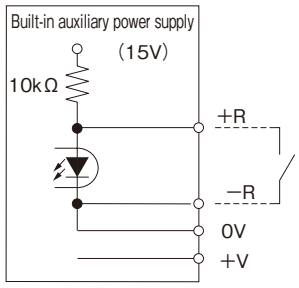
・Function of output module secondary side R type

The ground of control signals is not in floating condition.

- ○ Serial / parallel connection of the control terminals is not possible.
- ○ Control by application of external voltage is not possible.
- ○ The source current when in short is 2mA or less. When using switch elements, etc., design them so that the residual voltage is 1.5V or lower.

Status	+R level for -R level
On	Low: Short
Off	High: Open

Relay control type



Note that when Off, for both the S and R types, a little voltage remains in the condition with no load, as follows.

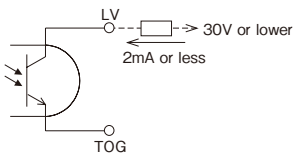
0.5V or lower: Q,B,K,J(ch1),L(ch1),R,A,F,G

1V or lower: C,D,E,P,H,J(ch2),L(ch2)

＊Long hours of usage in the control Off condition is not recommended.

(6) Low-output detection circuit (LV)

This is the output voltage monitoring function that detects drop of the output voltage of each module, and give the monitoring signal. Signals are output via the open collector system. The floating output system is used for LV and TOG.



Status	LV level for TOG
Usual	Low: 0.8V or lower (Sink current is 2mA or less.)
Unusual	High: 2.0V or higher (Applied voltage when Off is 30V or lower.)

The LV signals are detected in the following way.

The LV signals are detected when the voltage is dropped to 80%typ. of the set voltage, and the detection is reset when the voltage recovers to 85%typ.

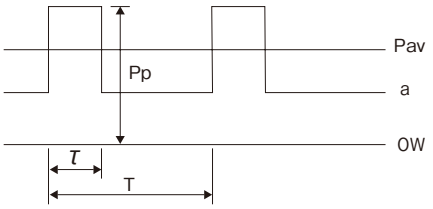
(For Q, K, J (ch1), L(ch1), and R modules, the LV signals are detected when the voltage is dropped to 60%typ. of the set voltage, and the detection is reset when the voltage recovers to 65%typ.)

3 Watt box function

In Alpha Ⅱ, the electric power output configuration is defined by the combination of output modules.
For each output module, the maximum output voltage/ current are defined. The total maximum output power of the unit is restricted by each module's specification, as well as the total output power definition.
Use the unit as a "watt box" within the total output power definition.

	AC 100V	AC 200V
Alpha Ⅱ 450P	450W	450W
Alpha Ⅱ 650	600W	650W

Alpha Ⅱ supports 700W peak power. The following formula should be satisfied in relation to the average DC output current. Also, use the unit under the conditions where the continuous time of the maximum DC output current applied is within 1 second, and the duty is 30% or less.



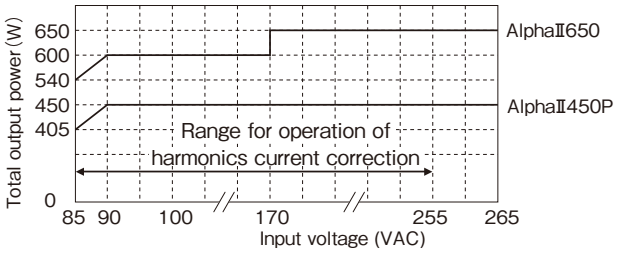
$$Pav \geqq \frac{(Pp-a) \times \tau}{T} + a \qquad \left(\frac{\tau}{T} \leqq 0.3 \right)$$

Pav: Average output power
AlphaⅡ450P:450W or less
AlphaⅡ650: AC100V: 600W or less
AC200V: 650W or less

Pp: Peak output power (700W or less)
τ: Pulse width of peak power (sec.) (within 1 second)
T: Cycle (sec.)
τ/T: Duty (0.3 or less)

4 Input voltage and harmonics current correction

Alpha Ⅱ is equipped with the harmonics current correction circuit (boost type active filter system), and the harmonics current is limited at no load through full load. Note that the input voltage range for operation of the harmonics current correction circuit is between 85VAC and 255VAC. The harmonics current correction circuit does not operate in between 255VAC and 265VAC. The input voltage range is between 85VAC and 265VAC without failure of the unit. Output derating is needed in between 85VAC and 90VAC. Do not use the unit in conditions below the input voltage range. This can cause irregularity in the output voltage and/or noises. Do not use the rectangular-wave input voltage such as UPS and inverter.



5 Circuit for Limit inrush current

Alpha Ⅱ has the Inrush Current Protection Circuit , which reduces inrush current flowing into input capacitor of the Alpha Ⅱ when input is turned on.
Note, the inrush current protection does not work, when returning input on is with in ten seconds, it depends on condition of holding energy in the circuit.
When using a switch, etc., for input, select a switch that endure to the inrush current.

6 Over-Current Protection (OCP)

Output Module has individual Overload Current Protection (OCP) on each output.
The OCP employ the constant current with autoreset method that makes the output voltage goes down immediately when the load current is over the OCP limiting point.
The OCP settings are preset in the factory when shipping, and adjustments by customers are not possible. The OCP value is set to 105% or over of each module's maximum output current. But the value can be adjusted down to around 70%. If you need a change in the standard OCP setting value, contact us in advance.
The inverter in the primary side is equipped with the OCP circuit for total output current. If an over-current condition occurs in the output side, the OCP circuit operates to protect the inverter, with limiting total output power.
If an over-current condition occurs in the output side, check the conditions of the load side, and remove the causes before using the unit again.
Never operate the unit under over-current or shorted conditions for 30 seconds or more. This can cause damage to the unit.

7 Over Voltage Protection (OVP)

Each output module is independently equipped with the Over Voltage Protection (OVP) circuit. When the OVP operates, the inverter in the primary side is shut down, so all the outputs are shut down at the same time. If the OVP operates, shut down input once, and then restart input after 30 seconds or more, to recover the inverter operation. Otherwise, set the Output On/Off (Global Inhibit, MUMJ) control to "H" once, and then set it to "L". If an OVP operation occurs, check the causes and take countermeasures against them before using the unit again.
The OVP settings are fixed in the factory when shipping. The output modules are equipped with two types of OVP. One is the "Tracking OVP", where the over voltage detection value changes in proportion to the output voltage. The other is the "Fixed OVP", where the over voltage detection value is fixed regardless of the output voltage.
In the "Tracking OVP", the setting voltage is followed by automatic tracking system, and the protection function, appropriate for the output voltage, is always in operation. The specification value is in the formula of "output voltage Vo $\times \alpha$". The value of "α" is fixed, and if the set output voltage value is V1, the value of "V1 $\times \alpha$" is automatically set as the OVP detection value. (α: 1.05- 1.50)
Note that the value of "α" and the over voltage detection value in the "Fixed OVP" cannot be changed.
For abrupt load change (Tr.Tf below 20μs), OVP might be triggered.
If this kind of load change occurs, attach additional external capacitor. (Low ESR type)

8 Over Temperature Protection (OTP)

In cases where the internal temperature increases unusually due to the operation of the fan stopping, clogging in the fan, or an unusual increase of ambient temperature, this function stops the inverter operation and shuts down all outputs. The monitoring signal to notify the operation of

OTP circuit, is similar to AC Fail. If the OTP is being operated, stop input once, wait until the inside of the unit has cooled down, and then restart input, to operate the inverter again.
As the OTP shuts down the output in the same mode as the OVP, there may be some cases where the causes are difficult to be detected. Check the causes and take countermeasures against them before using the unit again.

9 Adjusting the output voltage

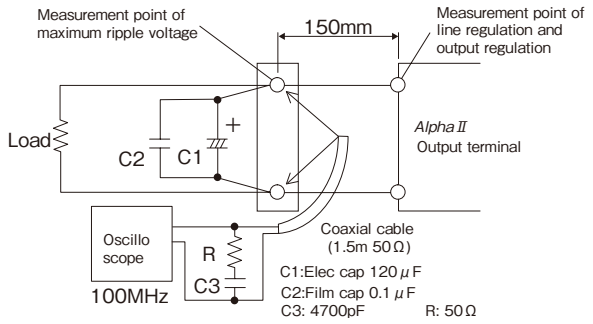
The Output Module of all Alpha Ⅱ has output voltage adjusting multi-turns trimmer VR. Output voltage increases in a clockwise direction. Remote programming by applying external voltage with sensing terminals, etc., is not possible.
When adjusting the output voltage, note that the current of the output modules may need to be derated depending on the output module. Refer to "1-2. Output module list".
Do not apply stress of 4.9N (reference value: 0.5kgf) or over to the trimmer.

10 Remote sensing

Each module is equipped with the remote sensing function. The voltage compensation value is 0.75V (total drop) or less.
Be careful to retain the voltage drop of the output terminal within the output voltage adjustable range.
When in use with the basic connections, in which the remote sensing function is not used, let the remote sensing terminal open (factory default). For the output voltage adjustable range, refer to the specifications. The housings and pins for remote sensing can be attached with the unit. For pin numbers, etc., refer to "3. Terminals".

11 Measurement of maximum ripple voltage

The maximum ripple voltage value (including noises) in the specifications, is measured by the conditions as shown below, complying with the RC-9131A of the JEITA regulations. Note that the accurate measurement is not possible if the probe ground of the oscilloscope is long in measurement.

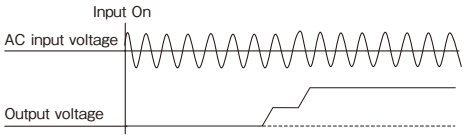


12 Series operation

The output modules can be operated in conjunction with one another in a series.
For the series operation, use the modules with the same output current.

13 Parallel operation

Plural modules of the same type can be operated in parallel. For that to be possible, however, some internal settings should be made when shipping.
For details, contact us in advance.
In series/parallel operations, when the input voltage applied, the output voltage may fluctuate, due to variation in the starting time.



Waveforms in starting time of series / parallel operations

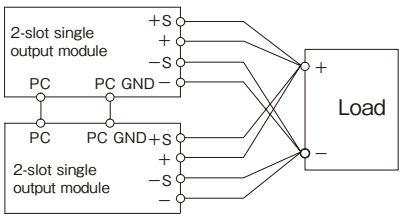
The series operation is superior to the parallel operation in response to dynamic load changes.
For use with dynamic load, series operation is recommended.

Notes on parallel operation

1) Each output voltage should be the same: either 100mV or 1% of the value of the nominal output voltage.
2) The wire materials for sensing should be same size and length.
3) The wire materials for loading should be same size and length.

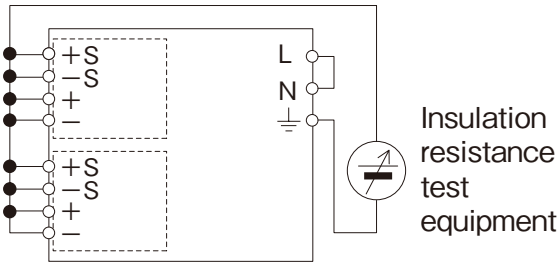
Concerning the parallel operation of 2-slot single output modules

For modules with the current balance function (optional), parallel operation with the load current balance function is possible for modules with the same outputs. The PC terminals are used for connections.



14 Insulation resistance test

The insulation resistance between the output and the protective earth terminal (⏚) is 100MΩ or over, at 25℃, 70%RH, and 500VDC.
All the connections of output terminals and connectors of each output module should be made.
Also, for safety, the voltage setting of the DC insulation resistance test equipment should be made before conducting the test, and after the test, discharge between the output and the protective earth terminal (⏚) with resistance, etc.

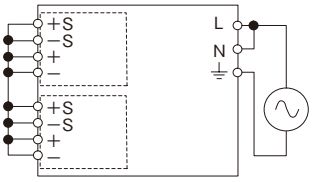


Between the output and the protective earth terminal (⏚): 500VDC 100MΩ

15 Withstand voltage test

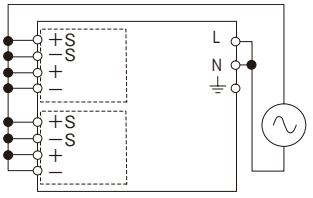
The withstand voltage of this unit is as follows: 1.5kVAC (medical: 2.0kVAC) for 1 minute between the input and

the protective earth terminal (⏚), 3kVAC (medical: 4.0kVAC) for 1 minute between the input and the output terminal.
Set the limit of the current value of the withstand voltage test equipment to 20mA.
All the connections of output terminals and connectors of each output module should be made.
In tests when the output side is open, output voltage may occur for a moment.
For safety, be sure to begin with the applied withstand voltage at zero and gradually increase it during the test. As well, after that, gradually reduce the voltage.
If a timer is used for measuring the test time, high voltage may be generated in applying and cutting off the voltage, causing damage to the unit.



Withstand voltage test equipment

Between the input and the protective earth terminal (⏚):
1.5kVAC (medical: 2.0kVAC) for 1 minute (20mA)



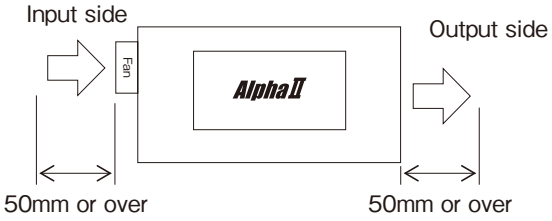
Withstand voltage test equipment

Between the input and the output terminal:
3.0kVAC (medical: 4.0kVAC) for 1 minute (20mA)

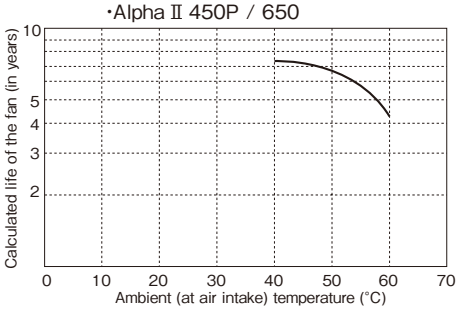
5. Installation

1 Cooling method

This unit uses the forced air cooling system through a built-in fan. Inhale type of fan (standard) is built into the input terminal side.
In mechanical designs of unit, ensure 50mm or over of space for both the input terminal side (intake) and the output terminal side exhale. Also, be careful that foreign objects do not get inside the unit.



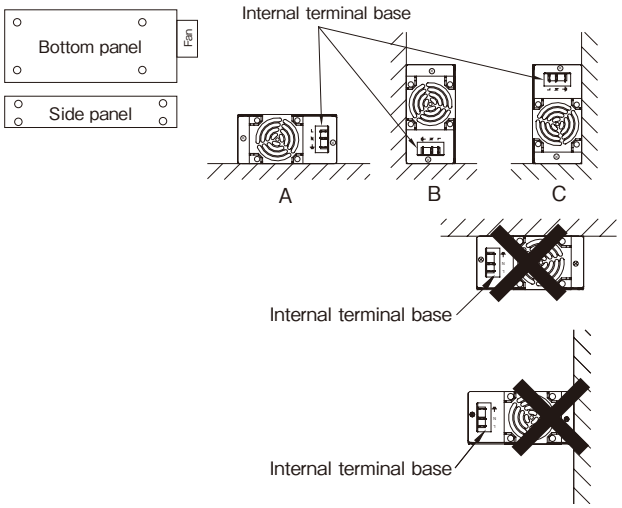
If the fan stops, the fan monitoring signals are given and the inverter may be stopped depending on the increase in the inside temperature, to protect the unit. If the fan stops and this protection circuit is activated, contact our sales representative or department. (Exchange of the fan will be a charged service.)
Also, fans are consumable parts, and periodical exchanges are needed before their lifetimes expire.
Refer to the data for the expected lifetime of fans, shown below.
(Expected lifetime of fans: Rate of remaining is 90%. Fan intake temperature is that of the location 50mm away from the inlet.)



2 Installation

There are M4 taps for use in installation on the bottom and both sides of the unit. Attaching only on one side is not able to satisfy the defined specification for vibration. Install the unit by following the standard instructions below (position and direction of A, B, or C).

1) Use the M4 taps on the bottom (4 taps) and sides (4 taps for each side).
2) The length of screws inserted inside the unit should be within 4.5 mm.
3) The recommended screw-tightening torque is 1.47Nm.
4) The recommended thickness of the base board to be attached is 1.5mm or over.



6.Important safety instructions

General installation instructions

1) These products are Class 1 and must therefore be reliably earthed and professionally installed in accordance with the prevailing electrical wiring regulations and the safety standards covered herein.
2) When requesting approval of safety standards, use the "CONFIG. NAME".
   For explanation on the "CONFIG. NAME", refer to "2. About product name".

Special Instructions for Medical Equipment

1) These products are designed for continuous operation within an overall enclosure, and must be mounted such that access to the mains terminals is restricted. See Clause 16, IEC/EN/UL60601-1.
2) These products are NOT suitable for use in the presence of flammable anaesthetic mixtures with air or with oxygen or with nitrous oxide.
3) These products are classed as ordinary equipment according to IEC/EN/UL60601-1 and are NOT protected against the ingress of water.
4) Connect only apparatus complying with IEC/EN/UL60601-1 to the signal ports.
5) When the PSU is installed within medical equipment an all pole mains input disconnect device must be fitted.
6) Reference should be made to local regulations concerning the disposal of these products at the of their useful life.
7) For use with a medical device (class 1 device) for North America, and with 240VAC, use the 240V single phase AC power supply unit with a center tap.

7.Troubleshooting

1) Is the specified input voltage being applied?
2) Are the connections to the input / output terminals correct?
3) Are the connections to the input / output terminals made securely with the specified tightening torque?
4) Check if the connecting wires are too thin.
5) Check if the volume of the output voltage adjustment is not turned up too high.. If the volume of the output voltage adjustment is turned up too high, it causes the OVP function to be activated, and the output is shut down.
6) Check if the GINH terminal is not open. If the GINH terminal is open, the output is stopped.
   Are the connections made properly, as specified?
7) Is the built-in fan in operation? Check if any foreign objects are not disturbing the rotation of the fan. When the fan stops, FAN ALM signals are given. In addition, when the fan stops, the inside temperature increases, causing the protection circuit to be activated.
   Note that fans are consumable parts.
8) The front panel and the rear panel of the unit are the inlet and outlet for the cooling air, respectively.
   Check if any foreign objects or dust are disturbing the air flow
9) Check if the unit does not become unusually heated. If the unit becomes unusually heated, it causes the OTP function to be activated, and the output is shut down.
   Cool down the unit, and then start input again.
10) Do you use the unit within the specified output current and output power?
11) Is the input voltage waveform the sine wave alternating current? If the input voltage waveform is not the sine wave like connection with UPS, etc., it can cause noises in the unit.
12) Some range of frequencies, where the load changes, may cause noises in the unit.

8.Warranty

The warranty period is 3 years after delivery. We will repair the product without charge for any failure that should occur in normal use for 3 years after delivery. However, exchange of the fan will be a charged service.
For exchange of the fan, contact our sales representative or department.

The conditions of normal use are the following.

1) An average of 40℃ or lower temperature when using (ambient temperature)
2) An average of 80% or less load ratio
3) Installation: Accordance with the standard instructions

The warranty should not be applicable for the following cases.

1) Failure due to inappropriate handling of the product including dropping or impacting the product, or due to use of the product under the conditions beyond the defined specifications
2) Failure caused by natural disasters such as fire disasters and flood disasters
3) Failure for which we should not be responsible, including the failure caused by modification or repair by any person other than the person authorized by us

AlphaII MRS (Question Sheet)

Date	
Office	Name

1	Company name		3	Store	
2	Section / Name		4	Note	

Information on equipment

1	Type of industy		3	Application device	

Business scale

1	Use quantity					
2	Target unit price			3	Annual Amount	
4	Competitor			5	Competition series	
6	Mass production start			7	Others	

Power supply specification

1	Input voltage	AC85-265V (47-63Hz) ※Output derating is required for 85 To 90VAC. ☐Yes・☐No
2	Safety standard	☐Standard (UL60950-1/EN60950-1/CSA60950-1/CE(Low Voltage Directive) ☐
3	Conducted EMI	☐Class A・☐Class B CISPR 22 (EN55022/VCCI/FCC)
4	Operating temperature	☐-20℃～50℃ ; 100% ・☐50℃～65℃ ; 75%
5	Direction of FAN	☐Inhale (no need derating) ☐Exhale (Output power / module current, derating 80%)
6	Terminal	Input →☐Fast-on・☐Screw Output terminal →☐Fast-on・☐Screw terminal
7	Is it used by watt box?	☐Yes・☐No

Output specification

		ch1	ch2	ch3	ch4	ch5	ch6	ch7	ch8	ch9	ch10
8	Rated output voltage										
9	Output current										
10	Output wattage										
11	Total output wattage										
12	Specification over current protection										

Various functions

13	Standard equipment	Output fall signal	☐Use ・☐No Use
14		ON / OFF Control for each channel	☐Use（☐Type S ☐Type R） ・☐No Use
15		Remote ON / OFF Control	☐Use ・☐No Use
16		AUX	☐Use（☐ 5V ☐12V） ・☐No Use
17		AC Fail OTP signal	☐Use ・☐No Use
18		FAN alarm signal	☐Use ・☐No Use
19	Is the connector for a function required?		☐Yes（☐Primary ☐Secondry）・☐No
20	Is the GINH terminal short connector appended?		☐Yes ・☐No

← Please fill in Use / No Use, Although it is set as standard equipment.

Correspondence by AlphaII

1	Input converter	☐650W type ・☐450W type									
		SLOT-1		SLOT-2		SLOT-3		SLOT-4		SLOT-5	
2	Output module										
3	Output setting voltage										
4	Required output current										
5	Required output wattage										
6	Total output wattage										
7	Specified max OCP										
8	Specified min OCP										
9	Config name										
10	Others										