

## Basic Characteristics Data

Model	Circuit method	Switching frequency [kHz]	Input current [A] *1	Inrush current protection	PCB/Pattern			Series/Parallel operation availability *2	
					Material	Single sided	Double sided	Series operation	Parallel operation
PMA15F	Flyback converter	100	0.4	Thermistor	CEM-3	Yes		Yes	No
PMA30F	Flyback converter	100	0.7	Thermistor	CEM-3	Yes		Yes	No
PMA60F	Active filter	60 ~ 550	0.8	Thermistor	CEM-3	Yes		Yes	No
	Forward converter	120							
PMA100F	Active filter	60 ~ 550	1.3	Thermistor	CEM-3	Yes		Yes	No
	Forward converter	120							

\*1 The value of input current is at ACIN 100V and rated load.

\*2 Refer to Instruction Manual 2.

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# 1 Function

## 1.1 Input voltage range

- Input voltage range of the power supplies is from AC85V to AC264V (please see SPECIFICATIONS for details).
- In cases that conform with safety standard, input voltage range is AC100-AC240V (50/60Hz).
- If input value doesn't fall within above range, a unit may not operate in accordance with specifications and/or start hunting or fail. If you need to apply a square waveform input voltage, which is commonly used in UPS and inverters, please contact us.
- When the input voltage changes suddenly, the output voltage accuracy might exceed the specification. Please contact us.

PMA

### ● PMA15F, PMA30F

- A power factor improvement circuit (active filter) is not built-in. If you use multiple units for a single system, standards for input harmonic current may not be satisfied. Please contact us for details.

## 1.2 Inrush current limiting

- An inrush current limiting circuit is built-in.
- If you need to use a switch on the input side, please select one that can withstand an input inrush current.
- Thermistor is used in the inrush current limiting circuit. When you turn the power ON/OFF repeatedly within a short period of time, please have enough intervals so that a power supply cools down before being turned on.

## 1.3 Overcurrent protection

- An overcurrent protection circuit is built-in and activated at 105% of the rated current. A unit automatically recovers when a fault condition is removed. Please do not use a unit in short circuit and/or under an overcurrent condition.
- Intermittent Operation Mode  
When the overcurrent protection circuit is activated and the output voltage drops to a certain extent, the output becomes intermittent so that the average current will also decrease.

## 1.4 Overvoltage protection

- An overvoltage protection circuit is built-in. If the overvoltage protection circuit is activated, shut down the input voltage, wait more than 3 minutes and turn on the AC input again to recover the output voltage. Recovery time varies depending on such factors as input voltage value at the time of the operation.

### Remarks :

Please avoid applying a voltage exceeding the rated voltage to an output terminal. Doing so may cause a power supply to malfunction or fail. If you cannot avoid doing so, for example, if you need to operate a motor, etc., please install an external diode on the output terminal to protect the unit.

## 1.5 Output voltage adjustment

- To increase an output voltage, turn a built-in potentiometer clockwise. To decrease the output voltage, turn it counterclockwise.

## 1.6 Isolation

- For a receiving inspection, such as Hi-Pot test, gradually increase (decrease) the voltage for the start (shut down). Avoid using Hi-Pot tester with the timer because it may generate voltage a few times higher than the applied voltage, at ON/OFF of a timer.

## 1.7 Remote ON/OFF

### ● PMA15F, PMA30F

- These models do not have a remote ON/OFF function.

### ● PMA60F, PMA100F

- Option -R is available to provide a remote ON/OFF function. Please see "4 Option and Others" for details.

# 2 Series Operation and Parallel Operation

- You can use a power supply in series operation. The output current in series operation should be lower than the rated current of a power supply with the lowest rated current among power supplies that are serially connected. Please make sure that no current exceeding the rated current flows into a power supply.

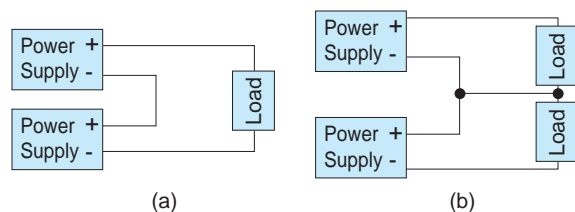


Fig.2.1 Examples of connecting in series operation

- Parallel operation is not possible.
- Redundancy operation is available by wiring as shown below.

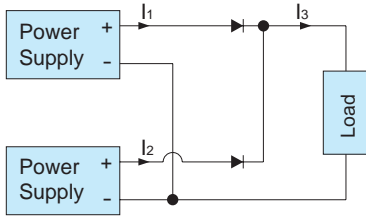


Fig.2.2 Example of redundancy operation

- Even a slight difference in output voltage can affect the balance between the values of  $I_1$  and  $I_2$ . Please make sure that the value of  $I_3$  does not exceed the rated current of a power supply.

$$I_3 \leq \text{the rated current value}$$

# 3 Assembling and Installation Method

## 3.1 Installation method

- Do not insert a screw more than 6mm from the outside of a power supply to keep enough insulation distance between the screw and internal components.

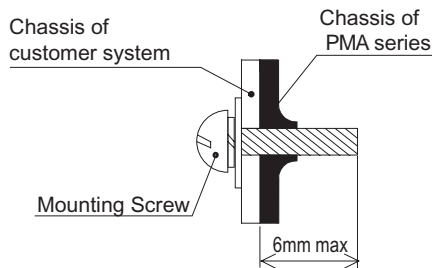


Fig.3.1 Mounting screw

- If you use two or more power supplies side by side, please keep a sufficient distance between them to allow enough air ventilation. Ambient temperature around each power supply should not exceed the temperature range shown in the derating curve.

## 3.2 Derating

- Mounting Method

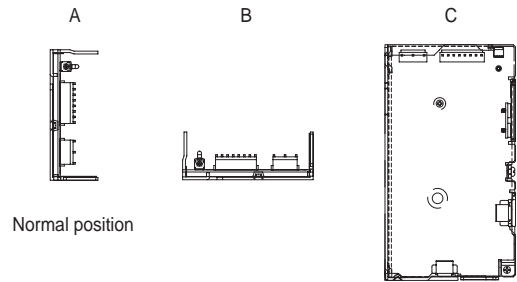


Fig.3.2 Mounting method

- Environment to use it and Installation environment

When using it, it is necessary to radiate heat by the heat of the power supply.

Table 3.1 - 3.4 shows the relation between the upper limit temperature (Point A and Point B) and load factors.

Please consider the ventilation so that the convection which is enough for the whole power supply is provided.

And temperature of Point A and Point B please become lower than upper limit temperature.

The expectancy life in the upper bound temperature (Point A and Point B) is three years or more.

Please refer to External View for the position of Point A and Point B.

**Remarks:**

- \* Please be careful of electric shock or earth leakage in case of temperature measurement, because Point A and Point B is live potential.

PMA

Table 3.1 Temperatures of Point A, Point B PMA15F-□

Mounting Method	Load factor	Max temperature	
		Point A[°C]	Point B[°C]
A	70% < $I_o$ ≤ 100%	72	75
	20% < $I_o$ ≤ 70%	75	77
	$I_o$ ≤ 20%	77	77
B	70% < $I_o$ ≤ 100%	62	62
	20% < $I_o$ ≤ 70%	64	66
	$I_o$ ≤ 20%	66	67
C	70% < $I_o$ ≤ 100%	55	62
	20% < $I_o$ ≤ 70%	58	64
	$I_o$ ≤ 20%	61	63

Table 3.2 Temperatures of Point A, Point B PMA30F-□

Mounting Method	Load factor	Max temperature	
		Point A[°C]	Point B[°C]
A	70% < $I_o$ ≤ 100%	77	83
	20% < $I_o$ ≤ 70%	79	83
	$I_o$ ≤ 20%	80	84
B	70% < $I_o$ ≤ 100%	72	74
	20% < $I_o$ ≤ 70%	70	74
	$I_o$ ≤ 20%	71	74
C	70% < $I_o$ ≤ 100%	66	76
	20% < $I_o$ ≤ 70%	67	75
	$I_o$ ≤ 20%	68	73

Table 3.3 Temperatures of Point A, Point B PMA60F-□

Mounting Method	Load factor	Max temperature	
		Point A[°C]	Point B[°C]
A	70%<lo≤100%	82	76
	20%<lo≤70%	88	81
	lo≤20%	88	83
B	70%<lo≤100%	66	68
	20%<lo≤70%	75	73
	lo≤20%	77	75
C	70%<lo≤100%	64	65
	20%<lo≤70%	71	72
	lo≤20%	73	72

Table 3.4 Temperatures of Point A, Point B PMA100F-□

Mounting Method	Load factor	Max temperature	
		Point A[°C]	Point B[°C]
A	70%<lo≤100%	78	80
	20%<lo≤70%	83	82
	lo≤20%	84	84
B	70%<lo≤100%	64	73
	20%<lo≤70%	70	73
	lo≤20%	73	75
C	70%<lo≤100%	59	76
	20%<lo≤70%	65	76
	lo≤20%	67	74

■The operative ambient temperature is different by with / without case cover or mounting position. Derating curve is shown below.

Note: In the hatched area, the specification of Ripple, Ripple Noise is different from other area.

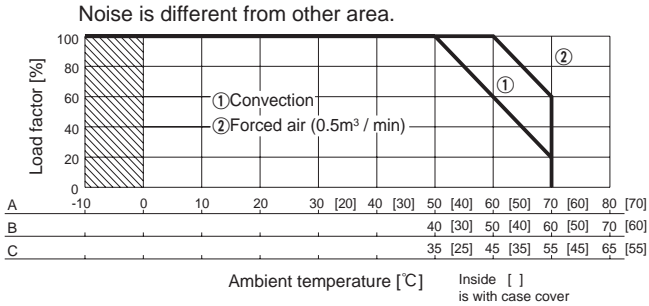


Fig.3.3 Ambient temperature derating curve (refer to Table 3.1-3.4)

● PMA15F, PMA30F

■Input Voltage Derating Curve

Input voltage derating curve is shown in Fig.3.4.

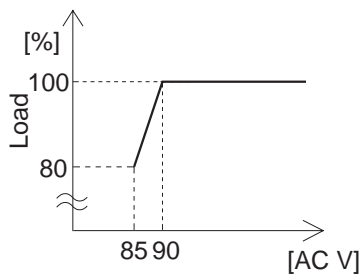


Fig.3.4 Input voltage derating curve

3.3 Expectancy life and warranty

■Expectancy Life.

Please see the following tables for expectancy life.

Table 3.5 Expectancy Life

Mounting Method	Annual Average of Ambient Temperatures	Load Factor	
		50%	100%
A	Ta = 30°C or less	10 years or more	10 years or more
	Ta = 40°C	10 years or more	6 years
	Ta = 50°C	5 years	3 years
B and C	Ta = 20°C or less	10 years or more	10 years or more
	Ta = 30°C	10 years or more	6 years
	Ta = 40°C	5 years	3 years

■Warranty

Table 3.6 Warranty

Mounting Method	Annual Average of Ambient Temperatures	Load Factor	
		50%	100%
A	Ta = 40°C or less	5 years	5 years
	Ta = 50°C	5 years	3 years
B and C	Ta = 30°C or less	5 years	5 years
	Ta = 40°C	5 years	3 years

## 4 Option and Others

### 4.1 Outline of options

- \*Please inquire us for details of specifications and delivery timing.
- \*You can combine multiple options. Some options, however, cannot be combined with other options. Please contact us for details.

#### ● -T

- Option -T units have vertically positioned screws on a terminal block.
- Please contact us for details about appearance.

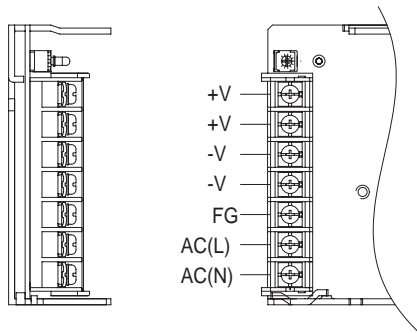


Fig.4.1 Example of option -T (PMA100F)

#### ● -T1

- Option -T1 units have horizontally positioned screws on a terminal block.
- Please contact us for details about appearance.

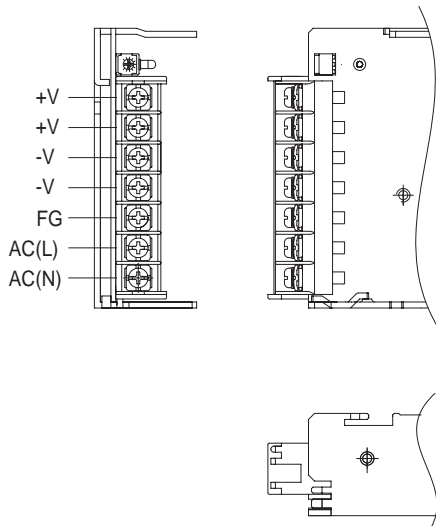


Fig.4.2 Example of option -T1 (PMA100F)

#### ● -N

- Option -N units come with a cover.
- Appearance of Option -N units is different from that of standard units. Please see External View for details.
- Derating curve for Option -N units is different from that for standard units. Please see 3.2 Derating Curve for details.

\*Safety agency approvals will be void if the cover is attached after the unit is ex-factoryed.

#### ● -J1

- Option -J1 units, the Input and Output connector is VH connectors (Mfr. J.S.T.).

#### ● -R (PMA60F, PMA100F)

- You can control output ON/OFF remotely in Option -R units. To do so, connect an external DC power supply and apply a voltage to a remote ON/OFF connector, which is available as option.

Model Name	Built-in Resistor Ri [Ω]	Voltage between RC (+) and RC (-) [V]		Input Current [mA]
		Output ON	Output OFF	
PMA60F PMA100F	780	4.5 - 12.5	0 - 0.5	(20max)

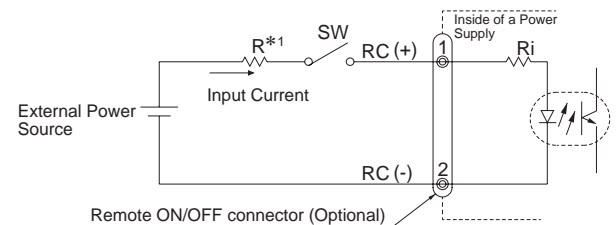


Fig.4.3 Example of using a remote ON/OFF circuit

- Dedicated harnesses are available for your purchase. Please see Optional Parts for details.

\*1 If the output of an external power supply is within the range of 4.5 - 12.5V, you do not need a current limiting resistor R. If the output exceeds 12.5V, however, please connect the current limiting resistor R.

To calculate a current limiting resistance value, please use the following equation.

$$R[\Omega] = \frac{V_{CC} - (1.1 + R_i \times 0.005)}{0.005}$$

\*Please wire carefully. If you wire wrongly, the internal components of a unit may be damaged.

■ Remote ON/OFF circuits (RC+ and RC-) are isolated from input, output and FG.

## 4.2 Others

■ While turning on the electricity, and for a while after turning off, please don't touch the inside of a power supply because there are some hot parts in that.

### ● PMA15F, PMA30F

■ When a mass capacitor is connected with the output terminal (load side), the output might become the stop or an unstable operation. Please contact us for details when you connect the capacitor.