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# 1 Function

## 1.1 Input voltage range

- The range is from 85VAC to 264VAC.  
In cases that conform with safety standard, input voltage range is 100VAC to 240VAC (50/60Hz).  
When DC input is required, Please contact us.
- 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, if the restart time of the short interruption power failure is less than 3seconds, perform a thorough evaluation.
- A unit can operate under the input voltage dip with derating.  
Table 1.1 shows the load factors that can be output.

Table 1.1 Load factor

Model	Input Voltage	
	100VAC→50VAC *	200VAC→100VAC
PDA15F	65%	100%
PDA30F	65%	100%
PDA50F	60%	100%

\*Please avoid using continuously for more than 1 second under above conditions. Doing so may cause a failure (Duty 1s/30s).

- 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 over 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.
- Hiccup Operation Mode  
When the output voltage drops at overcurrent, the average output current is reduced by hiccup operation of power supply. Please contact us for details.

## 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 :

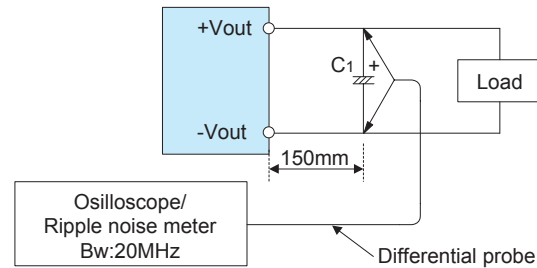
Please avoid applying a voltage exceeding the rated voltage to an output terminal. Doing so may cause a power supply to malfunction or fail. If you cannot avoid doing so, for example, if you need to operate a motor, etc., please install an external diode on the output terminal to protect the unit.

## 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 Output ripple and ripple noise

- Output ripple noise may be influenced by measurement environment, measuring method fig.1.1 is recommended.



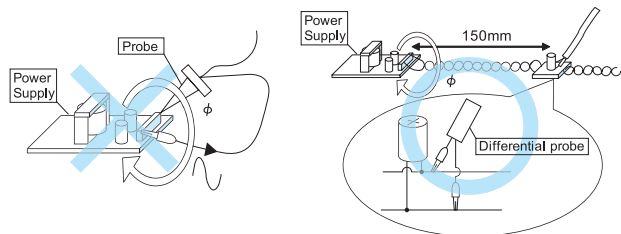
C1 : Aluminum electrolytic capacitor 22μF

Fig.1.1 Measuring method of Ripple and Ripple Noise

Remarks :

When GND cable of probe with flux of magnetic force from power supply are crossing, ripple and ripple noise might not measure correctly.

Please note the measuring environment.



Bad example

Good example

Fig.1.2. Example of measuring output ripple and ripple noise

### 1.7 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.

### 1.8 Reducing standby power

■ Burst operation at light loading, the internal switch element is intermittent operated, and the switching loss is decreased. The specification of the Ripple/Ripple Noise changes by this intermittent operation. The value of the Ripple / Ripple Noise when intermittent operates changes in the input voltage and the output current.

## 2 Series Operation and Parallel Operation

### 2.1 Series 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.

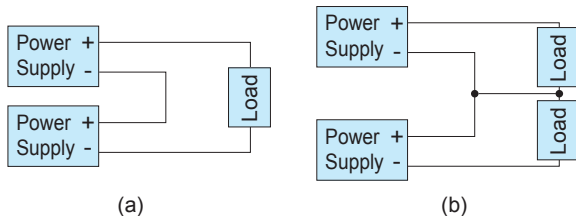


Fig.2.1 Examples of connecting in series operation

### 2.2 Parallel Operation

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

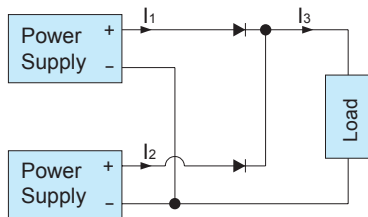


Fig.2.2 Example of redundancy operation

■ 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 Temperature Measurement Point

### ■ Installation environment

When using the power supply it is necessary to allow heat to radiate.

Table 3.1 - 3.8 shows the relation between the upper limit temperature (Point ①, ②) and load factors.

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

Temperature of Point ① and Point ② become lower than upper limit temperature.

The life expectancy when the temperature at points 1 and 2 are at the upper end the warranty is 3 years.

Please refer to External View for the position of Point ①, ②.

### Remark :

Please be careful of electric shock or earth leakage in case of temperature measurement, because Point ①, ② is live potential. Please contact us for details.

Table 3.1 Maximum temperature of measurement points (PDA15F-□)

Cooling Method	Voltage	Mounting Method	Load factor	Maximum temperature [°C]	
				Point ①	Point ②
Convection	5 - 24V	A	75% < $I_o \leq 100\%$	73	71
			$I_o \leq 75\%$	83	81
		B	75% < $I_o \leq 100\%$	73	68
			$I_o \leq 75\%$	87	83
		C	75% < $I_o \leq 100\%$	70	75
			$I_o \leq 75\%$	84	84
Forced air	5 - 24V	A, B, C	$I_o \leq 100\%$	80	80

Table 3.2 Maximum temperature of measurement points (PDA30F-□)

Cooling Method	Voltage	Mounting Method	Load factor	Maximum temperature [°C]	
				Point ①	Point ②
Convection	5 - 24V	A	75% < $I_o \leq 100\%$	75	72
			$I_o \leq 75\%$	85	82
		B	75% < $I_o \leq 100\%$	75	71
			$I_o \leq 75\%$	85	84
		C	60% < $I_o \leq 100\%$	68	72
			$I_o \leq 60\%$	79	82
Forced air	5 - 24V	A, B, C	$I_o \leq 100\%$	80	80

Table 3.3 Maximum temperature of measurement points (PDA50F-□)

Cooling Method	Voltage	Mounting Method	Load factor	Maximum temperature [°C]	
				Point ①	Point ②
Convection	5V	A	50% < $I_o \leq 100\%$	79	84
			$I_o \leq 50\%$	85	84
		B	40% < $I_o \leq 100\%$	79	82
			$I_o \leq 40\%$	89	86
		C	40% < $I_o \leq 100\%$	79	79
			$I_o \leq 40\%$	89	84
	12V, 24V	A	60% < $I_o \leq 100\%$	77	67
			$I_o \leq 60\%$	86	80
		B	50% < $I_o \leq 100\%$	77	66
			$I_o \leq 50\%$	88	81
		C	50% < $I_o \leq 100\%$	77	69
			$I_o \leq 50\%$	89	83
Forced air	5 - 24V	A, B, C	$I_o \leq 100\%$	80	80

## 4 Life expectancy and warranty

### Life Expectancy

Table 4.1 Life Expectancy (PDA15F-□)

Cooling Method	Voltage	Mounting Method	Average ambient temperature (year)	Life Expectancy	
				Io ≤ 75%	75% < Io ≤ 100%
Convection	5 - 24V	A	Ta=45°C or less	10years or more	10years or more
			Ta=55°C	10years or more	10years or more
		B, C	Ta=40°C or less	10years or more	10years or more
			Ta=50°C	10years or more	10years or more
Forced air	5 - 24V	A, B, C	Ta=60°C or less	5years	5years
			Ta=70°C	5years	3years

Table 4.2 Life Expectancy (PDA30F-□)

Cooling Method	Voltage	Mounting Method	Average ambient temperature (year)	Life Expectancy	
				Io ≤ 75%	75% < Io ≤ 100%
Convection	5V	A	Ta=45°C or less	10years or more	10years or more
			Ta=55°C	9years	6years
		B	Ta=40°C or less	10years or more	10years or more
			Ta=50°C	10years or more	7years
		C	Ta=35°C or less	10years or more	10years or more
			Ta=45°C	10years or more	8years
	12, 24V	A	Ta=45°C or less	10years or more	10years or more
			Ta=55°C	10years or more	8years
B		Ta=40°C or less	10years or more	10years or more	
		Ta=50°C	10years or more	10years or more	
C	Ta=35°C or less	10years or more	10years or more		
	Ta=45°C	10years or more	10years or more		
Forced air	5 - 24V	A, B, C	Ta=60°C or less	5years	5years
			Ta=70°C	5years	3years

Table 4.3 Life Expectancy (PDA50F-□)

Cooling Method	Voltage	Mounting Method	Average ambient temperature (year)	Life Expectancy	
				Io ≤ 75%	75% < Io ≤ 100%
Convection	5V	A	Ta=40°C or less	10years or more	6years
			Ta=50°C	6years	3years
		B	Ta=35°C or less	10years or more	7years
			Ta=45°C	7years	4years
		C	Ta=35°C or less	10years or more	8years
			Ta=45°C	8years	4years
	12, 24V	A	Ta=40°C or less	10years or more	10years or more
			Ta=50°C	10years or more	7years
B, C		Ta=35°C or less	10years or more	10years or more	
		Ta=45°C	10years or more	9years	
Forced air	5 - 24V	A, B, C	Ta=60°C or less	5years	5years
			Ta=70°C	5years	3years

### Warranty

Table 4.4 Warranty (PDA15F-□)

Cooling Method	Voltage	Mounting Method	Average ambient temperature (year)	Warranty	
				Io ≤ 75%	75% < Io ≤ 100%
Convection	5 - 24V	A	Ta=45°C or less	5years	5years
			Ta=55°C	5years	3years
		B, C	Ta=40°C or less	5years	5years
			Ta=50°C	5years	3years
Forced air	5 - 24V	A, B, C	Ta=60°C or less	5years	5years
			Ta=70°C	5years	3years

Table 4.5 Warranty (PDA30F-□)

Cooling Method	Voltage	Mounting Method	Average ambient temperature (year)	Warranty	
				Io ≤ 75%	75% < Io ≤ 100%
Convection	5 - 24V	A	Ta=45°C or less	5years	5years
			Ta=55°C	5years	3years
		B	Ta=40°C or less	5years	5years
			Ta=50°C	5years	3years
		C	Ta=35°C or less	5years	5years
			Ta=45°C	5years	3years
Forced air	5 - 24V	A, B, C	Ta=60°C or less	5years	5years
			Ta=70°C	5years	3years

Table 4.6 Warranty (PDA50F-□)

Cooling Method	Voltage	Mounting Method	Average ambient temperature (year)	Warranty	
				Io ≤ 75%	75% < Io ≤ 100%
Convection	5 - 24V	A	Ta=40°C or less	5years	5years
			Ta=50°C	5years	3years
		B, C	Ta=35°C or less	5years	5years
			Ta=45°C	5years	3years
Forced air	5 - 24V	A, B, C	Ta=60°C or less	5years	5years
			Ta=70°C	5years	3years

## 5 Ground

- When installing the power supply with your unit, ensure that the two mounting hole (M3) FG is connected to safety ground of the unit.
- It is recommended to electrically connect terminal FG and mounting hole FG to metal chassis for reducing noise.

## 6 Options and Others

### 6.1 Outline of Options

#### Option -N

- Option -N models come with a cover.
- Appearance of Option -N models are different from that of standard models. Please see External View for details.
- Derating curve for Option -N models is different from that for standard models. Please see "Derating" for details.

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

#### Maximum temperature of measurement points

Table 6.1 Maximum temperature of measurement points (PDA15F-□-N)

Cooling Method	Voltage	Mounting Method	Load factor	Maximum temperature [°C]		
				Point ①	Point ②	
Convection	5 - 24V	A	75% < Io ≤ 100%	70	69	
			Io ≤ 75%	85	82	
			70% < Io ≤ 100%	70	63	
		B	Io ≤ 70%	84	80	
			C	70% < Io ≤ 100%	67	69
				Io ≤ 70%	83	84
Forced air	5 - 24V	A, B, C	Io ≤ 100%	80	80	

**Table 6.2 Maximum temperature of measurement points (PDA30F-□-N)**

Cooling Method	Voltage	Mounting Method	Load factor	Maximum temperature [°C]	
				Point ①	Point ②
Convection	5 - 24V	A	70%<lo≤100%	73	69
			lo≤70%	86	84
		B	60%<lo≤100%	68	64
			lo≤60%	84	84
		C	50%<lo≤100%	63	66
			lo≤50%	81	84
Forced air	5 - 24V	A, B, C	lo≤100%	80	80

**Table 6.3 Maximum temperature of measurement points (PDA50F-□-N)**

Cooling Method	Voltage	Mounting Method	Load factor	Maximum temperature [°C]	
				Point ①	Point ②
Convection	5V	A	40%<lo≤100%	74	83
			lo≤40%	83	81
		B	40%<lo≤100%	87	84
			lo≤40%	87	81
		C	40%<lo≤100%	74	79
			lo≤40%	85	81
	12V, 24V	A	50%<lo≤100%	77	67
			lo≤50%	88	82
		B	30%<lo≤100%	85	63
			lo≤30%	86	75
		C	40%<lo≤100%	77	71
			lo≤40%	85	81
Forced air	5 - 24V	A, B, C	lo≤100%	80	80

**Life Expectancy**
**Table 6.4 Life Expectancy (PDA15F-□-N)**

Cooling Method	Voltage	Mounting Method	Average ambient temperature (year)	Life Expectancy	
				lo≤75%	75%<lo≤100%
Convection	5 - 24V	A	Ta=40°C or less	10years or more	10years or more
			Ta=50°C	10years or more	10years or more
		B, C	Ta=35°C or less	10years or more	10years or more
			Ta=45°C	10years or more	10years or more
Forced air	5 - 24V	A, B, C	Ta=60°C or less	5years	5years
			Ta=70°C	5years	3years

**Table 6.5 Life Expectancy (PDA30F-□-N)**

Cooling Method	Voltage	Mounting Method	Average ambient temperature (year)	Life Expectancy	
				lo≤75%	75%<lo≤100%
Convection	5V	A	Ta=40°C or less	10years or more	10years or more
			Ta=50°C	10years or more	7years
		B, C	Ta=30°C or less	10years or more	10years or more
			Ta=40°C	10years or more	9years
	12, 24V	A	Ta=40°C or less	10years or more	10years or more
			Ta=50°C	10years or more	9years
B, C	Ta=30°C or less	10years or more	10years or more		
	Ta=40°C	10years or more	10years or more		
Forced air	5 - 24V	A, B, C	Ta=60°C or less	5years	5years
			Ta=70°C	5years	3years

**Table 6.6 Life Expectancy (PDA50F-□-N)**

Cooling Method	Voltage	Mounting Method	Average ambient temperature (year)	Life Expectancy	
				lo≤75%	75%<lo≤100%
Convection	5V	A	Ta=30°C or less	10years or more	8years
			Ta=40°C	7years	3years
		B	Ta=30°C or less	10years or more	6years
			Ta=40°C	7years	3years
		C	Ta=25°C or less	10years or more	10years or more
			Ta=35°C	9years	5years
	12, 24V	A	Ta=35°C or less	10years or more	10years or more
			Ta=45°C	10years or more	7years
		B	Ta=30°C or less	10years or more	8years
			Ta=40°C	10years or more	4years
		C	Ta=30°C or less	10years or more	10years or more
			Ta=40°C	10years or more	8years
Forced air	5 - 24V	A, B, C	Ta=60°C or less	5years	5years
			Ta=70°C	5years	3years

**Warranty**
**Table 6.7 Warranty (PDA15F-□-N)**

Cooling Method	Voltage	Mounting Method	Average ambient temperature (year)	Warranty	
				lo≤75%	75%<lo≤100%
Convection	5 - 24V	A	Ta=40°C or less	5years	5years
			Ta=50°C	5years	3years
		B, C	Ta=35°C or less	5years	5years
			Ta=45°C	5years	3years
Forced air	5 - 24V	A, B, C	Ta=60°C or less	5years	5years
			Ta=70°C	5years	3years

**Table 6.8 Warranty (PDA30F-□-N)**

Cooling Method	Voltage	Mounting Method	Average ambient temperature (year)	Warranty	
				lo≤75%	75%<lo≤100%
Convection	5 - 24V	A	Ta=40°C or less	5years	5years
			Ta=50°C	5years	3years
		B, C	Ta=30°C or less	5years	5years
			Ta=40°C	5years	3years
Forced air	5 - 24V	A, B, C	Ta=60°C or less	5years	5years
			Ta=70°C	5years	3years

**Table 6.9 Warranty (PDA50F-□-N)**

Cooling Method	Voltage	Mounting Method	Average ambient temperature (year)	Warranty	
				lo≤75%	75%<lo≤100%
Convection	5V	A, B	Ta=30°C or less	5years	5years
			Ta=40°C	5years	3years
		C	Ta=25°C or less	5years	5years
			Ta=35°C	5years	3years
	12, 24V	A	Ta=35°C or less	5years	5years
			Ta=45°C	5years	3years
B, C	Ta=30°C or less	5years	5years		
	Ta=40°C	5years	3years		
Forced air	5 - 24V	A, B, C	Ta=60°C or less	5years	5years
			Ta=70°C	5years	3years

## 6.2 Output side attaching external capacitor

- Depending on the capacitance of the external capacitor, resonance may occur due to ESR, ESL, and wiring inductance, so please be careful of ripple increase.
- If the external capacitor is too large, the power supply might not start up.

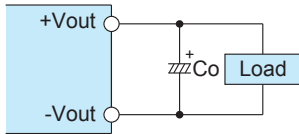


Fig.6.2 Output side external capacitor connection method

Table 6.2 Connectable External capacitor on the output side [ $\mu$ F]

Model	PDA15F	PDA30F	PDA50F
Output voltage			
5V	0 to 10,000	0 to 10,000	0 to 10,000
12V	0 to 4,700	0 to 6,800	0 to 2,800
24V	0 to 2,000	0 to 1,800	0 to 2,800