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 failvre 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%
PDA100F	50%	100%
PDA150F	50%	100%
PDA300F	-	100%
PDA600F	-	100%

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

● PDA15F, PDA30F, PDA50F

■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.

● PDA15F, PDA30F, PDA50F, PDA100F, PDA150F, PDA300F

■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.

● PDA600F

■Thyristor technique 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 the inrush current limiting circuit becomes operative.

■When the switch of the input is turned on, the primary inrush current and secondary inrush current will be generated because the thyristor technique is used for the inrush current limiting circuit.

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 Thermal Protection

● PDA300F,PDA600F

■A thermal protection circuit is built-in.
The thermal protection circuit may be activated under following conditions and shut down the output.
① When a current and a temperature continue to exceed the values determined by the derating curve.
② When a fan stops or air flow is blocked from the fan and weakens.
If the thermal protection circuit is activated, shut off the input voltage and eliminate all the overheating conditions. To recover the output voltage, have enough time to cool down the unit before turning on the input voltage again.

1.6 Output voltage adjustment

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

● PDA300F,PDA600F

■The power supplies have an external output voltage control function.

The output voltage can be adjusted from almost 0V.

You can calculate the output voltage in this case from formula 1 below.

Please note that the formula 1 gives you only an estimate.

Please contact us if you need accurate numbers.

$$\text{Output voltage} = \frac{\text{The voltage between TRM and -S}}{2.5\ [\text{V}]} \times \text{rated output voltage} \cdots ①$$

Please do not apply an external voltage of −0V or less or 3.0V or more.

There is more than one method to adjust the output voltage, including the methods to use external resistors and external power supplies. Since each method has different characteristic, please contact us for details.

■If the terminal TRM opens while the external output voltage control function is in use, a unit generates the rated voltage.

If the terminal VB and the terminal -S are connected and the terminal TRM opens as shown in Fig.1.1, the unit stops generating the output voltage.

■You can change the control voltage of TRM from 0 - 2.75V to 0 - 5.5V by serially connecting 1.73Ω to the TRM terminal as shown in Fig.1.2.

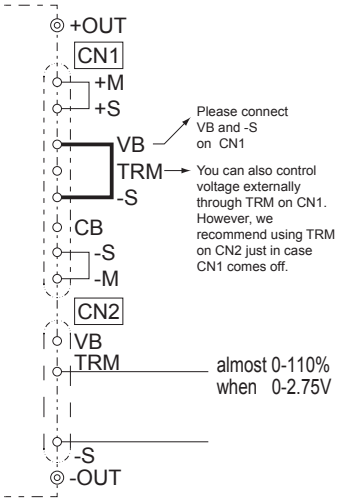


Fig.1.1 Wiring 1

(When TRM control voltage is 0 - 2.75V)

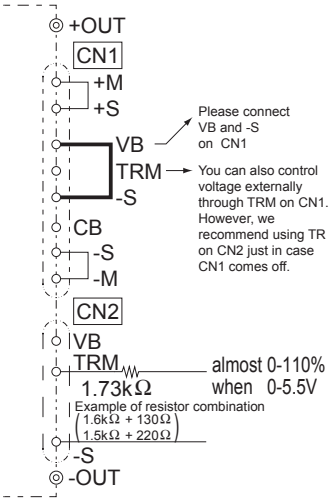


Fig.1.2 Wiring 2

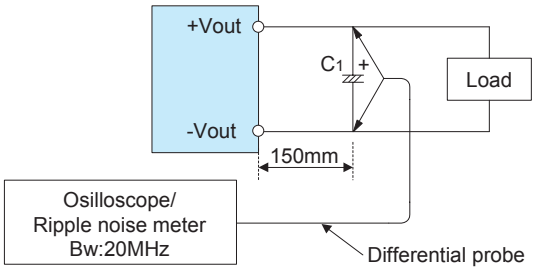
(When TRM control voltage is 0 - 5.5V)

■If the output voltage decreases to almost 0V, a fan may stop, output ripple may become large and PG signals may turn to “High.”

■Please do not change TRM voltage rapidly.

1.7 Output ripple and ripple noise

■Output ripple noise may be influenced by measurement environment, measuring method fig.1.3 is recommended.



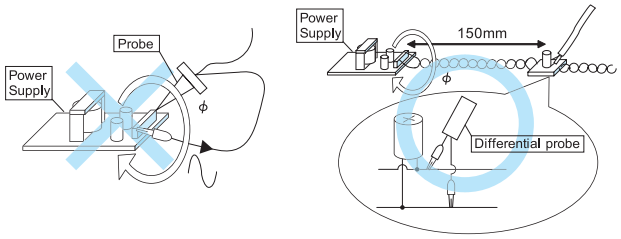
C1 : Aluminum electrolytic capacitor 22μF

Fig.1.3 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.1.4. Example of measuring output ripple and ripple noise

1.8 Remote ON/OFF

● PDA300F,PDA600F

■These models have a remote ON/OFF function.

You can operate the remote ON/OFF function by sending signals to CN1. Please see Table 1.2 for specifications and Fig.1.5 for connecting examples.

■Remote ON/OFF circuits (RC2 and RCG) are isolated from input, output, FG and AUX.

■Please note the followings when using the remote ON/OFF function.

①The output stops when a current flows to RC.

②The current flown to RC is a 5mA type (maximum 12mA).

③If the output voltage is turned off through the remote ON/OFF circuit, the built-in fan stops.

④If the output voltage is turned off through the remote ON/OFF circuit, PG signals turn to “High.”

⑤Description in this section is based on the assumption that you will use one unit alone. If you are planning to use the units in parallel operation or use multiple units for a single system, please check necessary voltage and current values.

⑧If voltage or current of a value not listed in Table 1.2 is applied between RC2 and RCG, the output voltage may not be generated normally.

Table 1.2 Specifications of remote ON/OFF

Connection method		Fig.1.5 (a)	Fig.1.5 (b)	Fig.1.5 (c)
SW Logic	Output on	SW open (0.1mA max)	SW open (0.1mA max)	SW close (0.5V max)
	Output off	SW close (3mA min)	SW close (3mA min)	SW open (0.1mA max)
pin		RCG	AUXG	RCG, AUXG
Optional harness		·H-SN-20 (or H-SN-21)	·H-SN-20 (or H-SN-21) ·H-SN-22 Both needed	·H-SN-20 (or H-SN-21) ·H-SN-24 Both needed

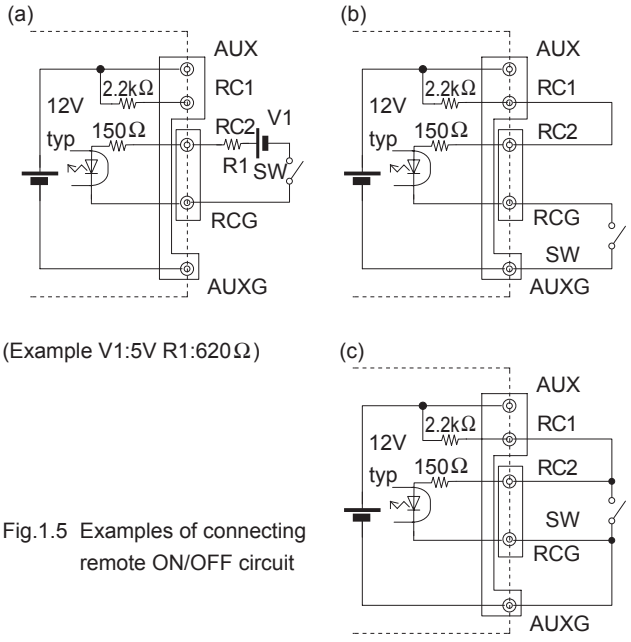


Fig.1.5 Examples of connecting remote ON/OFF circuit

1.9 Remote Sensing

● PDA300F, PDA600F

■These models have a built-in remote sensing function.
If you do not use the remote sensing function, you can short out between +S and +M and between -S and -M on CN1.
When the power supplies are shipped from a factory, they come with a dedicated harness (H-SN-19) being mounted on CN1. If you do not use the remote sensing function, you can use the power supplies as they are.

■Please see Fig.1.6 if you do not use the remote sensing function.
Please see Fig.1.7 if you use the remote sensing function.

■When you use the remote sensing function, please wire from +S and -S on CN1. Harnesses are available for your purchase. Please contact us for details.

■When you use the remote sensing, please note the followings.

①Wire carefully. When a connection of a load line becomes loose (due to such factors as loose screw), the load current flows to the sensing line and internal circuits of the power supply may be damaged.

②Use a sufficiently thick wire to connect between the power supply and the load and keep the line drop at 0.3V or below.

③If the sensing line is long, connect C1 and R1.

④Use a twisted pair wire or a shielded wire as the sensing line.

⑤Do not draw the output current from +M, -M, +S or -S.

⑥When the remote sensing function is used, the output voltage of the power supply may show an oscillating waveform or the output voltage may dramatically fluctuate because of an impedance of wiring and load conditions.
Please check and evaluate carefully before using the remote sensing function.
If the output voltage becomes unstable, we suggest you to try the followings.

・Remove the remote sensing line on the minus side and short out between -S and -M.
・Connect C1, R1 and R2.

Please contact us for details.

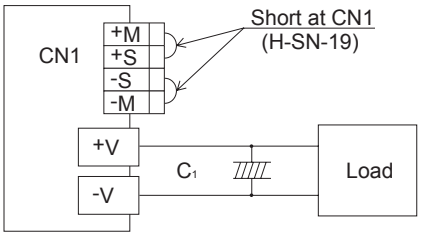


Fig.1.6 When not using remote sensing function

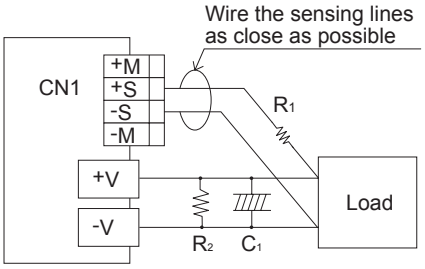


Fig.1.7 When using remote sensing function

1.10 Alarms

● PDA300F, PDA600F

■Alarms (PG signal) are generated from CN3. Please see Table 1.3 for the functions of the alarms. The objective of the PG signals is to detect whether or not a certain function of a power supply is working. It takes several seconds to generate the alarm signals and the timing when the alarm signals are generated is inconsistent.
Please check if the objective of the alarm is achieved.

Table 1.3 Description of the alarms (PG signal)

	Alarm	Output of Alarm
PG	The PG signals are "Low" when the power supply operates normally. The signals turn "High" when the fan stops or the power supply stops as a result of output voltage decrease/stop, activation of thermal protection, overvoltage protection or overcurrent protection functions.	Open collector method Good: Low (0-0.5V max at 10mA) Bad : High or Open 50V max

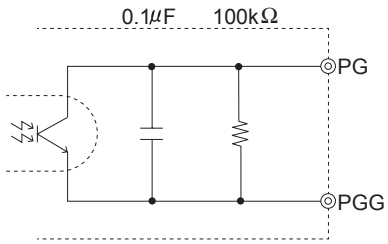


Fig.1.8 Internal circuit of PG

■Please note the followings when you use the alarms (PG signal).

①The time it takes until the PG signals turn "High" vary depending on models and conditions.

PDA300F and PDA600F ….. less than 1 second

②If the output voltage is turned off through a remote ON/OFF circuit,the PG signals turn "High".

③If the output voltage is decreased to almost 0V or decreased rapidly through an external adjustment mechanism, The PG signal may turn "High".

■The PG signal (Alarm) circuit is isolated from input, output, FG, RC and AUX.

1.11 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.

■When you test a unit for isolation between the input and output, input and the terminal FG or between the output and the terminal FG, short-circuit between the output and the terminals RCG, PGG and AUXG.

1.12 Reducing standby power

● PDA15F, PDA30F, PDA50F, PDA100F, PDA150F

■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 Peak Current

● PDA300F-24, PDA600F-24

■The units can generate the peak current under the following conditions.

・AC170 - 264V

・$I_{rms}^2 = \dfrac{I_P^2 t_1 + I_L^2 t_2}{t_1 + t_2}$

・$t_1 \leqq 10$ [sec]

・$I_p \leqq$ Rated peak current [A]

・$I_{rms} \leqq$ Rated current [A]

・$\text{Duty} = \dfrac{t_1}{t_1 + t_2} \times 100[\%] \leqq 35[\%]$

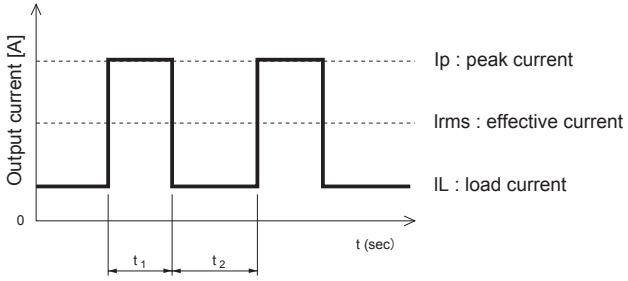


Fig.2.1 Peak current

3 Series Operation and Parallel Operation

3.1 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.

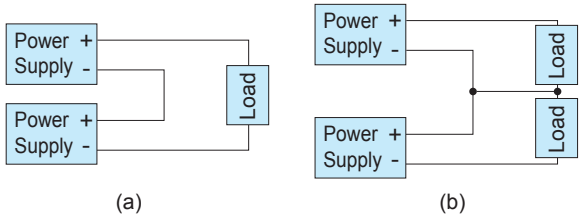


Fig.3.1 Examples of connecting in series operation

■The combined output voltage of series operation is 200V.

3.2 Parallel Operation/Master-slave Operation

● PDA15F, PDA30F, PDA50F, PDA100F, PDA150F

■Parallel operation is not possible.

■Redundancy operation is available by wiring as shown below.

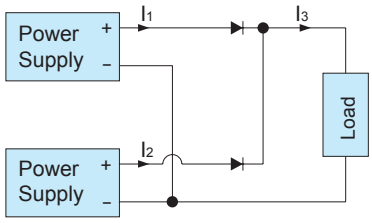


Fig.3.2 Example of redundancy operation

■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.

$I_3 \leqq$ the rated current value

● PDA300F, PDA600F

■You can use the power supplies in parallel operation by connecting units as shown in Fig.3.3.
Please parallelly connect ±S, VB and CB of each power supply in parallel operation and connect ±S and ±M on CN1 of the master power supply.
When the power supplies are shipped from a factory, they come with a dedicated harness (H-SN-19) being mounted on CN1.
Please remove the dedicated harness (H-SN-19), which is mounted on CN1 of the slave power supply, and use an optional harness, H-PA-3, to connect ±S, VB and CB parallelly.
Differences in the output current values among the power supplies in parallel connection are 10% at most. Please make sure that the sum of the output current values does not exceed a value obtained from the right side of the following equation.

(Output current in parallel operation)
= (Rated current per unit) × (Number of unit) ×0.9

■When the number of units in parallel operation increases, the input current also increases. Please design input circuitry (including circuit pattern, wiring and current capacity for equipment) carefully.

■Please make sure that the wiring impedance of a load from each power supply becomes even. Otherwise, the output current balance circuit may become inoperative.

■The maximum number of units you can use in parallel operation is 5.

■You can adjust the output voltage in parallel operation by adjusting a potentiometer of just one power supply.
To do so, select one power supply as the master unit and turn the potentiometers of the other (slave) power supplies clockwise to the end.
Once you have done this, you can adjust the output voltage by turning the potentiometer of the master unit.

■If you use the remote sensing function in parallel operation, connect parallelly +S and −S of slave power supplies must be connected to master and connect the sensing wire from the master unit to the load.

■You cannot parallelly operate power supplies with different output voltage or electrical power.

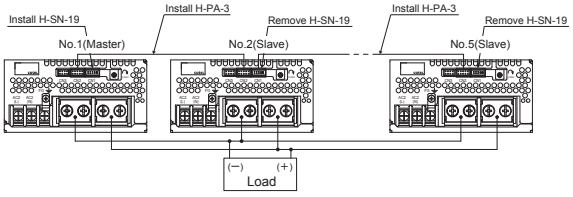


Fig.3.3 Example of parallel connection(PDA600F)

3.3 N+1 Parallel Redundancy Operation

● PDA300F,PDA600F

■You can have N+1 redundancy operation for improved system reliability.

■If you add one extra power supply in parallel operation, even if one of the power supplies in your system fails, the remaining non-failed power supplies continue to sustain the system. If one of the power supplies stops operating, the output voltage may change about 5%.

■When unit replacement is required due to unit failure, input voltage for all units must be cut off.

■After replacement, please make sure that all wirings are completed correctly, before re-applying input voltage.
Hot-swap or Hot-plug is not available.

■If 2 or more units failed, sufficient power could not be provided to the system. Therefore, please replace the failed unit immediately in case where unit failure is found.

■If you have any questions about series, parallel and N+1 redundancy operations, please contact us.

4 Temperature Measurement Point

● PDA15F, PDA30F, PDA50F, PDA100F, PDA150F

■Installation environment

When using the power supply it is necessary to allow heat to radiate.
Table 4.1 - 4.3 shows the relation between the upper limit temperature (Point ①, ②) and load factors whereas table 4.4, 4.5 shows the relation between the upper limit temperature (Point ①) 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 4.1 Maximum temperature of measurement points (PDA15F-□)

Cooling Method	Voltage	Mounting Method	Load factor	Maximum temperature [℃]	
				Point ①	Point ②
Convection	3.3 - 24V	A	75%<Io≦100%	73	71
			Io≦75%	83	81
		B	75%<Io≦100%	73	68
			Io≦75%	87	83
		C	75%<Io≦100%	70	75
			Io≦75%	84	84
Forced air	3.3 - 24V	A, B, C	Io≦100%	80	80

Table 4.2 Maximum temperature of measurement points (PDA30F-□)

Cooling Method	Voltage	Mounting Method	Load factor	Maximum temperature [℃]	
				Point ①	Point ②
Convection	3.3 - 24V	A	75%<Io≦100%	75	72
			Io≦75%	85	82
		B	75%<Io≦100%	75	71
			Io≦75%	85	84
		C	60%<Io≦100%	68	72
			Io≦60%	79	82
Forced air	3.3 - 24V	A, B, C	Io≦100%	80	80

Table 4.3 Maximum temperature of measurement points (PDA50F-□)

Cooling Method	Voltage	Mounting Method	Load factor	Maximum temperature [℃]	
				Point ①	Point ②
Convection	5V	A	50%<Io≦100%	79	84
			Io≦50%	85	84
		B	40%<Io≦100%	79	82
			Io≦40%	89	86
		C	40%<Io≦100%	79	79
			Io≦40%	89	84
	3.3V, 12 - 48V	A	60%<Io≦100%	77	67
			Io≦60%	86	80
		B	50%<Io≦100%	77	66
			Io≦50%	88	81
		C	50%<Io≦100%	77	69
			Io≦50%	89	83
Forced air	3.3 - 48V	A, B, C	Io≦100%	80	80

Table 4.4 Maximum temperature of measurement point (PDA100F-□)

Cooling Method	Voltage	Mounting Method	Load factor	Maximum temperature [℃]
				Point ①
Convection	3.3 - 48V	A	40%<Io≦100%	82
			Io≦40%	85
		B	40%<Io≦100%	69
			Io≦40%	75
		C	40%<Io≦100%	72
			Io≦40%	76
Forced air	3.3 - 48V	A, B, C	Io≦100%	80

Table 4.5 Maximum temperature of measurement point (PDA150F-□)

Cooling Method	Voltage	Mounting Method	Load factor	Maximum temperature [℃]
				Point ①
Convection	5V	A	40%<Io≦100%	88
			Io≦40%	86
		B	40%<Io≦100%	81
			Io≦40%	86
		C	40%<Io≦100%	86
			Io≦40%	88
	3.3V, 12 - 48V	A	40%<Io≦100%	88
			Io≦40%	86
		B	40%<Io≦100%	80
			Io≦40%	80
		C	40%<Io≦100%	86
			Io≦40%	80
Forced air	3.3 - 48V	A, B, C	Io≦100%	80

5 Life Expectancy and Warranty

■Life Expectancy

● PDA15F, PDA30F, PDA50F, PDA100F, PDA150F

Table 5.1 Life Expectancy (PDA15F-□)

Cooling Method	Voltage	Mounting Method	Average ambient temperature (year)	Life Expectancy	
				Io≦75%	75%<Io≦100%
Convection	3.3 - 24V	A	Ta=45℃ or less	10years or more	10years or more
			Ta=55℃	10years or more	10years or more
		B, C	Ta=40℃ or less	10years or more	10years or more
			Ta=50℃	10years or more	10years or more
Forced air	3.3 - 24V	A, B, C	Ta=60℃ or less	5years	5years
			Ta=70℃	5years	3years

Table 5.2 Life Expectancy (PDA30F-□)

Cooling Method	Voltage	Mounting Method	Average ambient temperature (year)	Life Expectancy	
				Io≦75%	75%<Io≦100%
Convection	3.3, 5V	A	Ta=45℃ or less	10years or more	10years or more
			Ta=55℃	9years	6years
		B	Ta=40℃ or less	10years or more	10years or more
			Ta=50℃	10years or more	7years
		C	Ta=35℃ or less	10years or more	10years or more
			Ta=45℃	10years or more	8years
	12, 15, 24V	A	Ta=45℃ or less	10years or more	10years or more
			Ta=55℃	10years or more	8years
		B	Ta=40℃ or less	10years or more	10years or more
			Ta=50℃	10years or more	10years or more
		C	Ta=35℃ or less	10years or more	10years or more
			Ta=45℃	10years or more	10years or more
Forced air	3.3 - 24V	A, B, C	Ta=60℃ or less	5years	5years
			Ta=70℃	5years	3years

Table 5.3 Life Expectancy (PDA50F-□)

Cooling Method	Voltage	Mounting Method	Average ambient temperature (year)	Life Expectancy	
				Io≦75%	75%<Io≦100%
Convection	3.3V	A	Ta=40℃ or less	10years or more	7years
			Ta=50℃	7years	4years
		B	Ta=35℃ or less	10years or more	9years
			Ta=45℃	10years or more	5years
		C	Ta=35℃ or less	10years or more	10years or more
			Ta=45℃	10years or more	6years
	5V	A	Ta=40℃ or less	10years or more	6years
			Ta=50℃	6years	3years
		B	Ta=35℃ or less	10years or more	7years
			Ta=45℃	7years	4years
		C	Ta=35℃ or less	10years or more	8years
			Ta=45℃	8years	4years
	12, 15, 24V	A	Ta=40℃ or less	10years or more	10years or more
			Ta=50℃	10years or more	7years
		B, C	Ta=35℃ or less	10years or more	10years or more
			Ta=45℃	10years or more	9years
	36, 48V	A	Ta=40℃ or less	10years or more	9years
			Ta=50℃	7years	5years
		B, C	Ta=35℃ or less	10years or more	10years or more
			Ta=45℃	10years or more	6years
Forced air	3.3 - 48V	A, B, C	Ta=60℃ or less	5years	5years
			Ta=70℃	5years	3years

Table 5.4 Life Expectancy (PDA100F-□)

Cooling Method	Voltage	Mounting Method	Average ambient temperature (year)	Life Expectancy	
				Io≦50%	50%<Io≦100%
Convection	3.3 - 24V	A	Ta=40℃ or less	10years or more	6years
			Ta=50℃	10years or more	3years
		B, C	Ta=35℃ or less	10years or more	10years or more
			Ta=45℃	10years or more	6years
	36, 48V	A	Ta=40℃ or less	10years or more	6years
			Ta=50℃	10years or more	3years
		B, C	Ta=35℃ or less	10years or more	9years
			Ta=45℃	10years or more	6years
Forced air	3.3 - 48V	A, B, C	Ta=60℃ or less	5years	5years
			Ta=70℃	5years	3years

Table 5.5 Life Expectancy (PDA150F-□)

Cooling Method	Voltage	Mounting Method	Average ambient temperature (year)	Life Expectancy	
				Io≦50%	50%<Io≦100%
Convection	3.3V	A	Ta=40℃ or less	10years or more	7years
			Ta=50℃	10years or more	4years
		B	Ta=30℃ or less	10years or more	10years or more
			Ta=40℃	10years or more	6years
		C	Ta=30℃ or less	10years or more	8years
			Ta=40℃	10years or more	4years
	5V	A	Ta=30℃ or less	10years or more	8years
			Ta=40℃	10years or more	4years
		B, C	Ta=25℃ or less	10years or more	7years
			Ta=35℃	9years	4years
	12, 15, 24V	A	Ta=35℃ or less	10years or more	10years or more
			Ta=40℃ or less	10years or more	7years
			Ta=50℃	9years	3years
		B, C	Ta=30℃ or less	10years or more	10years or more
			Ta=40℃	10years or more	6years
	36, 48V	A	Ta=40℃ or less	10years or more	6years
			Ta=50℃	9years	3years
		B, C	Ta=30℃ or less	10years or more	10years or more
			Ta=40℃	10years or more	6years
Forced air	3.3, 5V	A, B, C	Ta=60℃ or less	10years or more	10years or more
			Ta=70℃	6years	6years
	12 - 48V	A, B, C	Ta=60℃ or less	5years	5years
			Ta=70℃	5years	3years

Table5.6 Life Expectancy (PDA300F-□,PDA600F-□)

	Annual Average of Ambient Temperatures	Load Factor	
		50%	100%
ALL Mounting Methods	Ta=40℃ or less	7years✻	7years✻
	Ta=50℃	6years✻	5years

✻ Values with ✻ are based on the assumption that fan maintenance will be properly done.

■The estimated lifespan of the fans (R(t) = 90%) varies depending on use conditions as show in Fig.5.1, Fig.5.2.

● PDA300F, PDA600F

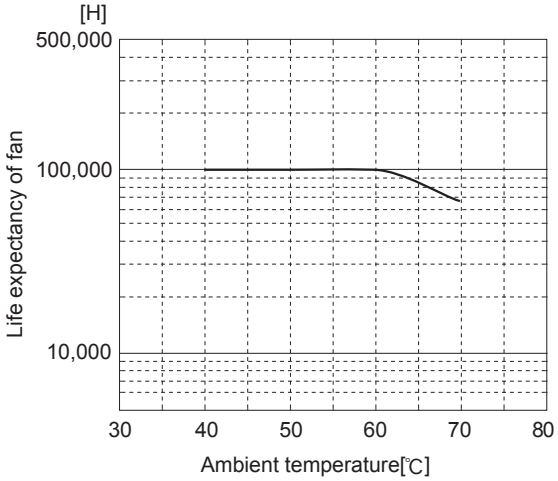


Fig.5.1 Life expectancy of fan (PDA300F)

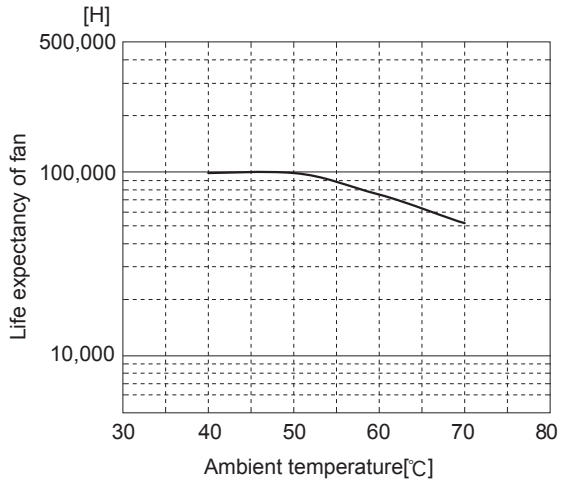


Fig.5.2 Life expectancy of fan (PDA600F)

● PDA15F, PDA30F, PDA50F, PDA100F, PDA150F

■Warranty

Table 5.7 Warranty (PDA15F-□)

Cooling Method	Voltage	Mounting Method	Average ambient temperature (year)	Warranty	
				Io≦75%	75%<Io≦100%
Convection	3.3 - 24V	A	Ta=45℃ or less	5years	5years
			Ta=55℃	5years	3years
		B, C	Ta=40℃ or less	5years	5years
			Ta=50℃	5years	3years
Forced air	3.3 - 24V	A, B, C	Ta=60℃ or less	5years	5years
			Ta=70℃	5years	3years

Table 5.8 Warranty (PDA30F-□)

Cooling Method	Voltage	Mounting Method	Average ambient temperature (year)	Warranty	
				Io≦75%	75%<Io≦100%
Convection	3.3 - 24V	A	Ta=45℃ or less	5years	5years
			Ta=55℃	5years	3years
		B	Ta=40℃ or less	5years	5years
			Ta=50℃	5years	3years
		C	Ta=35℃ or less	5years	5years
			Ta=45℃	5years	3years
Forced air	3.3 - 24V	A, B, C	Ta=60℃ or less	5years	5years
			Ta=70℃	5years	3years

Table 5.9 Warranty (PDA50F-□)

Cooling Method	Voltage	Mounting Method	Average ambient temperature (year)	Warranty	
				Io≦75%	75%<Io≦100%
Convection	3.3 - 48V	A	Ta=40℃ or less	5years	5years
			Ta=50℃	5years	3years
		B, C	Ta=35℃ or less	5years	5years
			Ta=45℃	5years	3years
Forced air	3.3 - 48V	A, B, C	Ta=60℃ or less	5years	5years
			Ta=70℃	5years	3years

Table 5.10 Warranty (PDA100F-□)

Cooling Method	Voltage	Mounting Method	Average ambient temperature (year)	Warranty	
				Io≦50%	50%<Io≦100%
Convection	3.3 - 48V	A	Ta=40℃ or less	5years	5years
			Ta=50℃	5years	3years
		B, C	Ta=30℃ or less	5years	5years
			Ta=40℃	5years	3years
Forced air	3.3 - 48V	A, B, C	Ta=60℃ or less	5years	5years
			Ta=70℃	5years	3years

Table 5.11 Warranty (PDA150F-□)

Cooling Method	Voltage	Mounting Method	Average ambient temperature (year)	Warranty	
				Io≦50%	50%<Io≦100%
Convection	5V	A	Ta=30℃ or less	5years	5years
			Ta=40℃	5years	3years
		B, C	Ta=25℃ or less	5years	5years
			Ta=35℃	5years	3years
	3.3V, 12 - 48V	A	Ta=40℃ or less	5years	5years
			Ta=50℃	5years	3years
		B, C	Ta=30℃ or less	5years	5years
			Ta=40℃	5years	3years
Forced air	3.3 - 48V	A, B, C	Ta=60℃ or less	5years	5years
			Ta=70℃	5years	3years

● PDA300F, PDA600F

■The warranty period is 5 years if a power supply is used within a derating curve.

6 Ground

■It is recommended to electrically connect terminal FG and mounting hole FG to metal chassis for reducing noise.

● PDA15F, PDA30F, PDA50F

■When installing the power supply with your unit, ensure that the two mounting hole (M3) FG is connected to safety ground of the unit.

7 Others

7.1 Output Current Monitor

● PDA300F,PDA600F

■You can monitor an output current by measuring a voltage between the terminal CB and the terminal -S on either CN1 or CN2.

■Fig.7.1 shows the relationship between the voltage of the terminal CB and the output current.

Fig.7.1 shows a typical characteristic of PDA600F-12. Please contact us for the characteristics of the other models.

The output current shown in Fig.7.1 should be used only as a guide.

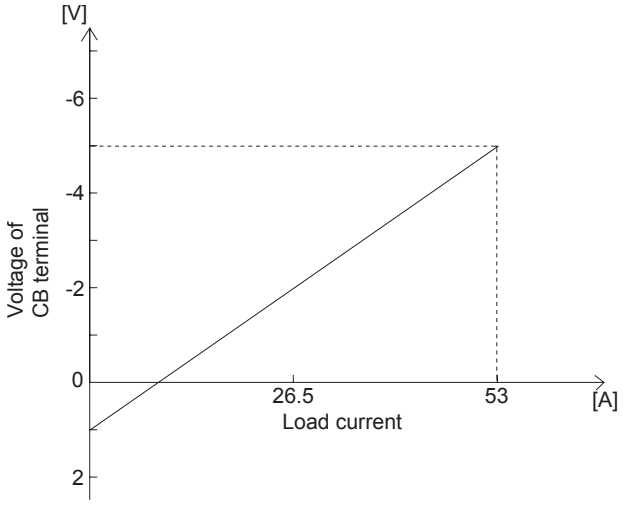


Fig.7.1 Load current conversion graph (PDA600F-12)

■Please note the followings when measuring the voltage of the terminal CB.

・Wire carefully to avoid malfunction caused by noise.

・Use a measuring instrument whose input impedance is 500kΩ or more.

・Do not short-circuit between CB terminal and -S terminal. Doing so could cause a failure.

7.2 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.

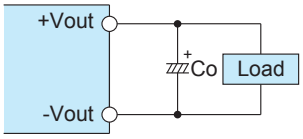


Fig.7.2 Output side external capacitor connection method

Table 7.1 Connectable External capacitor on the output side [μF]
(PDA15F, PDA30F)

Output voltage \ Model	PDA15F	PDA30F
3.3V	0 to 10,000	0 to 10,000
5V	0 to 10,000	0 to 10,000
12V	0 to 4,700	0 to 6,800
15V	0 to 4,700	0 to 4,000
24V	0 to 2,000	0 to 1,800

Table 7.2 Connectable External capacitor on the output side [μF]
(PDA50F, PDA100F, PDA150F)

Output voltage \ Model	PDA50F	PDA100F	PDA150F
3.3V	0 to 10,000	0 to 33,000	0 to 47,000
5V	0 to 10,000	0 to 33,000	0 to 47,000
12V	0 to 2,800	0 to 10,000	0 to 15,000
15V	0 to 2,800	0 to 10,000	0 to 15,000
24V	0 to 2,800	0 to 6,800	0 to 10,000
36V	0 to 1,000	0 to 3,500	0 to 3,300
48V	0 to 680	0 to 2,800	0 to 1,500

Table7.3 Connectable External capacitor on the output side [μF]
(PDA300F, PDA600F)

Output voltage \ Model	PDA300F	PDA600F
3.3V	0 to 68,000	0 to 220,000
5V	0 to 68,000	0 to 220,000
12V	0 to 33,000	0 to 100,000
15V	0 to 33,000	0 to 100,000
24V	0 to 24,000	0 to 68,000
36V	0 to 15,000	0 to 33,000
48V	0 to 6,800	0 to 15,000

7.3 Auxiliary Power (AUX)

● PDA300F,PDA600F

■The power supplies can generate an auxiliary power (AUX: 12V 0.1A) from CN3 to provide for remote ON/OFF and attached circuits.

■AUX circuit is isolated from other (input, output, FG, RC and PG) circuits.

■Please do not draw a current of 0.1A or higher from the auxiliary power because doing so could damage the internal circuits or cause malfunction.
When you connect a DC-DC converter, a current a few times higher than normal current may flow at start-up. Please check the current.

8 Options

8.1 Outline of Options

● -C

■Option -C models have coated internal PCB for better moisture resistance.

● -T5

・Acquired UL508.
・Safety approvals will be invalid with forced air.
Please contact us for any other conditions.

Table 8.1 Compatible Models

Model	Voltage
PDA15F	5V, 12V, 24V
PDA30F	5V, 12V, 24V
PDA50F	24V
PDA100F	24V
PDA150F	24V

● -G

・Option -G units are low leakage current type.
・Differences from standard versions are summarized in Table 8.1.

Table 8.2 Low leakage current type

Leakage Current (ACIN 240V 60Hz)	0.15mA max
Conducted Noise	N/A
Output Ripple Noise	Please contact us for details about Ripple Noise

● -J1 (PDA15F,PDA30F,PDA50F,PDA100F,PDA150F)

・Option -J1 models have VH connectors (Mfr. J.S.T.) instead of a terminal block.
・Dedicated harnesses are available for your purchase. Please see Optional Parts for details.
・Please contact us for details about appearance.
・For PDA100F and PDA150F, this option is available in -12, -15, -24, -36 and -48 types.
・Please do not apply more than 5A per 1 pin.

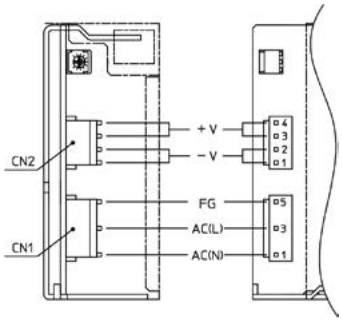


Fig.8.1 Image of option -J1 (PDA50F)

(1) Matching VH Connectors (Mfr. J.S.T.) and Terminals for PDA15F, PDA30F, and PDA50F.

I/O Connector		Matching Housing	Terminal
CN1	B3P5-VH	VHR-5N	Reel : SVH-21T-P1.1
			Loose : BVH-21T-P1.1
CN2	B4P-VH	VHR-4N	Reel : SVH-21T-P1.1
			Loose : BVH-21T-P1.1

(2) Matching VH Connectors (Mfr. J.S.T.) and Terminals for PDA100F and PDA150F.

I/O Connector		Matching Housing	Terminal
CN1	B3P5-VH	VHR-5N	Reel : SVH-21T-P1.1
			Loose : BVH-21T-P1.1
CN2	B6P-VH	VHR-6N	Reel : SVH-21T-P1.1
			Loose : BVH-21T-P1.1

● -N1 (PDA15F, PDA30F, PDA50F, PDA100F, PDA150F, PDA300F)

・Option -N1 models come with a dedicated DIN rail attachment.
・Please contact us for details about appearance.
・-Option -N1 models come with a cover (Option -N).
・Each model has its own vibration and shock specifications.

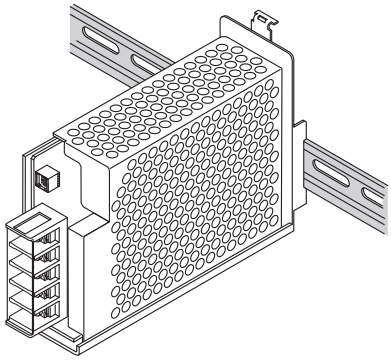


Fig.8.2 Power supply installed on a DIN rail

✻External views are different among models.

● -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-factoried.

■Maximum temperature of measurement points

Table 8.3 Maximum temperature of measurement points (PDA15F-□-N)

Cooling Method	Voltage	Mounting Method	Load factor	Maximum temperature [℃]	
				Point ①	Point ②
Convection	3.3 - 24V	A	75%<Io≦100%	70	69
			Io≦75%	85	82
		B	70%<Io≦100%	70	63
			Io≦70%	84	80
		C	70%<Io≦100%	67	69
			Io≦70%	83	84
Forced air	3.3 - 24V	A, B, C	Io≦100%	80	80

Table 8.4 Maximum temperature of measurement points (PDA30F-□-N)

Cooling Method	Voltage	Mounting Method	Load factor	Maximum temperature [℃]	
				Point ①	Point ②
Convection	3.3 - 24V	A	70%<Io≦100%	73	69
			Io≦70%	86	84
		B	60%<Io≦100%	68	64
			Io≦60%	84	84
		C	50%<Io≦100%	63	66
			Io≦50%	81	84
Forced air	3.3 - 24V	A, B, C	Io≦100%	80	80

Table 8.5 Maximum temperature of measurement points (PDA50F-□-N)

Cooling Method	Voltage	Mounting Method	Load factor	Maximum temperature [℃]	
				Point ①	Point ②
Convection	5V	A	40%<Io≦100%	74	83
			Io≦40%	83	81
		B	40%<Io≦100%	87	84
			Io≦40%	87	81
		C	40%<Io≦100%	74	79
			Io≦40%	85	81
	3.3V, 12 - 48V	A	50%<Io≦100%	77	67
			Io≦50%	88	82
		B	30%<Io≦100%	85	63
			Io≦30%	86	75
		C	40%<Io≦100%	77	71
			Io≦40%	85	81
Forced air	3.3 - 48V	A, B, C	Io≦100%	80	80

Table 8.6 Maximum temperature of measurement point (PDA100F-□-N)

Cooling Method	Voltage	Mounting Method	Load factor	Maximum temperature [℃]
				Point ①
Convection	3.3 - 48V	A	40%<Io≦100%	80
			Io≦40%	83
		B	40%<Io≦100%	65
			Io≦40%	72
		C	40%<Io≦100%	67
			Io≦40%	76
Forced air	3.3 - 48V	A, B, C	Io≦100%	80

Table 8.7 Maximum temperature of measurement point (PDA150F-□-N)

Cooling Method	Voltage	Mounting Method	Load factor	Maximum temperature [℃]
				Point ①
Convection	5V	A	40%<Io≦100%	88
			Io≦40%	88
		B	40%<Io≦100%	84
			Io≦40%	85
		C	40%<Io≦100%	87
			Io≦40%	85
	3.3V, 12 - 48V	A	40%<Io≦100%	88
			Io≦40%	85
		B	40%<Io≦100%	74
			Io≦40%	74
		C	40%<Io≦100%	77
			Io≦40%	80
Forced air	3.3 - 48V	A, B, C	Io≦100%	80

■Life Expectancy

Table 8.8 Life Expectancy (PDA15F-□-N)

Cooling Method	Voltage	Mounting Method	Average ambient temperature (year)	Life Expectancy	
				Io≦75%	75%<Io≦100%
Convection	3.3 - 24V	A	Ta=40℃ or less	10years or more	10years or more
			Ta=50℃	10years or more	10years or more
		B, C	Ta=35℃ or less	10years or more	10years or more
			Ta=45℃	10years or more	10years or more
Forced air	3.3 - 24V	A, B, C	Ta=60℃ or less	5years	5years
			Ta=70℃	5years	3years

Table 8.9 Life Expectancy (PDA30F-□-N)

Cooling Method	Voltage	Mounting Method	Average ambient temperature (year)	Life Expectancy	
				Io≦75%	75%<Io≦100%
Convection	3.3, 5V	A	Ta=40℃ or less	10years or more	10years or more
			Ta=50℃	10years or more	7years
		B, C	Ta=30℃ or less	10years or more	10years or more
			Ta=40℃	10years or more	9years
	12 - 24V	A	Ta=40℃ or less	10years or more	10years or more
			Ta=50℃	10years or more	9years
		B, C	Ta=30℃ or less	10years or more	10years or more
			Ta=40℃	10years or more	10years or more
Forced air	3.3 - 24V	A, B, C	Ta=60℃ or less	5years	5years
			Ta=70℃	5years	3years

Table 8.10 Life Expectancy (PDA50F-□-N)

Cooling Method	Voltage	Mounting Method	Average ambient temperature (year)	Life Expectancy	
				Io≦75%	75%<Io≦100%
Convection	3,3V	A	Ta=35℃ or less	10years or more	7years
			Ta=45℃	8years	4years
		B, C	Ta=30℃ or less	10years or more	10years or more
			Ta=40℃	10years or more	6years
	5V	A	Ta=30℃ or less	10years or more	8years
			Ta=40℃	7years	3years
		B	Ta=30℃ or less	10years or more	6years
			Ta=40℃	7years	3years
		C	Ta=25℃ or less	10years or more	10years or more
			Ta=35℃	9years	5years
	12, 15, 24V	A	Ta=35℃ or less	10years or more	10years or more
			Ta=45℃	10years or more	7years
		B	Ta=30℃ or less	10years or more	8years
			Ta=40℃	10years or more	4years
		C	Ta=30℃ or less	10years or more	10years or more
			Ta=40℃	10years or more	8years
	36, 48V	A	Ta=35℃ or less	10years or more	9years
			Ta=45℃	8years	5years
		B, C	Ta=30℃ or less	10years or more	10years or more
			Ta=40℃	10years or more	7years
Forced air	3.3 - 48V	A, B, C	Ta=60℃ or less	5years	5years
			Ta=70℃	5years	3years

Table 8.11 Life Expectancy (PDA100F-□-N)

Cooling Method	Voltage	Mounting Method	Average ambient temperature (year)	Life Expectancy	
				Io≦50%	50%<Io≦100%
Convection	3.3 - 48V	A	Ta=30℃ or less	10years or more	10years or more
			Ta=40℃	10years or more	6years
		B, C	Ta=30℃	10years or more	10years or more
Forced air	3.3 - 48V	A, B, C	Ta=60℃ or less	5years	5years
			Ta=70℃	5years	3years

Table 8.12 Life Expectancy (PDA150F-□-N)

Cooling Method	Voltage	Mounting Method	Average ambient temperature (year)	Life Expectancy	
				Io≦50%	50%<Io≦100%
Convection	3.3V	A	Ta=30℃ or less	10years or more	10years or more
			Ta=40℃	10years or more	6years
		B, C	Ta=20℃ or less	10years or more	10years or more
			Ta=30℃	10years or more	6years
	5V	A	Ta=25℃ or less	10years or more	6years
			Ta=35℃	10years or more	3years
		B, C	Ta=20℃ or less	10years or more	5years
			Ta=30℃	10years or more	3years
	12, 15, 24V	A	Ta=30℃ or less	10years or more	10years or more
			Ta=40℃	10years or more	5years
		B, C	Ta=30℃	10years or more	10years or more
	36, 48V	A	Ta=30℃ or less	10years or more	10years or more
			Ta=40℃	10years or more	5years
		B	Ta=30℃ or less	10years or more	10years or more
		C	Ta=20℃ or less	10years or more	10years or more
			Ta=30℃	10years or more	7years
Forced air	3.3V	A, B, C	Ta=60℃ or less	10years or more	9years
			Ta=70℃	6years	5years
	12 - 48V	A, B, C	Ta=60℃ or less	5years	5years
			Ta=70℃	5years	3years

■Warranty

Table 8.13 Warranty (PDA15F-□-N)

Cooling Method	Voltage	Mounting Method	Average ambient temperature (year)	Warranty	
				Io≦75%	75%<Io≦100%
Convection	3.3 - 24V	A	Ta=40℃ or less	5years	5years
			Ta=50℃	5years	3years
		B, C	Ta=35℃ or less	5years	5years
			Ta=45℃	5years	3years
Forced air	3.3 - 24V	A, B, C	Ta=60℃ or less	5years	5years
			Ta=70℃	5years	3years

Table 8.14 Warranty (PDA30F-□-N)

Cooling Method	Voltage	Mounting Method	Average ambient temperature (year)	Warranty	
				Io≦75%	75%<Io≦100%
Convection	3.3 - 24V	A	Ta=40℃ or less	5years	5years
			Ta=50℃	5years	3years
		B, C	Ta=30℃ or less	5years	5years
			Ta=40℃	5years	3years
Forced air	3.3 - 24V	A, B, C	Ta=60℃ or less	5years	5years
			Ta=70℃	5years	3years

Table 8.15 Warranty (PDA50F-□-N)

Cooling Method	Voltage	Mounting Method	Average ambient temperature (year)	Warranty	
				Io≦75%	75%<Io≦100%
Convection	5V	A, B	Ta=30℃ or less	5years	5years
			Ta=40℃	5years	3years
		C	Ta=25℃ or less	5years	5years
			Ta=35℃	5years	3years
	3.3V, 12 - 48V	A	Ta=35℃ or less	5years	5years
			Ta=45℃	5years	3years
		B, C	Ta=30℃ or less	5years	5years
			Ta=40℃	5years	3years
Forced air	3.3 - 48V	A, B, C	Ta=60℃ or less	5years	5years
			Ta=70℃	5years	3years

Table 8.16 Warranty (PDA100F-□-N)

Cooling Method	Voltage	Mounting Method	Average ambient temperature (year)	Warranty	
				Io≦50%	50%<Io≦100%
Convection	3.3 - 48V	A	Ta=30℃ or less	5years	5years
			Ta=40℃	5years	3years
		B, C	Ta=20℃ or less	5years	5years
			Ta=30℃	5years	3years
Forced air	3.3 - 48V	A, B, C	Ta=60℃ or less	5years	5years
			Ta=70℃	5years	3years

Table 8.17 Warranty (PDA150F-□-N)

Cooling Method	Voltage	Mounting Method	Average ambient temperature (year)	Warranty	
				Io≦50%	50%<Io≦100%
Convection	5V	A	Ta=25℃ or less	5years	5years
			Ta=35℃	5years	3years
		B, C	Ta=20℃ or less	5years	5years
			Ta=30℃	5years	3years
	3.3V, 12 - 48V	A	Ta=30℃ or less	5years	5years
			Ta=40℃	5years	3years
		B, C	Ta=20℃ or less	5years	5years
			Ta=30℃	5years	3years
Forced air	3.3 - 48V	A, B, C	Ta=60℃ or less	5years	5years
			Ta=70℃	5years	3years