PICO Electronics

AC-DC Converters

LPHA-1 (250 Watts) PHA-1 (500 Watts)

Universal AC input regulated to 365 VDC Output
or use with PICO's Hi-Power Models
for 3.3 to 100 VDC Outputs Single or Dual
Meets EN/IEC 6100-3-2 Requirements

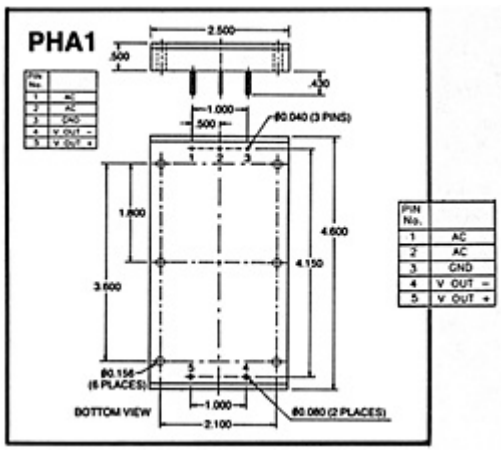
New Unity Power Factor Front End

PICO's LPHA1/PHA1 is the perfect match for universal AC inputs to your worldwide DC applications. Used with PICO's LPD, PD and HPD Series of DC-DC Converters you can obtain a variety of DC outputs from **3.3 VDC to 350 VDC in single and dual outputs. Many Laser and Motor Applications are able to use the LPHA1/PHA1 directly because of its unique 365 Volt regulated output**. **Regardless of use PICO always optimizes Size, Reliability and Cost.**

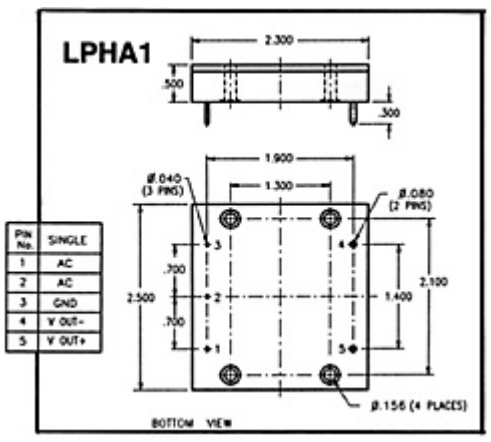
- Meets EN/IEC 6100-3-2 Requirements
- Universal Input Voltage (85 to 250 VAC)
- Power Factor: 0.99*
- Efficiency 90% or better
- PHA1: Up to 500 Watts**
- LPHA1: Up to 250 Watts**
- Regulated Output (365 VDC)
- **PHA1: Only $243.78/LPHA1: Only $219.28**

** Derate from 110 VAC to 85 VAC at the rate of 1.2% per volt
* 50-100% of Full Load

Networking: Can be used with PICO's LPD-PD-HPD Series to provide from 3.3 VDC to 350 VDC in single and dual outputs. Consult factory for network designs implementing all of PICO's over 1000 Power Converters to give you capabilities from 2.0 VDC to 5,000 VDC.



NOTE The torque for mounting screws must be 6 to 9 In-Lbs.
Larger Version of PHA1 Drawing [1]
View Heat Sinks [2]



NOTE The torque for mounting screws must be 6 to 9 In-Lbs.
Larger Version of LPHA1 Drawing [3]
View Heat Sinks [2]

Electrical Characteristics:

Regulated 365V DC Output-can be used directly for many Motor, Laser and Direct Drive Applications.

AC Line Input: 85-250 VAC/47-440 Hz
Output Power:

> **PHA1** Up to 500 Watts derate from 110 VAC to 85 VAC at the rate of 1.2% per volt
> **LPHA1** Up to 250 Watts derate from 110 VAC to 85 VAC at the rate of 1.2% per volt

Output Voltage Tolerance at Full Load: ± 2%
Output Ripple:

> **PHA1** 10V P-P, Full Load, with 470 UF capacitor
> **LPHA1** 10V P-P, Full Load with 250 UF capacitor

Operating Temperature: 0ºC to +85ºC
Start Up Current Typical: 25-40A to 120 VAC 15-20A to 240 VAC
Required Output Capacitor:

> **PHA1** 470 UF Min., External
> **LPHA1** 250 UF Min., External

Isolation: Input to Output: None
Input/Output to Baseplate**:** 2500V rms
Load Regulation: (FL-10%) ±3%
Thermal Shutdown: 90-100º C Baseplate
Short Circuit Protection:

> **PHA1** Requires 10AMP Fast-Blow Fuse in input.
> **LPHA1** Requires 5 AMP Fast-Blow Fuse in input. See connection diagram

Weight:

> **PHA1** 7.2 ounces (231 grams) typical
> **LPHA1** 3.5 ounces (112 grams) typical

Thermal Considerations

Table 1:

PHA-1 Series			
.	Baseplate	Heatsink CV	Heatsink CH
Free Air	5.1	3.5	3.0
200 LFM	2.8	1.8	1.0
400 LFM	1.8	1.1	0.7
600 LFM	1.4	0.8	0.55
800 LFM	1.2	0.65	0.45
1000 LFM	1.0	0.55	0.4

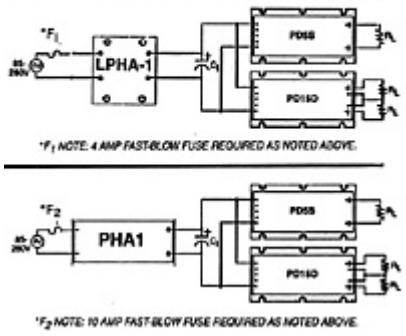
TABLE 1:= Thermal resistance of case to air.

Table 1:

LPHA-1 Series			
.	Baseplate	Heatsink LCV	Heatsink LCH
Free Air	7.9	4.2	4.0
200 LFM	4.9	1.6	1.6
400 LFM	2.5	1.3	1.3
600 LFM	2.2	0.9	0.9
800 LFM	1.5	0.7	0.7
1000 LFM	1.2	0.6	0.6

TABLE 1: Thermal resistance of case to air.

Connections Diagram:
Note: Consult factory for C_1 capacitance and voltage ratings.



Larger Version of Diagram [4]

EXAMPLE 1:

A PHA1 module has an efficiency of 92%. What is the maximum ambient temperature if 200 Watts of power is needed.

A) In free air.

From Table 1: T_{rca} = 4.7

Using Relation (2)

$$\Delta T = 4.7\ (200)\left[\frac{1}{0.92} - 1\right] = 82°C$$

$$Ta = 85 - 82 = 3°C$$

B) In free air with heatsink (CV).

T_{rca} = 3.2

$$\Delta T = 3.2\ (200)\left[\frac{1}{0.92} - 1\right] = 56°C$$

$$Ta = 85 - 56 = 29°C$$

C) With 400 LFM of air flow.

T_{rca} = 1.6

$$\Delta T = 1.6\ (200)\left[\frac{1}{0.92} - 1\right] = 28°C$$

$$Ta = 85 - 28 = 57°C$$

EXAMPLE 2:

What would be the maximum output power for a LPH-1 module at an ambient temperature of 50°C with an efficiency of 92%.

A) If the module is used in free air.

From Table 1: $T_{rca} = 7.9$

Using Relation (2)

$$85 - 50 = 7.9\ P_{out}\left[\frac{1}{0.92} - 1\right]$$

$$P_{out} = \frac{35}{7.9\ [0.087]} = 51 \text{ Watts}$$

B) If the module is used in an area with forced air at 200 LFM with no heatsink.

$T_{rca} = 4.9$

$$P_{out} = \frac{35}{4.9\ [0.087]} = 82 \text{ Watts}$$

C) If the module with heatsink (CV) is used if free air.

$T_{rca} = 4.2$

$$P_{out} = \frac{35}{4.2\ [0.087]} = 96 \text{ Watts}$$

EXAMPLE 3:

At a maximum ambient temperature of 50°C and an efficiency of 90%, how could a PHA1 module be used if 400 Watts of output power is required.

Using Relation (2), we first find the maximum thermal resistance from case to air.

$$\Delta T = T_{rca}(400)\left[\frac{1}{0.9} - 1\right]$$

$$85 - 50 = T_{rca}(44.4)$$

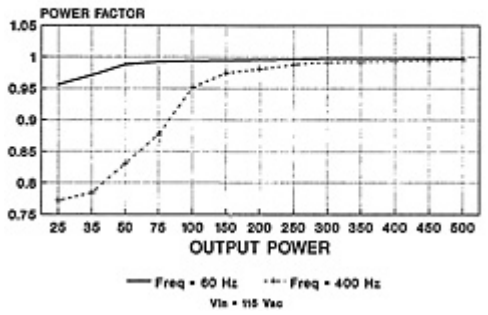
$$T_{rca} = 0.79$$

A) If no heatsink is used.
From Table 1, more than 1,000 LFM of airflow is required.

B) If a (CV) heatsink is used.
700 LFM of airflow is required.

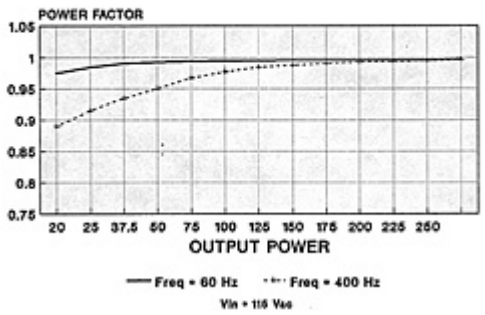
C) If a (CH) heatsink is used.
300 LFM of airflow is required.

POWER FACTOR CORRECTION
Pico Part PHA1



Larger Version of Graph [5]

POWER FACTOR CORRECTION
Pico Part LPHA1



Larger Version of Graph [6]

For immediate engineering assistance or to place an order:
Call Toll Free: 800-431-1064

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