

NEW UNITY POWER FACTOR FRONT END
PICO HPHA2
2000 Watt AC-DC Converter
Single or 3 Phase AC Input
Fixed Frequency: 100 Khz

PICO's HPHA2 is the perfect front end for your universal AC for your single phase or 3 phase input / DC output applications. The standard 2.5" x 4.6" x 0.5" footprint is one of the smallest on the market today in this power range. Providing a 365V regulated DC output, it can be used as a front end for PICO's FD/MD/LFD/LMD/LPD/PD and HPD series of DC-DC converters which can provide from 3.3V to 300V DC. Also, many laser and motor applications are able to use the HPHA2's 365V DC output directly. For different output voltages and for expanded operating temperature, please consult factory.

HIGHLIGHTS OF FEATURES:

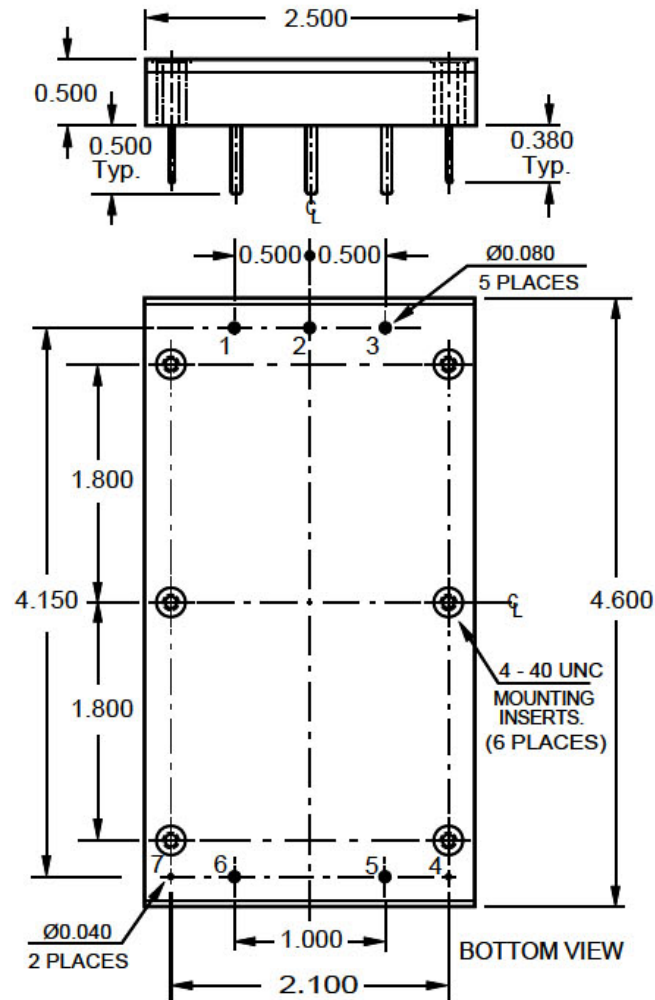
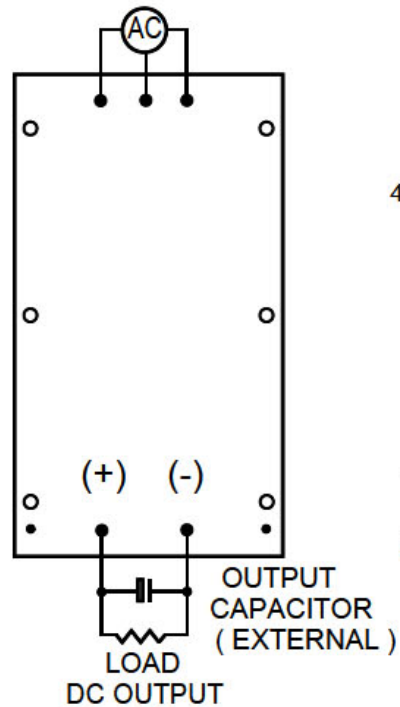
- Meets EN/IEC 61000-3-2 Requirements
- **Universal Input Voltage** (47 to 440Hz) (85 to 250V AC) or 208V AC $\pm 20\%$. Line-To-Line Three Phase Input Standard
- **Output Power:** 2000W (Derate from 220V AC to 170V AC at the rate of 0.5% per volt)
- **Power Factor:** 0.99 (from 50% to 100% FL)
- **Synchronizing Pin:** For systems needing synchronization, a 100 KHz synchronizing signal is available.
- **Enable Pin:** For preventing your Pico DC-DC Converter from turning on until the output of the HPHA2 is within acceptable limits. Connected directly to the Shut Down Pin of PICO's LP/P/HP DC-DC modules, the enable pin will keep the DC-DC module off until the HPHA2's output is within acceptable limits. If the DC-DC module is supplying heavy loads, this means this won't allow the DC-DC Converter to turn on at <300 volts input, where the HPHA2 would have to supply current of $I = \text{Power}/V_{\text{out}}$.
- **Efficiency:** 90% or better (95% minimum from 170 to 250V AC or for three phase input)
- **Cost: Only \$495.66 (Quantity: 1 to 99 pieces).**

Full Electrical Specifications:

NOTE: Regulated 365V DC Output can be used directly for many Motor, Laser, and Direct Drive applications.

- **Universal Input Voltage (47 to 440 Hz):** From 85 to 250V AC.
 - **NOTE: For 110/220V AC operation, make no connection to "AC3" terminal.**
- **Derated output power below 220V AC** (see "Output Power " below)
- **Power Factor** will be diminished for frequencies greater than 60 Hz. For special requirements, consult factory.
- **For Best Efficiency,** operation from 170 to 250V AC recommended. (Typical efficiency is 90% for 110V AC input / 95% for 220V AC input)
- **Three Phase Input:** 208V AC $\pm 20\%$ line-to-line three phase input
- **Output Power:** 2000 Watts maximum @ 220V AC. Derate output power linearly 0.5%/Volt from 220 VAC to 170 VAC (Max. power @ 170 VAC Input = 1,500 W). 1,000 Watts maximum @ 110 VAC. Derate output power linearly 1.2%/Volt from 110V_AX to 85 VAC (Maximum power @85 VAC Input = 700 Watts).
- **Output Voltage Tolerance at Full Load:** $\pm 2\%$
- **Operating Frequency:** 100KHz
- **Operating Temperature:** 0°C to +85°C baseplate with no power rating required.
- **Required Output Capacitor:** 1.5m F to 1200 μ F recommended at 2000W. This will guarantee ripple voltage less than 10Vpp. See formula for other power levels, line frequency or Vpp ripple.
 - **NOTE: Output Capacitor must be connected or the Power Supply will be damaged.**
- **Isolation:**
 - Input to Output: None
 - Input/Output to Baseplate: 2121V DC
- **Load Regulation:** (10% to 100% Load $\pm 3\%$)
- **Thermal Shutdown:** 90 to 100°C Baseplate
- **Short Circuit Protection:** The HPHA2 requires a 15 Amp Fast-Blow fuse in series with the input.
- **Weight:** 231 grams Typical

PIN No.	PIN FUNCTION
1	AC INPUT
2	AC INPUT
3	AC INPUT
4	SYNC.
5	- DC OUT
6	+ DC OUT
7	ENABLE OUT.



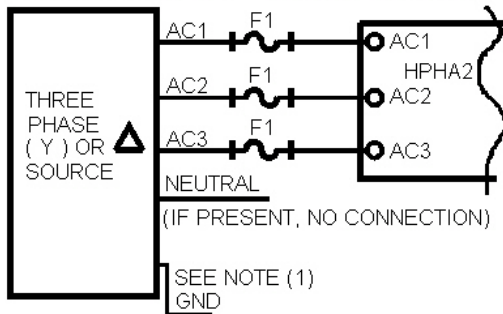
Notes: All dimensions are inches.
The torque for mounting screws must be 3 to 5 In-Lbs.
Weight: 213 grams

[View Heat Sinks](#)

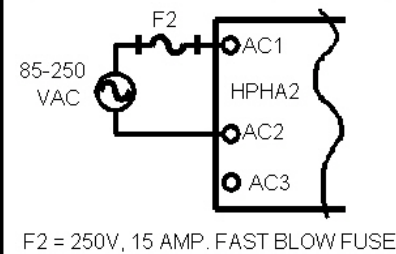
HPHA2 CONNECTIONS DIAGRAM

1) INPUT CONNECTIONS

A) THREE PHASE INPUT (208 VAC ±20% LINE TO LINE)

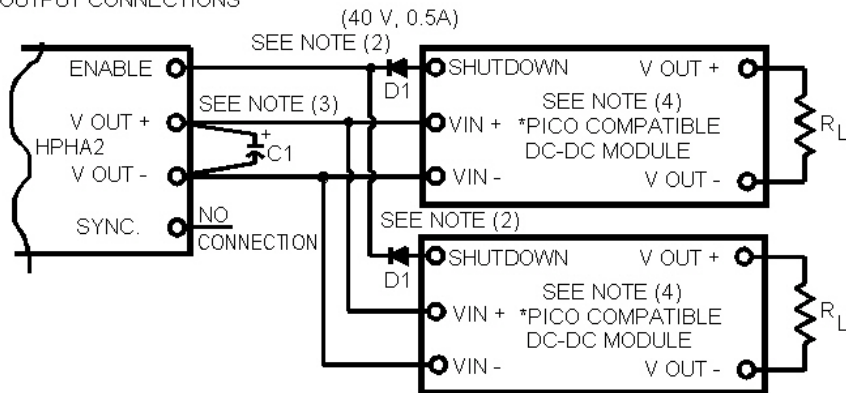


B) SINGLE PHASE INPUT (85-250 VAC)



F1 = 250V, 10 AMP. FAST BLOW FUSE ON EACH INPUT LINE

2) OUTPUT CONNECTIONS



NOTES:

(1) To HPHA2 Chassis or No Connection

(2) D1 Not needed for single DC-DC Module, for Multiple DC-DC Modules.

(3) Damage to unit will occur without C1 = 450 VDC 800 - 1500 μ F (Electrolytic Capacitor External). Capacitor can be paralleled for desired capacitance (1500 μ F Max). Connect C1 directly to output terminals using separate traces for load connections.

(4) PICO compatible units include LPD/LMD/FD and MD Series. (Expanded operating temperature LFD/LMD/FD and MD Series).

PICO recommends using an output capacitor large enough in value to limit the ripple voltage to 10Vpp. For the LPHA1, LPHA, HPAHA1, and HPHA2 Models, the following formula can be used to calculate the necessary

$$C_{OUT\ RECOMMENDED} = \frac{P_{out}}{\pi \cdot (2 \cdot \text{LINE_FREQUENCY}) \cdot V_{RIPPLEpp} \cdot V_{O_NOMINAL} \cdot \text{EFFICIENCY}}$$

capacitance for Vpp of 10V for any output power. Assume line frequency of 60 Hz and VO nominal of 365 V Efficiency of 90%.

HPHA2 Series Thermal Resistance (Trca) of case to Air

TABLE 1

	Baseplate alone*	With Heatsink CV*	With Heatsink CH*
Free Air	5.10	3.50	3.00
200 LFM	2.80	1.80	1.00
400 LFM	1.80	1.10	0.70
600 LFM	1.40	0.80	0.55
800 LFM	1.20	0.65	0.45
1000 LFM	1.00	0.55	0.40

*In units °C/W

To convert from LMF (linear feet per minute), you need to multiply
the LFM number by the cross sectional area of the fan (in square
feet).

Thermal Derating Examples:

Use the equation from application notes,
From Table 1, get Trca): $T_{case} - T_{ambient} = Trca$
 $\times P_{out} \times (1/n - 1)$

1) What is the maximum output power from HPHA1 module
in a 25°C ambient if the efficiency is 90% and the case temperature
is not to exceed 85°C?

a) in free air, no heatsink (From Table 1, use Trca=5.10)

$$P_{out} = (85^{\circ}\text{C} - 25^{\circ}\text{C}) / 5.1 \times (1/0.9 - 1) = 105.8 \text{ Watts}$$

b) in 200 LFM airflow, with CH heatsink:
From Table 1: use $Tr_{ca}=1.00$):

$$P_{out} = (85^{\circ}\text{C} - 25^{\circ}\text{C}) / 1.0 * (1/0.9 - 1) = 540 \text{ Watts}$$

c) in 1000 LFM airflow, with CH heatsink
(From Table 1, use $Tr_{ca} = 0.40$)

$$P_{out} = (85^{\circ}\text{C} - 25^{\circ}\text{C}) / 0.40 * (1/0.9 - 1) = 1350 \text{ Watts}$$

(However, $P_{out}=1000$ Watts maximum for HPHA1 module)

2) in 400 LFM airflow, with CH heatsink:
from Table 1: use $Tr_{ca} = 0.70$):

$$\Delta T = 0.7 * 600 * (1/0.9 - 1) = 46.7^{\circ}\text{C}$$

$$T_{ambient} = 85^{\circ}\text{C} - \Delta T = 38.3^{\circ}\text{C}$$

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

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