40 W AC-DC Power Supply PAC40E-Series

PHI-CON

- PCB-mountable plastic case
- 85 … 264 V_{AC} or 100 … 370 V_{DC} universal input range
- Continuously short circuit protected
- Over voltage protected
- Input / output isolation voltage test 4 kV_{AC}
- Isolation class II
- Designet to meet Safety EN 62368-1

CE

Model guide

Type	Output voltage [V_{DC}]	Output voltage tolerance typ. [%]	Output current max. [mA]	Output power max [W]	Efficiency @ full load typ. [%]	Output load capacitance max. [µF]	Stand by consumption max. [W]
PAC40E03S	3.3	±2	8000	26.4	78	60000	0.5
PAC40E05S	5.0	±2	8000	40	82	40000	0.5
PAC40E12S	12	±2	3330	40	84	9000	0.5
PAC40E15S	15	±2	2660	40	84	7000	0.5
PAC40E24S	24	±2	1670	40	84	2000	0.5
PAC40E48S	48	±2	830	40	84	1000	0.5

Specification

Input	
Voltage range	85..264 V_{AC} or 100..370 V_{DC} Power derating see diagram
Line frequency range	47…63 Hz
Full load input current	115 V_{AC}: 1000 mA, typ. 230 V_{AC}: 600 mA, typ.
Inrush current	115 V_{AC}: 50 A typ 230 V_{AC}: 70 A typ.
Recommended fuse	3.15 A / 250V, time delay type
Isolation	
Isolation voltage (input to output)	4000 V_{AC} for 1 Minute
Isolation resistance	10^8 Ω
Output	
Voltage accuracy	± 2 %
Line regulation	± 0.5 %
Temperature coefficient	± 0.02 % / °C
Output voltage trim range	≤ 10 %
Ripple & noise up to 20 MHz	≤ 150 mV (see Figure 1)
Load regulation	± 1 %, typ.
Minimum load	0 %
Hold-up time	10 ms typ. @ 115 V_{AC} 50 ms typ. @ 230 V_{AC}
Protection	
Short circuit	Continuous, auto recovery
Over current	≥ 110 % of rated load
Over voltage protection	
PAC40E3R3S	≤ 5.5 V_{DC}
PAC40E05S	≤ 9 V_{DC}
PAC40E12S	≤ 20 V_{DC}
PAC40E15S	≤ 24 V_{DC}
PAC40E24S	≤ 35 V_{DC}
PAC40E48S	≤ 56 V_{DC}
General	
Switching frequency	65 kHz typ.
Reliability MTBF MIL-HDBK-217F @ 25°C	> 300000 h

EMC compliance		
CE	EN 55032, CISPR 32	Class B
RE	EN 55032, CISPR 32	Class B
EMI		
ESD	EN-,IEC 61000-4-2	Air ± 8 kV, Contact ± 6 kV, perf. Criteria B
RS	EN-,IEC 61000-4-3	10 V / m, perf. Criteria A
EFT	EN-,IEC 61000-4-4	± 2 kV, perf. Criteria B ± 4 kV, perf. Criteria B (see Figure 3)
Surge	EN-,IEC 61000-4-5	Line to line: ±1 kV, perf. Criteria B Line to line: ± 2 kV, perf. Criteria B Line to GND: ±4 kV perf. Criteria B (see Figure 3)
CS	EN-,IEC 61000-4-6	10 Vrms, perf. Criteria A
Safety designet to meet		EN 62368-1
Safety class		Class II
Environmental		
Operating ambient temperature		-40 °C … 70 °C, with derating
Storage temperature		-40 °C … 85 °C
Humidity		95 %, non-condensing
Cooling		Free air convection, ≥ 35 LFM
Physical		
Dimensions, PCB version		89 x 63.5 x 25 mm
Weight		215 g
Case material		UL94V-0 rated
Wave soldering temperature		≤ 265 °C, duration ≤ 10 s, ≥ 1.5 mm distance from case
Manual soldering temperature		≤ 370 °C, duration ≤ 5 s, ≥ 1.5 mm distance from case
Hot swap		Not permissible!

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Figure 1 Output ripple & noise measure circuit

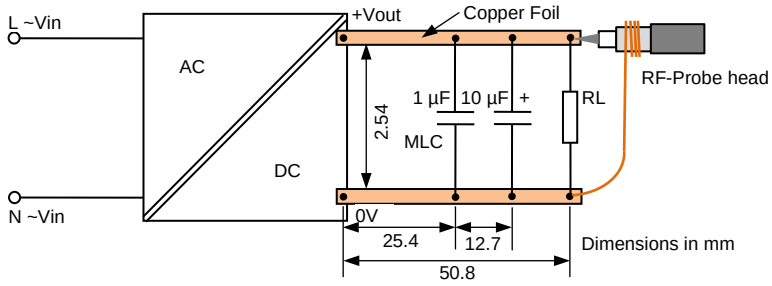

Figure 2 Typical application circuit

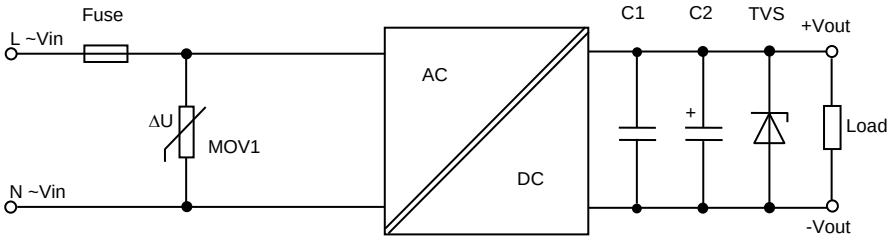

Figure 3 Application circuit and example for ripple and noise reduction

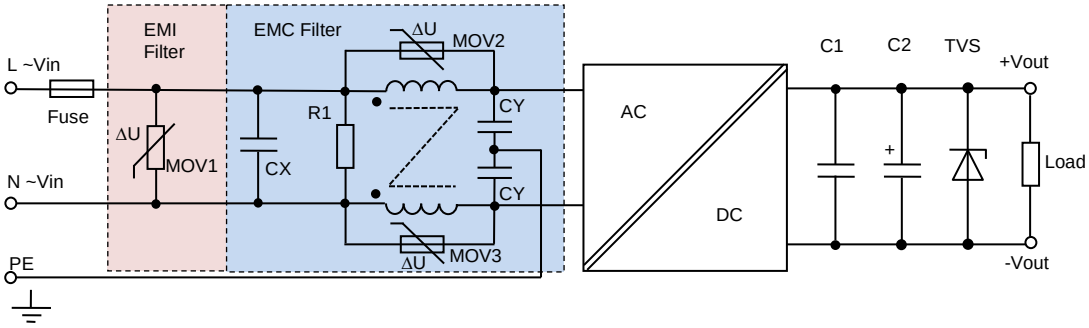

Table of components for Figure 2 and Figure 3										
Model	F1 250V~ fuse Time delayed type [A]	V MOV type	Cx 250 V~ [µF]	R1 2 Watt [MΩ]	L1 Common mode [mH]	MOV2 MOV3 type	Cy 400 V~ [nF]	C1 Cer. cap. [µF]	C2 El. cap. [µF]	TVS type
PAC40E03S	3.15	S07K350	0.15	1	2.2	S14K350	2.2	1	680	SMBJ7.0A
PAC40E05S	3.15	S07K350	0.15	1	2.2	S14K350	2.2	1	680	SMBJ7.0A
PAC40E12S	3.15	S07K350	0.15	1	2.2	S14K350	2.2	1	220	SMBJ20A
PAC40E15S	3.15	S07K350	0.15	1	2.2	S14K350	2.2	1	220	SMBJ20A
PAC40E24S	3.15	S07K350	0.15	1	2.2	S14K350	2.2	1	120	SMBJ30A
PAC40E48S	3.15	S07K350	0.15	1	2.2	S14K350	2.2	1	100	SMBJ64A

Note:
1. Output filtering capacitors C2 is an electrolytic capacitor. It is recommended to use high frequency and low impedance electrolytic capacitors. For capacitance and current of capacitor please refer to manufacture's datasheet. Voltage derating of capacitor should be 80 % or above. C1 is ceramic capacitor. It is used to filter high frequency noise. TVS is a recommended component to protect post-circuits in case of a converter failure.
2. For standard EMC requirement, please refer to figure 2. If higher an EMC requirement, please refer to figure 3.

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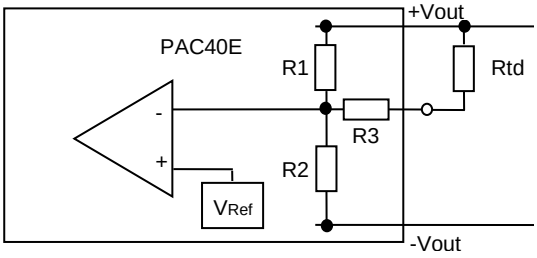
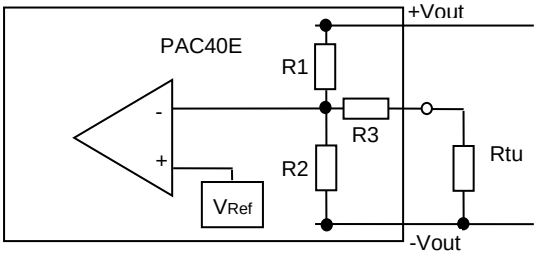
Application note for trim option

Trim down circuit



Trim up circuit



Calculation for trim down resistor (Rtd) or trim up resistor (Rtu)						
Model series	R1 [kΩ]	R2 [kΩ]	R3 [kΩ]	V Ref [V]	Rtd min. [kΩ]	Rtu min. [kΩ]
PAC40Exx03S	2	1.2	1	1.24	9.28	6.67
PAC40Exx05S	3.3	3.3	1	2.5	12.2	15.5
PAC40Exx12S	3.83	1	1	2.5	24	7.5
PAC40Exx15S	7.5	1.5	1	2.5	54	11.5
PAC40Exx24S	8.66	1	1	2.5	63.9	8.62
PAC40Exx48S	22	1.2	1	2.5	173.4	11.31
Maximum output voltage adjust range ±10 % of Vout nominal, see min. Rtd / Rtu						

Trim down resistor formula

$$b = \frac{Vout - Vref}{Vref} * R2$$

$$Rtd = \frac{R1 * b}{R1 - b} - R3$$

Trim up resistor formula

$$a = \frac{Vref}{Vout - Vref} * R1$$

$$Rtu = \frac{R2 * a}{R2 - a} - R3$$

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40 W AC-DC Power Supply PAC40E-Series

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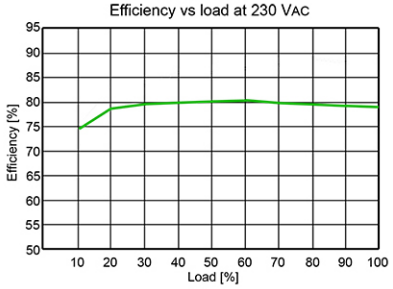
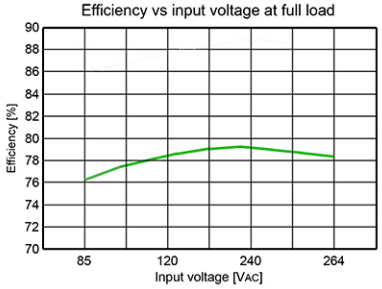
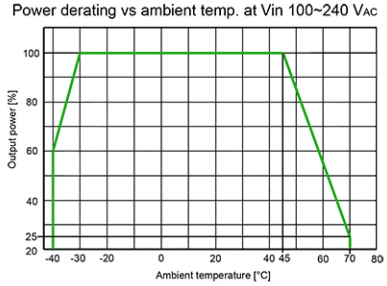
PAC40E03S
Efficiency vs load at 230 VAC



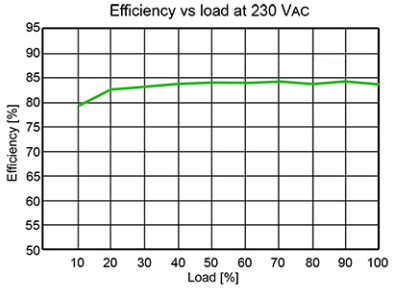
PAC40E03S
Efficiency vs input voltage at full load



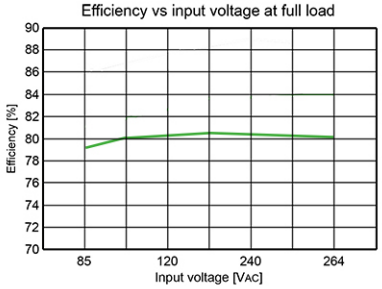
PAC40E03S, PAC40E05S
Power derating vs ambient temp. at Vin 100~240 VAC



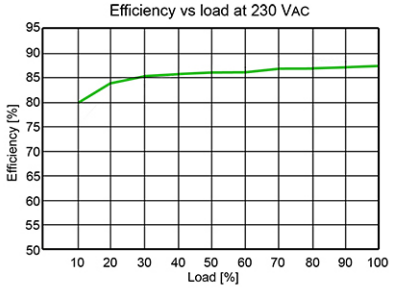
PAC40E05S
Efficiency vs load at 230 VAC



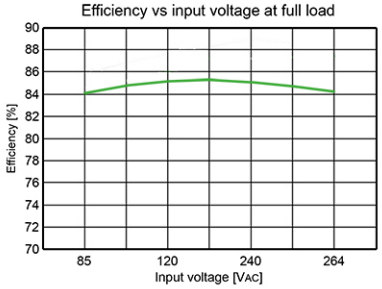
PAC40E05S
Efficiency vs input voltage at full load



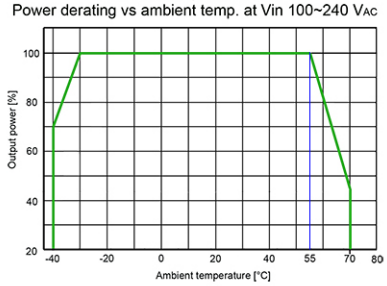
PAC40E12S
Efficiency vs load at 230 VAC



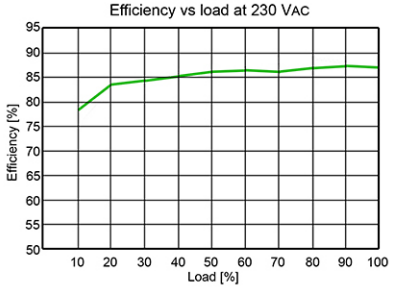
PAC40E12S
Efficiency vs input voltage at full load



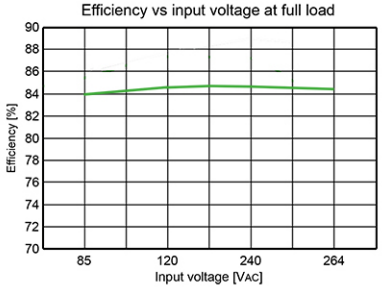
PAC40E12S, PAC40E15S
Power derating vs ambient temp. at Vin 100~240 VAC



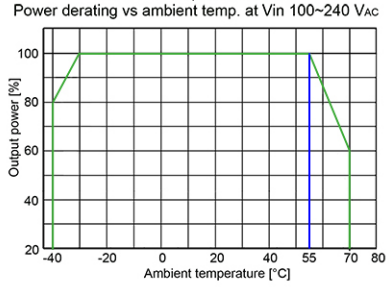
PAC40E15S
Efficiency vs load at 230 VAC



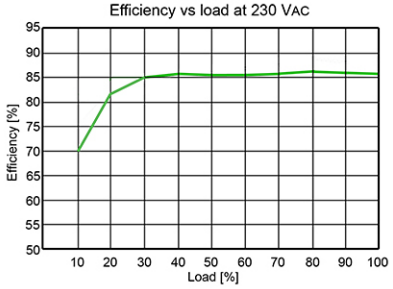
PAC40E15S
Efficiency vs input voltage at full load



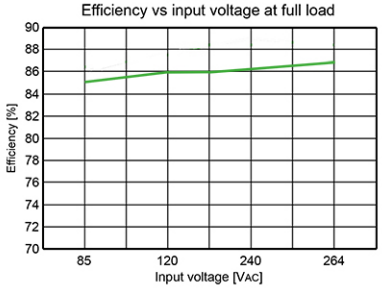
PAC40E24S, PAC40E48S
Power derating vs ambient temp. at Vin 100~240 VAC



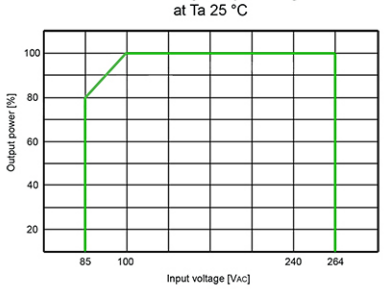
PAC40E24S
Efficiency vs load at 230 VAC



PAC40E24S
Efficiency vs input voltage at full load



Power derating vs input voltage at
at Ta 25 °C



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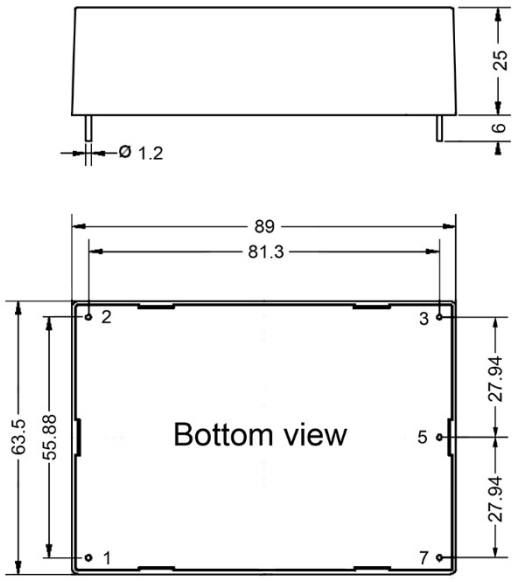
Mechanical dimensions



Pin assignment	
	Pin configuration
1	Input AC (L)
2	Input AC (N)
3	Trim input
4	No pin
5	- V output
6	No pin
7	+ V output

Unit: mm
Pin diameter tolerance: ± 0.1 mm
General tolerances: ± 0.5 mm

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