

**Features**

**Compliant with PICMG® CompactPCI® specifications. Input-to-output isolation. 4 high current outputs.**

- RoHS lead-free solder and lead-free-solder-exempted products are available
- Flexible load-distribution
- Integrated ORing FETs / diodes for true redundancy
- Inhibit and enable inputs
- Remote sense lines
- Single-wire current share for 3 outputs
- Hot-swap capability
- Extremely low inrush current
- Extremely high efficiency
- 1500 VDC input to PE (case) electric strength test
- Positronic 47-pin connector
- Automatic output power derating at high temperature
- Overtemperature, overvoltage, and overcurrent protection

Safety according to IEC/EN 60950-1, UL 60950



**Description**

The CPD Series are highly reliable power supplies for CompactPCI® systems, which are increasingly used in communications, industrial, military, aerospace, and other applications. These power supplies offer high power density in plug-in modules that meet the requirements of the PICMG® power interface specification for Compact-PCI® systems.

The converters use the patented EDGE™ technology and provide important advantages such as flexible output power, extremely high efficiency, excellent reliability, full input-to-output isolation, negligible inrush current, hot swap capability, soft start, and overtemperature protection. The inputs are protected against surges and transients occurring on the source lines and cover an input voltage range from 36 VDC up to 75 VDC. The outputs have continuous overload, open-circuit, and

short-circuit protection. LEDs on the front panel, a temperature warning signal, and a fail signal indicate the status of the power supply. Voltage suppressor diodes protect the input against overvoltage. Full n+1 redundant operating mode is made by integrated ORing FETs/diodes. When several converters are connected in parallel, a single-wire connection between converters ensures current sharing. The converters are designed as two separate forward converters with synchronous rectifiers at the outputs. The switching frequency is fixed at approx. 135 kHz.

The aluminium case acts as a heat sink and as RFI shield. It is particularly suitable for vertical mounting in 19" rack systems, but it can also be mounted in any other position as long as the necessary airflow is ensured. The connector is a 47-pin type from Positronic.

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## Model Selection

Model <sup>3</sup>	Output				Input voltage $V_{i \text{ min}} - V_{i \text{ max}}$	Rated power <sup>1</sup> $P_{o \text{ nom}}^1$ [W]	Efficiency <sup>2</sup> $\eta_{\text{typ}}^2$ [%]	Case
	No.	$V_{o \text{ nom}}$ [VDC]	$I_{o \text{ nom}}$ [A]	$I_{o \text{ max}}$ [A]				
CPD200-4530 CPD200-4530G	Vo1 Vo2 Vo3 Vo4	5.0 3.3 12 -12	20 20 2.5 0.5	40 40 5.5 2	36 – 75 VDC	200	82	3U x 8HP
CPD250-4530 CPD250-4530G	Vo1 Vo2 Vo3 Vo4	5.0 3.3 12 -12	25 20 4 1	40 40 5.5 2				

<sup>1</sup> The sum of the power of all outputs may not exceed the total power for the specified required forced-air cooling.

<sup>2</sup> Typical efficiency at  $V_{i \text{ nom}}$ ,  $I_{o \text{ nom}}$ .

<sup>3</sup> Models ending with G are RoHS-compliant for all 6 substances.

## Product Marking

Label with specific type designation, applicable safety approvals and recognition marks, CE mark, warnings, Power-One patents and company logo, input voltage range,

nominal output voltage and output current, degree of protection, batch no., serial no. and data code including production site, modification status and date of production. Identification of LEDs.

## Functional Description

The converter input is protected against surges and transients occurring on the source lines. The highly efficient input filter and the active inrush limiter ensure a very low inrush current of short duration. This prevents circuit

breakers and fuses from being damaged at switch on. The converter is equipped with two independent high efficiency 2-switch forward converters, switching 180° out of phase to minimize ripple current at the input. Both converters are fully regulated. On the secondary side, two

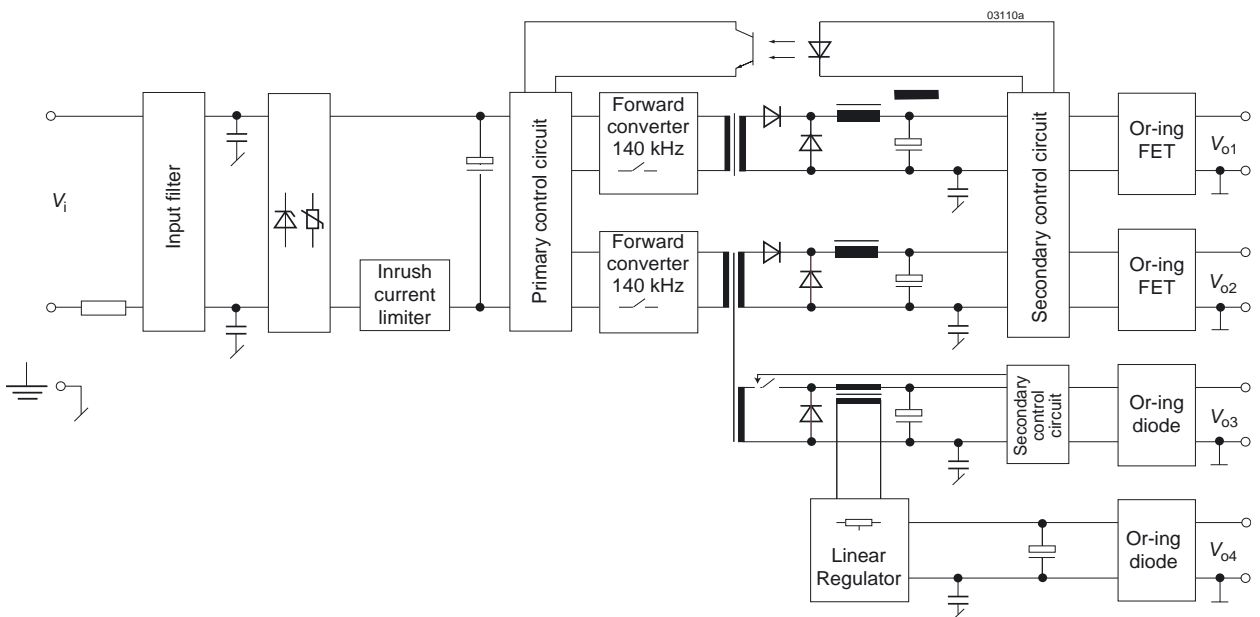


Fig. 1  
 Block diagram. Pin allocation see Mechanical Data



high current synchronous rectifiers supply the 5 V and 3.3 V outputs with up to 40 A. The secondary controlled +12 V post regulator is supplied by an additional winding of the 3.3 V main transformer, and the linear regulator for the -12 V output is supplied by the output choke of the +12 V output. After rectification, the output filter reduces ripple and noise to a minimum without compromising the dynamic response.

All outputs are protected from the bus by decoupling FETs or diodes. A current monitor calculates the output power. As soon as the output power exceeds the maximum threshold level, the converter starts to reduce the output power by decreasing the output voltages.

In contrast to the outputs 5 V, 3.3 V and +12 V with active current sharing, the -12 V output has a droop characteristic for passive current sharing. Each converter has a switching frequency of around 135 kHz.

Power-One's Efficient Dual Geometric Edge (EDGE™) Technology facilitates high current density, increases reliability by reducing component stresses, and decreases the amount of heat dissipated. The backbone of this patented technology is an interleaved, multi-channel forward converter utilising transitional resonant switching techniques and proprietary leading and trailing-edge pulse width modulation. It has a proven track record in high-availability power solutions.

## Electrical Input Data

General Conditions:

$T_A = 25\text{ °C}$ , unless  $T_C$  is specified.

Table 2: Input data

Input			CPD200			CPD250			
Characteristics		Conditions	min	typ	max	min	typ	max	Unit
$V_i$	Operating input voltage	$I_o = 0 - I_o \text{ max}$ $T_C \text{ min} - T_C \text{ max}$	36		75	36		75	VDC
$V_{i \text{ nom}}$	Nominal input voltage			48			48		
$V_{i \text{ abs}}$	Input voltage limits	without damage			80			80	
$I_i$	Typical input current	$V_{i \text{ nom}}, I_o \text{ nom}$		5.1			6.3		A
$I_{i \text{ max}}$	Max. input current	$V_{i \text{ min}}, I_o \text{ nom}$		7.0	7.6		8.7	9.5	
$I_{i \text{ nr p}}$	Peak inrush current	$V_{i \text{ max}}, I_o \text{ nom}$			12			12	
$P_{i0}$	No-load input power	$V_{i \text{ min}} - V_{i \text{ max}}$ $I_o = 0$			30			30	W
$P_{i \text{ inh}}$	Input power, when disabled	$V_{i \text{ min}} - V_{i \text{ max}}$			3.2			3.2	
$C_i$	Input Capacitance			1360			1360		$\mu\text{F}$
$f_{\text{switch}}$	Switching frequency			135			135		kHz

### Input Fuse

A fuse mounted inside the converter protects the module against further damage in the case of a failure. The fuse cannot be made externally accessible. Reverse polarity at the input will cause the fuse to blow but no other damage.

**Note:** Fuse is not customer-accessible.

Table 3: Fuse specification

Model	Fuse type	Fuse rating
CDP200/250	slow blow	T 250 V, 12.5 A

### Inrush Current Limitation

The CPD Series incorporates an active inrush current limiter in the input circuitry, which reduces the peak inrush current value by a factor of 10 – 15 to protect connectors and switching devices from damage.

**Note:** The inrush current limitation is achieved using an electronic circuitry. For effective limitation the converter should not be switched on and off more frequently than every 8 seconds.

### Input Transient Protection

A metal oxide VDR (Voltage Dependent Resistor) together with the input fuse and suppressor diode form an effective protection against high input voltage transients, which typically occur in most installations.

The CPD Series input range and input filters have been designed and tested to meet the requirements of EN 61000-4-5, criterion B.

### Reverse Polarity

The converters are not protected against reverse polarity at the input to avoid unwanted power loss. In case of reversed input voltage, the suppressor diode conducts blowing the fuse, but preventing further damage.



## Electrical Output Data

General Conditions:

- $T_A = 25\text{ }^\circ\text{C}$ , unless  $T_C$  is specified.
- CPD200: 250 LFM (1.25 m/s), CPD250: 400 LFM (2 m/s),
- Sense lines connected directly at the connector.

Table 4a: Output data for Vo1, Vo2

Output			Vo1 5.0 V			Vo2 3.3 V			Unit
Characteristics		Conditions	min	typ	max	min	typ	max	
$V_o$	Output voltage	$V_{i\text{ nom}}, 50\% I_{o\text{ nom}}$	4.95	5.0	5.05	3.267	3.3	3.333	VDC
$I_{o\text{ nom}}$	Nominal output current		20/25 <sup>1</sup>			20			A
$I_{o\text{ max}}$	Max. output current	$V_{i\text{ min}} - V_{i\text{ max}}$	40			40			
$I_{oL}$	Output current limit	$T_{C\text{ min}} - T_{C\text{ max}}$	50			50			
$I_{o\text{ min}}$	Minimum load		no min. load required			no min. load required			
$v_o$	Output voltage noise	Switch. frequ.	$V_{i\text{ nom}}, I_{o\text{ nom}}$ BW = 20 MHz $C_{\text{ext}} = 22\text{ }\mu\text{F} + 100\text{ nF}$						mV <sub>pp</sub>
		Total							
$\Delta V_{oV}$	Static line regulation	$V_{i\text{ min}} - V_{i\text{ max}}, I_{o\text{ nom}}$	$\pm 25$			$\pm 18$			mV
$\Delta V_{oL}$	Static load regulation	$V_{i\text{ nom}}, 50 - 100\% I_{o\text{ max}}$	$\pm 50$			$\pm 33$			
$\Delta V_{oS}$	Overshoot at switch on/off		0			0			
$v_{o\text{ d}}$	Dynamic load regulation	Voltage deviation	$\pm 120$			$\pm 120$			$\mu\text{s}$
$t_d$		Recovery time	100			100			
$\alpha V_o$	Temperature coefficient of output voltage	$T_{C\text{ min}} - T_{C\text{ max}}$ $0 - I_{o\text{ nom}}, V_{i\text{ min}} - V_{i\text{ max}}$	$\pm 0.3$			$\pm 0.2$			mV/K
$t_h$	Hold-up time	starting at $V_{i\text{ nom}}, I_{o\text{ nom}}$	4			4			ms
$t_s$	Start-up time	$V_{i\text{ nom}}, I_{o\text{ nom}}$	150 200		150 200				

<sup>1</sup> CPD200: 20 A, CPD250: 25 A



Table 4b: Output data for Vo3, Vo4

Output			Vo3 12 V			Vo4 -12 V			Unit
Characteristics		Conditions	min	typ	max	min	typ	max	
V <sub>o</sub>	Output voltage	V <sub>i nom</sub> , 50% I <sub>o nom</sub>	11.88	12.0	12.12	-11.52	-12.0	-12.48	VDC
I <sub>o nom</sub>	Nominal output current		2.5/4 <sup>1</sup>			0.5/1 <sup>1</sup>			A
I <sub>o max</sub>	Max. output current	V <sub>i min</sub> - V <sub>i max</sub>	5.5			2			
I <sub>oL</sub>	Output current limit	T <sub>C min</sub> - T <sub>C max</sub>	7			3.5			
I <sub>o min</sub>	Minimum load		I <sub>o3</sub> > 75% I <sub>o4</sub> <sup>2</sup>			no min. load required			
V <sub>o</sub>	Output voltage noise	Switch. frequ.	V <sub>i nom</sub> , I <sub>o nom</sub> BW = 20 MHz C <sub>ext</sub> = 22 μF + 100 nF						mV <sub>pp</sub>
		Total	120			120			
ΔV <sub>oV</sub>	Static line regulation	V <sub>i min</sub> - V <sub>i max</sub> , I <sub>o nom</sub>	±60			±60			mV
ΔV <sub>oL</sub>	Static load regulation	V <sub>i nom</sub> , 50 - 100% I <sub>o max</sub>	±120			-480 <sup>3</sup>			
ΔV <sub>oS</sub>	Overshoot at switch on/off		0			0			
V <sub>o d</sub>	Dynamic load regulation	Voltage deviation Recovery time	Vo3: ΔI <sub>o</sub> = 2 A, dI <sub>o</sub> /dt = 2 A/μs Vo4: ΔI <sub>o</sub> = 0.5 A, dI <sub>o</sub> /dt = 2 A/μs			± 200			μs
t <sub>d</sub>				500			500		
α V <sub>o</sub>	Temperature coefficient of output voltage	T <sub>C min</sub> - T <sub>C max</sub> 0 - I <sub>o nom</sub> , V <sub>i min</sub> - V <sub>i max</sub>	±0.3			±0.5			mV/K
t <sub>h</sub>	Hold-up time	starting at V <sub>i nom</sub> , I <sub>o nom</sub>	4			4			ms
t <sub>s</sub>	Start-up time	V <sub>i nom</sub> , I <sub>o nom</sub>	150 200		150 200				

<sup>1</sup> Values for CPD200/CPD250    <sup>2</sup> Required to maintain regulation of Vo4    <sup>3</sup> Droop characteristic for passive current sharing

### Hold-up Time

For extended hold-up time, use external output capacitors or decoupling diodes and input capacitors of adequate size.

Formula for additional external input capacitor

$$C_{i \text{ ext}} = \frac{2 \cdot P_o \cdot (t_{h \text{ total}} - t_h) \cdot 100}{\eta \cdot (V_{ti}^2 - V_{i \text{ min}}^2)}$$

where as:

- C<sub>i ext</sub> = external input capacitance [mF]
- P<sub>o</sub> = output power [W]
- η = efficiency [%]
- t<sub>h total</sub> = total hold-up time [ms]
- t<sub>h</sub> = hold-up time [ms]
- V<sub>i min</sub> = minimum input voltage [V]
- V<sub>ti</sub> = threshold level [V]

### Hot Swap

Hot swap is possible. Using the hot-swap capability, the output voltages may deviate dynamically by max. 5% during the plug-in / plug-out operations.

### Output Protection and Current Limitation

The outputs are fully protected against continuous open circuit (no load) and also against continuous short circuit.

All outputs have a constant current limitation with a rectangular characteristic (see figure below). The total current from the main power trains Vo1, Vo2 and Vo3 is limited by P<sub>o max</sub>. So there is a free choice of load distribution between these outputs.

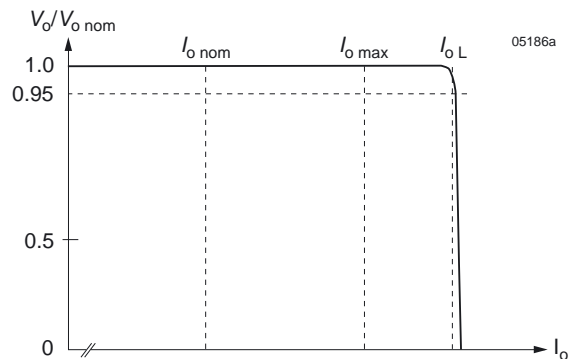


Fig. 2  
Current limitation behavior of a CPD.



**Thermal Considerations**

If a converter CPD is mounted in an upright position with air flow of 250 LFM (CPD200) or 400 LFM (CPD250) allowing unrestricted forced air cooling, and is operated at its nominal input voltage and power at maximum ambient temperature  $T_{A \max}$  (see: *Temperatures*), the temperature measured at the measurement point of the case temperature  $T_C$  (see: *Mechanical Data*) will approach the indicated maximum value  $T_{C \max}$  (105 °C) after an initial warm-up phase. However, the relationship between  $T_A$  and  $T_C$  depends heavily on the operating conditions and system integration. The thermal conditions are influenced significantly by the input voltage, the output current, the airflow, and the temperature of the adjacent elements and surfaces.  $T_{A \max}$  is therefore contrary to  $T_{C \max}$  only an indicative value.

**Caution:** The installer must ensure that under all operating conditions  $T_C$  remains within the limits shown in the diagrams fig. 3 valid for a converter mounted in free and quasi-stationary air, allowing unrestricted convection cooling.

**Note:** Forced-air cooling or an additional heat sink can improve the reliability or allow  $T_A$  to be increased above  $T_{A \max}$  provided that  $T_{C \max}$  is not exceeded.

**Thermal Protection**

A temperature sensor fitted on the main PCB provides an over temperature warning (degrade) signal 15 °C before the temperature  $T_{C \max}$  at which the thermal derating begins to reduce the output power. The output power returns to the nominal value, if the temperature drops back below this limit. See *Temperature Warning and Shut-Down*.

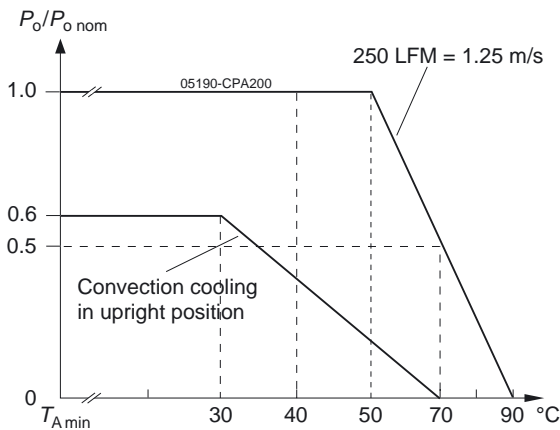


Fig. 3a  
Output power versus temperature  $T_A$  (CPD200)

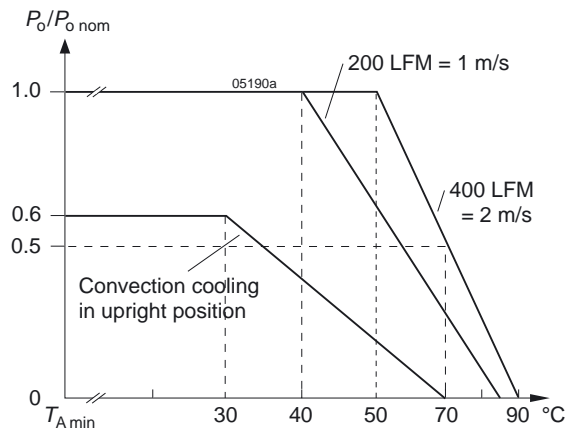


Fig. 3b  
Output power versus temperature  $T_A$  (CPD250)

**Auxiliary Functions**

**Inhibit**

The inhibit input enables (logic high, pull up) or disables (logic low, pull down) all outputs, if a logic signal (TTL, CMOS) is applied. In systems consisting of several converters this feature may be used to control the activation sequence of the converters by means of logic signals, or to enable the source to start up, before full load is applied.

pin 24), the internal logic will disable all outputs. The inhibit input is protected by a decoupling diode.

Table 5: Inhibit data

Characteristics		Conditions	min	typ	max	Unit
$V_{inh}$	Inhibit voltage	$V_o = \text{off}$	$V_{i \min} - V_{i \max}$	-2	0.8	V
		$V_o = \text{on}$	$I_o = 0 - I_o \max$	2.4	50	
$t_r$	Rise time			120		ms
$t_f$	Fall time			depending on $I_o$		

**Note:** If this function is not used, the inhibit pin 39 can be left open (not connected). If pin 39 is connected to a return (e.g.

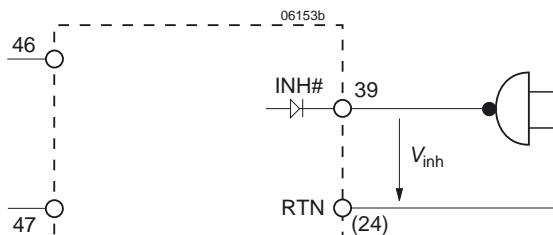


Fig. 4  
Definition of  $V_{inh}$ .

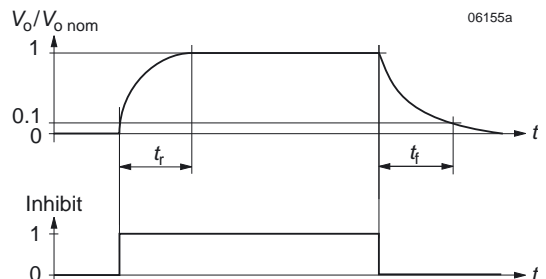


Fig. 5  
Typical output response as a function of inhibit voltage.



**Enable**

Connect enable pin 27 (EN#) with signal return pin 22 (RTN) externally to start the converter. Pin 27 is shorter than the others ensuring startup only when all other pins are already connected to the system providing a true hot-swap capability.

**Temperature Warning and Shut-Down**

The temperature warning circuitry monitors the case temperature. Its output signal changes from high to low impedance, when the case temperature exceeds the upper threshold level, and changes back to high impedance, when the case temperature falls below the lower threshold level.

Pin 38 (degrade signal  $V_{DEG\#}$ ) is internally connected via the collector-emitter path of an NPN transistor to the signal return pin 22. The current  $I_{DEG\#}$  through should not exceed 40 mA. To prevent the NPN transistor from damage,  $V_{DEG\#}$  should not exceed 40 V.

If the case temperature  $T_C$  exceeds 105 °C, the converter will be disabled. It resumes operation, once  $T_C$  falls below 105 °C.

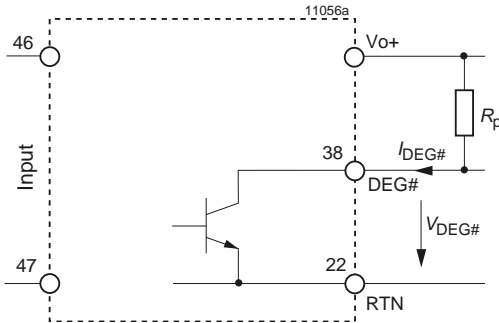


Fig. 6  
Degrade signal: NPN output  $V_{DEG\#} \leq 40$  V,  $I_{DEG\#} \leq 20$  mA

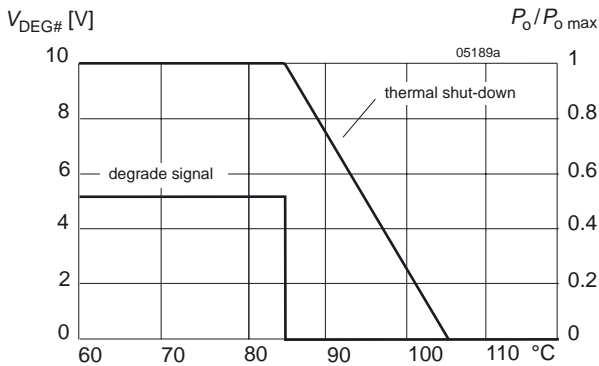


Fig. 7  
Degrade signal  $V_{DEG\#}$  versus case temperature  $T_C$

Table 6: Degrade threshold level

	Case Temperature		
	min	typ	max
Threshold level	80 °C	85 °C	90 °C

**Power Fail Signal**

The power fail circuitry monitors the input voltage and all output voltages. Its output signal  $V_{fail}$  changes from high to low impedance, when one of the monitored voltages falls below the threshold level;  $V_{fail}$  changes back to high impedance, when the monitored voltage exceeds the threshold level again.

The threshold levels correspond to approx. 90% of  $V_{i\ min}$  and approx. 85% of  $V_{o\ nom}$ .

Connector pin 42 (fail signal  $V_{fail}$ ) is internally connected via the drain-source path of a JFET (self-conducting type) to the signal return pin 22. The current  $I_{fail}$  should not exceed 2.5 mA. The JFET is not protected against overvoltage;  $V_{fail}$  should not exceed 40 V.

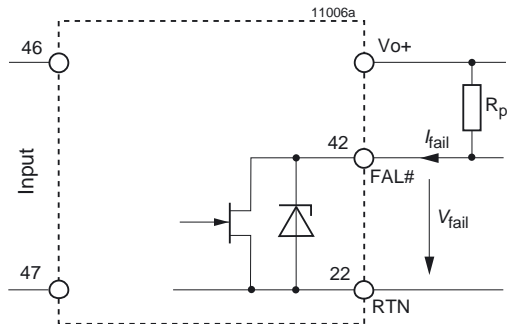


Fig. 8  
Power Fail: JFET output,  $I_{fail} \leq 2.5$  mA.

**Sense Lines**

(Only for Vo1, Vo2 and Vo3.)

This feature allows the compensation of voltage drops across the connector contacts and if necessary, across the load lines.

To ensure correct operation, each sense line (S+ and S-) should be connected to its respective power output (Vo+ and Vo-).

**Note:** All outputs have a common sense return.

The voltage difference between any sense line at its respective power output pin (as measured on the connector) should not exceed the following values.

Table 7: Sense line data

Output [V]	Total voltage difference between sense lines and their respective outputs
3.3	0.8 V
5	1 V
12	1 V

**Note:** The output terminals Vo+ and Vo- must always be connected to the load before connecting the sense lines S+ and S-, otherwise the converter will be damaged.

**Note:** If the sense lines S+ and S- compensate for a considerable voltage drop, the output loads shall be reduced in order to respect the maximum output power.



**Active Current Sharing for Vo1, Vo2, Vo3**

The current sharing facility, consisting of a single-wire link, should be used, where several converters are operated in parallel connection, for example, high reliability n+1 redundant systems or systems providing higher output power. Not more than six converters should be connected in parallel.

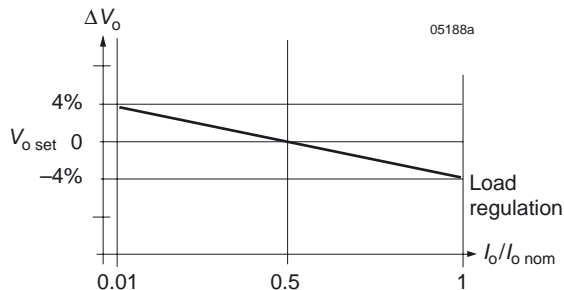
Using this feature reduces the stress on the individual converters and improves the reliability of the system. Interconnection of the current sharing terminals causes the converters to share the output current evenly. In n+1 redundant systems a failure of a single converter will not lead to a system failure, since the outputs are already decoupled by FETs and diodes internally.

**Passive Current Sharing for Vo4**

The output voltage changes slightly with the output current (droop characteristic) ensuring automatic current sharing

without further precautions, when several converters are connected in parallel. An increase in output current decreases the output voltage according to the formula:

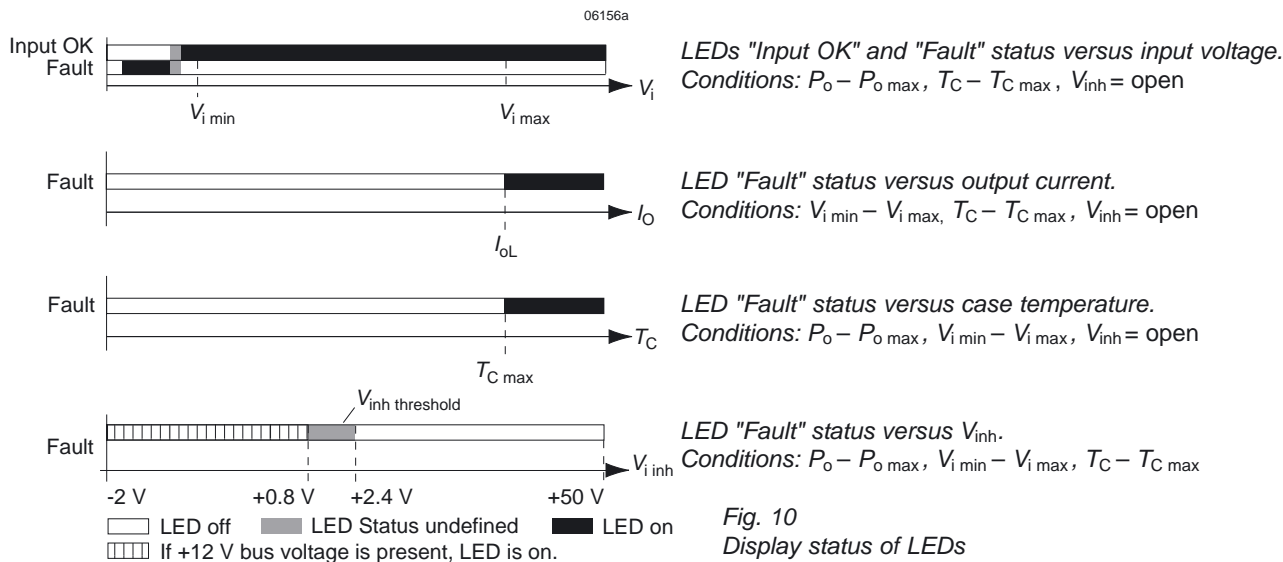
$$V_o = 12 V + (0.5 - \frac{I_o}{I_{o\ nom}}) \cdot 0.96 V$$



*Fig. 9*  
 Output voltage  $V_{o4}$  versus output current  $I_{o4}$ .

**LEDs**

A green LED "Input OK" and a red LED "Fault" are incorporated in the front panel.







### Electromagnetic Compatibility (EMC)

A metal oxide VDR together with an input fuse and filter form an effective protection against high input transient

voltages which typically occur in most installations. The CPD Series has been successfully tested to the following specifications:

### Electromagnetic Immunity

Table 8: Immunity type tests

Phenomenon	Standard	Level	Coupling mode <sup>1</sup>	Value applied	Waveform	Source imped.	Test procedure	In oper.	Per-form. <sup>2</sup>
Electrostatic discharge (to case)	IEC/EN 61000-4-2	4	contact discharge	8000 V <sub>p</sub>	1/50 ns	330 Ω	10 positive and 10 negative discharges	yes	A
			air discharge	15000 V <sub>p</sub>					
Electromagnetic field	IEC/EN 61000-4-3	3	antenna	10 V/m	AM 80% 1 kHz	n.a.	80 – 1000 MHz	yes	A
				10 V/m	50% duty cycle 200 Hz repetition frequency		900 ±5 MHz		
Electrical fast transients/burst	IEC/EN 61000-4-4	3	capacitive, o/c	1000 V <sub>p</sub>	bursts of 5/50 ns 2.5/5 kHz over 15 ms; burst period: 300 ms	50 Ω	60 s positive 60 s negative transients per coupling mode	yes	A
			direct, i/c, +i/-i	2000 V <sub>p</sub>					
Surges	IEC/EN 61000-4-5	3	i/c	2000 V <sub>p</sub>	1.2/50 μs	12 Ω	5 pos. and 5 neg. surges per coupling mode	yes	B
			+i/-i	1000 V <sub>p</sub>		2 Ω			
Conducted disturbances	IEC/EN 61000-4-6	3	i, o, signal wires	10 VAC (140 dBmV)	AM 80% 1 kHz	150 Ω	0.15 – 80 MHz	yes	A

<sup>1</sup> i = input, o = output, c = case connected to PE ⊕

<sup>2</sup> A = normal operation, no deviation from specifications, B = temporary deviation from specs possible.

### Electromagnetic Emission

Radiated and conducted emissions meet class A according to EN 55011/55022.

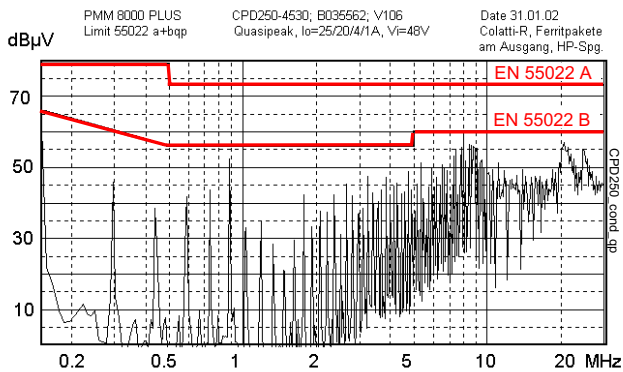


Fig. 11  
Typical disturbance voltage (quasi peak) at the input according to EN 55022, measured at V<sub>i nom</sub> and I<sub>o nom</sub> (CPD250-4530).

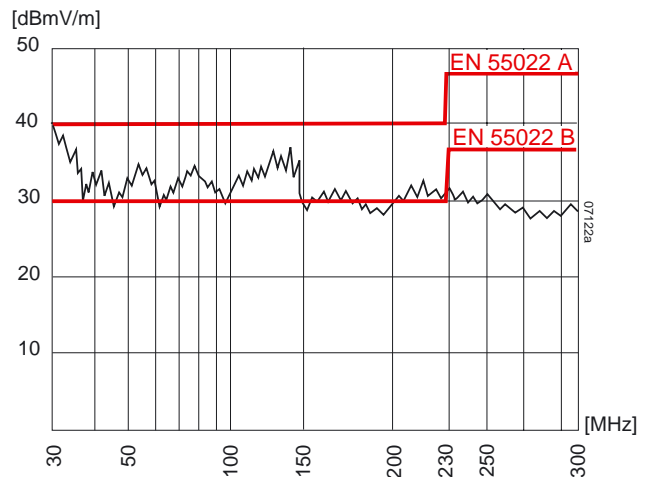


Fig. 12  
Typical radiated electromagnetic field strength (quasi peak) according to EN 55011/55022, normalised to a distance of 10 m, measured at V<sub>i nom</sub> and I<sub>o nom</sub>.



## Immunity to Environmental Conditions

Table 9: Mechanical and climatic stress

Test method		Standard	Test conditions		Status
Ca	Damp heat steady state	IEC/EN 60068-2-78	Temperature: Relative humidity: Duration:	40 ±2 °C 93 +2/-3 % 56 days	Converter not operating
Ea	Shock (half-sinusoidal)	IEC/EN 60068-2-27	Acceleration amplitude: Bump duration: Number of bumps:	20 g <sub>n</sub> 11 ms 18 (3 in each direction)	Converter operating
Eb	Bump (half-sinusoidal)	IEC/EN 60068-2-29	Acceleration amplitude: Bump duration: Number of bumps:	15 g <sub>n</sub> 6 ms 6000 (1000 in each direction)	Converter operating
Fda	Random vibration wide band Reproducibility high	IEC/EN 60068-2-35	Acceleration spectral density: Frequency band: Acceleration magnitude: Test duration:	0.05 g <sub>n</sub> <sup>2</sup> /Hz 20 – 500 Hz 4.9 g <sub>n rms</sub> 3 h (1 h in each axis)	Converter operating
	Drop test	Converter in proper packing	0.75 m	3 directions	Not operating

## Temperatures

Table 10: Temperature specifications, valid for an air pressure of 800 – 1200 hPa (800 – 1200 mbar)

Characteristics		Conditions	Relative humidity <sup>3</sup> [%]			Temperature [°C]		
			min	typ	max	min	typ	max
T <sub>A</sub>	Ambient temperature	Operational <sup>1</sup>	5		95	-25		50
T <sub>C</sub>	Case temperature <sup>2</sup>		5		95	-25		105 <sup>2</sup>
T <sub>S</sub>	Storage temperature	Non operational	10		95	-40		85
R <sub>th C-A</sub>	Thermal resistance case to ambient in still air		2 K/W					

<sup>1</sup> See: *Thermal Considerations*.

<sup>2</sup> Overtemperature shut-down at T<sub>C</sub> ≥ 105 °C

<sup>3</sup> Non condensing humidity

## Reliability

Table 11: MTBF

Ratings at specified case temperature	Model	Ground benign 40 °C	Ground fixed		Ground mobile 50 °C	Unit
			40 °C	70 °C		
MTBF acc. to MIL-HDBK-217F, notice 2	CPD250-4530	288 000	59 000	33 000	27 000	h



### Mechanical Data

Dimensions in mm.

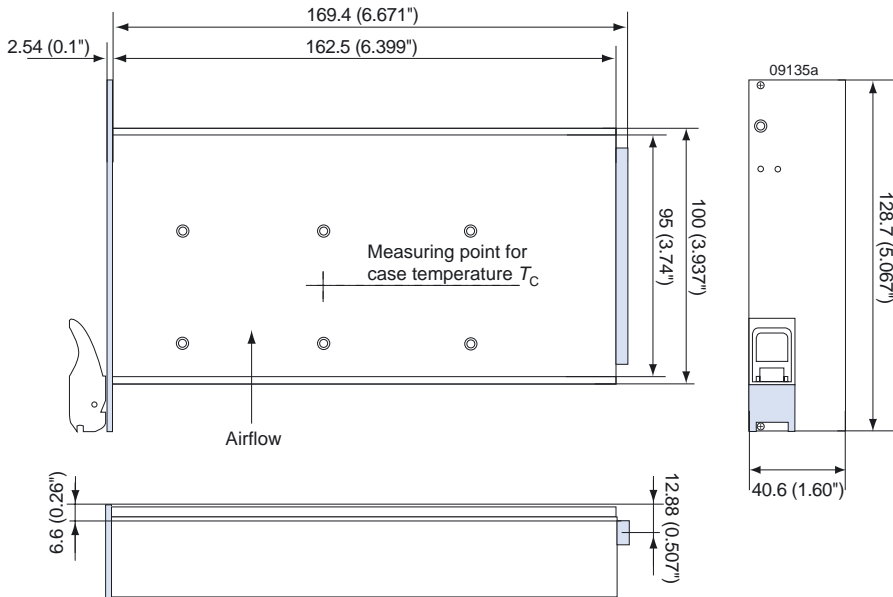


Fig. 14  
View of the Positronic connector

Fig. 13  
Overall size: 162.5 mm x 128.7 mm x 40.6 mm  
Weight: 0.8 kg

### Connector Pin Allocation

The connector pin allocation table defines the electrical potentials and the physical pin positions on the Positronic connector. Pin no. 45 (protective earth) pin is a leading pin, ensuring that it makes contact with the female connector first.

Connector: Positronic PCIH47M400A1

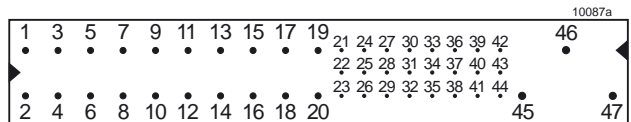


Fig. 15  
Pinout of the Positronic (PCIH47M400A1) connector.  
Mating connector: PCIH47F300A1

Table 12: Pin allocation of the Positronic (PCIH47M400A1) connector

Pin <sup>1</sup>	Length <sup>2</sup>	Signal name	Description
1-4	B	Vo1	Output 1
5-12	B	RTN	Return (Vo1 and Vo2)
13-18	B	Vo2	Output 2
19	B	RTN	Return (Vo3)
20	B	Vo3	Output 3
21	C	Vo4	Output 4
22	C	RTN	Return
23	C	Reserved	Reserved
24	C	RTN	Return (Vo4)
25	C	n.c.	Do not connect
26	C	Reserved	Reserved
27	D	EN#	Enable
28	C	n.c.	Do not connect
29	C	n.c.	Do not connect
30	C	Vo1SENSE	Vo1 remote sense
31	C	n.c.	Do not connect

Pin <sup>1</sup>	Length <sup>2</sup>	Signal name	Description
32	C	n.c.	Do not connect
33	C	Vo2SENSE	Vo2 remote sense
34	C	SRTN	Sense return
35	C	Vo1SHARE	Vo1 current share
36	C	Vo3SENSE	Vo3 remote sense
37	C	n.c.	Do not connect
38	C	DEG#	Degrade signal
39	C	INH#	Inhibit
40	C	n.c.	Do not connect
41	C	Vo2SHARE	Vo2 current share
42	C	FAL#	Fail signal
43	C	n.c.	Do not connect
44	C	Vo3SHARE	Vo3 current share
45	A <sup>3</sup>	CGND	Chassis ground
46	A	+DCIN	Positive input
47	A	-DCIN	Negative input

<sup>1</sup> Pin numbers shown are for the female backplane connector  
<sup>2</sup> A = very long pins, B = long pins, C = short pins, D = very short pins.  
<sup>3</sup> Pin 45 of the female connector is leading, ensuring that chassis ground makes contact first.



## Installation Instructions

These converters are components, intended exclusively for installation within other equipment by an industrial assembly process or by a professionally, competent person. Installation must strictly follow the national safety regulations in respect of the enclosure, mounting, creepage distances, clearance, casualty markings, and segregation requirements of the end-use application.

Connection to the system shall be made via the mating female connector (see fig. 15). Other installation methods may not meet the safety requirements. Check for hazardous voltages before altering any connections.

The converters are provided with a leading pin no. 45, which is reliably connected to the case. For safety reasons it is essential to connect this pin to the protective earth of the supply system, see also: *Safety of Operator-Accessible Output Circuits*.

The Vi input (pin no. 46) is internally fused. This fuse is designed to protect the converter in case of over current, but may not be able to satisfy all customer requirements. External fuses in the wiring to one or both input pins (no. 46 and/or no. 47) may therefore be necessary to ensure compliance with local requirements.

**Important:** If the inhibit function is not used, pin 39 (i) should be left unconnected to enable the outputs. Enable Pin 27 (EN#) should be connected to pin 22 (RTN) to enable the outputs.

Do not open the converters, or the warranty will be invalidated. Make sure that there is sufficient airflow available for convection cooling. This should be verified by measuring the case temperature, when the converter is installed and operated in the end-use application. The maximum specified case temperature  $T_{C\ max}$  should not be exceeded.

Make sure that a converter failure (e.g., by an internal short-circuit) does not result in a hazardous condition.

### Cleaning Agents

The power supplies are not hermetically sealed. In order to avoid possible damage, any penetration of cleaning fluids is to be avoided.

## Standards and Approvals

The converters correspond to class I equipment.

All converters are UL-recognized according to UL 60950 and CAN/CSA C22.2 No. 60950, and approved by TÜV to IEC/EN 60950-1:2001. The following considerations have been made during design concerning safety :

- Build-in component
- Basic insulation between input and output, based on 75 VDC. The input is identified as TNV-2.
- Operational insulation between output(s) and case
- Use in a pollution degree 2 environment.

The converters are subject to manufacturing surveillance in accordance with the above mentioned UL standards and ISO 9001:2000.

## Isolation

The electric strength test is performed as factory test in accordance with EN 50116 and EN/IEC 60950 and should not be repeated in the field (see table *Isolation*). Power-One will not honour any guarantee claims resulting from electric strength field tests.

Table 13: Isolation

Characteristic		Input to case + outputs	Outputs to case	Unit
Electric strength test	Actual factory test $\geq 1$ s	1500 <sup>1</sup>	700	VDC
	AC test voltage equivalent to factory test	1000	500	VAC
Insulation resistance at 500 VDC		>300	>300	MΩ

<sup>1</sup> According to IEC/EN 60950, subassemblies connecting input to output are pre-tested with  $\geq 3$  kVDC.

## Protection Degree

The converters correspond to protection degree IP 20, provided that the female connector is fitted.

## Safety of Operator-Accessible Output Circuits

If the output circuit of a DC-DC converter is operator-accessible, it shall be a SELV circuit according to the IEC/EN 60950 related safety standards.

However, it is the sole responsibility of the installer to ensure the compliance with the relevant and applicable safety regulations.

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NUCLEAR AND MEDICAL APPLICATIONS - Power-One products are not designed, intended for use in, or authorized for use as critical components in life support systems, equipment used in hazardous environments, or nuclear control systems without the express written consent of the respective divisional president of Power-One, Inc.

TECHNICAL REVISIONS - The appearance of products, including safety agency certifications pictured on labels, may change depending on the date manufactured. Specifications are subject to change without notice.



Declaration of Conformity  
***Declaration of Conformity***  
***CE MARKING***

We, **Power-One, Inc., 740 Calle Plano, Camarillo, CA. 93012 USA**  
declare under our sole responsibility that the products;

**Power Supply Model: CPD200 and CPD250 Series**

to which this declaration relates, is/are in compliance with the following document(s):

Quality Standard(s): **ISO 9001, EN 29001**

Directive: **DIR 73/23/EEC, Low Voltage Directive**

Product Safety Standard(s): **EN 60950-1: 2001**  
**IEC 60950-1: 2001**  
(Licensed by a Notified Body to the European Union )

These component level power supplies are intended exclusively for inclusion within other equipment by an industrial assembly operation or by professional installers per the Installation Instructions provided with the power supplies. The power supply is considered Class I and must be connected to a reliable earth grounding system.

*(Manufacturer)*

Robert P. White Jr.  
Product Safety Director

**Camarillo, Ca.**

*(Place)*

**October 24, 2006**

*(Date)*