

PMC



Highlights & Features

- Universal AC input range
- High PF > 0.99 @ 115 Vac
- Power Boost of 200% for 5 seconds
- Meet Surge Immunity IEC 61000-4-5, Level 4 (CM: 4 kV, DM: 2 kV)
- Built-in fan speed control and fan lock protection
- Wide operating temperature range -20°C to 70°C
- Overvoltage / Overcurrent / Over Temperature / Short Circuit Protections
- Certified according to IEC/EN/UL 62368-1

Safety Standards



CB Certified for worldwide use

Model Number:	PMC-24V600W1BA
Unit Weight:	1.60 kg (3.53 lb)
Dimensions (L x W x H):	215 x 120 x 61 mm (8.46 x 4.72 x 2.40 inch)

General Description

The PMC-24V600W1BA has a power rating of 600 W with 24 V output voltage. The product features Power Boost of 200% (up to 1200 W) for 5 seconds and built-in fan speed control with fan lock protection. The PMC-24V600W1BA accepts the full universal AC input range and have been approved for major safety standards like IEC/EN/UL 60950-1 and IEC/EN/UL 62368-1, EMI according to EN 55011 (Industrial, scientific and medical (ISM) radio-frequency equipment) and EMS according to EN 61000-6-2 (Immunity for industrial environments).

Model Information

PMC Panel Mount Power Supply

Model Number	Input Voltage Range	Output Voltage	Output Current
PMC-24V600W1BA	85-264 Vac (120-370 Vdc)	24 Vdc	25.0 A

Model Numbering

PM	C –	24 V	600 W	1	B	A
Panel Mount	Product Type C – Enclosed	Output Voltage	Output Power	Single Phase	With PFC	Front Face connector

Specifications

Input Ratings / Characteristics

Nominal Input Voltage	100-240 Vac
Input Voltage Range	85-264 Vac (Refer to the Output De-rating VS. Input Voltage graph)
Nominal Input Frequency	50-60 Hz
Input Frequency Range	47-63 Hz
Nominal DC Input Voltage	142-340 Vdc
DC Input Voltage Range*	120-370 Vdc (Refer to the Output De-rating VS. Input Voltage graph)
Input Current	< 6.50 A @ 115 Vac, < 3.20 A @ 230 Vac
Efficiency at 100% Load	> 86.0% @ 115 Vac, > 89.0% @ 230 Vac
Max Power Dissipation	0% load < 3.0W @ 115Vac, < 3.5W @ 230Vac
	100% load < 97.0W @ 115Vac, < 74.0W @ 230Vac
Max Inrush Current	< 20 A @ 115 Vac, < 40 A @ 230 Vac
Power Factor	> 0.99 @ 115 Vac, > 0.94 @ 230 Vac
Leakage Current	< 1.5 mA

*Fulfills tested conditions

Output Ratings / Characteristics**

Nominal Output Voltage	24 Vdc
Factory Set Point Tolerance	24Vdc \pm 2%
Output Voltage Adjustment Range	21.6-26.4Vdc
Output Current	25.0 A (continuously operating at 24 V) 50.0 A (Power Boost for 5 seconds at 24 V, refer to the details in the Functions section)
Output Power	600 W (continuously operating) 1200 W (Power Boost for 5 seconds, refer to the details in the Functions section)
Line Regulation	< 0.4% (@ 115-264 Vac input, 100% load)
Load Regulation	< 0.625% (@ 115-264 Vac input, 0-100% load)
PARD*** (20MHz)	< 180 mVpp @ 0°C to 50°C, < 240 mVpp @ -20°C to 0°C
Rise Time	< 50 ms @ 115 Vac & 230 Vac (100% load)
Start-up Time	< 800 ms @ 230 Vac (100% load)
Hold-up Time	> 20 ms @ 115 Vac & 230 Vac (100% load)
Dynamic Response (Overshoot & Undershoot O/P Voltage)	\pm 5% @ 115-264 Vac input, 0-100% load (Slew Rate: 0.1A/ μ s, 50% duty cycle @ 5Hz to 1KHz)
Start-up with Capacitive Loads	10,000 μ F Max

**For power de-rating from 50°C to 70°C, see power de-rating on page 3.

***PARD is measured with an AC coupling mode, 5cm wires, and in parallel with 0.1 μ F ceramic capacitor & 22 μ F electrolytic capacitor.

Mechanical

Case Chassis / Cover	SECC	
Dimensions (L x W x H)	215 x 120 x 61 mm (8.46 x 4.72 x 2.40 inch)	
Unit Weight	1.60 kg (3.53 lb)	
Indicator	Green LED DC OK	
Cooling System	Forced Cooling (Built-in Fan)	
Terminal	Input	3 Pins (Rated 300 V/20 A)
	Output	4 Pins (Rated 300 V/25 A)
Wire	AWG 14-12	
Noise (1 Meter from power supply)	Sound Pressure Level (SPL) < 52 dBA	

Environment

Surrounding Air Temperature	Operating	-20°C to +70°C
	Storage	-20°C to +75°C
Power De-rating	Temperature	> 50°C de-rate power by 2.5% / °C
	Input Voltage	< 115 Vac de-rate power by 0.67% / 1 V
Operating Humidity		5 to 95% RH (Non-Condensing)
Operating Altitude		0 to 3,000 Meters (9,840 ft.)
Shock Test	Non-Operating	IEC 60068-2-27, 30 G (300 m/S ²) for a duration of 18ms, 1 times per direction, 2 times in total
Vibration	Non-Operating	IEC 60068-2-6, 10 Hz to 150 Hz @ 50 m/S ² (5 G peak); 20 min per axis for all X, Y, Z direction
Over Voltage Category		II
Pollution Degree		2

Protections

Overvoltage	27.6-33.6 V, SELV Output, Latch Mode
Overload / Overcurrent	> 180% of rated load @ $V_{in} \geq 115$ Vac, Hiccup Mode, Non-Latching (Auto-Recovery)
Over Temperature	< 70°C Surrounding Air Temperature @ 100% load, Latch Mode
Short Circuit	Hiccup Mode, Non-Latching (Auto-Recovery when the fault is removed)
Fan Lock	Latch Mode
Internal Fuse at L pin	F 12.5AH
Protection Against Shock	Class I with PE* connection

*PE: Primary Earth

Reliability Data

MTBF	> 300,000 hrs. as per Telcordia SR-332 I/P: 115Vac, O/P: 100% load, Ta: 25°C
Expected Cap Life Time	10 years (115 Vac & 230 Vac, 50% load @ 40°C)

Safety Standards / Directives

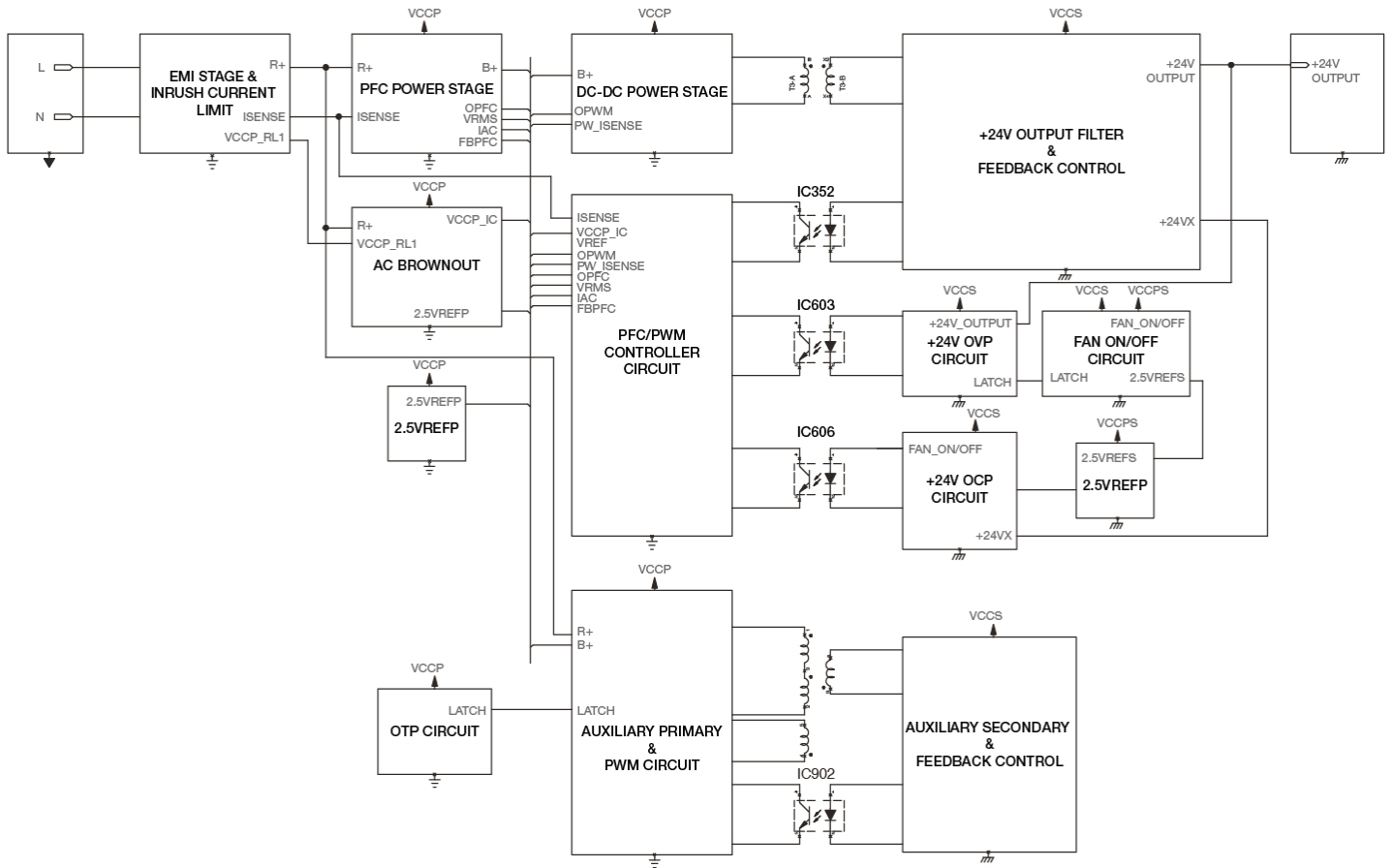
Safety Entry Low Voltage		SELV (IEC 60950-1)
Electrical Safety	SIQ Bauart	EN 62368-1
	UL/cUL recognized	UL 60950-1 and CSA C22.2 No. 60950-1 (File No. E191395), UL 62368-1 and CSA C22.2 No. 62368-1 (File No. E191395)
	CB scheme	IEC 60950-1, IEC 62368-1
	KC	K 60950-1
	UKCA	BS EN 62368-1
CE		In conformance with EMC Directive 2014/30/EU and Low Voltage Directive 2014/35/EU
UKCA		In conformance with Electrical Equipment (Safety) Regulations 2016 No. 1011 and The Electromagnetic Compatibility Regulations 2016 No. 1091
Galvanic Isolation	Input to Output	3.0 kVac
	Input to Ground	1.5 kVac
	Output to Ground	0.5 kVac

EMC

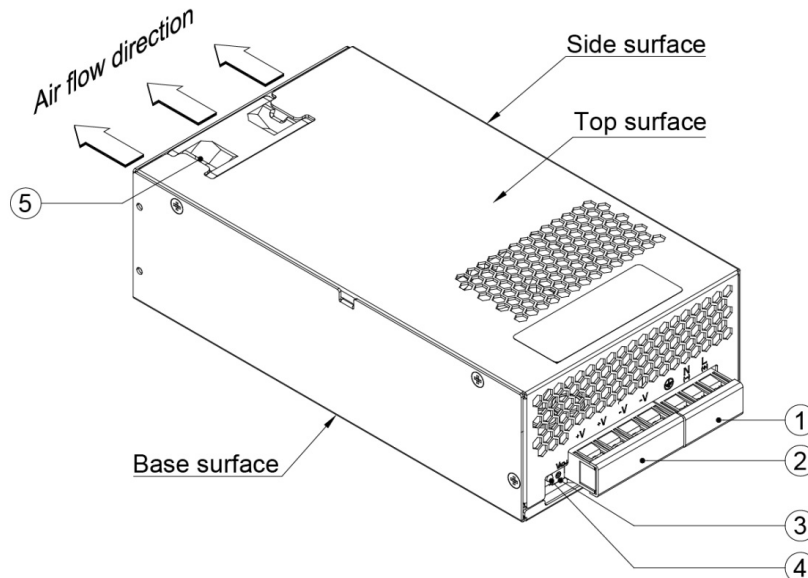
Emissions (CE & RE)		Generic Standards: CISPR 32, EN/BS EN 55032, CISPR 11, EN/BS EN 55011, FCC Title 47, VCCI ¹⁾ : Class B
Immunity		Generic Standards: EN/BS EN 55024, EN/BS EN 61000-6-2
Electrostatic Discharge	IEC 61000-4-2	Level 3 Criteria A ²⁾ Air Discharge: 8 kV Contact Discharge: 6 kV
Radiated Field	IEC 61000-4-3	Level 3 Criteria A ²⁾ 80 MHz - 1 GHz, 10 V/M, 80% modulation (1 KHz) 1.4 GHz - 2 GHz, 3 V/M, 80% modulation (1 KHz) 2 GHz - 2.7 GHz, 1 V/M, 80% modulation (1 KHz)
Electrical Fast Transient / Burst	IEC 61000-4-4	Level 3 Criteria A ²⁾ 2 kV
Surge	IEC 61000-4-5	Level 4 Criteria A ²⁾ Common Mode ³⁾ : 4 kV Differential Mode ⁴⁾ : 2 kV
Conducted	IEC 61000-4-6	Level 3 Criteria A ²⁾ 150 kHz-80 MHz, 10 Vrms
Power Frequency Magnetic Fields	IEC 61000-4-8	Criteria A ²⁾ 30 A/Meter
Voltage Dips	IEC 61000-4-11	100% dip; 1 cycle (20 ms); Self Recoverable
Harmonic Current Emission		IEC/EN/BS EN 61000-3-2, Class A
Voltage Fluctuation and Flicker		IEC/EN/BS EN 61000-3-3

- 1) Fulfills tested conditions
2) Criteria A: Normal performance within the specification limits
3) Asymmetrical: Common mode (Line to earth)
4) Symmetrical: Differential mode (Line to line)

Block Diagram



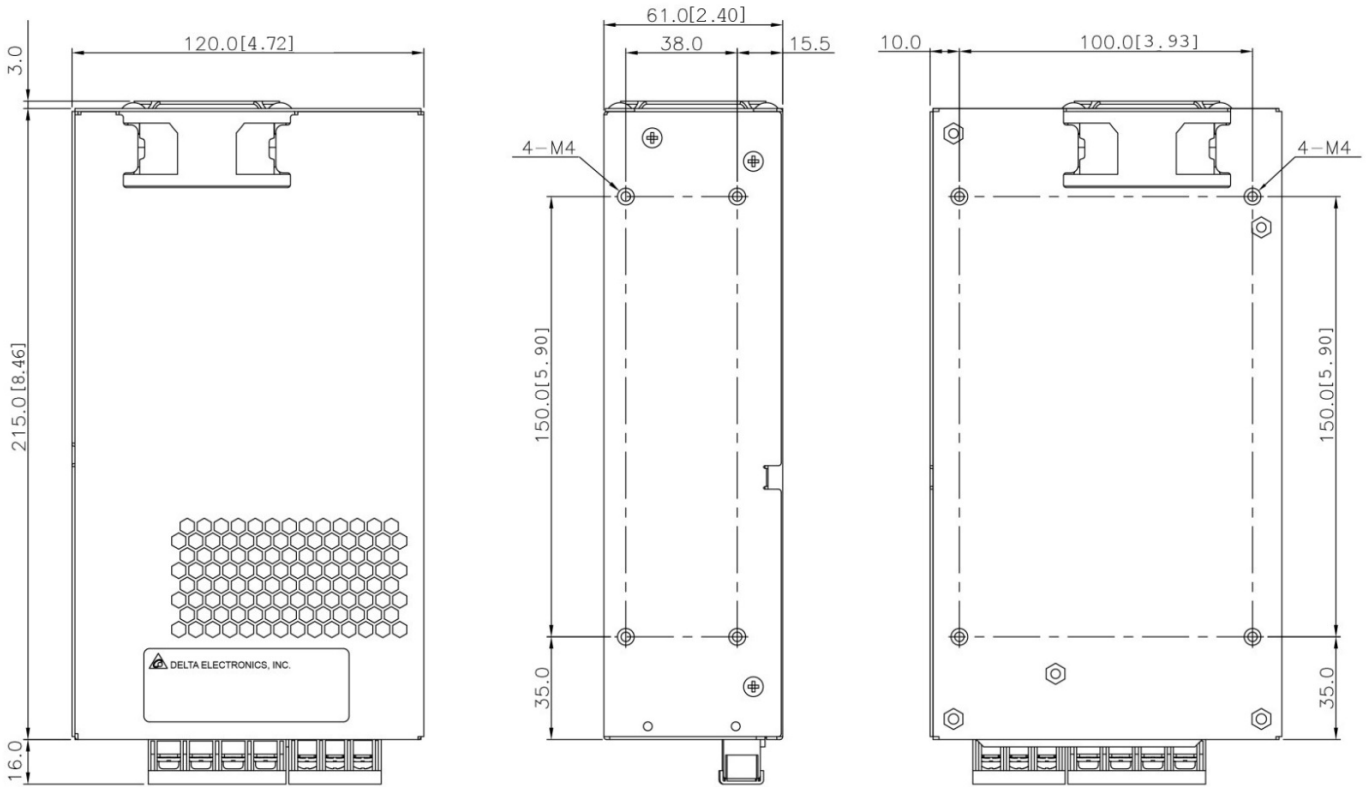
Device Description



- 1) Input terminal block connector
- 2) Output terminal block connector
- 3) DC voltage adjustment potentiometer
- 4) DC OK control LED (Green)
- 5) DC Fan

Dimensions

L x W x H: 215 x 120 x 61 mm (8.46 x 4.72 x 2.40 inch)



Engineering Data

Output Load De-rating VS Surrounding Air Temperature

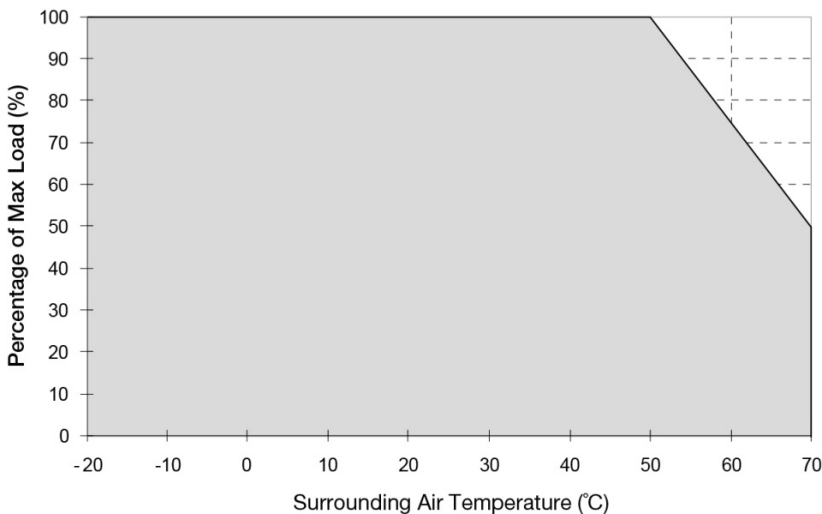
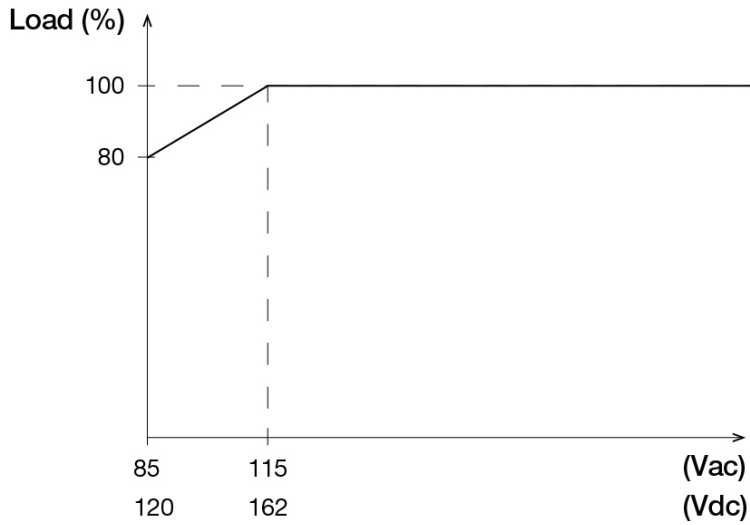


Fig. 1 De-rating for Vertical and Horizontal Mounting Orientation
 > 50°C de-rate power by 2.5% / °C

Note

1. Power supply components may degrade, or be damaged, when the power supply is continuously used outside the shaded region, refer to the graph shown in Fig. 1.
2. If the output capacity is not reduced when the surrounding air temperature exceeds its specification as defined on Page 3 under "Environment", the device may run into Over Temperature Protection. When activated, the output voltage will go into latch mode until the mains is re-applied and the surrounding air temperature drops to its normal operating temperature.
3. In order for the device to function in the manner intended, it is also necessary to keep a safety distance as recommended in the safety instructions while the device is in operation.
4. Depending on the surrounding air temperature and output load delivered by the power supply, the device can be very hot!
5. If the device has to be mounted in any other orientation, please contact info@deltapsu.com for more details.

Output Load De-rating VS Input Voltage



■ Output de-rating is required at 85 Vac to 115 Vac or 120 Vdc to 162 Vdc.

Assembly & Installation

- Ⓐ Mounting holes for power supply assembly onto the mounting surface.
The power supply shall be mounted on minimum 4 mounting holes using M4 screw minimum 5mm length.
- Ⓑ Input / Output Connector
- Ⓒ This surface belongs to customer's end system or panel where the power supply is mounted.

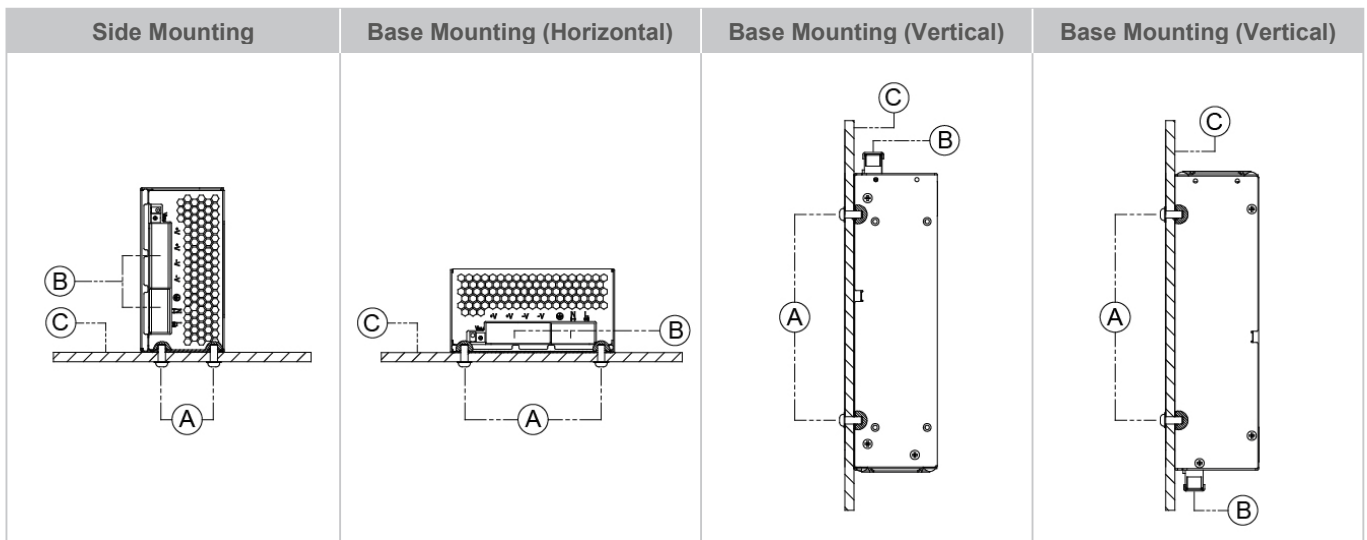
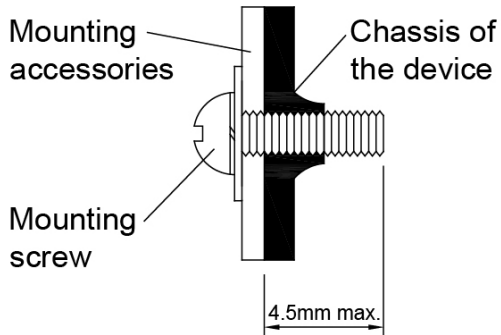


Fig. 2 Mounting Orientation

- Use flexible cable (stranded or solid) of AWG No. 14-12. The torque at the Input connector shall not exceed 11.98 Kgf.cm. The torque at the Output connector shall not exceed 16.59 Kgf.cm. The insulation stripping length should not exceed 0.275" or 7 mm.

Installation of Mounting Accessories



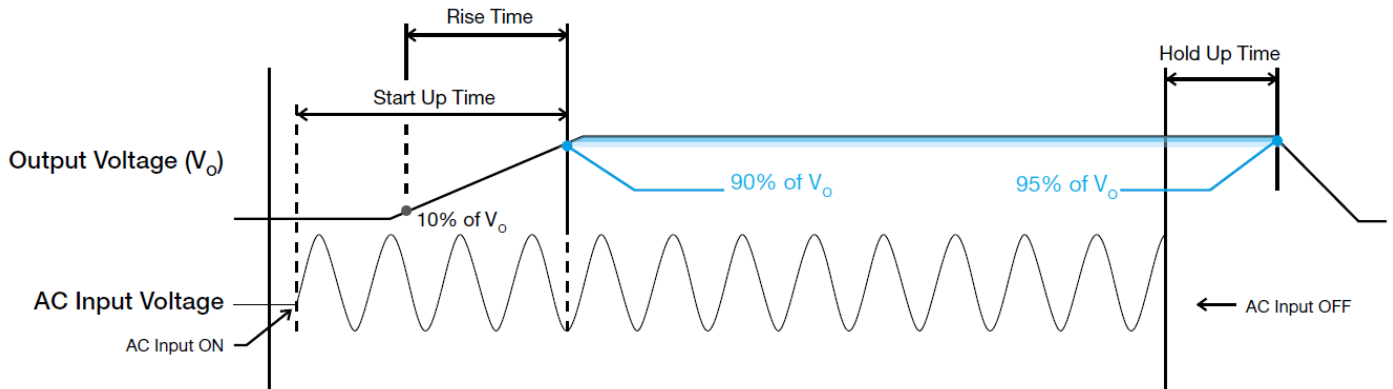
- Only use M4 screw ≤ 4.5 mm through the base mounting holes. This is to keep a safety distance between the screw and internal components.
- Recommended mounting tightening torque: 4~8 Kgf.cm.

Safety Instructions

- To ensure sufficient convection cooling, always maintain a safety distance of ≥ 50 mm from all ventilated surfaces while the device is in operation.
- The device is not recommended to be placed on low thermal conductive surface, for example, plastics.
- Note that the enclosure of the device can become very hot depending on the ambient temperature and load of the power supply. Do not touch the device while it is in operation or immediately after power is turned OFF. Risk of burning!
- Do not touch the terminals while power is being supplied. Risk of electric shock.
- Prevent any foreign metal, particles or conductors from entering the device through the openings during installation. It may cause: Electric shock; Safety Hazard; Fire; Product failure
- Warning: When connecting the device, secure Earth connection before connecting L and N. When disconnecting the device, remove L and N connections before removing the Earth connection.

Functions

- Graph illustrating the Start-up Time, Rise Time, and Hold-up Time



Start-up Time

The time required for the output voltage to reach 90% of its final steady state set value, after the input voltage is applied.

Rise Time

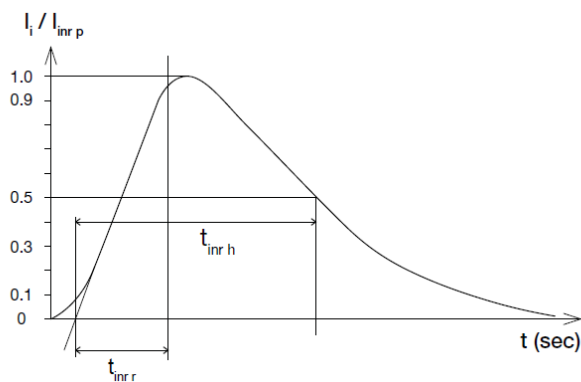
The time required for the output voltage to change from 10% to 90% of its final steady state set value.

Hold-up Time

Time between the collapse of the AC input voltage, and the output falling to 95% of its steady state set value.

Inrush Current

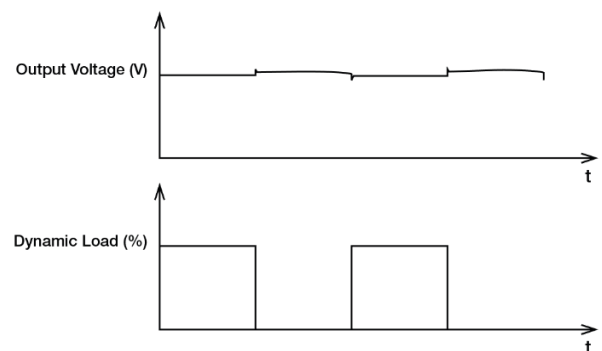
Inrush current is the peak, instantaneous, input current measured and, occurs when the input voltage is first applied. For AC input voltages, the maximum peak value of inrush current will occur during the first half cycle of the applied AC voltage. This peak value decreases exponentially during subsequent cycles of AC voltage.



Dynamic Response

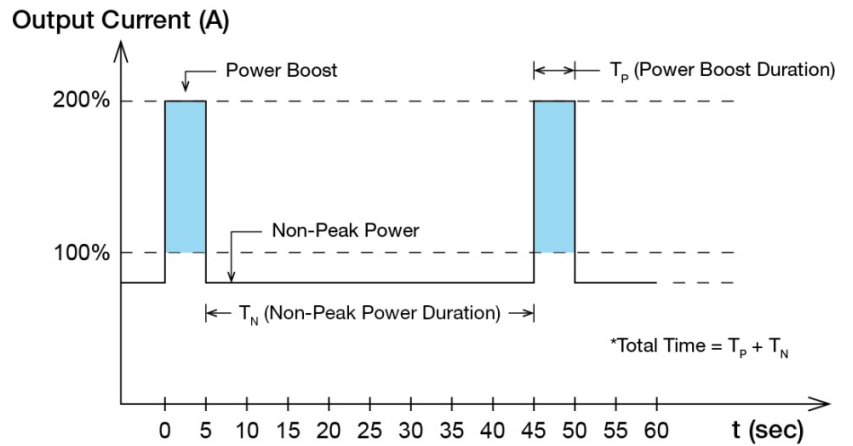
The power supply output voltage will remain within $\pm 5\%$ of its steady state value, when subjected to a dynamic load from 0% to 100% of its rated current.

- 50% duty cycle / 5 Hz to 1 KHz



Power Boost

Power Boost is the reserve power available constantly that allows reliable startup to support sudden and short spike of loads with high inrush current typically during turn on to remove the need of more expensive higher rated power supply unit. After the output has reached its steady state set value, the power supply can support surge loads with a higher short-term power demand up to 200% of maximum rated load (I_o Max), for a maximum duration of 5 seconds. The Power Boost is also available to repeatedly basis with according to the condition of an average (R.M.S) output power shall not exceed continuous operating condition or refer to duty cycle calculation below.



$$\text{Duty cycle (\%)} = \frac{T_p}{\text{Total Time}}$$

$$\text{Average Output Power } (P_{Avg}) = \frac{(\text{Power Boost} \times T_p) + (\text{Non-Peak Power} \times T_N)}{\text{Total Time}}$$

OR

$$\text{Non-Peak Power} = \frac{(P_{Avg} \times \text{Total Time}) - (\text{Power Boost} \times T_p)}{T_N}$$

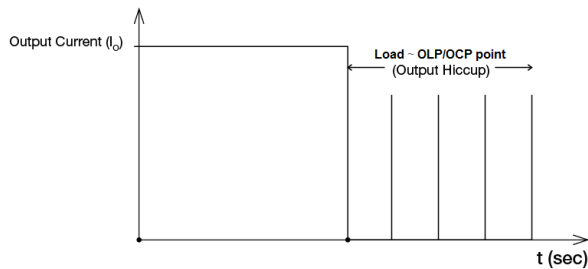
■ An example of Power Boost and Average Output Power

Power Boost	Peak Power (W _P)	Power Boost Duration (T _P)	Duty Cycle	Non-Peak Power (W _N)	Non-Peak Power Duration (T _N)	Total Time (T)
200%	1200	5 sec	10%	533	45 sec	50 sec
200%	1200	5 sec	35%	277	9.3 sec	14.3 sec
180%	1080	10 sec	20%	480	40 sec	50 sec
180%	1080	10 sec	35%	348	19 sec	29 sec
150%	900	15 sec	30%	471	35 sec	50 sec
150%	900	15 sec	35%	438	28 sec	43 sec
124%	744	20 sec	40%	504	30 sec	50 sec

It is not recommended to prolong the duration of Power Boost to be longer than the specified duty cycle calculation, this may cause damage to the PSU.

Overload & Overcurrent Protections (Auto-Recovery)

The power supply's Overload (OLP) and Overcurrent (OCP) Protections will be activated when output current (I_o) exceeds its specification as defined on Page 3 under "Protections". In such occurrence, the output voltage (V_o) will start to droop and once the power supply has reached its maximum power limit, the protection is activated and the power supply will go into "Hiccup mode" (Auto-Recovery). The power supply will recover once the fault condition of the OLP and OCP is removed and I_o is back within the specifications.



It is not recommended to prolong the duration of I_o when it is less than OLP/OCP point, but greater than 100%, since it may cause damage to the PSU.

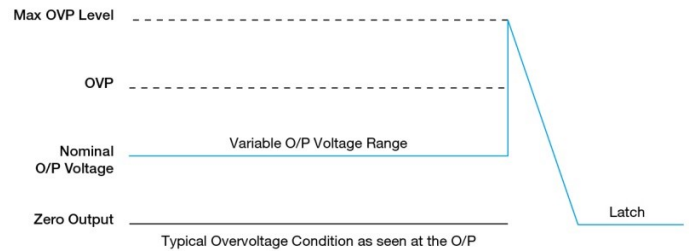
Short Circuit Protection (Auto-Recovery)

The power supply's output OLP/OCP function also provides protection against short circuits. When a short circuit is applied, the output current will operate in "Hiccup mode", as shown in the illustration in the OLP/OCP section on this page. The power supply will return to normal operation after the short circuit is removed.

Overvoltage Protection (Latch Mode)

The power supply's overvoltage circuit will be activated when its internal feedback circuit fails. The output voltage shall not exceed its specifications defined on Page 3 under "Protections". Power supply will latch, and require removal/re-application of AC voltage in order to restart.

The power supply should be latch, and require removal/re-application of input AC voltage in order to restart.



Over Temperature Protection (Latch Mode)

As described in load de-rating section, the power supply also has Over Temperature Protection (OTP). In the event of a higher operating temperature at 100% load, the power supply will run into OTP when the operating temperature is beyond what is recommended in the de-rating graph. When activated, the output voltage will go into latch mode until the surrounding temperature drops to its normal operating temperature or the load is reduced as recommended in the de-rating graph. Removal/re-application of input AC voltage will then be required in order to restart.

Operating Mode

■ Redundant Operation

In order to ensure proper redundant operation for the power supply units (PSUs), the output voltage difference between the two units must be kept at 0.45~0.50 V for these 24 V supplies. Follow simple steps given below to set them up for the redundant operation:

Step 1.

Measure output voltage of PSU 1 and PSU 2. If PSU 1 is the master unit, then V_O of PSU 1 must be higher than PSU 2. In order to set the output voltage, individually connect each power supply to 50% of rated load at any line voltage from 115-264Vac, and set the PSU 1 and PSU 2 output voltage.

Step 2.

Connect the power supply units PSU 1 and PSU 2 to $V_{in 1}$ & $V_{in 2}$, respectively, of the DRR-40N (or 40 A) module shown on the right of above diagram.

Step 3.

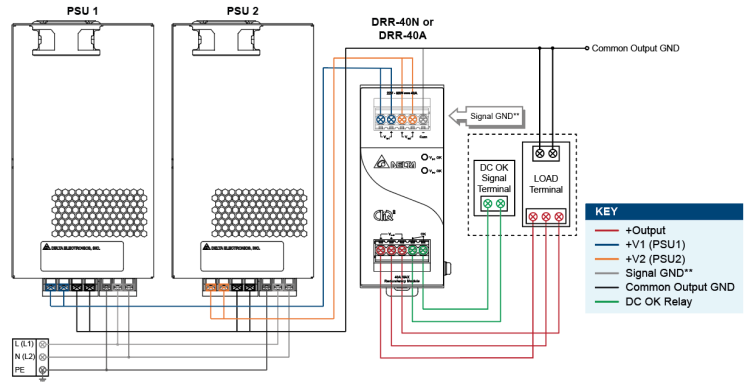
Connect the system load to V_{out} . Please note that output voltage V_{out} from DRR module will be $= V_O$ (output voltage of power supply) $- V_{drop}^*$ (in DRR module).

* V_{drop} will vary from 0.60V to 0.90V (Typical 0.65V) depending on the load current and surrounding air temperature.

■ Parallel Operation

The power supply units (PSUs) can also be used for parallel operation in order to increase the output power. The difference in output voltage between the two units must be kept to within 25mV of each other. This difference must be verified with the same output load connected independently to each unit.

Parameters such as EMI, inrush current, leakage current, PARD, start up time will be different from those on the datasheet, when two units are connected in parallel. The user will need to verify that any differences will still allow the two power supplies connected in parallel will work properly in their product/application.



**The Signal GND in the DRR module is for the built-in LED and DC OK signals. The Output GND terminals from the two PSU's do not need to be connected to the Signal GND terminal.

Fig. 3 Redundant Operation Connection Diagram

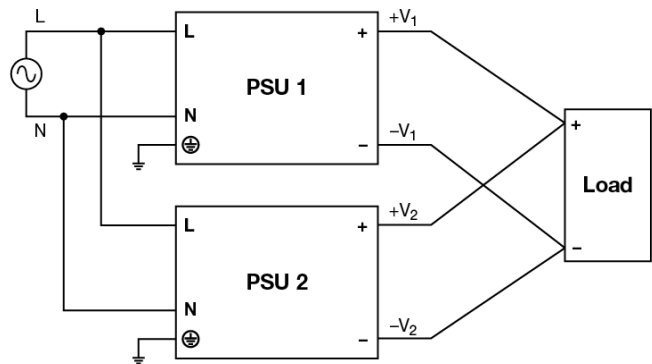


Fig. 4 Parallel Operation Connection Diagram

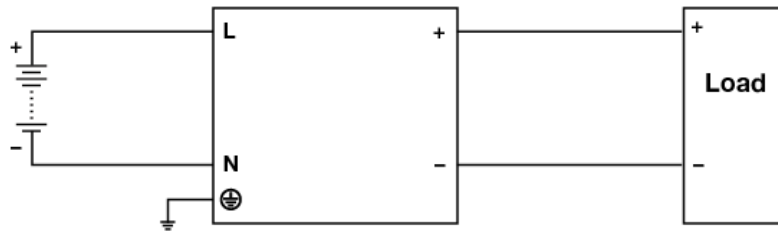


Fig. 5 DC Input Operation Connection Diagram

■ DC Input Operation

Step 1.

Use a battery or similar DC source.

Step 2.

Connect +pole to L and -pole to N.

Step 3.

Connect the PE terminal to an earth wire or to the machine ground.

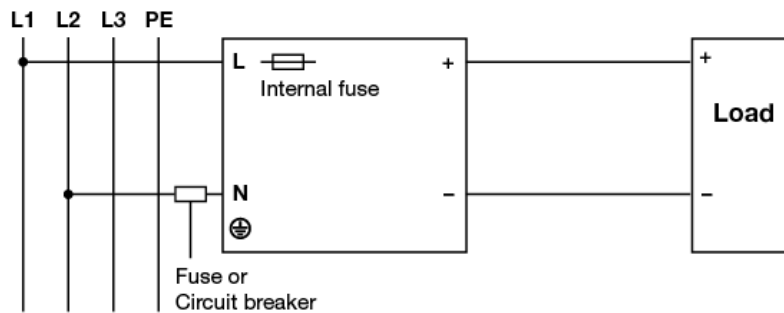


Fig. 6 2 of 3 Phase System Input Operation Connection Diagram

■ 2 of 3 Phase System Input Operation

Delta's PMC can use on 2 of 3 phase system. Please refer to the following step.

Step 1.

The input voltage applied from Line to Neutral is below the maximum rated input. The input voltage shall be below 240 Vac +10%.

Step 2.

The external protector is needed on N (Neutral) input line to secure a safety. N line does not have internal fuse protection. An appropriate fuse or circuit breaker should be connected in series with N input line connection like the following.

Others

PFC – Norm EN 61000-3-2



Line Current Harmonic content

Typically, the input current waveform is not sinusoidal due to the periodical peak charging of the input capacitor. In industrial environment, complying with EN 61000-3-2 is only necessary under special conditions. Complying to this standard can have some technical drawbacks, such as lower efficiency as well as some commercial aspects such as higher purchasing costs. Frequently, the user does not profit from fulfilling this standard, therefore, it is important to know whether it is mandatory to meet this standard for a specific application.

Attention