

# PMF Panel Mount Power Supply

## 24V 320W 1 Phase / PMF-24V320WC□□

# PMF

### Highlights & Features

- Universal AC input voltage
- Built-in active PFC and fan speed control
- Full corrosion resistant aluminium chassis
- Conforms to harmonic current IEC/EN 61000-3-2, Class A and Class D
- Cold start -20°C at 100% load (320W)
- Remote ON/OFF is available as an option

### Safety Standards



CB Certified for worldwide use



**Model Number:** PMF-24V320WC□□  
**Unit Weight:** 0.84 kg (1.85 lb)  
**Dimensions (L x W x D):** 215 x 115 x 50 mm  
 (8.46 x 4.53 x 1.97 inch)

### General Description

The PMF panel mount power supply series currently offers nominal output voltages of 24V. These power supply units come with universal AC input from 85Vac to 264Vac and wide operating temperature of -10°C to +70°C. The built-in active PFC provides high power factor and conforms to harmonic current IEC/EN 61000-3-2, Class A and Class D. This versatile series has two different connector options (Front Face and Terminal Block) to satisfy different application needs. Remote ON/OFF function is also available for the PMF series. All PMF power supplies conform to major international safety standards including IEC/EN/UL 60950-1 standards and are fully compliant with RoHS Directive 2011/65/EU for environmental protection.

### Model Information

#### PMF Panel Mount Power Supply

| Model Number   | Input Voltage Range | Rated Output Voltage | Rated Output Current |
|----------------|---------------------|----------------------|----------------------|
| PMF-24V320WC□□ | 85-264Vac           | 24Vdc                | 13.3A                |

### Model Numbering

|             |                                  |                |              |                              |                                                         | CC Code                                                     |
|-------------|----------------------------------|----------------|--------------|------------------------------|---------------------------------------------------------|-------------------------------------------------------------|
| PM          | F –                              | 24V            | 320W         | C                            | □                                                       | □                                                           |
| Panel Mount | Product Series<br>F – PFC Series | Output Voltage | Output Power | Package Type<br>C – Enclosed | Connector Type<br>G – Front Face<br>A – Terminal Block* | Variable<br>B – No Remote ON/OFF<br>R – With Remote ON/OFF* |

\*Options

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### Specifications

#### Input Ratings / Characteristics

|                         |                                        |
|-------------------------|----------------------------------------|
| Nominal Input Voltage   | 100-240Vac                             |
| Input Voltage Range     | 85-264Vac                              |
| Nominal Input Frequency | 50-60Hz                                |
| Input Frequency Range   | 47-63Hz                                |
| Input Current           | < 5.00A @ 115Vac, < 2.50A @ 230Vac     |
| Efficiency at 100% Load | 87.0% typ. @ 230Vac                    |
| Max Inrush Current      | < 20A @ 115Vac, < 40A @ 230Vac         |
| Power Factor            | 0.98 typ. @ 115Vac, 0.95 typ. @ 230Vac |
| Leakage Current         | < 1mA @ 240Vac                         |

#### Output Ratings / Characteristics

|                                                       |                                                                                                                                                      |
|-------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| Nominal Output Voltage                                | 24Vdc                                                                                                                                                |
| Output Voltage Tolerance                              | ± 1% (initial set point tolerance from factory)                                                                                                      |
| Output Voltage Adjustment Range                       | 21.6-26.4Vdc                                                                                                                                         |
| Output Current                                        | 13.3A                                                                                                                                                |
| Output Power                                          | 320W                                                                                                                                                 |
| Line Regulation                                       | ± 0.2% typ. (@ 115Vac & 230Vac)                                                                                                                      |
| Load Regulation                                       | ± 1.0% typ. (@ 115Vac & 230Vac)                                                                                                                      |
| PARD (20MHz)                                          | < 150mVpp @ 25°C<br>< 300mVpp @ -10°C                                                                                                                |
| Rise Time                                             | 50ms typ. @ 115Vac & 230Vac (100% load)                                                                                                              |
| Start-up Time                                         | 2500ms typ. @ 115Vac,<br>800ms typ. @ 230Vac (100% load)                                                                                             |
| Hold-up Time                                          | 20ms typ. @ 115Vac & 230Vac (100% load)                                                                                                              |
| Dynamic Response (Overshoot & Undershoot O/P Voltage) | ± 5% (2.4V pk-pk) @ 115Vac & 230Vac (0-100% load)                                                                                                    |
| Start-up with Capacitive Loads                        | 8,000μF Max                                                                                                                                          |
| Remote ON/OFF Function (Option)                       | CN102<br>Output ON: 5-12.5V<br>Output OFF: 0-0.5V<br>(For more information, please refer to the details in the Functional Manual section on Page 10) |

# PMF Panel Mount Power Supply

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### Mechanical

|                        |                |                                             |
|------------------------|----------------|---------------------------------------------|
| Case Chassis           |                | Aluminium                                   |
| Case Cover             |                | Aluminium                                   |
| Dimensions (L x W x D) |                | 215 x 115 x 50 mm (8.46 x 4.53 x 1.97 inch) |
| Unit Weight            |                | 0.84 kg (1.85 lb)                           |
| Indicator              |                | Green LED (DC OK)                           |
| Cooling System         |                | Forced Cooling                              |
| Terminal               | PMF-24V320WCG□ | M3.5 x 9 Pins (Rated 300V/20A)              |
|                        | PMF-24V320WCA□ | M3.5 x 9 Pins (Rated 300V/15A)              |
| Wire                   |                | AWG 20-12                                   |

### Environment

|                             |                                                                                           |                                      |
|-----------------------------|-------------------------------------------------------------------------------------------|--------------------------------------|
| Surrounding Air Temperature | Operating                                                                                 | -10°C to +70°C (Cold start at -20°C) |
|                             | Storage                                                                                   | -25°C to +85°C                       |
| Power De-rating             | > 50°C de-rate power by 2.5% / °C<br>< 100Vac de-rate power by 1.33% / 1V                 |                                      |
| Operating Humidity          | 5 to 95% RH (Non-Condensing)                                                              |                                      |
| Operating Altitude          | 0 to 5,000 Meters (16,400 ft)                                                             |                                      |
| Shock Test (Non-Operating)  | IEC 60068-2-27, Half Sine: 50G for a duration of 11ms, 3 shocks for each 3 directions     |                                      |
| Vibration (Non-Operating)   | IEC 60068-2-6, Random: 5Hz to 500Hz (2.09Grms); 20 min per axis for all X, Y, Z direction |                                      |
| Pollution Degree            | 2                                                                                         |                                      |

### Protections

|                          |                                                                     |
|--------------------------|---------------------------------------------------------------------|
| Overvoltage              | 27.6-32.4V, Latch Mode (AC power is recycled)                       |
| Overload / Overcurrent   | 105-150%, Hiccup Mode, Non-Latching (Auto-Recovery)                 |
| Over Temperature         | Hiccup Mode, Non-Latching (Auto-Recovery when the fault is removed) |
| Short Circuit            | Hiccup Mode, Non-Latching (Auto-Recovery when the fault is removed) |
| Protection Against Shock | Class I with PE* connection                                         |

\*PE: Primary Earth

### Reliability Data

|                        |                                                                                 |
|------------------------|---------------------------------------------------------------------------------|
| MTBF                   | > 700,000 hrs. as per Telcordia SR-332<br>I/P: 100Vac, O/P: 100% load, Ta: 35°C |
| Expected Cap Life Time | 10 years (115Vac & 230Vac, 50% load @ 40°C)                                     |

# PMF Panel Mount Power Supply

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### Safety Standards / Directives

|                          |                                                     |                                                                                   |
|--------------------------|-----------------------------------------------------|-----------------------------------------------------------------------------------|
| Safety Entry Low Voltage |                                                     | SELV (EN 60950-1)                                                                 |
| Electrical Safety        | TUV Bauart<br>UL/cUL recognized<br>CB scheme<br>CCC | EN 60950-1<br>UL 60950-1 and CSA C22.2 No. 60950-1<br>IEC 60950-1<br>GB4943       |
| CE                       |                                                     | In conformance with EMC Directive 2014/30/EU and Low Voltage Directive 2014/38/EU |
| Material and Parts       |                                                     | RoHS Directive 2011/65/EU Compliant                                               |
| Galvanic Isolation       | Input to Output                                     | 3.0KVac                                                                           |
|                          | Input to Ground                                     | 2.0KVac                                                                           |
|                          | Output to Ground                                    | 0.5KVac                                                                           |

### EMC

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

1) Criteria A: Normal performance within the specification limits

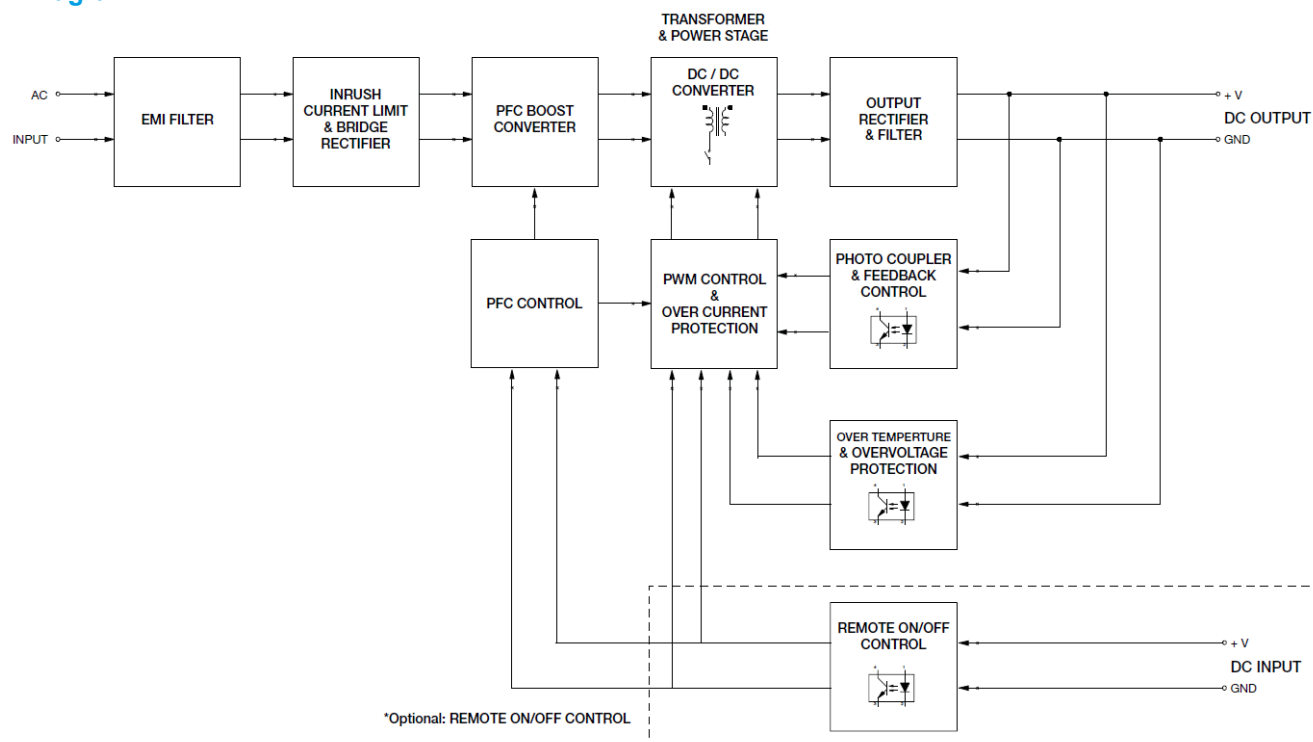
2) Asymmetrical: Common mode (Line to earth)

3) Symmetrical: Differential mode (Line to line)

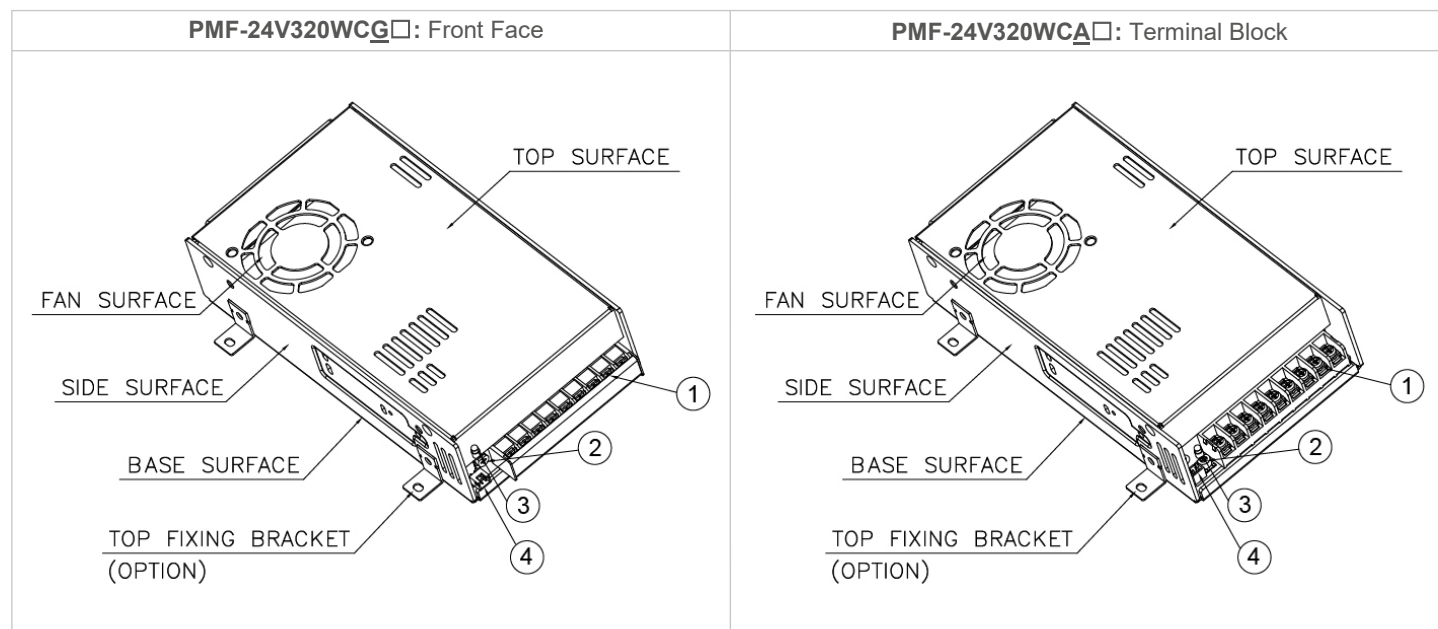
# PMF Panel Mount Power Supply

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### Block Diagram



### Device Descriptions



- 1) Input & Output terminal block connector
- 2) DC voltage adjustment potentiometer
- 3) DC OK control LED (Green)
- 4) Remote ON/OFF function connector (Option)

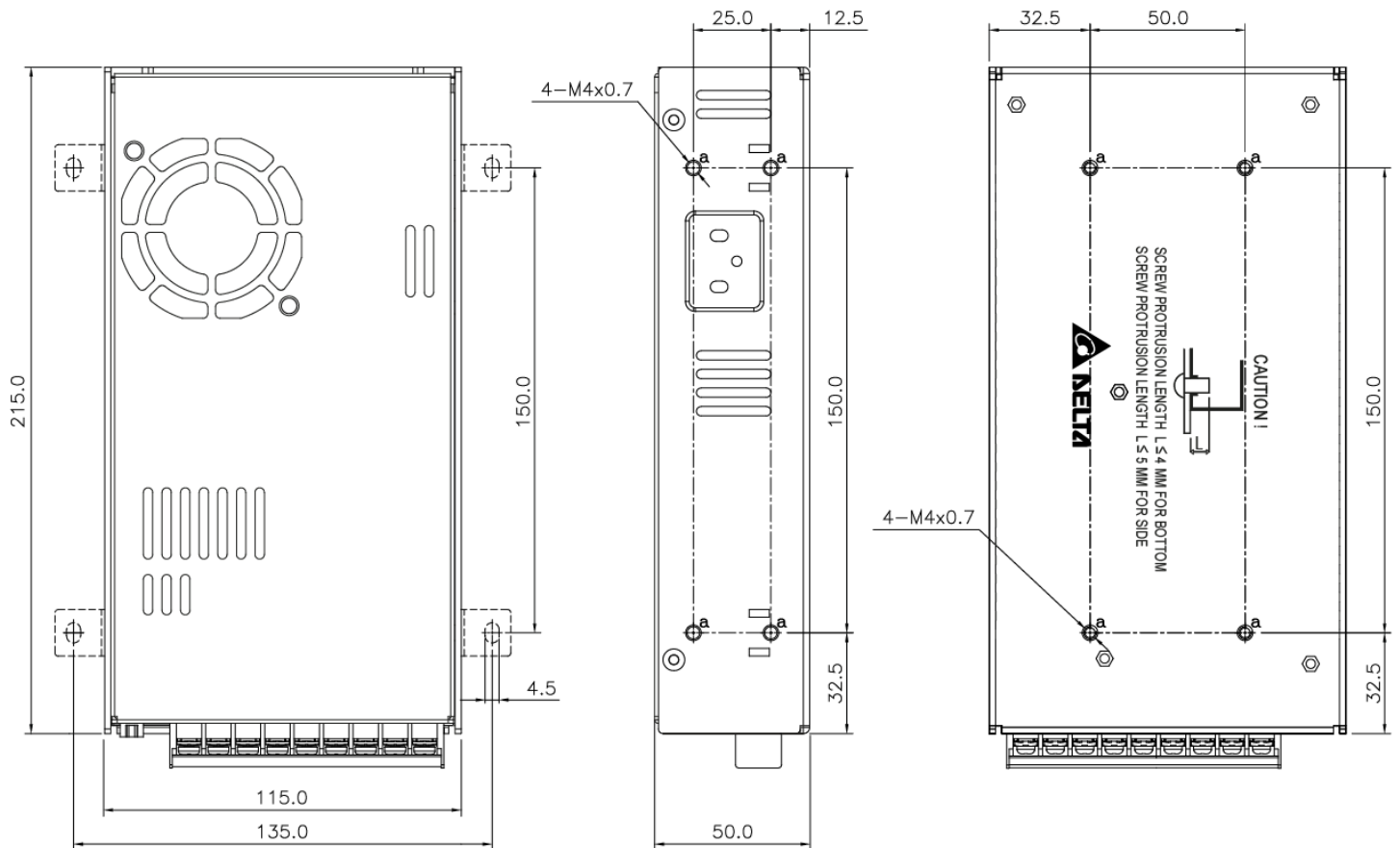
# PMF Panel Mount Power Supply

## 24V 320W 1 Phase / PMF-24V320WC□□

### Dimensions

PMF-24V320WC□□: Front Face

L x W x D: 215 x 115 x 50 mm (8.46 x 4.53 x 1.97 inch)

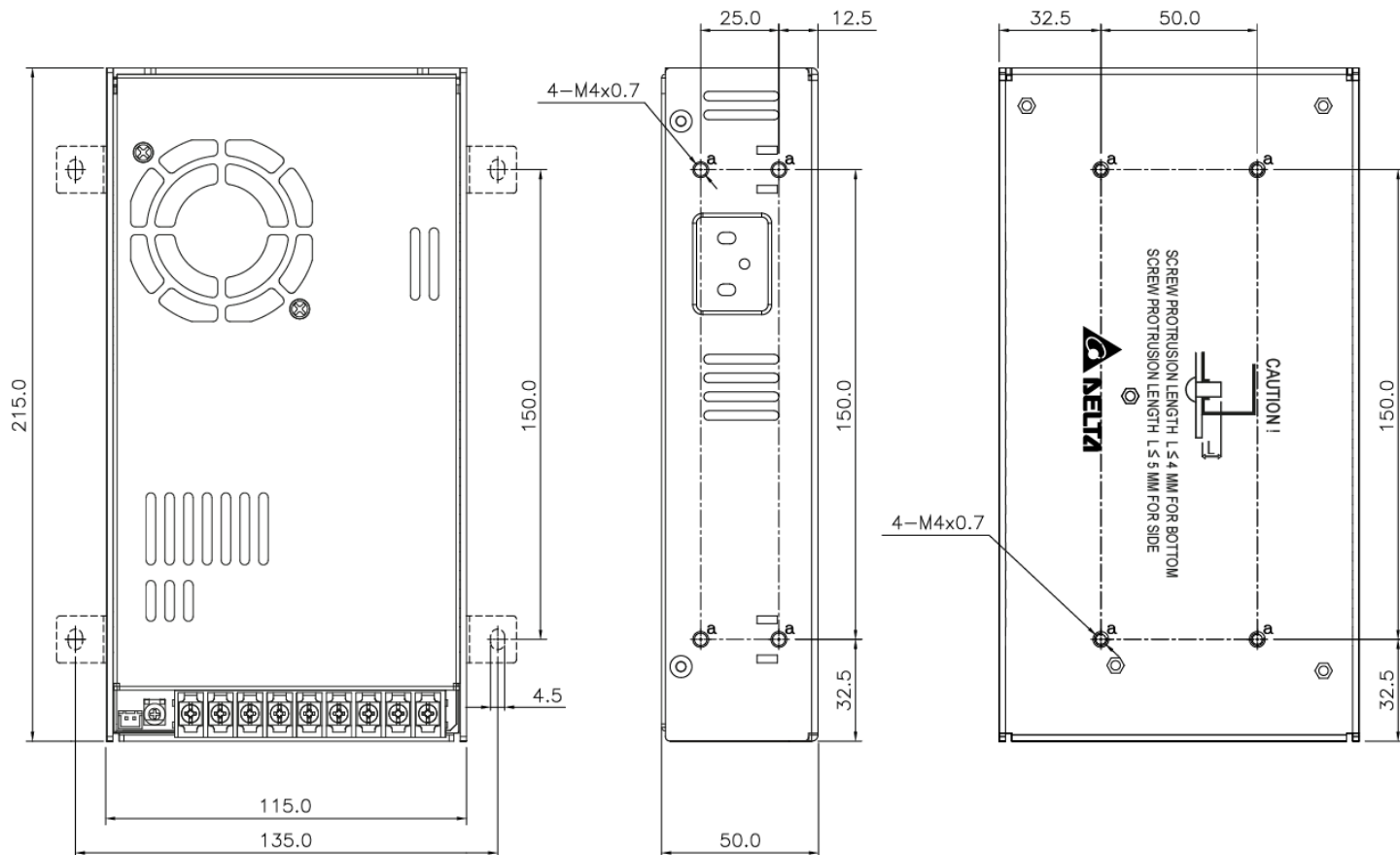


# PMF Panel Mount Power Supply

## 24V 320W 1 Phase / PMF-24V320WC□□

### PMF-24V320WC□□: Terminal Block

L x W x D: 215 x 115 x 50 mm (8.46 x 4.53 x 1.97 inch)

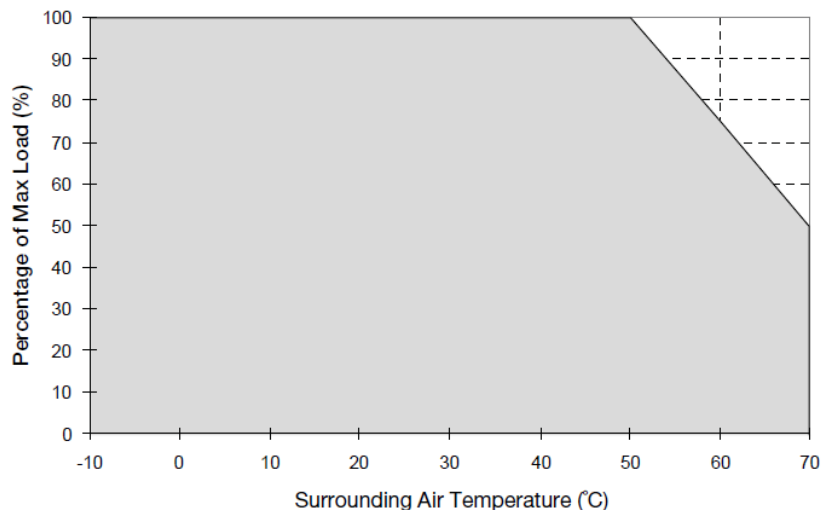


# PMF Panel Mount Power Supply

## 24V 320W 1 Phase / PMF-24V320WC□□

### Engineering Data

#### Output Load De-rating VS Surrounding Air Temperature

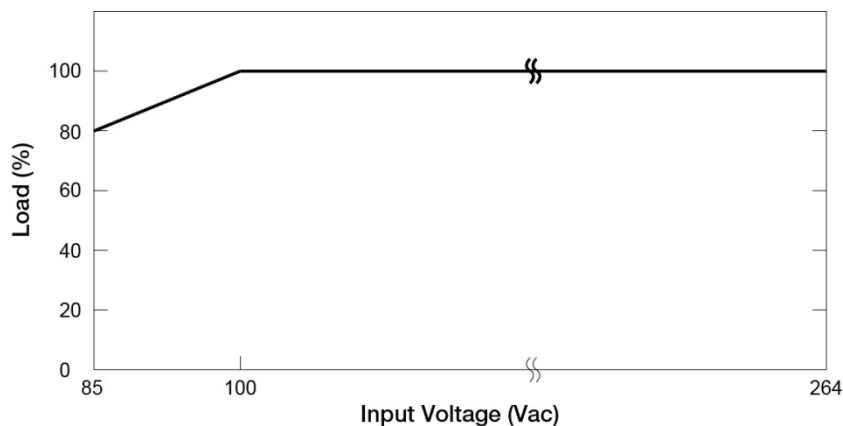


**Fig. 1 De-rating for Vertical and Horizontal Mounting Orientation**  
 > 50°C de-rate power by 2.5% / °C

#### 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 >50°C, the device will run into Over Temperature Protection. When activated, the output voltage will go into bouncing mode and will recover when the surrounding air temperature is lowered or the load is reduced as far as necessary to keep the device in working condition.
3. In order for the device to function in the manner intended, it is also necessary to keep a safety distance of 20mm with adjacent units 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 do not hesitate to contact [info@deltapsu.com](mailto:info@deltapsu.com) for more details.

#### Output Load De-rating VS. Input Voltage



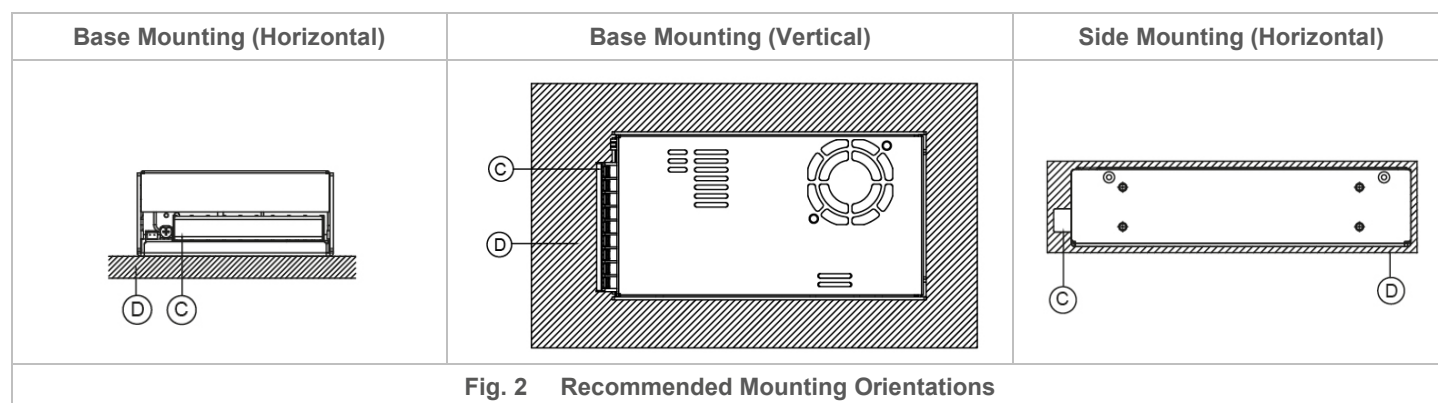
- No output power de-rating for the input voltage from 100Vac to 264Vac

# PMF Panel Mount Power Supply

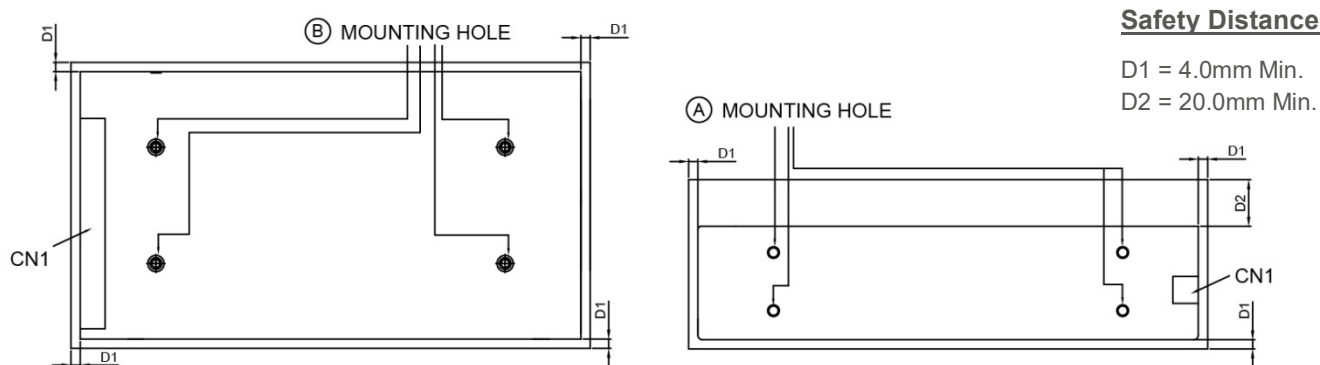
## 24V 320W 1 Phase / PMF-24V320WC□□

### Assembly & Installation

- Ⓐ Side Mounting: Fig. 2 and Fig. 3 show the mounting hole locations for power supply assembly onto a metal mounting surface. The power supply shall be mounted on minimum of 4 mounting holes using M4 screw of maximum 5mm length (Refer to Fig. 4). This is to maintain a safety distance between the screw and internal components.
- Ⓑ Base Mounting: Fig. 2 and Fig. 3 show the mounting hole locations for power supply assembly onto a metal mounting surface. The power supply shall be mounted on minimum of 4 mounting holes using M4 screw of maximum 4mm length (Refer to Fig. 4). This is to maintain a safety distance between the screw and internal components.
- Ⓒ Connector
- Ⓓ This surface belongs to customer's end system or panel where the power supply is mounted.

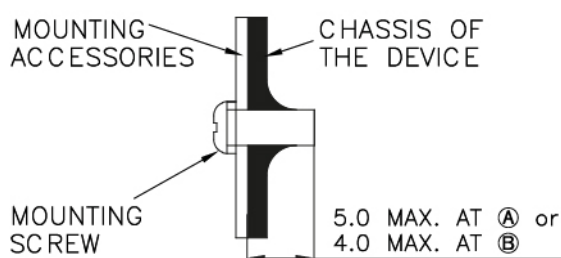


- Use flexible cable (stranded or solid) of AWG No. 20-12. The input/output connectors' allowable current is 23A max per pin. User should calculate and select the suitable wire specification (type/quantity/diameter) according to actual output current. The torque at the connector shall not exceed 13Kgf.cm. The insulation stripping length should not exceed 0.275" or 7mm.
- Recommended mounting torque of the product and its mounting accessories is 9~12Kgf.cm.



**Fig. 3 Mounting Hole Locations and the Safety Distance**

Ensure the mounted device is kept at  $\geq 4\text{mm}$  safety distance at all sides from other components and equipments. In addition, to ensure sufficient convection cooling, always maintain a distance of  $\geq 20\text{mm}$  from ventilated surfaces while the device is in operation.



- Only use M4 screw  $\leq 5\text{mm}$  through the base mounting holes at Ⓐ. This is to keep a safe distance between the screw and internal components.
- Only use M4 screws  $\leq 4\text{mm}$  through the base mounting holes at Ⓑ. This is to keep a safe distance between the screw and internal components.

**Fig. 4 Assembly Reference**

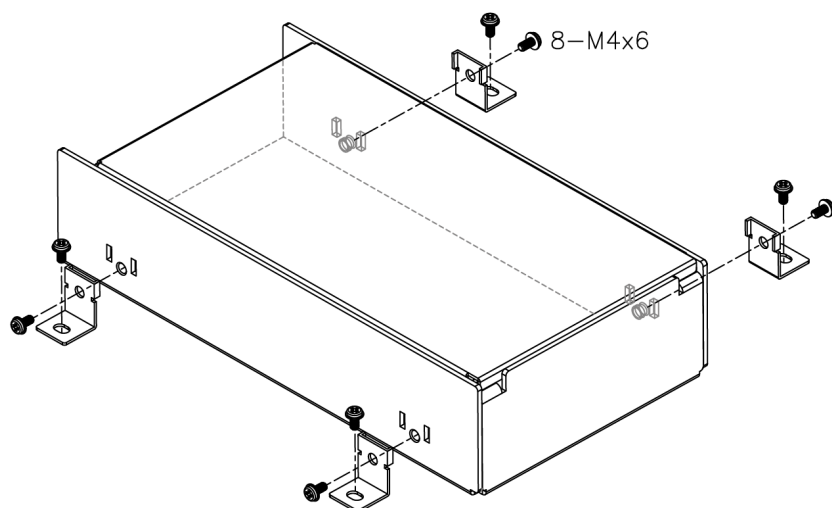
# PMF Panel Mount Power Supply

## 24V 320W 1 Phase / PMF-24V320WC□□

### Safety Instructions

- If user's mounting orientation is not according to the recommended mounting orientations, please consult Delta for further information.
- The device is not recommended to be placed on low thermal conductive surface. For example, plastics.
- 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 and/or 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. The power supply must be mounted by metal screws onto a grounded metal surface. It is highly recommended that the Earth terminal on the connector be connected to the grounded metal surface.

### Accessories



#### LM-01: Top Fixing Bracket

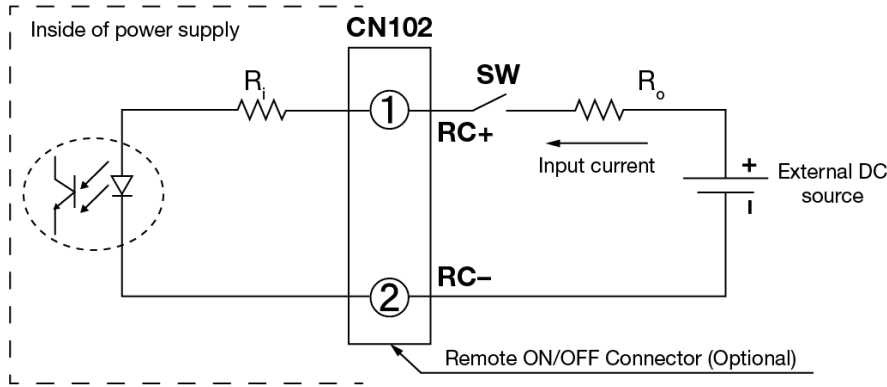
This bracket is used to fix the power supply onto a flat surface from the top.

# PMF Panel Mount Power Supply

## 24V 320W 1 Phase / PMF-24V320WC□□

Functional Manual

Remote ON/OFF Function



You can remotely control the power supply unit to turn ON/OFF by using an external DC source. Follow the DC power source voltage and current limiting defined in the table below.

| Built-in Resistor Ri (ohm) | Voltage Between RC+ and RC- (V) |            | Input Current (mA) |
|----------------------------|---------------------------------|------------|--------------------|
|                            | Output ON                       | Output OFF |                    |
| 820                        | 5-12.5                          | 0-0.5      | 20 Max             |

- Notes
1. Remote ON/OFF circuits are isolated from input, output and PE.
  2. Please check if the polarity of the wire connector is the same as the external DC source. If not, the power would not turn on and the internal components may be damaged.
  3. You do not need an external resistance Ro for current limit while the output voltage of external DC source is within the range of 5-12.5V. If the output voltage exceeds 12.5V, please use the following equation for the value of current limit resistance Ro.

$$R_o = \frac{V_{cc} - (3.5 + 0.006R_i)}{0.006}$$



# PMF Panel Mount Power Supply

## 24V 320W 1 Phase / PMF-24V320WC□□

### Functions

#### 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.

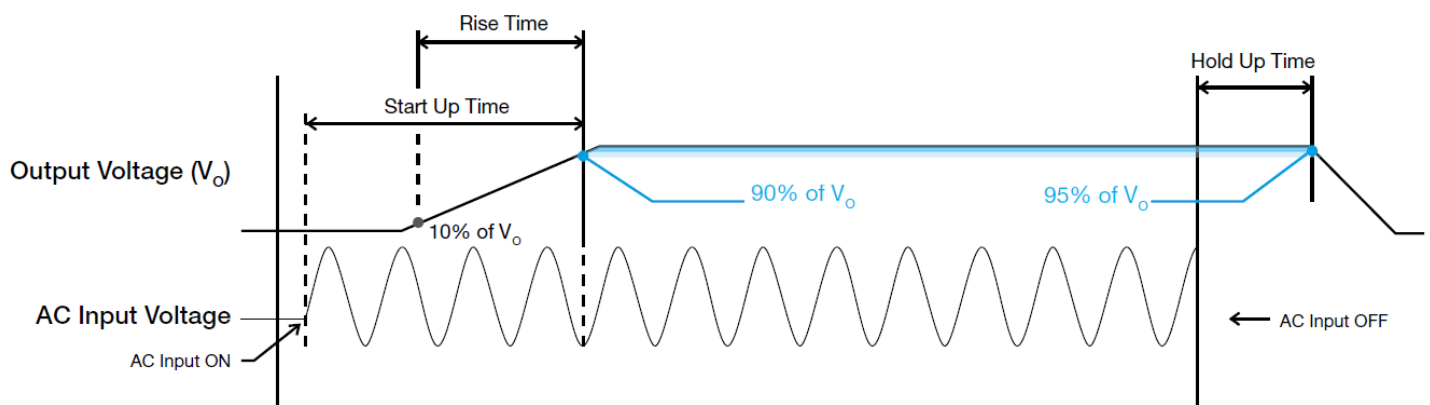
#### Rise Time

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

#### Hold-up Time

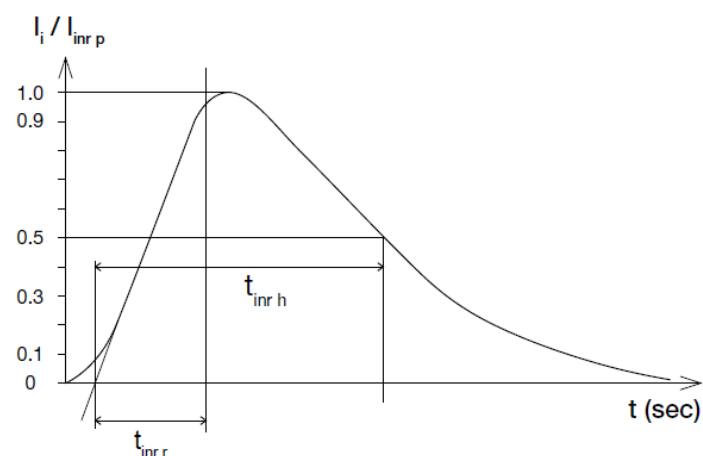
Time between the collapse of the AC input voltage, and the output falling to 95% of its steady state set value.

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



#### Inrush Current

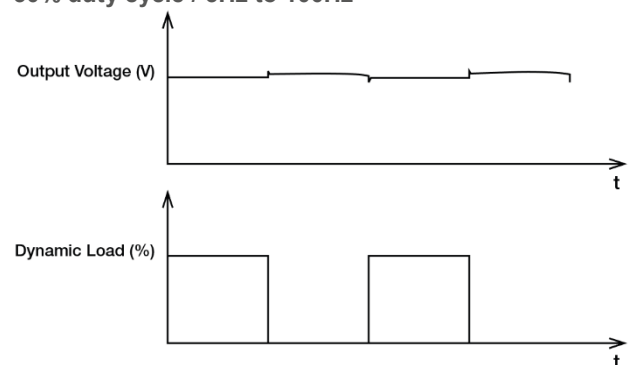
Inrush current is the peak, instantaneous, input current measured and, occurs when the input voltage is first applied. For AC input voltages, the maximum peak value of inrush current will occur during the first half cycle of the applied AC voltage. This peak value decreases exponentially during subsequent 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 / 5Hz to 100Hz

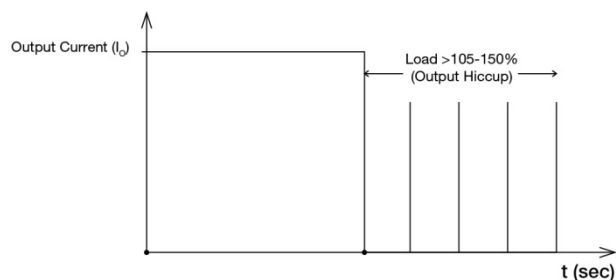


# PMF Panel Mount Power Supply

## 24V 320W 1 Phase / PMF-24V320WC□□

### Overload & Overcurrent Protections

The power supply's Overload (OLP) and Overcurrent (OCP) Protections will be activated when output current exceeds 105-150% of  $I_o$  (Max load). In such occurrence, the  $V_o$  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 <105% but >100%, since it may cause damage to the PSU.

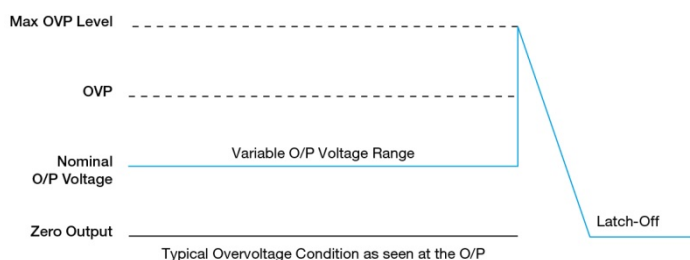
### Short Circuit Protection

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

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".

**The power supply should be latch.**



### Over Temperature Protection

As mentioned above, 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 bouncing mode until the temperature drops to its normal operating temperature as recommended in the de-rating graph.

# PMF Panel Mount Power Supply

## 24V 320W 1 Phase / PMF-24V320WC□□

### Operating Mode

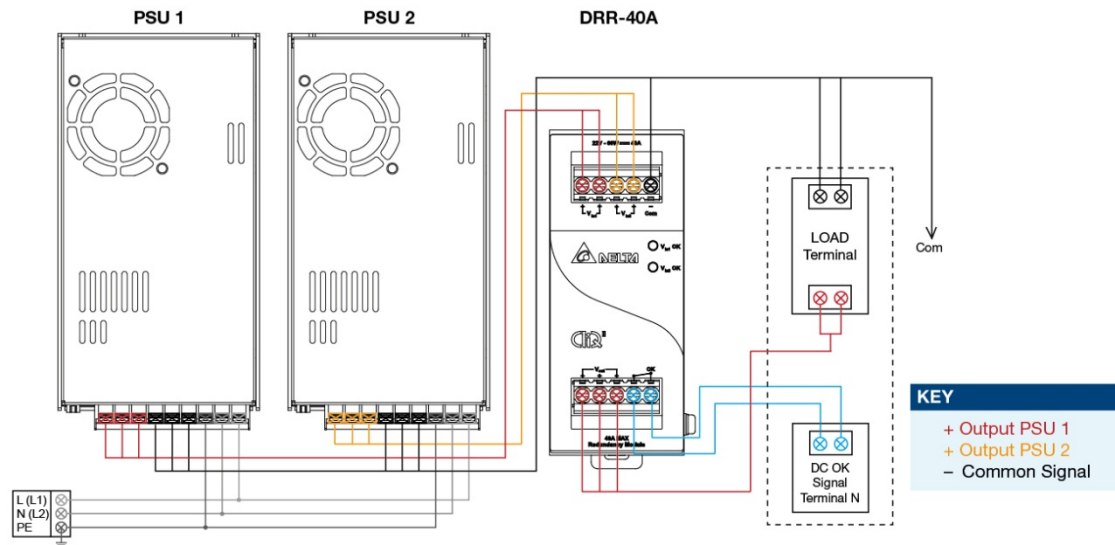


Fig. 5 Redundancy / Parallel Operation Connection Diagram

#### ■ Redundancy Operation

In order to ensure proper redundancy operation for the power supply unit (PSU), ensure that the output voltage difference between the two units is kept at 0.45~0.50V for 24V supplies. Follow simple steps given below to verify:

##### 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, connect the power supply to 50% load and set the PSU 1 and PSU 2 output voltage.

##### Step 2.

Connect the right DRR module, 40A as per the system requirement to the power supply units PSU 1 and PSU 2 at  $V_{in1}$  &  $V_{in2}$  respectively.

##### Step 3.

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

#### ■ Parallel Operation

These DRR modules can also be used for Parallel function in order to increase the output power by N+1 (e.g. 2.5A + 2.5A = 5A or 2.5A + 2.5A + 2.5A = 7.5A) or current sharing, and thus increasing the power supply and system reliability. Though the PMF-24V320WC□□ is not designed for current sharing, a good current sharing between two power supplies can be achieved by following simple steps as below (Refer to Fig. 5 for the Connection Diagram).

##### Step 1.

Set output load condition for both supplies at 50% and measure the output voltages.

##### Step 2.

Adjust output voltages to the same level or within  $\pm 25mV$  difference.

##### Step 3.

Connect PSU 1 and PSU 2 with the DRR-40A module and measure at  $V_{in1}$  &  $V_{in2}$  to verify the voltage difference. Ensure the voltages are within  $\pm 25mV$ .

##### Step 4.

Output voltage from DRR module  $V_{out}$  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.

# PMF Panel Mount Power Supply

## 24V 320W 1 Phase / PMF-24V320WC□□

### Others

#### Delta RoHS Compliant



#### Restriction of the usage of hazardous substances

The European directive 2011/65/EU limits the maximum impurity level of homogeneous materials such as lead, mercury, cadmium, chrome, polybrominated flame retardants PBB and PBDE for the use in electrical and electronic equipment. RoHS is the abbreviation for “Restriction of the use of certain hazardous substances in electrical and electronic equipment”.

This product conforms to this standard.

#### 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

Delta provides all information in the datasheets on an “AS IS” basis and does not offer any kind of warranty through the information for using the product. In the event of any discrepancy between the information in the catalog and datasheets, the datasheets shall prevail (please refer to [www.DeltaPSU.com](http://www.DeltaPSU.com) for the latest datasheets information). Delta shall have no liability of indemnification for any claim or action arising from any error for the provided information in the datasheets. Customer shall take its responsibility for evaluation of using the product before placing an order with Delta.

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