

PMH Panel Mount Power Supply

24V 200W 1 Phase / PMH-24V200WCB□



PMH

Highlights & Features

- Household appliance approvals IEC/EN 60335-1, IEC/EN 61558-1 and IEC/EN 61558-2-16
- Universal AC input voltage
- Full power from -20°C to +45°C operation @ 5000m or 16400 ft. altitude
- Full corrosion resistant aluminium casing
- High MTBF > 700,000 hrs as per Telcordia SR-332
- Versatile connector options available: IP20, Front Face and Harness connectors

Safety Standards



CB Certified for worldwide use

Model Number: PMH-24V200WCB□
Unit Weight: 0.61 kg (1.34 lb)
Dimensions (L x W x D): 190 x 97 x 38 mm
 (7.48 x 3.81 x 1.49 inch)



General Description

The PMH-24V200WCB□ offers universal input from 85Vac to 264Vac with nominal output voltage of 24V. The highly efficient convection cooling construction can operate from -30°C to 70°C. The PMH series is specifically designed for household electrical appliances with safety approvals including IEC/EN 60335-1 and IEC/EN 61558-2-16, as well as IEC/EN/UL 60950-1. In addition, the product meets the EMC approvals to EN 55014-1 / EN 55014-2 for household appliances and EN 61000-6-1 / EN 61000-6-3 for residential environment without extra EMI filter required and comes with several connector options consisting of Terminal Block, IP20, Front Face and Harness connectors. Other available options include isolation or non-isolation between Primary Earth and output DC Return (-V pins on output connector).

Model Information

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| Model Number | Input Voltage Range | Rated Output Voltage | Rated Output Current |
|----------------|------------------------|----------------------|----------------------|
| PMH-24V200WCB□ | 85-264Vac (120-375Vdc) | 24Vdc | 8.33A |

Model Numbering

| PM | H – | 24V | 200W | C | B | □ |
|-------------|--------------------------------------|----------------|--------------|------------------------------|----------|--|
| Panel Mount | Product Type H – Household Series | Output Voltage | Output Power | Package Type C – Enclosed | With PFC | Connector Type and Primary Earth to Output DC Return Connection. See options in table below |



A,S



J,U



L,V



H,T

| Connector Type | Output non-isolated to PE | Output isolated to PE |
|-----------------|---------------------------|-----------------------|
| Terminal Block | A | S |
| IP20 Connector* | J | U |
| Front Face* | L | V |
| Harness* | H | T |

*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 |
| DC Input Voltage Range* | 120-375Vdc |
| Input Current | < 2.20A @ 115Vac, < 1.2A @ 230Vac |
| Efficiency at 100% Load | > 89.5% @ 115Vac, > 91.5% @ 230Vac |
| Max Inrush Current (Cold Start) | < 60A @ 115Vac, < 120A @ 230Vac |
| Power Factor at 100% Load | > 0.98 @ 115Vac, > 0.92 @ 230Vac |
| Leakage Current | < 1mA @ 264Vac |

*Fulfills test conditions for DC input. Safety approval for DC input can be obtained upon request.

Output Ratings / Characteristics**

| | |
|---|--|
| Nominal Output Voltage | 24Vdc |
| Factory Set Point Tolerance | 24Vdc \pm 2% |
| Output Voltage Adjustment Range | 22-28Vdc |
| Output Current | 0-8.33A (200W max.) |
| Output Power | 200W |
| Line Regulation | < 0.5% (@ 85-264Vac input, 100% load) |
| Load Regulation | < 0.5% (@ 85-264Vac input, 0-100% load) |
| PARD*** (20MHz) | < 100mVpp @ -20°C to 70°C < 240mVpp @ < -20°C to -30°C |
| Rise Time | < 30ms @ nominal input, -20°C to 70°C < 100ms @ nominal input, < -20°C to -30°C |
| Start-up Time | < 1200ms @ 100Vac (100% load) < 800ms @ 240Vac (100% load) |
| Hold-up Time | > 20ms @ 115Vac & 230Vac (100% load) |
| Dynamic Response (Overshoot & Undershoot O/P Voltage) | \pm 5% @ 85-264Vac input, 0-100% load (Slew Rate: 0.1A/ μ S, 50% duty cycle @ 5Hz to 100Hz) |
| Start-up with Capacitive Loads | 8,000 μ F Max |

**For power de-rating from < -20°C to -30°C, and 45°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 & 47 μ F electrolytic capacitor.

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Mechanical

| | | |
|-----------------------------------|--|---|
| Case Chassis / Cover | Aluminium | |
| Dimensions (L x W x D) | 190 x 97 x 38 mm (7.48 x 3.81 x 1.49 inch) | |
| Unit Weight | 0.61 kg (1.34 lb) | |
| Indicator | Green LED (DC OK) | |
| Cooling System | Convection | |
| Terminal | PMH-24V200WCBA <u>(S)</u> | M3.5 x 7 Pins (Rated 300V/15A) |
| | PMH-24V200WCBJ <u>(U)</u> | M3.5 x 7 Pins (Rated 300V/20A) |
| | PMH-24V200WCBL <u>(V)</u> | M3.5 x 7 Pins (Rated 300V/20A) |
| | PMH-24V200WCBH <u>(T)</u> | Input: B3P(6-2.3.5)-VH(LF)(SN) Output: B4P7-VH(LF)(SN) |
| Wire | PMH-24V200WCBA <u>(S)</u> | AWG 20-14 |
| | PMH-24V200WCBJ <u>(U)</u> | AWG 20-12 |
| | PMH-24V200WCBL <u>(V)</u> | AWG 20-12 |
| Noise (1 Meter from power supply) | Sound Pressure Level (SPL) < 25dBA | |

Environment

| | | |
|-----------------------------|--|--|
| Surrounding Air Temperature | Operating | -30°C to +70°C |
| | Storage | -30°C to +85°C |
| Power De-rating | -20°C to -30°C de-rate power by 2.0% / °C > 45°C de-rate power by 2% / °C | |
| 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, 30G (300m/S ²) for a duration of 18ms, 1 times per direction, 2 times in total |
| Vibration | Non-Operating | IEC 60068-2-6, 10Hz to 150Hz @ 50m/S ² (5G peak); displacement of 0.35mm; 20 min per axis for all X, Y, Z direction |
| Bump | Operating | IEC 60068-2-29, 10G (100m/S ²) for a duration of 11ms, 1000 times per direction, 6000 times in total |
| Pollution Degree | 2 | |

Protections

| | |
|--------------------------|--|
| Overvoltage | 28.8-35.2V range, Hiccup Mode, Non-Latching (Auto-Recovery) |
| Overload / Overcurrent | > 120% of rated load current, Hiccup Mode, Non-Latching (Auto recovery) |
| Over Temperature | < 75°C Surrounding Air Temperature @ 100% load, Non-Latching (Auto-recovery) |
| Short Circuit | Hiccup Mode, Non-Latching (Auto-recovery when the fault is removed) |
| Degree of Protection | IP20 (PMH-24V200WCBJ and PMH-24V200WCBU) |
| Protection Against Shock | Class I with PE* connection |

*PE: Primary Earth

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Reliability Data

| | |
|------------------------|---|
| MTBF | > 700,000 hrs. as per Telcordia SR-332 I/P: 115Vac, O/P: 100% load, Ta: 25°C |
| Expected Cap Life Time | 10 years (115Vac & 230Vac, 50% load @ 40°C) |

Safety Standards / Directives

| | | |
|--------------------------|---|--|
| Safety Entry Low Voltage | Output non-isolated to PE | PELV (EN 60335), SELV (EN 60950) |
| | Output isolated to PE | SELV (EN 60335), SELV (EN 60950) |
| Electrical Safety | SIQ Bauart | EN 60950-1, EN 60335-1, EN 61558-1, EN 61558-2-16 |
| | UL/cUL recognized | UL 60950-1 and CSA C22.2 No. 60950-1 (File No. E191395) |
| | CB scheme | IEC 60950-1, IEC 60335-1, IEC 61558-1, IEC 61558-2-16 |
| CE | In conformance with EMC Directive 2014/30/EU and Low Voltage Directive 2014/35/EC | |
| Material and Parts | RoHS Directive 2011/65/EU Compliant | |
| Galvanic Isolation | Input to Output | 4.5KVac |
| | Input to Ground | 1.5KVac |
| | Output to Ground | Output non-isolated to PE (common pins connect to PE) (PMH-24V200WCBA, PMH-24V200WCBJ, PMH-24V200WCBL, PMH-24V200WCBH) 1.5KVdc (Output isolated to PE) (PMH-24V200WCBS, PMH-24V200WCBU, PMH-24V200WCBV, PMH-24V200WCBT) |

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EMC

| | | | |
|-----------------------------------|----------------|--|--|
| Emissions (CE & RE) | | CISPR 32, EN 55032, FCC Title 47: Class B, EN 55014-1, EN 61000-6-3 | |
| Immunity | | EN 55024, EN 61000-6-1, EN 55014-2 | |
| Electrostatic Discharge | IEC 61000-4-2 | Level 4 Criteria A ¹⁾ Air Discharge: 15kV Contact Discharge: 8kV | |
| Radiated Field | IEC 61000-4-3 | Level 3 Criteria A ¹⁾ 80MHz-1GHz, 10V/M with 1kHz tone / 80% modulation 1.4GHz-2GHz, 3V/M with 1kHz tone / 80% modulation 2GHz-2.7GHz, 1V/M with 1kHz tone / 80% modulation | |
| Electrical Fast Transient / Burst | IEC 61000-4-4 | Level 3 Criteria A ¹⁾ 2kV | |
| Surge | IEC 61000-4-5 | Level 3 Criteria A ¹⁾ Common Mode ³⁾ : 2kV Differential Mode ⁴⁾ : 1kV | |
| Conducted | IEC 61000-4-6 | Level 3 Criteria A ¹⁾ 150kHz-80MHz, 10Vrms | |
| Power Frequency Magnetic Fields | IEC 61000-4-8 | Criteria A ¹⁾ 30A/Meter | |
| Voltage Dips and Interruptions | IEC 61000-4-11 | 0% of 100Vac, 20ms 30% of 100Vac, 600ms 60% of 100Vac, 240ms 70% of 100Vac, 600ms 0% of 100Vac, 6000ms 0% of 240Vac, 20ms 30% of 240Vac, 600ms 60% of 240Vac, 240ms 70% of 240Vac, 600ms 0% of 240Vac, 6000ms | Criteria A ¹⁾ Criteria A ¹⁾ Criteria B ²⁾ Criteria A ¹⁾ Criteria B ²⁾ Criteria A ¹⁾ Criteria A ¹⁾ Criteria A ¹⁾ Criteria A ¹⁾ Criteria A ¹⁾ Criteria B ²⁾ |
| Low Energy Pulse Test (Ring Wave) | IEC 61000-4-12 | Level 3 Criteria A ¹⁾ Common Mode ³⁾ : 2kV Differential Mode ⁴⁾ : 1kV | |
| Harmonic Current Emission | | IEC/EN 61000-3-2, Class A | |
| Voltage Fluctuation and Flicker | | IEC/EN 61000-3-3 | |

1) Criteria A: Normal performance within the specification limits
 2) Criteria B: Temporary degradation or loss of function which is self-recoverable
 3) Asymmetrical: Common mode (Line to earth)
 4) Symmetrical: Differential mode (Line to line)

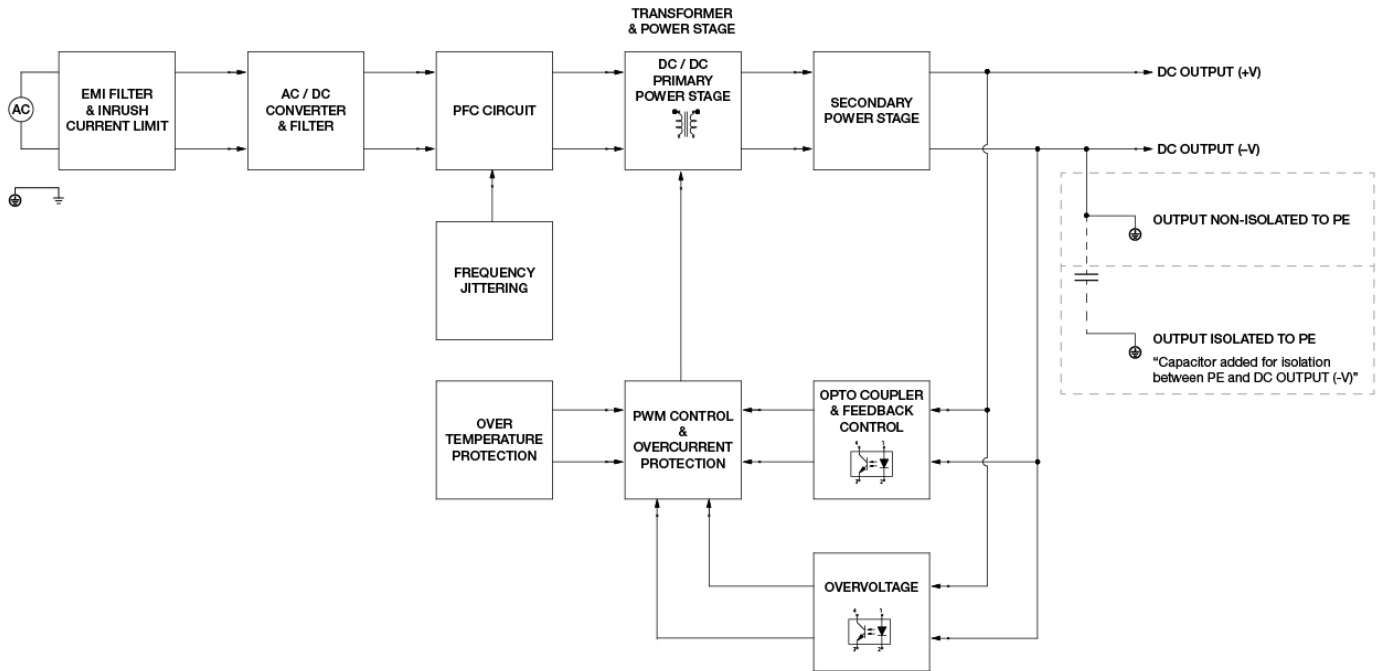


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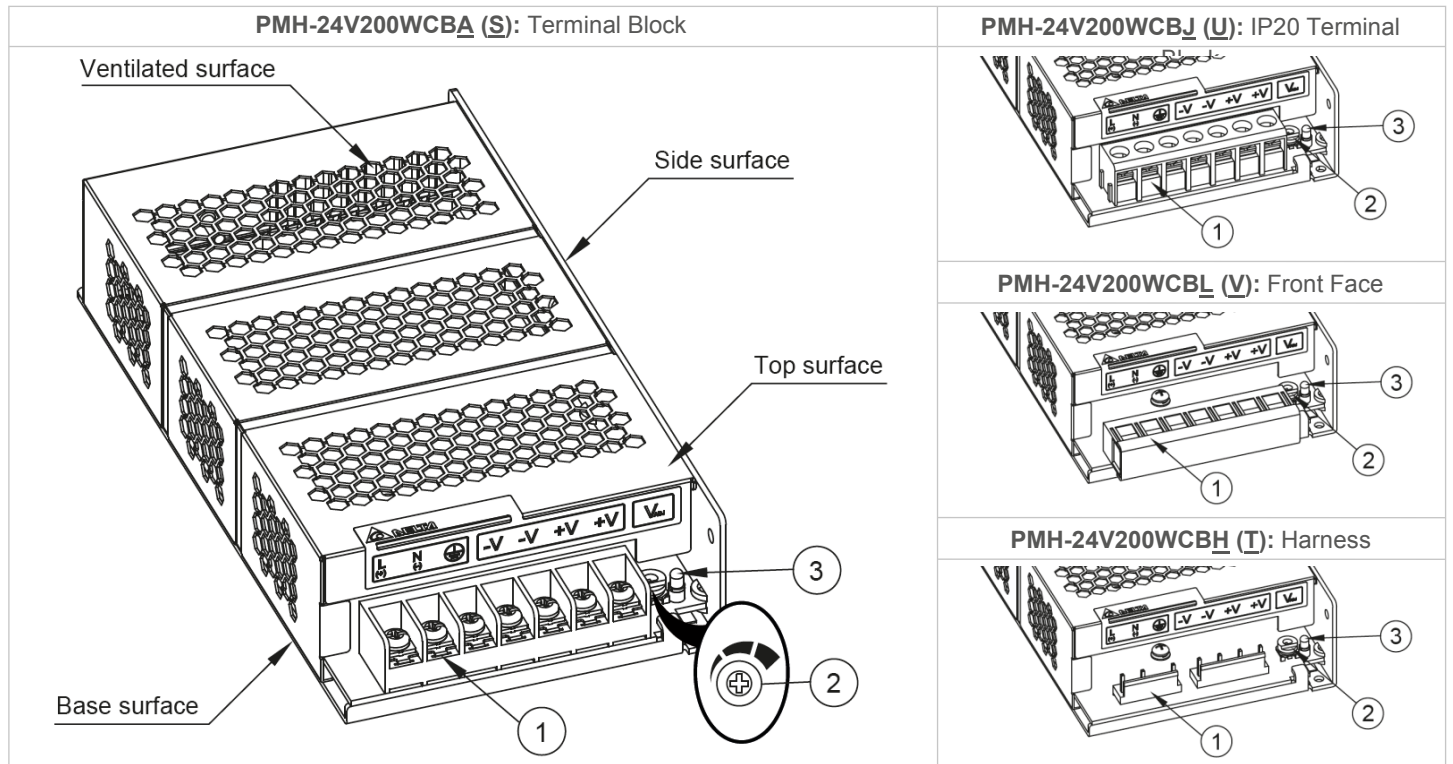
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Block Diagram



Device Descriptions



- 1) Input & Output terminal block connector
- 2) DC voltage adjustment potentiometer (22V – 28V)
- 3) DC OK control LED (Green)

| Connector Type | Output non-isolate to PE | Output isolate to PE |
|----------------|--------------------------|----------------------|
| Terminal Block | A | S |
| IP20 Connector | J | U |
| Front Face | L | V |
| Harness | H | T |

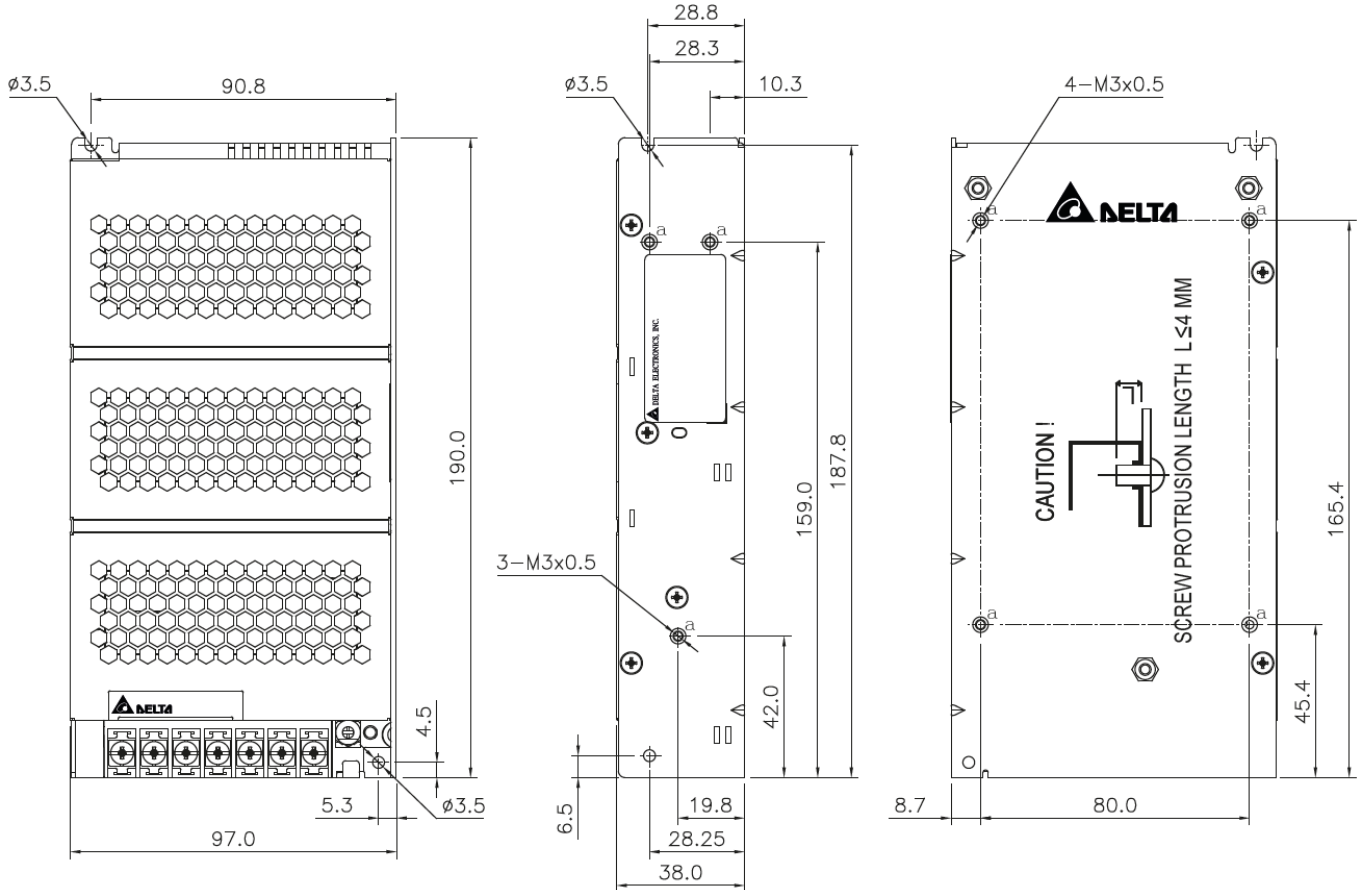
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Dimensions

L x W x D: 190 x 97 x 38 mm (7.48 x 3.81 x 1.49 inch) (PMH-24V200WCBA: Terminal Block)



Engineering Data

Output Load De-rating VS Surrounding Air Temperature

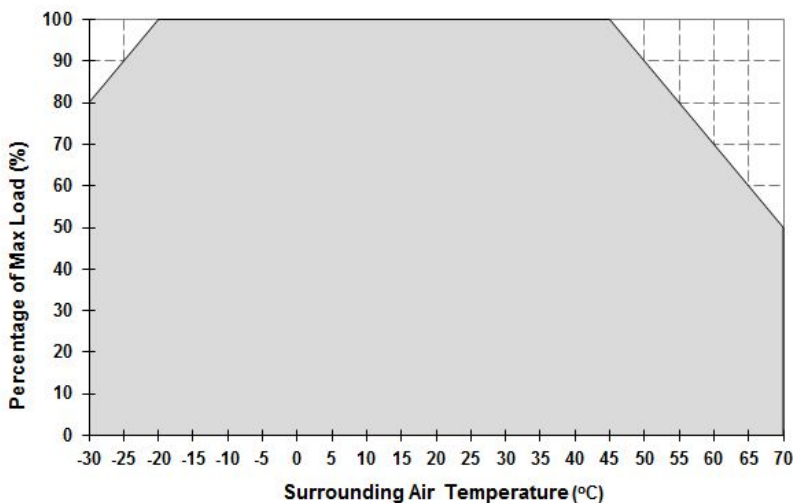


Fig. 1 De-rating for Vertical and Horizontal Mounting Orientation
 -20°C to -30°C de-rate power by 2.0% / °C
 > 45°C de-rate power by 2% / °C

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 surrounding air temperature >45°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 (0.78 inch) from 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 contact info@deltapsu.com for more details.

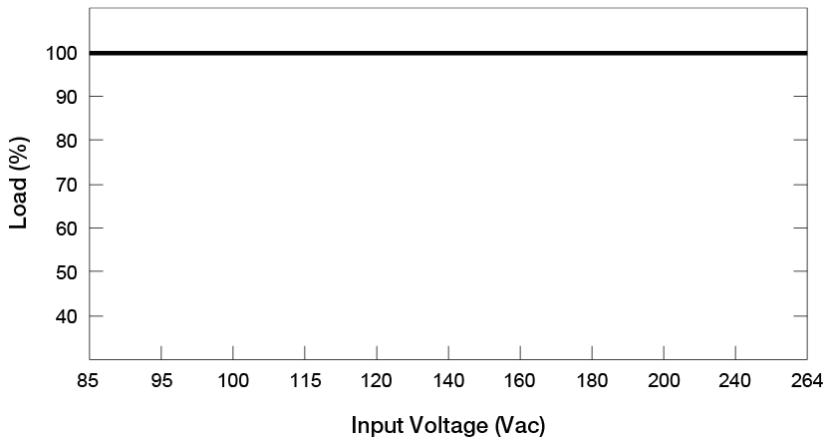


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Output Load De-rating VS Input Voltage



■ No output power de-rating across the entire input voltage range

Assembly & Installation

- Ⓐ Mounting holes for power supply assembly onto the mounting surface.
The power supply shall be mounted on minimum 2 mounting holes using M3 screw minimum 5mm length.
- Ⓑ This surface belongs to customer's end system or panel where the power supply is mounted.
- Ⓒ Connector

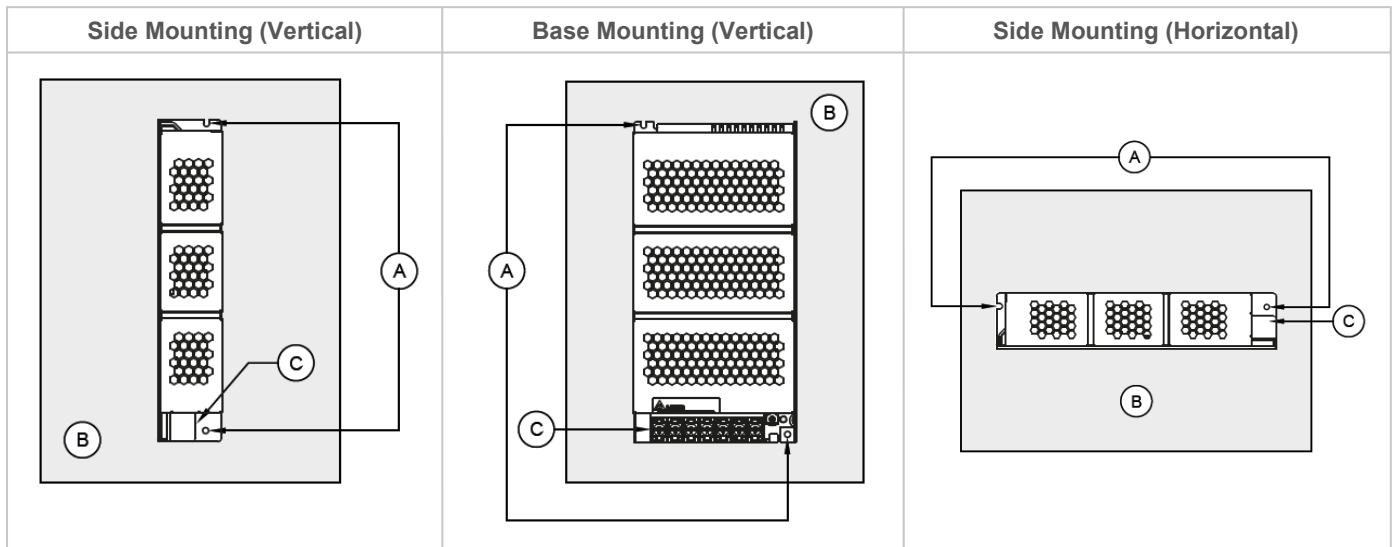


Fig. 2 Mounting Orientation

- Use flexible cable (stranded or solid) with the following sizes:

| PMH-24V200WCB _A (S) | PMH-24V200WCB _J (U) | PMH-24V200WCB _L (V) |
|--------------------------------|--------------------------------|--------------------------------|
| AWG 20-14 | AWG 20-12 | AWG 20-12 |

- The torque at the Connector shall not exceed 13Kgf.cm (11.23 lbf.in). The insulation stripping length should not exceed 0.275" or 7mm.
- Please refer the table below for the recommended mating connector, terminal and AWG wire size of **PMH-24V200WCB_H (I)**

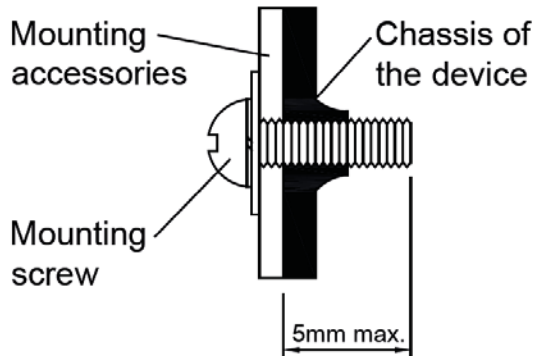
| | Power Supply Header | Mating Connector | Terminal | AWG |
|--------------|-------------------------|------------------|--------------|-------|
| Input (JST) | B3P(6-2.3.5)-VH(LF)(SN) | VHR-6N | SVH-21T-P1.1 | 22-18 |
| Output (JST) | B4P7-VH(LF)(SN) | VHR-7N | SVH-21T-P1.1 | 22-18 |

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Installation of Mounting Accessories



- Only use M3 screw $\leq 5\text{mm}$ (0.19 inch) through the base mounting holes. This is to keep a safety distance between the screw and internal components.
- Recommended mounting tightening torque: 4~8Kgf.cm (3.47~6.94 lbf.in).

Safety Instructions

- To ensure sufficient convection cooling, always maintain a safety distance of $\geq 20\text{mm}$ (0.78 inch) from all ventilated surfaces while the device is in operation.
- The device is not recommended to be placed on surface with low thermal conductivity, such as plastics, for example.
- 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
- The appliance is not to be used by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction.
- 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 device is earthed and must be inaccessible.

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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.

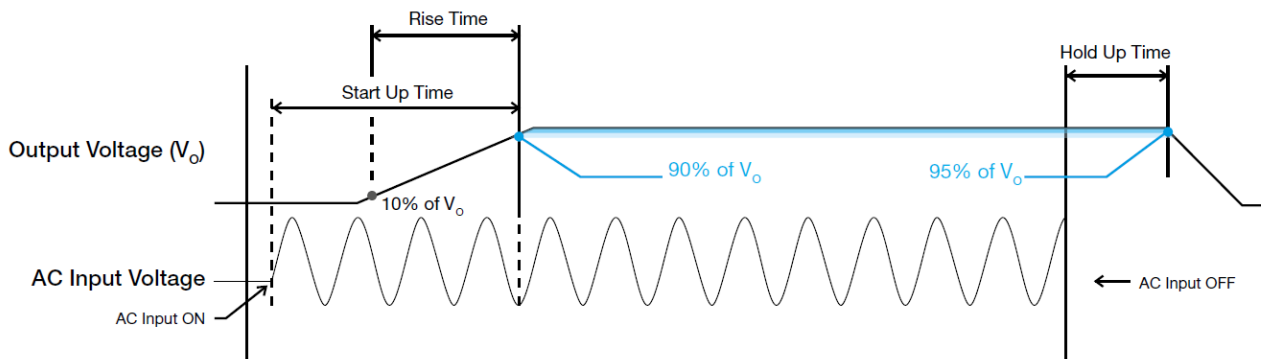
Rise Time

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

Hold-up Time

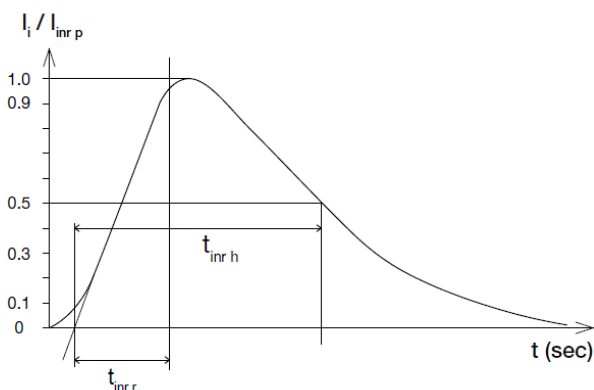
Time between the collapse of the AC input voltage, and the output falling to 95% of its steady state set value.

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



Inrush Current

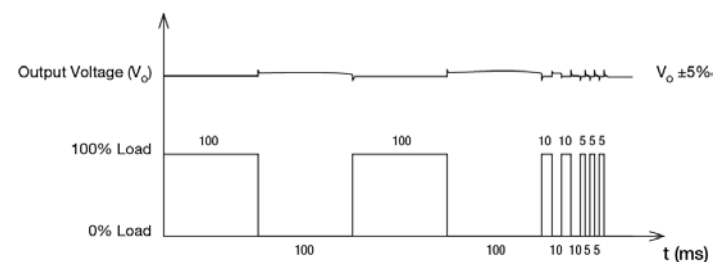
Inrush current is the peak, instantaneous, input current measured and, occurs when the input voltage is first applied. For AC input voltages, the maximum peak value of inrush current will occur during the first half cycle of the applied AC voltage. This peak value decreases exponentially during subsequent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



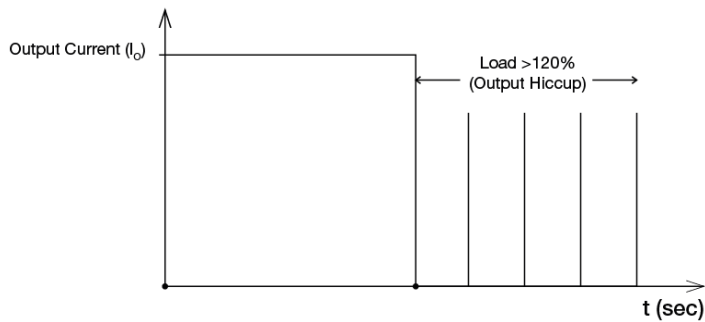
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Overload & Overcurrent Protections (Auto-Recovery)

The power supply's Overload (OLP) and Overcurrent (OCP) Protections will be activated when output current exceeds 120% 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.



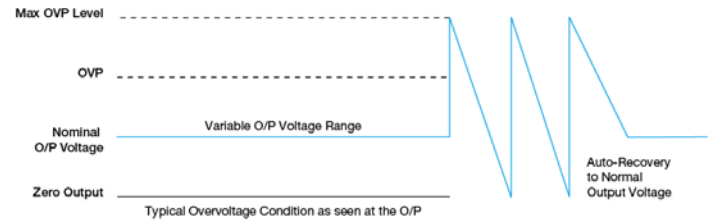
It is not recommended to prolong the duration of I_o when it is <120% but >100%, since it may cause damage to the PSU.

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 (Auto-Recovery)

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".



Over Temperature Protection (Auto-Recovery)

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

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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 0.45~0.50V for these 24V 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 85-264Vac, 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-20N (or 20A) 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.

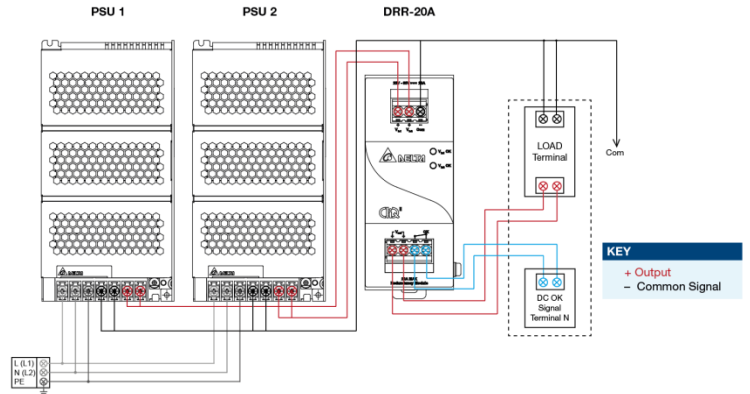


Fig. 3 Redundancy Operation Connection Diagram

■ 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.

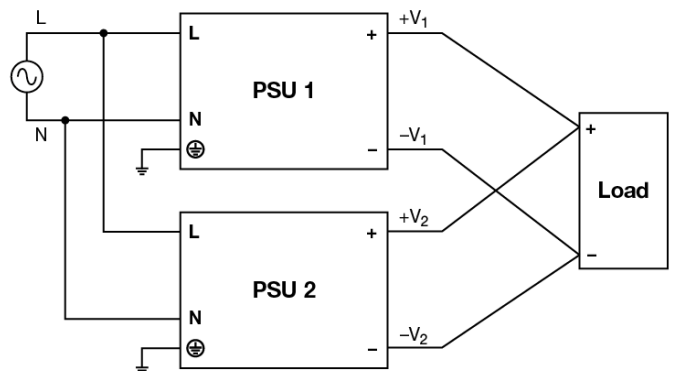


Fig. 4 Parallel Operation Connection Diagram

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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.