

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	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 Output isolated to PE	PELV (EN 60335), SELV (EN 60950) SELV (EN 60335), SELV (EN 60950)
Electrical Safety	SIQ Bauart UL/cUL recognized CB scheme	EN 60950-1, EN 60335-1, EN 61558-1, EN 61558-2-16 UL 60950-1 and CSA C22.2 No. 60950-1 (File No. E191395) 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 Input to Ground Output to Ground	4.5KVac 1.5KVac 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

EMC / Emissions		CISPR 22, EN 55022, FCC Title 47: Class B, EN 55014-1, EN 61000-6-3	
Immunity to		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⁾ 10A/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

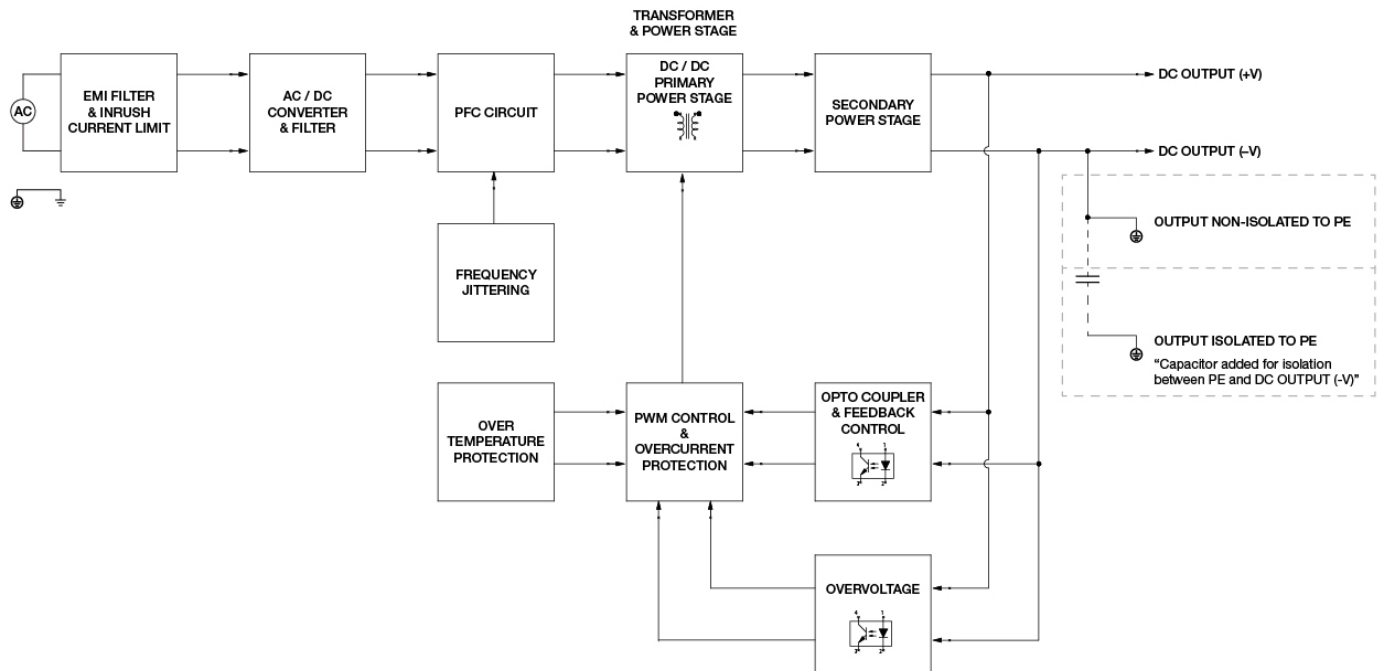
3) Asymmetrical: Common mode (Line to earth)

4) Symmetrical: Differential mode (Line to line)

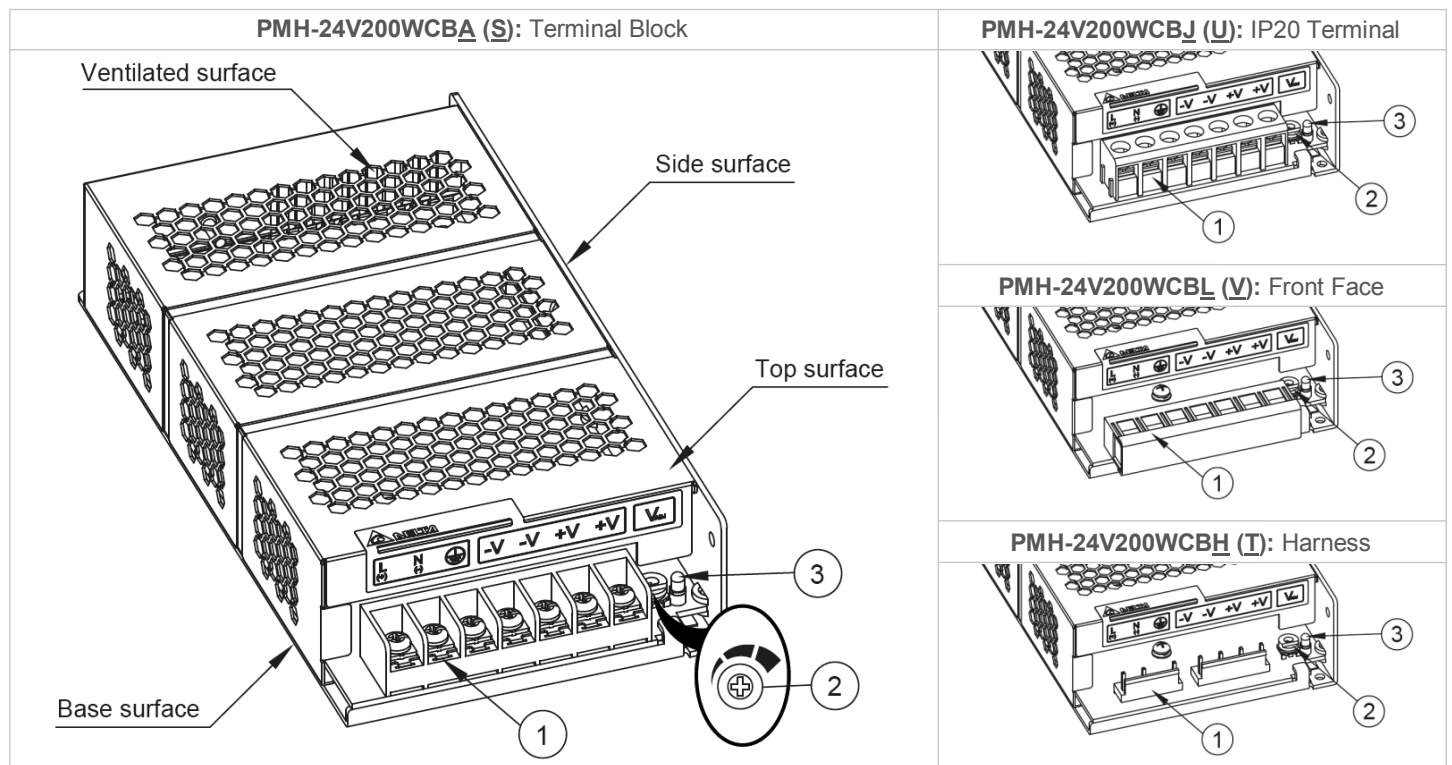
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Block Diagram



Device Descriptions



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

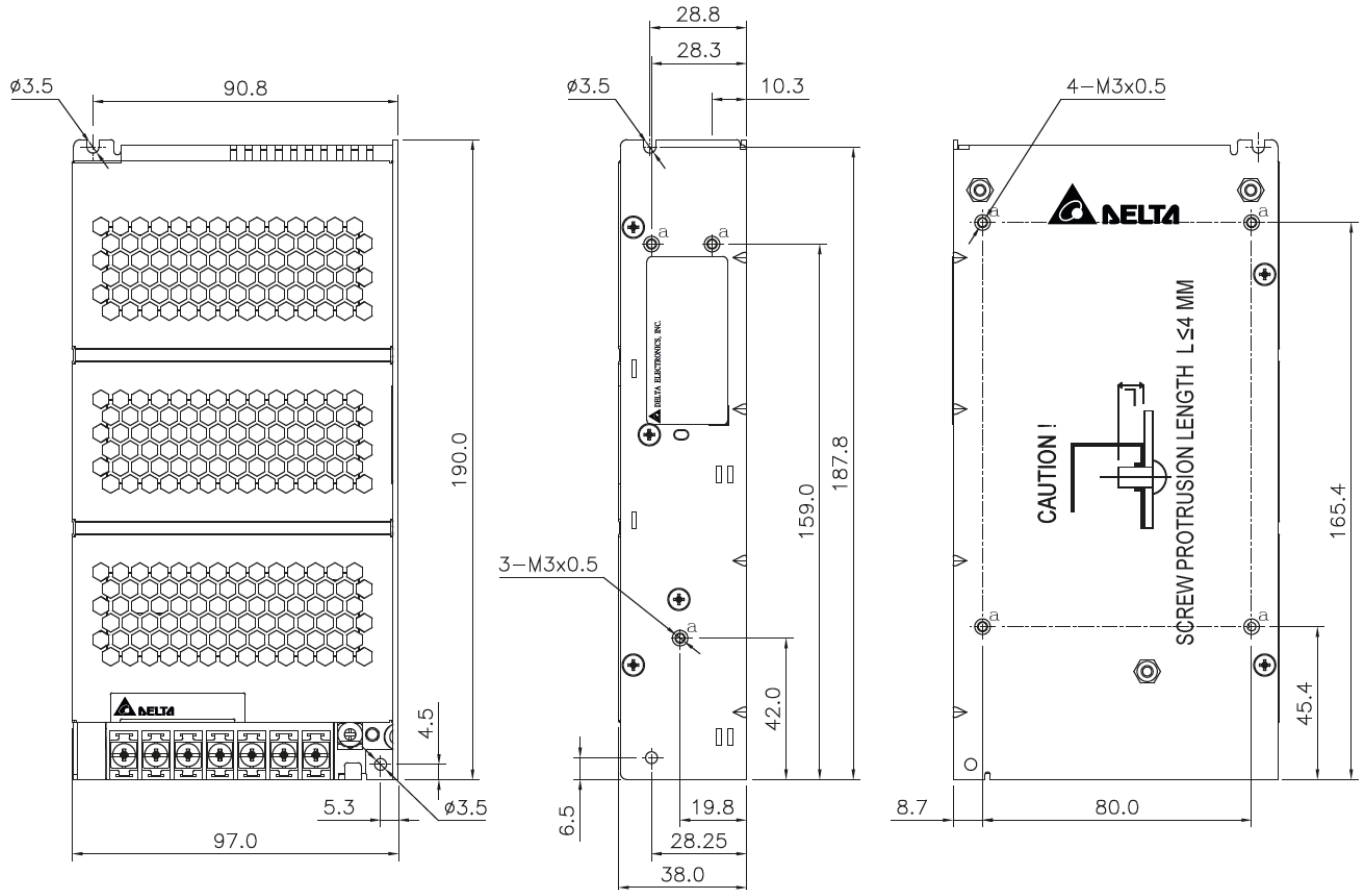
Connector Type	Output non-isolate to PE	Output isolate to PE
Terminal Block	A	S
IP20 Connector	J	U
Front Face	L	V
Harness	H	T

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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

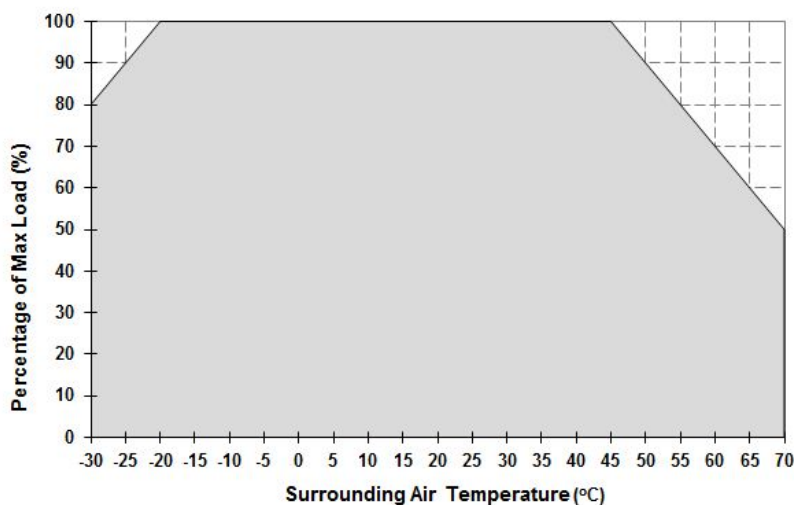


Fig. 1 De-rating for Vertical and Horizontal Mounting Orientation
 -20°C to -30°C de-rate power by 2.0% / °C
 > 45°C de-rate power by 2% / °C

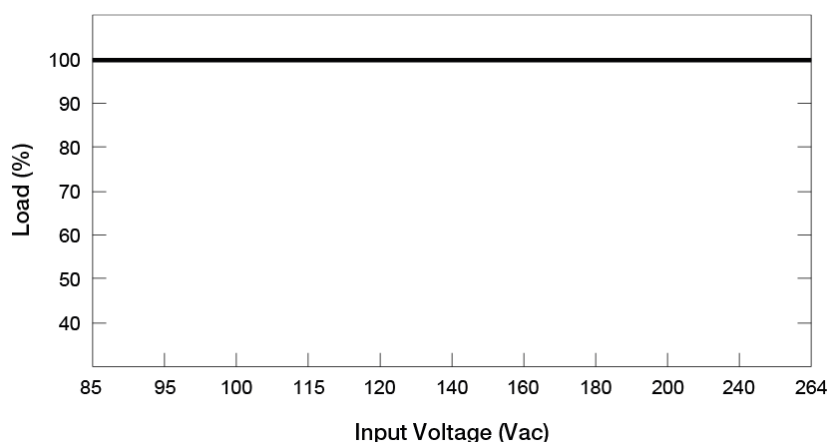
Note

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

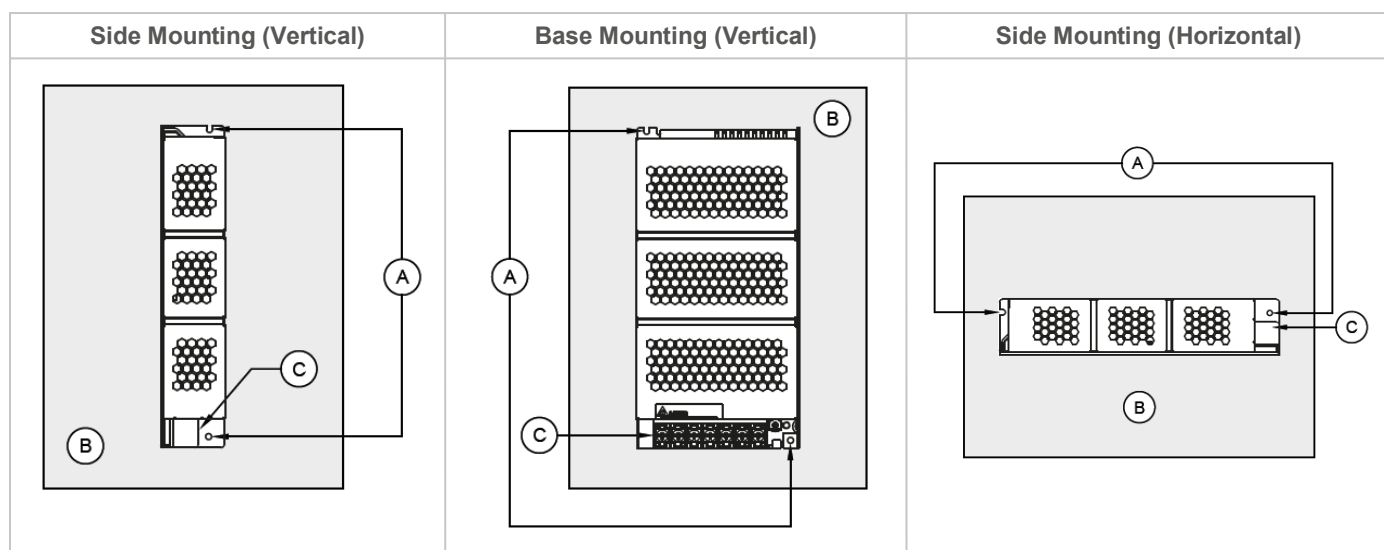


Fig. 2 Mounting Orientation

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

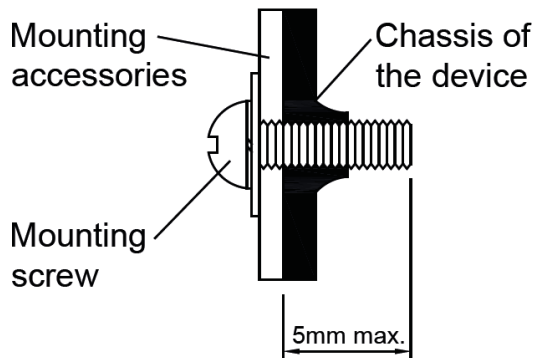
PMH-24V200WCB <u>A</u> (S)	PMH-24V200WCB <u>J</u> (U)	PMH-24V200WCB <u>L</u> (V)
AWG 20-14	AWG 20-12	AWG 20-12

- 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.

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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.

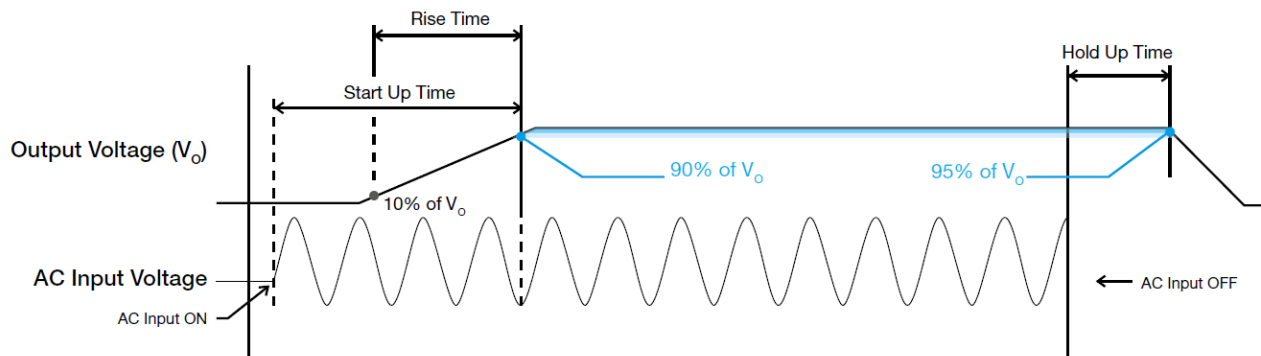
Rise Time

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

Hold-up Time

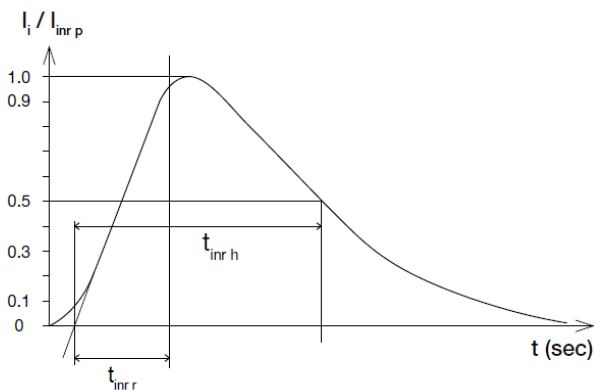
Time between the collapse of the AC input voltage, and the output falling to 95% of its steady state set value.

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



Inrush Current

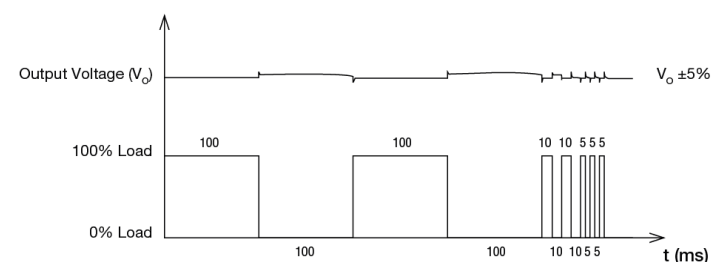
Inrush current is the peak, instantaneous, input current measured and, occurs when the input voltage is first applied. For AC input voltages, the maximum peak value of inrush current will occur during the first half cycle of the applied AC voltage. This peak value decreases exponentially during subsequent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

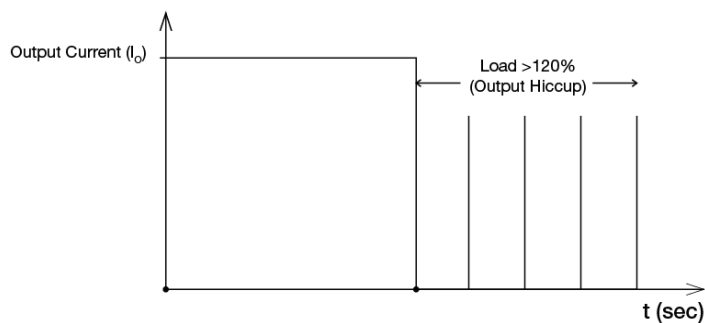


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Overload & Overcurrent Protections (Auto-Recovery)

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.



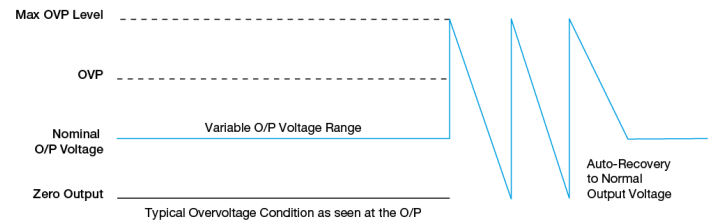
It is not recommended to prolong the duration of I_O when it is $<120\%$ but $>100\%$, since it may cause damage to the PSU.

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

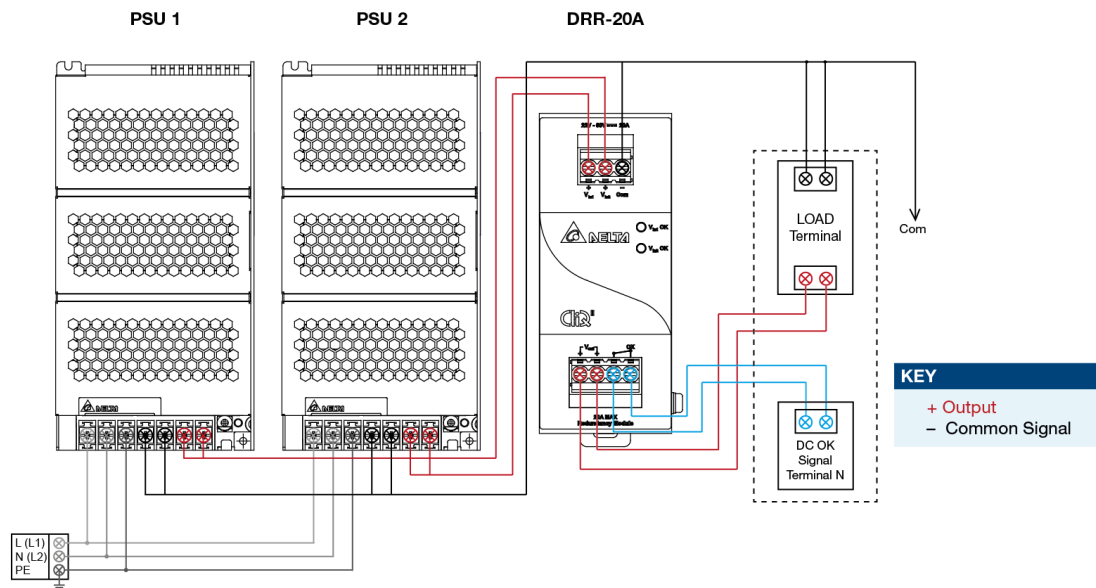


Fig. 3 Redundancy / Parallel Operation Connection Diagram

■ 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, connect each power supply to 50% of rated load, and set the PSU 1 and PSU 2 output voltage.

Step 2.

Connect the right DRR-20N (or 20A) module to the power supply units PSU 1 and PSU at $V_{in 1}$ & $V_{in 2}$, respectively.

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).

■ 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 PMH-24V200WCB□ 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. 3 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-20A module and measure at $V_{in 1}$ & $V_{in 2}$ 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.

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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.