

PMT Panel Mount Power Supply

24V 35W 1 Phase / PMT-24V35W1AA

PMT

Highlights & Features

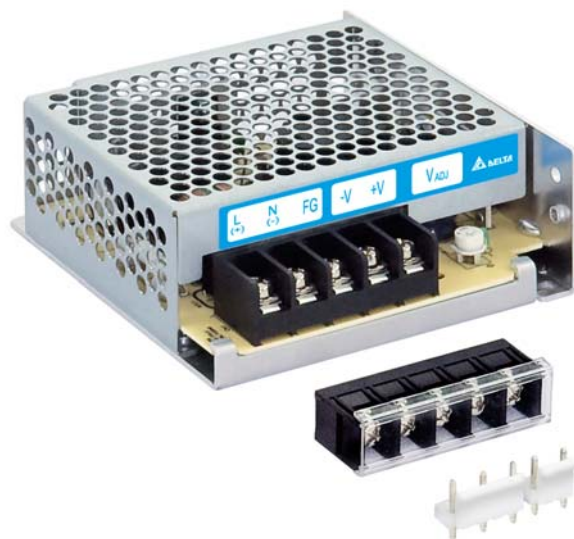
- 2 years warranty
- Reliable design, with expected life of 10 years
- RoHS Directive 2011/65/EU Compliant
- MTBF > 200,000 hrs. as per Telcordia SR-332
- Using 105°C AL cap for higher reliability
- Universal AC input range from 90Vac to 264Vac without power de-rating
- Overload / Overcurrent / Over Temperature Protections

Safety Standards



CB Certified for worldwide use

Model Number: PMT-24V35W1AA
Unit Weight: 0.22 kg
Dimensions (L x W x D): 98 x 97 x 38 mm



General Description

The new PMT series of panel mount power supplies is the latest offering from one of the world's largest power supply manufacturers and solution providers - Delta. The first range of PMT products will offer a nominal output voltage of 24V with a wide operating temperature range from -10°C to +70°C and can withstand shock and vibration according to IEC60068-2-6. In addition to features like overvoltage and overload protections, Delta's PMT series of panel mount power supplies is unlike many other brands in the same price level. The PMT series is designed for cost competitive markets without compromising the quality of the components and product specifications. The series of products has an expected life time of 10 years and will have no output power de-rating from 90 Vac to 264Vac. This versatile series has three different connector options (Terminal Block, Front Face and Harness) and can also be converted into L Frame (PML) or Open Frame (PMB) type of power supplies to satisfy different application needs.

Model Information

PMT Panel Mount Power Supply

Model Number	Input Voltage Range	Output Voltage	Output Current
PMT-24V35W1AA	90-264Vac (120-375Vdc)	24Vdc	1.46A

Model Numbering

PM	X –	24V	35W	1	A	X
Panel Mount	Product Type T - Enclosed L - L Frame* B - Open Frame*	Output Voltage	Output Power	Single Phase	No PFC Series	Connector Type A - Terminal Block G - Front Face* H - Harness*

* Options

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Specifications

Input Ratings / Characteristics

Nominal Input Voltage	100-240Vac
Input Voltage Range	90-264Vac
Nominal Input Frequency	50-60Hz
Input Frequency Range	47-63Hz
Input Current	< 0.75A @ 115Vac, < 0.50A @ 230Vac
Efficiency	> 85.0% @ 115Vac & 230Vac
Max Inrush Current	< 30A @ 115Vac, < 60A @ 230Vac
Power Factor	> 0.5 @ 100Vac
Leakage Current	< 1mA @ 240Vac

Output Ratings / Characteristics

Nominal Output Voltage	24Vdc
Output Voltage Tolerance	± 2% (initial set point tolerance)
Output Voltage Adjustment Range	22-28Vdc
Output Current	1.46A
Output Power	35W
Line Regulation	< 0.5% typ. (@ 85-264Vac input, 100% load)
Load Regulation	< 1% typ. (@ 85-264Vac input, 0-100% load)
Residual Ripple / PARD (20MHz)	< 150mVpp @ 25°C
Rise Time	< 30ms @ nominal input (100% load, 25°C)
Start-up Time	< 2500ms @ nominal input (100% load, 25°C)
Hold-up Time	> 16.7ms @ 115Vac
Dynamic Response (Overshoot & Undershoot O/P Voltage)	± 5% @ 0-100% load
Start-up with Capacitive Loads	8,000µF Max

Mechanical

Case Chassis	Aluminium
Case Cover	SGCC
Dimensions (L x W x D)	98 x 97 x 38 mm
Unit Weight	0.22 kg
Indicator	Green LED (DC OK)
Cooling System	Convection
Terminal	Refer to the Table on Page 7
Wire	Refer to the Table on Page 7

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Environment

Surrounding Air Temperature	Operating	-10°C to +70°C
	Storage	-25°C to +85°C
Power De-rating		> 50°C de-rate power by 2.5% / °C
Operating Humidity		< 95% RH (Non-Condensing)
Operating Altitude		3,000 Meters
Shock Test (Non-Operating)		IEC60068-2-27, 50G for a duration of 11ms
Vibration	Operating	IEC60068-2-6, 10Hz to 150Hz @ 25m/S ² (2.5G peak); 90 min per axis for all X, Y, Z direction
	Non-Operating	IEC60068-2-6, 10Hz to 150Hz @ 50m/S ² (5G peak); 90 min per axis for all X, Y, Z direction
Bump		IEC60068-2-29; 11ms / 10gn
Pollution Degree		2

Protections

Overvoltage	32V +10% / -10%, SELV Output, Hicc-up Mode, Non-Latching (Auto-Recovery)
Overload / Overcurrent	> 120% of rated load current, Hicc-up Mode, Non-Latching (Auto-Recovery)
Over Temperature	< 75°C Surrounding Air Temperature @ 100% load, Non-Latching (Auto-Recovery)
Short Circuit	Hicc-up Mode, Non-Latching (Auto-Recovery when the fault is removed)
Degree of Protection	IPX0
Protection Against Shock	Class I with PE* connection

*PE: Primary Earth

Reliability Data

MTBF	> 200,000 hrs.
Expected Cap Life Time	10 years (115Vac & 230Vac, 50% load @ 40°C)

Safety Standards / Directives

Electrical Safety	CCC, TUV Bauart to EN60950-1, UL/cUL recognized to UL60950-1, CSA C22.2 No. 60950-1, CB scheme to IEC60950-1
ITE	IEC/EN/UL 60950-1
CE	In conformance with EMC Directive 2004/108/EC and Low Voltage Directive 2006/95/EC
Material and Parts	RoHS Directive 2011/65/EU Compliant
Galvanic Isolation	Input to Output 3.0KVac
	Input to Ground 1.5KVac
	Output to Ground 0.5KVac

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EMC

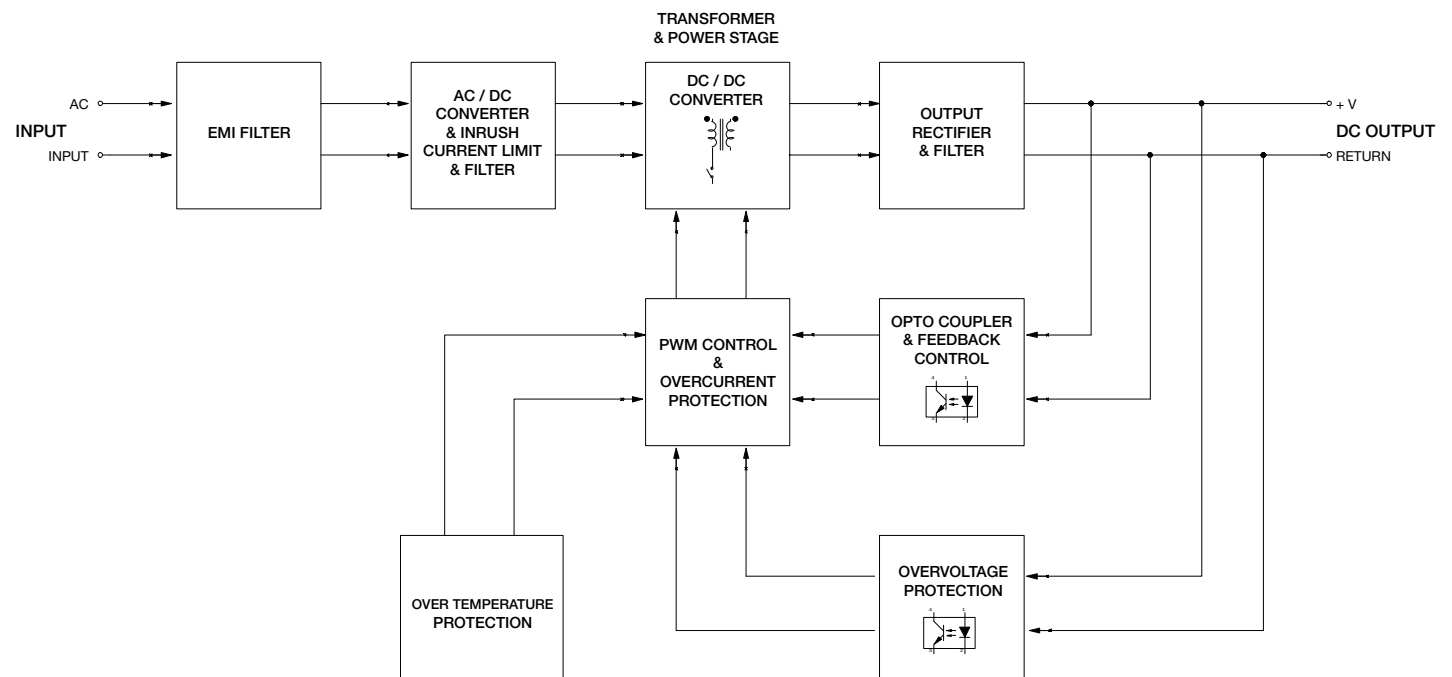
EMC / Emissions		CISPR22, EN55022, EN55011, FCC Title 47: Class B
Immunity to		
Electrostatic Discharge	EN61000-4-2	Level 4 Criteria A ¹⁾ Air Discharge: 15kV Contact Discharge: 8kV
Radiated Field	EN61000-4-3	Level 3 Criteria A ¹⁾ 80MHz–1GHz, 10V/M with 1kHz tone / 80% modulation
Fast Transient / Burst	EN61000-4-4	Level 3 Criteria A ¹⁾ 2kV
Surge	IEC61000-4-5	Level 3 Criteria A ¹⁾ Common Mode ²⁾ : 2kV Differential Mode ³⁾ : 1kV
Conducted	EN61000-4-6	Level 3 Criteria A ¹⁾ 150kHz–80MHz, 10Vrms
Power Frequency Magnetic Fields	EN61000-4-8	Level 3 Criteria A ¹⁾ 10A/Meter
Voltage Dips	EN61000-4-11	Level 3 Criteria A ¹⁾ 100% dip; 1 cycle (20ms); Self Recoverable
Low Energy Pulse Test (Ring Wave)	IEC61000-4-12	Level 3 Criteria A ¹⁾ Common Mode ²⁾ : 2kV Differential Mode ³⁾ : 1kV

1) Criteria A: Normal performance within the specification limits

2) Asymmetrical: Common mode (Line to earth)

3) Symmetrical: Differential mode (Line to line)

Block Diagram

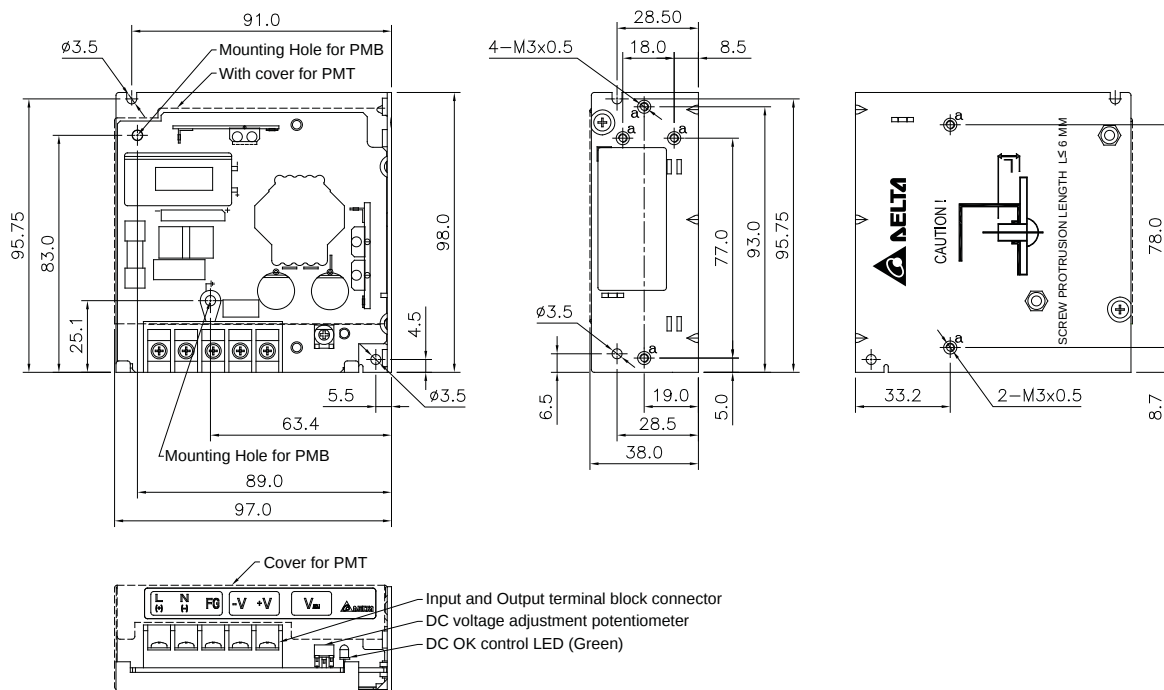


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Dimensions

L x W x D: 98 x 97 x 38 mm



Engineering Data

De-rating

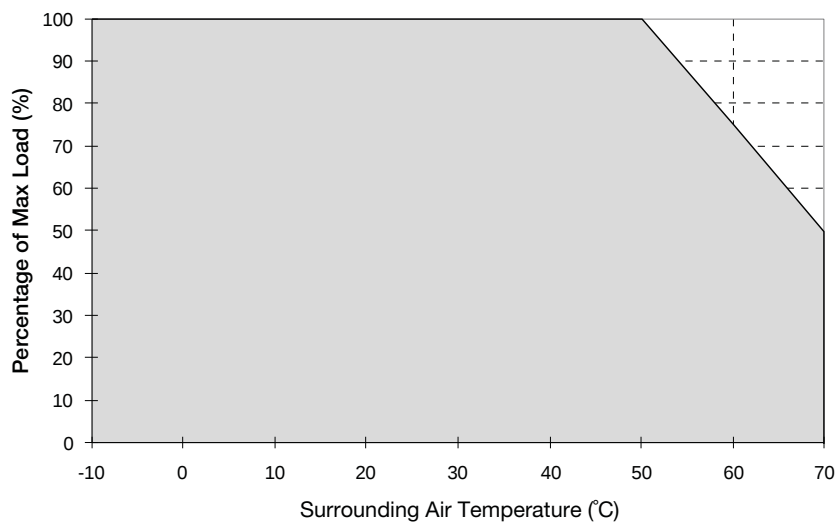


Fig. 1.1 De-rating for Vertical and Horizontal Mounting Orientation
> 50°C de-rate power by 2.5% / °C

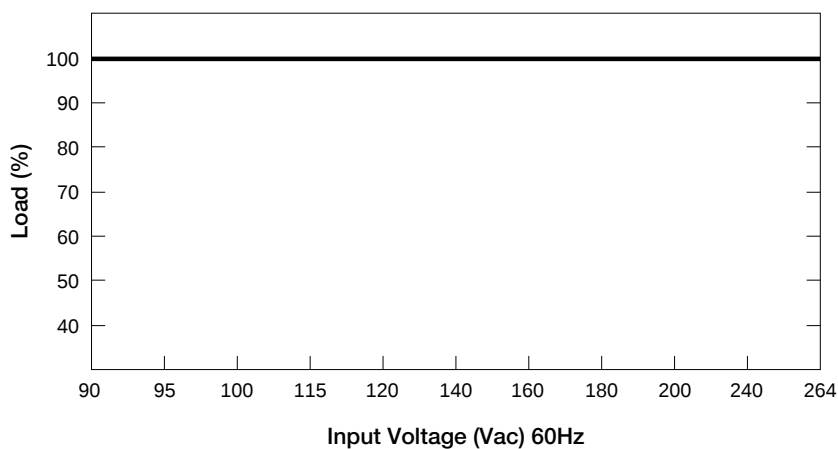
Note

- 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. 1.1.
- If the output capacity is not reduced when 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.
- If the device has to be mounted in any other orientation, please do not hesitate to contact info@deltapsu.com for more details.
- 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.
- Depending on the surrounding air temperature and output load delivered by the power supply, the device housing can be very hot!

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Output De-rating VS. Input Voltage



■ No output power de-rating for the input voltage from 90Vac to 264Vac

Assembly & Installation

Mounting holes for power supply assembly onto the mounting surface.

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

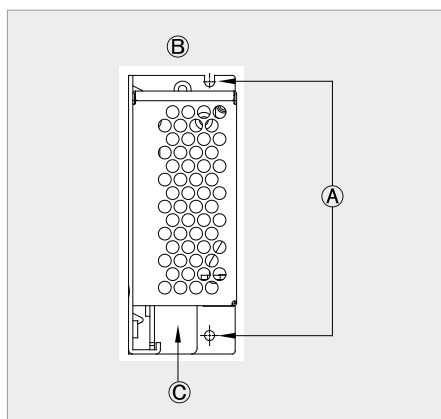


Fig. 2.1 Side Mounting (Vertical)

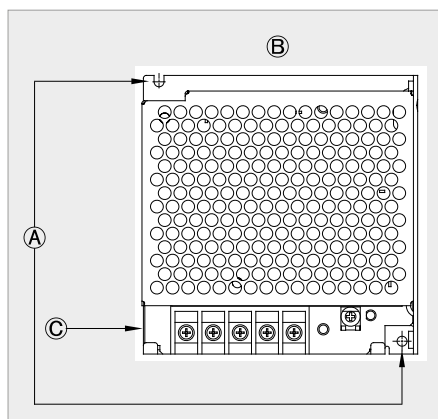


Fig. 2.2 Base Mounting (Vertical)

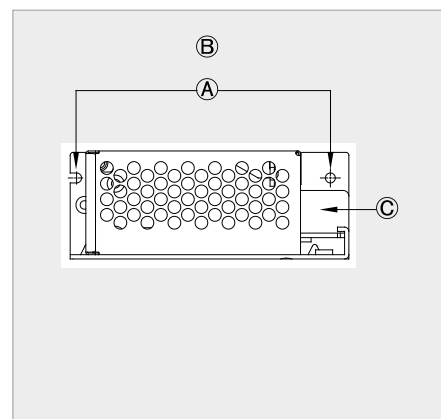
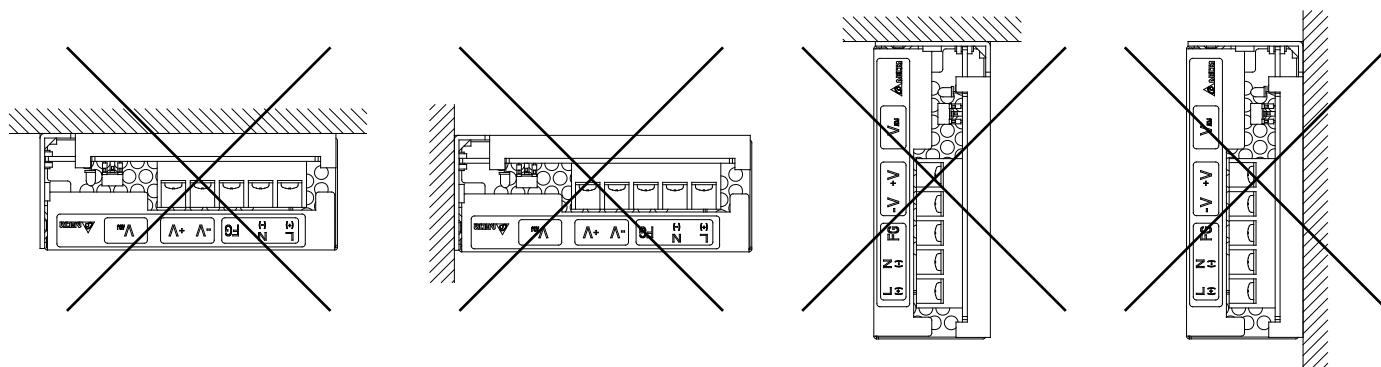


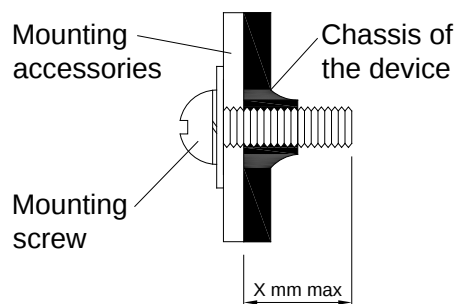
Fig. 2.3 Side Mounting (Horizontal)

Improper Installations



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■ Only use M3 screw $\leq X$ mm through the base mounting holes (Refer to the Screw Protrusion Length in the table below). This is to keep a safe distance between the screw and internal components.

Connection & Screw Protrusion Data

Product Group	Item	Connector Options		
		A - Terminal Block	G - Front Face*	H - Harness*
PMT	AWG	22-12	22-12	22-18
	Torque	13Kgf.cm	13Kgf.cm	–
	Input Connector	–	–	B3P5-VH(LF)(SN)
	Output Connector	–	–	B2P3-VH(LF)(SN)
	Input Mating Connector	–	–	VHR-5N
	Output Mating Connector	–	–	VHR-3N
	Input & Output Terminal	–	–	SVH-21T-P1.1
	Screw Protrusion Length	5mm (6mm Max)	5mm (6mm Max)	5mm (6mm Max)
PML*	AWG	22-12	22-12	22-18
	Torque	13Kgf.cm	13Kgf.cm	–
	Input Connector	–	–	B3P5-VH(LF)(SN)
	Output Connector	–	–	B2P3-VH(LF)(SN)
	Input Mating Connector	–	–	VHR-5N
	Output Mating Connector	–	–	VHR-3N
	Input & Output Terminal	–	–	SVH-21T-P1.1
	Screw Protrusion Length	5mm (6mm Max)	5mm (6mm Max)	5mm (6mm Max)
PMB*	AWG	22-12	22-12	22-18
	Torque	13Kgf.cm	13Kgf.cm	–
	Input Connector	–	–	B3P5-VH(LF)(SN)
	Output Connector	–	–	B2P3-VH(LF)(SN)
	Input Mating Connector	–	–	VHR-5N
	Output Mating Connector	–	–	VHR-3N
	Input & Output Terminal	–	–	SVH-21T-P1.1
	Screw Protrusion Length	5mm	5mm	5mm

* Options

- To ensure sufficient convection cooling, always maintain a safety distance of 20mm with adjacent units while the device is in operation.
- The device is not recommended to be placed on low thermal conductive surfaces, for example, plastics.
- Prevent any foreign metal, particles or conductors to enter the device through the openings during installation. It can cause: - Electric shock; Safety hazard; Fire; Product failure.

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Functions

Start-up Time

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

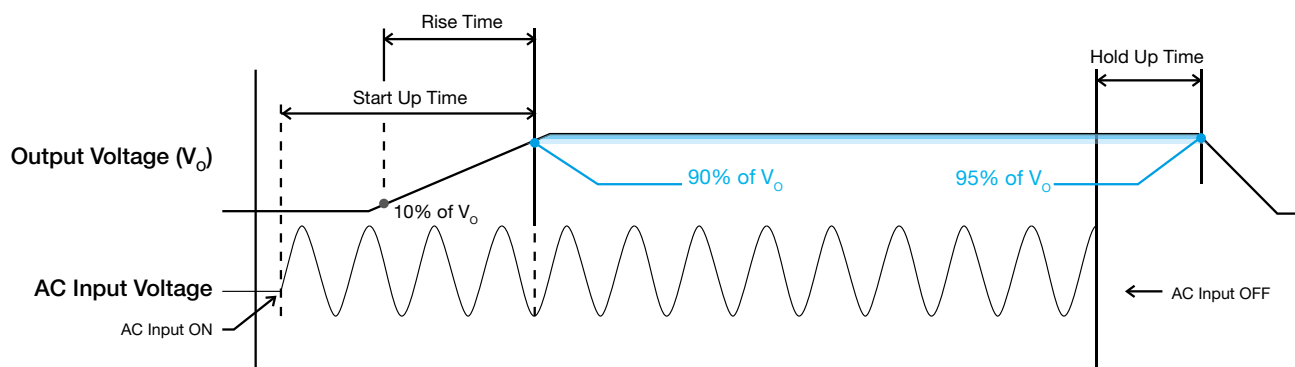
Rise Time

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

Hold-up Time

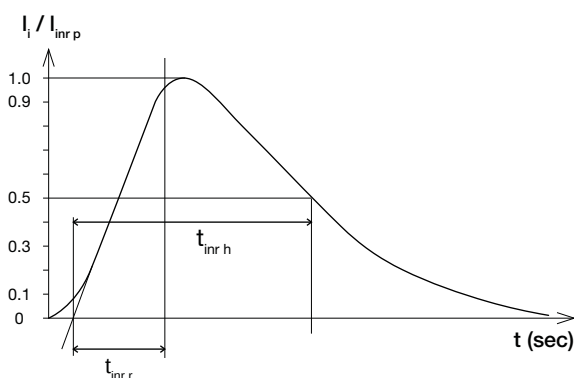
Hold up time is the time when the AC input collapses and output voltage retains regulation for a certain period of time. The time required for the output to reach 95% of its set value, after the input voltage is removed.

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



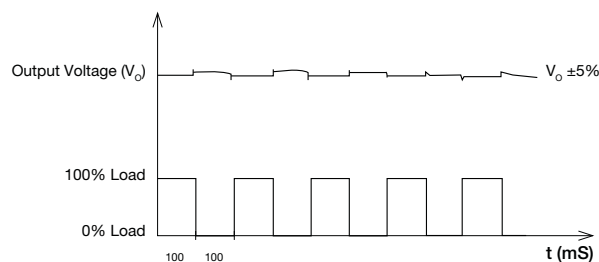
Inrush Current

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.



Step Load Response

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

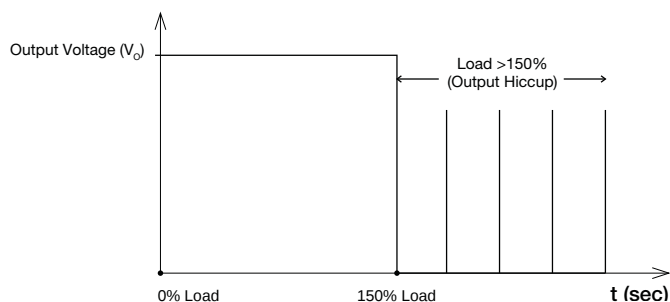


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Overload & Overcurrent Protections

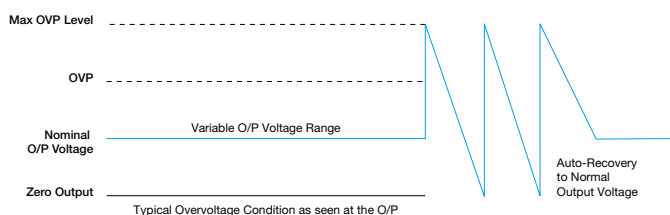
The power supply's Overload (OLP) and Overcurrent (OCP) Protections will be activated when output current exceeds 150% of I_o (Max load). In such occurrence, the V_o will start to droop and once the power supply has reached its maximum power limit, the protection is activated and the power supply will 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.



Additionally, if the I_o is $<150\%$ but $>100\%$ for a prolonged period of time (depending on the load), the Over Temperature Protection (OTP) will be activated due to high temperature on critical components. The power supply will then go into "Hiccup mode" until the fault 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".



Over Temperature Protection

As mentioned above, the power supply also has Over Temperature Protection (OTP). This is activated when the overload condition persists for an extended duration and the output current is below the overload trigger point but $>100\%$ load. In the event of a higher operating condition at 100% load, the power supply will run into OTP when the surrounding air temperature is $>80^{\circ}\text{C}$. When activated, the output voltage will go into bouncing mode until the operating surrounding air temperature drops to 50°C or output capacity is reduced as recommended in the de-rating graph.

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.

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Operating Mode

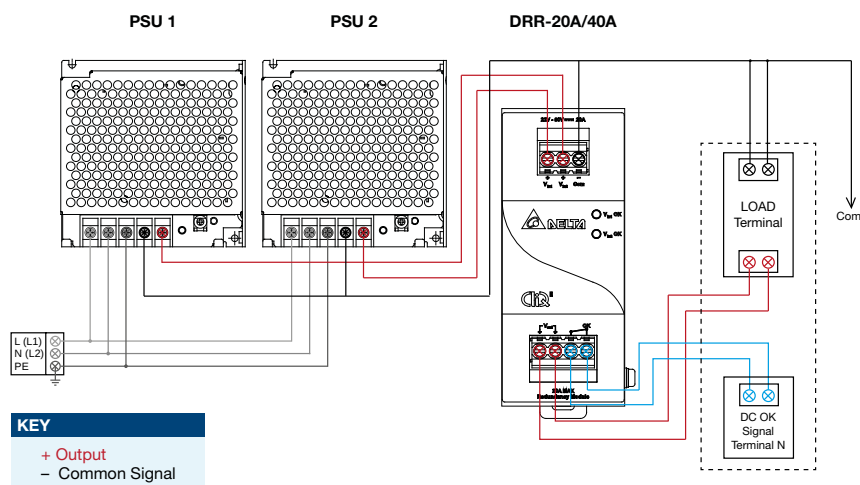


Fig. 3.1 Redundancy / Parallel Operation Connection Diagram

V_{drop} will vary from 0.6V to 0.9V (Typical 0.65V) depending on the load current and surrounding air temperature.

■ 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 PMT-24V35W1AA 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. 3.1 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 $\pm 25\text{mV}$ difference.
- Step 3.**
Connect PSU 1 and PSU 2 with the DRR-20A module and measure V_{in1} and V_{in2} to verify the voltage difference. Ensure the voltages are within $\pm 25\text{mV}$.
- 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 0.6V to 0.9V (Typical 0.65V) depending on the load current and surrounding air temperature.

Others

Delta RoHS Compliant



Restriction of the usage of hazardous substances

The European directive 2011/65/EC 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.

■ 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 0.45~0.5V for 24V supplies and 0.9~1.0V for 48V 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, 20A 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).