

PMC

Highlights & Features

- Universal AC input range
- Active PFC with high PF value
- Meet Surge Immunity IEC 61000-4-5, Level 4 (CM: 4 kV, DM: 2 kV)
- Wide operating temperature range -20°C to 70°C
- Compact Size
- Conformal coating on PCBA to protect against chemical and dust pollutants
- Built-in constant current circuit for reactive loads
- Design compliance with Japan PSE (DENAN)

Safety Standards



CB Certified for worldwide use



Model Number:	PMC-24V600W1RW
Unit Weight:	1.4 kg (3.1 lb)
Dimensions (L x W x H):	190 x 120 x 61 mm (7.48 × 4.72 × 2.4 inch)

General Description

Delta's 24 V 600 W power supply is now 20% smaller. As part of the PMC Series of Panel Mount power supply, the PMC-24V600W1RW provides 24 V output voltage with high efficiency > 92% @230 Vac. Leakage current has been reduced to less than 0.75 mA, whilst maintaining Power Factor levels up to 0.99. The product has a wide operating temperature of -20°C to 70°C, power de-rating from 50°C. Additional features include remote sense and remote on/off, built-in fan speed control with fan lock protection and conformal coating on the PCBAs to provide protection against dust and chemical pollutants.

The PMC-24V600W1RW is certified to IEC 60950-1, IEC/EN/UL 62368-1, K 60950-1 of KC. EMI approvals to EN/BS EN 55032 Class B.

Model Information

PMC Panel Mount Power Supply

Model Number	Input Voltage Range	Output Voltage	Output Current
PMC-24V600W1RW	85-264 Vac	24 Vdc	25.0 A

Model Numbering

PM	C –	24V	600W	1	□	W
Panel Mount	Product Type C – Enclosed	Output Voltage	Output Power	Single Phase	R : With PFC + Remote on/off + Remote Sense	Front Face connector & PCB Coating

Specifications

Input Ratings / Characteristics

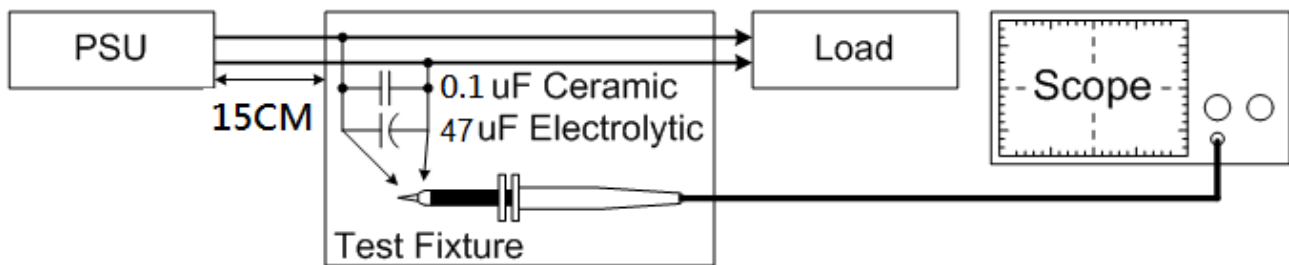
Nominal Input Voltage	100-240 Vac
Input Voltage Range	85-264 Vac (Refer to the Output De-rating VS. Input Voltage graph)
Nominal Input Frequency	50-60 Hz
Input Frequency Range	47-63 Hz
Input Current	6 A typ. @ 115 Vac, 3 A typ. @ 230 Vac
Efficiency at 100% Load	90.0% typ. @ 115 Vac, 92.0% typ. @ 230 Vac
Max Inrush Current	40 A typ. @ 230 Vac
Power Factor	0.99 typ. @ 100 Vac, 0.97 typ. @ 200 Vac
Leakage Current	< 0.75 mA @ 240 Vac

Output Ratings / Characteristics

Nominal Output Voltage	24 Vdc
Output Voltage Tolerance	± 2% (initial set point tolerance from factory)
Output Voltage Adjustment Range	21.6-27.6 Vdc
Output Current	25.0 A (continuously operating at 24 V)
Output Power	600 W max (continuously operating)
Line Regulation	± 0.4% typ. (@ 115 & 240 Vac input, 100% load)
Load Regulation	± 0.5% typ. (@ 115 & 240 Vac input, 100% load)
PARD*1 (20 MHz)	< 150 mVpp @ 0°C to 70°C, 180 mVpp typ. @ -20°C to 0°C
Rise Time	< 50 ms @ 115 Vac & 230 Vac (100% load)
Start-up Time	500 ms typ. @ 230 Vac (100% load)
Hold-up Time	20 ms typ. @ 115 Vac & 230 Vac (100% load)
Dynamic Response (Overshoot & Undershoot O/P Voltage)	± 5% @ 50-100% load
Start-up with Capacitive Loads	10,000 µF Max

*1 PARD is measured with an AC coupling mode, and in parallel to end terminal with 0.1 µF ceramic capacitor & 47 µF electrolytic capacitor.

Ripple & Noise Measurement Circuit



Mechanical

Casing	SGCC	
Dimensions (L × W × H)	190 x 120 x 61 mm (7.48 × 4.72 × 2.4 inch)	
Unit Weight	1.4 kg (3.1 lb)	
Cooling System	Built-in Fan	
Terminal	Input	M3.5 x 3 Pins (Rated 300 Vac/20 A)
	Output	M4 x 4 Pins (Rated 300 Vac/25 A)
	CN952	Signal Connector: JST S8B-PHDSS(LF)(SN) Mating connector: JST PHDR-08VS or equivalent
Wire	AWG 14-12	
Noise (1 Meter from power supply)	Sound Pressure Level (SPL) < 60 dBA	

Environment

Surrounding Air Temperature	Operating	-20°C to +70°C
	Storage	-30°C to +75°C
Power De-rating		> 50°C de-rate power by 2.5% / °C < 110 Vac de-rate power by 0.8% / 1V
Operating Humidity		20-95% RH
Operating Altitude		5,000 Meters
Shock Test	Non-Operating	IEC60068-2-27, Half Sine Wave: 50 G for a duration of 11 ms, 3 shocks for each 3 directions
	Operating	IEC60068-2-27, Half Sine Wave: 10 G for a duration of 11 ms, 3 shocks for each 3 directions
Vibration	Non-Operating	IEC60068-2-6, Random: 5 Hz to 500 Hz (2.09 Grms); 20 min per axis for all X,Y,Z direction
	Operating	IEC60068-2-6, Sine Wave: 10 Hz to 55 Hz @19.6 m/s ² (2 G peak); 10 min per cycle, 60 min per axis for all X,Y,Z direction
Over Voltage Category		II (Compliance to EN 62477-1 OVC III with 2000 meters altitude)
Pollution Degree		2

Protections

Overvoltage	27.6-33.6 V, SELV Output, Latch-off Mode
Overload / Overcurrent	105~160%; Constant current limit with automatic recovery
Over Temperature	Latch-off Mode
Short Circuit	Hiccup Mode, Non-Latching (Auto-Recovery when the fault is removed)
Protection Against Shock	Class I with PE*2 connection

*2 PE: Primary Earth

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 (115 Vac, 50% load @ 40°C)

Safety Standards / Directives

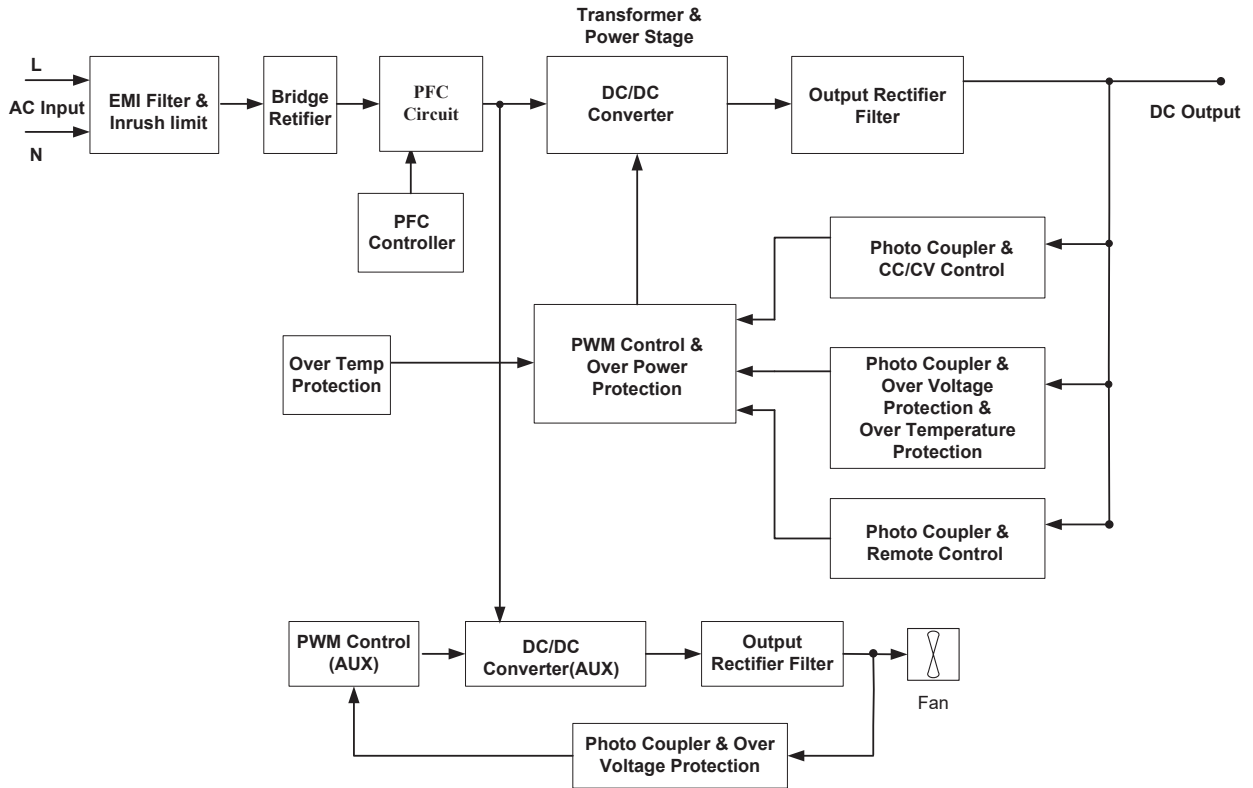
Safety Entry Low Voltage		SELV
Electrical Safety	TUV Bauart UL/cUL CB scheme KC	EN 62368-1 UL 62368-1, and CAN/CSA C22.2 No. 62368-1 IEC 62368-1, IEC 60950-1, IEC 61010-1 K 60950-1
CE		In conformance with EMC Directive 2014/30/EU and Low Voltage Directive 2014/35/EU
UKCA		In conformance with Electromagnetic Compatibility Regulations 2016 and Electrical Equipment (Safety) Regulations 2016
Galvanic Isolation	Input to Output	3.0 KVac
	Input to Ground	1.8 KVac
	Output to Ground	0.5 KVac

EMC

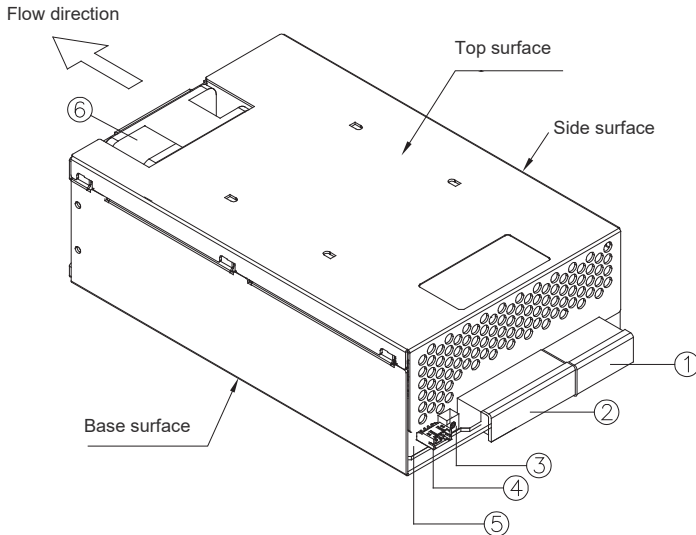
Emissions (CE & RE)		CISPR 32, EN/BS EN 55032 Compliance to FCC Title 47, VCCI, EN 55011 : Class B	
Immunity		EN/BS EN 55035, KN35 Compliance to EN 61000-6-2	
Electrostatic Discharge	IEC 61000-4-2	Level 4 Criteria A ¹⁾ Air Discharge: 15 kV Contact Discharge: 8 kV	
Radiated Field	IEC 61000-4-3	Level 3 Criteria A ¹⁾ 80 MHz-1 GHz, 10 V/M with 1 kHz tone / 80% modulation	
Electrical Fast Transient / Burst	IEC 61000-4-4	Level 3 Criteria A ¹⁾ 2 kV	
Surge	IEC 61000-4-5	Level 4 Criteria A ¹⁾ Common Mode ⁴⁾ : 4 kV Differential Mode ⁵⁾ : 2 kV	
Conducted	IEC 61000-4-6	Level 3 Criteria A ¹⁾ 150 kHz-80 MHz, 10 Vrms	
Power Frequency Magnetic Fields	IEC 61000-4-8	Level 4 Criteria A ¹⁾ 30 A/Meter	
Voltage Dips and Interruptions	IEC 61000-4-11	0% residual; 1 cycle, Criteria B ²⁾ 40% residual; 10 cycle, Criteria C ³⁾ 70% residual; 25 cycle, Criteria C ³⁾	
Harmonic Current Emission		IEC/EN/BS EN 61000-3-2 Class A	
Voltage Fluctuation and Flicker		IEC/EN/BS EN 61000-3-3	
Voltage Sag Immunity SEMI F47 – 0706		80% of 200 Vac 70% of 200 Vac 50% of 200 Vac	160 Vac, 1000 ms 140 Vac, 500 ms 100 Vac, 200 ms Criteria B ²⁾ Criteria B ²⁾ Criteria B ²⁾

1) Criteria A: Normal performance within the specification limits
2) Criteria B: Output out of regulation, or shuts down during test. Automatically restored to normal operation after test.
3) Criteria C: Output out of regulation, shuts down during test (Need to recycle AC power cord to normal operation after test)
4) Asymmetrical: Common mode (Line to earth)
5) Symmetrical: Differential mode (Line to line)

Block Diagram



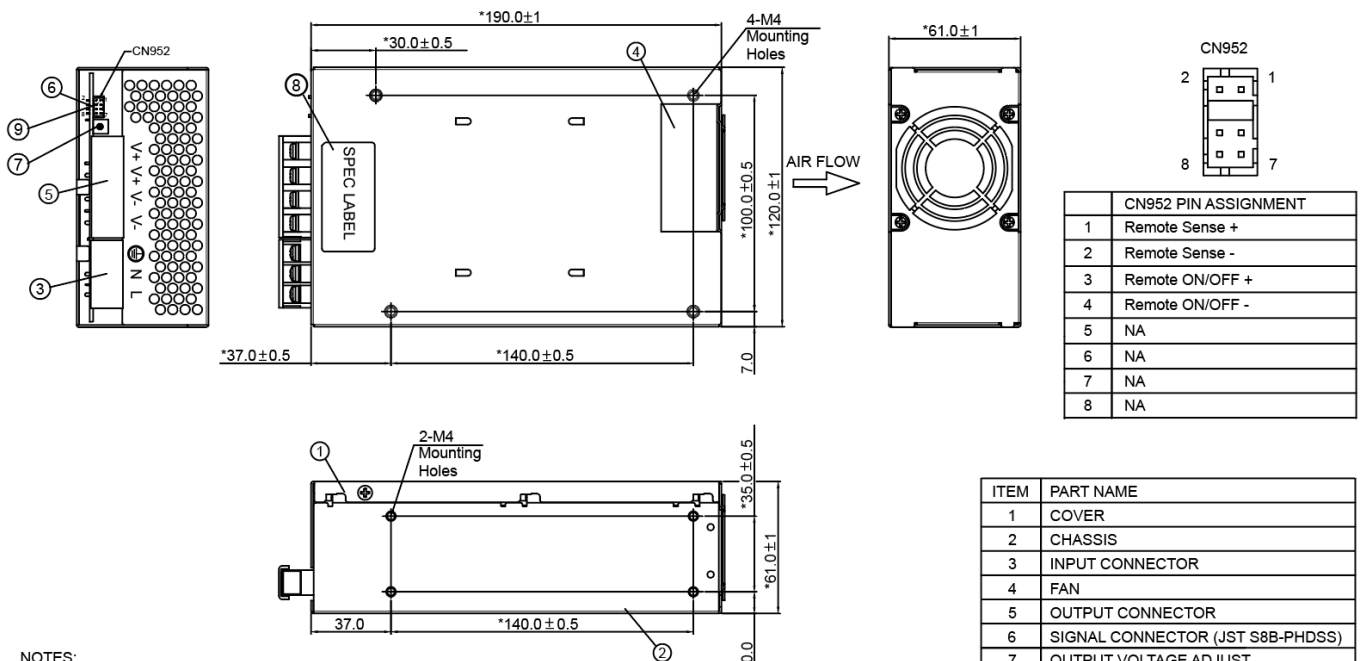
Device Descriptions



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

Dimensions

L x W x H: 190 x 120 x 61 mm (7.48 x 4.72 x 2.4 inch)



NOTES:

- 1. MARK MUST BE INSPECTED AND CONTROLLED STRICTLY BY QA.
- 2. MOUNTING TORQUE : 14.7Kgf-cm MAX
- 3. TERMINAL BLOCK SCREW TIGHTENING TORQUE : 13.5Kgf-cm MAX

Note : Built-in cooling fan. Must prevent dust suction into power supply, or use natural convection power supply if any concerns.

Engineering Data

Output Load De-rating VS Surrounding Air Temperature

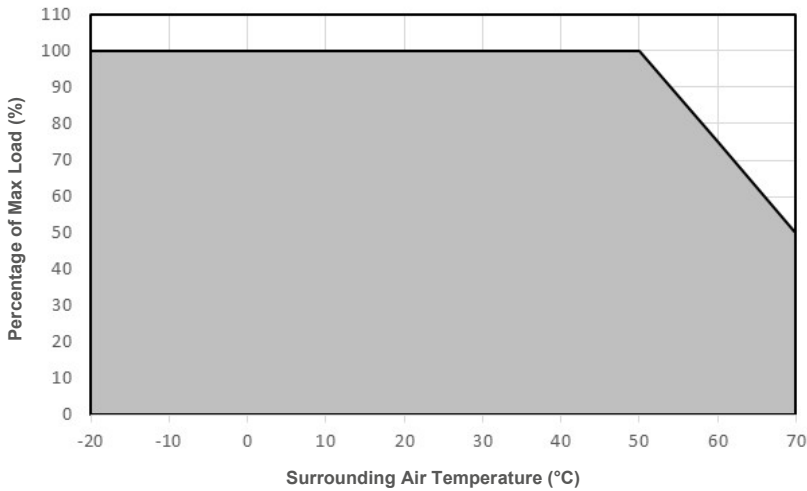
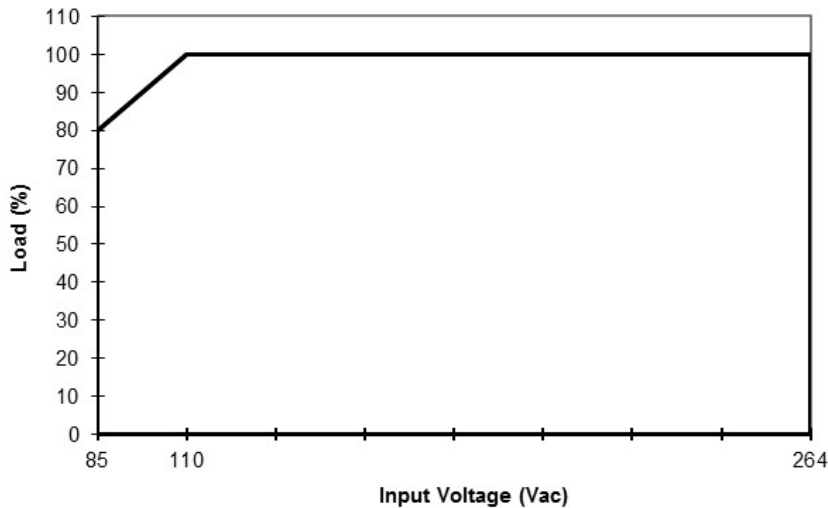


Fig. 1 De-rating for Horizontal Mounting Orientation
 > 50°C de-rate power by 2% / °C

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 & Fig. 2.
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, power supply will latch off, until the surrounding air temperature is lowered or the load is reduced as far as necessary to keep the device in working condition, and require removal/re-application of input AC voltage in order to restart.
3. In order for the device to function in the manner intended, it is also necessary to keep a safety distance as recommended in the safety instructions while the device is in operation.
4. Depending on the surrounding air temperature and output load delivered by the power supply, the device can be very hot!

Output Load De-rating VS Input Voltage



- No output power de-rating for the input voltage from 110 Vac to 264 Vac

Fig. 2 De-rating for AC Input Voltage
 < 110 Vac de-rate power by 0.8% / V

Assembly & Installation

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

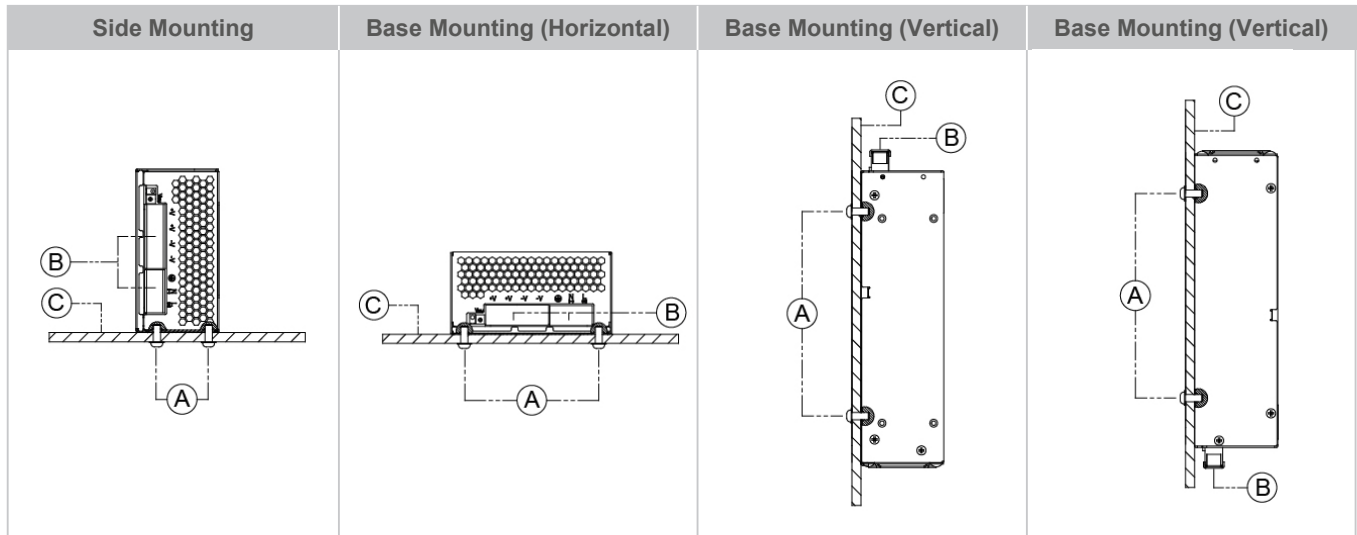
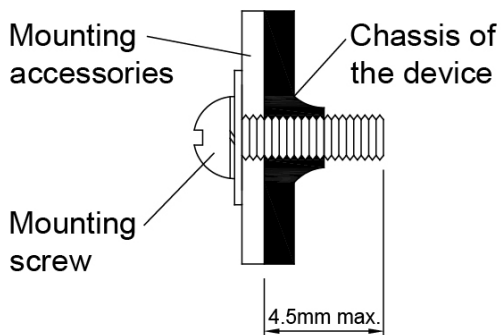


Fig. 3 Mounting Orientation

- Use flexible cable (stranded or solid) of AWG No. 14-12. The torque at the Input connector shall not exceed 13.5 Kgf.cm. The torque at the Output connector shall not exceed 13.5 Kgf.cm. The insulation stripping length should not exceed 0.275" or 7 mm.

Installation of Mounting Accessories



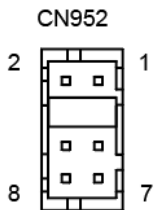
- Only use M4 screw ≤ 4.5 mm through the base mounting holes. This is to keep a safety distance between the screw and internal components.
- Recommended mounting tightening torque: 14.7 Kgf.cm max.

Safety Instructions

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

Functional Manual

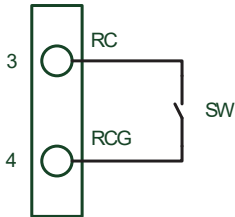
Pin Assignment of CN952



Pin	Functions	Descriptions
1	Remote Sense +	Positive sensing. The +S Signal should be connected to the positive terminal of the load
2	Remote Sense -	Negative sensing. Ground reference
3	Remote On/off +	Turn the output on and off by electrical SW or dry contact between Pin 4 (GND); Short: Power ON, Open: Power OFF
4	Remote On/Off -	Ground reference
5	N/A	N/A
6	N/A	N/A
7	N/A	N/A
8	N/A	N/A

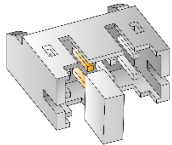
Remote On_OFF (INHIBIT)

Remote ON_OFF (INHIBIT) can be used to enable or disable only the main output. This signal can be pulled down to a low level of 0.3 volts, or shorted to Remote On/Off (GND), in order for the main output to be enabled; and, floated (no connection to the signal), or pulled up to a value greater than or equal to 5 volts & remove jumper at CN 952, in order to disable the main output.



Between Remote On/Off (CN952 pin3) and Remote On/Off GND (CN952 pin4)	Output Status
SW ON (Short)	ON
SW OFF (Open)	OFF

*Mating Connector : Refer to page 3.



Mating Jumper for enable the main output (+24V)

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.

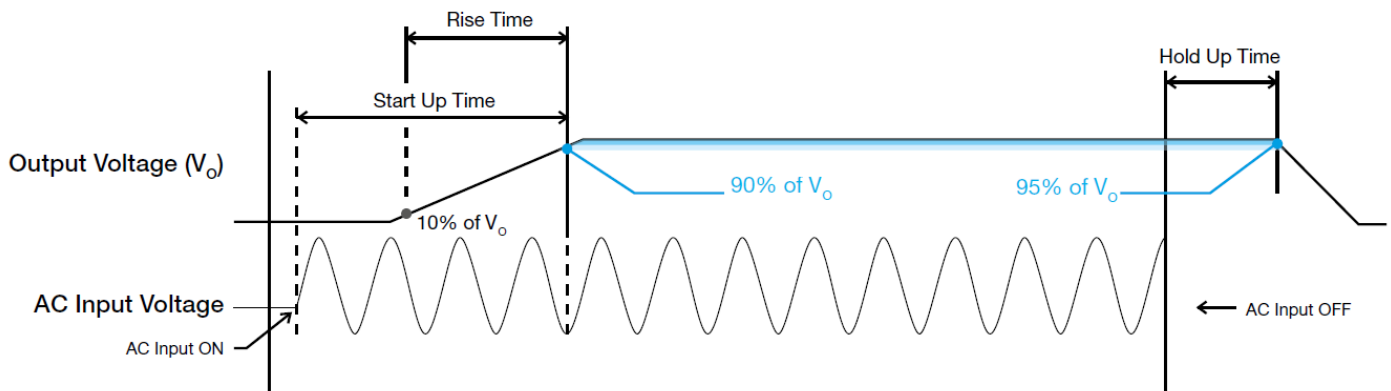
Rise Time

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

Hold-up Time

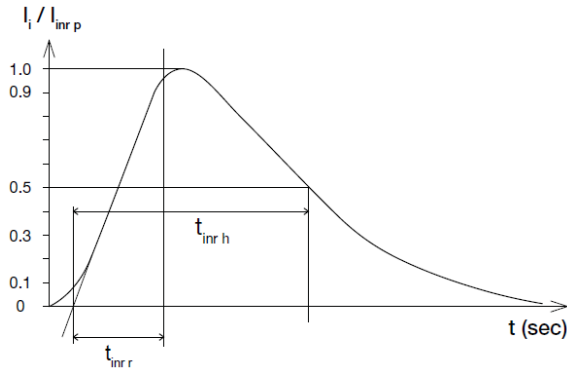
Time between the collapse of the AC input voltage, and the output falling to 95% of its steady state set value.

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



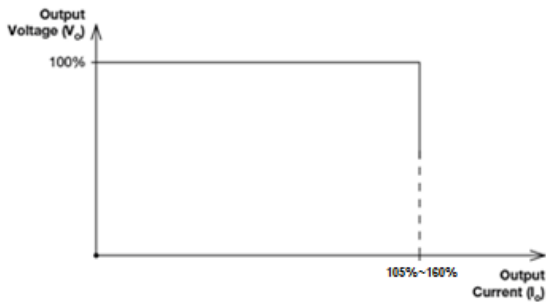
Inrush Current

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.



Overload & Overcurrent Protections (Continuous Current)

The power supply's Overload (OLP) and Overcurrent (OCP) Protections will be activated when output current is 105~160% of I_o (Max load). Upon such an occurrence, the V_o (output voltage) will start to droop. Once the power supply has reached its maximum power limit, the protection will be activated; and, the power supply will operate in continuous current. The power supply will recover once the cause of OLP or OCP is removed, and I_o (output current) is back within the specified range.



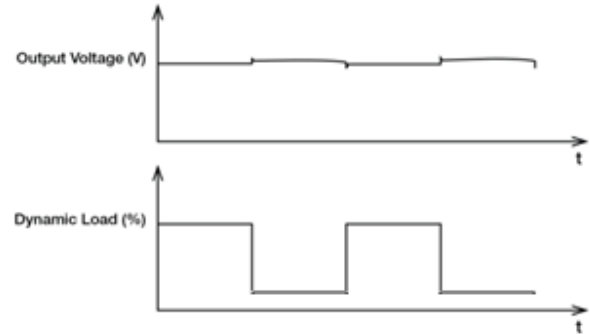
Short Circuit Protection (Auto-Recovery)

The power supply's output Short Circuit Protection function also provides protection against short circuits. When a short circuit is applied, the output current will operate in "Hiccup mode". The power supply will return to normal operation after the short circuit is removed.

Dynamic Response

The power supply output voltage will remain within $\pm 5\%$ of its steady state value, when subjected to a dynamic load from 50% to 100% of its rated current.

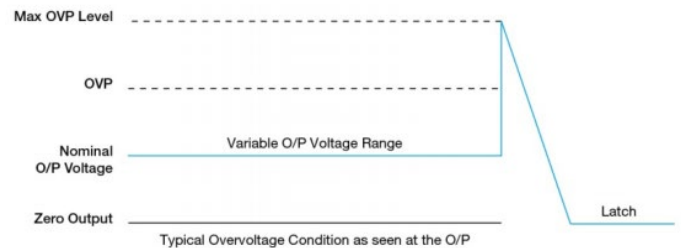
■ 50% duty cycle / 100 Hz



Overvoltage Protection (Latch Mode)

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

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



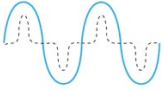
Over Temperature Protection (Latch Mode)

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

Others

PFC – Norm EN 61000-3-2

Line Current Harmonic content



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

(June 2022, Rev. 06)