Highlights & Features

- Universal AC input voltage range
- Power will not de-rate for the entire input voltage range
- UL 1310 safety approval
- NEC Class 2 and Limited Power Source (LPS) approvals
- Built-in active PFC, PF > 0.99 @ 115 Vac
- Full corrosion resistant aluminium casing
- Conforms to harmonic current IEC/EN 61000-3-2, Class A
- Conformal coating on PCBAs to protect against common dust and chemical pollutants
- Overvoltage / Overcurrent / Over Temperature / Short Circuit Protections
- Certified according to IEC/EN/UL 62368-1

Safety Standards

CB Certified for worldwide use

Model Number: DRP-24V100W1NN
Unit Weight: 0.60 kg (1.32 lb)
Dimensions (L x W x D): 124 x 40 x 124 mm (4.88 x 1.57 x 4.88 inch)

General Description

Delta's CliQ II DIN Rail Power Supply series with UL 1310 and NEC Class 2 approvals offers start-of-the-art designs made to withstand harsh industrial environments. The rugged Aluminium case is both shock and vibration resistant according to IEC 60068-2 and adheres to IP20 protection level. The DRP-24V100W1NN can be used in general industrial applications, especially for dry indoor condition with the advantage of lower wiring costs for a system due to its compliance with NEC Class 2 requirements. The NEC (National Electrical Code) is a North American standard, which is regarded as a law in most North American states. The NEC describes the installation of electric conductors and equipments within or on buildings. Like the rest of the models in the CliQ series, conformal coating is applied on the PCBAs to protect against dust and chemical pollutants. The Class 2 power units operates over a wide temperature range of -25°C to +80° and universal AC input voltage range from 85 Vac to 264 Vac, the power will not de-rate for the entire input voltage range value. The product also includes overvoltage, overload, over temperature and short circuit protections for the output.

Model Information

CliQ II DIN Rail Power Supply

Model Number	Input Voltage Range	Rated Output Voltage	Rated Output Current
DRP-24V100W1NN	85-264 Vac (120–375 Vdc)	24 Vdc	3.80 A

Model Numbering

DR	P –	24V	100W	1	N	N
DIN Rail	Power Supply	Output Voltage	Output Power	Single Phase	NEC Class 2	N - Metal Case, without Class I, Div 2

Specifications

Input Ratings / Characteristics

Nominal Input Voltage		100-240 Vac
Input Voltage Range		85-264 Vac
Nominal Input Frequency		50-60 Hz
Input Frequency Range		47-63 Hz
DC Input Voltage Range*		120-375 Vdc
Input Current		< 1.00 A @ 115 Vac, < 0.53A @ 230 Vac
Efficiency at 100% Load		> 88.0% @ 115 Vac, > 89.0% @ 230 Vac
Max Power Dissipation	0% load	< 0.7 W @ 115 Vac, < 0.8 W @ 230 Vac
	100% load	< 12.4 W @ 115 Vac, < 11.2 W @ 230 Vac
Max Inrush Current (Cold Start)		< 30 A @ 115 Vac, < 60 A @ 230 Vac
Power Factor		> 0.99 @ 115 Vac, > 0.94 @ 230 Vac
Leakage Current		< 0.5 mA @ 240 Vac

*Fulfills tested condition, additional testing for system approval might be necessary.

Output Ratings / Characteristics**

Nominal Output Voltage	24 Vdc
Factory Set Point Tolerance	24 Vdc ± 2%
Output Voltage Adjustment Range	22-24 Vdc
Output Current	0-3.80 A (91.2 W max)
Output Power	91.2 W
Line Regulation	< 0.5% (@ 85-264 Vac input, 100% load)
Load Regulation	< 1.0% at -25°C to +25°C < 2.0% at +25°C to +50°C (@ 85-264 Vac input, 0-100% load)
PARD*** (20 MHz)	< 150 mVpp
Rise Time	< 100 ms @ nominal input (100% load)
Start-up Time	< 2,000 ms @ nominal input (100% load)
Hold-up Time	> 20 ms @ 115 Vac, > 30 ms @ 230 Vac (100% load)
Dynamic Response (Overshoot & Undershoot O/P Voltage)	± 5% @ 85-264 Vac input, 0-100% load (Slew Rate: 0.1 A/µs, 50% duty cycle @ 5 Hz to 1 kHz)
Start-up with Capacitive Loads	8,000 µF Max

**For power de-rating from 50°C to 80°C, see power de-rating on page 3.
***PARD is measured with an AC coupling mode, 5 cm wires, and in parallel with 0.1 µF ceramic capacitor & 47 µF electrolytic capacitor.

Mechanical

Case Cover / Chassis		Aluminium
Dimensions (L x W x D)		124 x 40 x 124 mm (4.88 x 1.57 x 4.88 inch)
Unit Weight		0.60 kg (1.32 lb)
Indicator	Green LED	DC OK
Cooling System		Convection
Terminal	Input	3 Pins (Rated 600 V / 35 A)
	Output	4 Pins (Rated 300 V / 28 A)
Wire	Input / Output	AWG 18-12
Mounting Rail		Standard TS35 DIN Rail in accordance with EN 60715
Noise (1 Meter from power supply)		Sound Pressure Level (SPL) < 40 dBA

Environment

Surrounding Air Temperature	Operating	-25°C to +80°C (Cold Start at -40°C)	
	Storage	-40°C to +85°C	
Power De-rating	Vertical Mounting	> 50°C de-rate power by 2.5% / °C, > 70°C de-rate power by 4% / °C	
	Horizontal Mounting	> 40°C de-rate power by 2.5% / °C	
Operating Humidity		5 to 95% RH (Non-Condensing)	
Operating Altitude		0 to 2,500 Meters (8,200 ft)	
Shock Test	Non-Operating	IEC 60068-2-27, 30 G (300 m/S²) for a duration of 18 ms, 1 times per direction, 2 times in total	
Vibration	Non-Operating	IEC 60068-2-6, 10 Hz to 500 Hz @ 30 m/S² (3 G peak); 60 min per axis for all X, Y, Z direction	
Bump Test	Operating	IEC 60068-2-29, Half Sine Wave: 10 G for a duration of 11 ms, 1,000 times per direction, 6,000 times in total	
Over Voltage Category		III	According to IEC/EN 62477-1 / EN 60204-1 (clearance and creepage distances) and IEC 62103 (safety part)
Pollution Degree		2	

Protections

Overvoltage	< 32 V, ±10%, SELV Output, Hiccup Mode, Non-Latching (Auto-Recovery)
Overload	< 100 W, Constant Current, Hiccup Mode, Non-Latching (Auto-Recovery)
Overcurrent	< 8 A, Constant Current, Hiccup Mode, Non-Latching (Auto-Recovery)
Over Temperature	< 80°C Surrounding Air Temperature @ 100% load, Non-Latching (Auto-Recovery)
Short Circuit	Hiccup Mode, Non-Latching (Auto-Recovery when the fault is removed)
Internal Fuse at L pin	T 3.15 A H
Degree of Protection	IP20
Protection Against Shock	Class I with PE* connection

*PE: Primary Earth

Reliability Data

MTBF	> 800,000 hrs. as per Telcordia SR-332 I/P: 115 Vac, O/P: 100% load, Ta: 25°C
Expected Cap Life Time	10 years (115 Vac & 230 Vac, 50% load @ 40°C)

Safety Standards / Directives

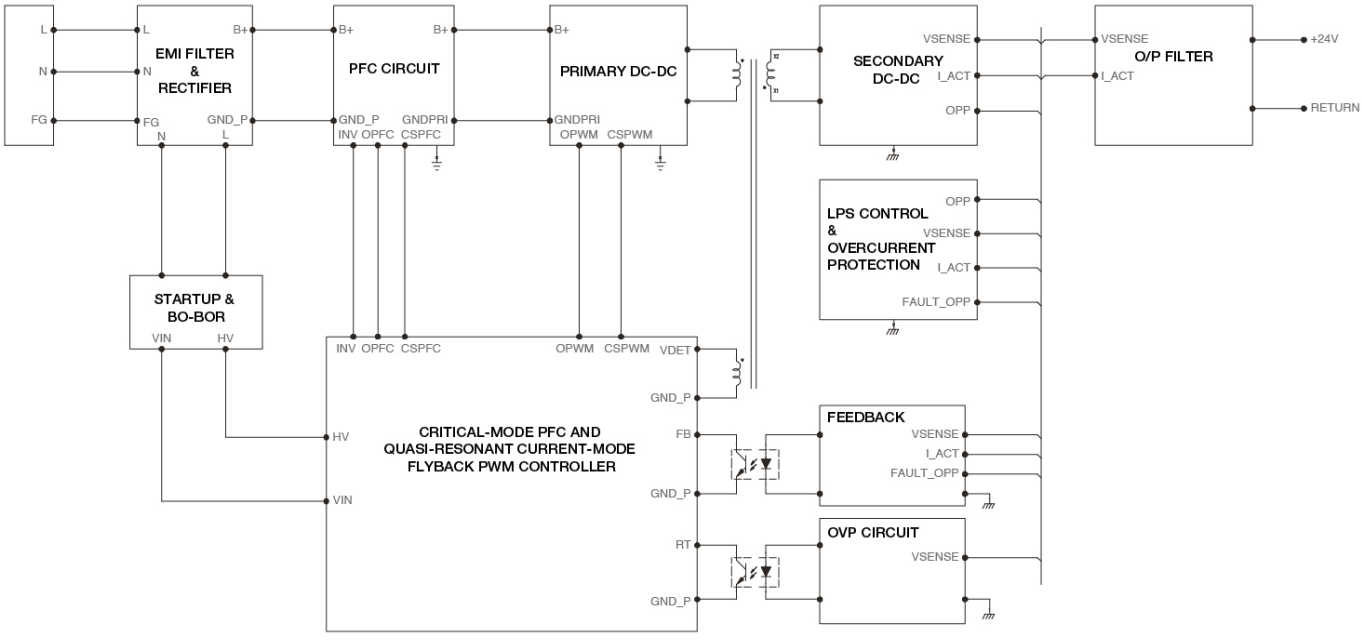
Electrical Equipment of Machines		EN/BS EN 60204-1 (over voltage category III)
Electrical Equipment for Use in Electrical Power Installations		IEC/EN/BS EN 62477-1 / IEC 62103
Safety Entry Low Voltage		SELV (IEC 60950-1)
Electrical Safety	SIQ Bauart	EN 62368-1
	UL/cUL recognized	UL 60950-1 and CSA C22.2 No. 60950-1 (File No. E191395) UL 62368-1 and CSA C22.2 No. 62368-1 (File No. E191395)
	CB scheme	IEC 60950-1, IEC 62368-1, Limited Power Source (LPS)
	UKCA	BS EN 62368-1
Industrial Control Equipment	UL/cUL listed	UL 508 and CSA C22.2 No. 107.1-01 (File No. E315355)
	CSA	CSA C22.2 No. 107.1-01 (File No. 181564)
Class 2 Power Supply	UL/cUL recognized	UL 1310 and CSA C22.2 No. 223 (File No. E350883)
CE		In conformance with EMC Directive 2014/30/EU and Low Voltage Directive 2014/35/EU
UKCA		In conformance with Electrical Equipment (Safety) Regulations 2016 No. 1011 and The Electromagnetic Compatibility Regulations 2016 No. 1091
Galvanic Isolation	Input to Output	4.0 KVac
	Input to Ground	1.5 KVac
	Output to Ground	1.5 KVac

EMC

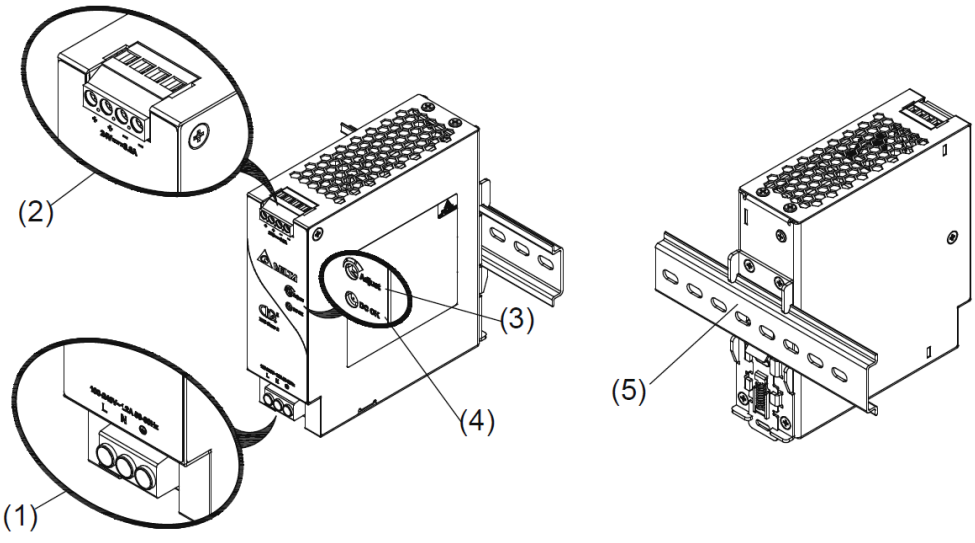
Emissions (CE & RE)		Generic Standards: CISPR 32, EN/BS EN 55032, CISPR 11, EN/BS EN 55011, FCC Title 47: Class B
Component Power Supply for General Use		EN/BS EN 61204-3
Immunity		Generic Standards: EN/BS EN 55024, EN/BS EN 61000-6-2
Electrostatic Discharge	IEC 61000-4-2	Level 4 Criteria A[1)] Air Discharge: 15 kV Contact Discharge: 8 kV
Radiated Field	IEC 61000-4-3	Level 3 Criteria A[1)] 80 MHz-1 GHz, 10 V/M, 80% modulation (1 KHz) 1.4 GHz-2 GHz, 3 V/M, 80% modulation (1 KHz) 2 GHz-2.7 GHz, 1 V/M, 80% modulation (1 KHz)
Electrical Fast Transient / Burst	IEC 61000-4-4	Level 3 Criteria A[1)] 2 kV
Surge	IEC 61000-4-5	Level 3 Criteria A[1)] Common Mode[2)]: 2 kV Differential Mode[3)]: 1 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	Criteria A[1)] 30 A/Meter
Voltage Dips and Interruptions	IEC 61000-4-11	100% dip; 1 cycle (20 ms); Self Recoverable
Low Energy Pulse Test (Ring Wave)	IEC 61000-4-12	Level 3 Criteria A[1)] Common Mode[2)]: 2 kV Differential Mode[3)]: 1 kV
Harmonic Current Emission		IEC/EN/BS EN 61000-3-2, Class A
Voltage Fluctuation and Flicker		IEC/EN/BS 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)

Block Diagram



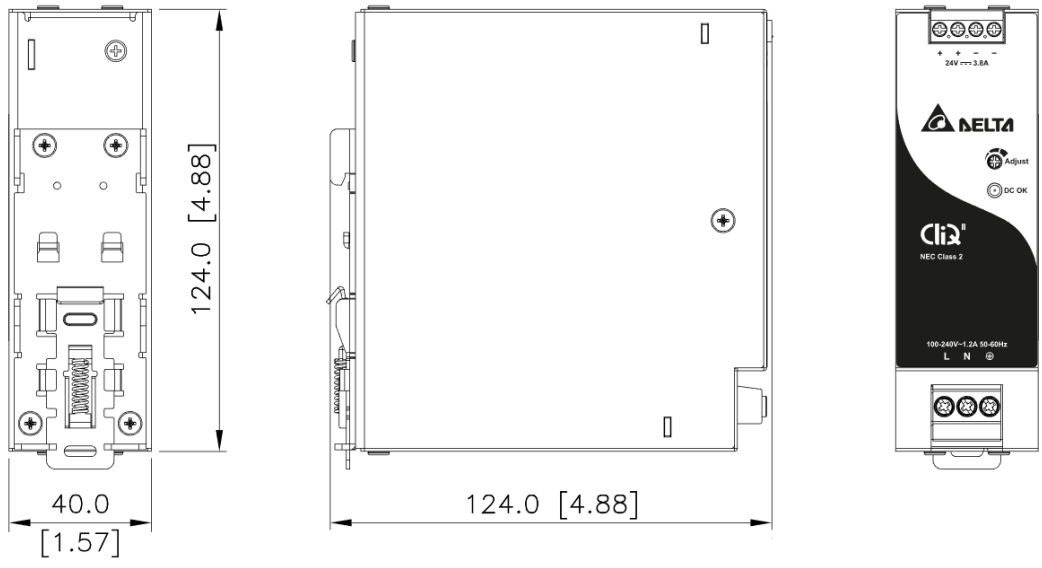
Device Description



1) Input terminal block connector
2) Output terminal block connector
3) DC Voltage adjustment potentiometer
4) DC OK control LED (Green)
5) Universal mounting rail system

Dimensions

L x W x D: 124 x 40 x 124 mm (4.88 x 1.57 x 4.88 inch)



Engineering Data

Output Load De-rating VS Surrounding Air Temperature

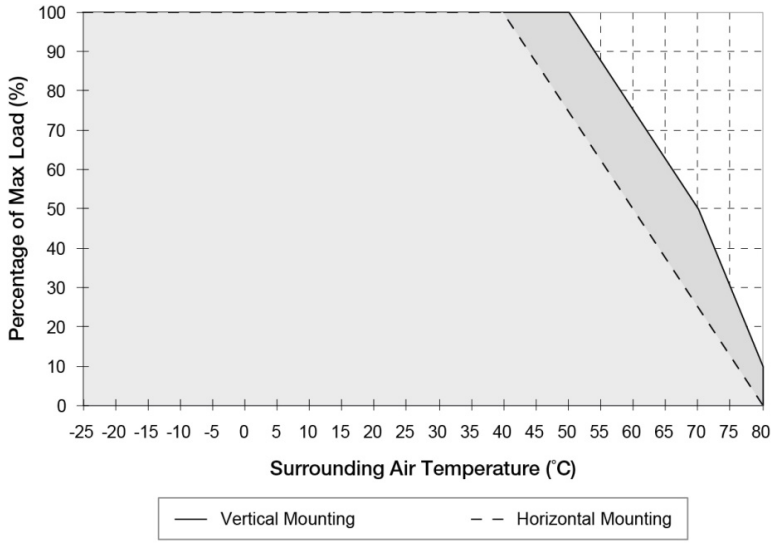


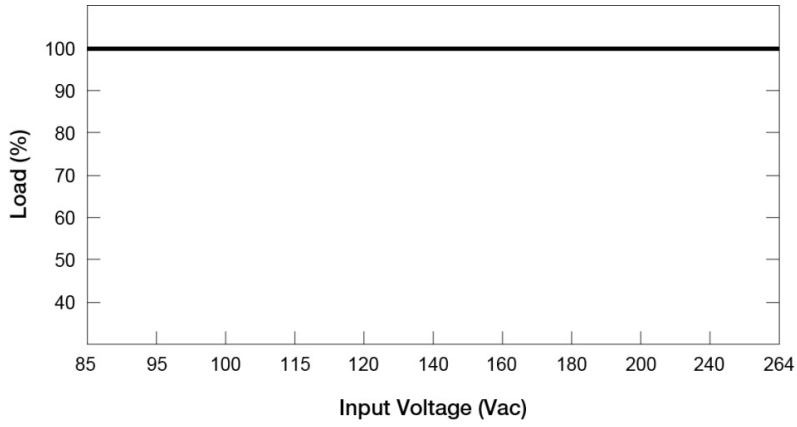
Fig. 1 **De-rating for Vertical Mounting Orientation**
> 50°C de-rate power by 2.5% / °C,
> 70°C de-rate power by 4% / °C

De-rating for Horizontal Mounting Orientation
> 40°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 exceeds its specification as defined on Page 3 under “Environment”, the device may 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 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!
5. If the device has to be mounted in any other orientation, please contact **info@deltapsu.com** for more details.

Output Load De-rating VS Input Voltage



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

Assembly & Installation

The power supply unit (PSU) can be mounted on 35 mm DIN rails in accordance with EN 60715. For Vertical Mounting, the device should be installed with input terminal block on the bottom. For Horizontal Mounting, the device should be installed with input terminal block on the left side.

Each device is delivered ready to install.

Mounting

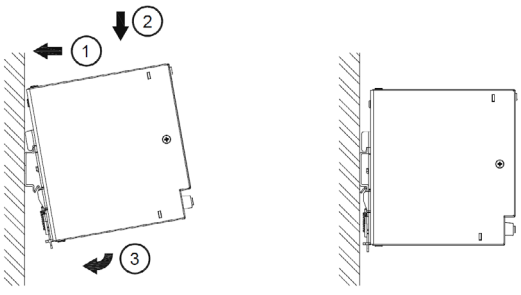


Fig. 2.1 Mounting

Snap on the DIN rail as shown in Fig. 2.1:
1. Tilt the unit upwards and insert it onto the DIN rail.
2. Push downwards until stopped.
3. Press against the bottom front side for locking.
4. Shake the unit slightly to ensure that it is secured.

Dismounting

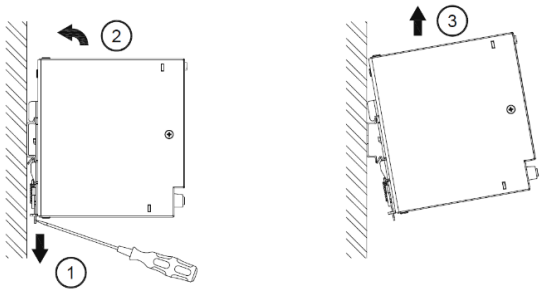


Fig. 2.2 Dismounting

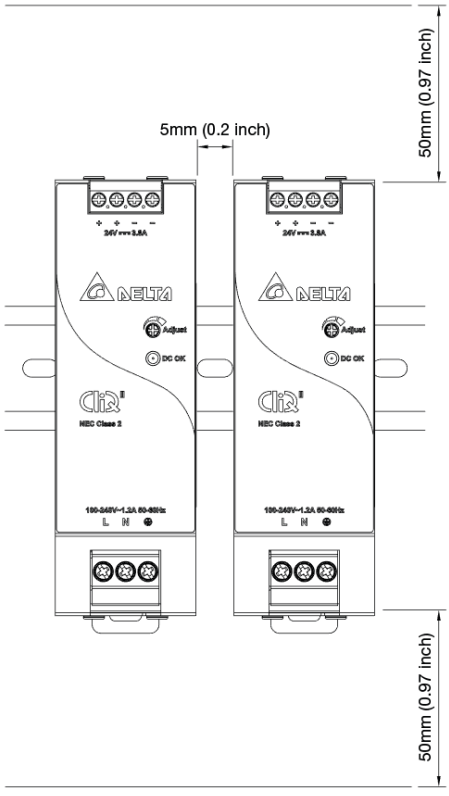
To uninstall, pull or slide down the latch with screw driver as shown in Fig. 2.2. Then slide the power supply unit (PSU) in the opposite direction, release the latch and pull out the power supply unit (PSU) from the rail.

In accordance to EN 60950 / UL 60950 and EN 62368 / UL 62368, flexible cables require ferrules.

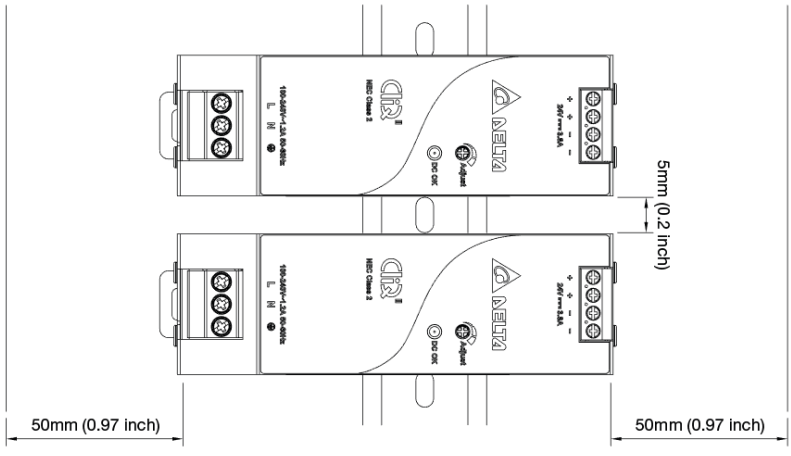
Use appropriate copper cables designed to sustain operating temperature of:
1. 60°C, 60°C / 75°C for USA
2. At least 75°C for ambient not exceeding 60°C, and 90°C for ambient exceeding 60°C for Canada.

Safety Instructions

■ **Vertical Mounting**



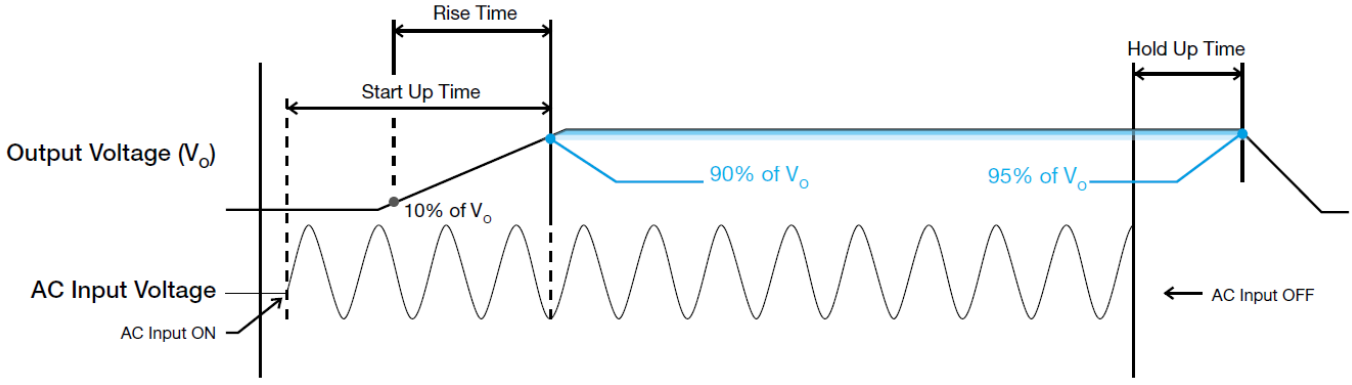
■ **Horizontal Mounting**



- ALWAYS switch mains of input power OFF before connecting and disconnecting the input voltage to the unit. If mains are not turned OFF, there is risk of explosion / severe damage.
- **To guarantee sufficient convection cooling, keep a distance of 50 mm (0.97 inch) above and below the device as well as a lateral distance of 5 mm (0.2 inch) to other units.**
- Note that the enclosure of the device can become very hot depending on the surrounding air temperature and load of the power supply. Risk of burns!
- Only plug in and unplug connectors when power is turned off!
- DO NOT insert any objects into the unit.
- Hazardous voltages may be present for up to 5 minutes after the input mains voltage is disconnected. Do not touch the unit during this time.
- The power supplies are built in units and must be installed in a cabinet or room (condensation free environment and indoor location) that is relatively free of conductive contaminants.
- CAUTION: “For use in a controlled environment”.

Functions

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



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

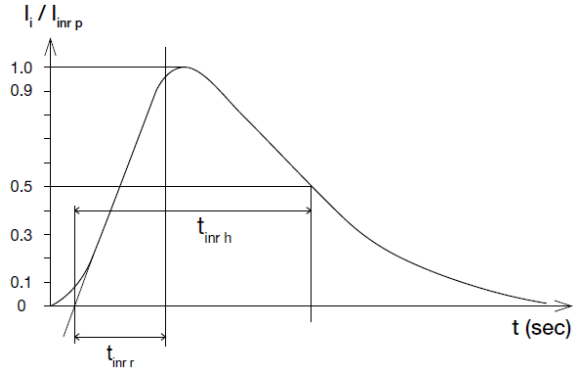
The time required for the output voltage to change from 10% to 90% of its final steady state set value.

Hold-up Time

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

Inrush Current

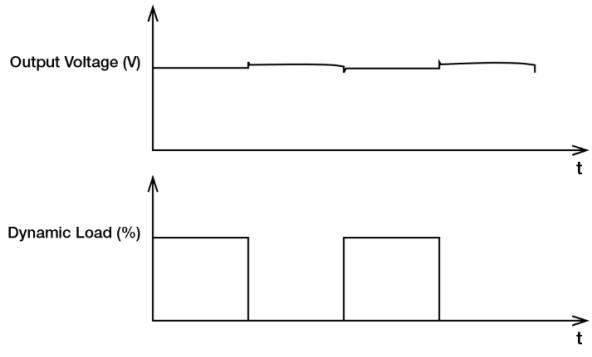
Inrush current is the peak, instantaneous, input current measured and, occurs when the input voltage is first applied. For AC input voltages, the maximum peak value of inrush current will occur during the first half cycle of the applied AC voltage. This peak value decreases exponentially during subsequent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



Dynamic Response

The power supply output voltage will remains within ±5% of its steady state value, when subjected to a dynamic load from 0 to 100% of its rated current.

■ **50% duty cycle / 5 Hz to 1 KHz**

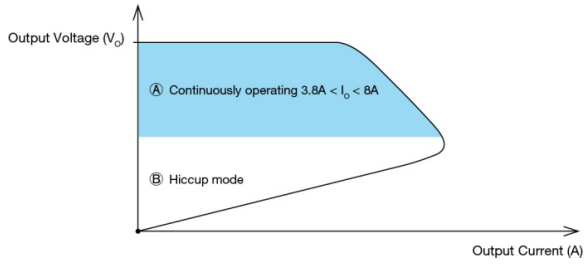


External Input Protection Device

The unit is protected at the L pin, with an internal fuse that cannot be replaced. The power supply has been tested and approved on 20 A (UL) and 16 A (IEC) branch circuits without additional protection device. An external protection device is only required if the supplying branch has an ampacity greater than above. Thus, if an external protective device is necessary, or, utilized, please refer a minimum value of 13 A B- or 6 A C- characteristic breaker.

Overload & Overcurrent Protections (Auto-Recovery)

The power supply's Overcurrent (OCP) Protection will be activated when output current is 3.8 A I_O (Max load) < 8 A. In such occurrence, the V_O will start to droop and once the output voltage is below 12.5 Vdc typ., the power supply will go into "Hiccup mode" (Auto-Recovery). The power supply will recover once the fault condition of the OCP is removed and I_O is back within the specifications.



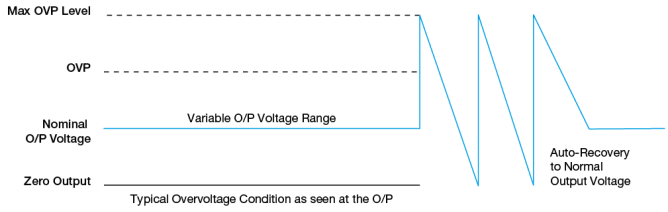
The Overload Protection (OLP) is limited at output power of less than 100 W according to safety requirements.

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 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.

Operating Mode

■ Redundant Operation

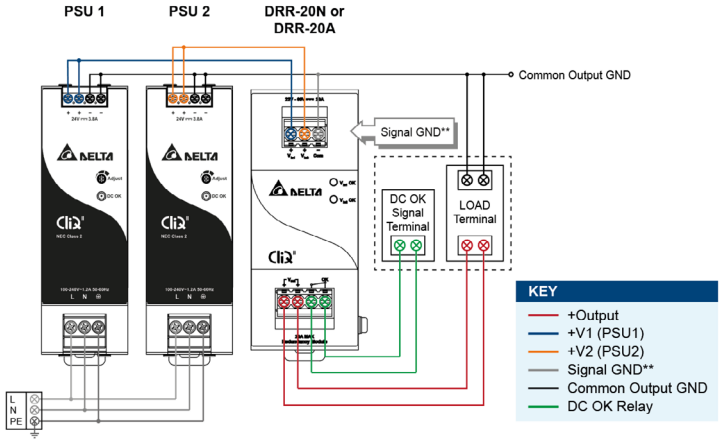
In order to ensure proper redundant operation for the power supply units (PSUs), the output voltage difference between the two units must be kept at 0.45~0.50 V for these 24 V supplies. Follow simple steps given below to set them up for the redundant operation:

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 Vin 1 & Vin 2, respectively, of the DRR-20N (or 20 A) 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 0.60 V to 0.90 V (Typical 0.65 V) depending on the load current and surrounding air temperature.



**The Signal GND in the DRR module is for the built-in LED and DC OK signals. The Output GND terminals from the two PSU's do not need to be connected to the Signal GND terminal.

Fig. 3 Redundant 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 25 mV 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.

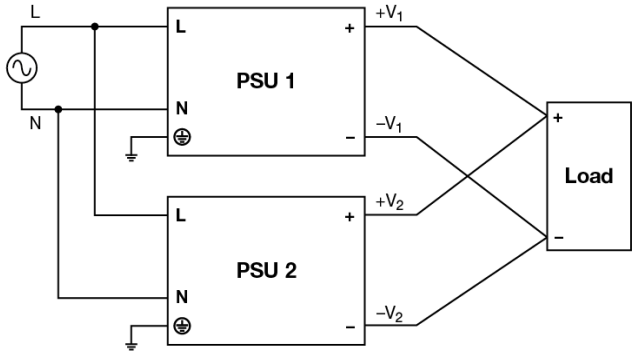


Fig. 4 Parallel Operation Connection Diagram

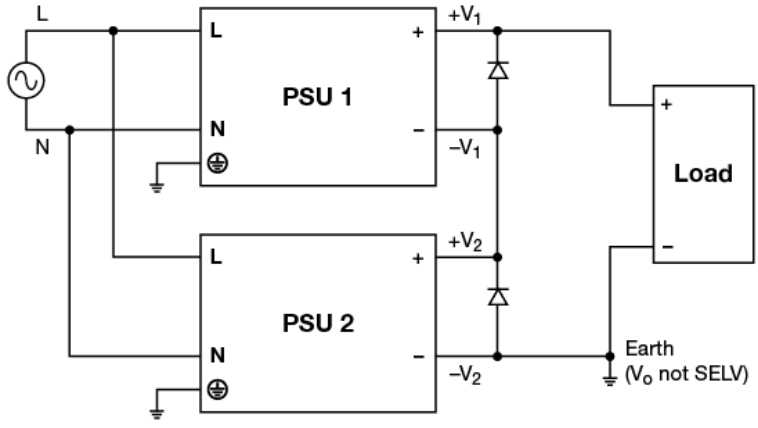
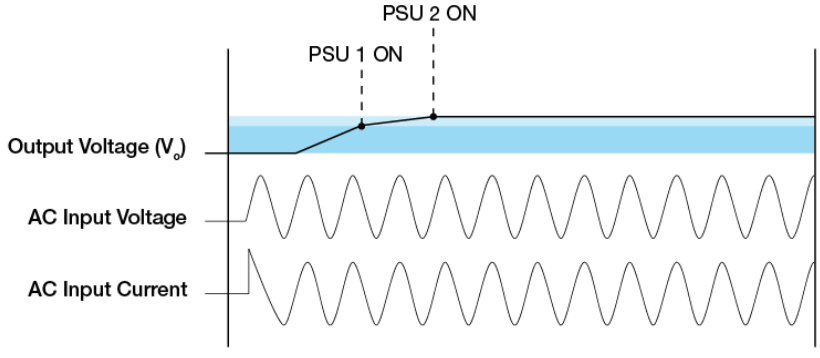


Fig. 5 Series Operation Connection Diagram

■ Series Operation

Delta's CliQ II can be connected in series to increase the output voltage as shown in figure above. Only power supply from the same product series, and with the same rated output current, can be used. The maximum load current should not exceed the smallest rated output current. Any number of power supplies can be connected in series. User must note that an output voltage > 60 Vdc will not meet SELV requirements and could be dangerous to user, the total voltage shall not exceed 150 Vdc. Installation a protection against the touching is a must and connect the output ground to earth when output voltage is not SELV. A diode in reverse bias must be added across output terminals of each power supply, this is to prevent -V voltage being applied to other power supply in fault conditions such as short circuit across load. During the short circuit $-V_1$ & $+V_1$ will come across $+V_2$ & $-V_2$ which means connecting 2 power supplies in opposite polarity and may cause damage to power supply. With reverse bias diodes in place the voltage across each power supply will be restricted to one diode drop – approximately 0.7 V to 1.0 V. It is recommended to provide sufficient voltage de-rating for diodes with 2 times the voltage rating of series output voltage. E.g. the two 24 V power supplies are connected in series, the total voltage is 48 volts. Hence, recommended to use diodes with reverse voltage rating of 2x48 = 96 volts. Therefore, diodes with reverse voltage rating of 100 volts can be used.

During the short circuit condition, the current through diodes will be large, hence it is recommended that diodes to be least twice the current rating of the power supply.



The turn ON would be non-monotonic as the power supply with the fastest startup time and rise time will turn on first. As a result, the combined output voltage waveform of the 2 power supplies connected in series will include a step.

User must consider to verify parameters such as EMI, inrush current, leakage current, PARD, start up time would differ from datasheet numbers as multiple power supplies in series.

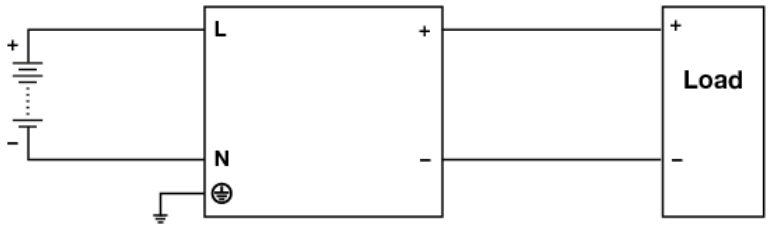


Fig. 6 DC Input Operation Connection Diagram

■ DC Input Operation

Step 1.
Use a battery or similar DC source.

Step 2.
Connect +pole to L and -pole to N.

Step 3.
Connect the PE terminal to an earth wire or to the machine ground.

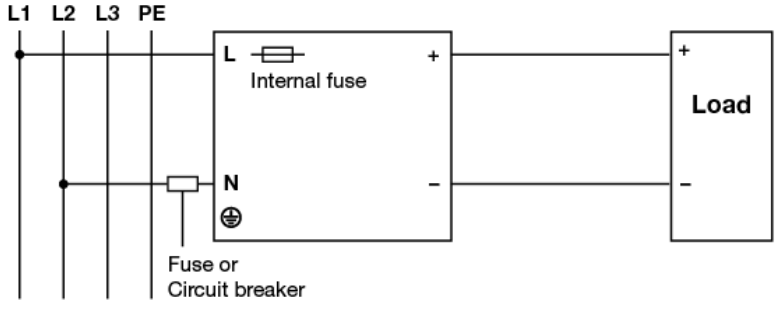


Fig. 7 2 of 3 Phase System Input Operation Connection Diagram

■ 2 of 3 Phase System Input Operation

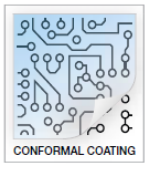
Delta's CliQ II can use on 2 of 3 phase system. Please refer to the following step.

Step 1.
The input voltage applied from Line to Neutral is below the maximum rated input. The input voltage shall be below 240 Vac +10%.

Step 2.
The external protector is needed on N (Neutral) input line to secure a safety. N line does not have internal fuse protection. An appropriate fuse or circuit breaker should be connected in series with N input line connection like the following.

Others

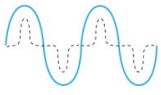
Conformal Coating



The Protective Coating Technology

Delta Electronics Group has designed the perfect dipping technique which penetrates everywhere including under device, and prevents leakage. The conformal coating dipping can be applied to PCBs or circuit board. The coating preserves the performance of precision electronic primarily by preventing ionizable contaminants such as salt from reaching circuit nodes, where the material slumps around sharp edges. This can be a problem especially in highly conversing atmosphere.

PFC – Norm EN 61000-3-2



Line Current Harmonic content

Typically, the input current waveform is not sinusodial 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.