CliQ II DIN Rail Power Supply

24V 60W 1 Phase / DRP024V060W1B☐

Highlights & Features

- Universal AC input voltage range
- Up to 90.0% efficiency
- Power Boost of 150% for 5 seconds
- Full corrosion resistant aluminium casing
- Extreme low temperature cold start at -40°C
- Conformal coating on PCBAs to protect against common dust and chemical pollutants
- Hazardous Locations approval to ATEX and Class I, Div 2 (DRP024V060W1BA)

Safety Standards

CB Certified for worldwide use

Model Number: DRP024V060W1B☐
Unit Weight: 0.37 kg (0.82 lb)
Dimensions (L x W x D): 121 x 32 x 125 mm (4.76 x 1.26 x 4.92 inch)

General Description

The CliQ II DIN rail power supply series from one of the world's leading power supply companies, Delta Electronics Group, offers output voltage of 24V. These products are encased in rugged yet lightweight full aluminium body that can withstand shock and vibration according to IEC 60068-2 standard. The series of single phase products can operate over a wide temperature range of -25°C to +80°C. These products also feature universal AC input voltage range from 85Vac to 264Vac and the power will not de-rate throughout the entire range. Another great feature is the conformal coating on the PCBA which allows selected models to be certified to ATEX and Class I, Div 2 for use in hazardous locations.

Model Information

CliQ II DIN Rail Power Supply

Model Number	Input Voltage Range	Rated Output Voltage	Rated Output Current
DRP024V060W1B☐	85-264Vac (120-375Vdc)	24Vdc	2.50A

Model Numbering

DR	P	024V	060W	1	B	☐
DIN Rail	Power Supply	Output Voltage	Output Power	Single Phase	CliQ II Series	A - Metal Case, with Class I, Div 2 and ATEX N - Metal Case, without Class I, Div 2 and ATEX

All parameters are specified at 25°C ambient and AC input unless otherwise indicated.
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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		< 1.40A @ 115Vac, < 0.80A @ 230Vac
Efficiency at 100% Load		> 90.0% @ 115Vac & 230Vac
Max Power Dissipation	0% load	< 0.5W @ 115Vac & 230Vac
	100% load	< 7.4W @ 115Vac & 230Vac
Max Inrush Current (Cold Start)		< 20A @ 115Vac, < 35A @ 230Vac
Leakage Current		< 1mA @ 240Vac

*Safety approval according to IEC/EN/UL 60950-1.

Output Ratings / Characteristics**

Nominal Output Voltage	24Vdc
Factory Set Point Tolerance	24Vdc ± 2%
Output Voltage Adjustment Range	24-28Vdc
Output Current	2.50A (continuously operating at 24V) 3.75A (Power Boost for 5 seconds at 24V, refer to the details in the Functions section)
Output Power	60W (continuously operating at 24V) 90W (Power Boost for 5 seconds at 24V, refer to the details in the Functions section)
Line Regulation	< 0.5% typ. (@ 85-264Vac input, 100% load)
Load Regulation	< 1% typ. (@ 85-264Vac input, 0-100% load)
PARD*** (20MHz)	< 150mVpp
Rise Time	< 100ms @ nominal input (100% load)
Start-up Time	< 2,000ms @ nominal input (100% load)
Hold-up Time	> 20ms @ 115Vac (100% load) > 125ms @ 230Vac (100% load)
Dynamic Response (Overshoot & Undershoot O/P Voltage)	± 5% @ 85-264Vac input, 0-100% load (Slew Rate: 0.1A/μS, 50% duty cycle @ 50Hz to 1KHz)
Start-up with Capacitive Loads	8,000μF 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, 5cm wires, and in parallel with 0.1μF ceramic capacitor & 47μF electrolytic capacitor.

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Mechanical

Case Cover / Chassis		Aluminium
Dimensions (L x W x D)		121 x 32 x 125 mm (4.76 x 1.26 x 4.92 inch)
Unit Weight		0.37 kg (0.82 lb)
Indicator		Green LED (DC OK)
Cooling System		Convection
Terminal	Input	3 Pins (Rated 300V/15A)
	Output	2 Pins (Rated 300V/15A)
Wire	Input / Output	AWG 22-12
Mounting Rail		Standard TS35 DIN Rail in accordance with EN 60715
Noise (1 Meter from power supply)		Sound Pressure Level (SPL) < 40dBA

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	
	Horizontal Mounting	> 50°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, 30G (300m/S²) for a duration of 18ms, 1 time per direction, 2 times in total	
Vibration	Non-Operating	IEC 60068-2-6, 10Hz to 500Hz @ 30m/S² (3G peak); 60 min per axis for all X, Y, Z direction	
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	< 32V, ±10%, SELV Output, Hiccup Mode, Non-Latching (Auto-Recovery)
Overload / Overcurrent	> 150% of rated load 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	T3.15AH
Degree of Protection	IP20
Protection Against Shock	Class I with PE* connection

*PE: Primary Earth

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Reliability Data

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

Safety Standards / Directives

Electrical Equipment of Machines		EN 60204-1 (over voltage category III)
Electrical Equipment for Use in Electrical Power Installations		IEC/EN 62477-1 / IEC 62103
Safety Entry Low Voltage		PELV* (EN 60204-1), SELV (EN 60950-1)
Electrical Safety	TUV Bauart	EN 60950-1
	UL/cUL recognized	UL 60950-1 and CSA C22.2 No. 60950-1 (under alternate part number EOE11010248 of File No. E191395)
	CB Scheme	IEC 60950-1
Industrial Control Equipment	UL/cUL listed	UL 508 and CSA C22.2 No. 107.1-01 (under alternate part number EOE11010248 of File No. E315355)
	CSA	CSA C22.2 No. 107.1-01 (under alternate part number EOE11010248 of File No. 181564)
Hazardous Location / ATEX (For DRP024V060W1BA)	Hazardous Location	cCSAus to CSA C22.2 No. 213-M1987, ANSI / ISA 12.12.01:2011 [Class I, Division 2, Group A, B, C, D T4, Ta= -25°C to +80°C (> +50°C derating)]
	ATEX	EN 60079-0:2009, EN 60079-15:2010 [Ex II 3G Ex nA nC IIC T4 Gc, Ta= -25°C to +80°C (> +50°C derating)]
Ex II 3G ATEX 2014/34/EU (For DRP024V060W1BA)		Certificate No. EPS 12 ATEX 1 491 X
CE		In conformance with EMC Directive 2014/30/EU and Low Voltage Directive 2014/35/EU For DRP024V060W1BA: In conformance with Equipment for explosive atmospheres (ATEX) directive 2014/34/EU
Material and Parts		RoHS Directive 2011/65/EU Compliant (EN 50581)
Galvanic Isolation	Input to Output	4.0KVac
	Input to Ground	1.5KVac
	Output to Ground	1.5KVac

*Output must be earthed in the final unit in order to comply with PELV requirements according to standard EN 60204-1.

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EMC

Emissions (CE & RE)		CISPR 22, EN 55022, CISPR 11, EN 55011, FCC Title 47: Class B
Component Power Supply for General Use		EN 61204-3
Immunity		Generic Standards: EN 55024, EN 61000-6-1, EN 61000-6-2
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, 80% modulation (1kHz)
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[2)]: 2kV Differential Mode[3)]: 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)] 3A/Meter
Voltage Dips	IEC 61000-4-11	100% dip; 1 cycle (20ms); Self Recoverable
Low Energy Pulse Test (Ring Wave)	IEC 61000-4-12	Level 3 Criteria A[1)] Common Mode[2)]: 2kV Differential Mode[3)]: 1Kv
Voltage Fluctuation and Flicker		IEC/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)

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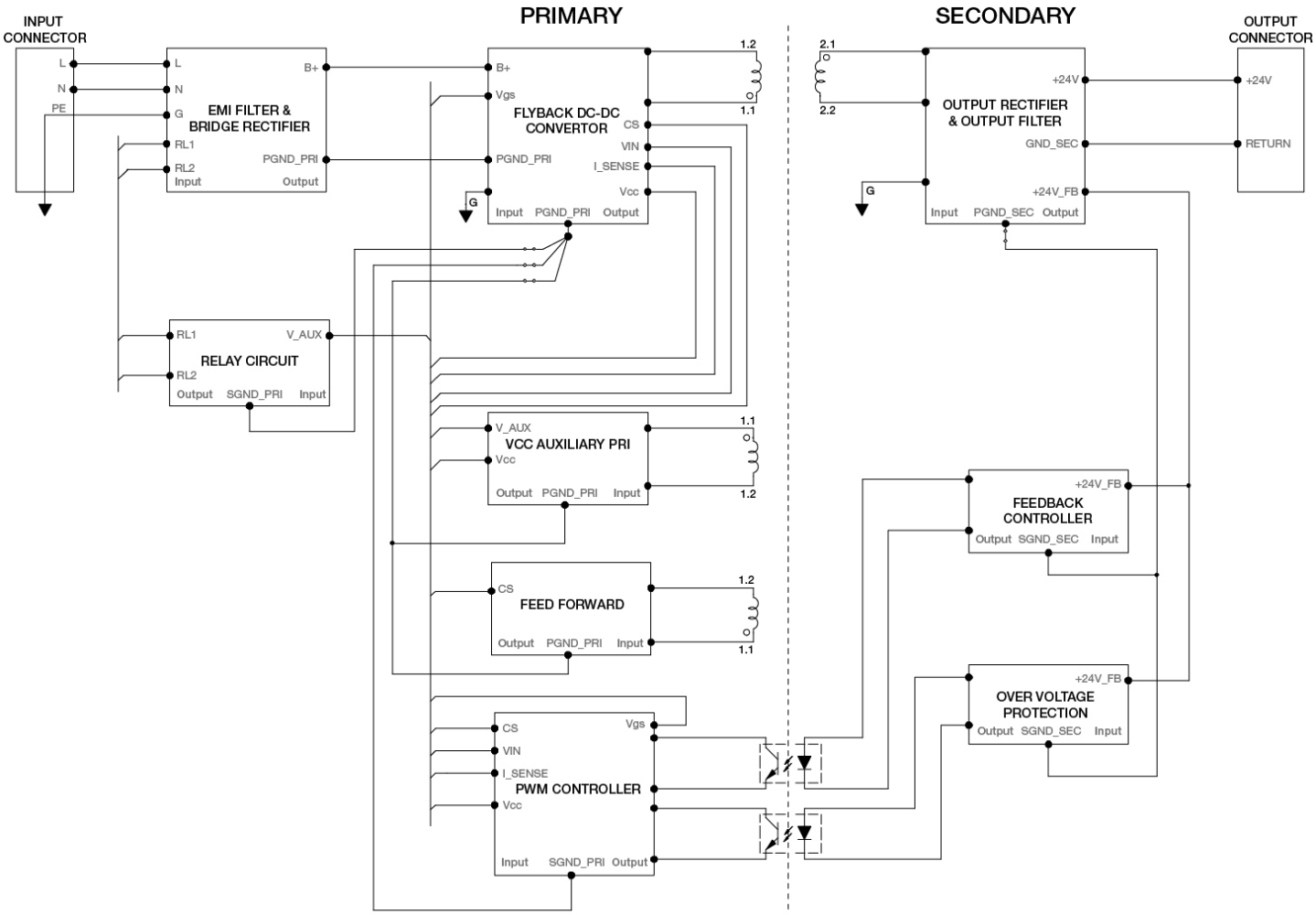
Block Diagram



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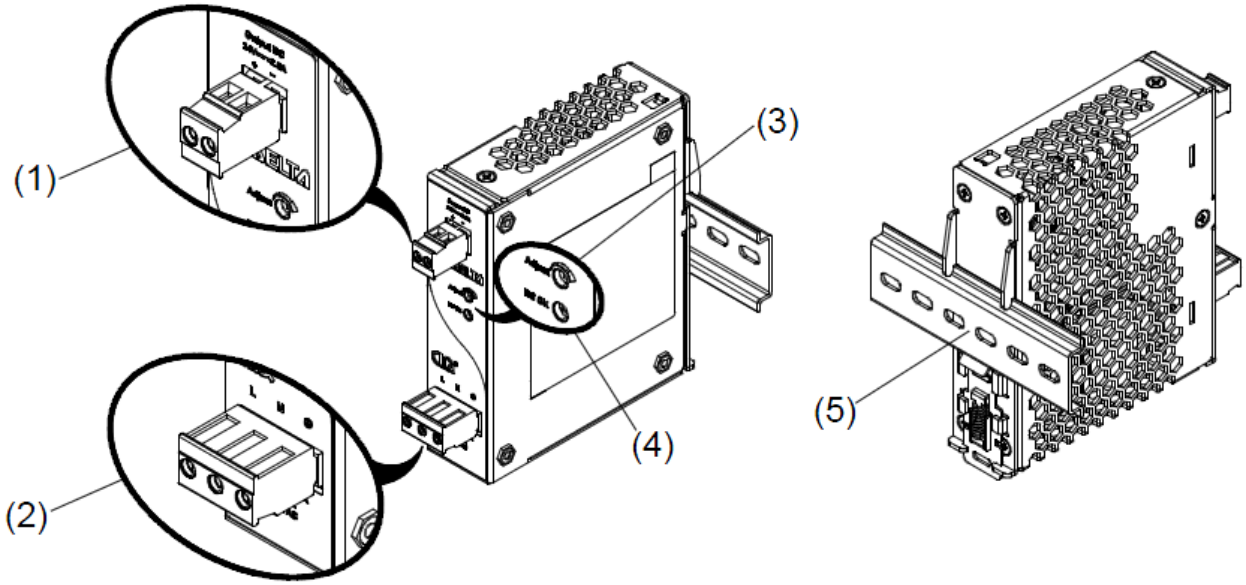
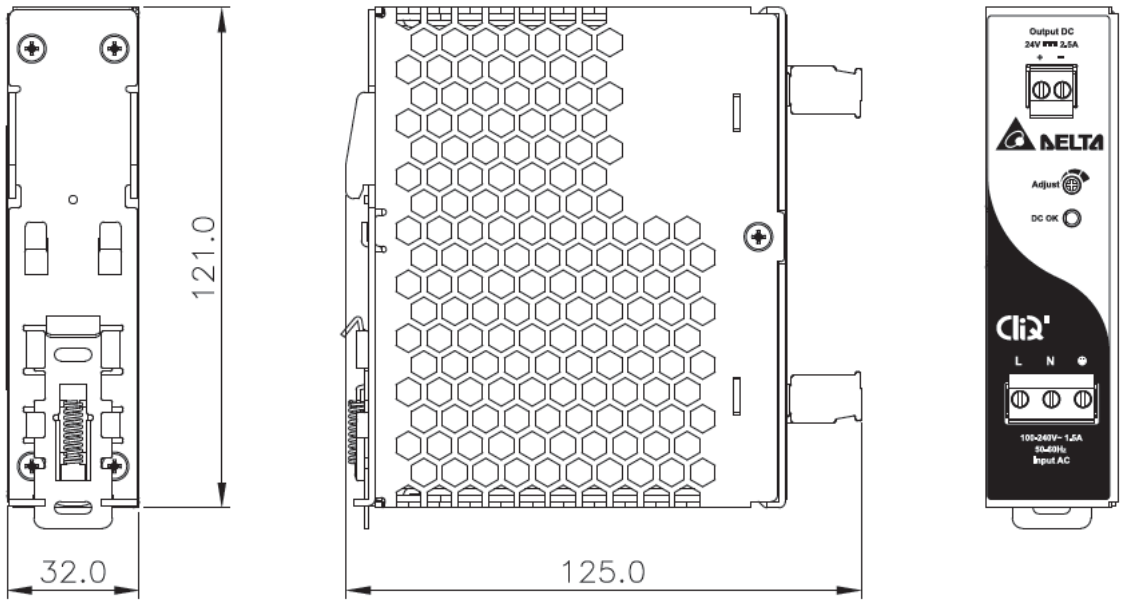
Device Description



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: 121 x 32 x 125 mm (4.76 x 1.26 x 4.92 inch)



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Engineering Data

Output Load De-rating VS Surrounding Air Temperature

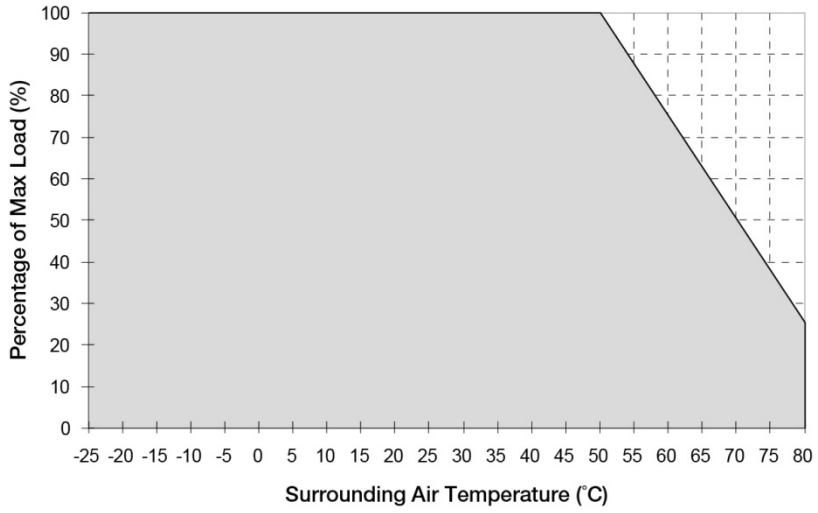
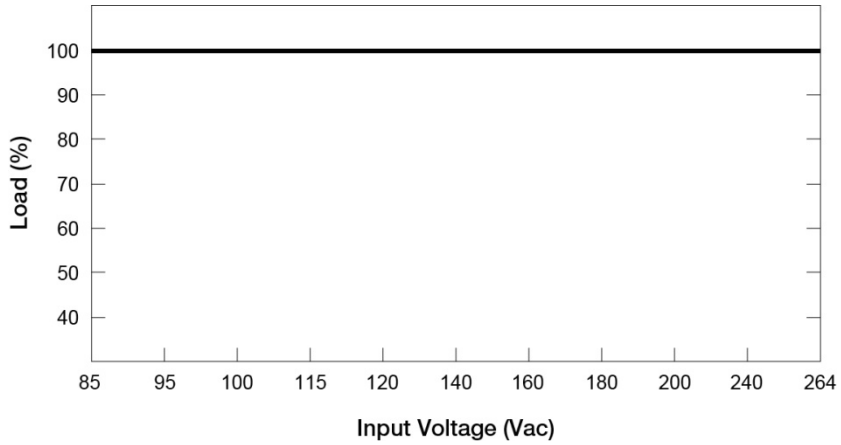


Fig. 1 **De-rating for Vertical and Horizontal Mounting Orientation**
> 50°C de-rate power by 2.5% / °C

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 > 50°C, 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

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Assembly & Installation

The power supply unit (PSU) can be mounted on 35mm DIN rails in accordance with EN 60715. The device should be installed with input terminal block at the bottom.

Each device is delivered ready to install.

Mounting

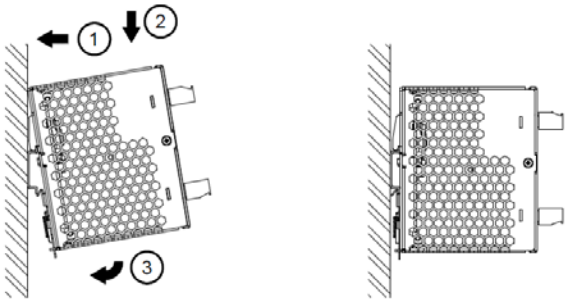

Fig. 2.1 Mounting

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

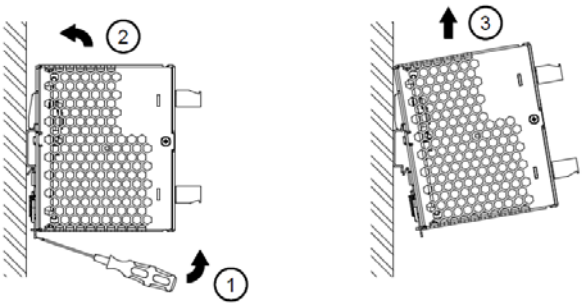

Fig. 2.2 Dismounting

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.

Connection

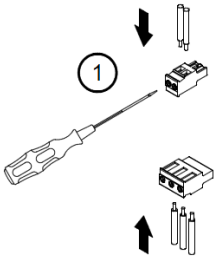

Fig. 3.1

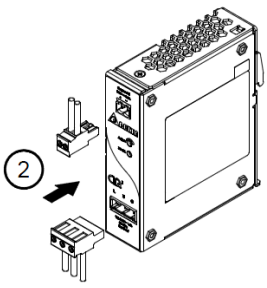

Fig. 3.2

CAUTION: Must tighten wire to housing (Fig. 3.1) before plugging into the terminal block connection (Fig. 3.2).

In accordance to EN 60950 / UL 50950, flexible cables require ferrules. Use appropriate copper cables designed to sustain operating temperature of 60°C / 75°C or more to fulfill UL requirements.

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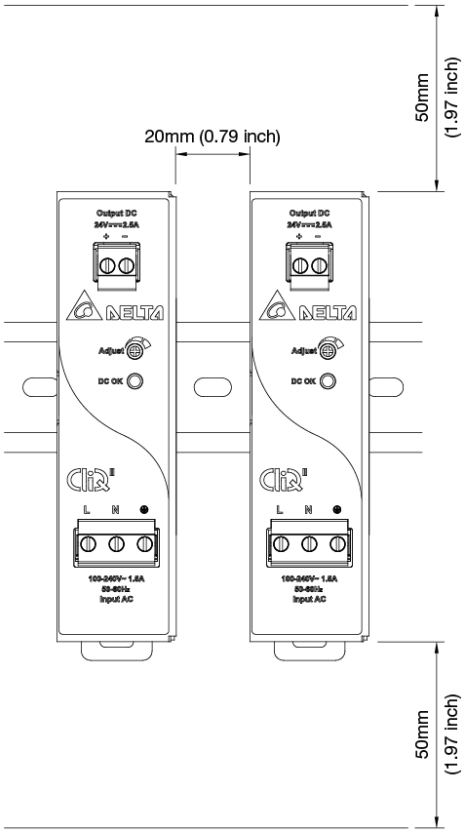
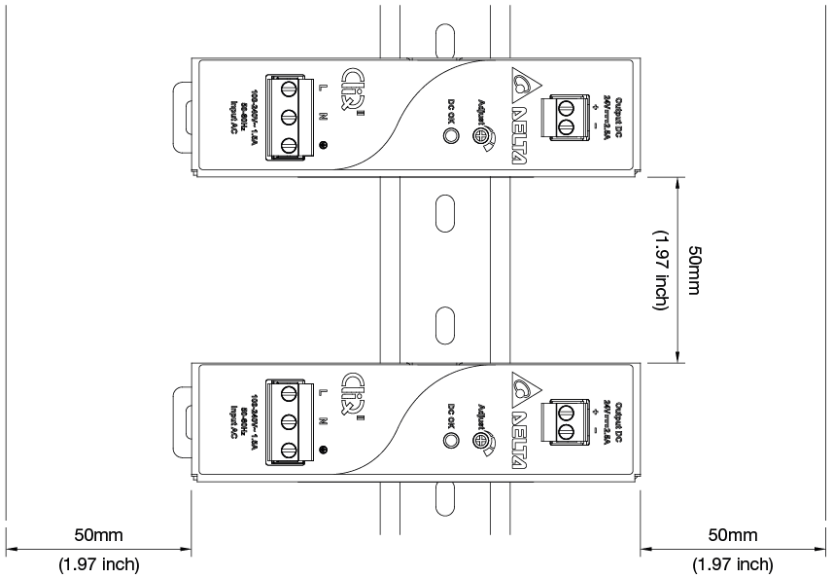
Safety Instructions

■ **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, please refer to the following instructions to ensure sufficient clearance around the device.**
  Vertical Mounting: 50mm (1.97 inch) above and below the device as well as a lateral distance of 20mm (0.79 inch) to other units.
  Horizontal Mounting: 50mm (1.97 inch) above and below the device as well as a lateral distance of 50mm (1.97 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”.

For DRP024V060W1BA:

- The power supplies unit must be installed in an IP54 enclosure or cabinet in the final installation. The enclosure or cabinet must comply with EN 60079-0 or EN 60079-15.
- Warning: Explosion Hazard - Substitution of components may impair suitability for Class I, Division 2.
- Warning: Explosion Hazard - Do not disconnect equipment or adjust potentiometer unless the power has been switched off or the area is known to be non-hazardous.

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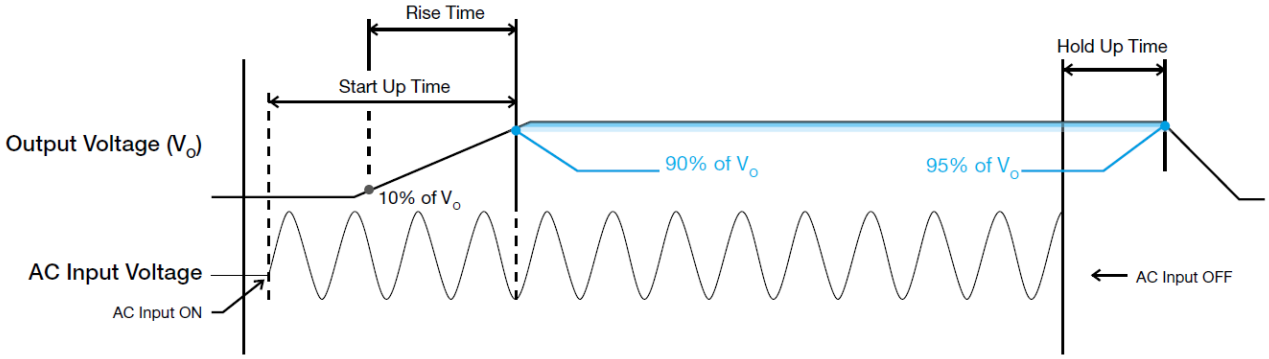
Functions

■ **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

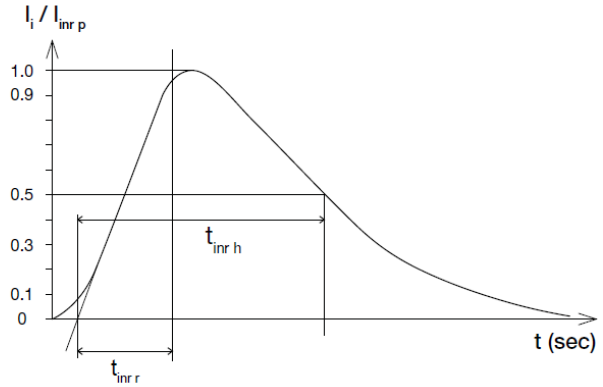
The time required for the output voltage to change from 10% to 90% of its final steady state set value.

Hold-up Time

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

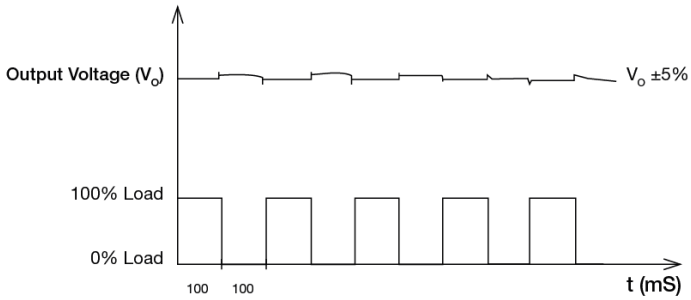
Inrush Current

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.



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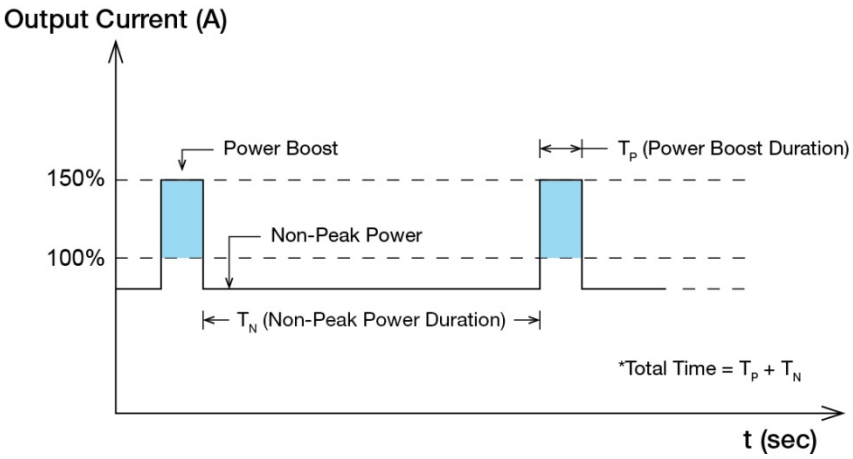
CliQ II DIN Rail Power Supply

24V 60W 1 Phase / DRP024V060W1B□

Power Boost

Power Boost is the reserve power available constantly that allows reliable startup to support sudden and short spike of loads with high inrush current typically during turn on to remove the need of more expensive higher rated power supply unit. After the output has reached its steady state set value, the power supply can support surge loads with a higher short-term power demand up to 150% of maximum rated load (I_O Max), for a maximum duration of 5 seconds. The Power Boost is also available to repeatedly basis with according to the condition of an average (R.M.S) output power shall not exceed continuous operating condition or refer to duty cycle calculation below.



$$Duty\ cycle\ (\%) = \frac{T_P}{Total\ Time}$$

$$Average\ Output\ Power\ (P_{Avg}) = \frac{(Power\ Boost\ \times T_P) + (Non\text{-}Peak\ Power \times T_N)}{Total\ Time}$$

OR

$$Non\text{-}Peak\ Power = \frac{(P_{Avg} \times Total\ Time) - (Power\ Boost\ \times T_P)}{T_N}$$

■ **An example of Power Boost and Average Output Power**

Power Boost	Peak Power (W_P)	Power Boost Duration (T_P)	Duty Cycle	Non-Peak Power (W_N)	Non-Peak Power Duration (T_N)	Total Time (T)
150%	90	5 sec	10%	57W	45 sec	50 sec
150%	90	5 sec	35%	44W	9.3 sec	14.3 sec
120%	72	10 sec	20%	57W	40 sec	50 sec
120%	72	10 sec	35%	54W	18.5 sec	28.5 sec

It is not recommended to prolong the duration of Power Boost to be longer than the specified duty cycle calculation, this may cause damage to the PSU.

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 20A (UL) and 16A (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 in instruction sheet with B or C characteristic breaker.

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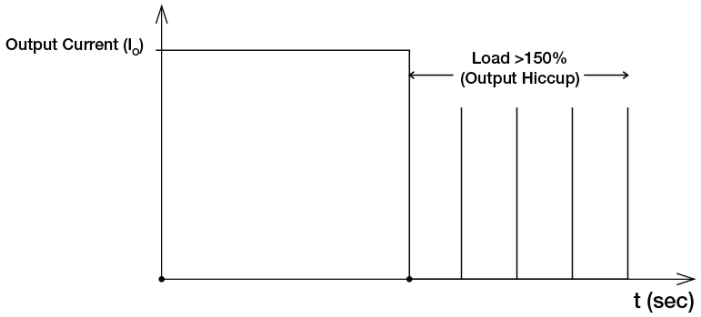
Overload & Overcurrent Protections (Auto-Recovery)

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



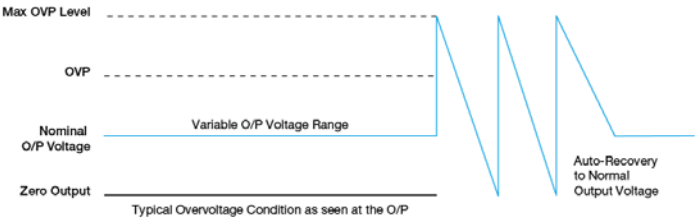
It is not recommended to prolong the duration of I_O when it is <150% but >100%, since it may cause damage to the PSU.

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.

CliQ II DIN Rail Power Supply

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Operating Mode

■ Redundant Operation

In order to ensure proper redundant operation for the power supply unit (PSU), the output voltage difference between the two units must be kept at 0.45~0.50V for 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 the 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 20A) module shown on the diagram on the right.

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).

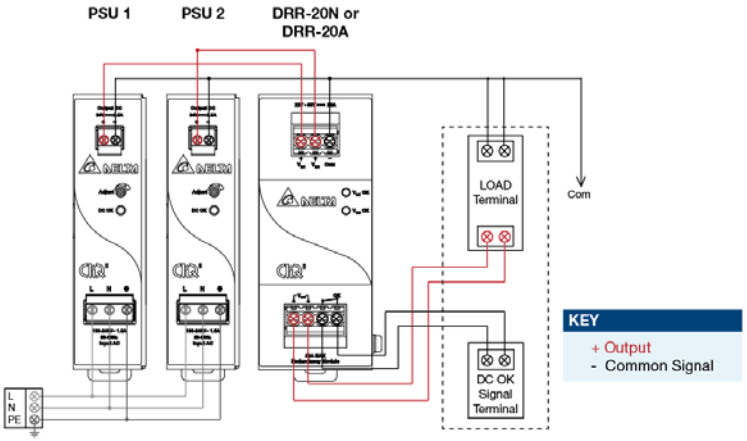

Fig. 4 Redundant Operation Connection Diagram

*V_{drop} will vary from 0.60V to 0.90V (Typical 0.65V) depending on the load current and surrounding air temperature.

■ 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.

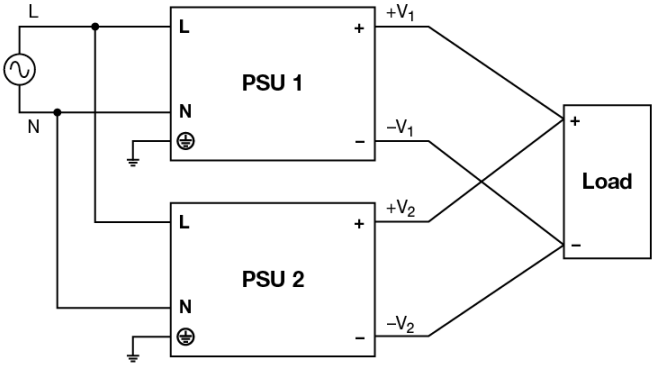

Fig. 5 Parallel Operation Connection Diagram

All parameters are specified at 25°C ambient and AC input unless otherwise indicated.
www.DeltaPSU.com (December 2016, Rev. 06)

CliQ II DIN Rail Power Supply

24V 60W 1 Phase / DRP024V060W1B□

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.

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 PCBAs 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.