TECHNICAL DATASHEET

# CliQ II DIN Rail Power Supply

## 24V 240W 2 Phase / DRP-24V240W2BN

### Highlights & Features

- Designed for single phase input 180-305Vac (for L-N) or 2 of 3-Phase system 2 x 180-550Vac (for L-L) or 254-780Vdc
- Compact and corrosion resistant aluminium casing
- High Efficiency > 90.0% and Power Boost of 120% for 3 seconds
- Built-in constant current and hiccup during overload protection
- Built-in DC OK Contact
- Conformal coating on PCBAs to protect against common dust and chemical pollutants
- Overvoltage / Overcurrent / Over Temperature/ Short Circuit Protections

### Safety Standards

CB Certified for worldwide use

**Model Number:** DRP-24V240W2BN
**Unit Weight:** 0.81 kg
**Dimensions (L x W x D):** 124 x 60 x 117 mm

### General Description

The CliQ II DIN rail power supply series with a new model offering two phase 2 x 180-550Vac (for L-L) or single phase 180-305Vac (for L-N) for 24V/5A output. The DRP-24V240W2BN has safety approvals for single phase and two phase input according to IEC/EN/UL 60950-1 and UL 508 safety standards. The product features wide AC input voltage for single or two phase range. Such feature can protect the power supply from damage when user accidentally apply two phase input on the single phase power supply. Other advantages include reduced external input protection components and improved installation time since there is only two phase connection. The product performs under wide operating temperature from -30°C to 70°C with 2-Phase of 3-Phase application (for L-L). Conformal coating is applied on the PCBA to protect against common dust and chemical pollutant to withstand harsh industrial environments. Other major safety approvals included.

### Model Information

CliQ II DIN Rail Power Supply

| Model Number | Input Voltage Range | Output Voltage | Output Current |
|---|---|---|---|
| DRP-24V240W2BN | 2 x 180-550Vac (2-Phase)<br>180-305Vac (Single Phase)<br>254-780Vdc | 24Vdc | 10.0A |

### Model Numbering

| DR | P – | 24V | 240W | 2 | B | N |
|---|---|---|---|---|---|---|
| DIN Rail | Power Supply | Output Voltage | Output Power | Two Phase | CliQ II Series | N - Metal Case, without Class I, Div 2 |



All parameters are specified at 25°C ambient and AC x 2 input unless otherwise indicated.
**www.DeltaPSU.com (March 2015, Rev. 00)**

# CliQ II DIN Rail Power Supply
## 24V 240W 2 Phase / DRP-24V240W2BN

## Specifications

### Input Ratings / Characteristics

| | |
|---|---|
| Nominal Input Voltage | 2 x 200-500Vac (2-Phase)<br>200-277Vac (Single Phase) |
| Input Voltage Range | 2 x 180-550Vac (2-Phase)<br>180-305Vac (Single Phase) |
| Nominal Input Frequency | 50-60Hz |
| Input Frequency Range | 47-63Hz |
| DC Input Voltage Range* | 254-780Vdc |
| Input Current | < 2.00A @ 2 x 230Vac, < 1.00A @ 2 x 400Vac |
| Efficiency at 100% Load | > 90.0% @ 2 x 400Vac |
| Max Inrush Current (Cold Start) | < 50A @ 2 x 200Vac & 2 x 500Vac |
| Leakage Current | < 3.5mA @ 500Vac |

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

### Output Ratings / Characteristics

| | | |
|---|---|---|
| Nominal Output Voltage | | 24Vdc |
| Output Voltage Tolerance | | ± 2% (initial set point tolerance from factory) |
| Output Voltage Adjustment Range | | 24-28Vdc |
| Output Current | | 10.0A (continuously operating at 24V)<br>12.0A (Power Boost for 3 seconds at 24V, refer to the details in the Functions section) |
| Output Power | | 240W (continuously operating at 24V)<br>288W (Power Boost for 3 seconds at 24V, refer to the details in the Functions section) |
| Line Regulation | | < 0.5% typ. (@ 200-550Vac input, 100% load) |
| Load Regulation | | < 1% typ. (@ 200-550Vac input, 0-100% load) |
| PARD (20MHz) | | < 150mVpp @ -10°C and above<br>< 200mVpp @ below -10°C |
| Rise Time | | < 100ms @ nominal input (100% load) |
| Start-up Time | | < 1,000ms @ nominal input (100% load) |
| Hold-up Time | | >18ms @ 2 x 230Vac,<br>> 30ms @ 2 x 400Vac (100% load) |
| Dynamic Response<br>(Overshoot & Undershoot O/P Voltage) | | ± 5% @ 0-100% load |
| Start-up with Capacitive Loads | | 10,000μF Max |
| Functional | DC OK Relay Contact | 30V / 1A Max<br>The relay is usually closed when the output is normal |

# CliQ II DIN Rail Power Supply

## 24V 240W 2 Phase / DRP-24V240W2BN

### Mechanical

| | | |
|---|---|---|
| Case Cover / Chassis | | Aluminium |
| Dimensions (L x W x D) | | 124 x 60 x 117 mm |
| Unit Weight | | 0.81 kg |
| Indicator | | Green LED (DC OK) |
| Cooling System | | Convection |
| Terminal | Input | 3 Pins (Rated 600V/35A) |
| | Output | 4 Pins (Rated 300V/28A) |
| Wire | Input | AWG 18-8 |
| | Output | AWG 16-12 |
| 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 | -30°C to +70°C |
| | Storage | -40°C to +85°C |
| Power De-rating | Vertical Mounting | > 50°C de-rate power by 2.25% / °C |
| | Horizontal Mounting | > 30°C de-rate power by 2% / °C |
| | Input Voltage | < 200Vac de-rate power by 0.5% / Vac |
| Operating Humidity | | 5 to 95% RH (Non-Condensing) |
| Operating Altitude | | 0 to 2,500 Meters for ITE application (@ 50°C)<br>0 to 2,000 Meters for Industrial application (@ 50°C) |
| Shock Test (Non-Operating) | | IEC 60068-2-27, 30G (300m/S²) for a duration of 18ms, 1 times 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 |
| Pollution Degree | | 2 |

### Protections

| | |
|---|---|
| Overvoltage | 32V ±10%, SELV Output, Hiccup Mode, Non-Latching (Auto-Recovery) |
| Overload / Overcurrent | > 120-180% of rated load current, Constant current, Hiccup Mode (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) |
| Degree of Protection | IP20 |
| Protection Against Shock | Class I with PE* connection |

*PE: Primary Earth

# CliQ II DIN Rail Power Supply
## 24V 240W 2 Phase / DRP-24V240W2BN

### Reliability Data

| | |
|---|---|
| MTBF | > 500,000 hrs. as per Telcordia SR-332<br>I/P: 2 x 200Vac, O/P: 100% load, Ta: 25°C |
| Expected Cap Life Time | 10 years (2 x 200Vac & 500Vac, 50% load @ 40°C) |

### Safety Standards / Directives

| | | |
|---|---|---|
| Electrical Equipment in Power Installations | | EN 50178 / IEC 62103 |
| Electrical Safety | | SIQ to EN 60950-1, UL/cUL recognized to UL 60950-1 and CSA C22.2 No. 60950-1 (File No. E191395), CB scheme to IEC 60950-1 |
| Industrial Control Equipment | | UL/cUL listed to UL 508 and CSA C22.2 No. 107.1-01 (File No. E315355), CSA to CSA C22.2 No. 107.1-01 (File No. 181564) |
| CE | | In conformance with EMC Directive 2004/108/EC (only AC input) and Low Voltage Directive 2006/95/EC |
| Material and Parts | | RoHS Directive 2011/65/EU Compliant |
| Galvanic Isolation | Input to Output | 4.0KVac |
| | Input to Ground | 2.0KVac |
| | Output to Ground | 1.5KVac |

# CliQ II DIN Rail Power Supply
## 24V 240W 2 Phase / DRP-24V240W2BN

### EMC

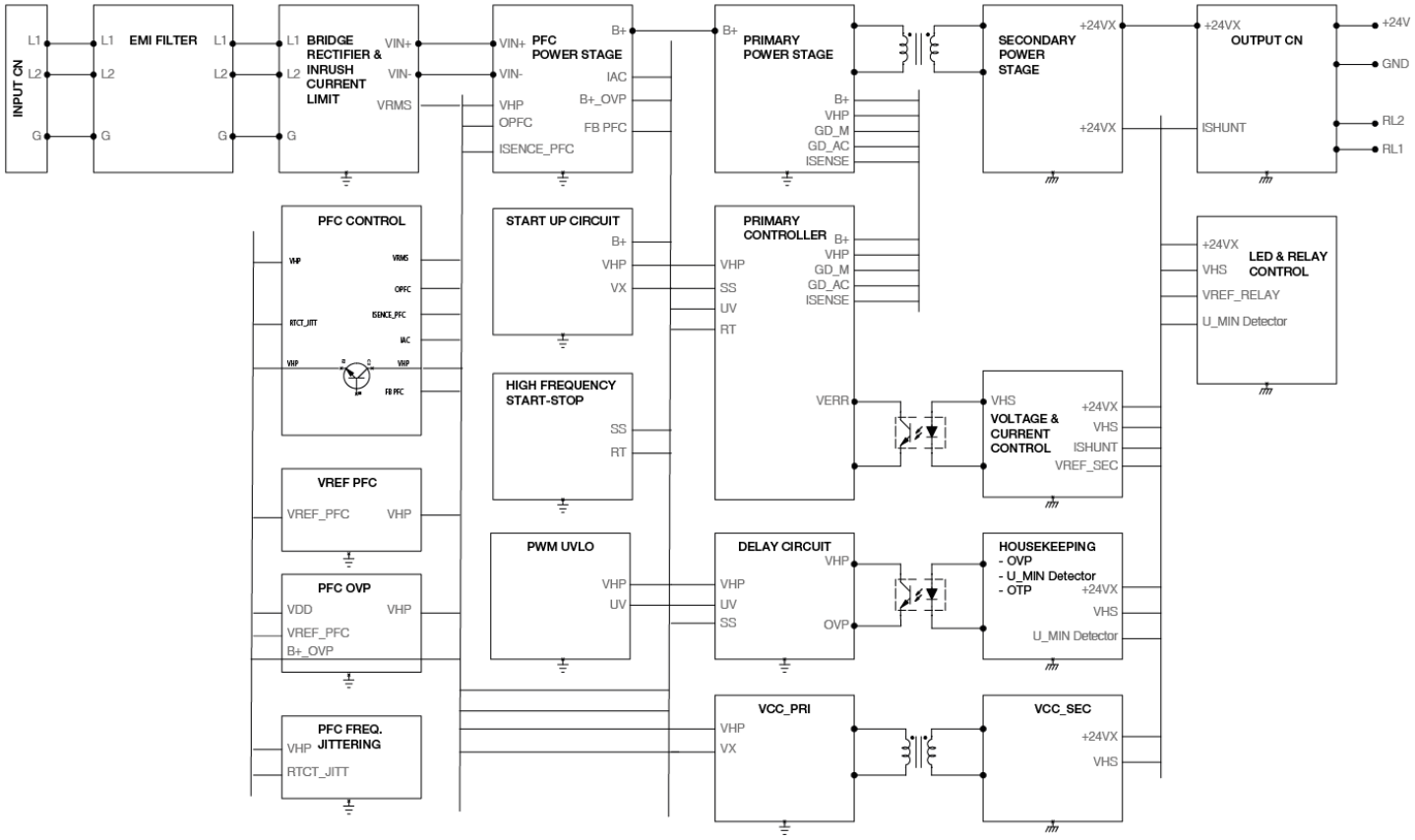
| | | |
|---|---|---|
| EMC / Emissions | | CISPR 22, EN 55022, CISPR 11, EN 55011,<br>FCC Title 47: Class B |
| Component Power Supply for General Use | | EN 61204-3 |
| Immunity to | | EN 55024, EN 61000-6-2 |
| Electrostatic Discharge | IEC 61000-4-2 | Level 4 Criteria A[1)]<br>Air Discharge: 15kV<br>Contact Discharge: 8kV |
| Radiated Field | IEC 61000-4-3 | Level 3 Criteria A[1)]<br>80MHz-1GHz, 10V/M, 80% modulation (1kHz)<br>1.4GHz-2GHz, 3V/M, 80% modulation (1KHz)<br>2GHz-2.7GHz, 1V/M, 80% modulation (1KHz) |
| Electrical Fast Transient / Burst | IEC 61000-4-4 | Level 3 Criteria A[1)]<br>2kV |
| Surge | IEC 61000-4-5 | Level 3 Criteria A[1)]<br>Common Mode[2)]: 2kV<br>Differential Mode[3)]: 1kV |
| Conducted | IEC 61000-4-6 | Level 3 Criteria A[1)]<br>150kHz-80MHz, 10Vrms |
| Power Frequency Magnetic Fields | IEC 61000-4-8 | Criteria A[1)]<br>30A/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)]<br>Common Mode[2)]: 2kV<br>Differential Mode[3)]: 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) Asymmetrical: Common mode (Line to earth)
3) Symmetrical: Differential mode (Line to line)

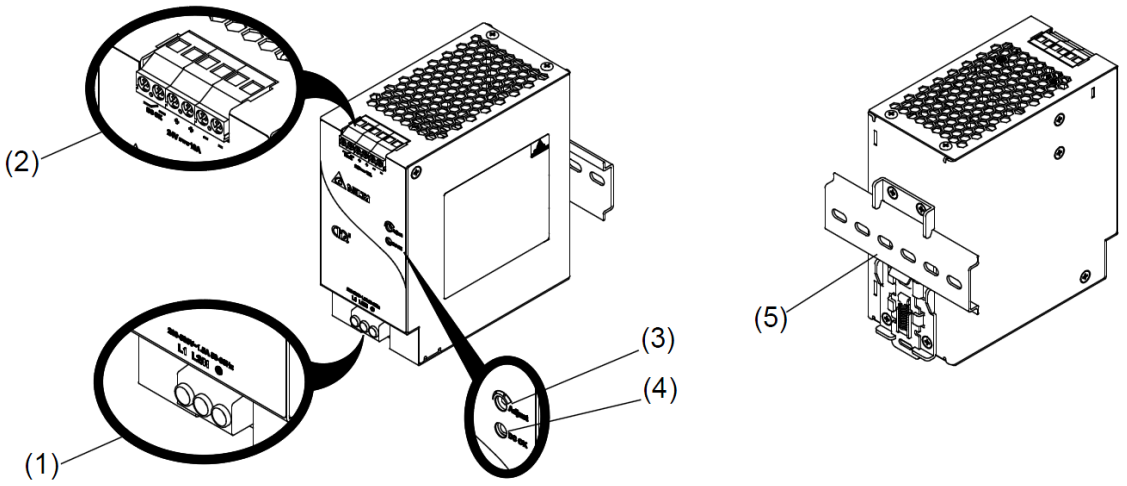
# CliQ II DIN Rail Power Supply

## 24V 240W 2 Phase / DRP-24V240W2BN

### Block Diagram




### Device Description



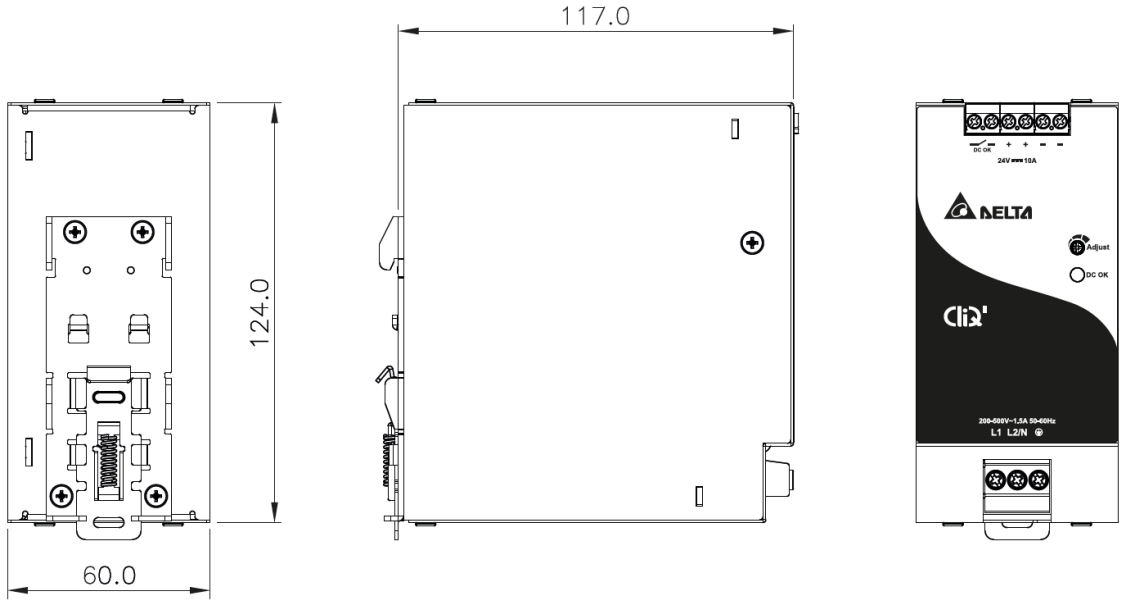

1) Input terminal block connector
2) Output terminal block connector
3) DC Voltage adjustment potentiometer
4) DC OK LED (Green)
5) Universal mounting rail system

# CliQ II DIN Rail Power Supply

## 24V 240W 2 Phase / DRP-24V240W2BN

### Dimensions

**L x W x D:** 124 x 60 x 117 mm




### Engineering Data

De-rating

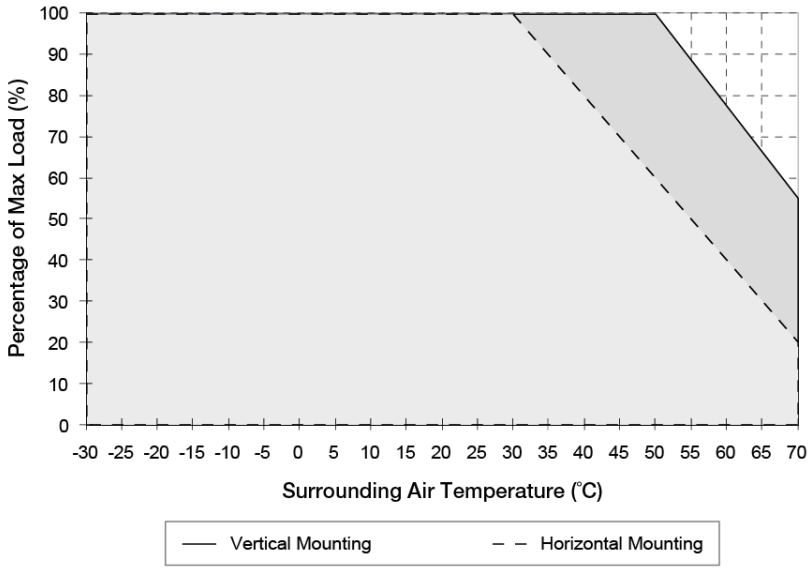



**Fig. 1** **De-rating for Vertical Mounting Orientation**
> 50°C de-rate power by 2.25% / °C

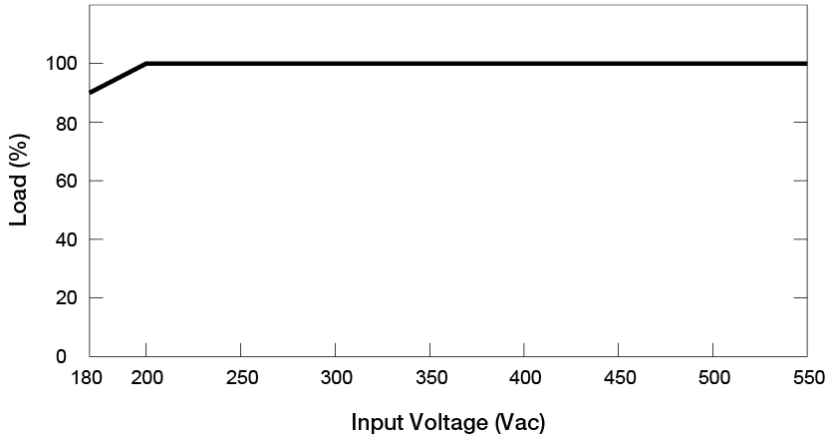
**De-rating for Horizontal Mounting Orientation**
> 30°C de-rate power by 2% / °C

**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 the surrounding air temperature >50°C (Vertical) or >30°C (Horizontal), 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 of 5mm (for Vertical Mounting) or 50mm (for Horizontal Mounting) with 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 do not hesitate to contact **info@deltapsu.com** for more details.

# CliQ II DIN Rail Power Supply
## 24V 240W 2 Phase / DRP-24V240W2BN

### Output De-rating VS. Input Voltage




- No output power de-rating for the input voltage range from 200Vac to 550Vac

### Assembly & Installation

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

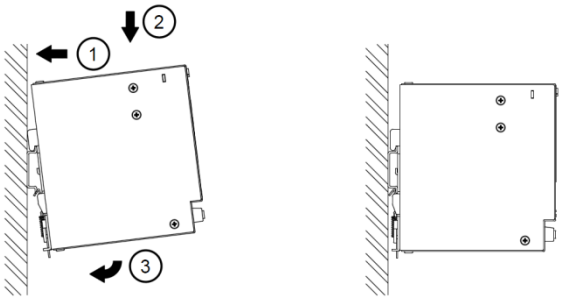



**Fig. 2.1 Mounting**

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

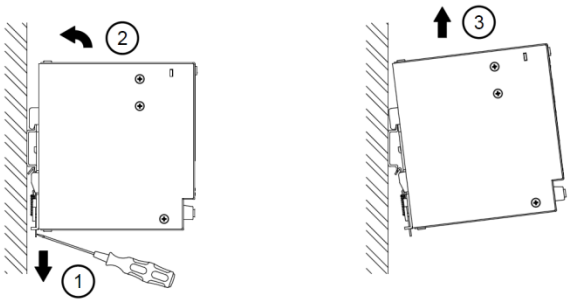



**Fig. 2.2 Dismounting**

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.

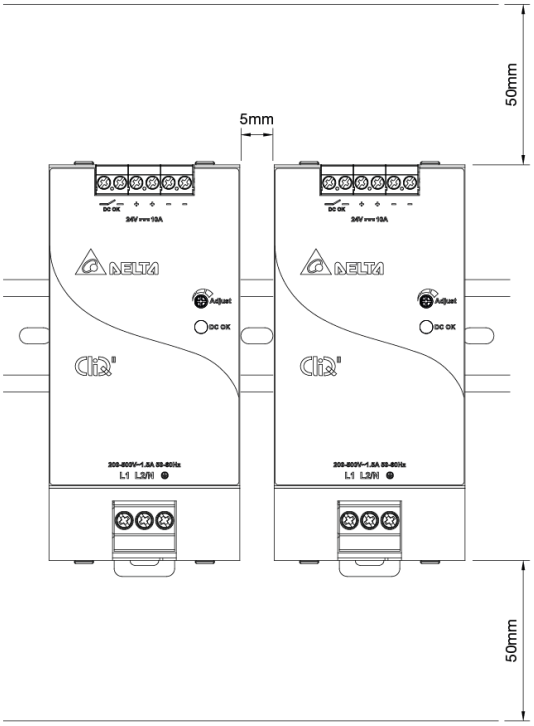
In accordance to EN 60950 / UL 50950, flexible cables require ferrules.
Use appropriate copper cables designed to sustain operating temperature of:
1. 60°C, 60°C / 75°C for USA
2. At least 75°C for ambient not exceeding 30°C, and 90°C for ambient exceeding 30°C for Canada.

# CliQ II DIN Rail Power Supply

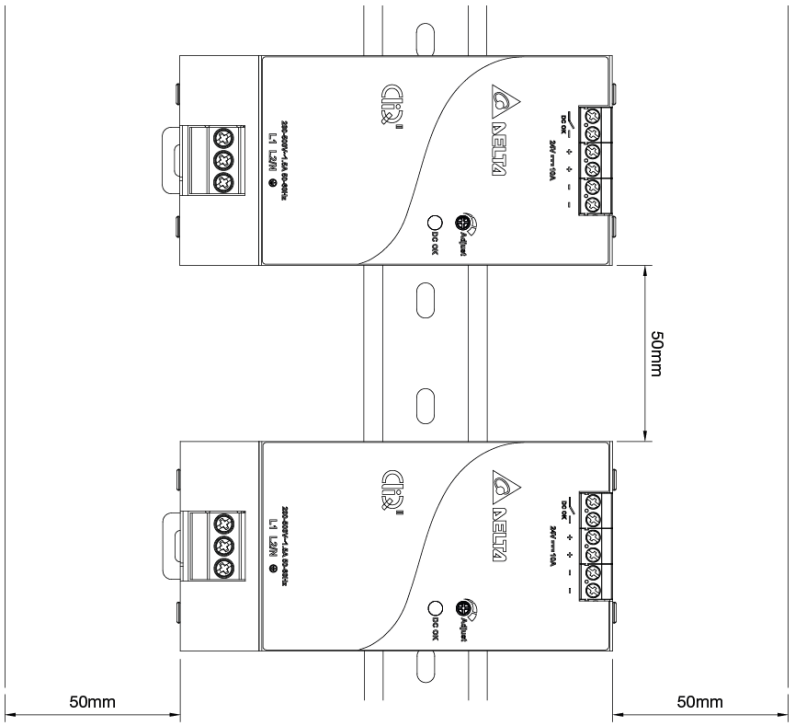
## 24V 240W 2 Phase / DRP-24V240W2BN

### Safety Instructions

■ **Vertical Mounting**




■ **Horizontal Mounting**



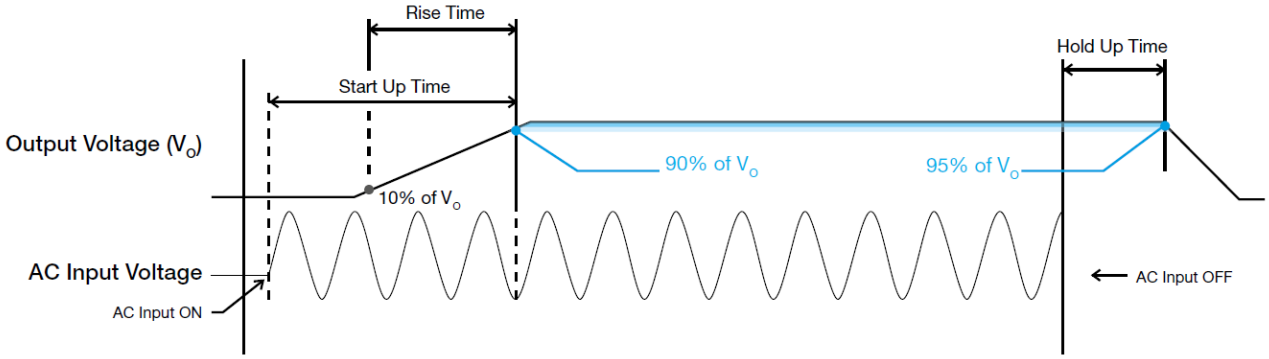

- ALWAYS switch mains of input power OFF before connecting and disconnecting the input voltage to the unit. If mains are not turned OFF, there is risk of explosion / severe damage.
- **To guarantee sufficient convection cooling, keep a distance of 50mm above and below the device as well as a lateral distance of 5mm (for Vertical Mounting) or 50mm (for Horizontal Mounting) 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!
- The main power must be turned off before connecting or disconnecting wires to the terminals.
- 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 unit should be installed in minimum IP54 rated enclosure.
- 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: Double pole/neutral fusing.
- CAUTION: “For use in a controlled environment”.

# CliQ II DIN Rail Power Supply

## 24V 240W 2 Phase / DRP-24V240W2BN

### 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 set value, after the input voltage is applied.

### Rise Time

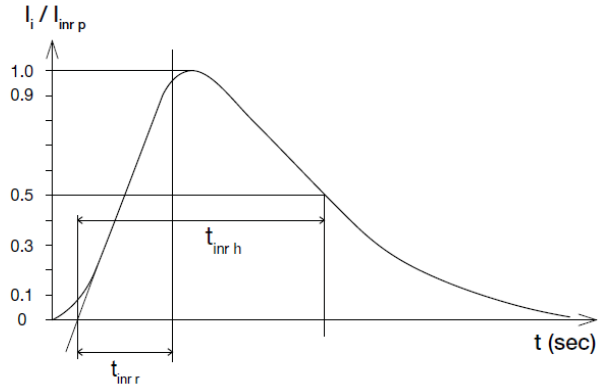
The time required for the output voltage to change from 10% to 90% of its set value.

### 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 90% of its set value, after the input voltage is removed.

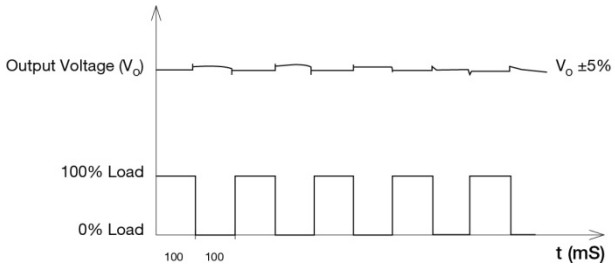
### Inrush Current

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.





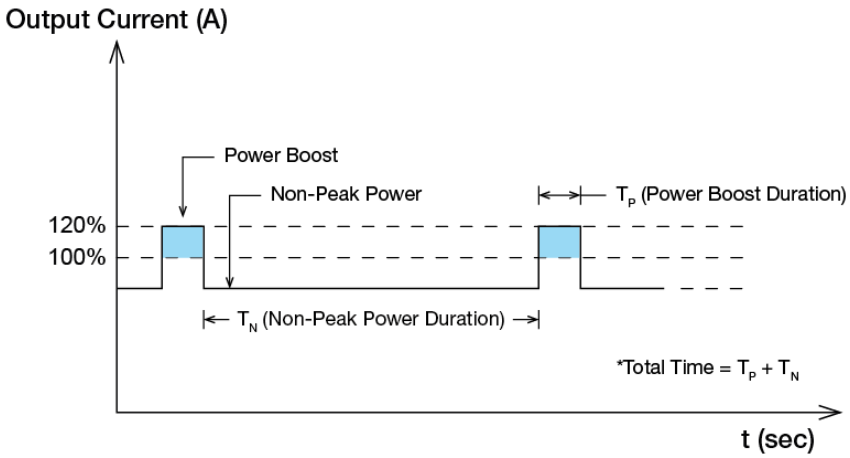

All parameters are specified at 25°C ambient and AC x 2 input unless otherwise indicated.

# CliQ II DIN Rail Power Supply

## 24V 240W 2 Phase / DRP-24V240W2BN

### 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 100% of maximum rated load ($I_O$ Max), for a maximum duration of 3 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) |
|---|---|---|---|---|---|---|
| 120% | 288 | 3 sec | 10% | 235W | 27 sec | 30 sec |
| 120% | 288 | 3 sec | 15% | 232W | 17 sec | 20 sec |

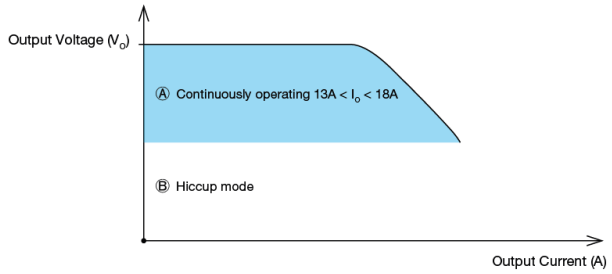
It is not recommended to prolong the duration of Power Boost to be longer than the specified duty cycle calculation, this may cause damage to the PSU.

# CliQ II DIN Rail Power Supply

## 24V 240W 2 Phase / DRP-24V240W2BN

### Overload & Overcurrent Protections

The power supply's Overcurrent (OCP) Protection will be activated when output current is > 13A typ. In such occurrence, the $V_O$ will start to droop and once the output voltage is below 18Vdc 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.

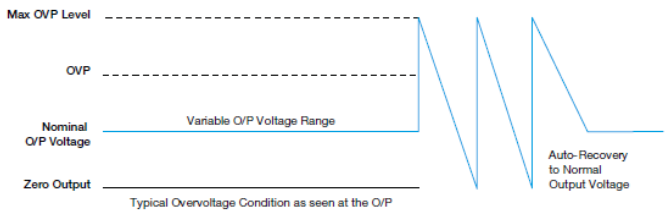



### Short Circuit Protection

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.

### 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). 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
## 24V 240W 2 Phase / DRP-24V240W2BN

### Operating Mode

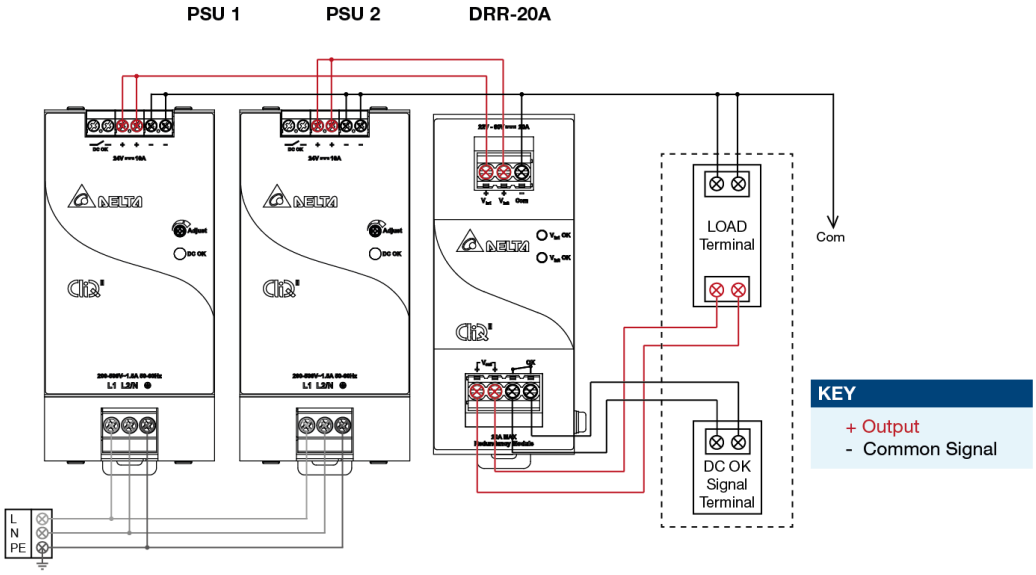



**Fig. 3 Redundancy / Parallel Operation Connection Diagram**

■ **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 0.45~0.50V for 24V 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 $V_{in}$ 1 & $V_{in}$ 2 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).

■ **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 DRP-24V240W2BN 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 ±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 ±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.

# CliQ II DIN Rail Power Supply
## 24V 240W 2 Phase / DRP-24V240W2BN

## Others

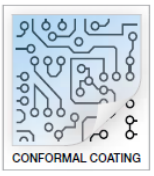
### Delta RoHS Compliant

**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.

### 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.