

CliQ M DIN Rail Power Supply

24 V 81.6 W 1 Phase / DRM-24V80W1PN



Highlights & Features

- Universal AC input voltage range
- High power density in corrosion resistant aluminium casing
- Power Boost of 150% up to 7 seconds
- Advanced Power Boost (APB)
- DNV GL and ABS approvals for maritime applications
- Extreme low temperature cold start at -40°C
- Built-in DC OK Contact and LED indicator for DC OK/ Overload
- Conformal coating on PCBAs to protect against common dust and chemical pollutants
- Certified according to IEC/EN/UL 62368-1

Safety Standards



CB Certified for worldwide use

| | |
|--------------------------------|--|
| Model Number: | DRM-24V80W1PN |
| Unit Weight: | 0.50 kg (1.10 lb) |
| Dimensions (L x W x D): | 124 x 32 x 102 mm (4.88 x 1.26 x 4.02 inch) |

General Description

Delta Electronics is introducing one of the slimmest DIN rail industrial power supplies in its class, the CliQ M DIN rail power supply series. To fulfill the demands in maritime applications, the product is designed according to major industrial and maritime (Lloyd's Register) safety standards. Other features include compliance with harmonic current IEC/EN 61000-3-2, class A. In addition to having Power Boost of 150% up to 7 seconds, the CliQ M series is the first in the CliQ family to feature Advanced Power Boost (APB). With multiple loads connected in a system, a large outrush current could be drawn (demanded) due to one fault load. This will be detected by APB. The APB will trip the circuit breaker (circuit breaker with appropriate rating based on the system load) on the current path of the fault load due to high current. This thus prevents the system from shutting down while the other connected current paths continue to operate without interruption. Additionally, the product also includes built-in DC OK contact and LED indicator for DC OK/ Overload.

Model Information

CliQ M DIN Rail Power Supply

| Model Number | Input Voltage Range | Rated Output Voltage | Rated Output Current |
|---------------|-------------------------|----------------------|----------------------|
| DRM-24V80W1PN | 85-276 Vac (88-375 Vdc) | 24 Vdc | 3.4 A |

Model Numbering

| DR | M - | 24V | 80W | 1 | P | N |
|----------|---------------|----------------|------------|--------------|----------------------------|---|
| DIN Rail | CliQ M Series | Output Voltage | 80W series | Single Phase | Advanced Power Boost (APB) | N - Metal Case, without Class I, Div 2 and ATEX approvals |

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Specifications

Input Ratings / Characteristics

| | | | | | | |
|--|------|---|--|---------|--|--|
| Nominal Input Voltage | | 100-240 Vac | Applicable for TN-, TT and IT mains networks | | | |
| Input Voltage Range | | 85-276 Vac | Continuously operating | | | |
| Input Frequency | Nom. | 50-60 Hz | ±3% range (47-63 Hz) | | | |
| Nominal DC Input Voltage | | 110-300 Vdc | | | | |
| DC input Voltage Range* | | 88-375 Vdc | Continuously operating | | | |
| | | | 100 Vac | 120 Vac | 230 Vac | |
| Input Current | Typ. | 0.91 A | 0.76 A | 0.44 A | At 24 V, 3.4 A. Refer to Fig. 1 | |
| | Max. | 1.0 A | 0.9 A | 0.6 A | At 24 V, 3.4 A. | |
| Efficiency | Typ. | 90.95% | 91.49% | 91.31% | At 24 V, 3.4 A. Refer to Fig. 2 | |
| | Min. | 87.10% | 90.10% | 90.00% | At 24 V, 3.4 A. | |
| Average Efficiency | Typ. | 89.78% | 89.46% | 89.64% | At 24 V, 0.85 A (25%), 1.7 A (50%) | |
| | Min. | 88.00% | 88.60% | 88.30% | 2.55 A (75%), 3.4 A (100%) | |
| Max Power Dissipation | Typ. | 1.19 W | 1.19 W | 1.29 W | At 24 V, 0 A. Refer to Fig. 3 | |
| | Max. | 1.5 W | 1.5 W | 1.5 W | At 24 V, 0 A. | |
| | Typ. | 8.16 W | 7.63 W | 7.81 W | At 24 V, 3.4 A. Refer to Fig. 3 | |
| | Max. | 9.5 W | 8.8 W | 9.1 W | At 24 V, 3.4 A. | |
| Max Inrush Current (Cold Start) | Typ. | 4.08 A | 4.44 A | 12.3 A | Entire operating temperature range | |
| | Max. | 6.0 A | 7.0 A | 13.0 A | | |
| Max Inrush Energy (Cold Start) | Max. | 2A ² s | | | | |
| Power Factor | Typ. | 0.99 | 0.98 | 0.89 | At 24 V, 3.4 A. Refer to Fig. 4 | |
| | Min. | 0.95 | 0.95 | 0.8 | At 24 V, 3.4 A. | |
| Crest Factor | Max. | 2.1 | 2.1 | 2.1 | At 24 V, 3.4 A. | |
| Leakage Current (Enclosure to Neutral) | | < 0.14 mA / 0.33 mA < 0.20 mA / 0.46 mA < 0.36 mA / 0.95 mA | | | 110 Vac, 50 Hz, TN/TT system / IT system 132 Vac, 50 Hz, TN/TT system / IT system 264 Vac, 50 Hz, TN/TT system / IT system | |

*Safety approval according to IEC/EN/UL 60950-1 and IEC/EN/UL 62368-1.

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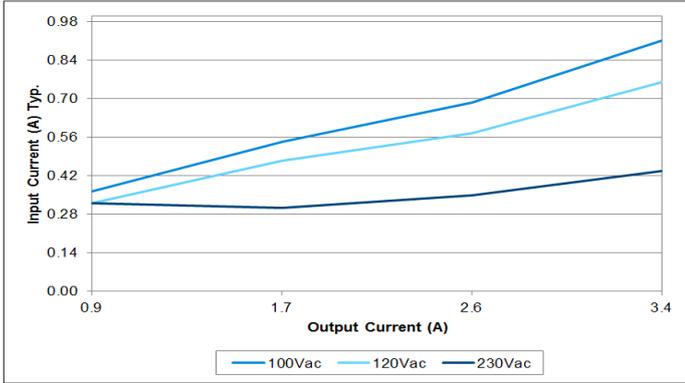


Fig. 1 Input Current Vs Output Load at 24 V

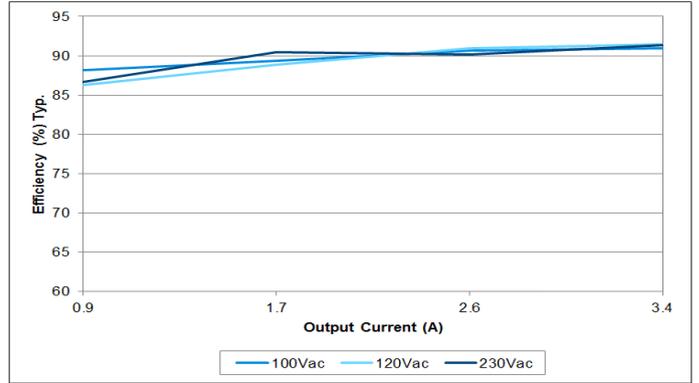


Fig. 2 Efficiency Vs Output Load at 24 V

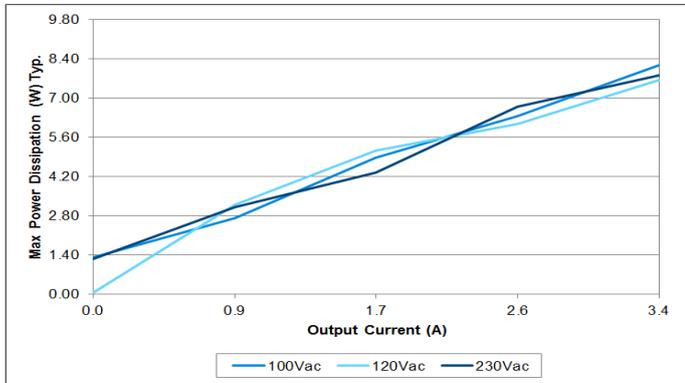


Fig. 3 Max Power Dissipation Vs Output Load at 24 V

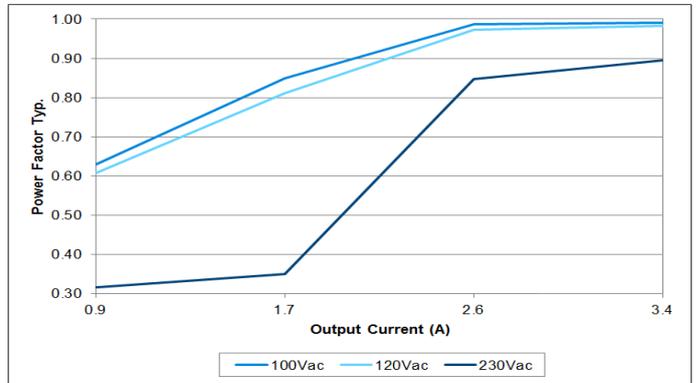


Fig. 4 Power Factor Vs Output Load at 24 V

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Output Ratings / Characteristics*

| | | | |
|---|----------------------|---|---|
| Nominal Output Voltage | | 24 Vdc | |
| Factory Set Point Tolerance | | 24 Vdc \pm 1.0% | |
| Output Voltage Adjustment Range | | 24-28 Vdc | |
| Output Current | Nom. Nom. | 3.4 A / 3.0 A 5.0 A / 4.5 A (Slew rate 0.1 A/ μ s) | Continuously operating at 24 V / 28 V Power Boost for 5 seconds at 24 V / 28 V, refer to the details in the Function section |
| Output Power | Nom. Nom. | 81.6 W / 84 W 120 W / 126 W | Continuously operating at 24 V / 28 V Power Boost for 5 seconds at 24 V / 28 V, refer to the details in the Functions section |
| Power Boost Duration | Typ. Max. | 5 seconds 7 seconds | Duration after which output voltage start to droop, refer to the details in the Function section at Overload & Overcurrent Protections |
| Power Boost Recovery Time | Typ. | 14 seconds | Required wait duration before next Power Boost is taken, refer to the details in the Function section |
| Advanced Power Boost (Slew rate 0.1A/ μ s) | Typ. Typ. Typ. | 6.8 A @ 50 ms, resistive load 13.5 A @ 2 ms, resistive load 13.5 A @ 5 ms, resistive load | Output voltage will drop (Refer to the details in the Function section) |
| Line Regulation | Max. | 10 mV (@ 85-276 Vac input, 100% load) | |
| Load Regulation | Max. | 100 mV (@ 85-276 Vac input, 0-100% load) | |
| PARD** | Max. | 50 mVpp | 20 Hz to 20 MHz, 50 Ohm, warm up for 10 mins |

*For power de-rating from 60°C to 70°C, see power de-rating on page 10.

**PARD is measured with an AC coupling mode, 5 cm wires, and in parallel with 0.1 μ F ceramic capacitor & 47 μ F electrolytic capacitor.

| | | 100 Vac | 120 Vac | 230 Vac | |
|--|------------------------|--|---------|---------|---|
| Rise Time | Max. | 15 ms | | | 0 μ F, 24 V, 3.4 A. |
| | Max. | 55 ms | | | 5,000 μ F, 24 V, 10 A. |
| Start-up Time | Max. | 430 ms | 370 ms | 330 ms | At 24 V, 3.4 A. |
| Hold-up Time | Typ. | 79 ms | 78 ms | 222 ms | At 24 V, 1.7 A. |
| | Min. | 70 ms | 70 ms | 90 ms | At 24 V, 1.7 A. |
| | Typ. | 40 ms | 40 ms | 118 ms | At 24 V, 3.4 A. |
| | Min. | 35 ms | 35 ms | 70 ms | At 24 V, 3.4 A. |
| Dynamic Response (Overshoot & Undershoot O/P Voltage) | Max. | \pm 5% @ 0-100% load | | | Slew rate 0.1 A/ μ s (@ 5 Hz, 50 Hz & 1 kHz, 50% Duty Cycle) |
| Start-up with Capacitive Loads | Max. | 8,000 μ F | | | |
| Output Capacitance | Typ. | 2,150 μ F | | | Built-in output capacitors |
| Functional | DC OK Relay Contact | Rated: 30 V at 1 A, resistive load The relay contact are normally "ON" (closed) when the output (Vout) is greater than 90% of its rated value. | | | |

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Mechanical

| | | |
|-----------------------------------|-----------|--|
| Case Cover / Chassis | | Aluminium |
| Dimensions (L x W x D) | | 124 x 32 x 102 mm (4.88 x 1.26 x 4.02 inch) |
| Unit Weight | | 0.50 kg (1.10 lb) |
| Indicator | Green LED | DC OK |
| | Red LED | Overload |
| Cooling System | | Convection |
| Terminal | Input | 3 Pins (Rated 600 V / 35 A) |
| | Output | 6 Pins (Rated 300 V / 8 A) |
| Wire | Input | AWG 18-8 |
| | Output | AWG 20-16 |
| Mounting Rail | | Standard TS35 DIN Rail in accordance with EN 60715 |
| Noise (1 Meter from power supply) | | Sound Pressure Level (SPL) < 25 dBA |

Environment

| | | | |
|-----------------------------|---------------------|--|---|
| Surrounding Air Temperature | Operating | -25°C to +70°C (Cold start -40°C) | |
| | Storage | -40°C to +85°C | |
| Power De-rating | Vertical Mounting | > 60°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 5,000 Meters (16,400 ft.) for ITE application 0 to 2,500 Meters (8,200 ft.) for Industrial application | |
| Shock Test | Non-Operating | IEC 60068-2-27, Half Sine Wave: 30 G for a duration of 18 ms; 3 times per direction, 6 times in total | |
| Vibration | Non-Operating | IEC 60068-2-6, Sine Wave: 10-500 Hz; 3 G peak; displacement of 0.35 mm; 60 min per axis for all X, Y, Z directions | |
| 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 | |

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Protections

| | | |
|------------------------------------|---|--|
| Overvoltage | 28.8 – 35.2 V, SELV Output, Hiccup Mode, Non-Latching (Auto-Recovery) | Refer to the details in the Function section |
| Overload / Overcurrent | > 150% of rated load current, Constant current limit, Auto-Recovery when the fault is removed | Refer to the details in the Function section |
| Over Temperature | < 80°C Surrounding Air Temperature @ 100% load, Non-Latching (Auto-Recovery) | Refer to the details in the Function section |
| Short Circuit | Hiccup Mode, Non-Latching (Auto-Recovery when the fault is removed) | Load impedance \leq 100 mOhm, refer to the details in the Function section |
| Transient Surge Voltage Protection | MOV (Metal Oxide Varistor) | |
| Internal Fuse at L pin | T 3.15 A | |
| Degree of Protection | IP20 | |
| Protection Against Shock | Class I with PE* connection | |

*PE: Primary Earth

Reliability Data

| | | | |
|--------------------------------|----------------|--|----------------------------|
| MTBF (as per Telcordia SR-332) | 2,164,300 hrs. | I/P: 100 Vac, O/P: 24 V, 3.4 A, Ta: 25°C | |
| | 1,341,200 hrs. | I/P: 100 Vac, O/P: 24 V, 3.4 A, Ta: 40°C | |
| Expected Cap Life Time** | 100 Vac | 230 Vac | |
| | 131,400 hrs. | | O/P: 24 V, 3.4 A, Ta: 25°C |
| | 131,400 hrs. | | O/P: 24 V, 3.4 A, Ta: 40°C |
| | 131,400 hrs. | | O/P: 24 V, 1.7 A, Ta: 40°C |

**Estimated lifetime when 24 hours operating a day and E-cap's manufacturer guarantee at 131,400 hrs (15 years) as maximum limit of lifetime.

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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, EN 61558-1, EN 61558-2-16, EN 61010-1, EN 61010-2-201 |
| | 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, IEC 61558-1, IEC 61558-2-16, IEC 61010-1, IEC 61010-2-201 |
| | UKCA | BS EN 62368-1, BS EN 61558-1, BS EN 61558-2-16, BS EN 61010-1, BS EN 61010-2-201 |
| 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) |
| Maritime | DNV GL | Germanischer Lloyd classified |
| | ABS | American Bureau for Shipping) PDA Environmental category: C, EMC2 |
| 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 | 4.54 KVac | Input / Output |
| | 2.5 KVac | Input / PE |
| | 4.54 KVac | Input / DC OK relay contact* |
| | 1.5 KVac | Output / PE |
| | 0.5 KVac | Output / DC OK relay contact |
| | 1.5 KVac | DC OK relay contact / PE |
| Isolation Resistance | > 5 MOhm | Input to Output, 500 Vdc |
| PE Resistance | < 0.1 Ohm | |

*Recommend to connect DC OK pins together with output pins.

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EMC

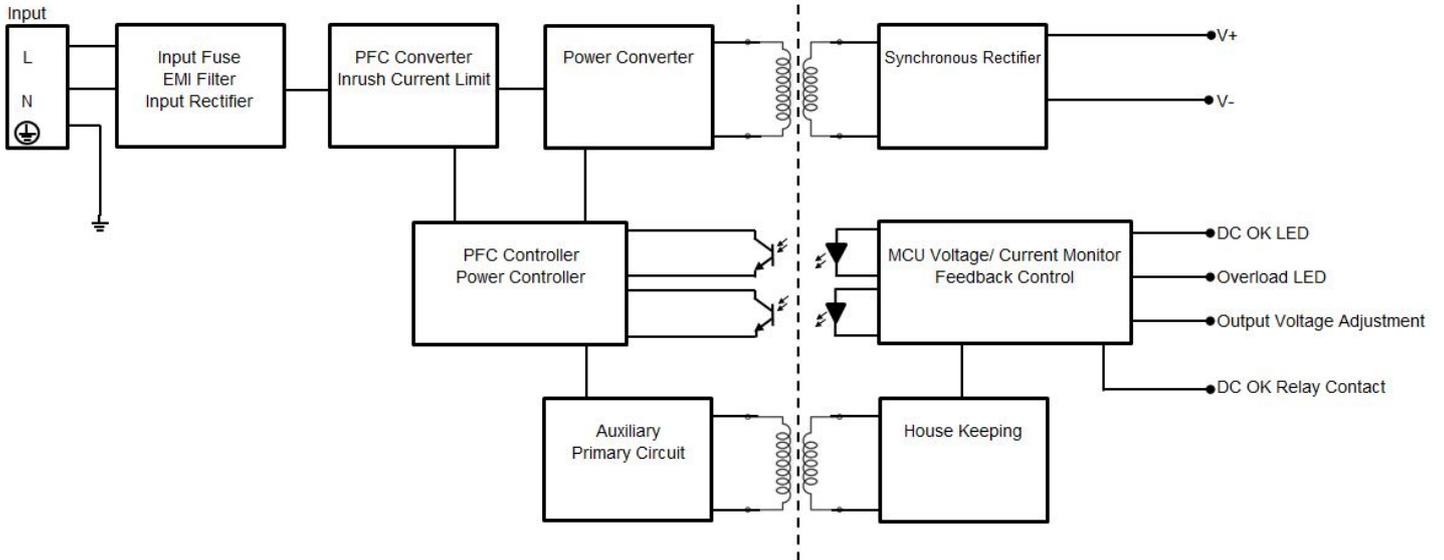
| | | | | |
|---|----------------|--|--|--|
| Emissions (CE & RE) | | Generic Standards: EN/BS EN 61000-6-3 CISPR 32, EN/BS EN 55032, KN 32, CISPR 11, EN/BS EN 55011, FCC Title 47: Class B | | |
| Component Power Supply for General Use | | EN/BS EN 61204-3 | | |
| Immunity | | Generic Standards: EN/BS EN 55024, KN 35, 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, 10 V/M, 80% modulation (1 Hz) 2 GHz - 2.7 GHz, 10 V/M, 80% modulation (1 Hz) | | |
| Electrical Fast Transient / Burst | IEC 61000-4-4 | Level 4 Criteria A ¹⁾ 4 kV | | |
| Surge | IEC 61000-4-5 | Level 4 Criteria A ¹⁾ Common Mode ³⁾ : 4 kV Differential Mode ⁴⁾ : 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 | Criteria A ¹⁾ 30 A/Meter | | |
| Voltage Dips and Interruptions | IEC 61000-4-11 | 0% of 100 Vac 40% of 100 Vac 70% of 100 Vac 0% of 200 Vac 40% of 200 Vac 70% of 200 Vac 0% of 200 Vac | 0 Vac, 20 ms 40 Vac, 200 ms 70 Vac, 500 ms 0 Vac, 20 ms 80 Vac, 200 ms 140 Vac, 500 ms 0Vac, 5000 ms | Criteria A ¹⁾ Criteria B ²⁾ Criteria A ¹⁾ Criteria A ¹⁾ Criteria A ¹⁾ Criteria A ¹⁾ Criteria B ²⁾ |
| Low Energy Pulse Test (Ring Wave) | IEC 61000-4-12 | Level 3 Criteria A ¹⁾ Common Mode ³⁾ : 2 kV Differential Mode ⁴⁾ : 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 | | |
| Voltage Sag Immunity SEMI F47 – 0706 | | 80% of 120 Vac 70% of 120 Vac 50% of 120 Vac | 96 Vac, 1000 ms 84 Vac, 500 ms 60 Vac, 200 ms | Criteria A ¹⁾ Criteria A ¹⁾ Criteria A ¹⁾ |

1) Criteria A: Normal performance within the specification limits
 2) Criteria B: Temporary degradation or loss of function which is self-recoverable
 3) Asymmetrical: Common mode (Line to earth)
 4) Symmetrical: Differential mode (Line to line)

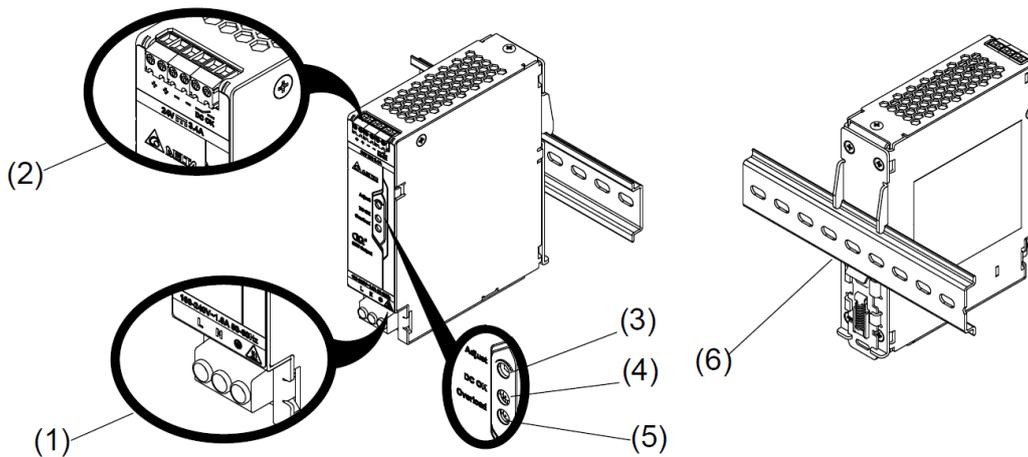
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Block Diagram



Device Description



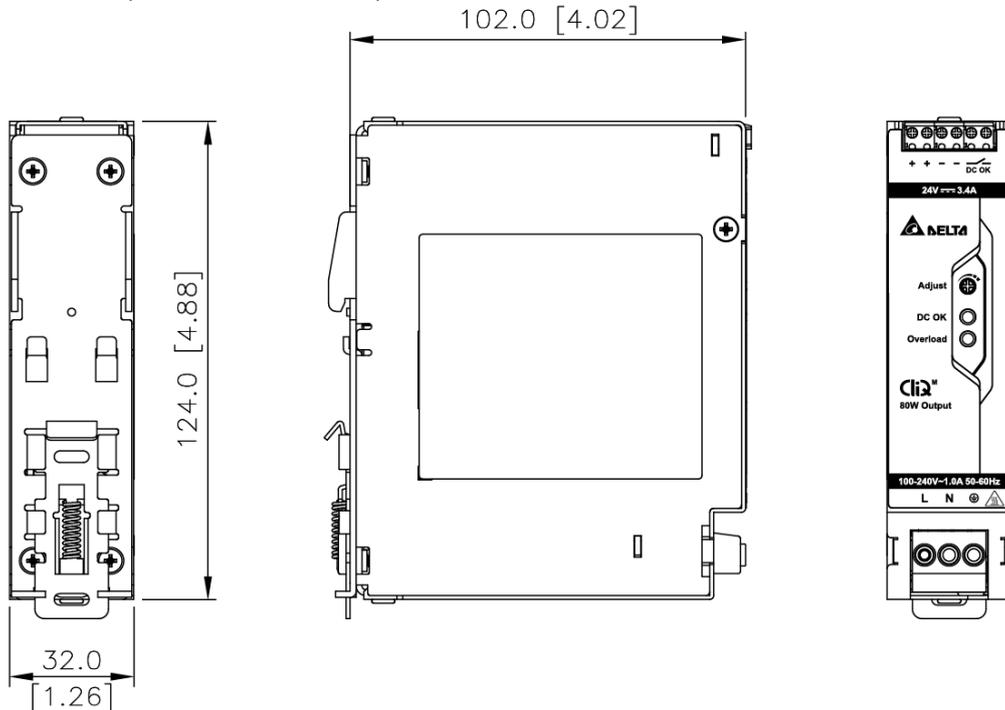
- 1) Input terminal block connector
- 2) Output and DC OK relay contact terminal block connector
- 3) DC Voltage adjustment potentiometer
- 4) DC OK LED (Green)
- 5) Overload LED (Red)
- 6) Universal mounting rail system

CliQ M DIN Rail Power Supply

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Dimensions

L x W x D: 124 x 32 x 102 mm (4.88 x 1.26 x 4.02 inch)



Engineering Data

Output Load De-rating VS Surrounding Air Temperature

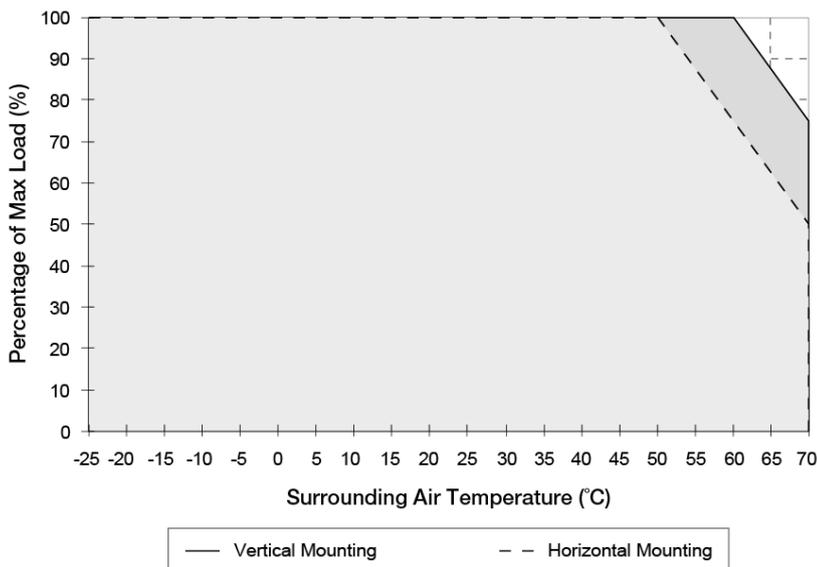


Fig. 5 De-rating for Vertical Mounting Orientation
 > 60°C de-rate power by 2.5% / °C

De-rating for Horizontal Mounting Orientation
 > 50°C de-rate power by 2.5% / °C

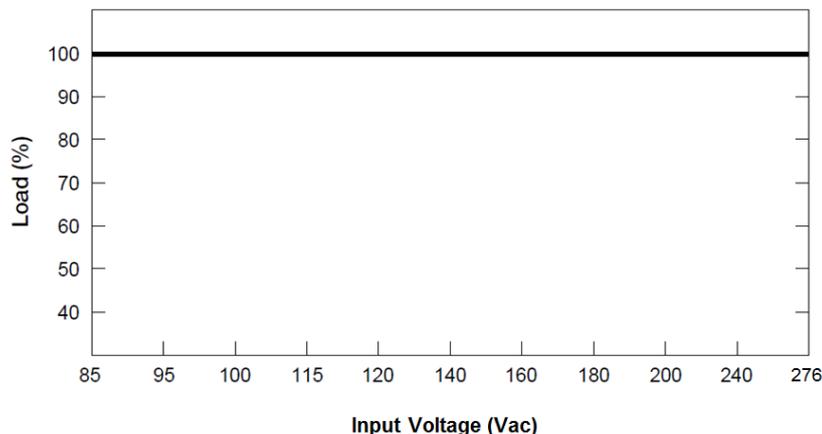
Note

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. 5.
2. If the output capacity is not reduced when the surrounding air temperature exceeds its specification as defined on Page 5 under "Environment", the device will run into Over Temperature Protection. When activated, the output voltage will go into bouncing mode and will recover when the surrounding air temperature is lowered or the load is reduced as far as necessary to keep the device in working condition.
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.

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Output Load De-rating VS Input Voltage



■ No output power de-rating for the 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 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.

1. Tilt the unit upwards and insert it onto the DIN rail. Snap on the DIN rail as shown in Fig. 6.1.
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.
5. To uninstall, pull or slide down the latch with screw driver as shown in Fig. 6.2. 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.

Mounting

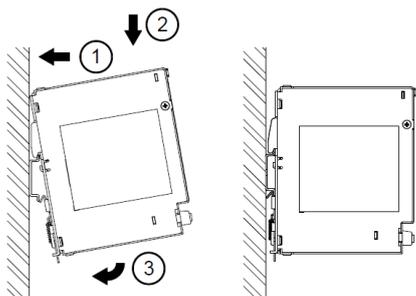


Fig. 6.1 Mounting

Dismounting

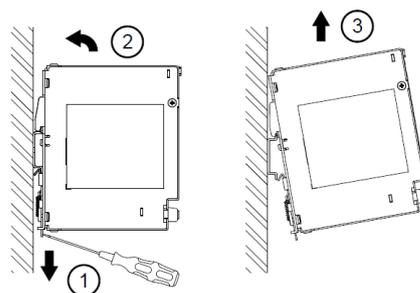


Fig. 6.2 Dismounting

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:

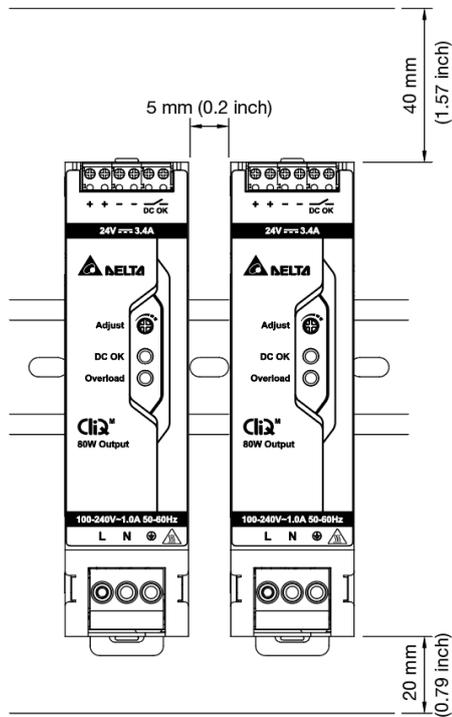
1. 60°C, 60°C / 75°C for USA
2. At least 90°C for Canada and IEC/EN 61010-1, IEC/EN 61010-2-201.

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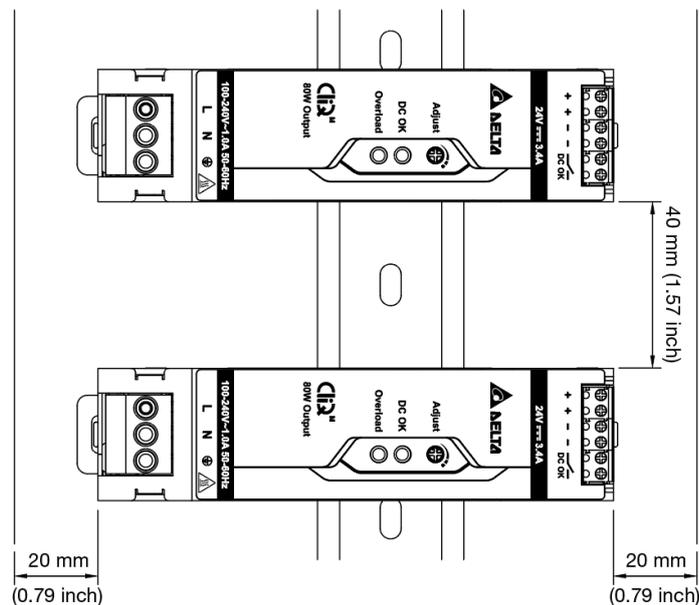
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Safety Instructions

■ Vertical Mounting



■ Horizontal Mounting



- ALWAYS switch mains of input power OFF before connecting and disconnecting the input voltage to the device. If mains are not turned OFF, there is risk of explosion / severe damage.
- If the unit is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.
- **To guarantee sufficient convection cooling, please refer to the following instructions to ensure sufficient clearance around the device.**

Vertical Mounting: 40 mm (1.57 inch) above and 20 mm (0.79 inch) below the device as well as a lateral distance of 5 mm (0.2 inch) to other units. In case the adjacent device is a heat source, the lateral distance will be 15 mm (0.6 inch).

Horizontal Mounting: 40 mm (1.57 inch) above and below the device as well as a lateral distance of 20 mm (0.79 inch) to other units.

- The external enclosure where the unit will be installed shall meet the requirements for mechanical, electrical and fire enclosure.
- Note that the enclosure of the device can become very hot depending on the surrounding air temperature and output load connected to the device. 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.
- Dangerous voltages present for at least 5 minutes after disconnected all sources of power.
- 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.

CliQ M DIN Rail Power Supply

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Functions

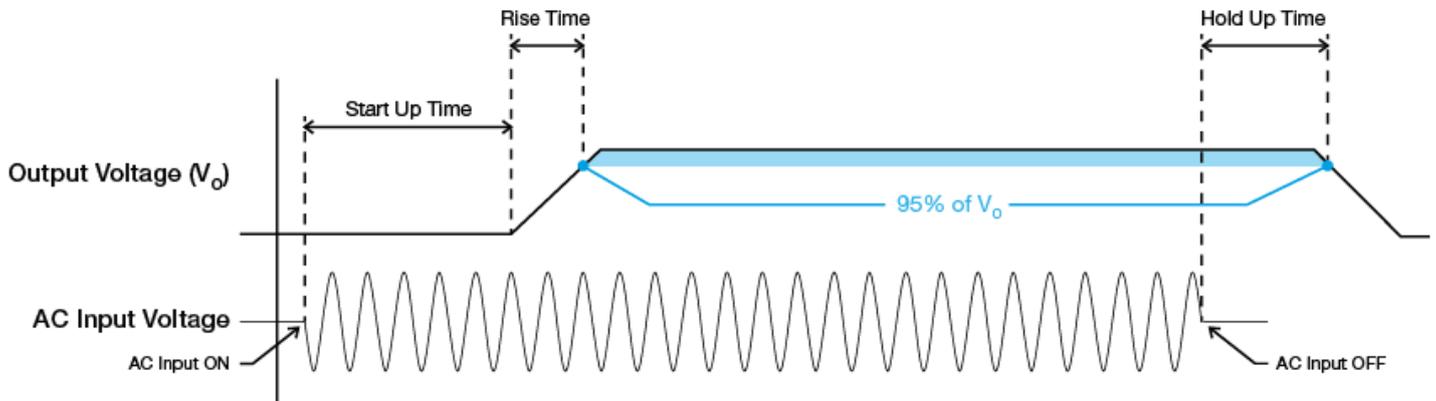
DC OK Relay Contacts and LED Indicator Characteristics

| Operating Status | DC OK (Green LED) | Overload (Red LED) | DC OK Relay Contact |
|--|----------------------|-----------------------|------------------------|
| Normal Operation | ON | OFF | Closed |
| During Power Boost | ON | OFF | Closed |
| Overload ($V_{out} \leq 90\%$ of adjusted voltage) | OFF | ON | Open |
| Output Short Circuit | OFF | Flashing | Open |
| Over Temperature | Flashing | Flashing | Open |
| No Input Power | OFF | OFF | Open |

CliQ M DIN Rail Power Supply

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



Start-up Time

The time required for the output voltage before output voltage rise up, after the input voltage is applied.

Rise Time

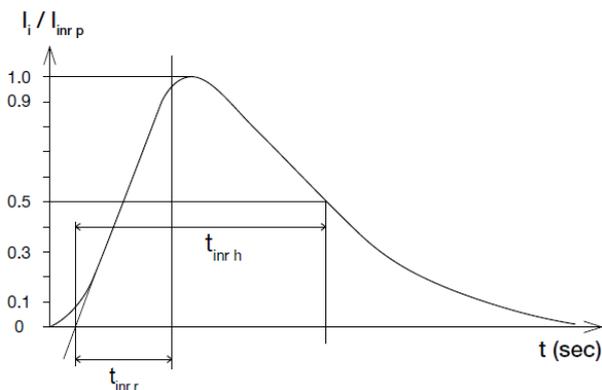
The time required for the output voltage to change from 0% to 95% of its final steady state set value.

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

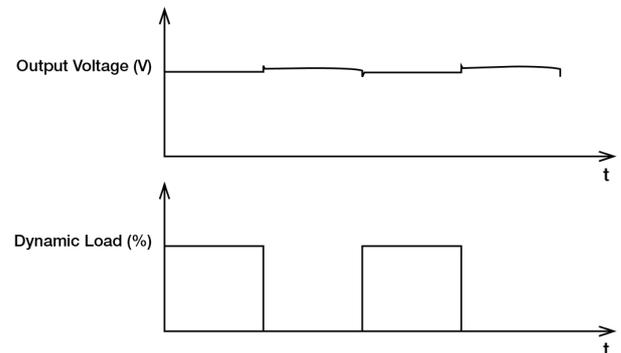
Inrush current is the peak, instantaneous, input current measured and, occurs when the input voltage is first applied. For AC input voltages, the maximum peak value of inrush current will occur during the first half cycle of the applied AC voltage. This peak value decreases exponentially during subsequent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



Dynamic Response

The power supply output voltage will remain within $\pm 5\%$ 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

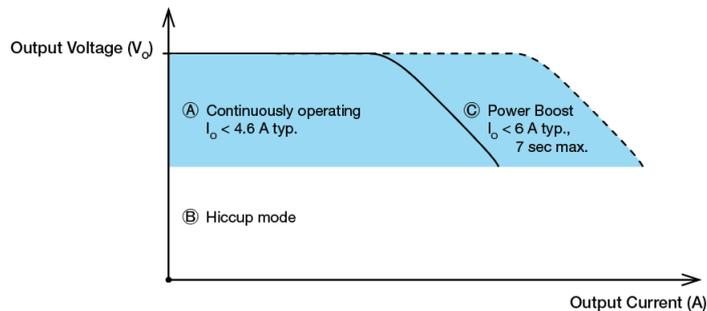


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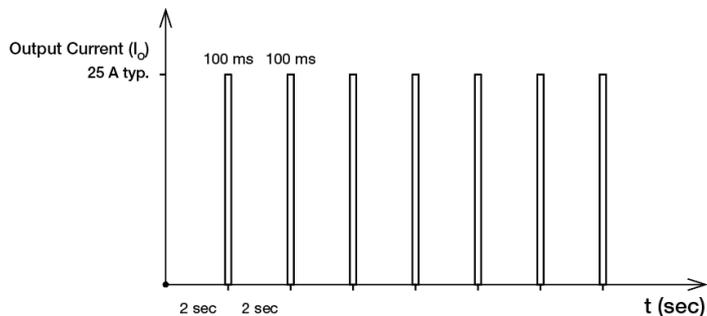
Overload & Overcurrent Protections (Auto-Recovery)

The power supply's Overload (OLP) and Overcurrent (OCP) Protections will be activated when output current is > 150% of I_O (output current). Upon such an occurrence, V_O (output voltage) will start to droop, refer to (C) and after 7 sec output current will limit to 4.6 A typ., refer to (A). Once V_O is below 11 Vdc typ., the power supply will operate in "Hiccup mode". The power supply will recover once the fault condition due to OLP or OCP is removed, then I_O is back within the specified range.



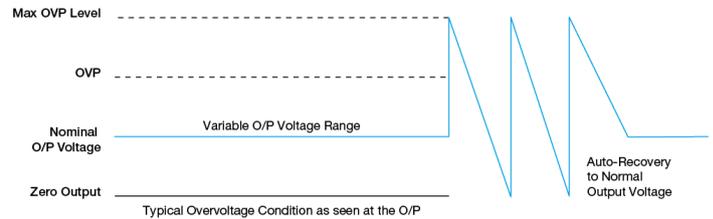
Short Circuit Protection (Auto-Recovery)

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.



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 6 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.

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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 7 seconds. If the power boost lasts longer than maximum duration, the output current will limit to 4.6 A typ. and V_O (output voltage) will start to droop. Once V_O is below 11 Vdc typ., the power supply will operate in “Hiccup mode”. The Power Boost is repetitive, need to maintain the duty cycle & recovery time to ensure that average (R.M.S) output power shall not exceed the continuous maximum, see duty cycle calculation below.

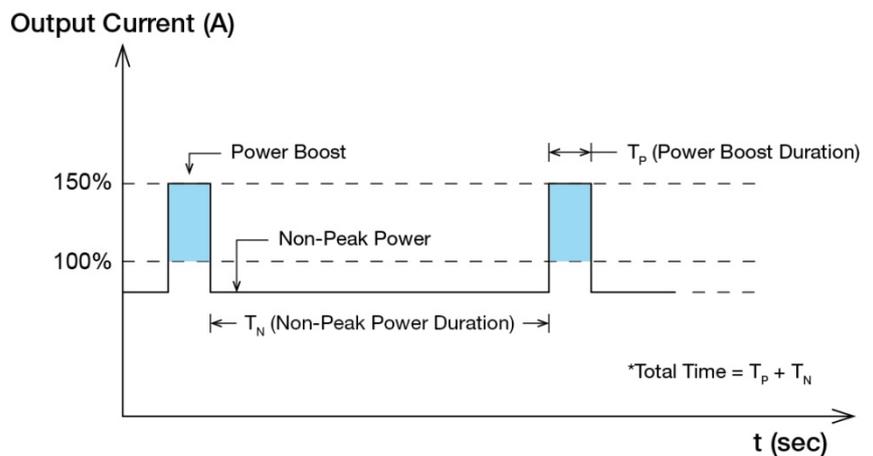


Fig. 7 Duty Cycle Calculation

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

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

OR

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

■ 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% | 120 | 7 sec | 10% | 75 W | 60 sec | 67 sec |
| 150% | 120 | 7 sec | 30% | 63 W | 16 sec | 23 sec |
| 120% | 96 | 7 sec | 10% | 78 W | 60 sec | 67 sec |
| 120% | 96 | 7 sec | 30% | 73 W | 16 sec | 23 sec |

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Advanced Power Boost (APB)

With multiple loads connected in a system and due to one of fault load a large outrush current is drawn (demanded), this will be detected by APB. This APB can trip the external output protection device with appropriate rating based on system load. Thus preventing the system from shutting down while other connected current paths continue to operate without interruption.

The following waveforms demonstrate the behavior.

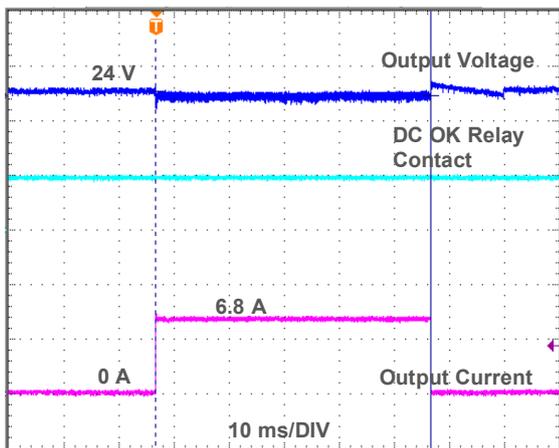


Fig. 8.1 APB 200% of nominal output current for 50 ms

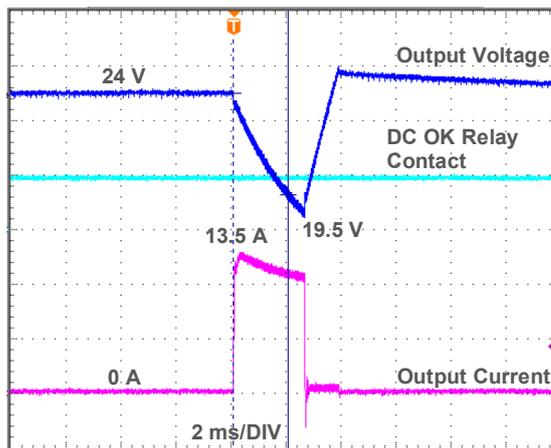


Fig. 8.2 APB 400% of nominal output current for 2 ms

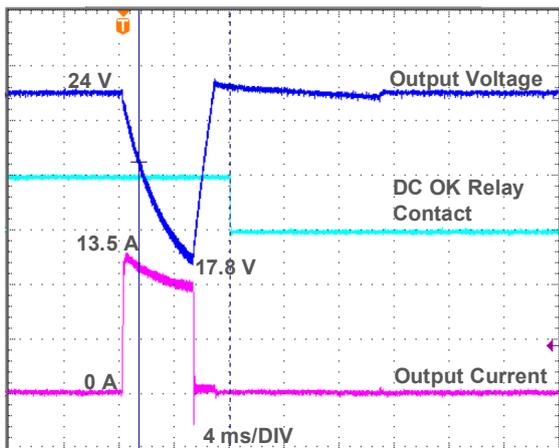


Fig. 8.3 APB 400% of nominal output current for 5 ms

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 6 A B- or 6 A C- characteristic breaker.

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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 input voltage, and set the PSU 1 and PSU 2 output voltage.

Step 2.

Connect the power supply units PSU 1 and PSU 2 to $V_{in 1}$ & $V_{in 2}$, respectively, of the DRR-20N (or 20A) module shown on the right of above diagram.

Step 3.

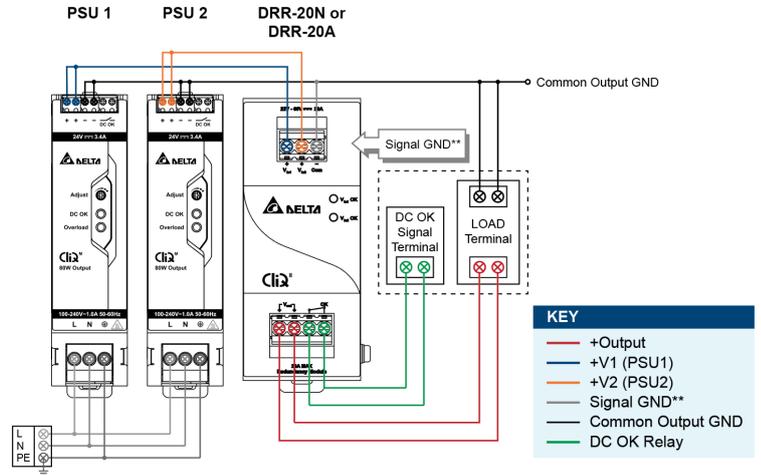
Connect the system load to V_{out} . Please note that output voltage V_{out} from DRR module will be = V_O (output voltage of power supply) – V_{drop}^* (in DRR module).

* 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.

■ 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.



**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. 9 Redundant Operation Connection Diagram

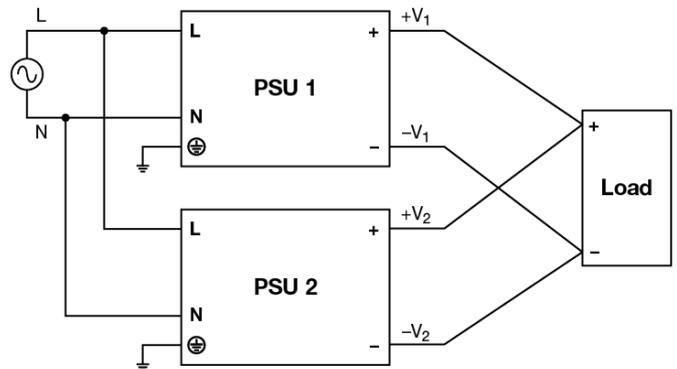


Fig. 10 Parallel Operation Connection Diagram

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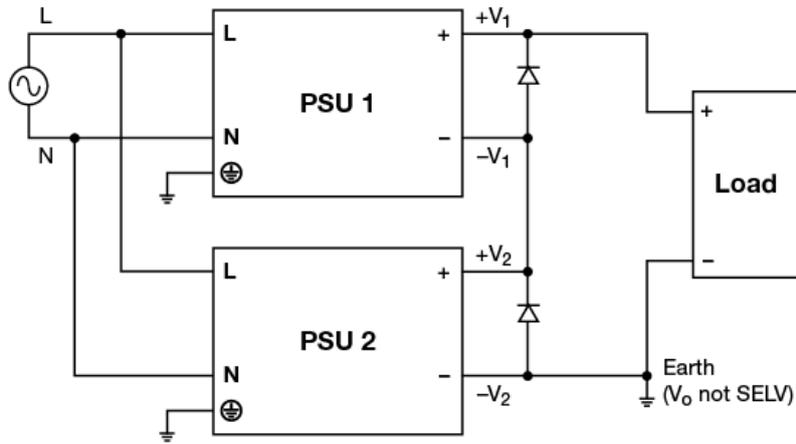
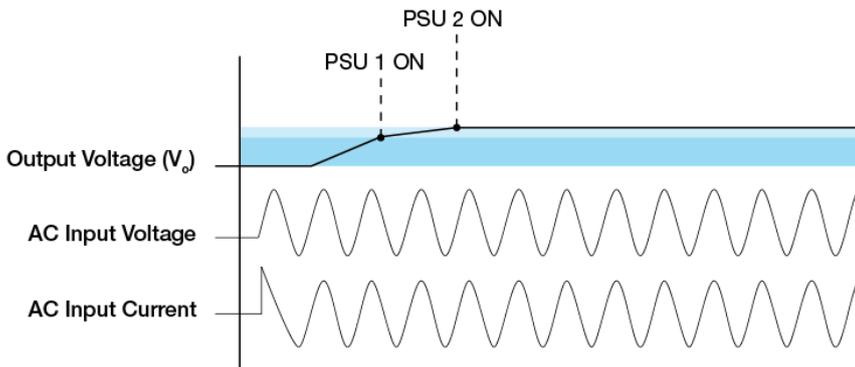


Fig. 11 Series Operation Connection Diagram

Series Operation

Delta's CliQ M can be connected in series to increase the output voltage as shown in figure above. Power supply from the same product series only be used and with the same rated output current. 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 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 short circuit -V₁ & +V₁ will come across +V₂ & -V₂ 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 de-rating for diodes use 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 startup waveform with 2 power supplies connected in series would see 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.

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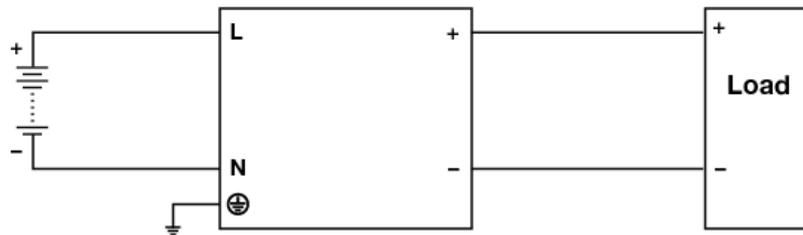


Fig. 12 DC Input Operation Connection Diagram

■ 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.

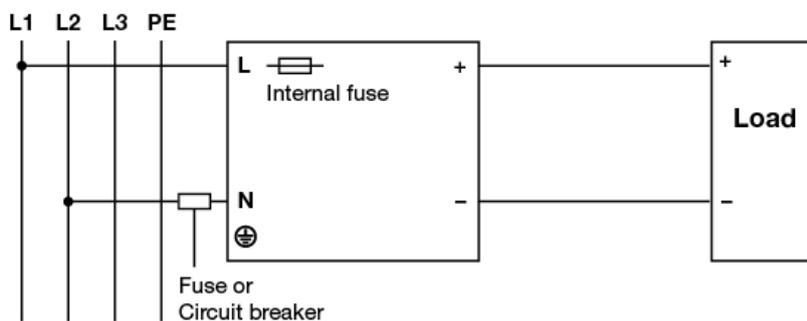


Fig. 13 2 of 3 Phase System Input Operation Connection Diagram

■ 2 of 3 Phase System Input Operation

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

Step 1.
The supplying voltage is below the maximum rated input. The input voltage shall be below 240 Vac +10%.

Step 2.
The external protector is needed on N input line to secure a safety. N line has no protection of a fuse internally. An appropriate fuse or circuit breaker should be connected on N input line like the following.

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Others

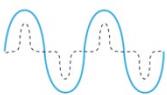
Conformal Coating



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 PCBA's 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.

Attention

Delta provides all information in the datasheets on an "AS IS" basis and does not offer any kind of warranty through the information for using the product. In the event of any discrepancy between the information in the catalog and datasheets, the datasheets shall prevail (please refer to www.DeltaPSU.com for the latest datasheets information). Delta shall have no liability of indemnification for any claim or action arising from any error for the provided information in the datasheets. Customer shall take its responsibility for evaluation of using the product before placing an order with Delta.

Delta reserves the right to make changes to the information described in the datasheets without notice.

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