TECHNICAL DATASHEET

CliQ VA DIN Rail Power Supply

24 V 480 W 1 Phase / DRV-24V480W1PN

Highlights & Features

- Universal AC input voltage range
- LCD display monitoring the output current / voltage / peak current and temperature
- Life time expectancy alarm signal and monitoring
- Built-in active PFC with up to 94% efficiency
- Power Boost of 150% up to 7 seconds
- Advanced Power Boost (APB)
- 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:	DRV-24V480W1PN
Unit Weight:	1.45 kg (3.20 lb)
Dimensions (L x W x D):	124 x 82 x 149 mm (4.88 x 3.23 x 5.87 inch)

General Description

Delta Electronics introduces the CliQ VA DIN rail power supply series with LCD display. The LCD displays output current, output voltage, peak hold current, lifetime expectancy and ambient temperature data. The high power density product is designed according to major industrial safety standards. Similar to the CliQ M DIN rail series, CliQ VA provides 150% Power Boost up to 7 seconds, including the Advanced Power Boost (APB) feature. APB works in a way when large outrush current due to faulty load on a current path of a multiple loads connection is detected by APB, APB will trip the circuit breaker on that current path. This prevents the other connected loads from shutting down. Other features include compliance to harmonic current IEC/EN 61000-3-2, Class A, built-in DC OK contacts, and an LED for indicating DC OK and Overload conditions.

Model Information

CliQ VA DIN Rail Power Supply

Model Number	Input Voltage Range	Rated Output Voltage	Rated Output Current
DRV-24V480W1PN	85-276 Vac (88-375 Vdc)	24 Vdc	20.0 A

Model Numbering

DR	V –	24V	480W	1	P	N
DIN Rail	CliQ VA Series	Output Voltage	Output Power	Single Phase	Advanced Power Boost (APB)	N - Metal Case, without Class I, Div 2 and ATEX approvals

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24 V 480 W 1 Phase / DRV-24V480W1PN

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			Range: 47-63 Hz
Nominal DC Input Voltage		110-300 Vdc			
DC input Voltage Range*	Vertical Mounting	88-375 Vdc			Continuously operating, with safety approval according to IEC/UL 60950-1.
	Horizontal Mounting	100-375 Vdc			
		100 Vac	120 Vac	230 Vac	
Input Current	Typ.	5.11 A	4.24 A	2.29 A	At 24 V, 20 A. Refer to Fig. 1 on page 3.
	Max.	5.30 A	4.60 A	2.50 A	At 24 V, 20 A.
Efficiency	Typ.	93.37%	93.83%	94.17%	At 24 V, 20 A. Refer to Fig. 2 on page 3.
	Min.	91.40%	92.20%	93.40%	At 24 V, 20 A.
Average Efficiency	Typ.	92.25%	92.54%	92.86%	At 24 V 5.0 A (25%), 10.0 A (50%),
	Min.	90.50%	91.50%	92.00%	15.0 A (75%), 20.0 A (100%)
Max Power Dissipation	Typ.	5.29 W	4.75 W	2.84 W	At 24 V, 0 A. Refer to Fig. 3 on page 3.
	Max.	9.20 W	9.40 W	10.20 W	At 24 V, 0 A.
	Typ.	34.08 W	31.58 W	29.70 W	At 24 V, 2 0A. Refer to Fig. 3 on page 3.
	Max.	46.00 W	40.60 W	34.00 W	At 24 V, 20 A.
Max Inrush Current (Cold Start)	Typ.	11 A	9 A	7 A	Entire operating temperature range
	Max.	13 A			
Max Inrush Energy (Cold Start)	Max.	5 A^2s			
Power Factor	Typ.	0.99	0.99	0.95	At 24 V, 20 A. Refer to Fig. 4 at page 3.
	Min.	0.93	0.92	0.87	At 24 V, 20 A.
Crest Factor	Max.	1.6	1.7	2.05	At 24 V, 20 A.
Leakage Current (Enclosure to Neutral)		< 0.31 mA / 0.77 mA < 0.45 mA / 1.13 mA < 0.80 mA / 2.00 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/UL 60950-1 and IEC/EN/UL 62368-1.

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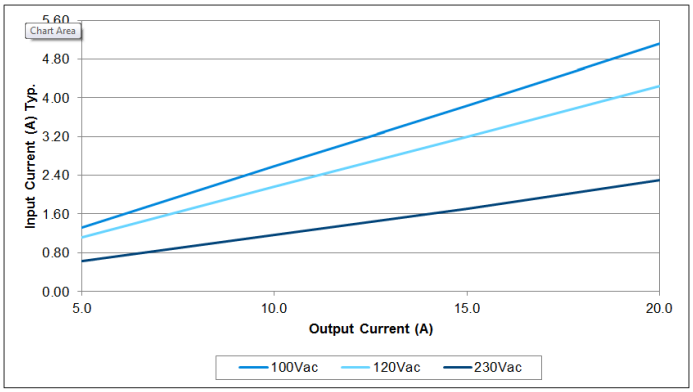

Fig. 1 Input Current Vs Output Load at 24 V

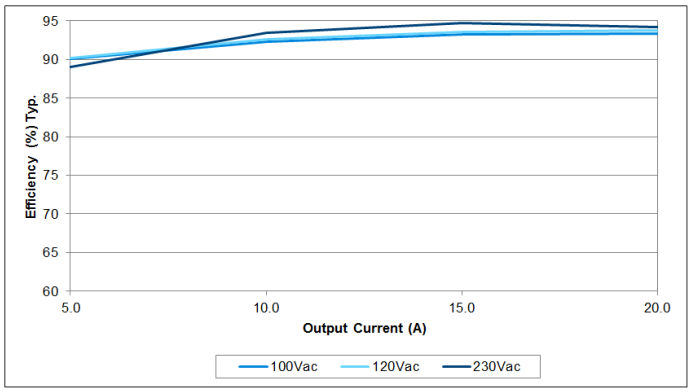

Fig. 2 Efficiency Vs Output Load at 24 V

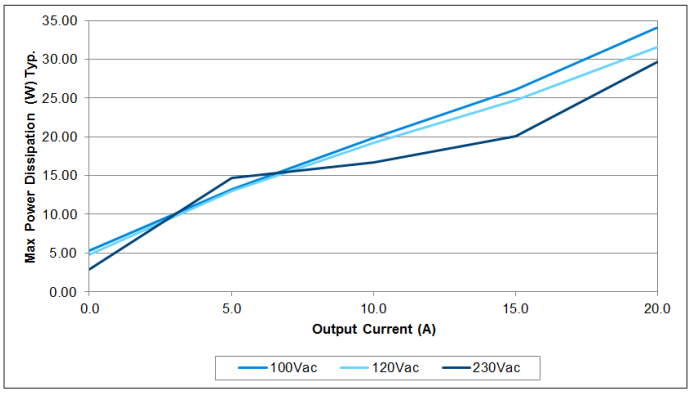

Fig. 3 Max Power Dissipation Vs Output Load at 24 V

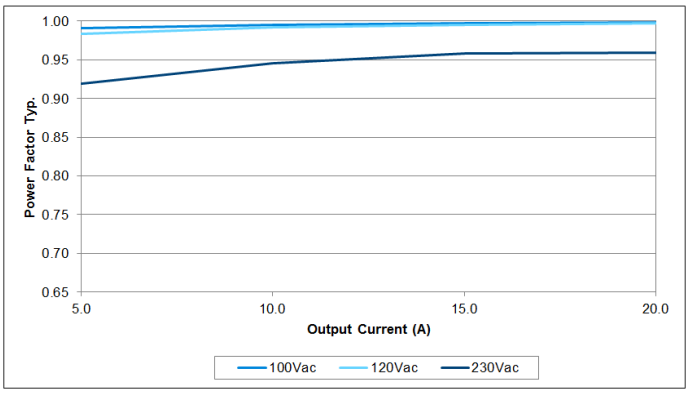

Fig. 4 Power Factor Vs Output Load at 24 V

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24 V 480 W 1 Phase / DRV-24V480W1PN

Output Ratings / Characteristics*

Nominal Output Voltage		24 Vdc	
Factory Set Point Tolerance		24 Vdc ± 1.0%	
Output Voltage Adjustment Range		24-28 Vdc	
Output Current	Nom. Nom.	20.0 A / 17.0 A 30.0 A / 25.5 A (Slew rate 0.1 A/µs)	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
Output Power	Nom. Nom.	480 W / 476 W 720 W / 714 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.	17 seconds	Required wait duration before next Power Boost can be delivered by the power supply. Refer to the details in the Function section
Advanced Power Boost (Slew rate 0.1A/µs)	Typ. Typ. Typ. Typ.	40 A @ 50 ms, resistive load 100 A @ 2 ms, resistive load 100 A @ 5 ms, resistive load 2-40 A @ 500 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.	100 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.
**Advanced Power Boost 2-40 A @ 500 ms for input voltage greater than or equal 120 Vac.
***PARD is measured with an AC coupling mode, 5 cm wires, and in parallel with 0.1 µF ceramic capacitor & 47 µF electrolytic capacitor.

		100 Vac	120 Vac	230 Vac	
Rise Time	Max.	100 ms			0 µF, 24 V, 20 A.
	Max.	100 ms			20,000 µF, 24 V, 20 A.
Start-up Time	Max.	1000 ms			At 24 V, 20 A.
Hold-up Time (100% Load)	Typ.	90 ms			At 24 V, 10 A.
	Min.	62 ms			At 24 V, 10 A.
	Typ.	43 ms			At 24 V, 20 A.
	Min.	30 ms			At 24 V, 20 A.
Dynamic Response (Overshoot & Undershoot O/P Voltage)	Max.	± 5% @ 0-100% load			Slew rate 0.1 A/µs (@ 5 Hz, 50 Hz & 1 kHz, 50% Duty Cycle)
Start-up with Capacitive Loads	Max.	20,000 µF			
Output Capacitance	Typ.	8,500 µF			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. (Refer to the details in the Function section)			
	Years alarm signal	Rated: 30 V Max. with sink current of 10mA Max.			

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24 V 480 W 1 Phase / DRV-24V480W1PN

Mechanical

Case Cover / Chassis		Aluminium and Plastic / Aluminium
Dimensions (L x W x D)		124 x 82 x 149 mm (4.88 x 3.23 x 5.87 inch)
Unit Weight		1.45 kg (3.20 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 / 28 A)
	Signal	2 Pins (Rated 300 V / 10 A)
Wire	Input	AWG 18-8
	Output	AWG 14-12*
	Signal	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

*Ensure that all output terminals are connected.

Environment

Surrounding Air Temperature	Operating	-25°C to +70°C	
	Storage	-40°C to +85°C	
Power De-rating	Vertical Mounting	> 60°C de-rate power by 2.5% / °C	
	Horizontal Mounting	> 40°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.)	
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, Hiccup Mode (Auto-Recovery)	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 ≤ 100 mOhm, refer to the details in the Function section
Transient Surge Voltage Protection	MOV (Metal Oxide Varistor)	
Internal Fuse at L pin	T 8 A	
Degree of Protection	IP20	
Protection Against Shock	Class I with PE* connection	

*PE: Primary Earth

Reliability Data

MTBF (as per Telcordia SR-332)	751,100 hrs.	I/P: 100 Vac, O/P: 24 V, 20 A, Ta: 25°C
	424,800 hrs.	I/P: 100 Vac, O/P: 24 V, 20 A, Ta: 40°C

	100 Vac	230 Vac	
Expected Cap Life Time**	131,400 hrs.		O/P: 24 V, 20 A, Ta: 25°C
	96,500 hrs.	114,100 hrs.	O/P: 24 V, 20 A, Ta: 40°C
	131,400 hrs.		O/P: 24 V, 10 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 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 61010-1, IEC 61010-2-201	
	UKCA	IEC 62368-1, IEC 61010-1, IEC 61010-2-201	
Industrial Control Equipment	UL/cUL listed	UL 508 and CSA C22.2 No. 107.1-01 (File No. E315355)	
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		3.0 KVac	Input / Output
		2.0 KVac	Input / PE
		3.0 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, 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, 10 V/M, 80% modulation (1 kHz) 2 GHz – 2.7 GHz, 10 V/M, 80% modulation (1 kHz)		
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 100 Vac 0% of 240 Vac 40% of 240 Vac 70% of 240 Vac 0% of 240 Vac	0V ac, 20 ms 40 Vac, 200 ms 70 Vac, 500 ms 0 Vac, 5000 ms 0 Vac, 20 ms 96 Vac, 200 ms 168 Vac, 500 ms 0 Vac, 5000 ms	Criteria A[1] Criteria B[2] Criteria A[1] Criteria B[2] 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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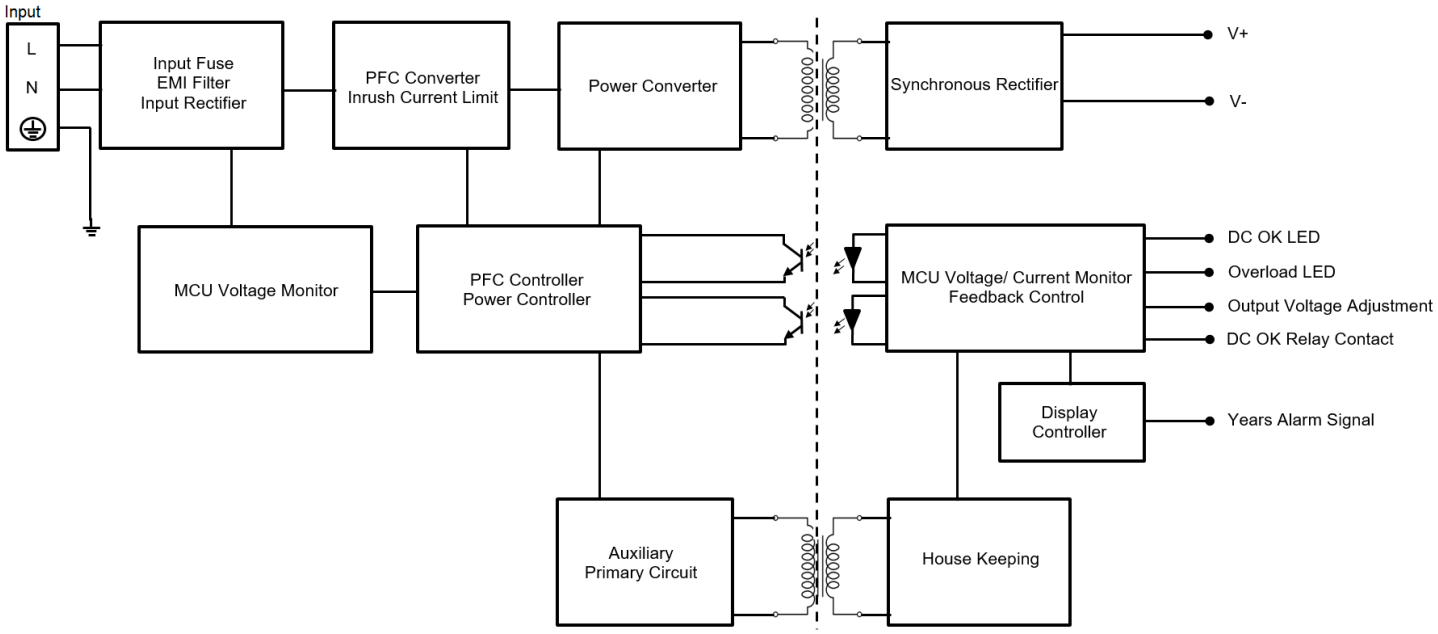
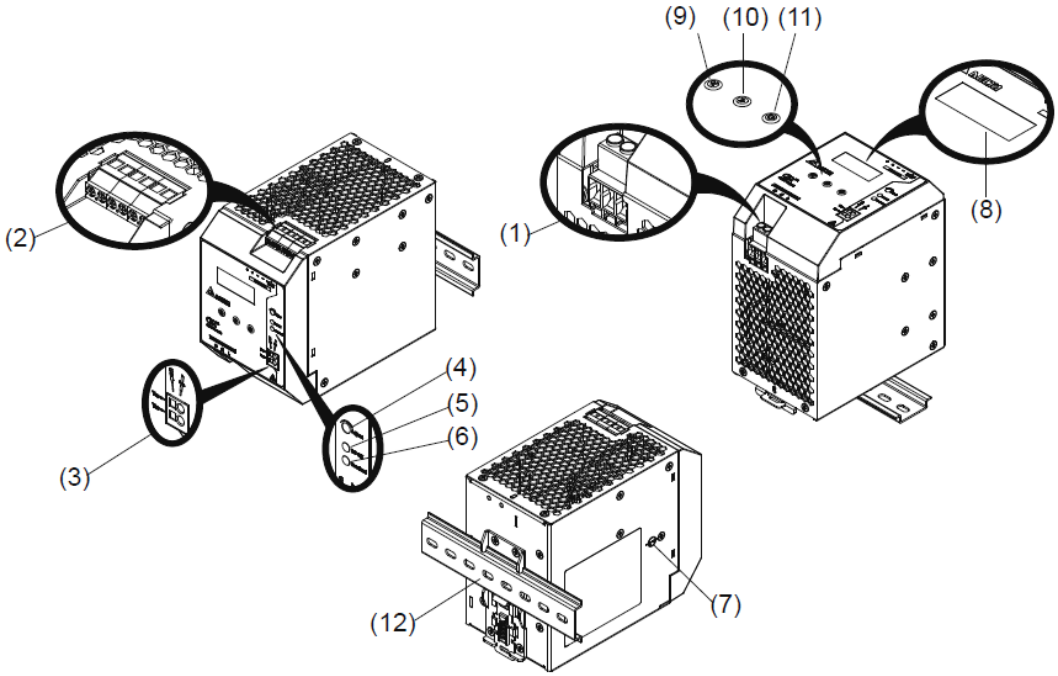
Block Diagram



Device Description



1) Input terminal block connector
2) Output and DC OK relay contact terminal block connector
3) Years alarm signal terminal block connector
4) DC Voltage adjustment potentiometer
5) DC OK LED (Green)
6) Overload LED (Red)
7) Gas discharge tube (on left side of housing) used for surge protection.
   Disconnect gas discharge tube (remove Phillips head screw) during dielectric test of > 0.9 KVac or 1.3 KVdc.
8) LCD display
9) Back key
10) Forward key
11) Mode key
12) Universal mounting rail system

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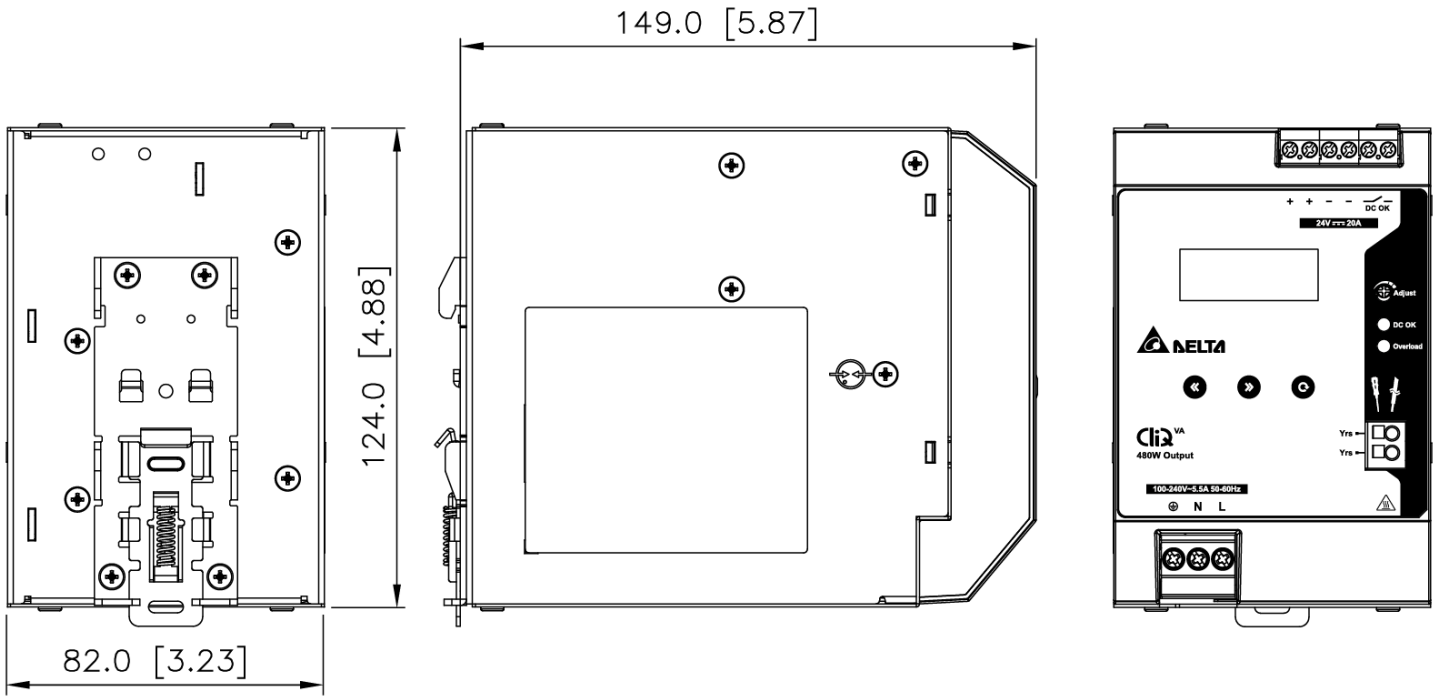
Dimensions

L x W x D: 124 x 82 x 149 mm (4.88 x 3.23 x 5.87 inch)



Engineering Data

Output Load De-rating VS Surrounding Air Temperature

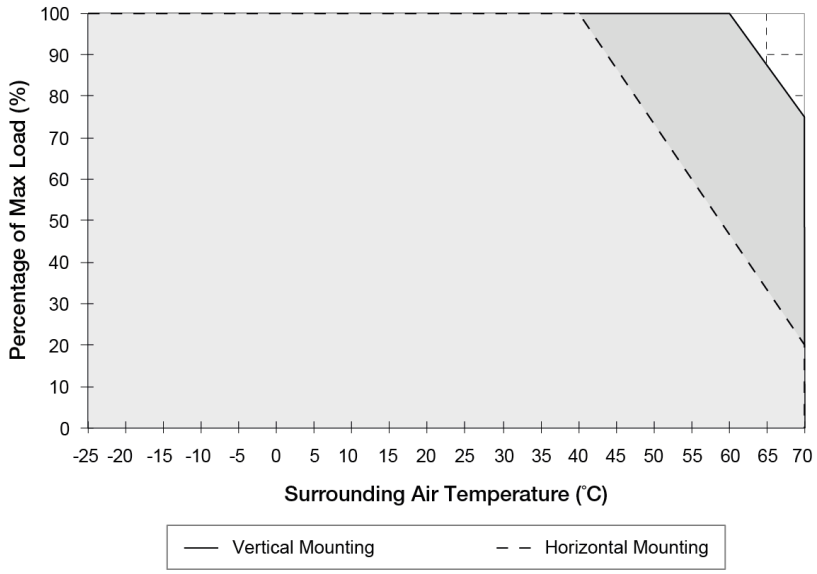


Fig. 5 **De-rating for Vertical Mounting Orientation**
> 60°C de-rate power by 2.5% / °C

De-rating for Horizontal Mounting Orientation
> 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. 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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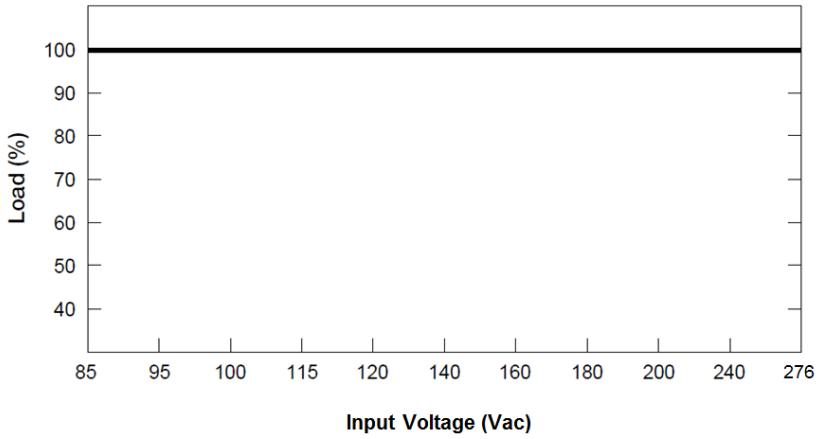
Output Load De-rating VS Input Voltage



- No output power de-rating 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 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

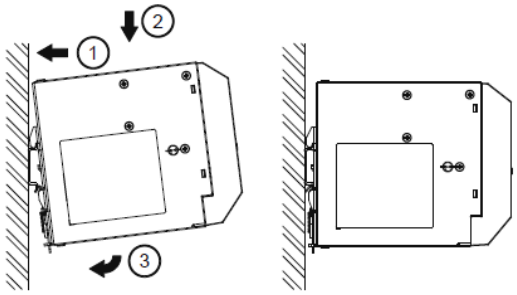


Fig. 6.1 Mounting

Dismounting

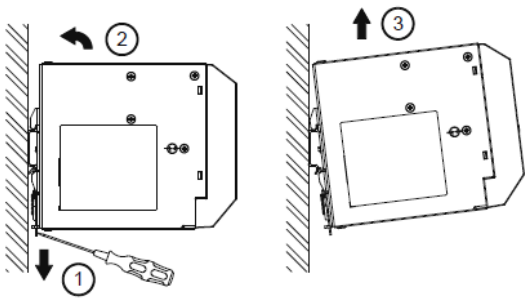


Fig. 6.2 Dismounting

In accordance to 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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CliQ VA DIN Rail Power Supply

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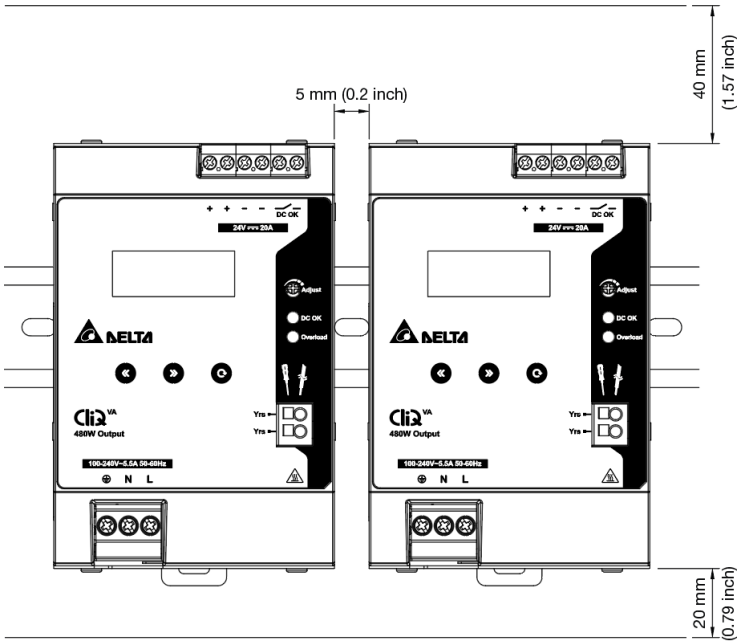
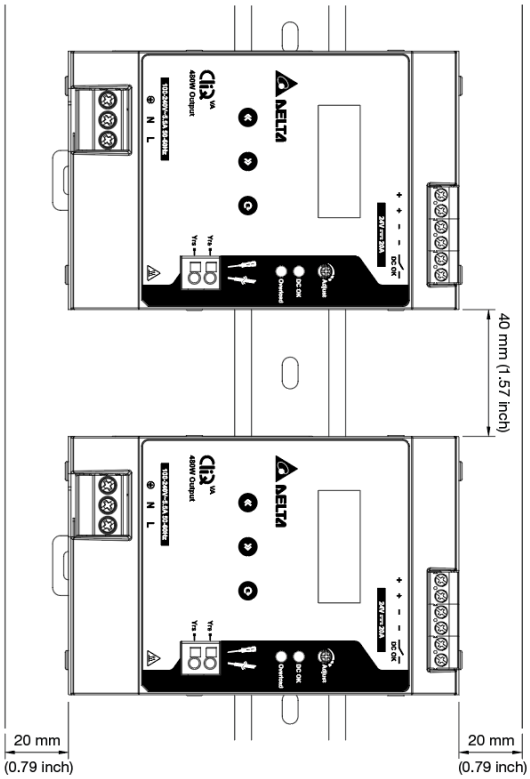
Safety Instructions

■ **Vertical Mounting**



■ **Horizontal Mounting**



- An easily accessible disconnecting device shall be provided to disconnect the unit from the mains supply for servicing.
- 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.

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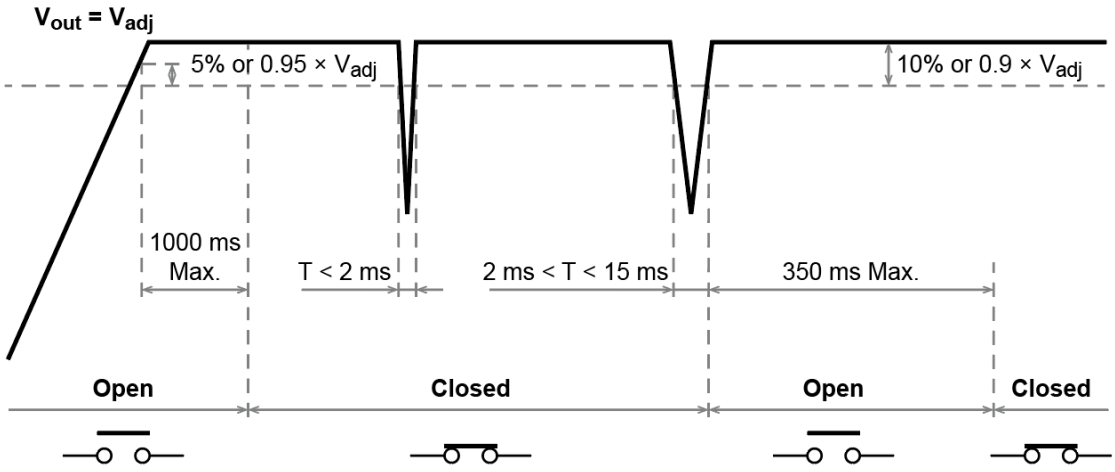
Functions

DC OK Relay Contacts and LED Indicator Characteristics

DC OK Relay Contacts Status	Characteristics
Contact closes	The output voltage reaches 95% of its steady state set value. The contact will close within 1000 ms.
Contact opens	The output voltage dip lower than 90% of its steady state set value: • Output voltage dip duration less than 2 ms will be ignored. • Output voltage dip duration more than 2 ms. The contact will open within 15 ms and remain open for an extended duration up to 350 ms max.
Contact re-closes	The output voltage reaches 90% of its steady state set value. The contact will close in 350 ms max.



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 (Vout ≤ 90% of adjusted voltage)	OFF	ON	Open
Output Short Circuit	OFF	Flashing	Open
Over Temperature	OFF	Flashing	Open
No Input Power	OFF	OFF	Open

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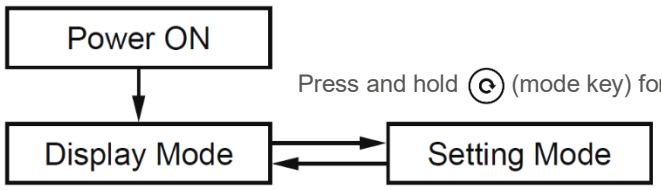
Display Functions and Operating Procedures

LCD module has the function to display the output voltage, output current, peak hold current, lifetime expectancy, ambient temperature, KWH in “Display Mode” and set years alarm value, reset peak hold current/KWH in “Setting Mode”.

Years alarm signal checking mode and failure display mode are also available in this CliQ VA series.

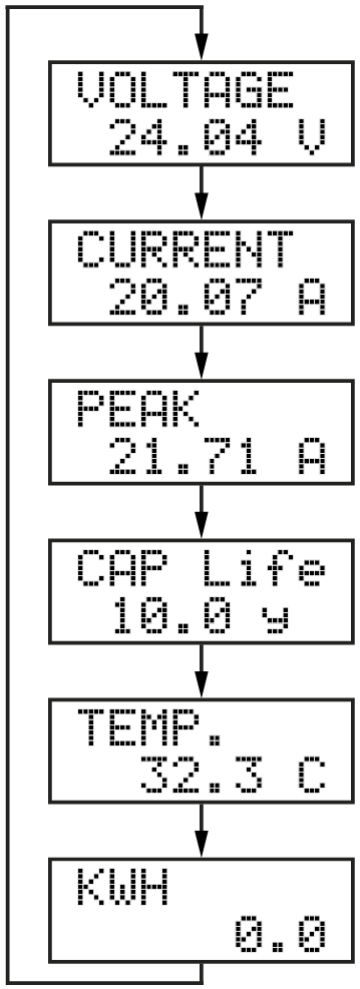
■ **Mode Change**



Press and hold (mode key) for 5 seconds or more to change the mode.

■ **Display Mode**

- By default, the power supply unit is set to auto display mode and will show the status in the following sequence below.
- Press (mode key) to freeze the current indicated status on the LCD display.
- Press « or » (back or forward key) to move between each status.
- Press (mode key) to return to auto display mode.



Output voltage
Values will show up to 2 decimal places (accuracy of output voltage indication is ±2%).

Output current
Values will show up to 2 decimal places (accuracy of output current indication is ±5%).*

Peak hold current
Values will show up to 2 decimal places (accuracy of peak hold current indication is ±5%).*
The minimum signal width required for hold current is 20ms.

Lifetime expectancy
Values will show up to 1 decimal place. The lifetime expectancy is calculated by the amount of deterioration according to the running hours and inside ambient temperature.

Ambient temperature
This is ambient temperature inside the power supply unit. Monitored readings will be displayed about 30 seconds after it is turned on. Values will show up to 1 decimal place.

KWH
Values will show up to 1 decimal place. The KWH is calculated based on the running hours and output power.

*If Io < 5%, accuracy is ±10%.

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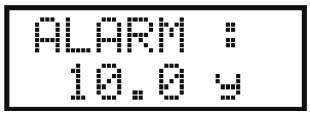
■ Setting Mode

- Press and hold (mode key) for 5 seconds or more to change from “Display Mode” to “Setting Mode”.
- The power supply unit will show the items in the following sequence below.

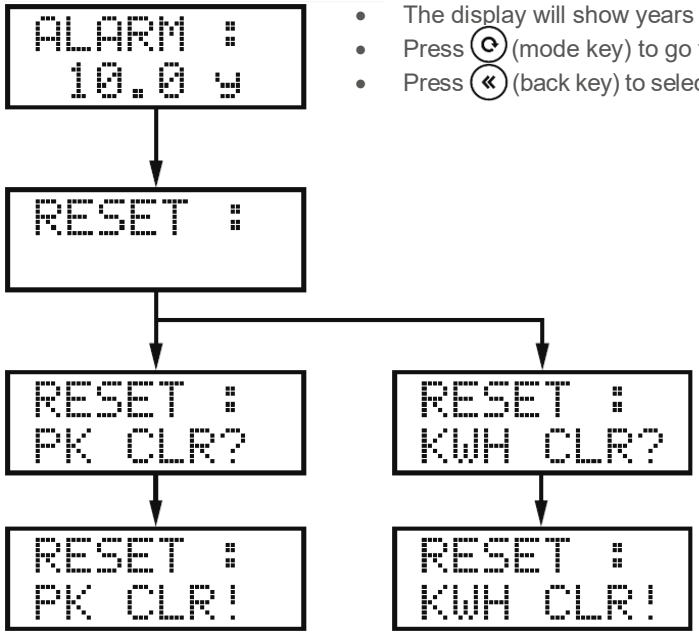
1) Years Alarm



- The display will show years alarm with the current setting, years alarm signal is counting the total running time of power supply. The user could be using this signal for maintenance forecast.
- Press « or » (back or forward key) to increase or decrease the alarm setting. (Factory setting is default 10.0 years and minimum setting is 0.5 years.)
- Once the desired value is SET, press (mode key) for 5 seconds or more to finish the task. The display will be changed to “Display Mode” after finish the years alarm setting.

Note: To return to auto display mode, press and hold (mode key) for 5 seconds or more.

2) Reset



- The display will show years alarm with the current setting.
- Press (mode key) to go to “RESET”.
- Press « (back key) to select peak hold current or press » (forward key) to select KWH.

Press (mode key) to confirm and clear peak hold current or KWH value.

Note: To return to auto display mode, press and hold (mode key) for 5 seconds or more.

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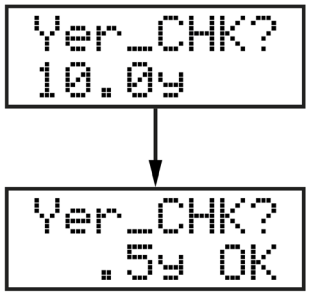
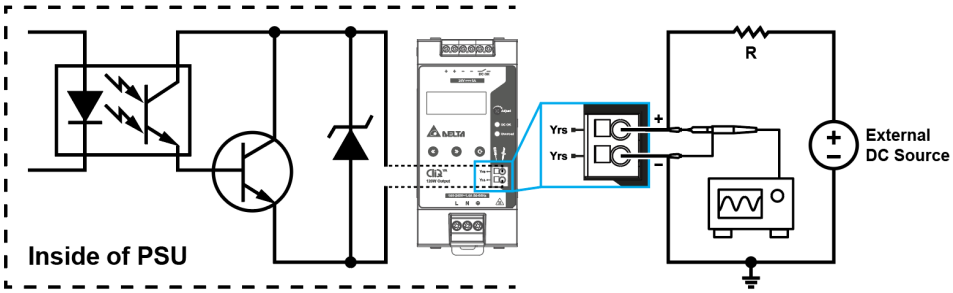
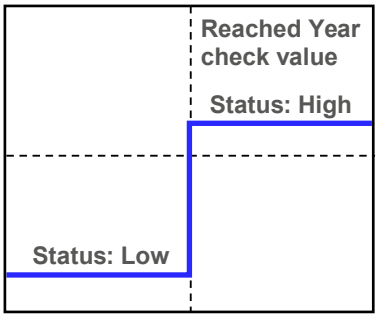
■ Years Alarm Signal Checking Mode

- The CliQ VA series has function “speed up check” for years alarm signal.
- Press « and » together (back and forward key) for 5 seconds or more to change from “Display Mode” to “Years Alarm Signal Checking Mode”.
- The power supply unit will show the items in the following sequence below.

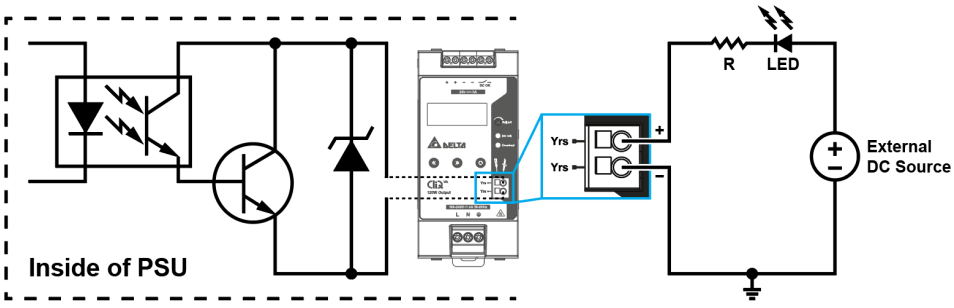
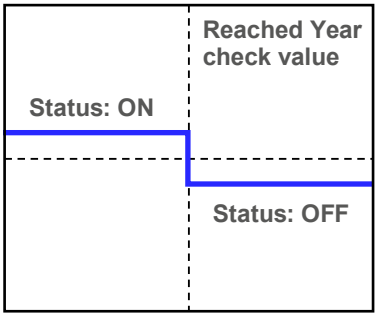


- The display will be changed to “Years Alarm Signal Checking Mode”.
- Press (mode key) to confirm years alarm signal check.
- The program will start counting running time (speed up) from 10 years back to the alarm year as original setting.
- After counting is complete, display will be changed to years alarm signal check OK.

Note: To return to auto display mode, press and hold (mode key) for 5 seconds or more.

Years Alarm Signal Connection Diagram*	Years Alarm Signal Status
	

- The years alarm signal status is Low when the set value of alarm year has not been reached.
- The years alarm signal status will be changed from Low to High when the set value of alarm year has been reached.

Years Alarm Signal Connection Diagram with LED*	LED Status
	

- The LED is ON when the set value of alarm year has not been reached.
- The LED will be changed from ON to OFF when the set value of alarm year has been reached.

*The applied voltage should be 30 V Max. with sink current of 10 mA Max.

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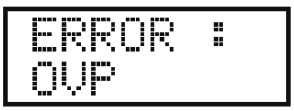
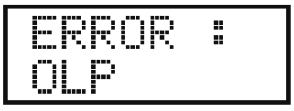
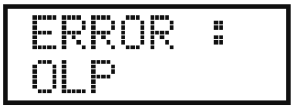
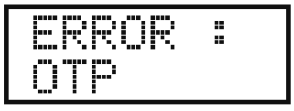
■ Failure Mode Display

- There are failure mode display for power supply protections as below.
- Press (mode key) to clear error messages and return to auto display mode.

	**When overvoltage protection occurs (Auto-recovery)**
	**When overload/over current protection occurs (Auto-recovery)**
	**When short circuit protection occurs (Auto-recovery)**
	**When over temperature protection occurs (Auto-recovery)**

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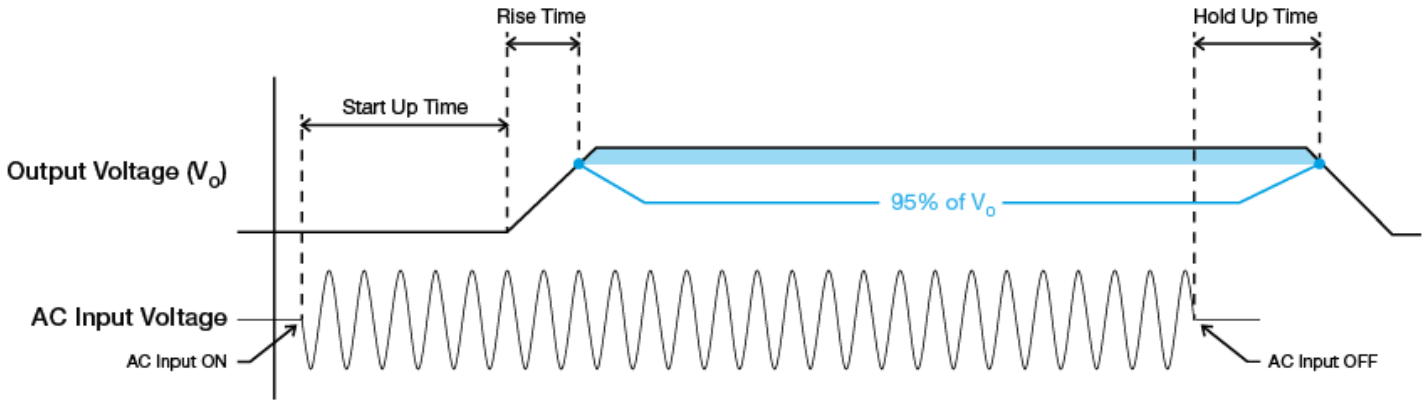
■ **Graph illustrating the Start-up Time, Rise Time, and Hold-up Time**



Start-up Time

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

Rise Time

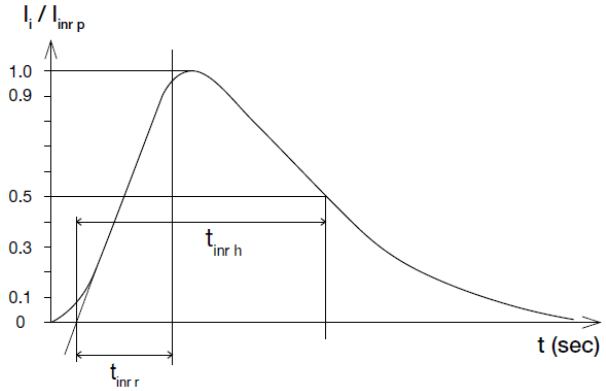
The time required for the output voltage to change from 0% to 95% of its final steady state set value.

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

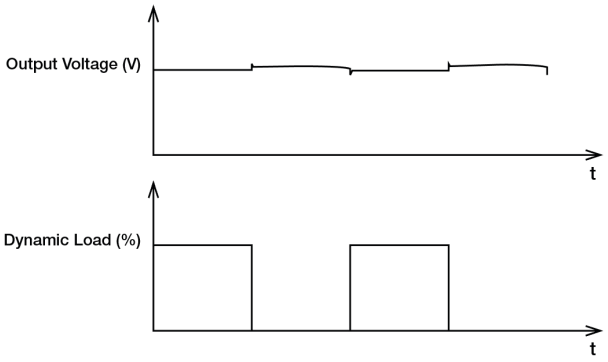
Inrush current is the peak, instantaneous, input current measured and, occurs when the input voltage is first applied. For AC input voltages, the maximum peak value of inrush current will occur during the first half cycle of the applied AC voltage. This peak value decreases exponentially during subsequent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



Dynamic Response

The power supply output voltage will 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**



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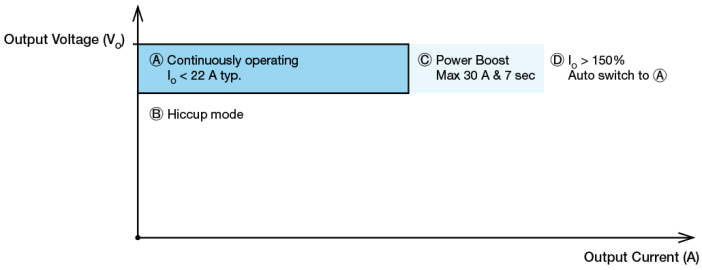
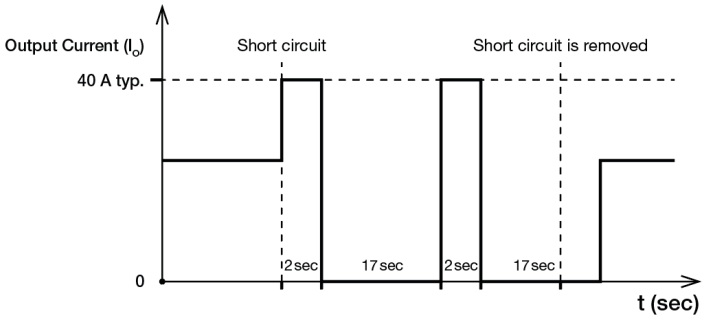
Overload & Overcurrent Protections (Auto-Recovery)

The power supply's Overload (OLP) and Overcurrent (OCP) Protections will be activated when output current (I_O) is > 150% of maximum rated load. In such occurrence, the I_O will limit to 22 A typ. (refer to Ⓐ below) and output voltage (V_O) will start to droop. Once V_O is below approximately 18 Vdc typ., the power supply will start to operate in "Hiccup mode" as described in short circuit protection. The power supply will recover once the fault condition due to OLP or OCP is removed, then I_O is back within its specified limits.



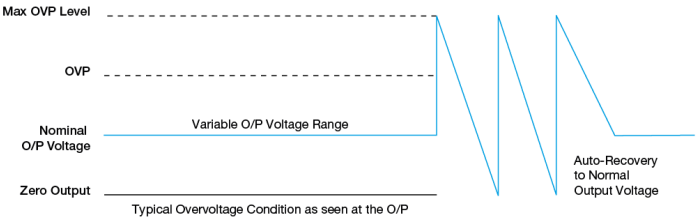
Short Circuit Protection (Auto-Recovery)

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 start to 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 22 A typ. and V_O (output voltage) will start to droop, refer to the details in overload & overcurrent protections and the next Power Boost will be available after power boost recovery time defined on Page 4. In order to avoid this, 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.

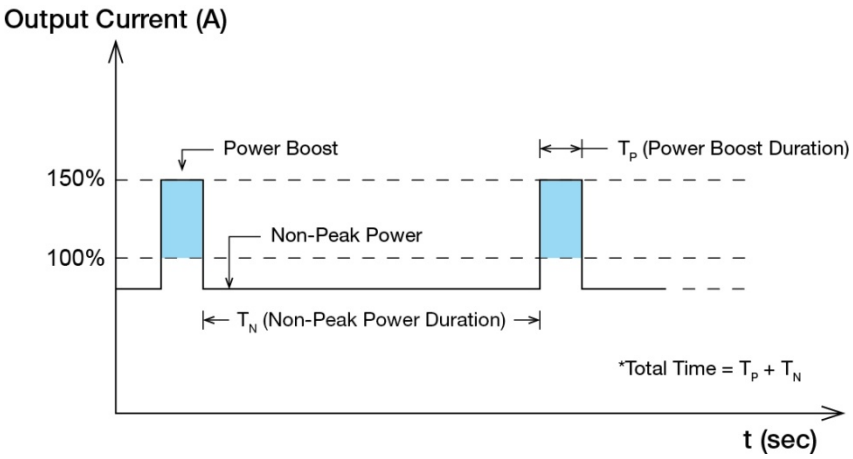

Fig. 7 Duty Cycle Calculation

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

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

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%	720	1 sec	10%	453 W	9 sec	10 sec
150%	720	5 sec	30%	376 W	11.5 sec	16.5 sec
125%	600	1 sec	10%	467 W	9 sec	10 sec
125%	600	5 sec	30%	428 W	11.5 sec	16.5 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.

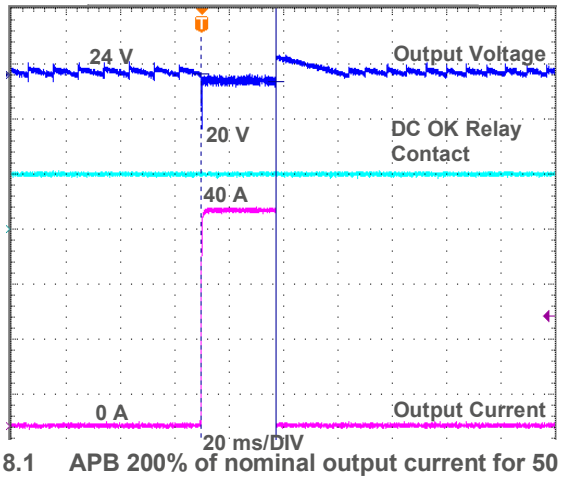

Fig. 8.1 APB 200% of nominal output current for 50 ms

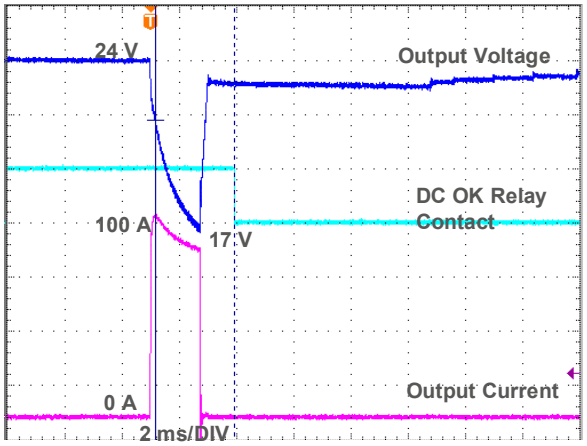

Fig. 8.2 APB 500% of nominal output current for 2 ms

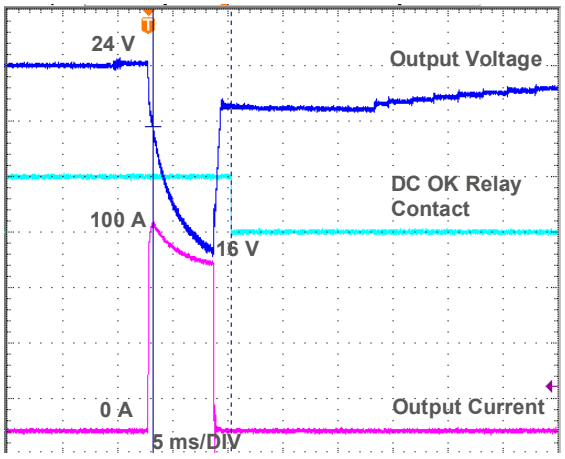

Fig. 8.3 APB 500% of nominal output current for 5 ms

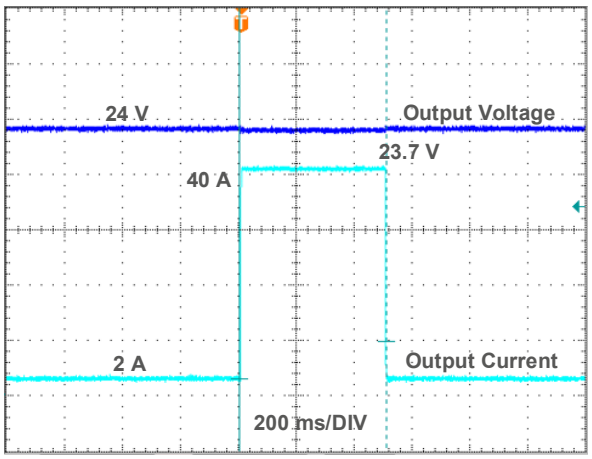

Fig. 8.4 APB 200% of nominal output current for 500 ms

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

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Operating Mode

■ Redundant Operation

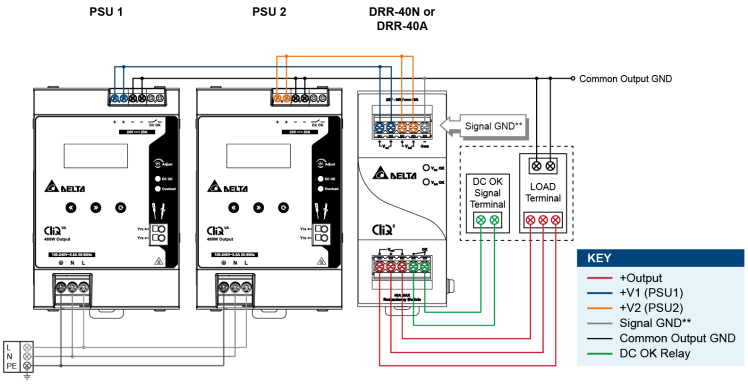
In order to ensure proper redundant operation for the power supply units (PSUs), the output voltage difference between the two units must be kept at 0.45~0.50 V for these 24 V supplies. Follow simple steps given below to set them up for the redundant operation:

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 voltage, 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-40N (or 40A) 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).

*Vdrop 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. 9 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.

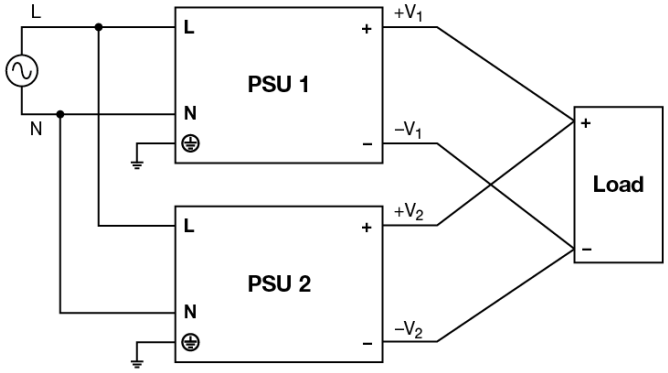


Fig. 10 Parallel Operation Connection Diagram

CliQ VA DIN Rail Power Supply
24 V 480 W 1 Phase / DRV-24V480W1PN

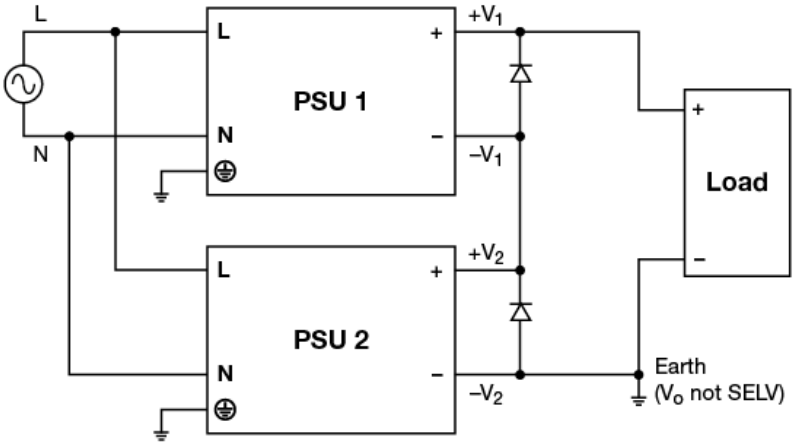
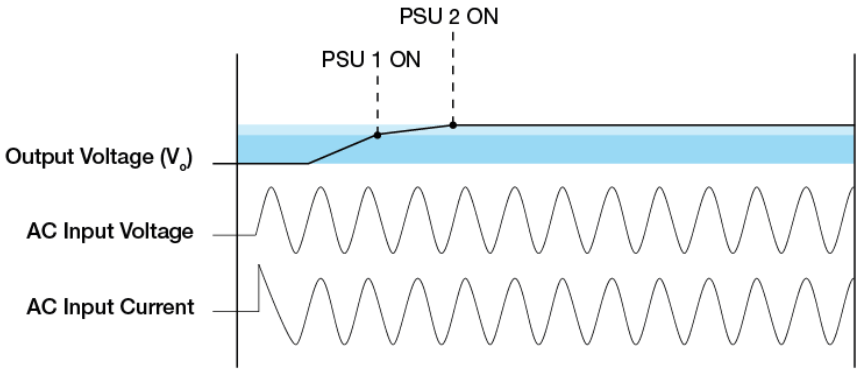


Fig. 11 Series Operation Connection Diagram

■ Series Operation

Delta's CliQ VA 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 can be dangerous. Under any circumstances, the total voltage shall not exceed 150 Vdc. When the total voltage exceeds the SELV limit of 60 Vdc, a protective barrier that protects against touching the output terminals must be installed. The output ground (DC Return) terminals of each power supply must also be connected to Earth ground. 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 be connected across $+V_2$ & $-V_2$ which means the 2 power supply output will be connected in opposite polarity; and may, cause damage to one or both power supplies. With diode connected in reverse bias across the output, the voltage across each power supply output 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. Example: When two 24 V power supplies are connected in series, the total voltage is 48 volts. Hence, it is 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.

Send Quote Requests to info@automatedpt.com
Call +1(800)985-6929 To Order or Order Online At Deltaacdrives.com

CliQ VA DIN Rail Power Supply

24 V 480 W 1 Phase / DRV-24V480W1PN

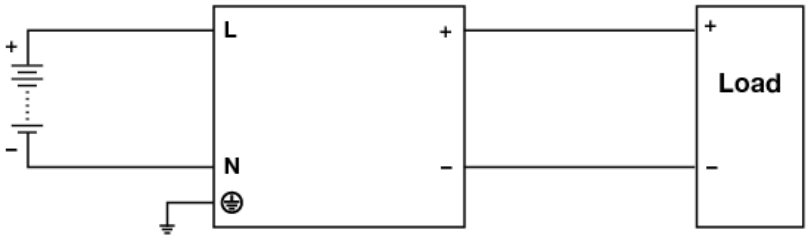


Fig. 12 DC Input Operation Connection Diagram

■ 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.

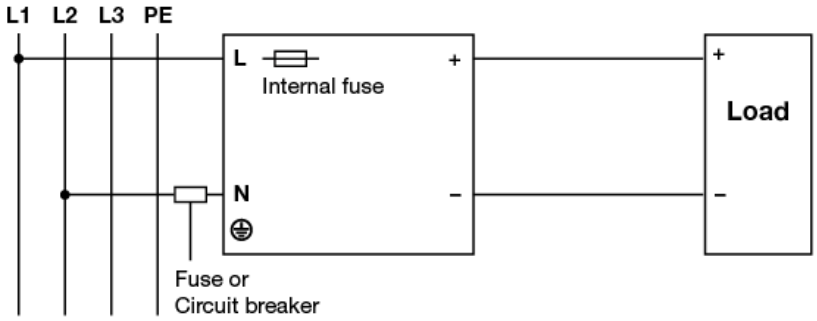


Fig. 13 2 of 3 Phase System Input Operation Connection Diagram

■ 2 of 3 Phase System Input Operation

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

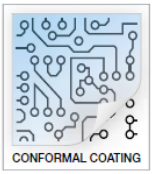
Step 1.
The input voltage applied from Line to Neutral is below the maximum rated input. The input voltage shall be below 240 Vac +10%.

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.

CliQ VA DIN Rail Power Supply
24 V 480 W 1 Phase / DRV-24V480W1PN

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 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.

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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