RACPRO1 Series Switching Power Supplies 1-Phase

Overview

The slim RACPRO1 series is a high-reliability, single-phase AC input, DIN rail mount power supply. It is specially designed for demanding applications in the harsh industrial automation field. The unique and innovative modern design with 25-degree push-in connectors allows easy tool-less installation or replacement.

Features

- Slim design with 25-degree push-in connectors
- Fast tool-less mounting and demounting
- DC-OK Signal
- Thermal power bonus 120%/45 °C
- Power Boost 150% for 5s
- 3-year warranty

RACPRO1-S240E/12

Switching Power Supplies 1-Phase Selection Chart

Part Number	Price	Output	Output Voltage Range	Input Voltage Range	Efficiency (@ +25 °C)	Dimensions H x W x D mm [in]	Weight gram [lb]	Drawing Link
RACPRO1-S120/12	$105.00	12 VDC @ 8A/96W (adjustable)	12–15 VDC	85–277 VAC / 88–370 VDC	90.3% @ 230 VAC	100.00 x 28.00 x 112.00 [3.90 x 1.10 x 4.40]	330 [0.73]	PDF
RACPRO1-S120/24	$105.00	24 VDC @ 5A/120W (adjustable)	24–29 VDC		93% @ 230 VAC			PDF
RACPRO1-S120/48	$105.00	48 VDC @ 2.5A/120W (adjustable)	48–56 VDC		93% @ 230 VAC			PDF
RACPRO1-S240E/12	$120.00	12 VDC @ 15A/180W (adjustable)	12–15 VDC	85–132 VAC / 170–277 VAC	91.3% @ 230 VAC	125.00 x 39.00 x 139.00 [4.90 x 1.50 x 4.47]	600 [1.32]	PDF
RACPRO1-S240E/24	$120.00	24 VDC @ 10A/240W (adjustable)	24–29 VDC		93.1% @ 230 VAC			PDF
RACPRO1-S240E/48	$120.00	48 VDC @ 5A/240W (adjustable)	48–56 VDC		94% @ 230 VAC			PDF
RACPRO1-S240/24	$158.00	24 VDC @ 10A/240W (adjustable)	24–29 VDC	85–277 VAC / 88–370 VDC	95% @ 230 VAC			PDF
RACPRO1-S480/24	$220.00	24 VDC @ 20A/480W (adjustable)	24–28 VDC		95% @ 230 VAC	135.00 x 52.00 x 155.00 [5.30 x 2.00 x 6.10]	790 [1.74]	PDF
RACPRO1-S480/48	$220.00	48 VDC @ 10A/480W (adjustable)	48–56 VDC		95.4% @ 230 VAC			PDF

Switching Power Supplies 1-Phase

Part Number	Input/Output Cage Clamp								Push-in Signal Terminal *			
	Function	AWG	mm^2	Wire Stripping Length	Function	AWG	mm^2	Wire Stripping Length	Function	AWG	mm^2	Wire Stripping Length
120, 240E and 240 Watt Models	L, N	24–12	0.25–4	10–12mm	+1, +2 (Vout)	24–12	0.25–4	10–12mm	Signal (13,14)	24–16	0.25–1.5	8–9mm
	PE				-1, -2 (Vout)							
480 Watt Models	L, N	24–8	0.25–6	12–13mm	+1, +2 (Vout)	24–8	0.25–6	12–13mm				
	PE				-1, -2 (Vout)							

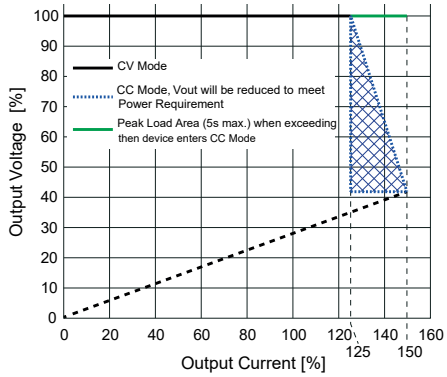
*** Do not connect to hazardous voltages. Ferrules are required for stranded wire.**
Use flexible (stranded wire) or solid cables with above wire cross-section is recommended. Use copper conductors designed for an operating temperature of at least 90 °C.

RACPRO1 Series Switching Power Supplies 1-Phase S120 Models

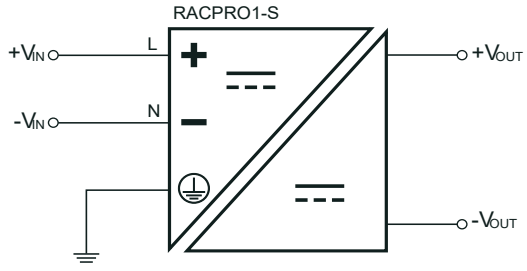
Specifications			
Model	***S120***		
Nominal Input Voltage	50/60 Hz		120 to 240 VAC
	DC Input		120 to 240 VDC
Operating Range [1]	47–63 Hz		85 to 277 VAC
	DC Operation (Refer to Connections for DC Operation Diagram)		88 to 370 VDC
Turn-on Voltage	AC Operation		Typical 70 VAC
	DC Operation		Typical 85 VDC
Turn-off Voltage	AC Operation		Typical 60 VAC
	DC Operation		Typical 65 VDC
Input Current	AC Operation	RACPRO1-S120/12	Typical 120 VAC 2.2A, 240 VAC 1.1A
		RACPRO1-S120/24 and RACPRO1-S120/48	Typical 120 VAC 2.2A, 240 VAC 1.2A
	DC Operation	RACPRO1-S120/12	Typical 110 VDC 1.1A, 240 VDC 0.4A
		RACPRO1-S120/24 and RACPRO1-S120/48	Typical 110 VDC 1.2A, 240 VDC 0.5A
Inrush Current	Cold Start		120 VAC 9A, 240 VAC 19A
No Load Power Consumption	120 VAC		Typical 200 mW
	230 VAC		Typical 300 mW
Input Frequency Range	—		47–63 Hz
Nominal Output Voltage (Factory Set)	RACPRO1-S120/12		Typical 12 VDC
	RACPRO1-T480/24RACPRO1-S120/24		Typical 24 VDC
	RACPRO1-S120/48		Typical 48 VDC
Minimum Load	—		0%
Power Factor	Full load		Typical 0.6
Start-up Time	—		Typical 190 ms maximum 300 ms
Rise Time	—		Typical 70 ms maximum 100 ms
Hold-up Time	120 VAC		Minimum 12 ms typical 15 ms
	230 VAC		Minimum 58 ms typical 73 ms
Internal Operating Frequency	—		Typical 70 kHz
Ripple and Noise	20 MHz Bandwidth		Maximum 100 mVp-p
Housing Material	—		Polycarbonate (UL94 V-0) / aluminum
Agency Approvals	—		cULus File E550315 CE

Measured @ T_{AMB} = 25 °C, 230 VAC full load and after warm-up unless otherwise stated.
[1] The products were submitted for safety files at AC and DC-Input operation. (120–240 VAC ±10% and 110–240 VDC -15/+20%) .
Output power derating for Line-input of less than: 120 VAC (derate linearly from 100% at 120VAC to 80% at 85 VAC).
120 VDC (derate linearly from 100% at 120 VDC to 80% at 88 VDC).

U/I Characteristic

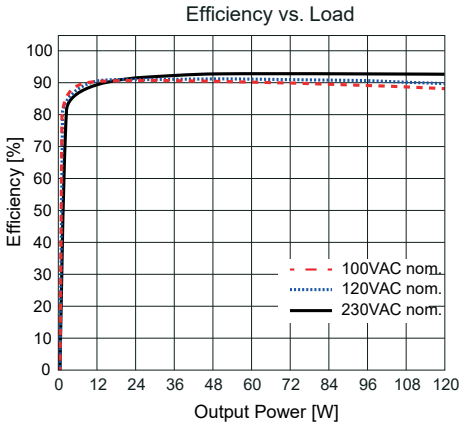


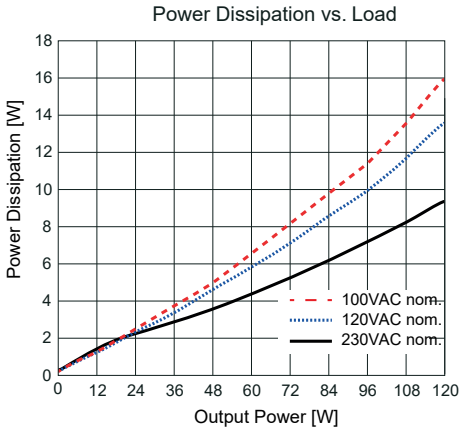
Connections for DC Operation



RACPRO1 Series Switching Power Supplies 1-Phase S120 Models

Characteristic Curves for RACPRO1-S120/24





Additional Features			
Parameter	***Condition***		***Value***
Output Voltage Adjustability (1)	Potentiometer	RACPRO1-S120/12	12–15 VDC
		RACPRO1-S120/24	24–29 VDC
		RACPRO1-S120/48	48–56 VDC
Boost Power	Refer to Boost Power		150% for 5s
DC-OK LED	LED Green		Output voltage OK, normal mode
	LED off		Abnormal mode, no operation or failure
Signal Contact	Closed		Normal mode
	Open		Abnormal mode, no operation or failure
Signal Contact Rating	Do not connect signaling contact to hazardous voltages	RACPRO1-S120/12 and RACPRO1-S120/24	30 VDC / 0.1A
		RACPRO1-S120/48	60 VDC / 0.1A

(1) **Make sure that the maximum rated output power will not be exceeded when trimming up.**

Regulations		
Parameter	***Condition***	***Value***
Output Accuracy	—	Maximum ±1.0%
Line Regulation	Low line to high line, full load	Maximum ±0.1%
Load Regulation	0–100% load	Maximum ±0.5%
Max. Capacitive Load (Start-up)	RACPRO1-S120/12	16 mF
	RACPRO1-S120/24	10 mF
	RACPRO1-S120/48	5 mF
Transient Response	10–100% load	Typical ±2.0%
	Recovery time	Typical 10 ms

Measured @ T_{AMB} = 25 °C, 230 VAC full load and after warm-up unless otherwise stated.

RACPRO1 Series Switching Power Supplies 1-Phase S120 Models

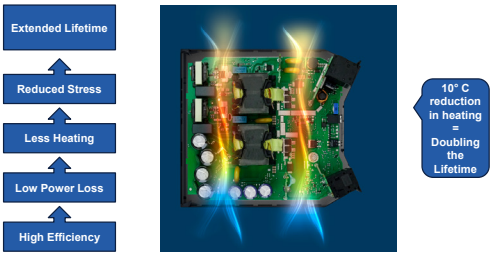
Protections			
Parameter	***Type***		***Value***
Internal Input Fuse	T3.15A, slow-blow		
External Input Protection	Maximum 16A C-characteristic circuit breaker or faster		
Short Circuit Protection (SCP)	Hiccup mode, auto recovery		
Over Voltage Protection (OVP)	SELV output	RACPRO1-S120/12	19 VDC, hiccup mode
		RACPRO1-S120/24	35 VDC, hiccup mode
		RACPRO1-S120/48	59.8 VDC, hiccup mode
Return Voltage Immunity	Continuous	RACPRO1-S120/12	Maximum 20 VDC
		RACPRO1-S120/24	Maximum 35 VDC
		RACPRO1-S120/48	Maximum 63 VDC
	<5 min	RACPRO1-S120/12	Maximum 25 VDC
		RACPRO1-S120/24	Maximum 38 VDC
		RACPRO1-S120/48	Maximum 63 VDC
Absorbing Energy	—	RACPRO1-S120/12	0.75J
		RACPRO1-S120/24	0.58J
		RACPRO1-S120/48	0.40J
Over Voltage Category (OVC)	OVC II (5000m)		
	OVC III (2000m)		
Over Current Protection (OCP)	<5s		> 150% of rated load current, hiccup mode, auto recovery
Class of Equipment	Class I with PE connection		
Isolation Voltage (Safety Certified) (1)	I/P to O/P (tested for 1 minute)		3 kVAC / 4 kVDC
	I/P to PE (tested for 1 minute)		1.6 kVAC / 2.5 kVDC
	O/P to PE (tested for 1 minute)		500 VAC / 700 VDC
Isolation Resistance	I/P to O/P		Minimum 4.5 MΩ
Insulation Grade	Reinforced		
Earth Leakage Current	240 VAC / 60 Hz		Maximum 1 mA

Measured @ T_{AMB} = 25 °C, 230 VAC full load and after warm-up unless otherwise stated.
(1) For repeat Hi-Pot testing, reduce the time and/or the test voltage.

RACPRO1 Series Switching Power Supplies 1-Phase S120 Models

Environmental		
Parameter	***Condition***	***Value***
Operating Ambient Temperature Range	At Natural Convection (0.1 m/s)	Derating -40 to +70 °C [-40 to +158 °F] Without derating refer to Derating graph
Operating Altitude	Refer to Altitude Derating graph	Recognized by safety agency for safe operation up to 5000m. High altitude operation may impact the performance and lifetime.
Operating Humidity	Non-condensing	95% RH max.
Pollution Degree	—	PD2
IP Rating	—	IP20
Shock	According to IEC 60068-2-27 Fa (non-operating)	15G/11 ms, 3 times (positive/negative) in all axis
Vibration	According to IEC 60068-2-6 Fc (non-operating)	5–8.4 Hz @ 3.5mm deflection 8.4–150 Hz @ 2G, 10 cycles/axis (min-max-min); 1 octave/min
MTBF	According to EN/IEC 61709 (SN29500); T_{AMB} = 40 °C	1590 x 10^3 hours
Lifetime Expectancy	230 VAC	Refer to lifetime expectancy table

Measured @ T_{AMB} = 25 °C, 230VAC full load and after warm-up unless otherwise stated.



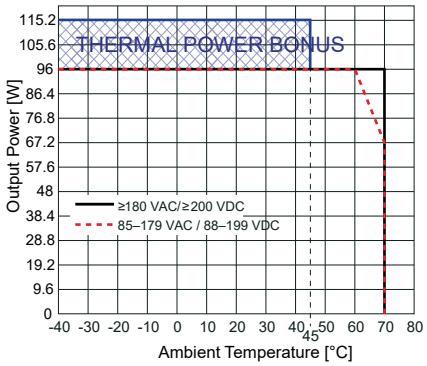
Lifetime Expectancy at 230 VAC for RACPRO1-S120/24			
Ambient Temperature	***50% Load***	***75% Load***	***100% Load***
+20 °C	1044 x 10^3h	923 x 10^3h	392 x 10^3h
+30 °C	522 x 10^3h	462 x 10^3h	196 x 10^3h
+40 °C	261 x 10^3h	231 x 10^3h	98 x 10^3h

The stated lifetime expectancy of more than 15 years is provided for comparison purposes only and does not imply continuous 24/7 operation.

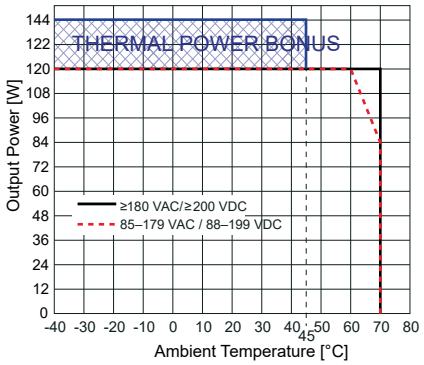
Derating Graph

(@ Chamber and natural convection 0.1m/s)

RACPRO1-S120/12

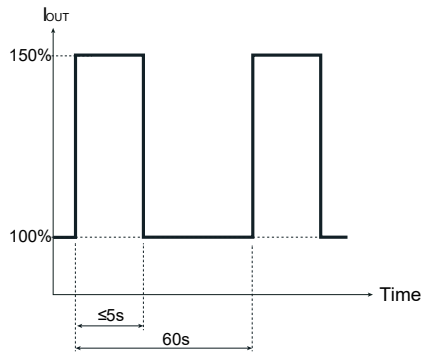


RACPRO1-S120/24, RACPRO1-S120/48

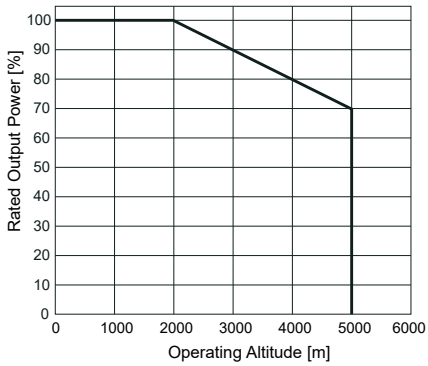


Thermal power bonus only applies at an input voltage ≥108 VAC and ≥150 VDC

Boost Power (-40 °C to +60 °C max)



Altitude Derating

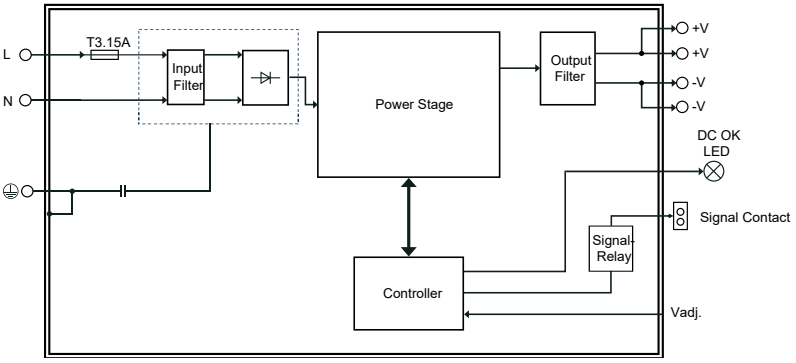


RACPRO1 Series Switching Power Supplies 1-Phase S120 Models

Safety & Certifications 1-Phase S120 RACPRO1 Series		
Certificate Type (Safety)	***Report Number***	***Standard***
Electrical Equipment For Measurement, Control, and Laboratory Use; Part 1: General Requirements (CB)	25TH0250_ 61010-1_0	IEC61010-1:2010+A1:2016 3rd Edition
Electrical Equipment For Measurement, Control, and Laboratory Use; Part 1: General Requirements		EN61010-1:2010+A1:2019
Electrical Equipment For Measurement, Control, and Laboratory Use; Part 1: General Requirements	E550315	UL61010-1:2012 3rd Edition CAN/CSA-C22.2 No. 61010-1-12 3rd Edition
Electrical Equipment For Measurement, Control, and Laboratory Use; Part 2-201: Particular requirements for control equipment (CB)	25TH0250_ 61010-1_0	IEC61010-2-201:2017 2nd Edition EN IEC 61010-2-201:2018
Electrical Equipment For Measurement, Control, and Laboratory Use; Part 2-201: Particular requirements for control equipment	E550315	UL61010-2-201:2018 2nd Edition CAN/CSA-C22.2 No. 61010-2-201: 2018-02-01
RoHS2	—	RoHS 2011/65/EU + AM2015/863

EMC Compliance According to IEC/EN61000-6-4/6-2 1-Phase S120 RACPRO1 Series		
EMC Compliance according to IEC/EN61000-6-4/6-2	***Condition***	***Standard / Criterion***
Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity standard for industrial environments	—	IEC/EN61000-6-2:2019
Electromagnetic compatibility (EMC) - Part 6-3: Generic standards - Emission standard for residential area	—	IEC/EN 61000-6-3:2021
ESD Electrostatic discharge immunity test	Air: ±8 kV; Contact: ±6 kV	IEC61000-4-2:2008, Criteria A EN61000-4-2:2009, Criteria A
Radiated, radio-frequency, electromagnetic field immunity test	10 V/m (80–1000 MHz)	IEC/EN61000-4-3:2006+A2:2010, Criteria A
Fast Transient and Burst Immunity	AC Power Port ±4 kV DC Output Port: ±2 kV	IEC/EN61000-4-4:2012 Criteria A
Surge Immunity	AC-Power Port L–N ±2 kV L1-PE; N-PE: ± 4 kV	IEC/EN61000-4-5:2014+A1:2017, Criteria A
Immunity to conducted disturbances, induced by radio-frequency fields	10 Vrms (0.15–80 MHz)	IEC61000-4-6:2013, Criteria A EN61000-4-6:2014, Criteria A
Power Magnetic Field Immunity	30 A/m, 50/60 Hz	EN61000-4-8:2010 Criteria A
Voltage Dips (230 VAC, 50 Hz)	100% 5 cycles 70% 10 cycles 40% 25 cycles 30% 25 cycles	IEC61000-4-11:2004+A1:2017, Criteria B
Voltage Interruptions (230 VAC, 50 Hz)	100% 250 cycles	IEC61000-4-11:2004+A1:2017, Criteria B
Limits of Harmonic Current Emissions	—	EN IEC 61000-3-2:2019
Limits of Voltage Fluctuations & Flicker	—	IEC61000-3-3:2013+A1:2017

Block Diagram



RACPRO1 Series Switching Power Supplies 1-Phase S120 Models

Parallel Operation for Redundancy 1+1

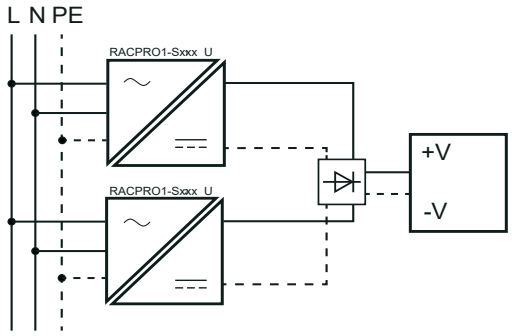
1) Adjust each power supply to the exact same output voltage with the same load and cooling conditions.

2) Use the same wire length and cable cross-section for each power supply (star connection) and energize all units at the same time to avoid triggering overload protection.

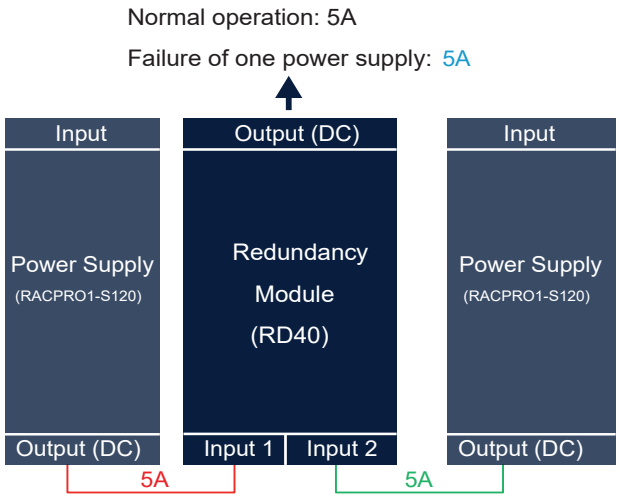
3) It must be ensured that one of the power supplies is able to provide the total required output power of the DC load to be supplied.

4) In normal operation, each of the two power supplies will be utilized by up to 50%.

5) **Attention**: To prevent high reverse currents in the event of a secondary output fault, it is recommended to install a protective circuit at the output of each device when more than two power supplies are connected in parallel (e.g. decoupling diode or DC fuse). Leakage current, EMI, inrush current, harmonics will increase when using multiple power supplies.



Please Note: This basic redundancy configuration does not protect against internal short circuits on the secondary side. In such cases, the faulty unit may draw current from the remaining supplies, resulting in loss of output regulation. To prevent this, use redundancy modules with integrated decoupling elements. RECOM offers the RACPRO1-RD40 redundancy module as a suitable solution for this purpose:



RACPRO1 Series Switching Power Supplies 1-Phase S120 Models

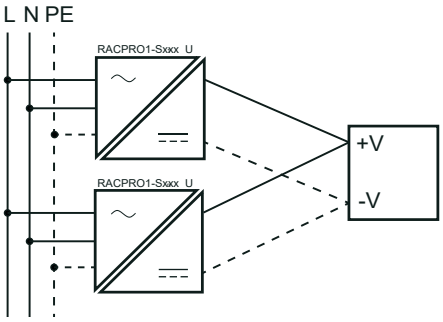
Parallel Operation For Increasing Output Power 1+n

1) Adjust each power supply to the exact same output voltage with the same load and cooling conditions.

2) Use the same wire length and cable cross-section for each power supply (star connection) and energize all units at the same time to avoid triggering overload protection.

3) A 10% safety margin may be recommended because the power distribution may be slightly asymmetrical depending on the cabling.

4) **Attention**: To prevent high reverse currents in the event of a secondary output fault, it is recommended to install a protective circuit at the output of each device when more than two power supplies are connected in parallel (e.g. decoupling diode or DC fuse). Leakage current, EMI, inrush current, harmonics will increase when using multiple power supplies.



Series Operation

1) Only use PSU with the same type and performance class with identical parameters.

2) To increase the DC output voltage, connect 2 or more power supply units in series.

3) Therefore, negative output terminal "-1" of the first power supply unit must be connected to the positive output terminal "+1" of the second power supply unit and routed to the load. Depending on the common output-side earth reference point of the power supply unit, see below table/figures as example.

4) **Attention**: Leakage current, EMI, inrush current, harmonics will increase when using power supplies.

Example with 2 PSUs In Series			
Part Number	***Figure 1***	***Figure 2***	***Figure 3***
RACPRO1-S120/24	+48 VDC	-48 VDC	±24 VDC
RACPRO1-S120/48	+96 VDC	-96 VDC	±48 VDC

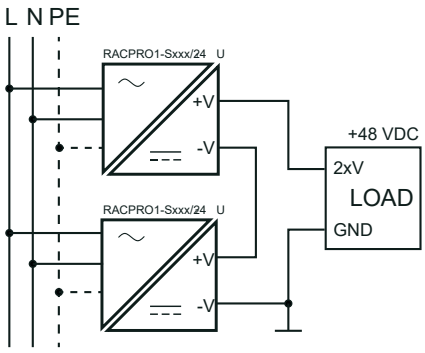


Figure 1

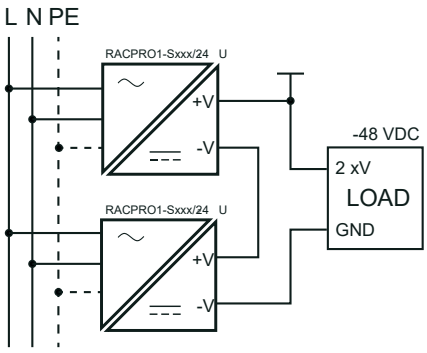


Figure 2

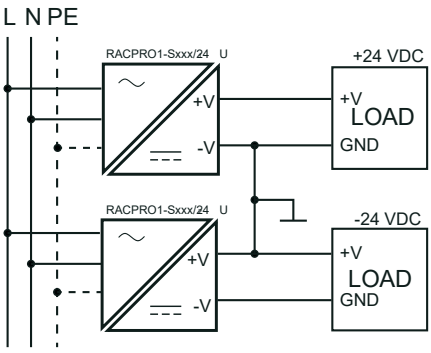


Figure 3