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)							

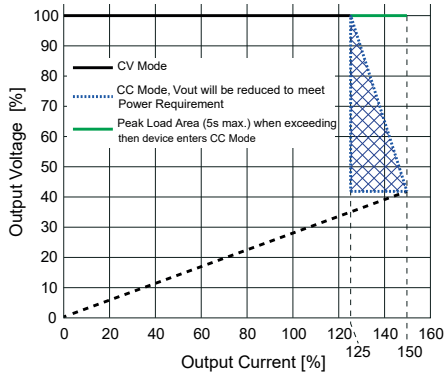
*** Do not connect to hazardous voltages. Ferrules are required for stranded wire.**
Use flexible (stranded wire) or solid cables with above wire cross-section is recommended. Use copper conductors designed for an operating temperature of at least 90 °C.

RACPRO1 Series Switching Power Supplies 1-Phase S240 Models

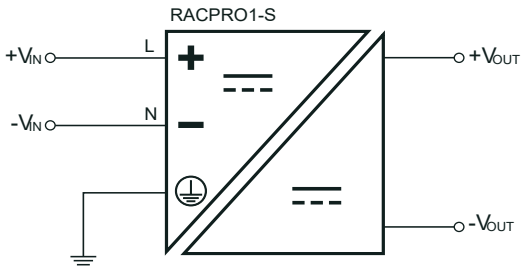
Specifications			
Models	***S240***		
Nominal Input Voltage (Automatic Voltage Selection)	50/60 Hz		120 to 240 VAC
	DC Input		110 to 240 VDC
Operating Range [1]	47–63 Hz		85 to 277 VAC
	Refer to Connections for DC Operation		88 to 370 VDC
Turn-on Voltage	AC Operation		Typical 70 VAC
	DC Operation		Typical 85 VDC
Turn-off Voltage	AC Operation		Typical 60 VAC
	DC Operation		Typical 65 VDC
Input Current	AC Operation	120 VAC	Typical 2.2A
		240 VAC	Typical 1.2A
	DC Operation	110 VDC	Typical 2.4A
		240 VDC	Typical 1.1A
Inrush Current	Cold Start	120 VAC	Maximum 2.9A
		240 VAC	Maximum 5.6A
No Load Power Consumption	120 VAC/240 VAC		Typical 1W maximum 2W
Input Frequency Range	47–63 Hz		
Nominal Output Voltage (Factory Set)	Typical 24 VDC		
Minimum Load	0%		
Power Factor	Full Load	120 VAC	Typical 0.99
		240 VAC	Typical 0.97
Start-up Time	240 VAC		Typical 700 ms maximum 1s
Rise Time	240 VAC		Typical 5 ms
Hold-up Time	240 VAC		Typical 33 ms
Internal Operating Frequency	Typical 70 kHz		
Ripple and Noise	20 MHz Bandwidth		Typical 100 mVp-p
			Maximum 120 mVp-p
Housing Material	Polycarbonate (UL94 V-0) / aluminum		
Agency Approvals	cULus File E550315, CE		

[1] **The products were submitted for safety files at AC and DC-Input operation. (120–240 VAC ±10% and 110–240 VDC -15/+20%)**
Measured @ T_{AMB} = 25 °C, 240 VAC full load and after warm-up unless otherwise stated.

U/I Characteristic

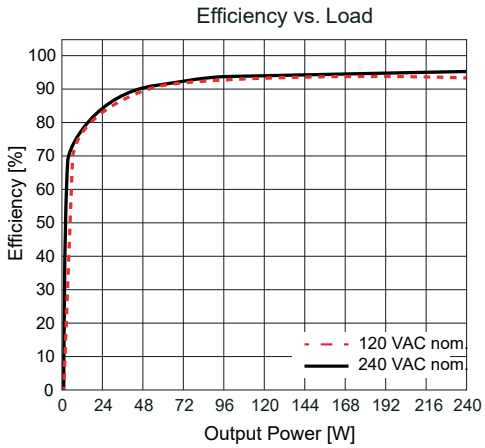


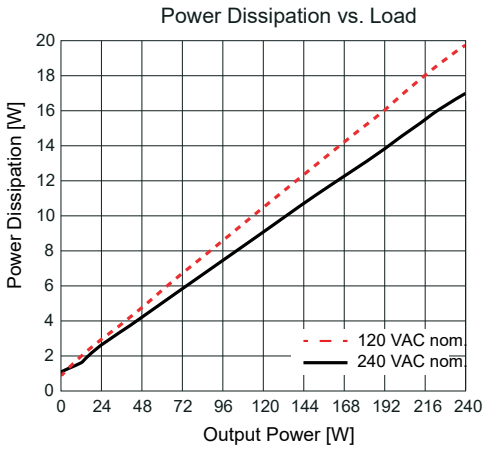
Connections for DC Operation



RACPRO1 Series Switching Power Supplies 1-Phase S240 Models

Characteristic Curves for RACPRO1-S240/24





Additional Features		
Parameter	***Condition***	***Value***
Output Voltage Adjustability (1)	Potentiometer	24–29 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	30 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)	—	80 mF
Transient Response	10–100% load	Typical ±1.5%
	Recovery time	Typical 1 ms

Measured @ T_{AMB} = 25 °C, 240 VAC full load and after warm-up unless otherwise stated.

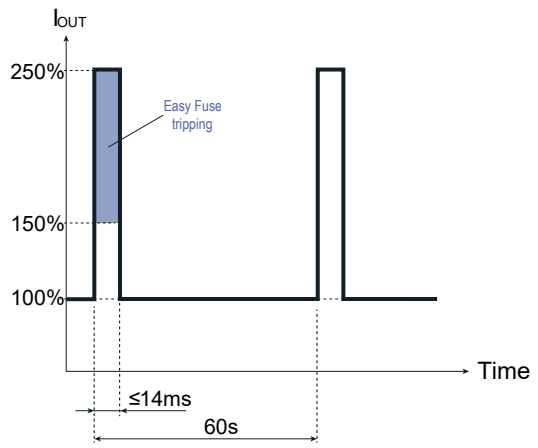
RACPRO1 Series Switching Power Supplies 1-Phase S240 Models

Protections		
Parameter	***Type***	***Value***
Internal Input Fuse	DC Compliant	T6.3A, slow-blow
Easy Fuse Tripping	Refer to Easy Fuse Tripping	250% / 14 ms
External Input Protection	—	16A max. C-characteristic circuit breaker or faster
Short Circuit Protection (SCP)	—	Hiccup mode, auto recovery
Over Voltage Protection (OVP)	SELV Output	33 VDC, hiccup mode
Return Voltage Immunity	Continuous	Maximum 50 VDC
Absorbing Energy	—	1.3J
Over Voltage Category (OVC)	—	OVC II (5000m)
Over Current Protection (OCP)	<5s	> 150% of rated load current, hiccup mode, auto recovery
	<14 ms (1)	>250% of rated load current, hiccup mode, auto recovery
Class of Equipment	—	Class I with PE connection
Isolation Voltage (Safety Certified) (2)	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	Mmaximum 1.5 mA

Measured @ T_{AMB} = 25 °C, 240 VAC full load and after warm-up unless otherwise stated.
(1) RACPRO1-S240/24 = 20 VDC min.
(2) For repeat Hi-Pot testing, reduce the time and/or the test voltage

Easy Fuse Tripping

(120–240 VAC or 240 VDC; -40 to +60 °C max.)

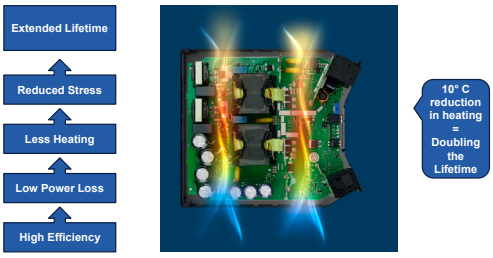


Easy fuse tripping is designed to trip a fuse in the event of a short circuit. Once the fuse has tripped, the current returns to its normal operation value. The impulse that causes easy fusing tripping happens independently of the power boost.

RACPRO1 Series Switching Power Supplies 1-Phase S240 Models

Environmental		
Parameter	***Condition***	***Value***
Operating Ambient Temperature Range	At Natural Convection (0.1m/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	1013 x 10^3 hours
Lifetime Expectancy (1)	230 VAC	Refer to lifetime expectancy table

Measured @ T_{AMB}= 25 °C, 240 VAC full load and after warm-up unless otherwise stated.

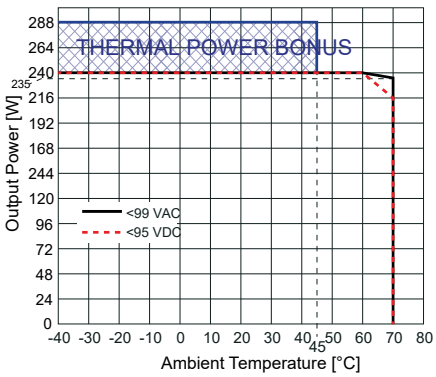


Lifetime Expectancy at 230 VAC for RACPRO1-S240/24			
Ambient Temperature	***50% Load***	***75% Load***	***100% Load***
+20 °C	1255 x 10^3h	1092 x 10^3h	546 x 10^3h
+30 °C	627 x 10^3h	546 x 10^3h	273 x 10^3h
+40 °C	314 x 10^3h	273 x 10^3h	137 x 10^3h

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

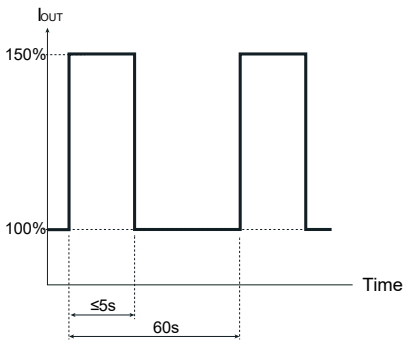
(@ Chamber and natural convection 0.1m/s)



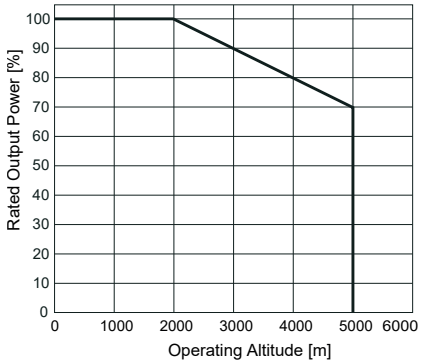
Thermal power bonus only applies at an input voltage ≥90 VAC and ≥106 VDC

Boost Power

(-40 °C to +60 °C max)



Altitude Derating

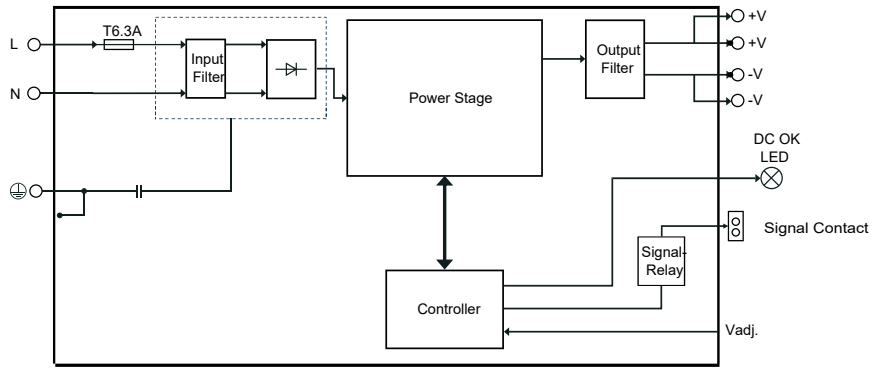


RACPRO1 Series Switching Power Supplies 1-Phase S240 Models

Safety & Certifications 1-Phase S240 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 S240 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: ±8kV; 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 S240 Models

Parallel Operation For Increasing Output Power 1+1

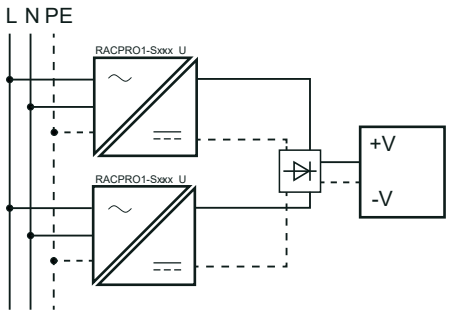
1) Adjust each power supply to the exact same output voltage with the same load and cooling conditions.

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**: Leakage current, EMI, inrush current, harmonics will increase when using multiple power supplies.



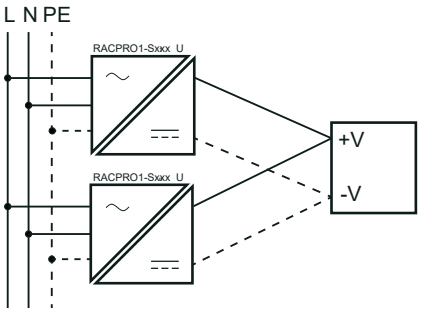
Parallel Operation For Increasing Output Power 1+n

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**: Leakage current, EMI, inrush current, harmonics will increase when using multiple power supplies.



RACPRO1 Series Switching Power Supplies 1-Phase S240 Models

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-S240/24	+48 VDC	-48 VDC	±24 VDC

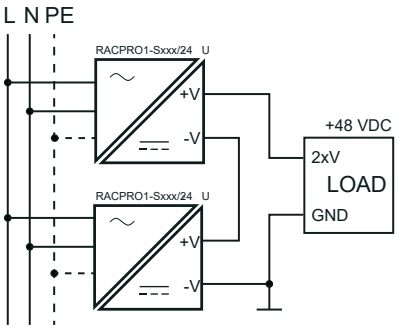


Figure 1

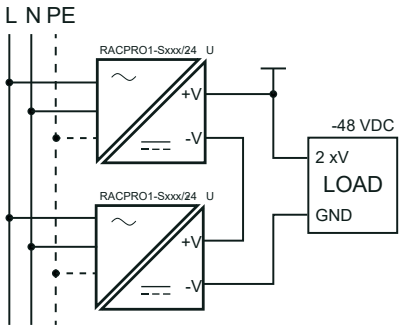


Figure 2

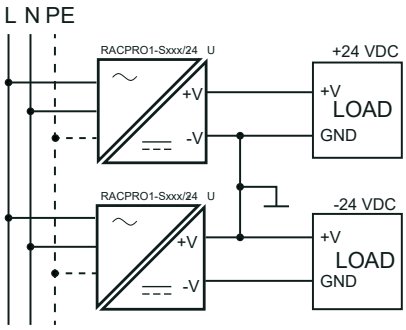


Figure 3