



# RHINO PRO DC To DC Converters

## Overview

The RHINO PRO DC to DC Converters, designed for harsh industrial environments, feature stringent protection ratings, such as:

- High EMC immunity against surge, burst, radiated, and conducted disturbances
- High shock and vibration resistance
- High thermal shock resistance

At 100% load, the current characteristics goes from constant voltage to constant current which makes the units also suitable for battery charger applications. With protection against over-temperature, overload, short-circuit, reverse input, overvoltage and input under-voltage lock-out they are hard to destroy.

## Features

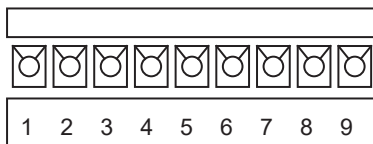
- Input voltage ranges: 9 to 36 and 18 to 75 VDC
- Constant current output characteristic for battery load applications
- Wide operating temperature range: -40 to 75°C [-40 to 167°F]
- Under voltage lock-out, overtemperature & reverse input protection
- Easy chassis and wall mounting
- 3-year warranty



**PSRP-15-DC24-150**

RHINO PRO DC Converters								
Part Number	Price	Drawing Link	Input Voltage Range	Input Current @ No Load	Output Voltage	Output Current Max	Output Power	Efficiency typ.
<a href="#">PSRP-12-DC24-150</a>	\$199.00	<a href="#">PDF</a>	9-36 VDC (24VDC Nom)	100mA (24VDC Nom)	12VDC	12,500 mA	150W	86%
<a href="#">PSRP-15-DC24-150</a>	\$199.00	<a href="#">PDF</a>			15VDC	10,000 mA		
<a href="#">PSRP-24-DC24-150</a>	\$199.00	<a href="#">PDF</a>			24VDC	6,300 mA		
<a href="#">PSRP-28-DC24-150</a>	\$199.00	<a href="#">PDF</a>			28VDC	5,400 mA		
<a href="#">PSRP-48-DC24-150</a>	\$199.00	<a href="#">PDF</a>			48VDC	3,200 mA		
<a href="#">PSRP-12-DC48-150</a>	\$215.00	<a href="#">PDF</a>	18-75 VDC (48VDC Nom)	65mA (48VDC Nom)	12VDC	12,500 mA	88%	
<a href="#">PSRP-24-DC48-150</a>	\$215.00	<a href="#">PDF</a>			24VDC	6,300 mA		89%

## Wiring



PINOUT		
PIN	Function	Recommended Wire
1	+Vin	14-16 AWG
2	+Vin	14-16 AWG
3	-Vin	14-16 AWG
4	-Vin	14-16 AWG
5	Remote	14-24 AWG
6	+Vout	14-16 AWG
7	-Vout	14-16 AWG
8	Trim	14-24 AWG
9	Trim	14-24 AWG



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Input Specifications	
<b>Surge Voltage (100 sec. max.)</b>	24 VDC models: 50VDC 48 VDC models: 100VDC
<b>Start-Up Time</b>	35 ms typ.
<b>Under Voltage Lockout</b>	24 Vin models: 7.9 - 8.5 VDC 48 Vin models: 15.6 - 16.8 VDC
<b>Recommended Input Fuse</b>	24 Vin models 30A (slow blow) 48 Vin models 15A (slow blow)
<b>ESD (Electrostatic Discharge)</b>	Air: EN 61000-4-2, $\pm 8$ kV, perf. criteria A Contact: EN 61000-4-2, $\pm 6$ kV, perf. criteria A
<b>Radiated Emissions</b>	EN 55032 class A (internal filter) FCC Part 15 class A (internal filter)
<b>Reverse Voltage Protection</b>	Parallel diode (external input fuse required)
<b>Input Filter</b>	Internal Pi-Type

Note: All specifications valid at nominal input voltage, full load and +25°C after warm-up time unless otherwise stated.

Output Specifications	
<b>Voltage Set Accuracy</b>	$\pm 1\%$ max
<b>Regulation</b>	Input Variation ( $V_{min} - V_{max}$ ) 0.2% max. - Load Variation (0 - 100%) 0.4% max.1
<b>Minimum Load</b>	Not required
<b>Temperature Coefficient</b>	$\pm 0.02\%$ /K
<b>Ripple and Noise (20MHz bandwidth)</b>	12VDC and 15VDC models: 100 mVp-p max. 24VDC and 28VDC models: 200 mVp-p max. 48V DC models: 300 mVp-p max.
<b>Transient Response</b>	200 $\mu$ s typ. (25% Load Step)
<b>Overvoltage Protection</b>	125 - 140% of $V_{out}$ nom
<b>Output Current Limitation</b>	105 - 120% of $I_{out}$ max.
<b>Short Circuit Protection</b>	Continuous, Automatic recovery
<b>Capacitive Load</b>	12VDC models: 40'000 $\mu$ F max. 15VDC models: 26'000 $\mu$ F max. 24VDC models: 10'000 $\mu$ F max. 28VDC models: 7'600 $\mu$ F max. 48VDC models: 2'600 $\mu$ F max.

Note: All specifications valid at nominal input voltage, full load and +25°C after warm-up time unless otherwise stated.



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General Specifications	
<b>Output Voltage Adjustable Range</b>	0% to +20% (By external trim resistor)
<b>Output Voltage Regulation*</b>	Input variation - 0.2% max Load variation - 0.4% max
<b>Ripple/Noise (20MHz bandwidth)</b>	12VDC and 15VDC models: 100 mVp-p max. 24VDC and 28VDC models: 200 mVp-p max. 48VDC models: 300 mVp-p max.
<b>Temperature: Operating Storage (non-operating)</b>	-40 to 75°C [-40 to 167°F max] -55 to 125°C, [-67 to 257°F max]
<b>Derating</b>	Above 50°C -> 2.0 %/K [24VDC nom.] Above 55°C -> 2.2 %/K [48VDC nom.]
<b>Relative Humidity</b>	95% max. (non-condensing)
<b>Output Power Derating (natural convection)</b>	Natural convection
<b>Temperature Coefficient</b>	±0.02 %/K max.
<b>Switching Frequency</b>	203 - 330 kHz (PWM)
<b>Isolation Voltage (1 min.) – Input/Output</b>	3,000 VDC
<b>Safety Standards</b>	EN 60950-1, EN 62368-1, IEC 60950-1, IEC 62368-1, UL 60950-1, UL 62368-1 - Railway Applications EN 50155
<b>Electromagnetic Compatibility (EMC)</b>	EN 61000-4-3, 10 V/m, perf. criteria A
<b>Parallel Operation</b>	N/A
<b>Pollution Degree</b>	PD 2
<b>Environmental Air</b>	No corrosive gases permitted
<b>Enclosure Rating</b>	IP 55 [IEC 60529]
<b>Enclosure Material</b>	Aluminum
<b>Mounting</b>	Chassis mount
<b>Mounting Orientation</b>	Vertical only
<b>Wiring</b>	14-24 AWG [2.5-0.25 mm <sup>2</sup> ]
<b>Weight [g]</b>	300
<b>Connections</b>	Screw terminal Recommended tightening torque 0.25 Nm [2.21 in-lb]
<b>Short Circuit Protection</b>	Continuous, automatic recovery
<b>Agency Approvals</b>	CE, cURus File E198298

\* Input variation Vin min to Vin max and load variation 0 to 100%

Note: All specifications valid at nominal input voltage, full load and +25°C after warm-up time unless otherwise stated.

To obtain the most current agency approval information, see the Agency Compliance & Certifications Checklist section on the specific part number's web page.



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## Output Voltage Adjustment

Output voltage set point adjustment allows the user to increase the output voltage set point of the module. This is accomplished by connecting an external resistor between pin 8 (Trim) and pin 9 (Trim). The external TRIM resistor needs to be at least 1/16 W of rated power.

### Trim-Tables

PSRP-12-DC24-150, PSRP-24-DC48-150										
	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%
<b>Vout [V]</b>	12.12	12.24	12.36	12.48	12.60	12.72	12.84	12.96	13.08	13.20
<b>R<sub>U</sub> [kOhm]</b>	222.64	105.09	66.35	47.06	33.51	27.83	22.34	18.23	18.23	12.48
	11%	12%	13%	14%	15%	16%	17%	18%	19%	20%
<b>Vout [V]</b>	13.32	13.44	13.56	13.68	13.80	13.92	14.04	14.16	14.28	14.40
<b>R<sub>U</sub> [kOhm]</b>	10.39	8.65	7.18	5.91	4.82	3.86	3.02	2.27	1.60	0.99

PSRP-15-DC24-150										
	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%
<b>Vout [V]</b>	15.15	15.30	15.45	15.60	15.75	15.90	16.05	16.20	16.35	16.50
<b>R<sub>U</sub> [kOhm]</b>	238.62	113.62	71.95	51.12	38.62	30.29	24.33	19.87	16.40	13.62
	11%	12%	13%	14%	15%	16%	17%	18%	19%	20%
<b>Vout [V]</b>	16.65	16.80	16.95	17.10	17.25	17.40	17.55	17.70	17.85	18.00
<b>R<sub>U</sub> [kOhm]</b>	11.35	9.45	7.85	6.48	5.29	4.25	3.33	2.51	1.78	1.12

PSRP-24-DC24-150, PSRP-24-DC48-150										
	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%
<b>Vout [V]</b>	24.24	24.48	24.72	24.96	25.20	25.44	25.68	25.92	26.16	26.40
<b>R<sub>U</sub> [kOhm]</b>	212.47	106.69	68.79	49.30	37.43	29.44	23.70	19.37	15.99	13.28
	11%	12%	13%	14%	15%	16%	17%	18%	19%	20%
<b>Vout [V]</b>	26.64	26.88	27.12	27.36	27.6	27.84	28.08	28.32	28.56	28.80
<b>R<sub>U</sub> [kOhm]</b>	11.06	9.20	7.63	6.28	5.11	4.08	3.18	2.37	1.65	1.00

PSRP-28-DC24-150										
	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%
<b>Vout [V]</b>	28.28	28.56	28.84	29.12	29.40	29.68	29.96	30.24	30.52	30.80
<b>R<sub>U</sub> [kOhm]</b>	255.65	121.72	77.08	57.08	41.36	32.44	26.06	21.28	17.56	14.58
	11%	12%	13%	14%	15%	16%	17%	18%	19%	20%
<b>Vout [V]</b>	31.08	31.36	31.64	31.92	32.20	32.48	32.76	33.04	33.32	33.60
<b>R<sub>U</sub> [kOhm]</b>	12.14	10.11	8.40	6.93	5.65	4.53	3.55	2.67	1.89	1.10

PSRP-48-DC24-150										
	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%
<b>Vout [V]</b>	48.48	48.96	49.44	49.92	50.40	50.88	51.36	51.84	52.32	52.80
<b>R<sub>U</sub> [kOhm]</b>	268.86	127.44	80.57	57.19	43.17	33.84	27.17	22.18	18.29	15.18
	11%	12%	13%	14%	15%	16%	17%	18%	19%	20%
<b>Vout [V]</b>	53.28	53.76	54.24	54.72	55.20	55.68	56.16	56.64	57.12	57.60
<b>R<sub>U</sub> [kOhm]</b>	12.64	10.52	8.73	7.20	5.87	4.70	3.67	2.76	1.94	1.21

Connection of trim-up resistor

