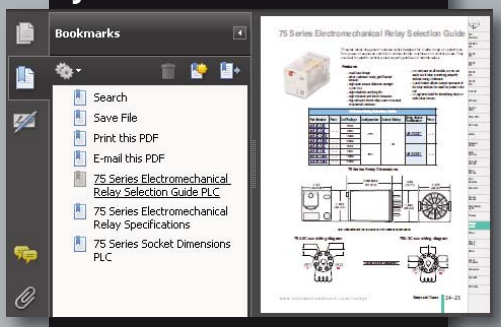
Power
Section 30

DC Power Supplies

Control Transformers

DC-to-DC Converters

In this interactive PDF you can:



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Power Products

Quality power products...

NEW! Rhino PSC Series NEC Class 2 Power Supplies

- DIN rail mounting
- 12W to 90W
- Universal 85 to 264 VAC input voltage and output current limitation.
- Plastic-housed low-profile
- UL508 listed, UL1310 recognized for NEC Class 2 compliance, and CE marked

Rhino PSM Series Power Supplies

- Industrial grade
- Sturdy metal case
- Low output ripple
- DIN rail mounting/optional wall mount
- Specialty modules for redundancy, power backup and UPS
- 12VDC from 78 to 156 watts
- 24VDC from 90 to 600 watt

Order Today, Get it Tomorrow

RHINO™ AUTOMATIONDIRECT.com

Rhino PSP Slimline Power Supplies

- Compact footprint
- Plastic housing
- Universal input 85 to 264 VDC/VAC
- 20 W to 120 W
- 5 VDC, 20 W, 4 A output
- 12 VDC from 24 to 120 watts
- 24 VDC from 24 to 120 watts
- DIN rail mountable

DC to DC Converters

DIN-rail and panel mount DC-to-DC converters

PSP series - wide input ranges of 9.5 to 18VDC and 18 to 75VDC for operation with all popular DC supply voltage systems. 5, 12 and 24 VDC adjustable output ranges.

FA-DCDC-1 - Isolated ±10VDC, ±5VDC multiple outputs. 12-24VDC input voltage range. Designed to handle many types of configuration applications.

Rhino PS Series Power Supplies

- DIN rail mounting
- Durable metal case
- 12VDC from 50 to 75 watt
- 24 VDC from 50 to 600 watt

...at great prices

Hammond Compact Control Transformers

New! .... HPS Fortress™ Encapsulated Transformers

Encapsulated power transformers with electrical grade silica sand and resin compounds, which completely enclose the core and coil to seal out moisture, airborne contaminants and eliminates corrosion and deterioration.

- **Inexpensive potted transformers**
- **Compact, efficient design**
- **Easy installation and hook-up, wall mounting**
- **10 year warranty - Superior quality in materials and workmanship**
- **NEMA 3R rated commercial power transformer**

HPS Imperator™ Compact Control Transformers

HPS Imperator control transformers from Hammond are specifically designed for high inrush applications requiring reliable output voltage stability. Lifetime warranty. Secondary fuse kit included.

Four series of compact control transformers are available:

MQMJ Series - 480x240 VAC to 240x120 VAC
MGJ Series - 380x277x208 VAC to 240x120 VAC ... New!
PG Series - 240x120 VAC to 24x12 VAC
MLI Series - 480x240 VAC to 120x25 VAC ... New!

Convenience Outlet

- 15 amp rated
- NEMA 5 -15 R
- DIN rail mounting
- UL 508 listed

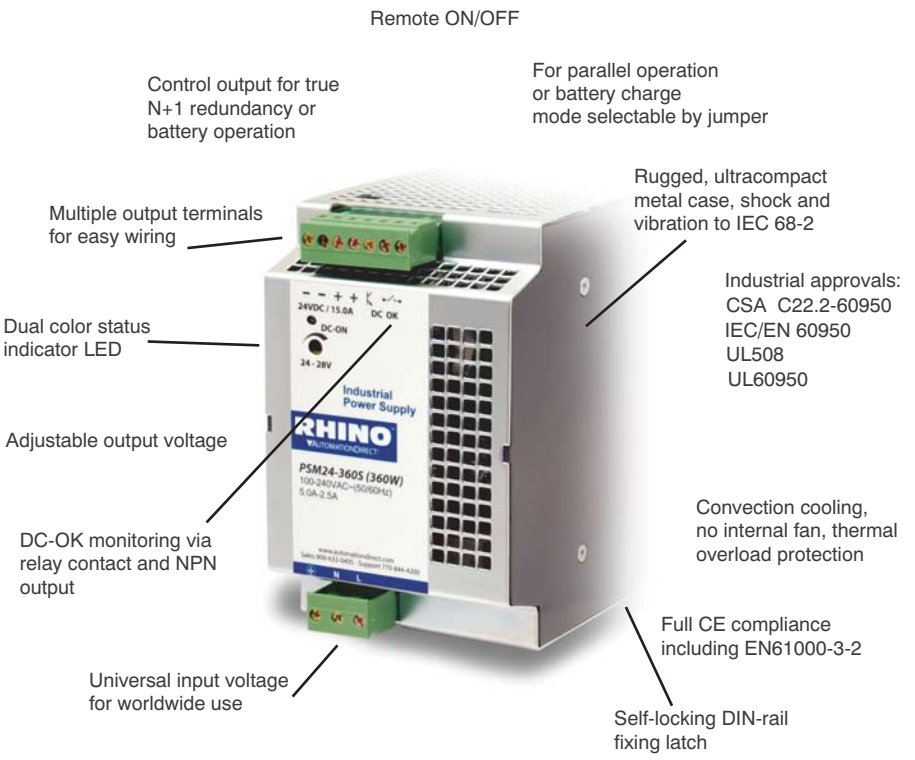
Open Frame Power Supplies

- DIN rail mounting
- Low cost
- 24 VDC
- Units available with 1.25 amp or 3.7 amp
- Universal inputs:
  FA-24PS: 100-240 VAC/VDC
  FA-24PS-90: 95-130 VAC or 190-264 VAC

RHINO PSM Series Power Supplies

Versatile switching power supplies are DIN-rail mountable

AUTOMATIONDIRECT offers the most practical industrial control power supplies available. The RHINO PSM series power supplies are industrial grade switching DC output supplies with a sturdy steel case to withstand harsh environments. Autoselect inputs for 115 VAC or 230 VAC and international agency approvals make the RHINO PSM series suitable for worldwide use. RHINO PSM power supplies are available in 12 or 24 VDC output, with adjustable output voltages, and feature low output ripple along with overload and overtemperature protection. The seven models offer power ratings from 78W to 600W, and up to 25A output current.



Features

- Industrial grade design
- Sturdy metal case to withstand harsh industrial environments
- Model PSM24-090S-N meets NEC Class 2
- Universal 100/230 VAC input voltage
- Adjustable output voltage
- Low output ripple
- Short-circuit, overvoltage and overtemperature protection
- Power Good signal
- Remote ON/OFF
- Optional wall mounting
- Specialty modules for redundancy, power backup and UPS
- Terminal connectors included
- 3-year product warranty

Part Numbering System

PSM 24 090S-N

- NEC Class 2
- Screw Terminal Connector
- Output Watts
- Output Volts
- Series Name: PSM = metal case

RHINO PSM Industrial Power Supplies			
Part Number	****Output Voltage (V_{nom})***	*****Output Current (I_{max})***	******Output Power (P_{max})***
PSM12-078S	12 VDC	6.5 A	78 W
PSM24-090S	24 VDC	3.75 A	90 W
PSM24-090S-N	24 VDC	3.75 A	90 W
PSM12-156S	12 VDC	13.0 A	156 W
PSM24-180S	24 VDC	7.5 A	180 W
PSM24-360S	24 VDC	15.0 A	360 W
PSM24-600S	24 VDC	25.0 A	600 W

12V models adjustable from 12 to14 VDC. 24V models adjustable from 24 - 28 VDC

****Maximum current at nominal output voltage***

*****Up to an operating temperature of +40°C***

RHINO PSM Series Power Supplies Specifications

Input Specifications									
Part Number	**Input Voltage Range**	**Input Frequency Range**	**Input Current (Typical) at full load**		**Inrush Current max (<2ms) @ +25°C**		**Holdup Time**	**Efficiency (Typical) @ 115VAC**	**Circuit Breaker or Fuse (slo-blo)**
			115 VAC	**230 VAC**	**115 VAC**	**230 VAC**			
PSM12-078S	100 - 240 VAC 85 - 264 VAC (47 - 63 Hz)	47-63 Hz	2.0 A	1.0 A	<12 A	<20 A	20 ms min. (full load 115/230 VAC)	82%	6.0 A to 16.0 A
PSM24-090S			2.1 A	1.0 A				85%	
PSM24-090S-N			2.1 A	1.0 A				85%	
PSM12-156S	100 - 120 VAC/ 220 - 230 VAC 85 - 132 VAC/ 187 - 264 VAC (47 - 63 Hz) Autoselect		2.5 A	1.4 A	<13 A	<25 A		85%	
PSM24-180S			2.8 A	1.5 A				88%	
PSM24-360S			5.0 A	2.5 A	<16 A	<25 A		87%	10.0 A to 16.0 A
PSM24-600S			10.0 A	5.0 A	<25 A	<30 A		89%	16.0 A to 25.0 A

Output Specifications										
Part Number	**Price**	**Output Voltage**	**Output Voltage Adj. Range**	**Output Current (Max.)**	**Output Power (Max.)**	**Output Overvoltage Protection**	**Power - Good Signal**			**MTBF (IEC 61709 @ 25°C)**
							Trigger Threshold	**Active Output Signal**	**Relay Output**	
PSM12-078S	<--->	12 VDC	12 - 14 VDC	6.5 A	78 watts	20 V	9 - 11 V	11 V ± 1 V/20 mA max.	DC OK = contact closed (rated:30 VDC 1.0A)	350,000 hours
PSM24-090S	<--->	24 VDC	24 - 28 VDC	3.75 A	90 watts	35 V	18 - 22 V	22 V ± 2 V/10 mA max		
PSM24-090S-N	<--->			3.75 A	90 watts	35 V				
PSM12-156S	<--->	12 VDC	12 - 14 VDC	13.0 A	156 watts	20 V	9 - 11 V	11 V ± 1 V/40 mA max.		
PSM24-180S	<--->	24 VDC	24 - 28 VDC	7.5 A	180 watts	35 V	18 - 22 V	22 V ± 2 V/20 mA max		
PSM24-360S	<--->			15.0 A	360 watts	35 V				
PSM24-600S	<--->			25.0 A	600 watts	35 V				

General Specifications	
Specification	**Description**
Temperature	**Operating (ambient):** -25°C to + 70°C max (-13°F to 158°F). Above +40°C(104°F) load derating **Storage (non-operating):** -25°C to + 85°C max (-13°F to 185°F). **Temperature drift:** 0.02%/C. **Cooling:** convection, no internal fan
Humidity	95% (non-condensing) relative humidity maximum
Isolation	According to IEC/EN 60950, EN50178, EN61558-2-8, EN60204, CSA
Output Regulation	Input variation: 0.5% maximum. Load variation (10 to 100%): 0.5% maximum
Output Voltage Ripple	100 mV peak-to-peak typical (20 MHz bandwidth), (200 mV peak - peak maximum at Imax)
Output Protection	Current limit: 110% constant current, automatic recovery, thermal protection, output rating, Voltage limit: 140% Vout nom
Over-temperature Protection	Switch off at over-temperature, automatic restart
Status Indicator	Dual color LED (green: DC Ok; Red: DC Off)
Remote ON/OFF	By external contact. DC On: -S contact open. DC Off: -S connected via 1 KΩ to -Vout, [3VDC max across Vout(+) and Vout(-)]
Maximum Capacitive Load	Unlimited
Vibration	IEC 60068-2-6: 3 axis, sine sweep, 10-55 Hz, 1g, 1 oct/min
Shock	IEC 60068-2-27: 3 axis, 15g half sine, 11ms
Enclosure Rating	IP20 (IEC 529)
Enclosure Material	Aluminum (chassis) / zinc plated steel (cover)
Mounting	Snap-on with self-locking spring for 35mm DIN rails per EN 50022-35x15/75, or wall mount with bracket
Connection	Pluggable screw terminals (plugs included) 2 terminals per output (not available in 600 watt unit.)
Agency Approvals	UL 508 Listed File E157382, UL 60950 Recognized File E198298; CSA C22.2-60950 File 229285; CE
Note: Unless otherwise stated all specifications are valid at nominal input voltage, full load and +25°C after warmup time.	

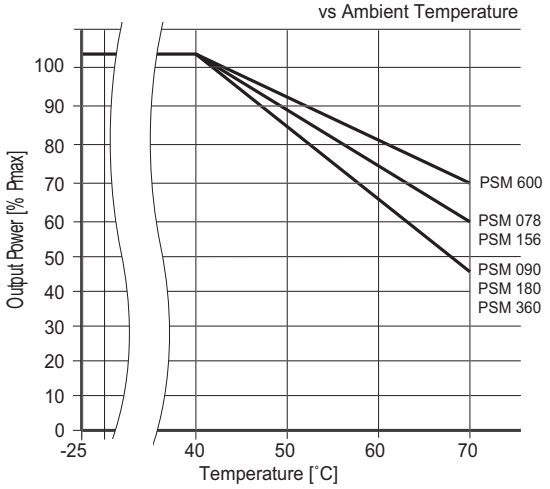
RHINO PSM Series Power Supplies Specifications

General Specifications (continued)		
Specification	***Standard***	***Document Number***
Harmonic Limits	Harmonic Current Limits	EN 61000-3-2, Class A for limited output power
Safety Standards	Information technology equipment	IEC/EN60950; CSA 60950-1-03/UL 60950-1
	Industrial control equipment	UL 508
	Electrical equipment of machines	EN 60204
	Electronic equipment for power installation	EN 50178
	Safety, transformers	EN 61558-2-8
	Limited power source (model PSM24-090S-N)	EN 60950 sect. 2.5 and NEC Class 2
Safety Approvals	CB-Report per IEC 60950	EN 50178, EN 60079-15 EN 61558-2-8, CSA
Safety Class	Degree of electrical protection Class1	IEC 536
Electromagnetic Compatibility (EMC), Emissions	EMC, Emissions	EN 61204-3, EN61000-6-3
	Conducted RI suppression on input	EN 55011 class B, EN 55022 class B
	Radiated RI suppression	EN 55011 class B, EN 55022 class B
Electromagnetic Compatibility (EMC), Immunity	EMC, Immunity	EN 61000-6-2, EN 61204-3
	Electrostatic Discharge (ESD)	IEC / EN 61000-4-2 4 kV (contact discharge) / 8 kV (air discharge)
	Radiated RF field immunity (80-1000 MHz)	IEC / EN 61000-4-3 10 V / m
	Electrical fast transient / burst immunity	IEC / EN 61000-4-4 2 kV
	Surge immunity	IEC / EN 61000-4-5 1 kV / 2 kV
	Immunity to conducted RF disturbances (0.15 to 80 MHz)	IEC / EN 61000-4-6 10 V
	Power frequency field immunity	IEC / EN 61000-4-8 30 A / m
	Voltage dips	IEC / EN 61000-4-11(70% UN Crit. B/40%/100% UN Crit. C)
Pollution Degree	2*	

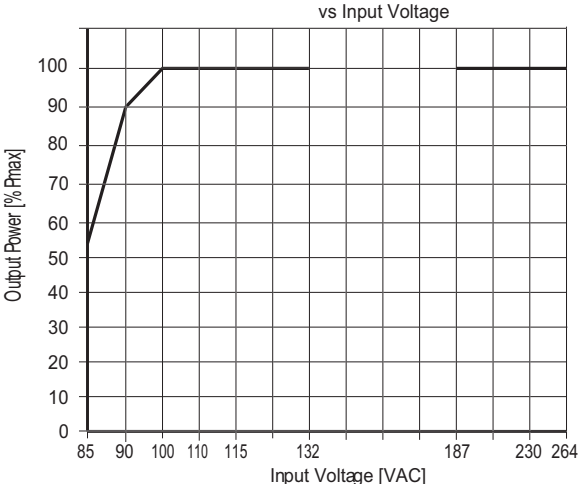
Note: Normally, only non-conductive pollution occurs. Temporary conductivity caused by condensation is to be expected.

Output Power Derating

A) Output Power Derating vs Ambient Temperature



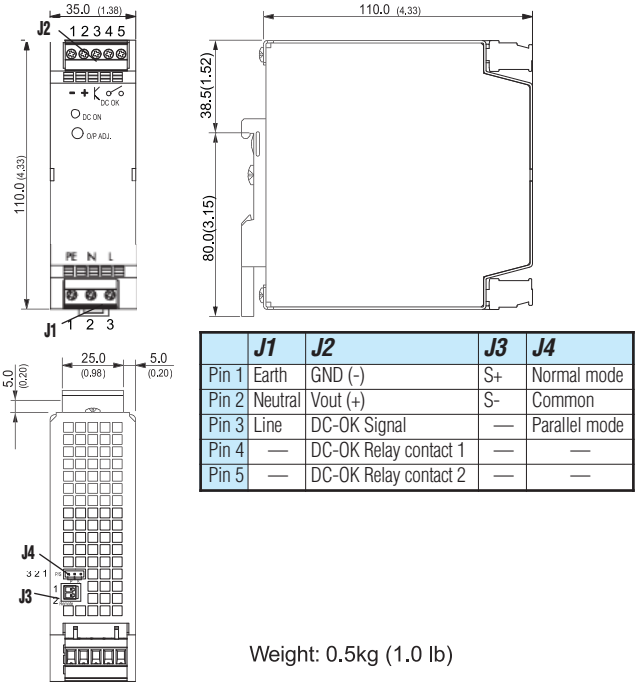
B) Output Power Derating vs Input Voltage



Note: Unless otherwise stated, all specifications are valid at nominal input voltage, full load and +25°C after warmup time.

RHINO PSM Series Dimensions/Connections

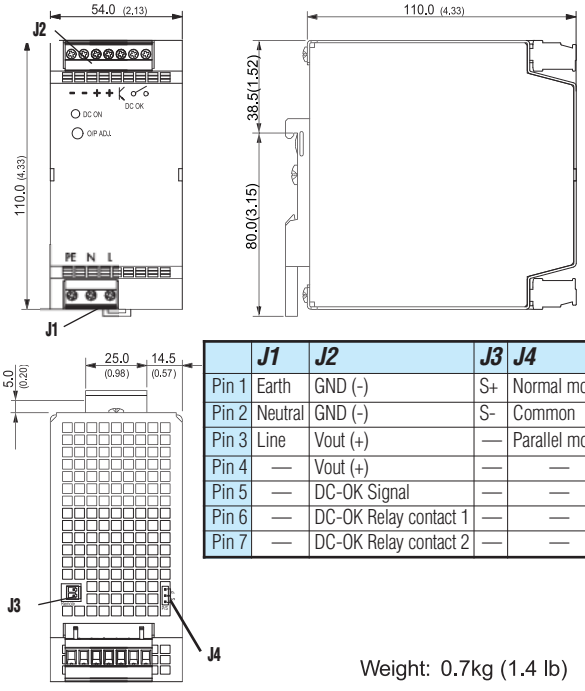
PSM12-078S, PSM24-090S, PSM24-REM360S, PSM24-BCM360S



	J1	J2	J3	J4
Pin 1	Earth	GND (-)	S+	Normal mode
Pin 2	Neutral	Vout (+)	S-	Common
Pin 3	Line	DC-OK Signal	—	Parallel mode
Pin 4	—	DC-OK Relay contact 1	—	—
Pin 5	—	DC-OK Relay contact 2	—	—

Weight: 0.5kg (1.0 lb)

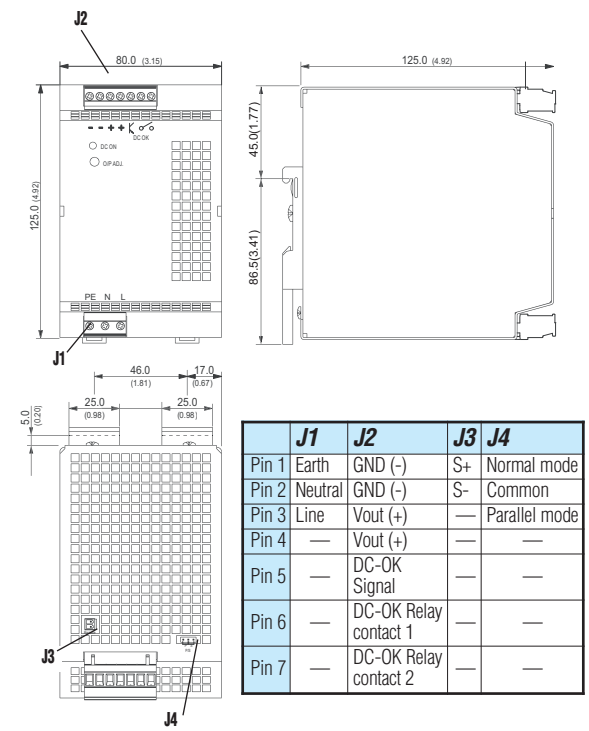
PSM12-156S, PSM24-180S, PSM24-BFM600S



	J1	J2	J3	J4
Pin 1	Earth	GND (-)	S+	Normal mode
Pin 2	Neutral	GND (-)	S-	Common
Pin 3	Line	Vout (+)	—	Parallel mode
Pin 4	—	Vout (+)	—	—
Pin 5	—	DC-OK Signal	—	—
Pin 6	—	DC-OK Relay contact 1	—	—
Pin 7	—	DC-OK Relay contact 2	—	—

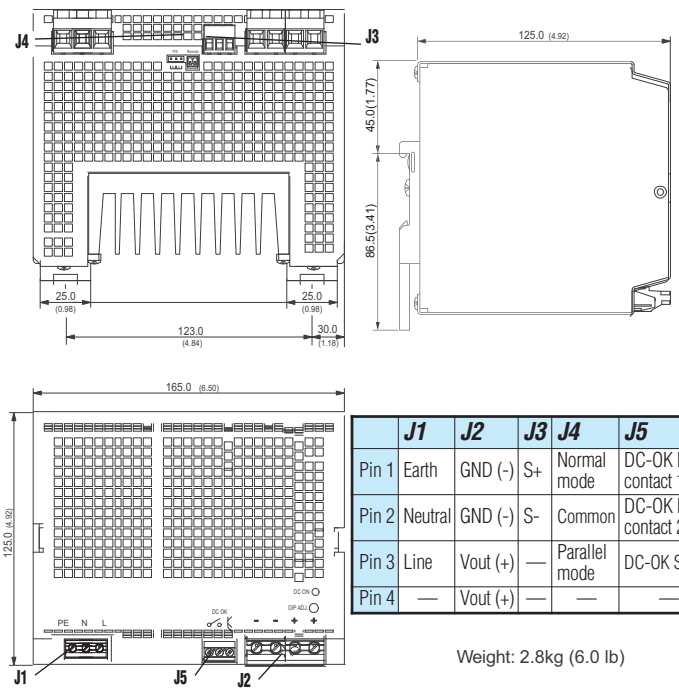
Weight: 0.7kg (1.4 lb)

PSM24-360S



	J1	J2	J3	J4
Pin 1	Earth	GND (-)	S+	Normal mode
Pin 2	Neutral	GND (-)	S-	Common
Pin 3	Line	Vout (+)	—	Parallel mode
Pin 4	—	Vout (+)	—	—
Pin 5	—	DC-OK Signal	—	—
Pin 6	—	DC-OK Relay contact 1	—	—
Pin 7	—	DC-OK Relay contact 2	—	—

PSM24-600S



	J1	J2	J3	J4	J5
Pin 1	Earth	GND (-)	S+	Normal mode	DC-OK Relay contact 1
Pin 2	Neutral	GND (-)	S-	Common	DC-OK Relay contact 2
Pin 3	Line	Vout (+)	—	Parallel mode	DC-OK Signal
Pin 4	—	Vout (+)	—	—	—

Weight: 2.8kg (6.0 lb)

All dimensions in millimeters (inches)
Tolerances: ±0.5mm (±0.02")

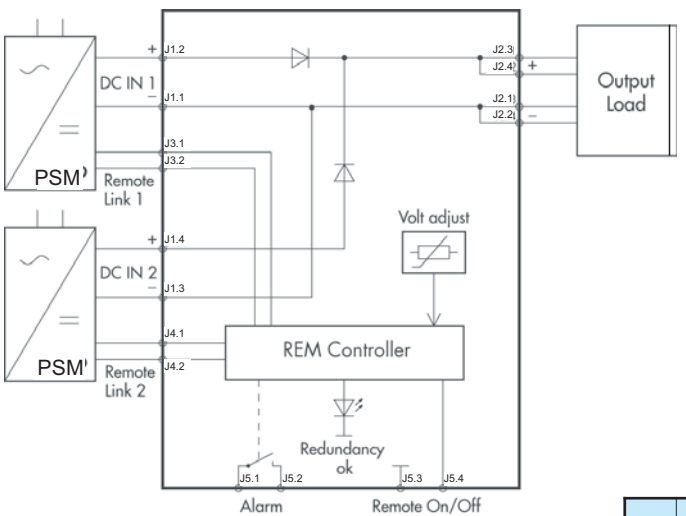
RHINO PSM24-REM360S Redundancy Module

Using two PSM24 power supplies and a redundancy module, you can configure a redundant power system, featuring active current sharing, without any additional components. Even if one power supply fails or becomes disconnected, the second unit will supply full current to the load. The module has an alarm contact for monitoring of operations. The inputs are hot-swappable and can be loaded up to 15A each.

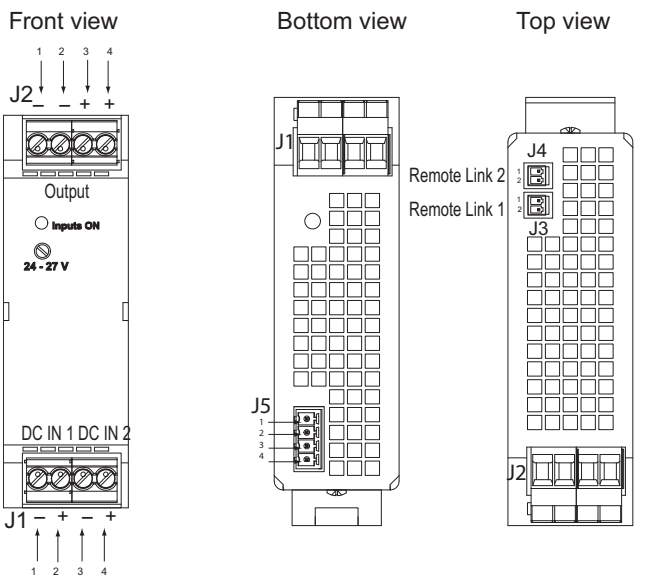
Redundancy Module					
Part Number	***Price***	***Input***	***Max Power per Input***	***Output Voltage Adjust***	***Output Power Max***
PSM24-REM360S (includes terminal plugs)	<--->	2 x 24 VDC 2 x Control Input	2 x 360 W	24 VDC (24 - 27 VDC)	360 W

General Specifications	
Operating Temperature	-25°C to +70°C max (-13°F to +158°F), derating above 40°C (104°F)
Electromagnetic Compatibility	In correspondence to connected units (no internal switching device)
Redundancy OK Signal	Trigger threshold at 18 to 22 VDC. Contact closed if one or both inputs failed
Dimensions	Same as model PSM24-090S (see dimensions page)
Remote Link Wire 0.5m	Two cables included with PSM24-REM360S module
Remote ON/OFF	By external contact: ON = J5.3 + J5.4 not shorted OFF = J5.3 + J5.4 shorted
Alarm Contact Rating	30 VDC/1.0 A max

Redundancy Module Function Diagram



Redundancy Module Connector Positions



	J1	***J2***	***J3 Voltage control 1 for Input 1***	***J4 Voltage control 2 for Input 2***	***J5***
Pin 1	Input 1 -Vin	GND (-)	S+	S+	DC-OK Signal
Pin 2	Input 1 +Vin	GND (-)	S-	S-	DC-OK Relay contact
Pin 3	Input 2 -Vin	Vout (+)	—	—	Remote ON/OFF
Pin 4	Input 2 +Vin	Vout (+)	—	—	Remote ON/OFF

Note: this redundancy module only works with the PSM series. Other series of power supplies are not compatible.

RHINO PSM24-BCM360S Battery Control Module

The battery control module, when combined with a PSM24 power supply, makes a perfect DC-UPS system by providing the means to charge and monitor an external lead acid battery. The power supply charges the connected battery and keeps it in a charged mode. Consequently, the output voltage of the system is equivalent to the battery voltage.

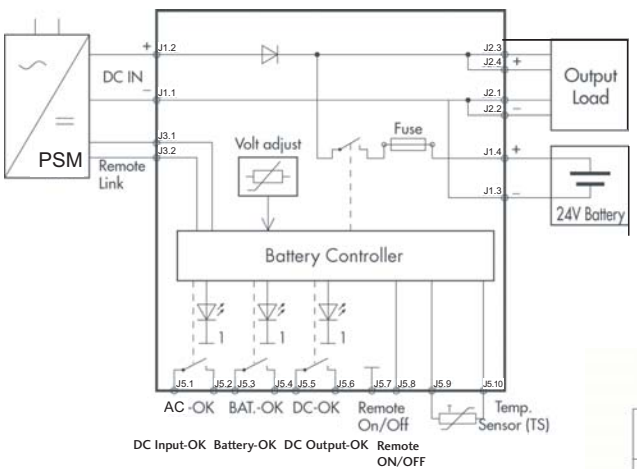
To avoid overcharging the battery, an external temperature sensor (sold separately) automatically adjusts the battery voltage to the required end of charge voltage. This configuration extends the battery life.

Battery Control Module					
Part Number	***Price***	***Input***	***Input Power Max***	***Output Voltage Nom***	****Output Power Max***
PSM24-BCM360S (includes terminal plugs)	<--->	24 VDC power supply and 24 VDC battery	360 W	24 VDC	360 W

****reduce maximum output current by battery charging current.***

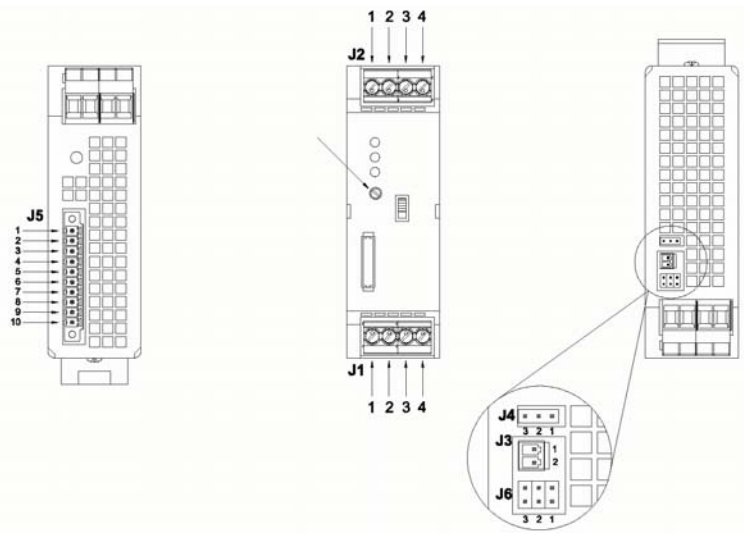
General Specifications	
Operating Temperature	-25°C to +70°C max (-13°F to +158°F) 1.5%/K, derating above 40°C (104°F)
Electromagnetic Compatibility	In correspondence to connected units (no internal switching device)
Battery Protection	Over voltage, deep discharge, short-circuit and reverse connection (built-in fuse)
Status Signals	DC-OK input, DC-OK output, BAT OK (all relay contacts closed at status OK)
Rating per Relay Contact	30 VDC / 1.0 A max.
Dimensions	Same as model PSM24-090S (see dimensions page)
Remote Link Wire 0.5m	One cable included with PSM24-BCM360S module
Remote ON/OFF	By external contact: ON = J5.7 + J5.8 not shorted OFF = J5.7 + J5.8 shorted

Battery Control Module Function Diagram



	J1	J2	J3	J4	J5	J6
Pin 1	- Vin (DC In)	GND (-)	S+	15 sec test	DC Input-OK Signal	PSM24-360S (factory setting)
Pin 2	+ Vin (DC In)	GND (-)	S-	Common	DC-OK Relay contact	PSM24-180S
Pin 3	- Bat in	Vout (+)	—	10 min test	Bat-OK Signal	PSM24-090S
Pin 4	+ Bat in	Vout (+)	—	—	Bat-OK Relay Contact	
Pin 5	—	—	—	—	DC Output OK Signal	
Pin 6	—	—	—	—	DC Output OK Relay Contact	
Pin 7	—	—	—	—	Remote ON/OFF	
Pin 8	—	—	—	—	Remote ON/OFF	
Pin 9	—	—	—	—	Temperature Sensing	
Pin 10	—	—	—	—	Temperature Sensing	

Battery Control Module Connector Positions



RHINO PSM24-BFM600S Buffer Module

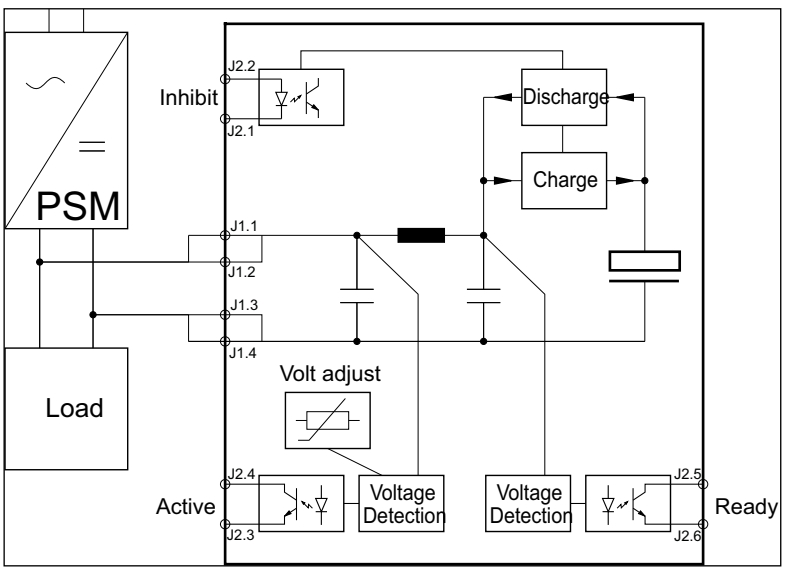
The buffer module will maintain the output voltage of a 24 VDC power supply after brownouts or voltage dips for up to 200 ms at 25 amps. It is a cost effective alternative to a battery-based backup system. The operation modes are indicated by an LED on the front panel.

Storing the energy in a capacitor bank, this backup solution is completely maintenance free. Its storage capacity does not deteriorate over the lifetime of the unit.

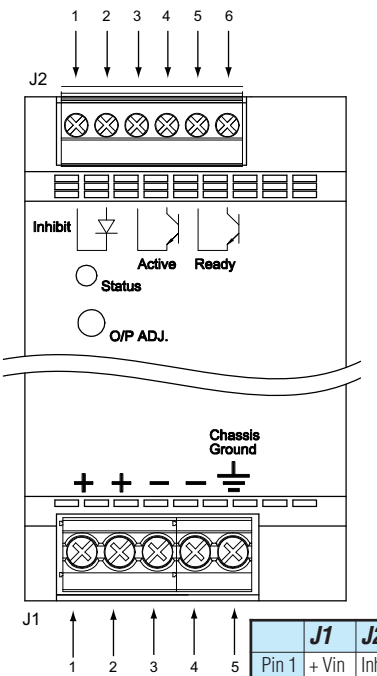
Buffer Module					
Part Number	***Price***	***Input***	***Operating Voltage Range***	***Buffer Time***	***Output Power Max***
PSM24-BFM600S (includes terminal plugs)	<--->	24 VDC	22 to 28 VDC	200 msec typical @ 25A max load 4.0 sec maximum @ 1.2A load	25.0 A (600 W)

General Specifications	
Operating Temperature	-25°C to +70°C max (-13°F to +158°F), derating above 40°C (104°F)
Electromagnetic Compatibility	In correspondence to connected units (no internal switching device)
Buffer Voltage	Adjustable, >1 V below input voltage, min. 22 VDC
Charging	0.6 A max/30s max
Status Signals	Buffer Active, Buffer Ready (optocoupler output), dual-color LED for status indication
Inhibit Input	Optocoupler input: supply between 5 VDC and 28 VDC to Inhibit
Dimensions	Same as model PSM12-156S (see dimensions page)
Signal Output Ratings	10 mA

Buffer Module Function Diagram



Buffer Module Connector Positions



	J1	*J2*
Pin 1	+ Vin	Inhibit GND
Pin 2	+ Vin	Inhibit +
Pin 3	- Vin	Active GND
Pin 4	- Vin	Active Signal
Pin 5	FG	Ready GND
Pin 6	—	Ready Signal

RHINO PSM Power Supplies - Accessories

A variety of accessories is available to complement the RHINO PSM power supplies. Choose panel mounting brackets and replacement plug kits from the table below, based on the size of the power supply. There is also a temperature sensor for the battery control module and replacement link cable for the redundancy and battery control modules.

Accessories		
Part Number	***Price***	***Description***
PSM-PANEL1	<--->	Panel mounting bracket. 1 bracket type A includes M4-screw (DIN 74-4fA) for 78W, 90W, 156W, 180W PSM power supplies
PSM-PANEL2	<--->	Panel mounting bracket. 2 brackets type A include M4-screws (DIN 74-4fA) for 360W, 600W PSM power supplies
PSM-PK1	<--->	Replacement plug kit for PSM series with 78W and 90W outputs
PSM-PK2	<--->	Replacement plug kit for PSM series with 156W, 180W and 360W outputs
PSM-PK3	<--->	Replacement plug kit for PSM series redundancy module
PSM-PK4	<--->	Replacement plug kit for PSM series buffer module
PSM-PK5	<--->	Replacement plug kit for PSM series battery control module
PSM-TS	<--->	Temperature sensor for PSM24-BCM360S battery control module
PSM-JC01	<--->	Replacement link cable for PSM series redundancy module PSM24-REM360S and battery control module PSM24-BCM360S

Mounting

PSM power supplies are designed for mounting on a DIN rail. Please allow minimum free space of 80 mm (3.15") above and below, and 50 mm (1.97") on each side of the power supply for air convection. To attach unit onto the DIN rail, hook the top part of clip on DIN rail, then push down and inward until you hear the clipping sound. To remove, pull the latch of the clip using an insulated flat-head screwdriver.

For wall or chassis mounting, use mounting brackets PSM-PANEL1 (for 78W to 180W PSM style power supplies) or PSM-PANEL2 (for 360W and 600W PSM power supplies). Remove the DIN clips and replace with the brackets. Use the countersink screws included with the wall mount kit to attach the brackets to the power supply.

To attach the power supply to the DIN rail

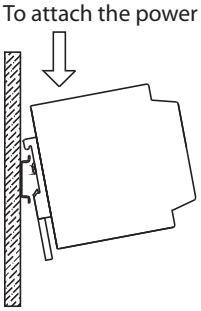


Fig. 2.1

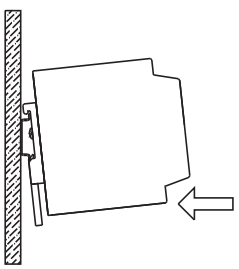


Fig. 2.2

To remove the power supply from DIN rail

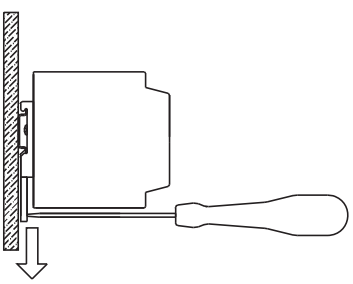


Fig. 2.3

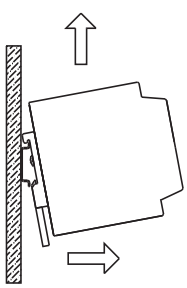
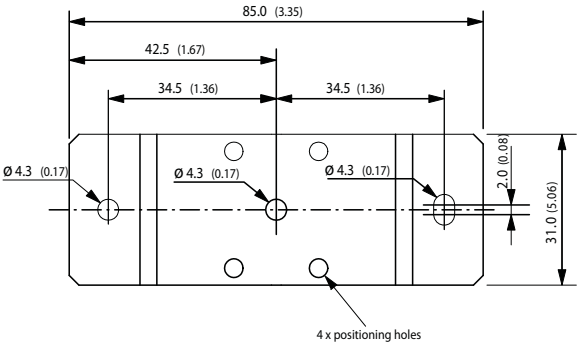
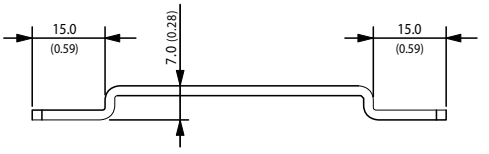


Fig. 2.4

RHINO PSM Panel Mounting Bracket Dimensions

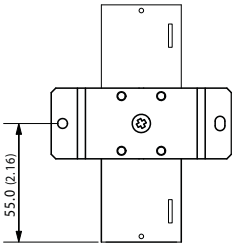
PSM-PANEL1



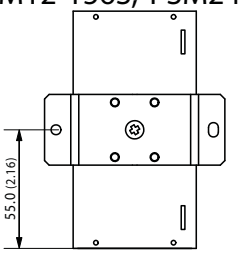


Material: 2 mm Mild Steel
Tolerance: ±0.1mm (± 0.004)

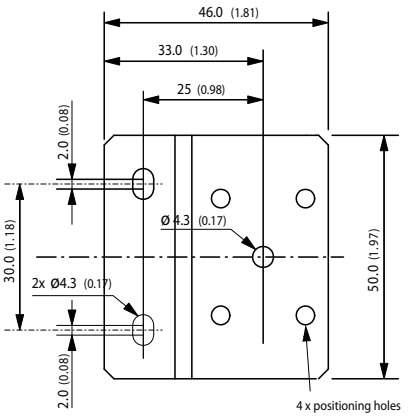
PSM12-078S, PSM24-090S

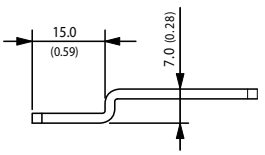


PSM12-156S, PSM24-180S



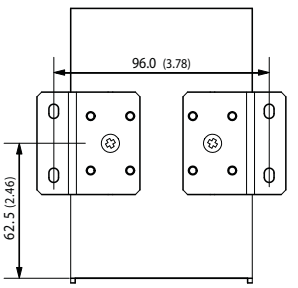
PSM-PANEL2



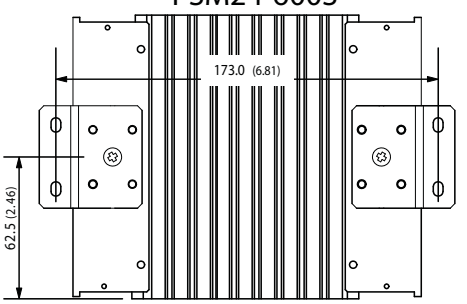


Material: 2 mm Mild Steel
Tolerance: ±0.1mm (± 0.004)

PSM24-360S

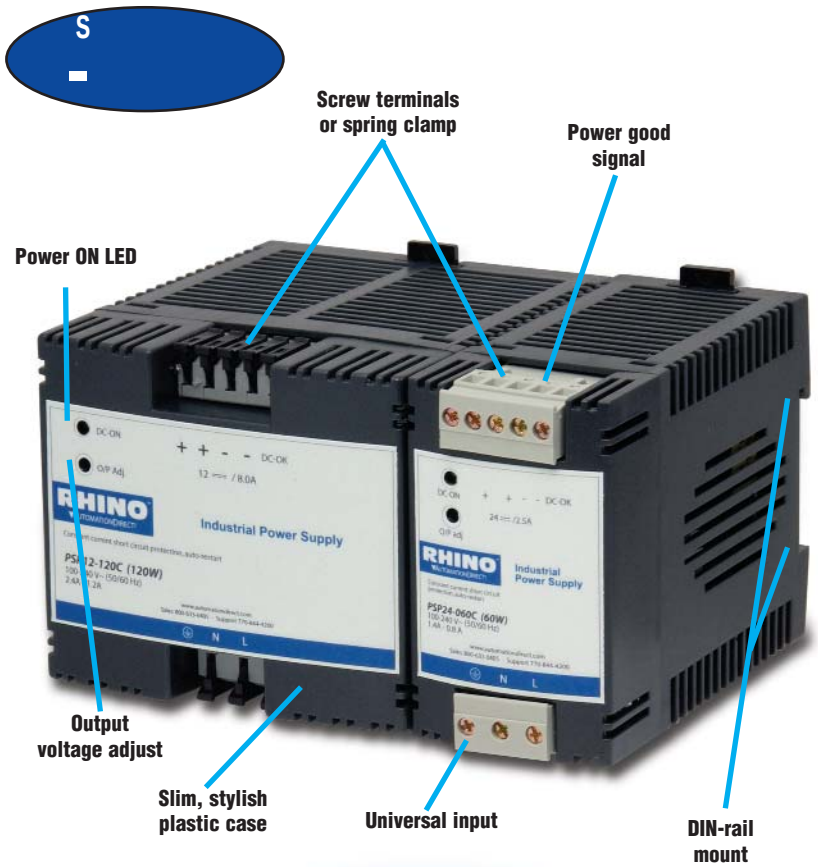


PSM24-600S



Dimensions: [mm] ( ) = Inch

RHINO PSP Series 5,12 & 24 VDC Power Supplies



Slimline Power Supplies

RHINO PSP series power supplies are plastic housed ultracompact switching supplies available in 5V, 12V and 24V adjustable models. There are 13 models available with power ratings of 20W to 240W and up to 10A output current. They are DIN rail or panel-mountable and feature universal 85-264 VAC/DC inputs, adjustable DC voltage outputs, power good signal and feature low output ripple along with short circuit, overvoltage and overload protection.

The RHINO PSP series of switching power supplies offer an excellent price/performance ratio. They provide tightly regulated output voltage for sensitive loads in industrial environments. The slim plastic case is lightweight and compact, and comes in both screw and spring clamp terminal versions. The constant-current, short-circuit protection limits the output current as the voltage is reduced, to safely protect the control components from direct shorts and device failures. Once a fault is corrected, the power supply automatically resumes supplying full-voltage power. (PSPxx-024x models have foldback current protection with auto-recovery.)

The RHINO PSP power supplies have a **Power ON** LED for easy visual indication of operation as well as a **Power Good** signal for feedback to your system controller.

With a UL 508C rating, the RHINO PSP series is the right choice for space limited applications.

Features

- Regulated switch mode type
- Ultra-compact plastic case
- Finger-safe terminals
- Reliable snap-on mounting on DIN-rails
- Wall mounting bracket included
- Universal input 85-264 VAC, 50/60 Hz or 85-375 VDC (no DC input on PSP24-240S)
- Models with 5, 12 or 24 VDC output
- Output voltage adjustable
- Parallel operation up to five units (not PSP24-240S)
- Power good signal (some models)
- Low ripple and noise
- Overload and short-circuit protection
- UL/cUL 508 listed, UL/cUL 60950 recognized*
- Worldwide safety approvals
- 3-year product warranty

Note: PSP24-240S is not cUL listed. PSP05-020S, PSP12-024S, and PSP24-240S are not UL 60950 recognized.

RHINO PSP Series Power Supplies Specifications

PSP05-020S
PSP12-024S
PSP24-024S

PSP24-024C

PSP12-060S
PSP24-060S

PSP12-060C
PSP24-060C

PSP12-120C
PSP24-120C

PSP24-120S
PSP12-120S

PSP24-240S

Input Specifications

Part Number	Input Voltage Range		Input Freq. Range	Input Current (Typical) at full load		Efficiency (Typ.)	C-Curve Circuit Breaker or Slow-blow Fuse
				115 VAC	230 VAC		
PSP05-020S	85-264 VAC 85-375 VDC	30% output derating below 93 VAC/ 130 VDC	47-63 Hz	0.35 A	0.2A	88%	5.0 A
PSP12-024S		20% output derating below 93 VAC/ 130 VDC					
PSP24-024S				0.35 A	0.2 A		
PSP24-024C							
PSP12-060S		15% output derating below 93 VAC/ 130 VDC		1.2 A	0.6 A	88%	
PSP12-060C							
PSP24-060S							
PSP24-060C							
PSP12-120S				2.0 A	1.0 A	88%	
PSP12-120C							
PSP24-120S							
PSP24-120C							
PSP24-240S	85-132/ 187-264 VAC	20% output derating below 93 VAC		3.3 A	1.7 A		

Output Specifications

Part Number	Price	Output Voltage	Output Volt. Adjust. Range	Output Current (Max.)	Output Power (Max.)	Hold-Up Time		MTBF (IEC 1709 @ 25°C)
						115 VAC	230 VAC	
PSP05-020S	<--->	5.1 VDC	5-5.25 VDC	4.0 A	20 W	15 ms	125 ms	2,681,000 hours
PSP12-024S	<--->	12 VDC	12-16 VDC	2.0 A	24 W			
PSP24-024S	<--->	24 VDC	24-28 VDC	1.0 A	24 W			
PSP24-024C	<--->							
PSP12-060S	<--->	12 VDC	12-15 VDC	4.0 A	60 W			2,947,000 hours
PSP12-060C	<--->							
PSP24-060S	<--->	24 VDC	24-28 VDC	2.5 A				
PSP24-060C	<--->							
PSP12-120S	<--->	12 VDC	12-15 VDC	8.0 A	120 W			1,620,000 hours
PSP12-120C	<--->							
PSP24-120S	<--->	24 VDC	24-28 VDC	5.0 A				
PSP24-120C	<--->							
PSP24-240S	<--->			10.0 A	240 W			1,912,000 hours

Part numbering system

PSP24-024S

- Terminal Connector Type: C: Clamp S: Screw
- Output Watts
- Output Volts
- PSP: Series Name

RHINO PS

Starting at <--->

The unit can be mounted on a chassis or wall using the included mounting bracket.

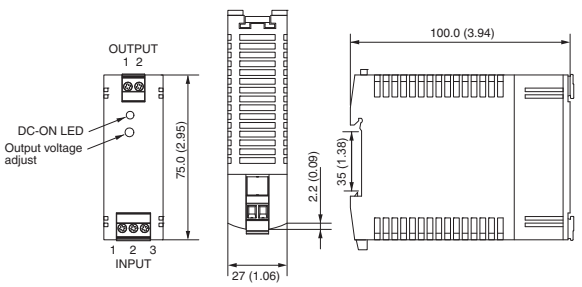
RHINO PSP Series Power Supplies Dimensions

General Specifications		
Temperature	**Operating:** -10°C to +70°C (14°F to 158°F), Derating at 93-132 VAC or 130-187 VDC: -1.10%/C above 40°C, Derating at 187-264 VAC or 265-375 VDC: -1.67%/C above 50°C, Derating at 85-93 VAC or 85-130 VDC: -1.30%/C above 30°C, Temperature Coefficient: 0.02%/C **Storage:** -25°C to +85°C (-13°F to 185°F)	
Humidity	95% (non-condensing) relative humidity max.	
Output Regulation	2.5% (1% for PSP12-060x), 10 to 90% load variation	
Switching Frequency	55 - 180 kHz depending on load	
Safety Standards	IEC/EN 60950 (output SELV), UL 60950, UL 508, EN 50178, EN 60204, EN 61558-2-8	
Output Voltage Ripple	<50 mV peak-to-peak	
Output Protection	Current Limit at 120% typ., constant current, auto recovery (PSPxx-024x foldback, auto-recovery), Voltage Limit <40 VDC	
Power Good Signal*	Trigger Point 12 VDC Models: >11 V 24 VDC Models: >22 V	Output Signal (reference to -Vout) 11.0 V+/- 1.0 V @ 60 mA max. 22.0 V+/- 2.0 V @ 30 mA max.
Electromagnetic Compatibility (EMC)	EN 61000-3-2, EN 61000-6-2, EN 61000-6-3	
Enclosure Rating	IP 20	
Enclosure Material	Plastic FR2010-110C (UL 94 V-0 rated)	
Mounting	35 mm DIN rails, snap on with self-locking spring or wall mount adapter included	
Connection	S models: Plug-in Screw Terminals, C Models: Clamp Terminals. For 28-12 AWG wire	
Agency Approvals	UL/cUL 508 listed File E197592(PSP24-240S not cUL), UL 60950 recognized, file E198298 (except PSP05-020S, PSP12-024S and PSP24=240S).	

Note: PSP05-020S, PSP12-024S and PSP24-024x models do not have Power Good output.

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

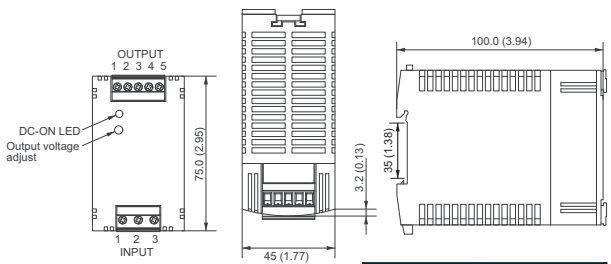
PSP05-020S, PSP12-024S, PSP24-024x



Input		Output	
1	AC Ground	1	+Vout
2	Neutral	2	-Vout
3	Line		

Weight: 140g (4.9 oz.)

PSPxx-060x

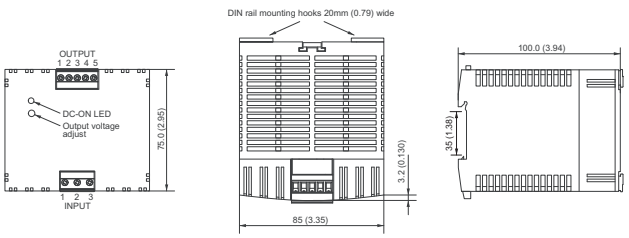


Input		Output	
1	AC Ground	1	+Vout
2	Neutral	2	+Vout
3	Line	3	-Vout
		4	-Vout
		5	Power Good

Weight: 265g (9.4 oz.)

Note: All dimensions are in millimeters (inches).

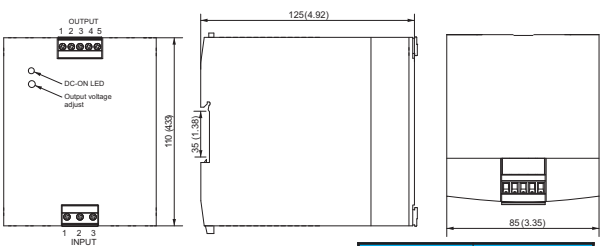
PSPxx-120x



Input		Output	
1	AC Ground	1	+Vout
2	Neutral	2	+Vout
3	Line	3	-Vout
		4	-Vout
		5	Power Good

Weight: 440g (15.5 oz.)

PSP24-240S



Input		Output	
1	AC Ground	1	+Vout
2	Neutral	2	+Vout
3	Line	3	-Vout
		4	-Vout
		5	Power Good

Weight: 950g (33.5 oz.)

RHINO PSC Series Power Supplies Specifications

PSC-05-012, PSC-12-015, PSC-24-015

PSC-12-030, PSC-24-030

PSC-12-060, PSC-24-060

PSC-24-090

NEC Class 2 Compliant Supplies

The **RHINO PSC** series power supplies are plastic low-profile housed switching supplies available in 5, 12 and 24 VDC adjustable output models. There are 8 models with power ratings from 12W to 90W. They have an integral DIN rail mounting adapter and feature universal 85 to 264 VAC input voltage, adjustable DC output, DC-OK LED indication, and output current limitation.

The **RHINO PSC** series of switching power supplies provide tightly regulated output voltage for sensitive loads in industrial, commercial and residential environments. The plastic housing is lightweight and low-profile, designed to fit in shallow depth control panels often used in the building automation industry. Screw terminals are provided for simple and speedy wiring terminations.

The **RHINO PSC** series is both UL508 listed for demanding industrial applications and UL1310 recognized for NEC Class 2 compliance in industrial, commercial and residential applications.

Features

- Low-profile housing - only 2.15 inches (55mm) deep (MCB form factor)
- 5, 12, 24VDC adjustable outputs
- Output power ratings from 12 to 90W
- Integral DIN rail mouting adapter
- Universal input voltage range 85-264VAC
- Tight output voltage regulation
- DC-OK LED indication
- UL508 Listed
- UL1310 Recognized for NEC Class 2 compliance
- CE compliant
- RoHS compliant

Input Specifications

Part Number	Input Voltage Range	Input Freq. Range	Input Current (Typical) at full load		Efficiency (Typ.)	C-Curve Circuit Breaker or Slow-blow Fuse
			115 VAC	230 VAC		
PSC-05-012	100-240VAC - Nominal 85 to 264VAC - Universal (output power derating 5% / V for operation below 90 VAC)	47-63 Hz	0.25A typ.	0.17A typ.	73%	6.0 A
PSC-12-015			0.29A typ.	0.20A typ.	79%	
PSC-24-015					81%	
PSC-12-030			0.57A typ.	0.39A typ.	81%	
PSC-24-030					83%	
PSC-12-060			1.00A typ.	0.68A typ	83%	
PSC-24-060			1.10A typ.	0.70A typ.	85%	
PSC-24-090			1.60A typ.	1.07A typ.	86%	

Output Specifications

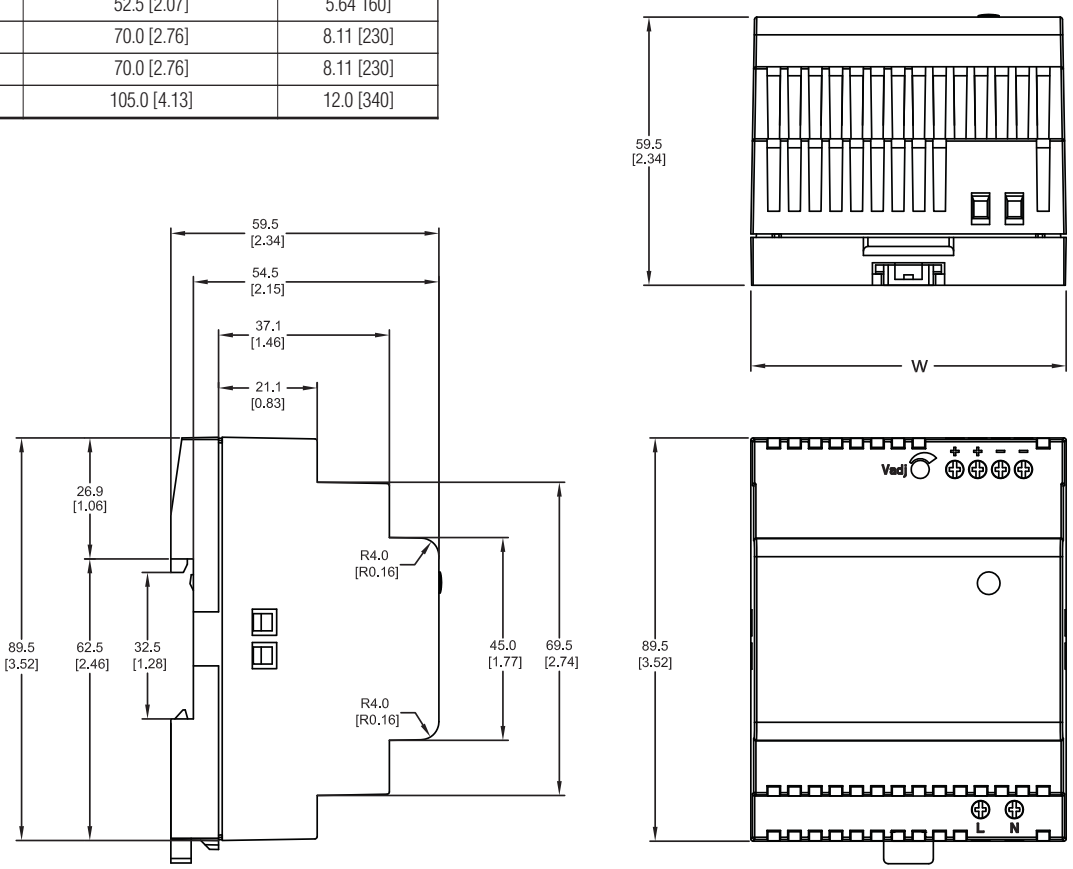
Part Number	Price	Output Voltage	Output Volt. Adjust. Range	Output Current (Max.)	Output Power (Max.)	Hold-Up Time	
						115 VAC	230 VAC
PSC-05-012	<--->	5.0VDC	5.0 to 5.2VDC	2.4A	12 Watt	minimum 10 ms	minimum 20 ms
PSC-12-015	<--->	12.0VDC	12.0 to 16.0VDC	1.25A	15 Watt		
PSC-24-015	<--->	24.0VDC	24.0 to 28.0VDC	0.63A			
PSC-12-030	<--->	12.0VDC	12.0 to 16.0VDC	2.5A	30 Watt		
PSC-24-030	<--->	24.0VDC	24.0 to 28.0VDC	1.25A			
PSC-12-060	<--->	12.0VDC	12.0 to 16.0VDC	4.5A	54 Watt		
PSC-24-060	<--->	24.0VDC	24.0 to 28.0VDC	2.5A	60 Watt		
PSC-24-090	<--->	24.0VDC		3.75A	90 Watt		

RHINO PSC Series Power Supplies Specifications and Dimensions

General Specifications		
Temperature	**Operating:** -25°C (-13°F) to +60°C (+140°F) max at nominal load, above +60°C (+140°F) 2.5% / °C derating up to +70°C (+185°F) **Storage:** -25°C (-13°F) to +85°C (+185°F) max	
Humidity	95% (non-condensing) relative humidity max.	
Output Regulation	1%	
Safety Standards	UL508, UL1310, Class 2 IEC/EN 60950-1, UL60950-1, EN50178 EN60204, EN61558-2-8	
Output Voltage Ripple	<100 mV peak-to-peak	
Output Protection	Current limitation at 100 - 150% typ. (automatic recovery)	
Electromagnetic Compatibility (EMC)	Emissions - EN61000-6-3 Conducted RI suppression on input - EN55022 class B Radiated RI suppression - EN55022 class B	Immunity - EN61000-6-2 EN61000-4-X
Enclosure Rating	IP 20 (IEC 60529)	
Enclosure Material	Plastic FR2010-110C (UL 94V- 0 rated)	
Mounting	DIN-rails as per EN50022-35x15/735 (snap-on with self-locking springs)	
Connection	Screw terminals with combi-type screw heads for wire size 24 to 12 AWG (0.20 to 3.30mm²)	
Agency Approvals	UL508 Listed, file #E197592 UL1310 Class 2 Recognized, file #E198298	

Dimensions		
Part No.	***Width (W) - mm [inches]***	***Weight oz [g]***
PSC-05-012	26.3 [1.04]	3.53 [100]
PSC-12-015	26.3 [1.04]	3.53 [100]
PSC-24-015	26.3 [1.04]	3.53 [100]
PSC-12-030	52.5 [2.07]	5.64 [160]
PSC-24-030	52.5 [2.07]	5.64 160]
PSC-12-060	70.0 [2.76]	8.11 [230]
PSC-24-060	70.0 [2.76]	8.11 [230]
PSC-24-090	105.0 [4.13]	12.0 [340]

Wiring		
Input/Output	***Description***	***Wire size***
AC Input	all models: L, N only (2 pin terminal)	24 -12 AWG / 3.30mm² max
DC Output	15 -30 Watt models: single + and - terminals	24 -12 AWG / 3.30mm² max
DC Output	60 - 90 Watt models: double + and - terminals	24 -12 AWG / 3.30mm² max



TOLERANCE +/- 0.5mm [0.02"]

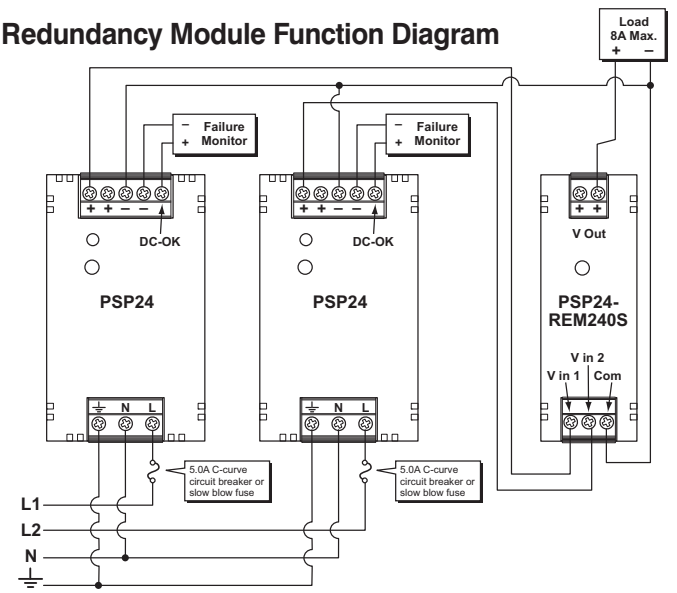
RHINO PSP24-REM240S Redundancy Module

The PSP24-REM240S redundancy module used with two Rhino PSP Series power supplies creates redundancy to help prevent costly downtime due to power supply failure. The PSP24-REM240S decouples the outputs of the two connected power supplies so that in case of failure, one power supply cannot overload the other.

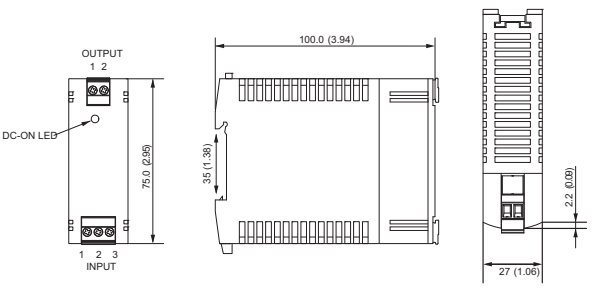
PSP Redundancy Module						
Part Number	***Price***	***Input Voltage Range***	***Max Power per Input***	***Output Voltage***	***Output Current Max.***	***Connection***
PSP24-REM240S	<--->	2 x 5 – 60 VDC	144 W	V in - 0.9 VDC	8 A	Detachable screw terminal block

PSP24-REM240S General Specifications	
Temperature	**Operating:** -10°C to +70°C max (14°F to +158°F max), **Storage:** -25°C to +85°C max, (-13°F to +185°F max), **Cooling:** Natural air convection
Parallel Operation	(2) Rhino PSP power supplies (except PSP24-240S) per module
Electromagnetic Compatibility	In correspondence with connected power supplies
Enclosure Material	Gray plastic, FR2010-110C (UL94 V-0 rated)
Mounting	Built-in snap-on connection for 35mm DIN rail or surface mount adapter included
Indication	Green LED for Output ON
Connections	Plug-in screw terminals, 0.5 to 0.7Nm (4.5 to 6.2lb-in) recommended tightening torque
Wire Size range	24 to12 AWG (0.21 to 3.16 mm^2)
Dimensions	HxWxD 2.95" x 1.06" x 3.94" (75 x 27 x 100mm)
Agency Approvals	UL/cUL 508 listed, File E197592, CE

Redundancy Module Function Diagram



Redundancy Module Connector Positions



Input		Output	
1	+Vin1	1	+Vout
2	+Vin2	2	+Vout
3	Common		

Recommendations for redundant PSP Series power supply applications:

- ***With no load connected, adjust the output voltage of both power supplies to the same value.***
- ***Use separate input over-current protection for each power supply.***
- ***When possible, connect the input power to each power supply to different phases or circuits.***
- ***Use the DC-OK output and/or DC-ON LED on each power supply to monitor for failure. (PSP05-020S, PSP12-024S and PSP24-024x do not have DC-OK output).***
- ***Connect all output leads together at a single distribution node using leads having the same length and cross section.***

PS Series 12 VDC and 24 VDC Power Supplies

Switching power supplies at linear supply prices

The PS Series power supplies give you consistent, reliable, switched DC power at linear power supply prices.

These power supplies use efficient switching technology to produce the most power in the smallest space, while generating a minimum amount of heat. The constant-current short circuit protection limits the output current as the voltage is reduced to safely protect your control components from direct shorts and device failures. Once the short is corrected, the PS Series power supplies automatically resume supplying full-voltage power. Precisely regulated output power is suitable for battery charging applications. Extra-sturdy DIN rail mounts and removable plug connections make installation a breeze.

Meeting UL/cUL 60950, 508 and 1604* (Class I, Div. 2), our PS-D (DIN-rail mounted) power supplies meet the standards required for practically any industrial control application.

Features

- 2A - 24A at 24 VDC, 3.5A at 12 VDC
- Regulated switch mode type
- Low profile case
- Easy DIN-rail mounting
- Constant-current short circuit protection
- Low ripple and noise
- Selectable input voltage (115/230 VAC)
- High EMC immunity
- EMI meets EN 55011-B and FCC Part 15, Level B
- Worldwide safety approvals: UL/cUL 508, 60950 and 1604 Class I, Div. 2 , CE

* (PS12-050D, PS24-050D and PS24-500D do not meet UL 1604 Class I Div 2),

Removable plug terminals:
- Easy to install and disconnect wiring

Sturdy DIN-rail mounting:
- Easy to mount and remove, but still secure

Power ON LED:
- Quick visual check for troubleshooting

Durable metal case:
- A reliable industrial duty package

Constant current protection with auto-recovery:
- No current spikes to damage powered devices due to improper wiring or a powered device failure

Efficient switching technology:
- Smaller size and less heat generated results in less wasted space and energy

Part numbering system

PS12-050D

- D: DIN-Rail Mounting
- Output Watts
- Output Volts
- PS: Series Name

PS Series Power Supplies Specifications

PS12-050D
PS24-050D

PS12-075D
PS24-075D

PS24-150D

PS24-300D

PS24-500D

PS24-600D

General Specifications	
Temperature	**Operating (ambient):** -25°C to + 70°C (-13°F to 158°F) max, Derating above 50°C 2%/C **Storage (non-operating)**: -25°C to + 85°C (-13°F to 185°F) max, **Temperature drift:** 0.02%/C
Humidity	95% (non-condensing) relative humidity max
Switching Frequency	80 kHz typical (PWM)
Isolation	According to IEC/EN 60950, UL 60950, UL 508
Output Regulation	Input variation: ± 0.2% max Load variation: 50 W, 75 W, 150 W models: ± 1% max . . . . . 300 W, 500 W, 600 W models: ± 0.3% max
Output Voltage Ripple	< 50 mV peak to peak (20 MHz bandwidth)
Output Protection	Current limit: 110% maximum output rating. Voltage limit: 140% Vout nom
Vibration	1gn 20 sweeps each axis
Shock	15gn, 11mS each axis
Enclosure Rating	IP 20
Enclosure Material	Aluminum (chassis) / stainless steel (cover)
Mounting	Snap-on with self-locking spring for 35mm DIN rails
Connection	Removable screw terminals for 22-10 AWG
Agency Approvals	UL/cUL 60950 recognized, file E198298, UL/cUL 508 listed File E197592, UL/cUL 1604 listed (Class I, Div 2, groups A,B,C, and D hazardous locations), File E197886, **except PSxx-050D and PS24-500D**, which are not UL/cUL1604 listed. CE
Note: All specifications are valid at nominal input voltage, full load and +25°C after warm-up time, unless otherwise stated.	

Input Specifications

Part Number	*Input Voltage Range*	*Input Frequency Range*	*Input Current (Typical)*		*Inrush Current (<2mS)*		*Efficiency (Typ.)*	*C-Curve Circuit Breaker or Slow-blow Fuse*
			115 VAC	*230 VAC*	*115 VAC*	*230 VAC*		
PS12-050D	93-264 VAC	47-63 Hz	1.2 A	0.7 A	<15 A	<30 A	84%	5.0 A
PS24-050D	93-264 VAC		1.2 A	0.7 A			87%	
PS12-075D	93-132 VAC 187-264 VAC *(switch selectable)*		1.7 A	0.9 A	<16.5 A	<33 A	83%	
PS24-075D			1.7A	0.9 A			85%	
PS24-150D			3.0 A	1.7 A	<35 A	<70 A	84%	10.0 A
PS24-300D			5.4 A	3.3 A			87%	15.0 A
PS24-500D	93-132 VAC		9.5 A	N/A	<50 A	N/A	87%	
PS24-600D	93-132 VAC 187-264 VAC *(switch selectable)*		10.5 A	6.4 A	<70 A	<80 A	88%	20.0 A

Output Specifications

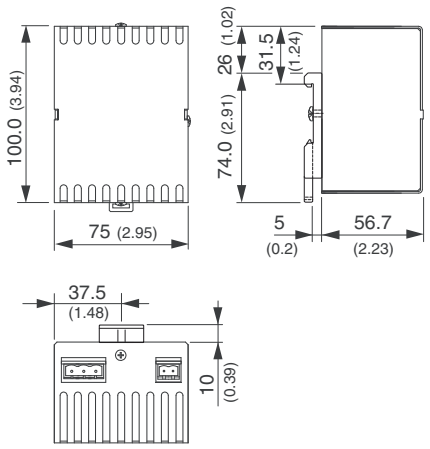
Part Number	*Price*	*Output Voltage*	*Output Voltage Adj. Range*	*Output Current (Max.)*	*Output Power (Max.)*	*Output Voltage Regulation**	*Hold-Up Time*		*MTBF (IEC 1709 @ 25°C)*
							115 VAC	*230 VAC*	
PS12-050D	<--->	12 VDC	12-14 VDC	3.5 A	50 W	1%	25 mS	30 mS	2,992,000 hours
PS24-050D	<--->	24 VDC	24-28 VDC	2.0 A	50 W				
PS12-075D	<--->	12 VDC	12-14 VDC	6.0 A	75 W				1,800,000 hours
PS24-075D	<--->	24 VDC	24-28 VDC	3.0 A	75 W				
PS24-150D	<--->			6.0 A	150 W				1,939,000 hours
PS24-300D	<--->			12.0 A	300 W	0.3%			1,913,000 hours
PS24-500D	<--->			20.0 A	500 W		20 mS	N/A	1,467,000 hours
PS24-600D	<--->			24.0 A	600 W		15 mS	25 mS	1,434,000 hours
***Load variation (10-90%)**				***Notes: Output current characteristic suitable for battery charging applications. Not recommended for redundancy or parallel operation.***					

Replacement terminal blocks are available. See price list.

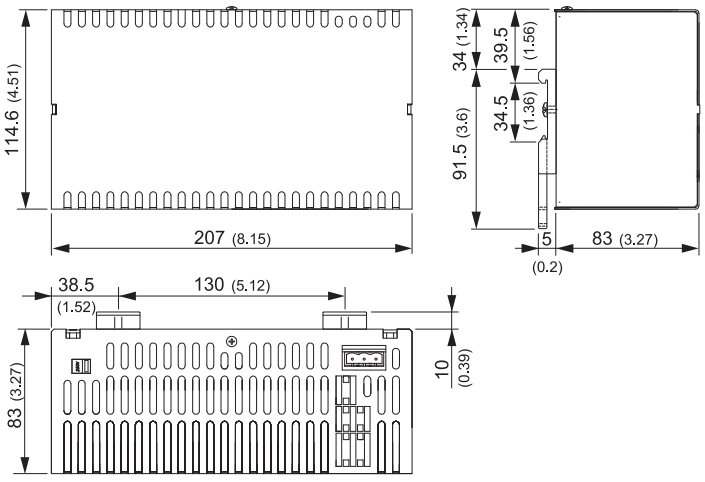
PS Series Power Supplies Dimensions

Note: All dimensions are in millimeters (inches). Tolerances ±0.5mm

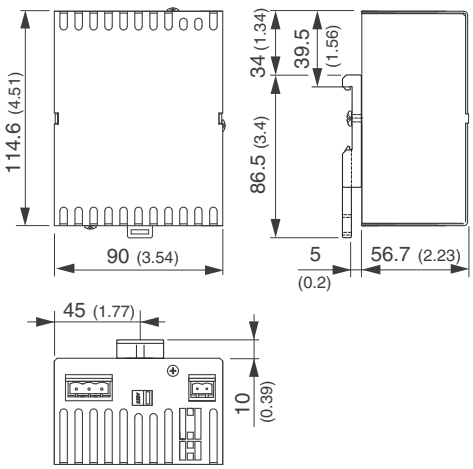
PS12-050D, PS24-050D



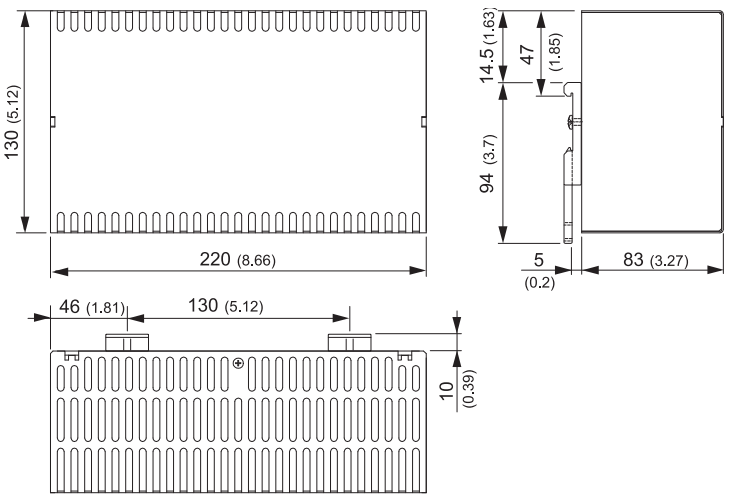
PS24-300D



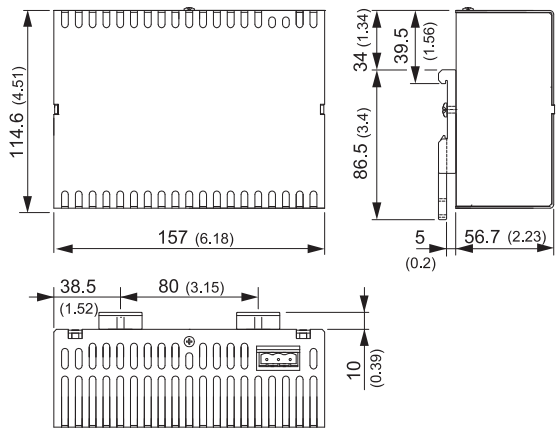
PS12-075D, PS24-075D



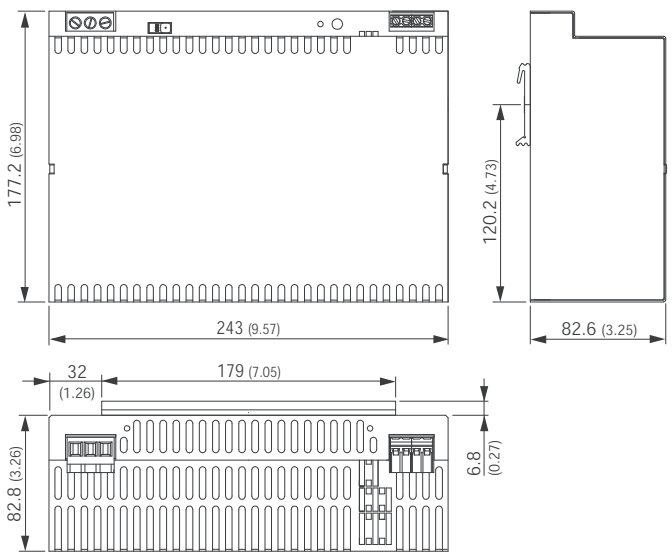
PS24-500D



PS24-150D



PS24-600D



RHINO DC to DC Converters

Four models for DC input voltage are available in the PSP series of DIN-rail DC-to-DC converters. Wide input ranges of 9.5 to 18VDC and 18 to 75VDC allow these models to be operated from all popular DC supply voltage systems. With tightly regulated output voltage these DC/DC converters provide a reliable power source for sensitive loads in industrial process controls, factory automation and other equipment exposed to a critical industrial environment. They can be used to isolate a specific load from the 24 volt bus voltage, and offer easy installation with snap-on mounting on DIN rails and detachable screw terminal block.

Features

- Ultra-wide input voltage range
- Output voltage adjustable
- Overload and short circuit protection
- Low ripple and noise
- I/O-isolation 1500 VDC
- Compact, slim plastic case
- Reliable snap-on mount on 35mm DIN rail
- Wall-mount bracket included
- 3-year warranty

PSP12-DC24-2

PSP24-DC12-1

PSP05-DC24-5

PSP24-DC24-1

Input Specifications					
Part Number	*Input Voltage Range*	*Input Power (no load)*	*Startup Voltage*	*Undervoltage Shut-down*	*Efficiency (Typical)*
PSP24-DC12-1	9.5 – 18.0 VDC	1.0 W. max	8.4 VDC	7.6 VDC	86%
PSP05-DC24-5	18 – 75 VDC		17.2 VDC	15.7 VDC	
PSP12-DC24-2					
PSP24-DC24-1					

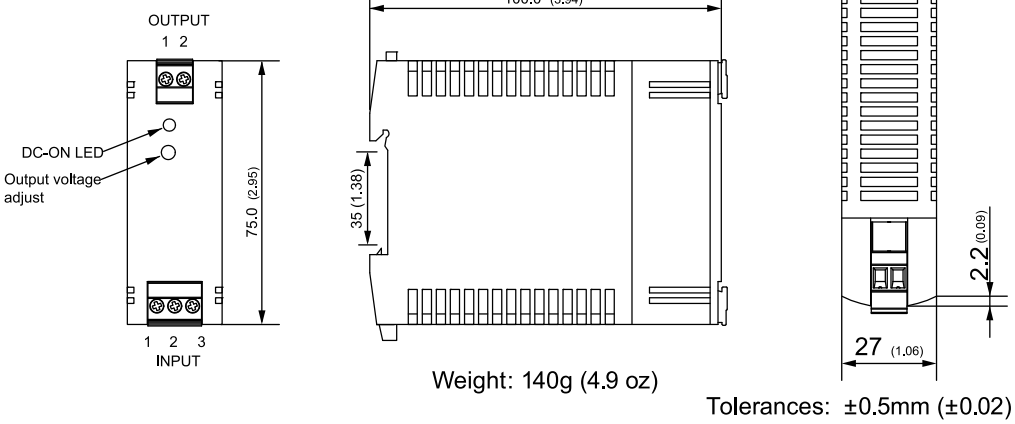
Output Specifications									
Part Number	*Price*	*Output Voltage*	*Output Voltage Adj. Range*	*Output Current (Max.)*	*Ripple/ Noise*	*Output Voltage Regulation**	*Overvoltage Protection, Trigger Point*	*Short Circuit Protection*	*MTBF (IEC 1709 @ 25°C)*
PSP24-DC12-1	<--->	24 VDC	24.0 - 28.0 VDC	1 A	<50mV peak to peak	±0.5 % max	<42 V	Current limited at 110% typical	2.5 million hours
PSP05-DC24-5	<--->	5 VDC	5.0 - 5.25 VDC	5 A			<6.5 V		
PSP12-DC24-2	<--->	12 VDC	12.0 - 15.0 VDC	2 A			<24 V		
PSP24-DC24-1	<--->	24 VDC	24.0 - 28.0 VDC	1 A			<42 V		

**Note: Input variation V_{in} min to V_{in} max and load variation 0 to 100%*

RHINO DC to DC Converters

General Specifications	
Temperature: Operating Storage (non-operating) Derating	-10°C to 70°C max (14°F to 158°F max) -25°C to 85°C max, (-13°F to 185°F max) 1.5%/K above 50°C (122°F)
Humidity (Non-condensing)	95 % relative humidity max.
Temperature Coefficient	0.02 %/K
Switching Frequency	55 – 180 kHz depending on load (frequency modulation)
Isolation Voltage (1 min.) – Input/Output	1500 VDC
Reliability, Calculated MTBF @ 25°C	>2.5 Mio h (according to IEC-1709)
Safety Standards	IEC 60950-1, EN 60950-1 (output SELV), UL/cUL 60950-1, EN 60204
Electromagnetic Compatibility (EMC), Emissions	EN 61000-6-3
Electromagnetic Compatibility (EMC), Immunity	EN 61000-6-2
Safety Class	Degree of protection class 1
Enclosure Rating	IP 20 (IEC 60529)
Enclosure Material	Plastic FR2010-110C (UL 94V-0 rated)
Mounting	DIN rails per EN 50022-35x15/7.5 (snap-on with self-locking spring) bracket for wall/chassis mount included
Agency Approvals UL Approval CB Report	UL/cUL 508 Listed, File E197592, CE
Note: All specifications valid at nominal input voltage, full load and +25°C after warm-up time unless otherwise stated.	

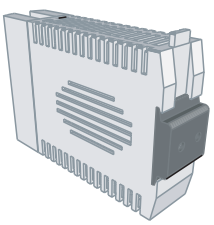
Dimensions



Weight: 140g (4.9 oz)

Tolerances: ±0.5mm (±0.02)

Input		Output	
1	Ground	1	+Vout
2	-Vin	2	-Vout
3	+Vin		



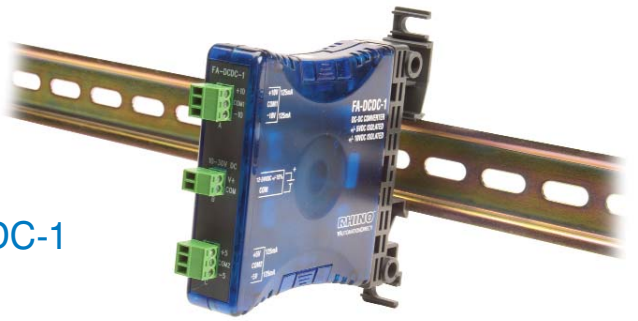
The unit can be mounted on a chassis or wall using the included mounting bracket.

RHINO DC to DC Isolated Converter

This isolated DC to DC power supply is used for eliminating ground loops or addressing isolation issues when interfacing to PLC analog I/O modules. The design features handle many types of configuration problems. The FA-DCDC-1 is a DIN-rail mount, ±10VDC, ±5VDC isolated power supply, with each output rated at 125mA. The ±10V and ± 5V outputs are fixed at 1.0% regulation. The input voltage range is 12-24V DC ±15% at approximately 6.7 Watts.

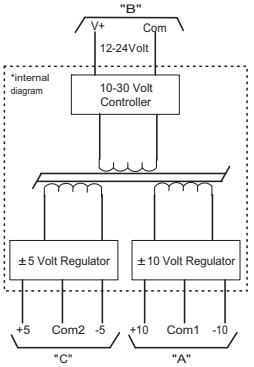
FA-DCDC-1

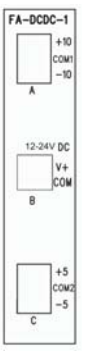
<--->

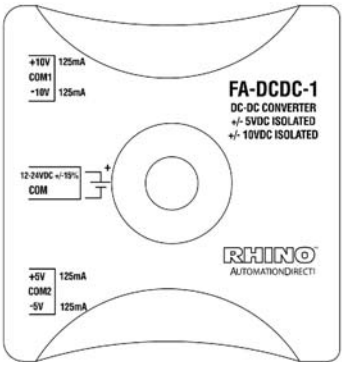


FA-DCDC-1 General Specifications[1]	
Input Voltage Range	12V to 24VDC ± 15%
Input Power [2]	6.7 Watts, Vin 27.6V, 125mA load each channel
Output Voltage [3] (25°C)	+5V ±1%, 125mA load,-5V ±1% 125mA load +10V ±1% 125mA load,-10V ±1% 125mA load
Output Current	125mA (per output voltage)
Output Ripple	±5V channels: <10mV peak to peak, Vin 10.2V 125mA load on both channels ±10V channels: <25mV peak to peak, Vin 10.2V, 125mA load on both channels
Line Regulation [4]	±5V channels: <10mV, Vin 10.2V to 27.6V, 125mA load on both channels ±10V channels: <20mV, Vin 10.2V to 27.6V, 125mA load on both channels
Load Regulation [5]	±5V channels: <20mV, Vin 10.2V, 0 - 125mA load variation ±10V channels: <40mV, Vin 10.2V, 0 - 125mA load variation
Isolation	**Input to Output:** 1500V; **±5V to ±10V:** 1500V
Inrush Current (50ms)	970mA, Vin 10.2V, 125mA load all channels
Holdup Time (all channels)	30mS minimum, Vin 10V, 125mA load all channels
Overshoot Protection	No overshoot - Turn on and turn off of Vin
Input Protection (reverse DC input voltage)	Up to -50V reverse. ± Vin reverse polarity connection.
Overload Protection	Auto shutdown. Short circuit. Cycle Vin post event
Output Protection	Indefinite duration. ±5V tied to ±10V
Peak Line Transient Voltage	100V for 10mS. Voltage spike on input
Operating Temperature	0 to 60°C (32 to 140°F) full rated
Storage Temperature	-20 to 70°C (-4 to 158°F)
Enclosure	Clear Lexan 221-111 with UN5016 transparent blue colorant
Mounting	35mm wide DIN rail: part # DN-R35S1 or DN-35HS1; surface mount
Connection	5mm screw terminal
Relative Humidity	5 to 90% (non-condensing)
Environmental Air	No corrosive gases permitted
Vibration	MIL STD 810C 514.2
Shock	MIL STD 810C 516.2
Noise Immunity	NEMA ICS3-304
Agency Standards and Approvals	UL/cUL listed, UL file E200031, UL508/CSA - C22.2 No. 142-M1987 for ordinary locations. Class I, Division 2, Groups A, B, C, D Hazardous Locations

Notes: 1. All specifications are over the full operating temperature range (0°C to 60°C) unless stated otherwise.
2. "Channel" means Output Voltage. For example: +5V is one channel and -10V is another.
3. All output voltage channels are independent of each other. Changing loading on one will have no effect on the other voltage outputs.
4. LINE Regulation: varying the Input Voltage over entire range (12V to 24V ± 15%) and the resultant change in the Output Voltage(s) under worst case load conditions (all output channels drawing 125mA).
5. LOAD Regulation: varying the output loads from no-load to a worst case 125mA load and measuring the resultant change in the Output Voltage(s) under a worst case minimum Input Voltage (10.2V) condition.

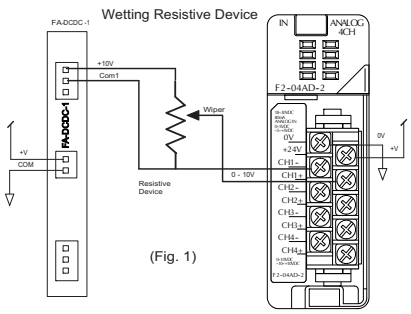




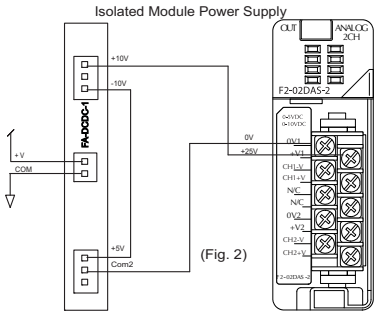


RHINO DC to DC Isolated Converter

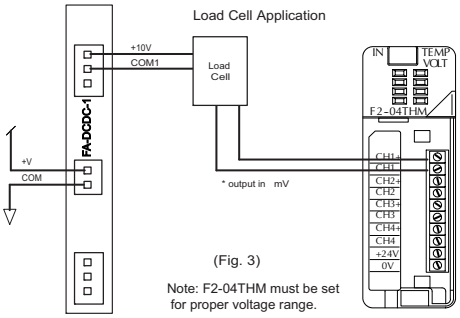
Applications



When using a linear potentiometer, the +10V connects to the high side of the potentiometer and the COM1 becomes the zero volt reference. The wiper connects to the analog input. The result is 0 to 10V at the analog module input. (Fig. 1)



Use in a solar/battery application where unregulated 12VDC is available and the analog module requires 24VDC for operation, connect the +10V to +24V module power, connect the -10V to the +5V and the COM2 to the 0V module power. (Fig. 2)



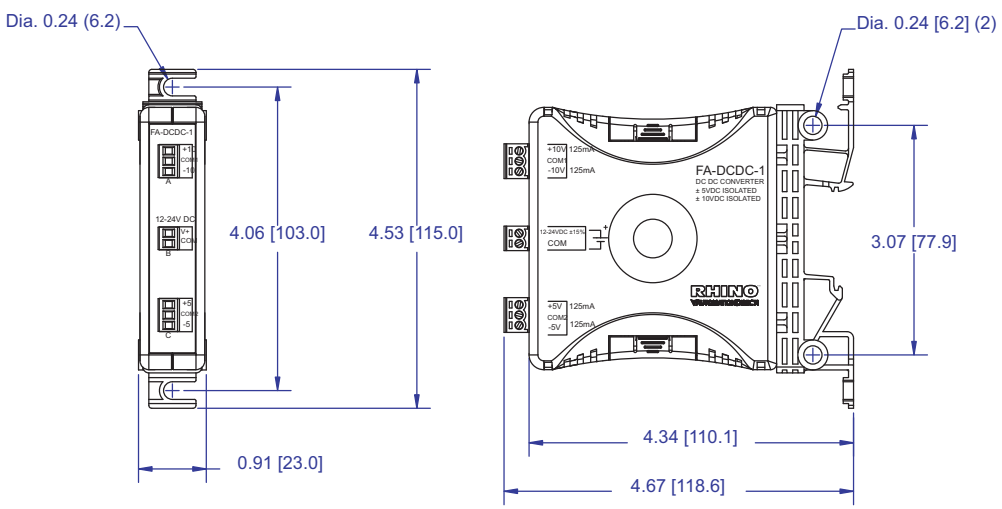
Use to power a load cell application. (Fig. 3)

THIS EQUIPMENT IS SUITABLE FOR USE IN CLASS I, DIVISION 2/ZONE 2, GROUPS A, B, C AND D NON-HAZARDOUS LOCATIONS ONLY.

WARNING - EXPLOSION HAZARD - SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR CLASS I, DIVISION 2/ZONE 2.

WARNING - EXPLOSION HAZARD - DO NOT CONNECT OR DISCONNECT CONNECTORS OR OPERATE SWITCHES WHILE CIRCUIT IS LIVE UNLESS THE AREA IS KNOWN TO BE NON HAZARDOUS.

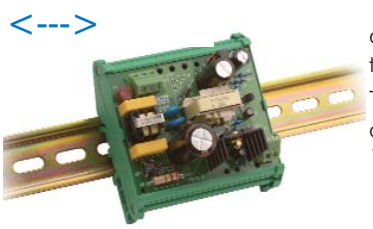
Dimensions, in(mm)



Power Supplies: Open Frame

The most economical choice for 24 VDC power

FA-24PS

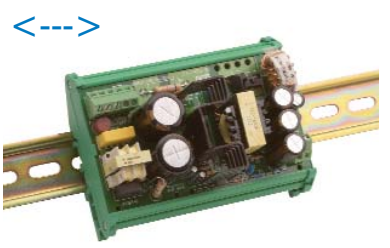


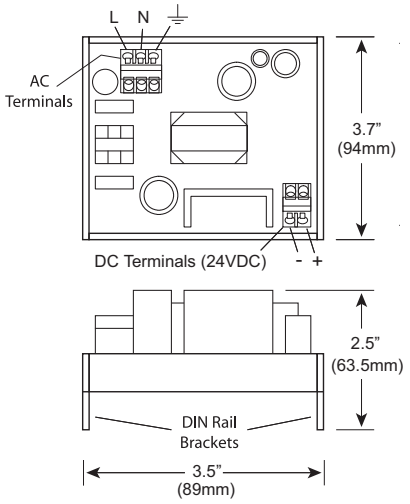
These power supplies are especially useful when an inexpensive external supply is required.

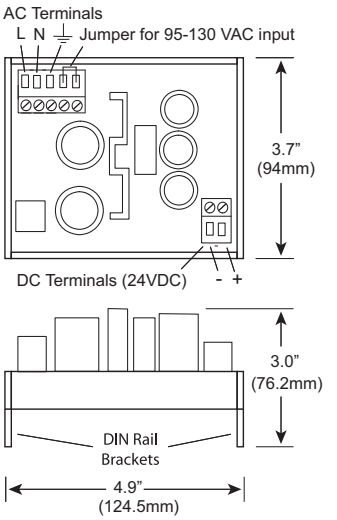
The FA-24PS compact switching power supply accepts 100-240 VAC or DC input and provides up to 1.25A (30 watts) output current at 24 VDC.

The FA-24PS-90 supplies 3.7A (90 watts) at 24 VDC and its input is jumper selectable between 95-130 or 190-264 VAC.

FA-24PS-90







General Specifications		
Part Number	***FA-24PS***	***FA-24PS-90***
Input Voltage Range	100-240 VAC/DC	95-130 VAC or 190-264 VAC, jumper selectable
Input Voltage Frequency	47 to 63 Hz	47 to 63 Hz
Input Power	40 VA	112 VA
Output Voltage	24 VDC ±5%	24 VDC ±5%
Output Current	1.25 A maximum continuous	3.7 A maximum continuous, subject to derating
Output Ripple	± 200 mV maximum	± 200 mV maximum
Temperature Rating	0°C to 60°C full rated	0°C to 30°C full rated; derate current 1.1% per degree above 30°C; 60°C max
Transient Response	Output stays within 1% for a load current change from 75% (0.9A) to either 50% (0.6A) or 100% (1.25A)	Output stays within 1% for a load current change from 75% (2.8A) to either 50% (1.8A) or 100% (3.7A)
Mounting	DIN rail, 35mm wide; Models DN-R35S1 or DN-R35HS1	DIN rail, 35mm wide; Models DN-R35S1 or DN-R35HS1
Screw Terminals	Wire Size: 18-12 AWG Rec. Screw Torque: 4.4 in•lb or 0.5 Nm	Wire Size: 18-12 AWG Rec. Screw Torque: 4.4 in•lb or 0.5 Nm
Insulation Resistance	10 MΩ at 500 V minimum	10 MΩ at 500 V minimum
Dielectric Withstand Voltage	L or N Input to Output: 500 V min; Ground Input to Output: 250 V min	L or N Input to Output: 500 V min; Ground Input to Output: 250 V min
Brown-out Protection	Provides temporary regulation down to 85 VAC at full load	Provides temporary regulation at 95VAC at full load
Input Protection	The power supply has an internal fuse for the AC input line, rated at 3.15 amps; not user replaceable; external input fusing required.	The power supply has an internal fuse for the AC input line, rated at 3.15 amps; not user replaceable; external input fusing required.
Overload Protection	Protects power supply from overload and short circuit conditions. Includes automatic recovery upon removal of the overload condition	Protects power supply from overload and short circuit conditions. Includes automatic recovery upon removal of the overload condition
Inrush Current (2mS)	115 V <12.5 A / 230 VAC <13.9 A	115 VAC <79 A / 230 VAC <37 A
Overshoot Protection	No overshoot on turn-on or turn-off	No overshoot on turn-on or turn-off
Agency Standards and Approvals	UL 508; Class I, Div 2, Groups A, B, C, D hazardous locations; CUL, UL Listed File E200031	

Hammond Transformers

Get years of reliable service from a quality transformer at a practical price

HPS Imperator™ control transformers for industrial applications

HPS Imperator control transformers from Hammond are specifically designed for high inrush applications requiring reliable output voltage stability. Designed to meet industrial applications where electromagnetic devices such as relays, solenoids, etc. are used, they maximize inrush capability and output voltage regulation when electromagnetic devices are initially energized.

HPS Imperator control transformers use Mylar, Nomex and other high-quality insulating materials. Insulation is used to electrically insulate turn-to-turn windings, layer-to-layer windings, primary-to-secondary windings and ground. These transformers are vacuum impregnated with VT polyester resin and oven-cured, which seals the surface and eliminates moisture. Filling the entire unit provides a strong mechanical bond and offers protection from the environment. This design utilizes superior insulation systems and is constructed with high quality silicon steel laminations, which provide optimum performance and reliability.

The custom injection-molded cover, with its unique fin-shaped design, provides excellent cooling properties while protecting the coils and terminations from moisture, dirt and other industrial airborne contaminants.

The heavy steel mounting feet are welded to the core, providing maximum strength and low noise in a compact design.

The HPS imperator's unique terminal block design (patent pending) allows for the quick and easy installation of standard secondary or optional primary 13/32" x 1 1/2" midget/type CC fuse clips on every unit. This is the simplest and most inexpensive fusing installation provided on any industrial control transformer in the market today.

The windings and internal terminations of the HPS Imperator are encapsulated, which protects them from moisture, dirt and other aiborne contaminants. The custom molded coil covers with their uniquie 'fin shaped' design combine superior transformer cooling properties with a clean bold look.

The HPS Imperator utilizes custom serrated terminals, in combination with standard SEMS washer screws making assembly easier and quicker to install; and provides superior connection strength when connecting with bare, solid, or stranded wire. It also allows for ring or spade termination conenctors.

HPS Fortress™ commercial potted transformers

The HPS Fortress commercial potted transformers provide an innovative design with commercial applications where quality, ease of installation, and low cost are key.

All Fortress units are encapsulated with electrical grade silica sand and resin compounds, which completely enclose the core and coil to seal out moisture, airborne contaminants and eliminates corrosion and deterioration.

Superior quality and value

- Compact, efficient design
- Easy installation and hook-up
- Inexpensive while maintaining superior quality in materials and workmanship
- Wall mounting

Applications

- Shopping centers
- Schools
- Sports complexes
- Office buildings
- Lighting

Control Transformer Selection

Control transformer selection

To select the proper transformer, you must first determine three characteristics of the load circuit. They are: total steady-state (sealed) VA, total inrush VA, and inrush load power factor.

Total steady-state "sealed" VA is the total amount of VA that the transformer must supply to the load circuit for an extended length of time. Calculate by adding the total steady-state VA of all devices in your control circuit. *(The operating VA data for the devices should be available from the manufacturers.)*

The **inrush VA** is the amount of VA that the transformer must supply for all components in the control circuit that are energized together. Consideration for the start-up sequence may be required. *(Inrush VA data should be obtained from the device manufacturers.)*

The **inrush load power factor** is difficult to determine without detailed vector analysis of all the control components. In the absence of such information, we recommend that a 40% power factor be utilized.

Six easy steps

Once the three load circuit variables have been determined, follow these steps to select the proper transformer.

1. Determine your primary (supply) and secondary (output) voltage requirements, as well as the required frequency (i.e. 60 Hz).
2. Calculate the total sealed VA of your circuit by adding the total sealed VA of all devices in the control circuit.
3. Calculate the inrush VA by adding the inrush VA of all components being energized together. Remember to add the sealed VA of all components that do not have inrush VA (lamps, timers, etc.), as they do present a load to the transformer during maximum inrush. If the inrush for your components is unknown, assume a 40% inrush power factor.

A $$\text{Total Inrush VA} = \sqrt{(\text{VA sealed})^2 + (\text{VA inrush})^2}$$

or

B $$\text{Total Inrush VA} = \text{VA Sealed} + \text{VA Inrush}$$

4. Calculate the total inrush VA using one of two methods:
   Method B will result in slightly larger transformer selected.
5. If the nominal supply voltage does not fluctuate more than 5%, then reference the 90% secondary voltage column in the Regulation Data Table for the correct VA rating.
   If the supply voltage varies up to 10%, the 95% secondary voltage column should be used to size the transformer. The 85% secondary voltage column gives minimum values for proper electromagnetic device operation and should only be used as a reference.
6. Using the regulation data table below, select the appropriate VA rated transformer:
   - **A.** With a continuous VA rating that is equal to or greater than the value in Step 2.
   - **B.** With a maximum inrush VA equal to or greater than the value obtained in Step 4.

Note: See over-current protection chart for transformers at the end of this section.

HPS Imperator Transformer Regulation Data Table

Continuous VA Transformer Nameplate	*Inrush VA @ 40% Power Factor*		
	85% Secondary Voltage	*90% Secondary Voltage*	*95% Secondary Voltage*
50	330	259	192
75	350	258	170
100	620	467	321
150	895	699	512
250	1596	1229	880
350	2464	1889	1345
500	3939	2854	1819
750	6422	4778	3228
1000	9842	7102	4530
1500	12797	9018	5489

Note: It is recommended that a control transformer be sized at a 40% power factor. Some components in a circuit, such as electromagnetic devices, typically operate at that level due to their inherently lower power factor. Selecting a transformer at 40% power factor will more than adequately size the unit for all the various loads in the circuit.

HPS Imperator™ 480x240 / 240x120 VAC Control Transformers Specifications

Features

- 600V class, machine tool rated industrial control transformers
- 50/60 Hertz
- VA range from 50 VA up to 1500 VA
- Constructed with high quality silicon steel laminations that provide optimum performance and reliability
- Encapsulated coils, encased in a custom injection molded cover, protect coils and terminations from moisture, dirt and other industrial airborne contaminants.
- Terminated with #8/32 slot/Phillips terminal screws complete with SEMS washer (suitable for 18 AWG to 14 AWG solid or 14 AWG stranded wire)
- Insulation system:
  - 50 - 150VA, temperature rise 55°C (131°F), insulation class 105°C (221°F),
  - 250 - 1500VA, temperature rise 80°C (176°F), insulation class 130°C (266°F)
- SEMS (standard machine screw with lock washer) standard
- Standard secondary fuse kits utilizing 13/32" x 1 ½" midget class CC fuse clips included with all transformers. Fuses are not included. (See Edison fuse section for HCTR fuses.)
- Optional primary fuse kits available utilizing 13/32" x 1 ½" midget class CC fuse clips
- Optional finger-safe terminal covers
- LIFETIME warranty (limited to mfg. defects)

Agency Approvals

- UL Listed (approved for U.S. and Canada) File E50394
- CE Mark standard on all units
- RoHS Compliant

HPS Imperator 480x240/240x120 Control Transformer Specifications

Part Number	Wt/Lbs	Price	Volt-Amp Rating*	Mtg. Fig.	Output Current Amps	Primary Voltage (50/60Hz)	Secondary Voltage	Impedance %		Total Heat Dissipation (Watts)**
								VA	%z	
PH50MQMJ	3.50	<--->	50	A	0.42/0.21	240x480 230x460 220x440	120x240 115x230 110x220	50	8.3	11
PH75MQMJ	3.54	<--->	75	A	0.63/0.31			75	8.7	14
PH100MQMJ	4.50	<--->	100	A	0.83/0.42			100	8.4	14
PH150MQMJ	5.70	<--->	150	B	1.25/0.63			150	8.0	18
PH250MQMJ	7.50	<--->	250	B	2.08/1.04			250	7.8	29
PH350MQMJ	10.1	<--->	350	B	2.92/1.46			350	7.0	33
PH500MQMJ	14.2	<--->	500	B	4.17/2.08			500	5.0	40
PH750MQMJ	16.6	<--->	750	B	6.25/3.13			750	4.9	54
PH1000MQMJ	23.6	<--->	1000	B	8.33/4.17			1000	3.9	69
PH1500MQMJ	34.0	<--->	1500	B	12.5/6.25			1500	3.9	101

*Note: *VA capacity rated at the output of the transformer.*
*** Heat dissipation calculated based on full rated load on transformer.*

Dimensions

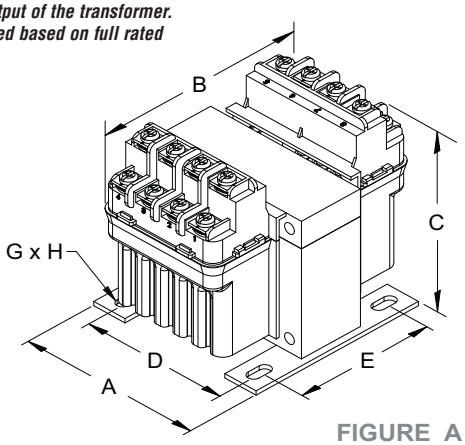


FIGURE A
(100VA and less)

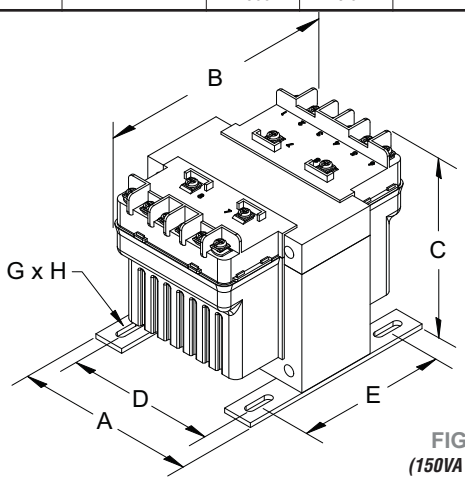


FIGURE B
(150VA to 1500VA)

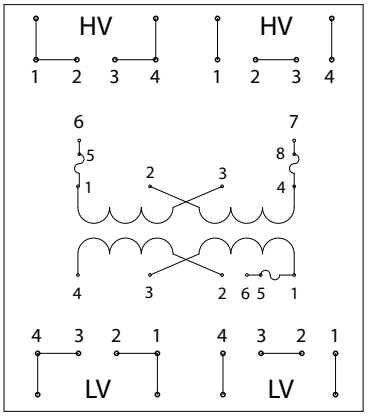
HPS Imperator 480x240/240x120 Control Transformer Dimensions

Part Number	Mtg. Fig.	Overall Dimensions inches (mm)			Mounting Centers inches (mm)		Mounting Slot inches (mm)	Height with Finger Guard inches (mm)	Depth with Finger Guard inches (mm)
		A	B	C	D	E	G x H		
PH50MQMJ	A	3.00 (76.2)	4.38 (111.3)	3.19 (81.0)	2.50 (63.5)	2.25 (57.2)	0.22 x 0.44 (5.6 x 11.2)	4.00 (101.6)	5.82 (147.8)
PH75MQMJ	A	3.25 (82.6)	3.88 (85.9)	3.56 (90.4)	2.63 (66.8)	2.50 (63.5)	0.22 x 0.44 (5.6 x 11.2)	4.37 (111.0)	5.32 (135.1)
PH100MQMJ	A	3.25 (82.6)	4.19 (106.4)	3.63 (92.2)	2.63 (66.8)	2.63 (66.8)	0.22 x 0.44 (5.6 x 11.2)	4.44 (112.8)	5.63 (143.0)
PH150MQMJ	B	4.00 (101.6)	4.94 (125.5)	3.81 (96.8)	3.38 (85.9)	2.75 (69.9)	0.22 x 0.75 (5.6 x 19.1)	4.31 (109.5)	6.44 (163.6)
PH250MQMJ	B	4.50 (114.3)	5.44 (138.2)	3.81 (96.8)	3.75 (95.3)	3.13 (79.5)	0.22 x 0.75 (5.6 x 19.1)	4.31 (109.5)	6.94 (176.3)
PH350MQMJ	B	4.50 (114.3)	5.19 (131.8)	4.44 (112.8)	3.75 (95.3)	3.75 (95.3)	0.22 x 0.75 (5.6 x 19.1)	4.94 (125.5)	6.69 (169.9)
PH500MQMJ	B	4.75 (120.7)	5.94 (150.9)	4.31 (109.5)	4.06 (103.1)	3.81 (96.8)	0.31 x 0.94 (7.9 x 23.9)	4.81 (122.2)	7.44 (189.0)
PH750MQMJ	B	5.13 (130.3)	6.69 (169.9)	4.31 (109.5)	4.38 (111.3)	4.31 (109.5)	0.31 x 0.81 (7.9 x 20.6)	4.81 (122.2)	8.19 (208.1)
PH1000MQMJ	B	5.25 (133.4)	6.81 (173.0)	4.94 (125.5)	4.50 (114.3)	4.44 (112.8)	0.31 x 0.81 (7.9 x 20.6)	5.44 (138.2)	8.31 (211.1)
PH1500MQMJ	B	5.25 (133.4)	8.19 (208.0)	4.94 (125.5)	4.50 (114.3)	6.06 (153.9)	0.38 x 1.00 (9.7 x 25.4)	5.44 (138.2)	9.69 (246.1)

Note: All dimensions are ±0.06 inches unless otherwise noted.

HPS Imperator™ 480x240 / 240x120 VAC Control Transformers Wiring Specifications

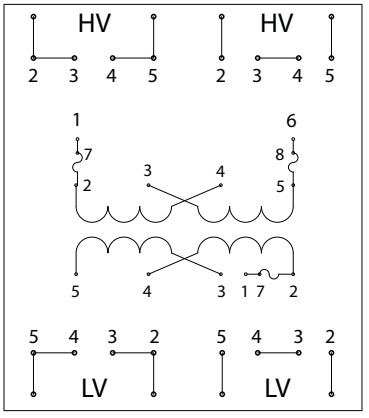
Wiring



PH***MQMJ Schematic for 50, 75 and 100VA Units

High Voltage (HV) (Primary Volts)	Install Jumpers/Links Between Lines	Supply Lines Connect To	Install Fuse Clips To
240 230 220	1-2, 3-4	1, 4	
480 460 440	2-3	1, 4	
240 230 220	1-2, 3-4	6, 7	1-5, 4-8
480 460 440	2-3	6, 7	1-5, 4-8

Low Voltage (LV) (Secondary Volts)	Install Jumpers/Links Between Lines	Load Lines Connect To	Install Fuse Clips To
120 115 110	3-4, 1-2	1, 4	
240 230 220	2-3	1, 4	
120 115 110	3-4, 1-2	4, 6	1-5
240 230 220	2-3	4, 6	1-5



PH***MQMJ Schematic for 150VA to 1500VA Units

High Voltage (HV) (Primary Volts)	Install Jumpers/Links Between Lines	Supply Lines Connect To	Install Fuse Clips To
240 230 220	2-3, 4-5	2, 5	
480 460 440	3-4	2, 5	
240 230 220	2-3, 4-5	1, 6	2-7, 5-8
480 460 440	3-4	1, 6	2-7, 5-8

Low Voltage (LV) (Secondary Volts)	Install Jumpers/Links Between Lines	Load Lines Connect To	Install Fuse Clips To
120 115 110	4-5, 2-3	2, 5	
240 230 220	3-4	2, 5	
120 115 110	4-5, 2-3	1, 5	2-7
240 230 220	3-4	1, 5	2-7

Notes

1. FUSES NOT INCLUDED (see Edison fuse section for HCTR fuses).

2. Secondary fuse clips supplied but not installed. Order fuses and primary fuse clips separately.

3. Jumper links to make primary/secondary series/parallel connections supplied, but not installed.

HPS Imperator™ 380x277x208 / 240x120 VAC Control Transformers Specifications

Features

- 600V class, machine tool rated industrial control transformers
- 50/60 Hertz
- VA range from 50 VA up to 500 VA
- Constructed with high quality silicon steel laminations that provide optimum performance and reliability
- Encapsulated coils, encased in a custom injection molded cover, protect coils and terminations from moisture, dirt and other industrial airborne contaminants.
- Terminated with #8/32 slot/Phillips terminal screws complete with SEMS washer (suitable for 18 AWG to 14 AWG solid or 14 AWG stranded wire)
- Insulation system:
  - 50 - 150VA, temperature rise 55˚C (131˚F), insulation class 105˚C (221˚F),
  - 250 - 500VA, temperature rise 80˚C (176˚F), insulation class 130˚C (266˚F)
- SEMS (standard machine screw with lock washer) standard
- Standard secondary fuse kits utilizing 13/32" x 1 ½" midget class CC fuse clips included with all transformers. Fuses are not included. (See Edison fuse section for HCTR fuses.)
- Optional primary fuse kits available utilizing 13/32" x 1 ½" midget class CC fuse clips
- Optional finger-safe terminal covers
- LIFETIME warranty (limited to mfg. defects)

Agency Approvals

- UL Listed (approved for U.S. and Canada) File E50394
- CE Mark standard on all units
- RoHS Compliant

HPS Imperator 380x277x208/240x120 Control Transformer Specifications										
Part Number	Wt/Lbs	Price	Volt-Amp Rating*	Mtg. Fig.	Output Current Amps	Primary Voltage (50/60Hz)	Secondary Voltage	Impedance %		Total Heat Dissipation (Watts)**
								VA	%z	
PH50MGJ	3.5	<--->	50	A	0.42/0.21	208x277x380	120x240	50	8.3	11
PH75MGJ	4.5	<--->	75	A	0.63/0.31			75	8.7	14
PH100MGJ	5.2	<--->	100	A	0.83/0.42			100	8.4	14
PH150MGJ	7.6	<--->	150	B	1.25/0.63			150	8.0	18
PH250MGJ	8.3	<--->	250	B	2.08/1.04			250	7.8	29
PH350MGJ	11.0	<--->	350	B	2.92/1.46			350	7.0	33
PH500MGJ	16.3	<--->	500	B	4.17/2.08			500	5.0	40

*Note: *VA capacity rated at the output of the transformer.*
*** Heat dissipation calculated based on full rated load on transformer.*

Dimensions

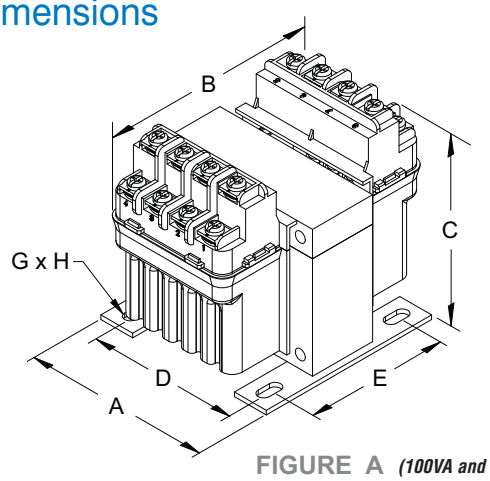


FIGURE A *(100VA and less)*

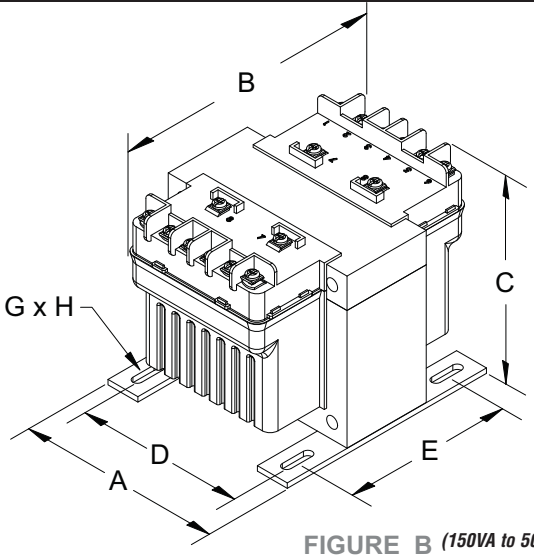


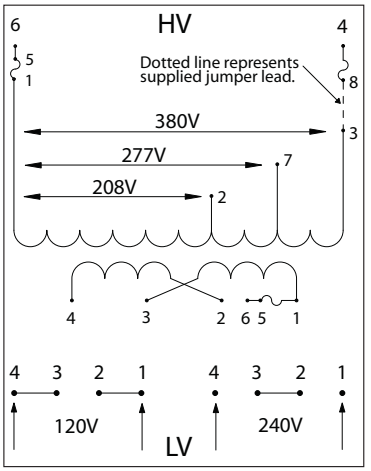
FIGURE B *(150VA to 500VA)*

HPS Imperator 380x277x208/240x120 Control Transformer Dimensions									
Part Number	Mtg. Fig.	Overall Dimensions inches (mm)			Mounting Centers inches (mm)		Mounting Slot inches (mm)	Height with Finger Guard, inches (mm)	Depth with Finger Guard inches (mm)
		A	B	C	D	E	G X H		
PH50MGJ	A	3.25 (82.6)	3.88 (98.6)	3.56 (90.4)	2.63 (66.8)	2.50 (63.5)	0.22 x 0.44 (5.6 x 11.2)	4.37 (111.0)	5.32 (135.1)
PH75MGJ	A	3.25 (82.6)	4.19 (106.4)	3.63 (92.2)	2.63 (66.8)	2.63 (66.8)	0.22 x 0.44 (5.6 x 11.2)	4.44 (112.8)	5.63 (143.0)
PH100MGJ	A	3.25 (82.6)	4.69 (119.1)	3.63 (92.2)	2.63 (66.8)	2.63 (66.8)	0.22 x 0.44 (5.6 x 11.2)	4.44 (112.8)	6.13 (155.7)
PH150MGJ	B	4.00 (101.6)	5.44 (138.2)	3.81 (96.8)	3.38 (85.9)	2.75 (69.9)	0.22 x 0.75 (5.6 x 19.1)	4.50 (114.3)	6.94 (176.3)
PH250MGJ	B	4.50 (114.3)	4.88 (124.0)	4.44 (112.8)	3.75 (95.3)	3.75 (95.3)	0.22 x 0.75 (5.6 x 19.1)	4.94 (125.5)	6.38 (162.1)
PH350MGJ	B	4.50 (114.3)	5.56 (141.2)	4.44 (112.8)	3.75 (95.3)	3.75 (95.3)	0.22 x 0.75 (5.6 x 19.1)	4.94 (125.5)	7.06 (179.3)
PH500MGJ	B	4.75 (120.7)	6.69 (169.9)	4.31 (109.5)	4.06 (103.1)	4.50 (114.3)	0.31 x 0.94 (7.9 x 23.9)	4.81 (122.2)	8.19 (208.0)

Note: All dimensions are ±0.06 inches unless otherwise noted.

HPS Imperator™ 380x277x208 / 240x120 VAC Control Transformers Wiring Specifications

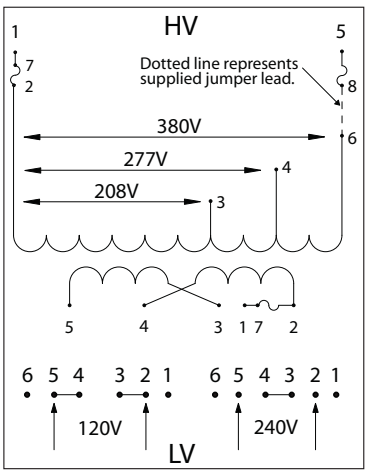
Wiring



PH***MGJ Schematic for 50, 75 and 100VA Units

High Voltage (HV) (Primary Volts)	Install Supplied Jumpers Between Terminals	Supply Lines Connect To	Install Fuse Clips To
380	None	1, 3	Unfused
277	None	1, 7	Unfused
208	None	1, 2	Unfused
380	3-8	6, 4	1-5, 4-8
277	8-7	6, 4	1-5, 4-8
208	2-8	6, 4	1-5, 4-8

Low Voltage (LV) (Secondary Volts)	Install Supplied Links Between Terminals	Load Lines Connect To	Install Fuse Clips To
120	3-4, 1-2	1, 4	Unfused
240	2-3	1, 4	Unfused
120	3-4, 1-2	4, 6	1-5
240	2-3	4, 6	1-5



PH***MGJ Schematic for 150VA to 1000VA Units

High Voltage (HV) (Primary Volts)	Install Supplied Jumpers Between Terminals	Supply Lines Connect To	Install Fuse Clips To
380	None	2, 6	Unfused
277	None	2, 4	Unfused
208	None	2, 3	Unfused
380	8-6	1, 5	2-7, 5-8
277	4-8	1, 5	2-7, 5-8
208	3-8	1, 5	2-7, 5-8

Low Voltage (LV) (Secondary Volts)	Install Supplied Links Between Terminals	Load Lines Connect To	Install Fuse Clips To
120	4-5, 2-3	2, 5	Unfused
240	3-4	2, 5	Unfused
120	4-5, 2-3	1, 5	2-7
240	3-4	1, 5	2-7

Notes

1. FUSES NOT INCLUDED (see Edison fuse section for HCTR fuses).

2. Secondary fuse clips supplied but not installed. Order fuses and primary fuse clips separately.

3. Jumper links to make primary/secondary series/parallel connections supplied, but not installed.

HPS Imperator™ 240x120 / 24x12 VAC Control Transformers Specifications

Features

- 600V class, machine tool rated industrial control transformers
- 50/60 Hertz
- VA range from 50 VA up to 1000 VA
- Constructed with high quality silicon steel laminations that provide optimum performance and reliability
- Encapsulated coils, encased in a custom injection molded cover, protect coils and terminations from moisture, dirt and other industrial airborne contaminants.
- Terminated with #8/32 slot/Phillips terminal screws complete with SEMS washer (suitable for 18 AWG to 14 AWG solid or 14 AWG stranded wire).
- Insulation system:
  - 50 - 150VA, temperature rise 55°C (131°F), insulation class 105°C (221°F),
  - 250 - 1000VA, temperature rise 80°C (176°F), insulation class 130°C (266°F)
- SEMS (standard machine screw with lock washer) standard (not on PH750PG or PH1000PG)
- Standard secondary fuse kits utilizing 13/32" x 1 ½" midget class CC fuse clips included with all transformers. Fuses are not included. (See Edison fuse section for HCTR fuses.)
- Optional primary fuse kits available utilizing 13/32" x 1 ½" midget class CC fuse clips
- Optional finger-safe terminal covers
- LIFETIME warranty (limited to mfg. defects)

Agency Approvals

- UL Listed (approved for U.S. and Canada) File E50394
- CE Mark standard on all units
- RoHS Compliant

HPS Imperator 240x120/24x12 Control Transformer Specifications

Part Number	Wt/Lbs	Price	Volt-Amp Rating*	Mtg. Fig.	Output Current Amps	Primary Voltage (50/60Hz)	Secondary Voltage	Impedance %		Total Heat Dissipation (Watts)**
								VA	%z	
PH50PG	3.5	<--->	50	A	0.417/2.08	120x240 115x230 110x220	12x24 11.5x23 11x22	50	8.3	11
PH75PG	3.5	<--->	75	A	6.25/3.13			75	8.7	14
PH100PG	4.5	<--->	100	A	8.33/4.17			100	8.4	14
PH150PG	5.7	<--->	150	B	12.5/6.25			150	8.0	18
PH250PG	7.5	<--->	250	B	20.8/10.4			250	7.8	29
PH350PG	10.1	<--->	350	B	29.2/14.6			350	7.0	33
PH500PG	14.2	<--->	500	B	41.7/20.8			500	5.0	40
PH750PG	16.6	<--->	750	B	62.5/31.3			750	4.9	54
PH1000PG	23.6	<--->	1000	B	83.3/41.7			1000	3.9	69

*Note: *VA capacity rated at the output of the transformer.*
*** Heat dissipation calculated based on full rated load on transformer.*

Dimensions

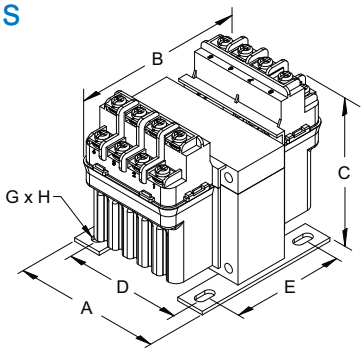


FIGURE A *(100VA and less)*

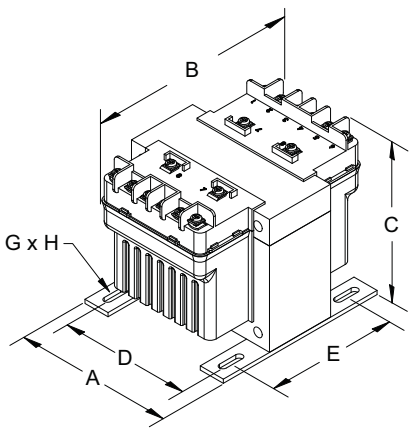


FIGURE B *(150VA to 1000VA)*

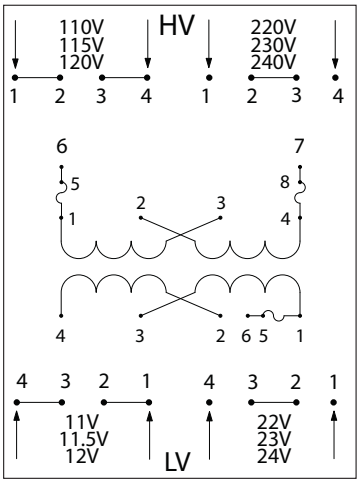
HPS Imperator 240x120/24x12 Control Transformer Dimensions

Part Number	Mtg. Fig.	Overall Dimensions inches (mm)			Mounting Centers inches (mm)		Mounting Slot inches (mm)	Height with Finger Guard, inches (mm)	Depth with Finger Guard inches (mm)
		A	B	C	D	E	G X H		
PH50PG	A	3.00 (76.2)	4.38 (111.3)	3.19 (81.0)	2.50 (63.5)	2.25 (57.2)	0.22 x 0.44 (5.6 x 11.2)	4.00 (101.6)	5.82 (147.8)
PH75PG	A	3.25 (82.6)	3.88 (85.9)	3.56 (90.4)	2.63 (66.8)	2.50 (63.5)	0.22 x 0.44 (5.6 x 11.2)	4.37 (111.0)	5.32 (135.1)
PH100PG	A	3.25 (82.6)	4.19 (106.4)	3.63 (92.2)	2.63 (66.8)	2.63 (66.8)	0.22 x 0.44 (5.6 x 11.2)	4.44 (112.8)	5.63 (143.0)
PH150PG	B	4.00 (101.6)	4.94 (125.5)	3.81 (96.8)	3.38 (85.9)	2.75 (69.9)	0.22 x 0.75 (5.6 x 19.1)	4.31 (109.5)	6.44 (163.6)
PH250PG	B	4.50 (114.3)	5.44 (138.2)	3.81 (96.8)	3.75 (95.3)	3.13 (79.5)	0.22 x 0.75 (5.6 x 19.1)	4.31 (109.5)	6.94 (176.3)
PH350PG	B	4.50 (114.3)	5.19 (131.8)	4.44 (112.8)	3.75 (95.3)	3.75 (95.3)	0.22 x 0.75 (5.6 x 19.1)	4.94 (125.5)	6.69 (169.9)
PH500PG	B	4.75 (120.7)	5.94 (150.9)	4.31 (109.5)	4.06 (103.1)	3.81 (96.8)	0.31 x 0.94 (7.9 x 23.9)	4.81 (122.2)	7.44 (189.0)
PH750PG	B	5.13 (130.3)	6.69 (169.9)	4.31 (109.5)	4.38 (111.3)	4.31 (109.5)	0.31 x 0.81 (7.9 x 20.6)	4.81 (122.2)	8.19 (208.1)
PH1000PG	B	5.25 (133.4)	6.81 (173.0)	4.94 (125.5)	4.50 (114.3)	4.44 (112.8)	0.31 x 0.81 (7.9 x 20.6)	5.44 (138.2)	8.31 (211.1)

Note: All dimensions are ±0.06 inches unless otherwise noted.

HPS Imperator™ 240x120 / 24x12 VAC Control Transformers Wiring Specifications

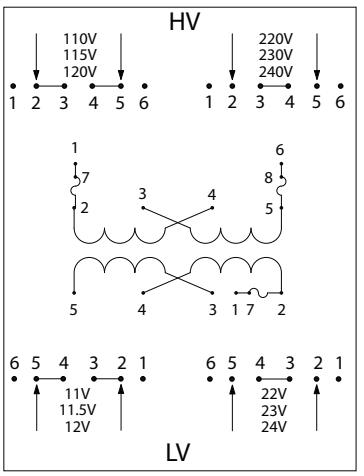
Wiring



PH***PG Schematic for 50, 75 and 100VA Units

High Voltage (HV) (Primary Volts)			Install Supplied Links Between Terminals	Supply Lines Connect To	Install Fuse Clips To
120	115	110	1-2, 3-4	1, 4	Unfused
240	230	220	2-3	1, 4	Unfused
120	115	110	1-2, 3-4	6, 7	1-5, 4-8
240	230	220	2-3	6, 7	1-5, 4-8

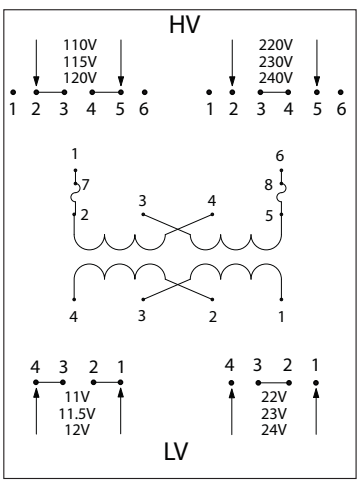
Low Voltage (LV) (Secondary Volts)			Install Supplied Links Between Terminals	Load Lines Connect To	Install Fuse Clips To
12	11.5	11	3-4, 1-2	1, 4	Unfused
24	23	22	2-3	1, 4	Unfused
12	11.5	11	3-4, 1-2	4, 6	1-5
24	23	22	2-3	4, 6	1-5



PH***PG Schematic for 150VA to 500VA Units

High Voltage (HV) (Primary Volts)			Install Supplied Links Between Terminals	Supply Lines Connect To	Install Fuse Clips To
120	115	110	2-3, 4-5	2, 5	Unfused
240	230	220	3-4	2, 5	Unfused
120	115	110	2-3, 4-5	1, 6	2-7, 5-8
240	230	220	3-4	1, 6	2-7, 5-8

Low Voltage (LV) (Secondary Volts)			Install Supplied Links Between Terminals	Load Lines Connect To	Install Fuse Clips To
12	11.5	11	4-5, 2-3	2, 5	Unfused
24	23	22	3-4	2, 5	Unfused
12	11.5	11	4-5, 2-3	1, 5	2-7
24	23	22	3-4	1, 5	2-7



PH***PG Schematic for 750VA and 1000VA Units

High Voltage (HV) (Primary Volts)			Install Supplied Links Between Terminals	Supply Lines Connect To	Install Fuse Clips To
120	115	110	2-3, 4-5	2, 5	Unfused
240	230	220	3-4	2, 5	Unfused
120	115	110	2-3, 4-5	1, 6	2-7, 5-8
240	230	220	3-4	1, 6	2-7, 5-8

Low Voltage (LV) (Secondary Volts)			Install Supplied Links Between Terminals	Load Lines Connect To	Install Fuse Clips To
12	11.5	11	3-4, 1-2	1, 4	Unfused
24	23	22	2-3	1, 4	Unfused

Note: secondary fuse clips not available on PH750PG or PH1000PG.

Notes

1. FUSES NOT INCLUDED (see Edison fuse section for HCTR fuses).

2. Jumper links to make primary/secondary series/parallel connections supplied, but not installed.

3. Secondary fuse clips supplied but not installed. Order fuses and primary fuse clips separately.

HPS Imperator™ 480x240 / 120x25 VAC Control Transformers Specifications

Features

- 600V class, machine tool rated industrial control transformers
- 50/60 Hertz
- VA range from 50 VA up to 500 VA
- Constructed with high quality silicon steel laminations that provide optimum performance and reliability
- Encapsulated coils, encased in a custom injection molded cover, protect coils and terminations from moisture, dirt and other industrial airborne contaminants.
- Terminated with #8/32 slot/Phillips terminal screws complete with SEMS washer (suitable for 18 AWG to 14 AWG solid or 14 AWG stranded wire)
- Insulation system:
  - 50 - 150VA, temperature rise 55°C (131°F), insulation class 105°C (221°F),
  - 250 - 500VA, temperature rise 80°C (176°F), insulation class 130°C (266°F)
- SEMS (standard machine screw with lock washer) standard
- Standard secondary fuse kits utilizing 13/32" x 1 ½" midget class CC fuse clips included with all transformers. Fuses are not included. (See Edison fuse section for HCTR fuses.)
- Optional primary fuse kits available utilizing 13/32" x 1 ½" midget class CC fuse clips
- Optional finger-safe terminal covers
- LIFETIME warranty (limited to mfg. defects)

Agency Approvals

- UL Listed (approved for U.S. and Canada) File E50394
- CE Mark standard on all units
- RoHS Compliant

HPS Imperator 480x240/120x25 Control Transformer Specifications

Part Number	Wt/Lbs	Price	Volt-Amp Rating*	Mtg. Fig.	Output Current Amps	Primary Voltage (50/60Hz)	Secondary Voltage	Impedance %		Total Heat Dissipation (Watts)**
								VA	%z	
PH50MLI	4.0	<--->	50	A	0.43/2.08	240x480 208x230x460 200x220x440	25x120 24x115 23x110	50	8.3	11
PH100MLI	5.2	<--->	100	A	0.87/4.17			100	8.4	14
PH250MLI	10.1	<--->	250	B	2.17/10.42			250	7.8	29
PH350MLI	11.0	<--->	350	B	3.04/14.58			350	7.0	33
PH500MLI	16.3	<--->	500	B	4.35/20.83			500	5.0	40

*Note: *VA capacity rated at the output of the transformer.*
*** Heat dissipation calculated based on full rated load on transformer.*

Dimensions

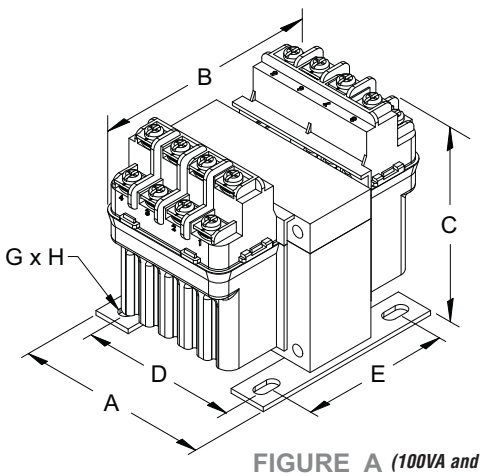


FIGURE A *(100VA and less)*

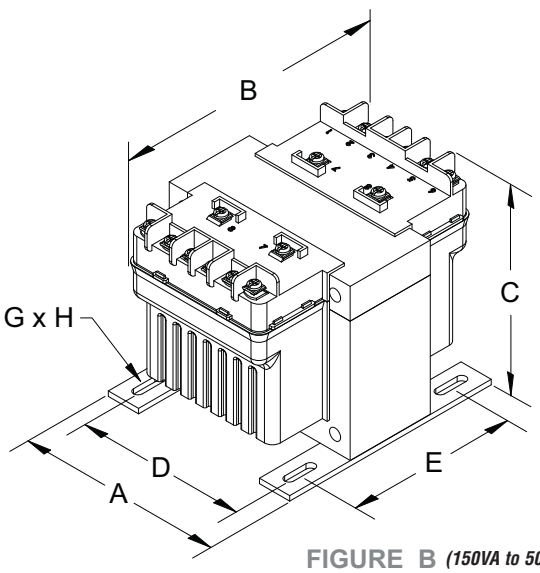


FIGURE B *(150VA to 500VA)*

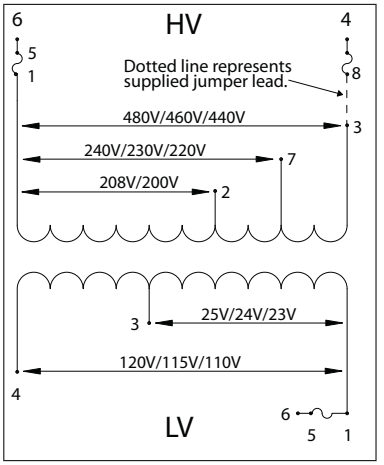
HPS Imperator 480x240/120x25 Control Transformer Dimensions

Part Number	Mtg. Fig.	Overall Dimensions inches (mm)			Mounting Centers inches (mm)		Mounting Slot inches (mm)	Height with Finger Guard, inches (mm)	Depth with Finger Guard inches (mm)
		A	B	C	D	E	G X H		
PH50MLI	A	3.25 (82.6)	4.06 (103.1)	3.56 (90.4)	2.63 (66.8)	2.50 (63.5)	0.22 x 0.44 (5.6 x 11.2)	4.37 (111.0)	5.32 (135.1)
PH100MLI	A	3.25 (82.6)	4.69 (119.1)	3.63 (92.2)	2.63 (66.8)	2.63 (66.8)	0.22 x 0.44 (5.6 x 11.2)	4.44 (112.8)	6.13 (155.7)
PH250MLI	B	4.50 (114.3)	5.19 (131.8)	4.44 (112.8)	3.75 (95.3)	3.75 (95.3)	0.22 x 0.75 (5.6 x 19.1)	4.94 (125.5)	6.38 (162.1)
PH350MLI	B	4.50 (114.3)	5.56 (141.2)	4.44 (112.8)	3.75 (95.3)	3.75 (95.3)	0.22 x 0.75 (5.6 x 19.1)	4.94 (125.5)	7.06 (179.3)
PH500MLI	B	4.75 (120.7)	6.69 (169.9)	4.31 (109.5)	4.06 (103.1)	4.50 (114.3)	0.31 x 0.94 (7.9 x 23.9)	4.81 (122.2)	8.19 (208.0)

Note: All dimensions are ±0.06 inches unless otherwise noted.

HPS Imperator™ 480x240 / 120x25 VAC Control Transformers Wiring Specifications

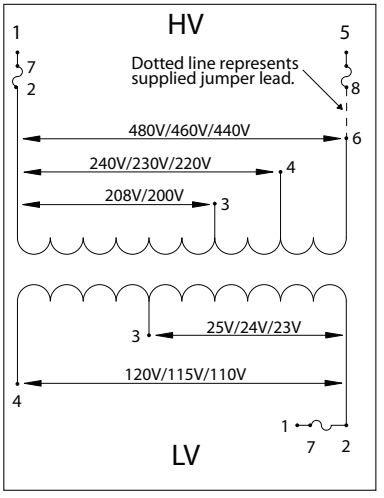
Wiring



PH***MLI Schematic for 50, 75 and 100VA Units

High Voltage (HV) (Primary Volts)			Install Supplied Jumpers Between Terminals	Supply Lines Connect To	Install Fuse Clips To
480	460	440	None	1, 3	Unfused
240	230	220	None	1, 7	Unfused
	208	200	None	1, 2	Unfused
480	460	440	3-8	6, 4	1-5, 4-8
240	230	220	8-7	6, 4	1-5, 4-8
	208	200	2-8	6, 4	1-5, 4-8

Low Voltage (LV) (Secondary Volts)			Install Supplied Jumpers Between Terminals	Load Lines Connect To	Install Fuse Clips To
120	115	110	None	1, 4	Unfused
25	24	23	None	1, 3	Unfused
120	115	110	None	4, 6	1-5
25	24	23	None	3, 6	1-5



PH***MLI Schematic for 150VA to 500VA Units

High Voltage (HV) (Primary Volts)			Install Supplied Jumpers Between Terminals	Supply Lines Connect To	Install Fuse Clips To
480	460	440	None	2, 6	Unfused
240	230	220	None	2, 4	Unfused
	208	200	None	2, 3	Unfused
480	460	440	8-6	1, 5	2-7, 5-8
240	230	220	4-8	1, 5	2-7, 5-8
	208	200	3-8	1, 5	2-7, 5-8

Low Voltage (LV) (Secondary Volts)			Install Supplied Jumpers Between Terminals	Load Lines Connect To	Install Fuse Clips To
120	115	110	None	2, 4	Unfused
25	24	23	None	2, 3	Unfused
120	115	110	None	1, 4	2-7
25	24	23	None	1, 3	2-7

Notes

1. FUSES NOT INCLUDED (see Edison fuse section for HCTR fuses).

2. Secondary fuse clips supplied but not installed. Order fuses and primary fuse clips separately.

3. Jumper links to make primary/secondary series/parallel connections supplied, but not installed.

4. Transformers secondary is NOT designed for dual voltages. Secondary voltage is either 25/24/23V or 120/115/110V.

HPS Imperator™ Transformers Accessories – Terminal Covers and Fuse Kits

Finger-safe terminal covers

These one-piece molded terminal covers are a quick and easy way to provide safety and protection in the workplace. They protect operators from potential shock hazards and guard against accidental contact with the fuses.

Fuse Kits

These optional primary side fuse kits contain four fuse clips, four mounting screws, and complete instructions.

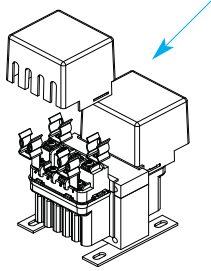
The table below makes it easy to choose the correct terminal covers and fuse kits for your Hammond control transformer.

Transformer	Finger-Safe Terminal Covers				Primary Side Fuse Kits		
Part Number	Part Number	Pcs/Pkg	Price	Description.	Part Number	Pcs/Pkg	Price
PH50MQMJ PH50PG	FG1	1 cover	<--->	Finger-safe cover for 50VA **unfused** control transformers. Cover fits primary side or secondary side.	PFK1	4 fuse clips, 4 mounting screws	<--->
	FGF1	1 cover	<--->	Finger-safe cover for 50VA **fused** control transformers. Cover fits primary side or secondary side.			
PH75MQMJ PH75PG	FG2	1 cover	<--->	Finger-safe cover for 75VA and 100VA **unfused** control transformers. Cover fits primary side or secondary side.			
PH75MQMJ PH75PG PH100MQMJ PH100PG	FGF2	1 cover	<--->	Finger-safe cover for 75VA and 100VA **fused** control transformers. Cover fits primary side or secondary side.			
PH150MQMJ PH150PG PH250MQMJ PH250PG	FG3	1 cover	<--->	Finger-safe cover for 150VA and 250VA **fused** and **unfused** control transformers. Cover fits primary side or secondary side.	PFK2	4 fuse clips, 4 mounting screws	<--->
PH350MQMJ PH350PG PH500MQMJ PH500PG PH750MQMJ	FG4	1 cover	<--->	Finger-safe cover for 350VA and 500VA **fused** and **unfused** control transformers. Also for use with PH750MQMJ. Cover fits primary side or secondary side.	PFK3	4 fuse clips, 4 mounting screws	<--->
PH1000MQMJ PH750PG PH1500MQMJ PH1000PG	FG5	1 cover	<--->	Finger-safe cover for 750VA (PH750PG only), 1kVA and 1.5kVA **fused** and **unfused** control transformers. Cover fits primary side or secondary side.		4 fuse clips, 4 mounting screws	<--->
PH50MLI PH50MGJ	FG1	1 cover	<--->	Finger-safe cover for 50VA **unfused** control transformers. Cover fits primary side or secondary side.	PFK4	4 fuse clips, 4 mounting screws 1 cover	<--->
	FGF1	1 cover	<--->	Finger-safe cover for 50VA **fused** control transformers. Cover fits primary side or secondary side.			
PH100MGJ PH100MLI	FG2	1 cover	<--->	Finger-safe cover for 75VA and 100VA **unfused** control transformers. Cover fits primary side or secondary side.	PFK5	4 fuse clips, 4 mounting screws 1 cover	<--->
	FGF2	1 cover	<--->	Finger-safe cover for 75VA and 100VA **fused** control transformers. Cover fits primary side or secondary side.			
PH150MGJ PH250MGJ PH250MLI	FG3	1 cover	<--->	Finger-safe cover for 150VA and 250VA **fused** and **unfused** control transformers. Cover fits primary side or secondary side.	PFK6	4 fuse clips, 4 mounting screws	<--->
PH350MJG PH500MJG PH350MLI PH500MLI	FG4	1 cover	<--->	Finger-safe cover for 350VA and 500VA **fused** and **unfused** control transformers. Also for use with PH750MQMJ. Cover fits primary side or secondary side.	PFK7	4 fuse clips, 4 mounting screws	<--->

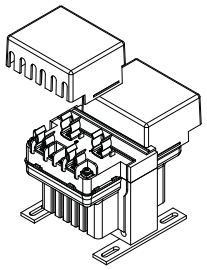
1. *Torque all terminal screws between 12 and 14 in-lbs.*
2. *For all bare wire connections, the recommended wire size range is 18 AWG to 14 AWG for solid wire, and 14 AWG for stranded. A ring or spade connector must be used if using a wire size outside the range listed above.*
3. *Ensure mounting screws used for transformer installation (not supplied) are properly sized for transformer weight.*
4. *When mounting fuse clips, remove the appropriate captive washer screw(s) from terminal block and install fuse clip(s) and new terminal screw(s).*
5. *Please refer to wiring instructions included with the Hammond control transformer for connection details.*

Finger-safe Cover accessories

Sample Assembly Drawing for Finger Guard Installation (for 50, 75 and 100VA)

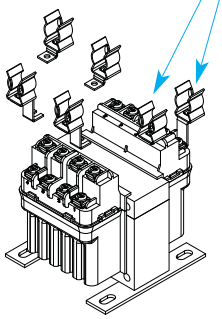


Sample Assembly Drawing for Finger Guard Installation (for 150VA to 1500VA)

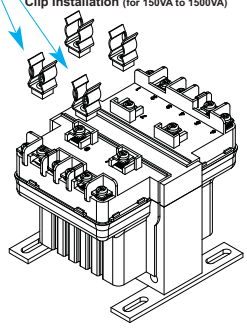


Fuse Clips accessories

Sample Assembly Drawing for Fuse Clip Installation (for 50, 75 and 100VA)



Sample Assembly Drawing for Fuse Clip Installation (for 150VA to 1500VA)



Standard secondary fuse kits utilizing 13/32" x 1 ½" midget class CC fuse clips included with all transformers. Fuses are not included. (See Edison fuse section for HCTR fuses.)

Recommendations for Overcurrent Protection UL and CSA (North American) Standards

UL and CSA (North American) Standards

North American standards, including UL 508, National Electric Code 450, and the Canadian Electrical Code, Part 1, require overcurrent protection on all control circuit transformers. There are two options for overcurrent protection:

Option 1 (Primary only Protection)

Provide an overcurrent device in the primary circuit rated to the current of the transformer. The overcurrent limits are as follows:

- Primary 9 Amps or more: no more than 125% of rated current
- Primary 2 to 9 Amps: no more than 167% of rated current
- Primary less than 2 Amps: no more than 300% of rated current for power circuits; no more than 500% of rated current for control circuits

Note: This method is considered less desirable, as start-up inrush to the transformer can frequently surpass the current rating of the device and result in nuisance interruptions.

Option 2 (Primary and Secondary Protection)

The second option is to install overcurrent devices in both the primary and secondary circuits of the transformer. In this option, the secondary device must be rated no more than 125% of rated current of the transformer and the primary no more than 250%. The Canadian Electrical Code permits 300% overcurrent on the primary for this option.

In both options listed, it is recommended that time delay fuses be considered to avoid unnecessary interruptions.

REFERENCES:

UL 508
UL 845
NEC 430-72
NEC 450-3
CEC Part 1, 26-256

Recommendations for Overcurrent Protection UL and CSA (North American) Standards, continued

PRIMARY (UL and CSA)

To assist in the selection of fuses, the following chart recommends the maximum primary fuse rating in amperes. The first number shown is the maximum overcurrent protection when the primary current is less than 2 amps and the overcurrent protection device is rated for 300%. The second number (shown in brackets) is recommended when the primary is less than 2 amps and the overcurrent device is to be rated at 500% of rated current. Where only one number is indicated, the primary is 2 amps or more and one rating of overcurrent protection is shown as optimal. Choose the next higher fuse rating if these numbers do not correspond with standard fuse selections.

HCTR Current Limiting Class CC Fuses				
Part Number	*AMP Rating*	*Pcs/Pkg*	*Weight*	*Price*
HCTR-25	0.25	10/1	0.2 lb	<--->
HCTR-5	0.5	10/1	0.2 lb	<--->
HCTR-75	0.75	10/1	0.2 lb	<--->
HCTR1	1	10/1	0.2 lb	<--->
HCTR1-25	1.25	10/1	0.2 lb	<--->
HCTR1-5	1.5	10/1	0.2 lb	<--->
HCTR2	2	10/1	0.2 lb	<--->
HCTR2-5	2.5	10/1	0.2 lb	<--->
HCTR3	3	10/1	0.2 lb	<--->
HCTR3-5	3.5	10/1	0.2 lb	<--->
HCTR4	4	10/1	0.2 lb	<--->
HCTR5	5	10/1	0.2 lb	<--->
HCTR6	6	10/1	0.2 lb	<--->
HCTR7-5	7.5	10/1	0.2 lb	<--->
HCTR8	8	10/1	0.2 lb	<--->
HCTR10	10	10/1	0.2 lb	<--->
HCTR15	15	10/1	0.2 lb	<--->
HCTR20	20	10/1	0.2 lb	<--->
HCTR25	25	10/1	0.2 lb	<--->
HCTR30	30	10/1	0.2 lb	<--->

Note: See HCTR fuse catalog page for characteristic curves.

Recommended Maximum Primary Fuse Ratings in Amps Where Primary Current is less than 2 Amps.

Primary Voltage	Overload Protection	Hammond Transformers VA RATING												
		50	*75*	*100*	*150*	*250*	*350*	*500*	*750*	*1000*	*1500*	*2000*	*3000*	*5000*
115	300%	1.25	1.8	2.5	3.5	4.0	5.0	8.0	10.0	15.0	20.0	25.0	–	–
	500%	(2.0)	(3.2)	(4.0)	(6.5)	–	–	–	–	–	–	–	–	–
120	300%	1.25	1.8	2.25	3.5	4.0	5.0	8.0	10.0	15.0	15.0	20.0	–	–
	500%	(2.0)	(3.2)	(4.0)	(6.5)	–	–	–	–	–	–	–	–	–
220	300%	0.6	1 .0	1.25	2 .0	3.2	4.5	4.0	6.0	8.0	12.0	15.0	20.0	30.0
	500%	(1.125)	(1.6)	(2.25)	(3.2)	(5.6)	(7.5)	–	–	–	–	–	–	–
208	300%	0.6	1.0	1.4	2.0	3.5	5.0	4.0	6.0	8.0	12.0	15.0	20.0	30.0
	500%	(1.125)	(1.8)	(2.25)	(3.5)	(6.0)	(8.0)	–	–	–	–	–	–	–
230	300%	0.6	0.8	1.25	1.8	3. 2	4.5	4.0	6.0	8.0	10.0	15.0	20.0	30.0
	500%	(1.0)	(1.6)	(2.0)	(3.2)	(5.0)	(7.5)	–	–	–	–	–	–	–
240	300%	0.6	0.8	1.25	1.8	3.0	4.0	3.5	5.0	7.0	10.0	15.0	15.0	30.0
	500%	(1.0)	(1.5)	(2.0)	(3.0)	(5.0)	(7.0)	–	–	–	–	–	–	–
277	300%	0.5	0.8	1.0	1.6	2.5	3.5	5.0	5.0	6.0	9.0	12.0	15.0	25.0
	500%	(0.8)	(1.25)	(1.8)	(4.5)	(6.25)	(9.0)	–	–	–	–	–	–	–
380	300%	0.3	0.5	0.75	1.125	1.8	2.5	3.5	5.6	4.5	6.25	9.0	15.0	20.0
	500%	(0.6)	(0.8)	(1.25)	(1.8)	(3.2)	(4.5)	(6.25)	(9.0)	–	–	–	–	–
440	300%	0.3	0.5	0.6	1 .0	1.6	2.25	3.2	5.0	4.0	6.0	8.0	12.0	15.0
	500%	(0.5)	(0.8)	(1.125)	(1.6)	(2.8)	(3.5)	(5.6)	(8.0)	–	–	–	–	–
460	300%	0.3	0.4	0.6	0.8	1.6	2.25	3.2	4.5	3.5	6.0	8.0	12.0	15.0
	500%	(0.5)	(0.8)	(1.0)	(1.6)	(2.5)	(3.5)	(5.0)	(8.0)	–	–	–	–	–
480	300%	0.3	0.4	0.6	0.8	1.5	2.0	3.0	4.5	3.5	5.0	7.0	10.0	15.0
	500%	(0.5)	(0.75)	(1.0)	(1.5)	(2.5)	(3.5)	(5.0)	(7.5)	–	–	–	–	–

Recommendations for Overcurrent Protection UL and CSA (North American) Standards, continued

SECONDARY

The overcurrent protection listed below, in amperes, is 125% of the rated current of the transformer. Choose the next higher fuse rating if these numbers do not correspond with standard fuse selections.

MEN General Purpose Midget Class Fuses				
Part Number	*AMP Rating*	*Pcs/Pkg*	*Weight*	*Price*
MEN-5	0.5	10/1	0.2 lb	<--->
MEN-6	0.6	10/1	0.2 lb	<--->
MEN1	1	10/1	0.2 lb	<--->
MEN1-4	1.4	10/1	0.2 lb	<--->
MEN1-5	1.5	10/1	0.2 lb	<--->
MEN2	2	10/1	0.2 lb	<--->
MEN2-5	2.5	10/1	0.2 lb	<--->
MEN3	3	10/1	0.2 lb	<--->
MEN3-5	3.5	10/1	0.2 lb	<--->
MEN4	4	10/1	0.2 lb	<--->
MEN5	5	10/1	0.2 lb	<--->
MEN6	6	10/1	0.2 lb	<--->
MEN7	7	10/1	0.2 lb	<--->
MEN8	8	10/1	0.2 lb	<--->
MEN10	10	10/1	0.2 lb	<--->
MEN12	12	10/1	0.2 lb	<--->
MEN15	15	10/1	0.2 lb	<--->
MEN20	20	10/1	0.2 lb	<--->
MEN25	25	10/1	0.2 lb	<--->
MEN30	30	10/1	0.2 lb	<--->

Note: See MEN fuse catalog page for characteristic curves.

Recommended Maximum Secondary Fuse Ratings in Amps.

Secondary Voltage	Overload Protection	Hammond Transformers VA RATING												
		50	*75*	*100*	*150*	*250*	*350*	*500*	*750*	*1000*	*1500*	*2000*	*3000*	*5000*
12	125%	5.3	7.9	11.0	16.0	27.0	–	–	–	–	–	–	–	–
24	125%	2.7	4.0	5.3	7.9	14.0	19.0	27.0	–	–	–	–	–	–
110	125%	0.6	0.9	1.2	1.8	2.9	4.0	5.7	8.6	12.0	18.0	23.0	–	–
115	125%	0.6	0.9	1.1	1.7	2.8	3.9	5.5	8.2	11.0	17.0	22.0	–	–
120	125%	0.6	0.8	1.1	1.6	2.7	3.7	5.3	7.9	11.0	16.0	21.0	–	–
220	125%	0.3	0.5	0.6	0.9	1.5	2.0	2.9	4.3	5.7	8.6	12.0	18.0	29.0
230	125%	0.3	0.5	0.6	0.9	1.4	2.0	2.8	4.1	5.5	8.2	11.0	17.0	28.0

HPS Fortress™ 480x240 / 240x120 VAC Commercial Potted Transformers Specifications

Features

- **Ratings:** 1 phase from 0.50kVA thru to 5kVA; 60 Hz
- **Electrostatic Shield:** Standard on all single phase units over 0.75kVA
- **Quality Design:** All units are encapsulated with electrical grade silica sand and resin compounds which completely enclose the core and coil to seal out moisture, airborne contaminants and eliminates corrosion and deterioration.
- **Insulation:** Offering UL class 130°C (266°F) insulation, 80°C (176°F) temperature rise up to 1kVA on single phase; 180°C (°F) insulation, 115°C (°F) temperature rise on all units over 1kVA on single phase. Quiet operation with sound levels below NEMA standards.
- **Enclosures:** NEMA 3R enclosures meet or exceed listing criteria including NEMA, ANSI, and OSHA standards for indoor and outdoor service.
- Rear and side entry into an easily accessible and roomy wiring compartment.
- **Wiring compartment:** Provides tinned copper lead wire terminations and standard ground lug assembly for easy cable installation.
- **Installation made quick and easy:** Via keyhole mounting slots. Wall mounting available on single phase units from 0.50kVA to 5kVA. Lifting provisions are included on all single phase units.
- **10 year warranty** (limited to mfg. defects)

Agency Approvals

- UL Listed File No. E50394 (Type Q)
- CSA File No. LR3902 (Type Q)

C1FC50LE

C1F1C5LES

C1F005LES

HPS Fortress 480x240/240x120 Control Transformer Specifications

Part Number	Wt/Lbs	Price	kVA Rating	Mtg. Fig.	Output Current Amps	Primary Voltage (50/60Hz)	Secondary Voltage	Impedance %		Total Heat Dissipation (Watts)*
								VA	%z	
C1FC50LE	15.0	<--->	0.50	A	4.17/2.08	240x480	120x240	500	7.6	35.8
C1FC75LES	18.0	<--->	0.75	A	6.25/3.13			750	5.6	57.2
C1F1C0LES	22.0	<--->	1.0	A	8.33/4.17			1000	4.8	75.3
C1F1C5LES	25.0	<--->	1.5	A	12.5/6.25			1500	4.1	100
C1F002LES	40.0	<--->	2.0	A	16.7/8.33			2000	4.3	121.6
C1F003LES	55.0	<--->	3.0	A	25.0/12.5			3000	3.7	160.8
C1F005LES	90.0	<--->	5.0	B	41.7/20.8			5000	4.2	314

*Note: * Heat dissipation calculated based on full rated load on transformer.*

HPS Fortress™ 480x240 / 240x120 VAC Commercial Potted Transformers Specifications and Wiring

Dimensions

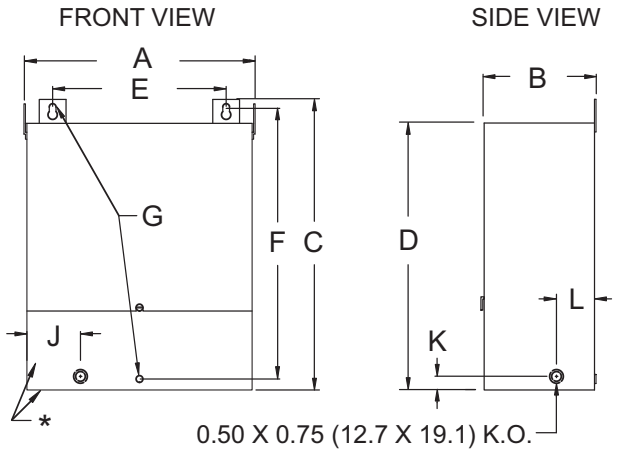


FIGURE A *(300VA and less)*

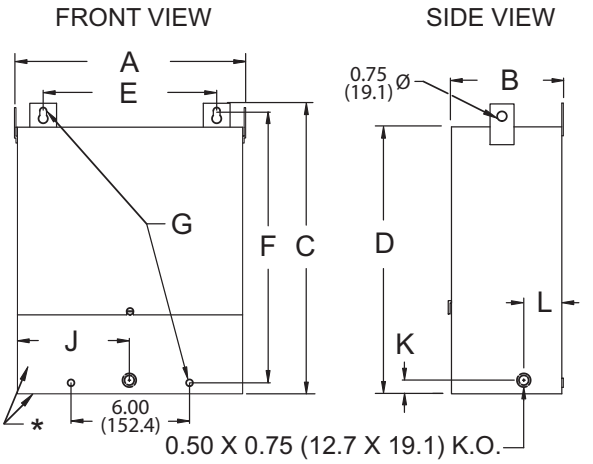


FIGURE B *(500VA)*

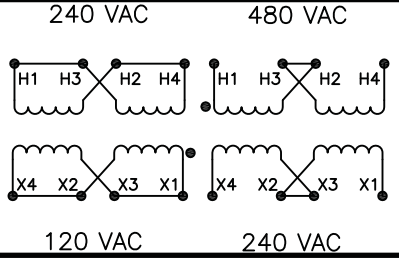
** Front & bottom panel is hinged for access to terminals, bottom mounting holes and rear knockout.*

HPS Fortress 480x240/240x120 Control Transformer Dimensions											
Part Number	Mtg. Fig.	Overall Dimensions inches (mm)				Mounting Holes inches (mm)		Mounting Hole Dia. inches (mm)	Knock Out Dimensions inches (mm)		
		A	B	C	D	E	F	G	J	K	L
C1FC50LE	A	5.00 (127.0)	4.75 (120.7)	9.25 (235.0)	8.25 (209.6)	3.88 (98.6)	7.75 (196.9)	0.22 (5.6)	1.00 (25.4)	1.50 (38.1)	2.00 (50.8)
C1FC75LES	A	5.00 (127.0)	4.75 (120.7)	9.25 (235.0)	8.25 (209.6)	3.88 (98.6)	7.75 (196.9)	0.22 (5.6)	1.00 (25.4)	1.50 (38.1)	2.00 (50.8)
C1F1C0LES	A	5.88 (149.4)	5.50 (139.7)	10.00 (254.0)	8.50 (215.9)	4.13 (104.9)	8.25 (209.6)	0.28 (7.1)	1.25 (31.8)	1.50 (38.1)	2.00 (50.8)
C1F1C5LES	A	5.88 (149.4)	5.50 (139.7)	10.00 (254.0)	8.50 (215.9)	4.13 (104.9)	8.25 (209.6)	0.28 (7.1)	1.25 (31.8)	1.50 (38.1)	2.00 (50.8)
C1F002LES	A	7.00 (177.8)	6.50 (165.1)	11.25 (285.8)	9.75 (247.7)	5.38 (136.7)	9.50 (241.3)	0.28 (7.1)	1.50 (38.1)	1.50 (38.1)	2.00 (50.8)
C1F003LES	A	7.00 (177.8)	6.50 (165.1)	11.25 (285.8)	9.75 (247.7)	5.38 (136.7)	9.50 (241.3)	0.28 (7.1)	1.50 (38.1)	1.50 (38.1)	2.00 (50.8)
C1F005LES	B	10.00 (254.0)	7.75 (196.9)	17.25 (438.2)	15.25 (387.4)	7.38 (187.5)	15.38 (390.7)	0.44 (11.2)	4.00 (101.6)	2.00 (50.8)	2.00 (50.8)

Note: All dimensions are ±0.06 inches unless otherwise noted.

Wiring

SCHEMATIC



CONNECTIONS

Primary Volts	Connect lines to	Inter-connect
480	H1, H4	H2-H3
240	H1, H4	H1-H3, H2-H4

Secondary Volts	Connect lines to	Inter-connect
240	X1, X4	X2-X3
120/240	X1, X2, X4	X2-X3
120	X1, X2	X2-X4, X1-X3

Note: Lower secondary voltages are not available, only 120/240 VAC.

Convenience Outlet

The hard way

The convenient way

Got power?

Have you ever needed to plug in your laptop or oscilloscope at the control enclosure only to find there was no outlet available?

Our customers asked us for a solution to this problem. We turned to our friends at FACTS Engineering for help. To install the FA-REC3 outlet, snap the outlet on the DIN rail, terminate three wires, and that's it! It doesn't get much more convenient than that. Practically every enclosure installed these days has DIN rail incorporated into the control design. Instead of buying metallic boxes, covers, outlets, and strain reliefs, why not just install one of our convenience outlets?

Specifications

- Output voltage: 125VAC
- Outlet type: NEMA 5-15R
- Output current: 15A maximum
- Total current: Must not exceed 15A if all outlets are used
- GFCI: None
- Mounting: 35mm DIN rail
- Wire capacity: 12-22 AWG X1 or 16-22AWG X2
- Tightening torque: 6 in-lbs.
- Operating temp.: 0-60 degrees C (32-140 F)
- Circuit protection: None
- UL 508 listed

FA-REC3 <--->

Dimensions