

SURESTEP™ SYSTEM POWER SUPPLIES



CHAPTER 9

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Features

- Linear models available with 32V@4A, 48V@5A, 48V@10A, & 70V@5A DC unregulated step motor power
- 5VDC $\pm 5\%$ at 500 mA regulated logic power (electronic overload)
- Screw terminal AC input and DC output connectors
- 120 or 240 VAC, 50/60 Hz power input, switch selectable
- Power ON LEDs
- Integrated input and output fusing
- Matched to SureStep drives for maximum voltage
- Switching models also available. Series PSBxx-xxxS is recommended.



Linear Power Supplies



Switching Power Supplies



The stepping system power supplies can supply power for multiple SureStep STP-DRV-xxxx microstepping motor drives, depending on step motor size and application requirements. To select a power supply for multiple drives, use the following formula:

$$I(ps) \geq 0.66 \times (I_{motor1} + I_{motor2} + I_{motor3} + \dots)$$



Further information about braking accessories and regeneration clamping can be found in Appendix A and the STP-DRVA-RC-050 REGENERATION CLAMP datasheet.

Specifications

SureStep™ Linear Power Supply Specifications				
Part Number	STP-PWR-3204	STP-PWR-4805	STP-PWR-4810	STP-PWR-7005
Input Power (fuse protected) ¹⁾	1-phase, 120/240 VAC, 50/60 Hz, 150 VA Fuse ¹⁾ : 3A	1-phase, 120/240 VAC, 50/60 Hz, 350 VA Fuse ¹⁾ : 5A	1-phase, 120/240 VAC, 50/60 Hz, 650 VA Fuse ¹⁾ : 8A	1-phase, 120/240 VAC, 50/60 Hz, 500 VA Fuse ¹⁾ : 7A
Input Voltage	120/240 VAC ±10% ⁽³⁾ (switch selectable; voltage range switch is set to 240 VAC from factory)			
Inrush Current	120 VAC < 12A 240 VAC < 14A	120 VAC < 20A 240 VAC < 24A	120 VAC < 40A 240 VAC < 50A	
Motor Supply Output (linear unregulated, fuse protected ¹⁾ , power on LED indicator)	32 VDC @ 4A (full load) 35 VDC @ 1A load 41 VDC @ no load Fuse ¹⁾ : 6A	46.5 VDC @ 5A (full load) 52 VDC @ 1A load 57.5 VDC @ no load Fuse ¹⁾ : 8A	46.5 VDC @ 10A (full load) 50 VDC @ 1A load 57.5 VDC @ no load Fuse ¹⁾ : 15A	70 VDC @ 5A (full load) 79 VDC @ 1A load 86.5 VDC @ no load ⁽³⁾ Fuse ¹⁾ : 8A
SureStep Drive Compatibility 2)	STP-DRV-4035 (STP-DRV-4850) (STP-DRV-80100)	STP-DRV-4850 (STP-DRV-80100)		STP-DRV-80100
Logic Supply Output	5VDC ±5% @ 500 mA (regulated, electronically overload protected, power on LED indicator)			
Watt Loss	13W	25W	51W	42W
Storage Temperature	-55 to 85 °C -67 to 185 °F			
Operating Temperature	0 to 50 °C (32 to 122 °F) full rated; 70 °C (158 °F) maximum Derate current 1.1% per degree above 50 °C			
Humidity	95% (non-condensing) relative humidity maximum			
Cooling Method	Natural convection (mount power supply to metal surface if possible)			
Dimensions (in [mm])	4.00 x 7.00 x 3.25 [101.6x177.8x82.6]	5.00 x 8.10 x 3.88 [127.0x205.7x98.6]	5.62 x 9.00 x 4.62 [142.7 x 228.6 x 117.3]	
Mounting	Use four (4) #10 screws to mount on either wide or narrow side.			
Weight (lb [kg])	6.5 [2.9]	11 [4.9]	18 [8.3]	16 [7.2]
Connections	Screw Terminals, tightening torque of 4.5 in-lbs			
Agency Approvals	UL (file # E181899), CSA, CE			

1) Fuses to be replaced by qualified service personnel only. Use (1-1/4 x 1/4 in) ceramic fast-acting fuses (Edison type ABC from AutomationDirect, or equivalent).

2) Caution: Do not use a power supply that exceeds the input voltage range of the drive. Using a lower voltage power supply with a higher voltage drive is acceptable, but will not provide full system performance.

3) An unloaded STP-PWR-7005 can float above the allowable input voltages of some drives if it is fed with a high AC input voltage (greater than 120VAC). Either ensure that the incoming AC supply is less than 120V, or supply a burden resistor to pull the unloaded linear DC voltage level down.

4) For switching power supply specifications, please refer to that part number's data sheet or manual.

Drive Heating

Note: The following information applies to STP-DRV-6575, STP-DRV-4850, and STP-DRV-80100 models only.

While STP drives efficiently transmit power between the power supply and motor, they do generate some heat in the process. This will cause the temperature of the drive to rise above the surrounding air temperature and may also require that the drive be mounted to a heat conducting metal surface.

For those who wish to calculate the power dissipation and temperature rise, the following information is provided:

1. Drive power dissipation P_d versus motor current and power supply voltage (see chart).
2. Drive thermal constant R_{θ}

The final drive case temperature is given by:

$$T_c = T_a + R_{\theta} * P_d$$

Where T_a is the ambient temperature of the surrounding air. The case of the drive should not be allowed to exceed 70°C or the life of the product could be reduced.

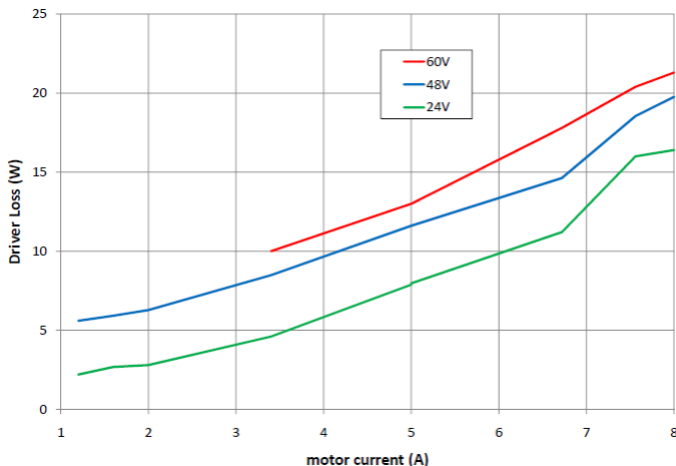
Drive Thermal Constant

- Narrow side of drive mounted on a 13.5" x 13.5" steel plate, 0.70" thick:

$$R_{\theta} = 1.0^{\circ}\text{C/W}$$

- Narrow side of drive mounted on a non-heat conducting surface: $R_{\theta} = 2.1^{\circ}\text{C/W}$

Drive Watt Loss



Choosing a Power Supply

Voltage

Chopper drives work by switching the voltage to the motor terminals on and off while monitoring current to achieve a precise level of phase current. Due to the inductances in the windings which rely on current to produce torque, the voltage should be much greater to allow fast changes in winding current (stepping). To do this efficiently and silently, you'll want to have a power supply with a voltage rating at least five times that of the motor. SureStep Drives are designed to work well with SureStep motors so choosing the proper voltage of the supply is made easy when using all AutomationDirect products. A compatibility chart for AutomationDirect power supplies and drives is located below.

SureStep™ Power Supply Compatibility				
Drive	Linear Power Supply			
	STP-PWR-3024	STP-PWR-4805	STP-PWR-4810	STP-PWR-7005*
STP-DRV-4035	✓	No	No	No
STP-DRV-4830	✓	✓	✓	No
STP-DRV-4845	✓	✓	✓	No
STP-DRV-4850	✓	✓	✓	No
STP-DRV-6575	✓	✓	✓	No
STP-DRV-80100	✓	✓	✓	✓
STP-MTRD-17	✓	✓	✓	No
STP-MTRD-23,-24	✓	✓	✓	✓
Drive	Switching Power Supply			
	PSB12-xxxS	PSB24-xxxS	PSB48-xxxS	
STP-DRV-4035	✓	✓	No	
STP-DRV-4830	✓	✓	✓	
STP-DRV-4845	✓	✓	✓	
STP-DRV-4850	No	✓	✓	
STP-DRV-6575	No	✓	✓	
STP-DRV-80100	No	✓	✓	
STP-MTRD-17	✓	✓	✓	
STP-MTRD-23,-24	✓	✓	✓	
*An unloaded STP-PWR-7005 can float above the allowable input voltages of some drives if it is fed with a high AC input voltage (greater than 120VAC). Either ensure that the incoming AC supply is less than 120V, or supply a burden resistor to pull the unloaded liner DC voltage level down.				

Depending on how fast you want to run the motor, you may need even more voltage. Generally, more is better; the upper limit being the maximum voltage rating of the drive itself. With voltage, there is a trade-off between higher voltage and increased heating.

Voltage determines max speed. A higher voltage power supply equals higher top-end motor speed. But higher voltages also mean higher temperatures (drive and motor), so the lowest voltage that will satisfy your required speed should be used.

Linear (Unregulated) vs Switching (Regulated) Power Supplies

If you choose an unregulated power supply, do not allow the “no load” voltage to exceed the maximum voltage rating of the drive. Unregulated supplies are rated at full load current. At lesser loads, such as when the motor is not moving, the actual voltage can be up to 25% greater than the voltage listed on the power supply label. Some applications may have regeneration (the motor tries to decelerate a large load quickly and becomes a generator). The motor tries to dump the excess energy back into the drive (and supply). This can sometimes boost the DC voltage up higher than the regulated supply would normally output which can turn into an overvoltage situation, causing the power supply to shut down. Regeneration clamp STP-DRVA-RC-050 can help in these situations. It is installed between the power supply and drive, where it monitors incoming power supply voltage and the voltage on the drive side. If the drive side goes higher than the incoming (the motor is regenerating power), the clamp “dumps” energy out to its resistor. Linear supplies don’t care (they will just float higher), but regulated supplies might trip. STP-DRVA-BR-100 allows the regeneration clamp to “dump” even more energy from the system.

Current

The maximum supply current you will need is the sum of the two phase currents. However, you will generally need a lot less than that, depending on the motor type, voltage, speed and load conditions. That’s because the SureStep drives use switching amplifiers, converting a high voltage and low current into lower voltage and higher current. The more the power supply voltage exceeds the motor voltage, the less current you’ll need from the power supply.

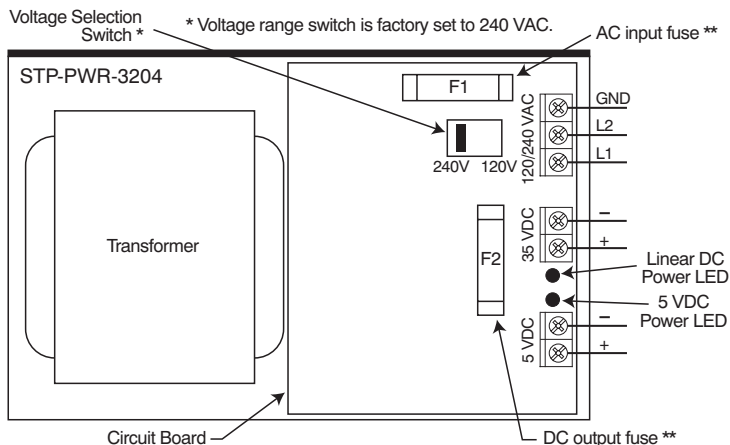
We recommend the following selection procedure:

1. If you plan to use only a small number of drives, choose a power supply using the following formula:
$$I(ps) \geq 0.66 \times (I_{motor1} + I_{motor2} + I_{motor3} + \dots)$$
2. If you are designing for mass production and must minimize cost, get one power supply with more than twice the rated current of the motor. Install the motor in the application and monitor the current coming out of the power supply and into the drive at various motor loads. This test will tell you how much current you really need so you can design in a lower cost power supply.

If you plan to use a regulated or switching power supply, you may encounter a problem with current foldback. When you first power up your drive, the full current of both motor phases will be drawn for a few milliseconds while the stator field is being established. After that, the amplifiers start chopping and much less current is drawn from the power supply. If your power supply thinks this initial surge is a short circuit it may “foldback” to a lower voltage. With many foldback schemes the voltage returns to normal only after the first motor step and is fine thereafter. In that sense, unregulated power supplies are better.

Power Supply Terminal & Component Layout

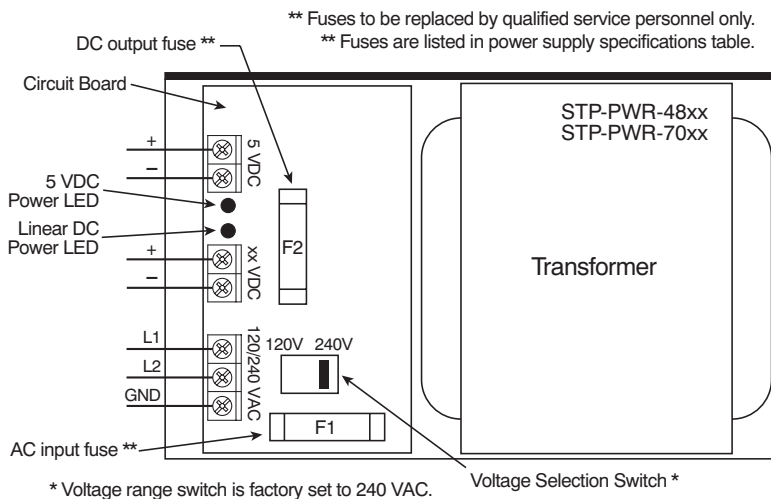
STP-PWR-3204



** Fuses are listed in power supply specifications table.

** Fuses to be replaced by qualified service personnel only.

STP-PWR-4805, STP-PWR-4810, STP-PWR-7005



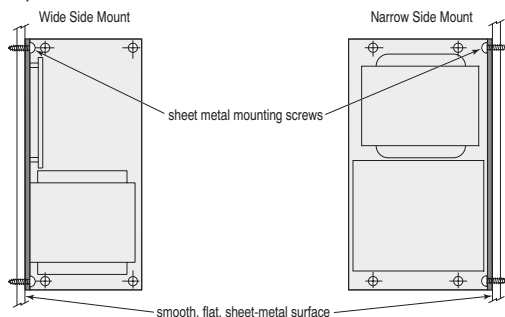
** Fuses to be replaced by qualified service personnel only.

** Fuses are listed in power supply specifications table.

Mounting the Power Supply

STP-PWR-xxxx power supplies can be mounted on either the bottom (wide) side, or the back (narrow) side of the chassis. Either orientation contains mounting holes for machine screws. Use #10 screws for STP-PWR-3204 and -4805, or 1/4" screws for STP-PWR-4810 and -7005.

Since power supplies generate heat, they should be mounted in a location that allows air flow. They also should be securely fastened to a smooth, flat metal surface that will dissipate heat.

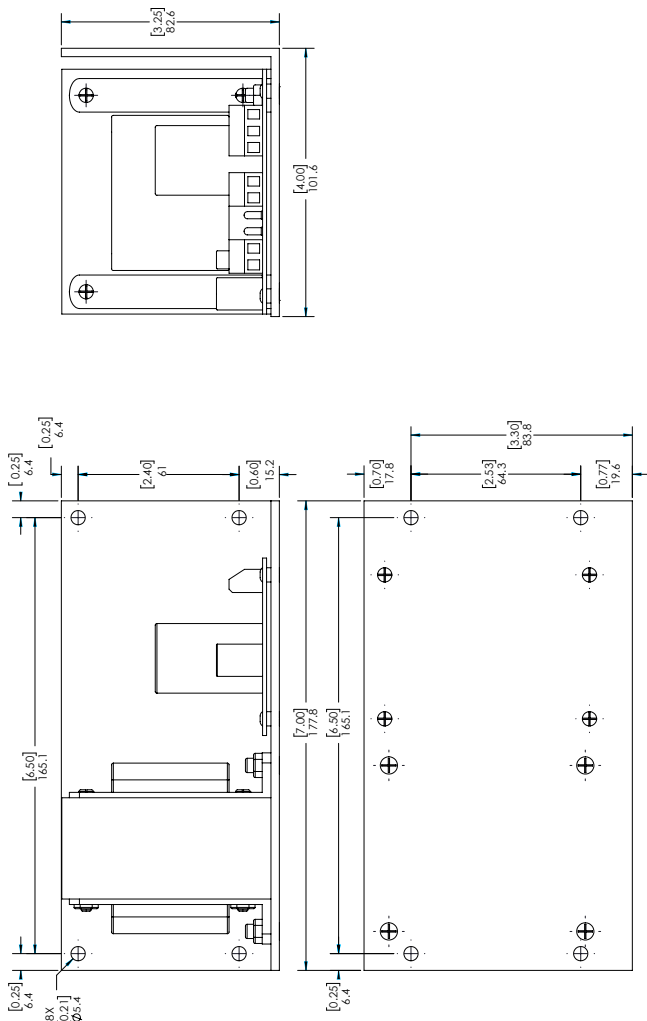


Warning: *Never use the power supply in a space where there is no air flow, or where the surrounding air temperature is greater than 70 °C.*

Dimensions

STP-PWR-3204

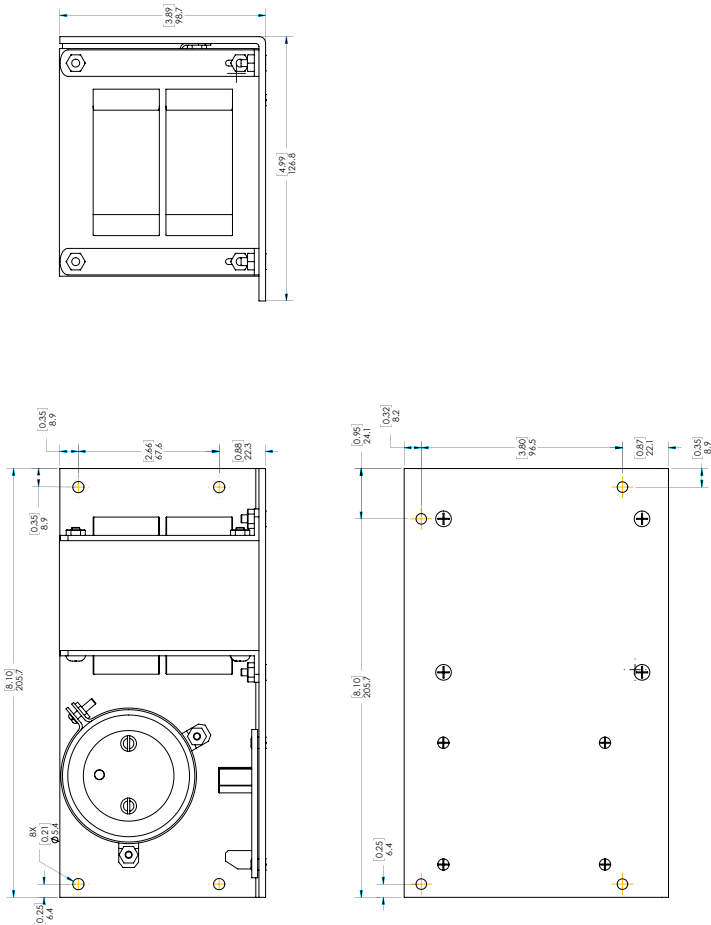
Dimensions = [in] mm



Dimensions (continued)

STP-PWR-4805, -4810, -7005

Dimensions = [in] mm



SureStep™ Series – 48V & 70V Power Supplies			
	STP-PWR-4805	STP-PWR-4810	STP-PWR-7005
Mtg Screw	#10	1/4	