

# Series 7 Power Controllers

## Series 7 DIN Rail Mount Power Devices

Series 7 Power Devices put 12 to 80 Amps in a DIN rail mount package that provides precision machine control for heater bands, cartridge heaters, and other resistive loads.



- **DIN Rail or Wall Mounting**
- **Zero Crossing Control**
- **AC/DC ON-OFF or mA Proportional Inputs**
- **SCR or Triac Version**
- **No Need for External Wire Crimping**

### Introduction

The Series 7 Power Device family features a sleek design and robust performance specifications which ensure that your tough heating requirements are surpassed. These devices were developed to control resistive heating loads using the time proportional SSR driver output or the linear output from a temperature controller. Specifically tuned to ensure quick temperature ramping, precise operating control, and immediate temperature stabilization, all these features mean better product homogeneity, less wasted time and less scrap.

The Series 7 Power Device family consists of:

Model	Vac	Phase	Device	Control	Input
7PT	240	Single	Triac	On-off	Vdc
7PD	400 & 600	Single	SCR	On-off	Vdc
7PA	400 & 600	Single	SCR	On-off	100/240 Vac
7PL	400 & 600	Single	SCR	On-off	24 Vac
7PM	400 & 600	Single	SCR	Proportional	4 to 20 mA
7PE	400 & 600	Three	Two leg SCR	On-off	Vdc
7PB	400 & 600	Three	Two leg SCR	On-off	100/240 Vac
7PF	400 & 600	Three	Two leg SCR	On-off	24 Vac

### Features

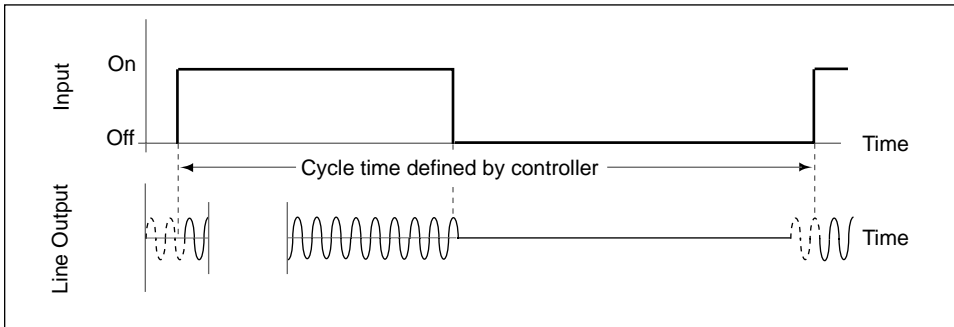
- All models can be DIN rail or Panel mounted
- Complete line and load connections provided for easy installation
- All terminals accessible from the front
- Common height for all models

### Thermal Protection Option

When the junction temperature reaches 125°C (257°F), a separator inhibits the command signal and turns on the OH LED indicator. Once the heat sink temperature becomes acceptable, the command signal is again enabled and the OH LED is turned off.

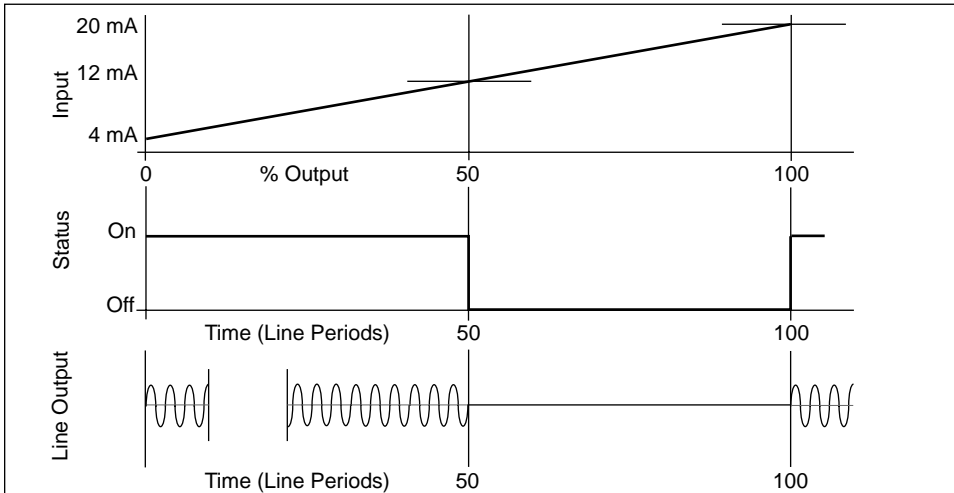
# Series 7 Power Controllers

## ON-OFF Control Mode



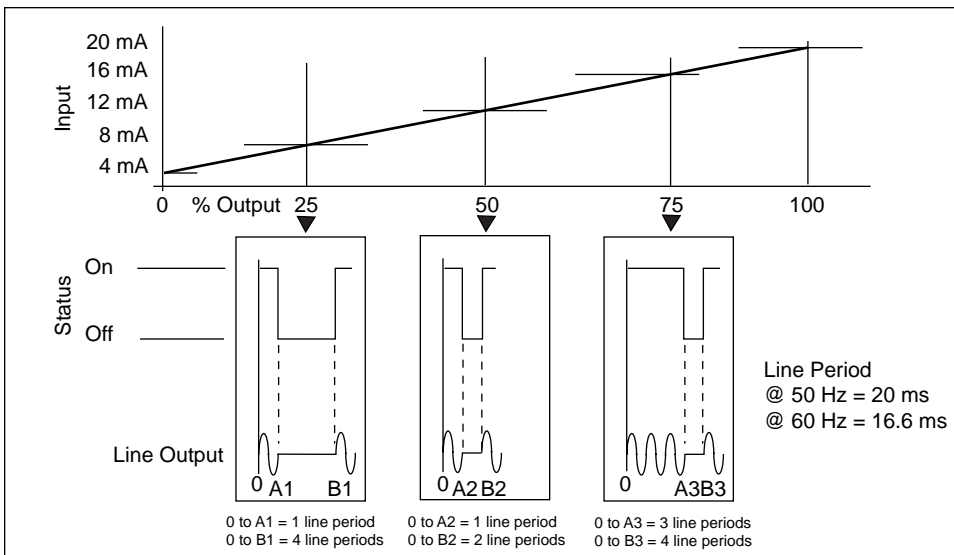
In the On-Off control mode, the output of the contactor turns on only when the input is turned on and the supply voltage is at a zero-crossing point. If the input is turned on at a non-zero point, the contactor will simply wait for the next zero-point to turn on. Unlike a mechanical relay, the Series 7 with On-Off control eliminates electrical switching disturbances and audible noise.

## Fast Cycle Proportional Control Mode (7PM only)



The Fast Cycle control mode is a zero-crossing firing mode that uses a fixed 100-cycle time base for control. For example, 50 cycles on and 50 cycles off results in a 50% output. Fast Cycle control is best for loads that need the slower, less frequent switching (i.e., resistive loads).

## Single Cycle Proportional Control Mode (7PM only)



Single Cycle control mode is a zero-crossing firing mode that uses a variable time base (on-time plus off-time) for control. Based on the command level, the time base is kept at a minimum, which improves control compared to the Fast Cycle control mode. For example, one cycle on and one cycle off results in a 50% output. Three cycles on and one cycle off results in a 75% output. Single Cycle control is best for loads that require faster, more precise control (i.e., low thermal inertia loads).

# Series 7 Power Controllers

## Ordering Information

**MODEL:** 7 P  -      -   0 - 0 - 0 0  
 Field No. 2 3 4 5 6 7 8 9 10 11 12 13 14 15

### Field 1. RESERVED

### Fields 2, 3, 4. BASE MODEL

7PT - Solid State Contactor, 1Ø, Triac, DC Volt, On/Off  
 7PD - Solid State Contactor, 1Ø, SCR, DC Volt, On/Off  
 7PA - Solid State Contactor, 1Ø, SCR, 100/240 Vac, On/Off  
 7PL - Solid State Contactor, 1Ø, SCR, 24 Vac, On/Off  
 7PM - Power Controller, 1Ø, SCR, 4 to 20 mA, Proportional  
 7PE - Solid State Contactor, 3Ø, SCR, DC Volt, On/Off  
 7PB - Solid State Contactor, 3Ø, SCR, 100/240 Vac, On/Off  
 7PF - Solid State Contactor, 3Ø, SCR, 24 Vac, On/Off

### Fields 8, 9, 10. LOAD VOLTAGE

240 - 240 Volts/800 V Peak Reverse (7PT only)  
 400 - 400 Volts/1200 V Peak Reverse  
 600 - 600 Volts/1700 V Peak Reverse

### Field 11. THERMAL PROTECTION

0 - None  
 1 - Over Temperature Protection

### Fields 12 through 15. RESERVED

### Fields 5, 6, 7. LOAD AMPERES

T12 - 12 Amps (7PT only)  
 T18 - 18 Amps (7PT only)  
 020 - 20 Amps (7PB, 7PE, 7PF)  
 025 - 25 Amps (7PA, 7PD, 7PL, 7PM)  
 035 - 35 Amps (7PA, 7PD, 7PL, 7PM)  
 040 - 40 Amps (7PB, 7PE, 7PF)  
 045 - 45 Amps (7PA, 7PD, 7PL, 7PM)  
 060 - 60 Amps (7PA, 7PB, 7PD, 7PE, 7PF, 7PL, 7PM)  
 080 - 80 Amps (7PA, 7PD, 7PL, 7PM)

## Output Specifications

### Model 7PT

Nominal Voltage	240V	240V
Nominal Current*	12A	18A
Non-repeatable Surge Current	160A	208A
I <sup>2</sup> t for fusing (10 ms)	128	259
Non-repeatable Peak Voltage	900V	900V
ΔV/Δt	250V/μs	250V/μs
Peak Reverse Voltage	800V	800V
Total Power Dissipation (I=I <sub>mm</sub> )	18W	27W
Weight (grams)	510g	510g

### Models 7PA, 7PL, 7PD and 7PM

Nominal Voltage	400V	400V	400V	400V	400V	600V	600V	600V	600V	600V
Nominal Current*	25A	35A	45A	60A	80A	25A	35A	45A	60A	80A
Non-repeatable Surge Current	280A	400A	400A	1200A	1200A	280A	400A	400A	1200A	1200A
I <sup>2</sup> t for fusing (10 ms)	550	860	860	10180	10180	550	860	860	10180	10180
Non-repeatable Peak Voltage	1300V	1300V	1300V	1300V	1300V	1700V	1700V	1700V	1700V	1700V
ΔV/Δt	500V/μs	500V/μs	500V/μs	500V/μs	500V/μs	1000V/μs	1000V/μs	1000V/μs	1000V/μs	1000V/μs
Peak Reverse Voltage	1200V	1200V	1200V	1200V	1200V	1600V	1600V	1600V	1600V	1600V
Total Power Dissipation (I=I <sub>mm</sub> )	30W	45W	55W	75W	100W	30W	45W	55W	75W	100W
Weight (grams)	630g	630g	900g	1100g	2000g	630g	630g	900g	1100g	2000g

# Series 7 Power Controllers

## Models 7PB and 7PE and 7PF

<b>Nominal Voltage</b>	400V	400V	400V	600V	600V	600V
<b>Nominal Current*</b>	20A	40A	60A	20A	40A	60A
<b>Non-repeatable Surge Current</b>	280A	400A	1200A	280A	400A	1200A
<b>I<sup>2</sup>t for fusing (10 ms)</b>	550	860	10180	550	860	10180
<b>Non-repeatable Peak Voltage</b>	1300V	1300V	1300V	1700V	1700V	1700V
<b>ΔV/Δt</b>	500V/μs	500V/μs	500V/μs	1000V/μs	1000V/μs	1000V/μs
<b>Peak Reverse Voltage</b>	1200V	1200V	1200V	1600V	1600V	1600V
<b>Total Power Dissipation (I=I<sub>mm</sub>)</b>	50W	90W	130W	50W	90W	130W
<b>Weight (grams)</b>	1800g	1800g	1800g	1800g	1800g	1800g

## Input Specifications

	7PT	7PD	7PA	7PL	7PM	7PE	7PB	7PF
	Single Phase	Single Phase	Single Phase	Single Phase	Single Phase	Three Phase	Three Phase	Three Phase
<b>Minimum Holding Current</b>	50 mA rms	50 mA rms	500 mA rms	500 mA rms	50 mA rms	50 mA rms	500 mA rms	500 mA rms
<b>Leakage Current</b>	10 mA rms	10 mA rms	10 mA rms	10 mA rms	10 mA rms	10 mA rms	10 mA rms	10 mA rms
<b>Minimum Latching Voltage</b>	20V	20V	40V	40V	20V	20V	40V	40V
<b>Voltage Drop on Power Semiconductor</b>	1.8V	1.2V	1.2V	1.2V	1.2V	1.2V	1.2V	1.2V
<b>Control Type</b>	On/Off	On/Off	On/Off	On/Off	Linear	On/Off	On/Off	On/Off
<b>Control Voltage</b>	Off < 2	Off < 2	Off < 10 Vac	Off < 4 Vac		Off < 2	Off < 10 Vac	Off < 4 Vac
	On 4.5 to 35 Vdc	On 4.5 to 35 Vdc	On 100 to 240 Vac (±10%)	On 24 Vac (±15%)		On 9 to 35 Vdc	On 100 to 240 Vac (±10%)	On 24 Vac (±15%)
<b>Input Current</b>	15 mA	15 mA	< 33 mA	< 33 mA	4 to 20 mA	15 mA	< 33 mA	< 33 mA
<b>Insulation between Power Circuit and Earth</b>	1800 Vrms for 1 minute	3000 Vrms for 1 minute	2200 Vrms for 1 minute	2200 Vrms for 1 minute	3000 Vrms for 1 minute	3000 Vrms for 1 minute	2200 Vrms for 1 minute	2200 Vrms for 1 minute
<b>Insulation between Command and Power Circuits</b>	7500 Vpk for 1 minute	7500 Vpk for 1 minute	3500 Vpk for 1 minute	3500 Vpk for 1 minute	7500 Vpk for 1 minute	7500 Vpk for 1 minute	3500 Vpk for 1 minute	3500 Vpk for 1 minute
<b>Insulation Resistance</b>	>100MΩ at 500 Vdc	>100MΩ at 500 Vdc			>1MΩ at 500 Vdc (400V) >2MΩ at 500 Vdc (600V)	>100MΩ at 500 Vdc		
<b>Operational Temperature</b>	0 to 50°C (32 to 122°F)							
<b>Humidity</b>	20 to 85% RH, non-condensing							
<b>Storage Temperature</b>	-20 to 70°C (-4 to 158°F)							
<b>Protection</b>	IP20							
<b>Mounting</b>	Vertical; rear of board on wall or DIN rail							
<b>Terminals</b>	Screw, with front access							
<b>Load Type</b>	Resistive							

# Series 7 Power Controllers

## Recommended Fusing

Contactor/Power Controller	Amps - Volts	Supplier	Fuse Model	
Model 7PT	12 - 240	Ferraz	6600.CP.URGB.14.51/20	
		Bussman	FWP.20B.14F	
	18 - 240	Ferraz	6600.CP.URGB.14.51/32	
		Bussman	FWP.30B.14F	
Model 7PA, 7PD, 7PL & 7PM	25 - 400	Ferraz	6600.CP.URGA.22X58/32	
		Bussman	FWP.32A.22F	
		Gould	52443	
	35 - 400	Ferraz	6600.CP.URGA.22X58/50	
		Bussman	FWP.50A.22F	
		Gould	53251	
	45 - 400	Ferraz	6600.CP.URGA.22X58/50	
		Bussman	FWP.50A.22F	
		Gould	53251	
	60 - 400	Ferraz	6600.CP.URGA.22X58/80	
		Bussman	FWP.80A.22F	
		Gould	53259	
	80 - 400	Ferraz	6600.CP.URGA.22X58/100	
		Bussman	FWP.100A.22F	
		Gould	53263	
	20 - 600	Ferraz	6600.CP.URD.22X58/32	
Ferraz		6600.CP.URD.22X58/50		
Ferraz		6600.CP.URD.22X58/50		
Ferraz		6600.CP.URD.22X58/80		
Ferraz		6600.CP.URD.22X58/100		
Model 7PB, 7PE & 7PF		20 - 400	Ferraz	6600.CP.URGA.22X58/32
			Bussman	FWP.32A.22F
	Gould		52443	
	40 - 400	Ferraz	6600.CP.URGA.22X58/50	
		Bussman	FWP.50A.22F	
		Gould	53251	
60 - 400	Ferraz	6600.CP.URGA.22X58/80		
	Bussman	FWP.80A.22F		
	Gould	53259		
20 - 600	Ferraz	6600.CP.URD.22X58/32		
40 - 600	Ferraz	6600.CP.URD.22X58/50		
60 - 600	Ferraz	6600.CP.URD.22X58/80		

# Series 7 Power Controllers

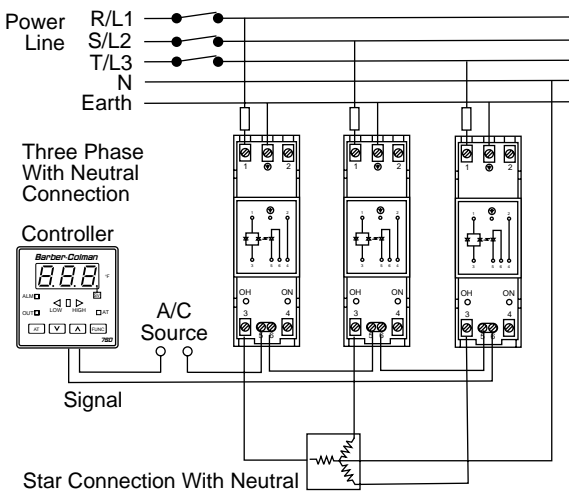
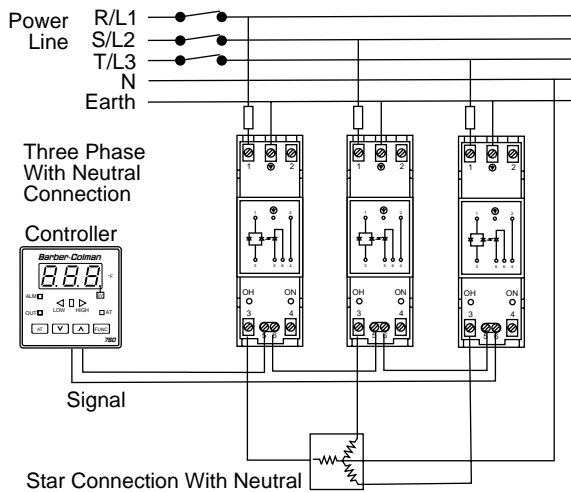
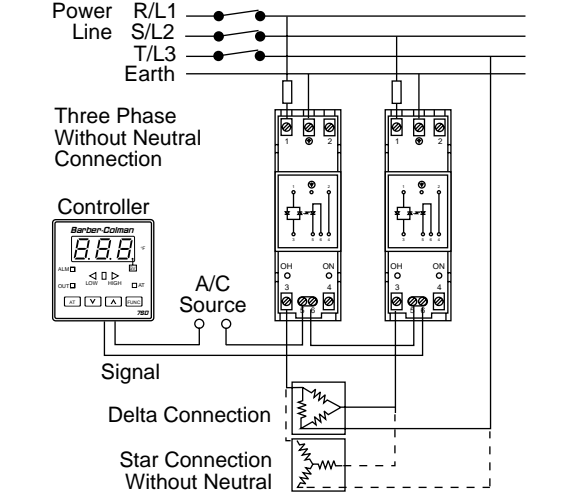
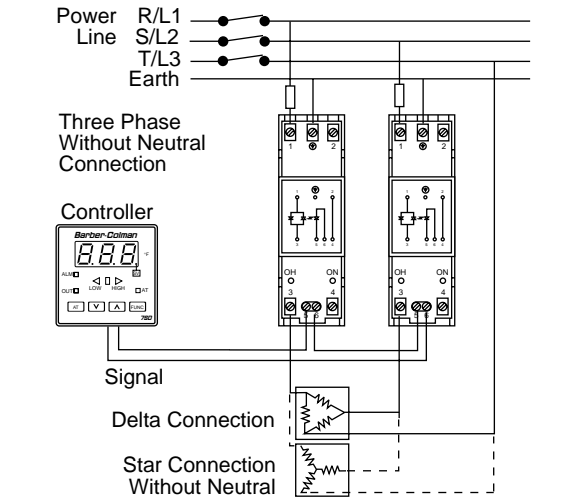
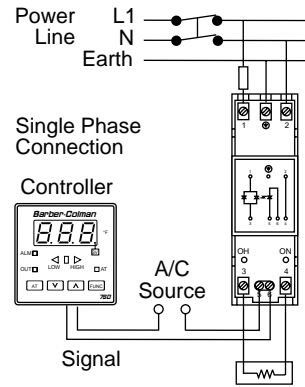
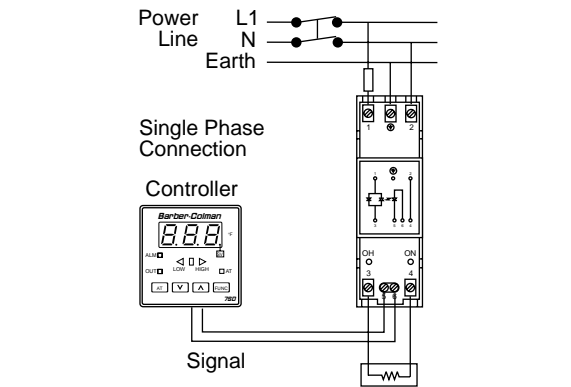
## Single Phase Wiring

### WARNING!

The SSR assembly is not a replacement for a disconnect switch, which must always be installed in the supply feeder!

### Model 7PD, 7PM, 7PT

### Model 7PA, 7PL

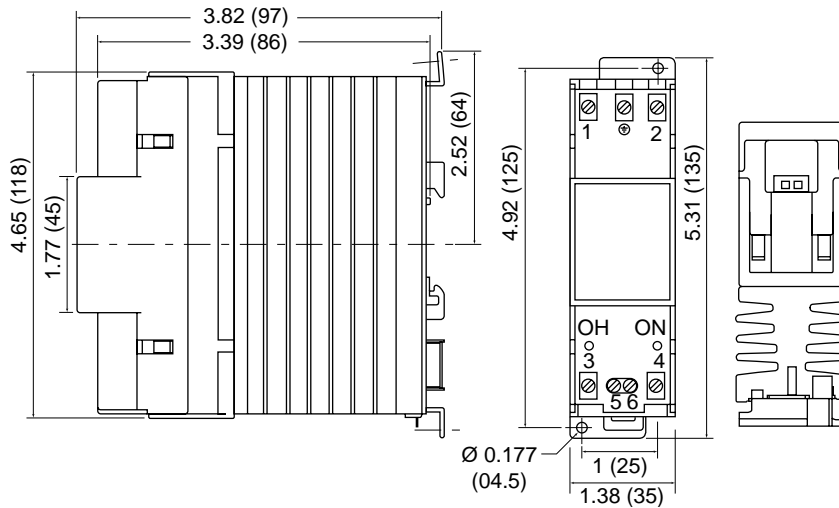


# Series 7 Power Controllers

## Mounting

### Model 7PT

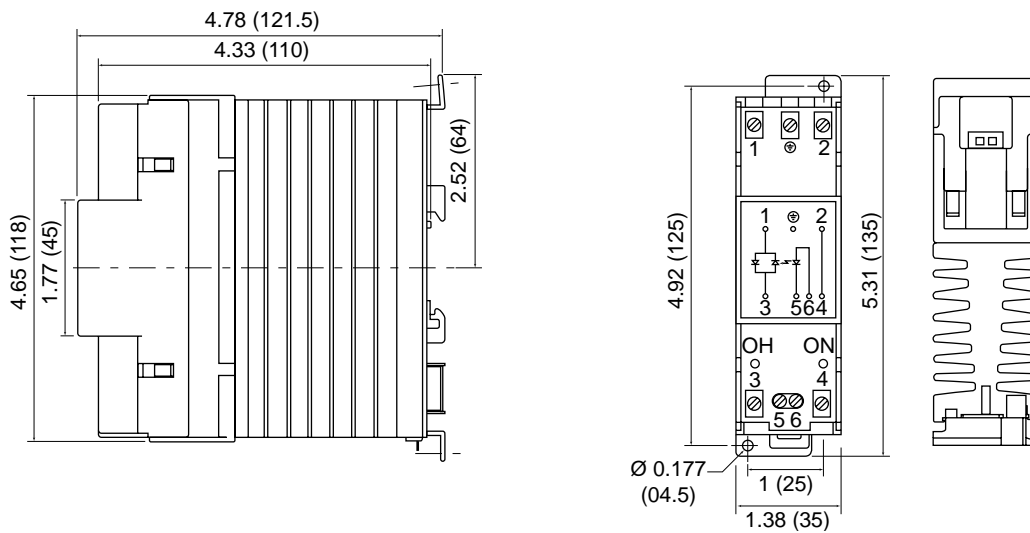
Dimensions shown in inches (millimeters in parenthesis)



**12 - 18 Amps**

### Model 7PD, 7PA, 7PL, 7PM

Dimensions shown in inches (millimeters in parenthesis)



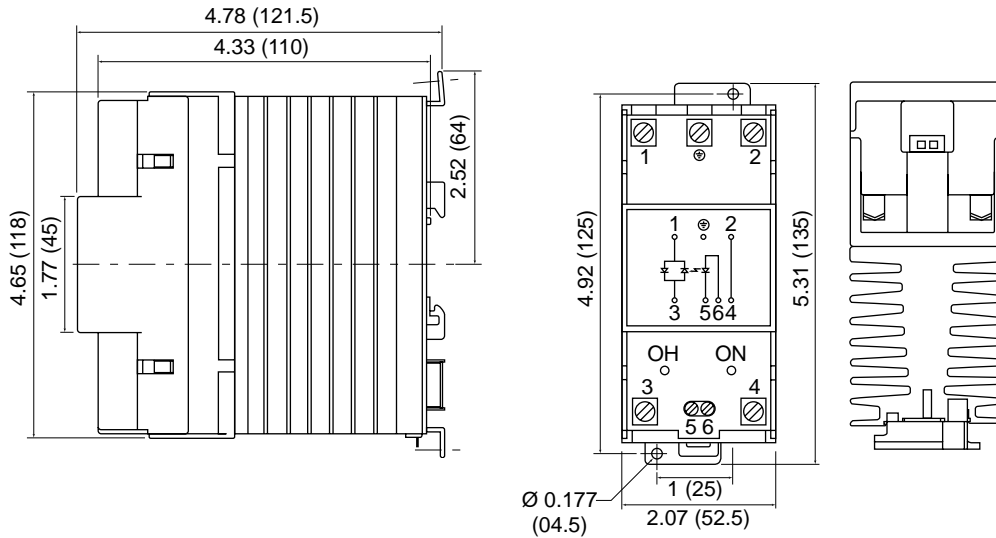
**25 - 35 Amps**

# Series 7 Power Controllers

## Mounting (continued)

### Model 7PD, 7PA, 7PL, 7PM

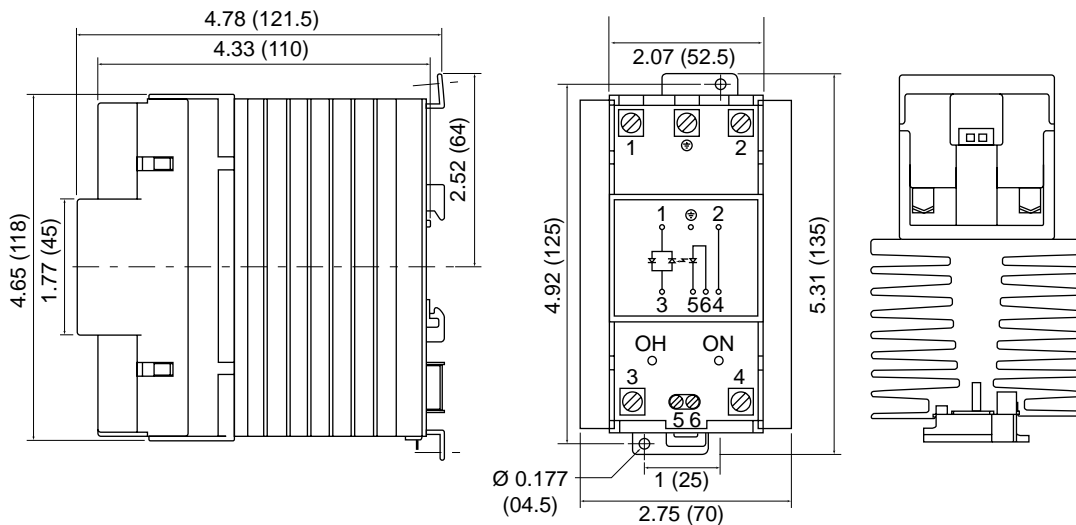
Dimensions shown in inches (millimeters in parenthesis)



**45 Amps**

### Model 7PD, 7PA, 7PL, 7PM

Dimensions shown in inches (millimeters in parenthesis)



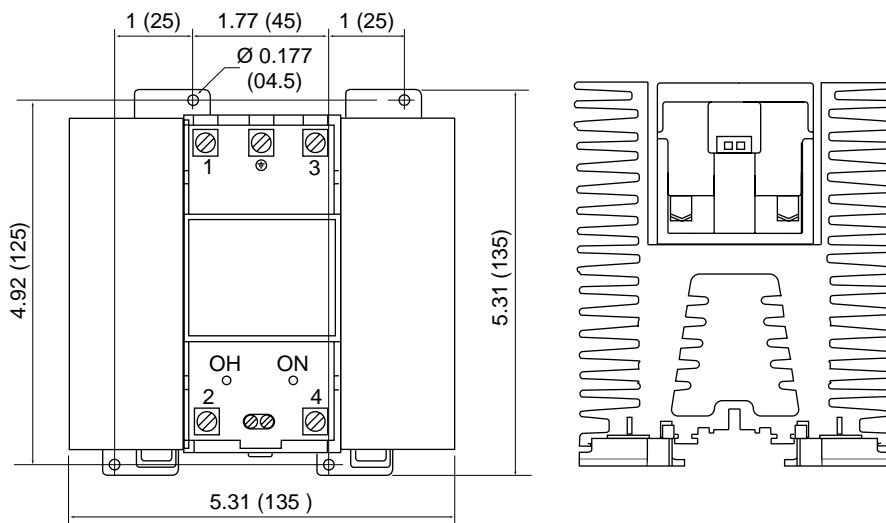
**60 Amps**

# Series 7 Power Controllers

## Mounting (continued)

### Model 7PD, 7PA, 7PL, 7PM

Dimensions shown in inches (millimeters in parenthesis)



**80 Amps**

# Series 7 Power Controllers

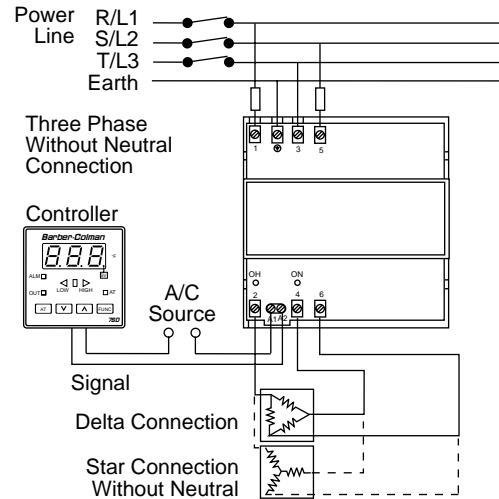
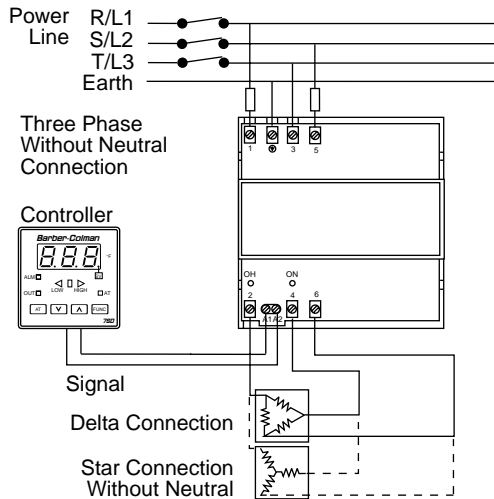
## Three Phase Wiring

### WARNING!

The SSR assembly is not a replacement for a disconnect switch, which must always be installed in the supply feeder!

### Model 7PE

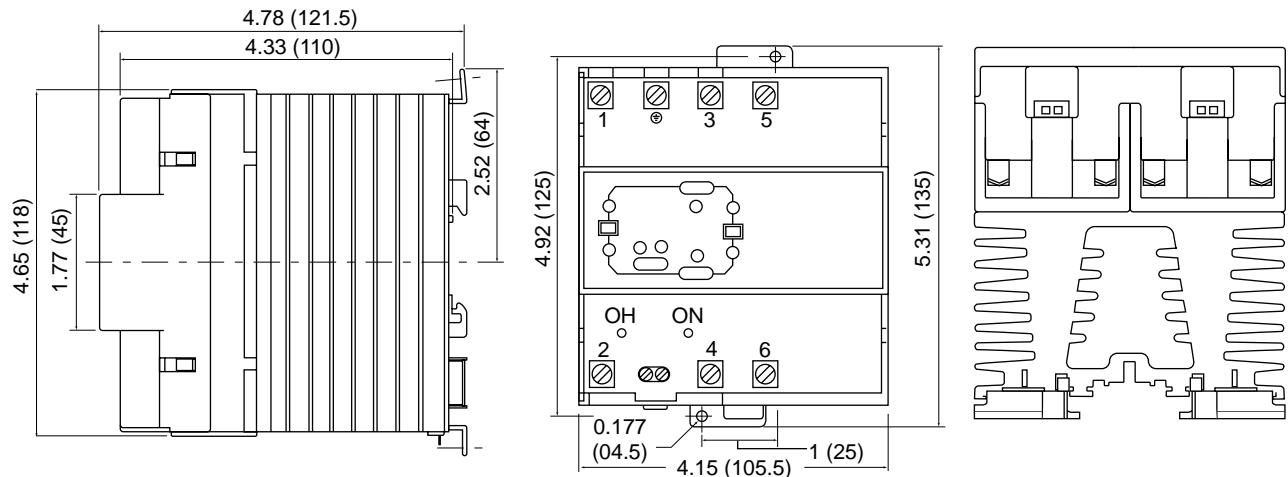
### Model 7PB, 7PF



## Mounting

### Model 7PB, 7PE, 7PF

Dimensions shown in inches (millimeters in parenthesis)



# Series 7 Power Controllers

## Formulas

### Sizing

Power/nominal current conversion

The following formulas are provided to simplify model selection. These formulas enable you to calculate the nominal current of each SSR when the total load power is known. The load must be resistive so that in the following formulas, the  $\cos \phi$  will be considered equal to 1. The formulas related with the three phase application are referred to a balanced three phase system only.

### Single Phase Connection

$$I_{RMS} = \frac{P}{V_{RMS}}$$

where: P = Power (in Watts)  
V<sub>RMS</sub> = Phase to neutral or phase to phase voltage  
I<sub>RMS</sub> = Nominal line current

### Three Phase Without Neutral Connection (Star or Delta Application)

$$I_{RMS} = \frac{P}{V_{RMS} \cdot \sqrt{3}}$$

where: P = Total load power (in Watts)  
V<sub>RMS</sub> = Phase to phase voltage  
I<sub>RMS</sub> = Nominal line current

### Three Phase With Neutral Connection (Star Application)

$$I_{RMS} = \frac{P}{V_{RMS} \cdot 3}$$

where: P = Total load power (in Watts)  
V<sub>RMS</sub> = Phase to neutral voltage  
I<sub>RMS</sub> = Nominal line current

### Heat Generated by the Solid State Contactors

Full Load Current x 1.2 volts\* x # of Legs of Control = Watts

\*1.8 volts for 7PT

Example 7PE calculation: 60 amps x 1.2 volts x 2 = 144 Watts