

1 Phase electronic analogue power controller (SPC 1)



- Analogue controller for accurate process control
- Phase angle or burst firing control of heaters, lamps, trafos
- Rated operational voltage range: 120VAC, 230VAC, 480VAC
- Rated operational current up to 30A or 50A AC1
- Current Loop Control: 0-20mA, 4-20 mA
- Voltage Control: 0-10 VDC
- Manual Control: 10 kohm potentiometer
- Reverse action operation possible

Item selection and technical specifications

Load AC-1/51 Heating-element	Load AC-3 Motor*	Load AC-55b Lamp	Load AC-56a Trans-former	Analogue control input signal	Item number by 110-127VAC 50/60Hz Line Voltage	Item number by 208-240VAC 50/60Hz Line Voltage	Item number by 380-480VAC 50/60Hz Line Voltage	Module-width
30A	15A	30A	30A	0-20 / 20-0 mA, 4-20 / 20-4 mA 0-10 / 10-0 VDC, 0-10 / 10-0 kohm	SPC 1 AD 1230	SPC 1 AD 2330	SPC 1 AD 4030	45mm
50A	15A	30A	30A		SPC 1 AD 1250	SPC 1 AD 2350	SPC 1 AD 4050	90mm

Output load specification

Leakage current	1mA ACmax.	Min. operational current	10mA
Duty cycle	100%		
Load power by 30A / 120VAC	0-3.6kW	Load power by 50A / 120VAC	0-6kW
Load power by 30A / 230VAC	0-6.9kW	Load power by 50A / 230VAC	0-11.5kW
Load power by 30A / 400VAC	0-12kW	Load power by 50A / 400VAC	0-20kW

Control terminal specifications

Current Loop Control Voltage drop 3 Volt Max.	0 - 20 mA / 20 - 0 mA	Manual Control with potentiometer	0-10 kohm / 10-0 kohm
Current Loop Control Voltage drop 3 Volt Max.	4 - 20 mA / 20 - 4 mA		
Voltage Control Input resistance 300 kohm min.	0-10 V / 10-0 V	Control Voltage supply	24VAC/24VDC max. 30 mA

Thermal specification

Power dissipation for continuous operation PDmax	1.2 W/A	Operation in ambient temperatures exceeding 40°C is possible if the power dissipation is limited either by reducing the steady-state current or by reducing the duty-cycle as shown in the table. Max.cycle time 15min.		
Power dissipation for intermittent operation PD	1.2 W/A x dutycycle			
Cooling method	Natural convection			
Mounting	Vertical +/-30°			
Operating temperature range EN 60947-4-2	-5°C to 40°C			
Max. operating temperature with current derating	60°C			
Storage temperature EN 60947-4-2	-20°C to 80°C			
		By 40°C	By 50°C	By 60°C
		100% load Duty-cycle 100%	80% load Duty-cycle max. 0.8	70% load Duty-cycle max. 0.65
Environment				
Degree of protection		IP 20	Pollution degree	3
Approval				

Insulation specifications

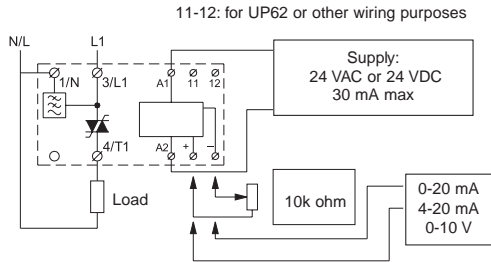
Rated insulation voltage	Ui 660 Volt
Rated impulse withstand voltage	Uimp. 4 kVolt
Installation category	III

cUL Std No. 508 (*No UL approval for AC 3 motor load)
 UL: Use thermal overload protection as required by the National Electric Code. When protected by a non-time delay K5 or H Class fuse, rated 266% of motor FLA, this device is rated for use on a circuit capable of delivering not more than 5,000 rms. symmetrical amperes, 600 V maximum.
 Maximum surrounding temperature 40°C.

1 Phase electronic analogue power controller (SPC 1)

Wiring specifications

SPC 1 AD



Short-circuit protection by fuses

Two type of short-circuit protection can be used:
Short-circuit protection by fuses.

Short-circuit protection is divided into 2 levels **Type 1** or **Type 2**

Co-ordination Type 1: Short-circuit protects the installation

Co-ordination Type 2: Short-circuit protects the installation and the semiconductors inside the motor controller

Short-circuit protection by fuses

Type 1: SPC 1 AD XX30 Protection max. 50A gL/gG
Type 1: SPC 1 AD XX50 Protection max. 50A gL/gG

Type 2: SPC 1 AD XX30 Protection max. i^2t of the fuse 1800 A²S
Type 2: SPC 1 AD XX50 Protection max. i^2t of the fuse 1800 A²S

Fuses from e.g. Ferraz, Siba, Bussmann can be used as short-circuit protection Type 2

More information concerning Co-ordination Type 2 see page 37

EMC

This component meets the requirements of the product standard EN 60947-4-3 and is CE marked according to this standard. This products has been designed for class A equipment. Use of the product in domestic environments may cause radio interference, in which case the user may be required to employ additional mitigation methods.

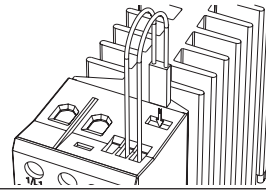
Mounting and cable wiring information

Mounting information see page 36 / Cable wiring see page 37

Application hints and general specifications

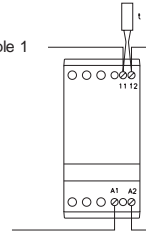
See page 32-33

Thermal overload protection (see also page 36)



Optional thermal overload protection is possible by inserting a thermostat in a slot on the right hand side of the electronic contactor. Type number UP62

Example 1

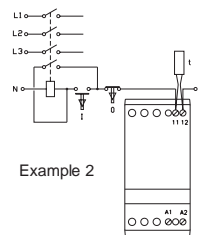


The thermostat can be connected in series with the control circuit of the electronic contactor.

When the temperature of the heatsink exceeds 90°C the electronic contactor will switch Off.

Note:

When the temperature has dropped approx. 30°C the electronic contactor will automatically be switched on again.



Example 2

The thermostat is connected in series with the control circuit of the main contactor.

When the temperature of the heatsink exceeds 90°C the main contactor will switch Off.

Note:

A manual reset is necessary to restart this circuit.

Utilisation Categories (EN 60947-4-3)

AC - 51 Switching of resistive loads

AC - 55a Switching of electric discharge lamp controls

AC - 55b Switching of incandescent lamps

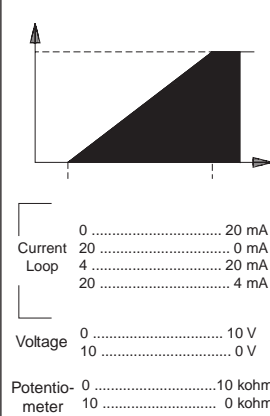
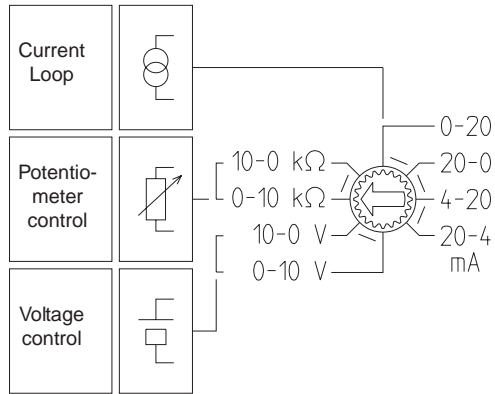
AC - 56a Switching of transformers

Dimensions (see also page 36)

Type	H	D	W
45 mm module	94 mm	124.3 mm	45 mm
90 mm module	94 mm	124.3 mm	90 mm

Application hints analogue power controller for SPC 1

Control mode selection



Selection of control signal

The type of control signal, Current, Voltage or Potentiometer, can be selected on the rotary switch.

Protection

The control inputs are protected against overload. If the current exceeds 25 mA the loop will be switched Off and the LED's will indicate failure. The input will not be damaged if the 24 V supply by mistake is connected to the signal input. Control input terminals are marked with + correct polarity must be observed. The control input is floating.

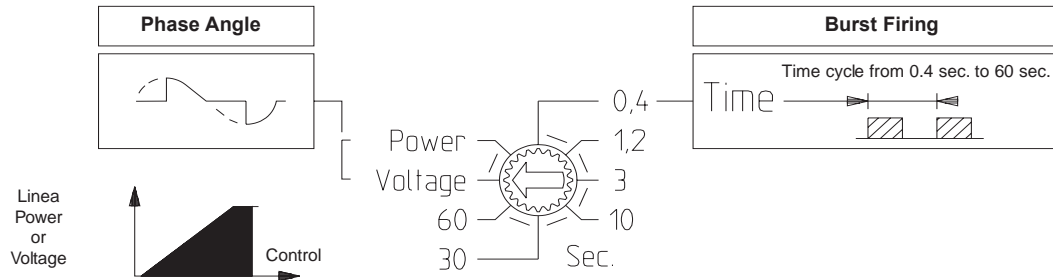
Isolation Voltage:

Line to Control: 2.5kV AC

Isolation Voltage:

Supply to Control: 500V AC

Function mode selection



Phase Angle: Phase angle control is used for control of infrared lamps or heaters in IR heating applications

Two different operation modes can be selected.

Lin. Voltage: The load voltage varies linearly with the control signal

Lin. Power: The power delivered to the load varies linearly with the control signal

Burst Firing

In Burst Firing mode full sine waves are supplied to the load. Consequently DC magnetising of the supply transformer is avoided. The number of sine waves varies linearly with the control signal.

Adjustable cycle times from 400 ms to 60 sec.

Line and load wiring hints for 1 or 3 phase application with or without neutral

Single Phase 230 / 400 V AC

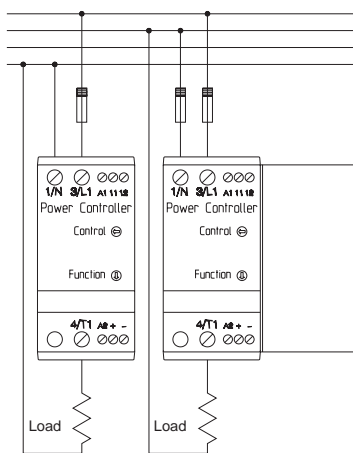
Phase Angle and Burst Firing applications
230 and 400 V Heaters

Three Phase with Neutral

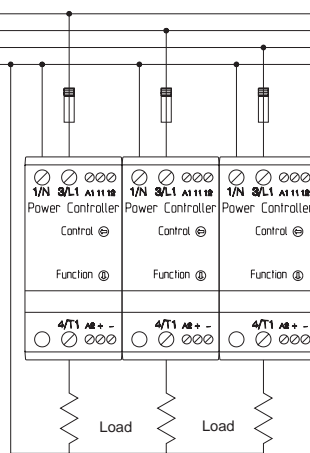
Phase Angle and Burst Firing for heater applications

Three Phase without Neutral Economy

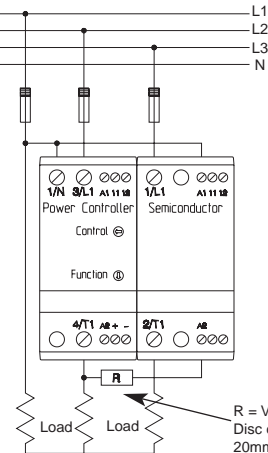
With single pole contactor SC1DA4030 as slave.
Only Burst Firing applications.



SPC1AD 2330= 6.9kW/SPC1AD 4030= 12kW Max
SPC1AD 2350= 11.5kW/SPC1AD 4050= 20kW Max



3 x SPC1AD 2330 = 20.7kW Max
3 x SPC1AD 2350 = 34.5kW Max



R = Varistor 230 VAC.
Disc diameter min 20mm e.g. Siemens S10V-S20K230

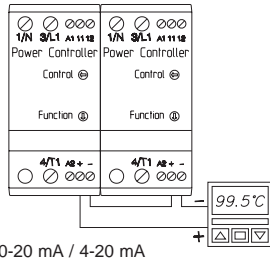
SPC1AD 4030 + SC1DA 4030= 20.7kW Max
SPC1AD 4050 + SC1DA 4050= 34.5kW Max

Application hints analogue power controller for SPC 1

Different applications hints

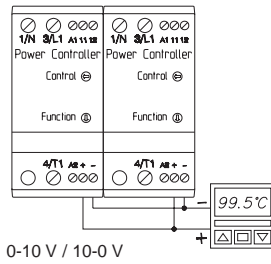
Current Loop:

0-20 mA or 4-20 mA. Controller inputs must be connected in series



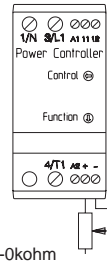
Voltage Control :

Controller inputs must be connected in parallel



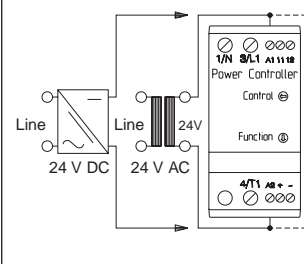
Potentiometer Control :

10 kohm linear potentiometer



Control Supply :

Controller supply must be connected in parallel



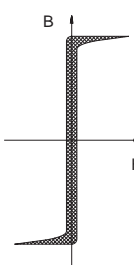
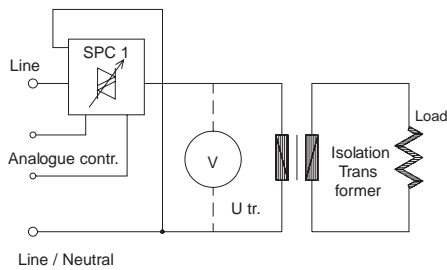
Transformer applications hints

Transformer Loads

SPC1 load driving capability includes transformer applications which means that low voltage loads can be controlled via an isolation transformer without any surge or DC magnetising of the transformer

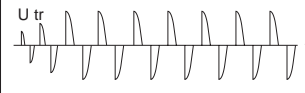
Switching Transformers

The problem in transformer switching is the magnetic circuit. When the transformer is switched Off, (H=0) the field (B) remains on a high level due to the high remanence of modern transformer core material. At initial turn-On where the remanence is unknown the SPC1 will soft-start to avoid the high current surge and at repetitive turn-on the switch-off polarity is "remembered" so next turn-on will be in the opposite polarity, thereby eliminating the high current surge normally seen in transformer applications. DC magnetising is eliminated by operating in full cycle mode only



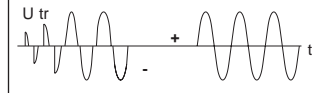
Phase Angle Mode :

A initial turn On SPC 1 will soft-start the transformer to the voltage level set by the analogue input.

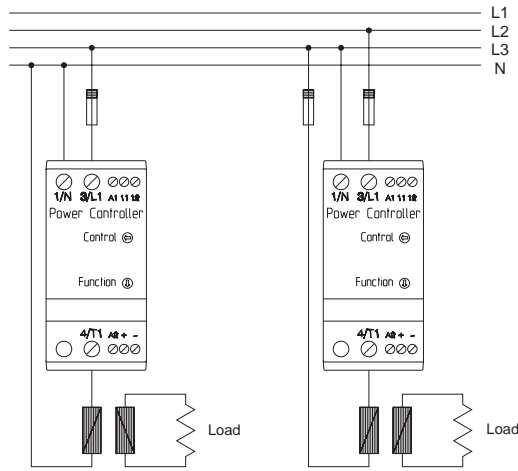


Burst Firing Mode :

A initial turn On SPC 1 will soft-start the transformer to full On mode. The controller will only allow full cycles to be supplied to the transformer hereby eliminating current surges and DC saturation of the transformer.

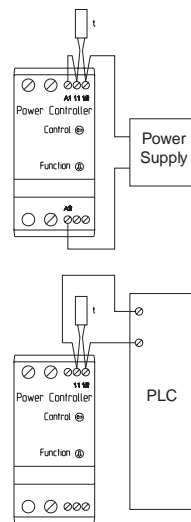


Transformer applications hints



Single Phase Line - Neutral
For 3 Phase applications use
3 x single phase circuit

Single Phase Line - Line

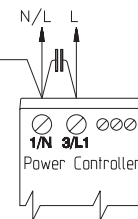


Application Examples

The thermostat is connected in series with the control supply of the controller. When the controller heatsink temperature exceeds 90°C the control supply is switched Off. When the controller heatsink has dropped to approx. 60°C the control supply is switched On again.

Application Examples

The thermostat is connected to a PLC or other form of controller for controlled shutdown in case of over temperature



EMC Specifications

SPC 1 is in conformity with EN60947-4-3 AC Semiconductor Contactors for non motor loads

Burst Firing Control Mode:

No action necessary.

Phase Angle Control Mode: I < 10 A

No action necessary.

Internal filter is sufficient.

Phase Angle Control Mode: I > 10 A

Connect 1uF capacitor from N/L to L1 as shown above.