

Autonics

POWER CONTROLLER

SPC SERIES

INSTRUCTION MANUAL



Thank you for choosing our Autonics product.  
Please read the following safety considerations before use.

Safety Considerations

※Please observe all safety considerations for safe and proper product operation to avoid hazards.

※⚠ symbol represents caution due to special circumstances in which hazards may occur.

Warning

Failure to follow these instructions may result in serious injury or death.

Caution

Failure to follow these instructions may result in personal injury or product damage.

Warning

1. **Fail-safe device must be installed when using the unit with machinery that may cause serious injury or substantial economic loss.** (e.g. nuclear power control, medical equipment, ships, vehicles, railways, aircraft, combustion apparatus, safety equipment, crime/disaster prevention devices, etc.)  
Failure to follow this instruction may result in personal injury, economic loss or fire.

2. **Do not use the unit in the place where flammable/explosive/corrosive gas, high humidity, direct sunlight, radiant heat, vibration, impact, or salinity may be present.**  
Failure to follow this instruction may result in explosion or fire.

3. **Install on the device panel, and ground to the F.G. terminal separately.**  
Failure to follow this instruction may result in fire or electric shock.

4. **Do not connect, repair, or inspect the unit while connected to a power source.**  
Failure to follow this instruction may result in fire or electric shock.

5. **Check 'Connections' before wiring.**  
Failure to follow this instruction may result in fire.

6. **Do not disassemble or modify the unit.**  
Failure to follow this instruction may result in fire or electric shock.

Caution

1. **Use the unit within the rated specifications.**  
Failure to follow this instruction may result in fire or product damage.

2. **Use dry cloth to clean the unit, and do not use water or organic solvent.**  
Failure to follow this instruction may result in fire or electric shock.

3. **Keep the product away from metal chip, dust, and wire residue which flow into the unit.**  
Failure to follow this instruction may result in product damage.

4. **Since leakage current still flows right after turning off the power or in the output OFF status, do not touch the load terminal.**  
Failure to follow this instruction may result in electric shock.

Ordering Information

SPC1 - 35 - E

Marking language

EEnglish

Rated load current

3535A

5050A

Control phase

1Single phase

Item

SPCSolid state Power Controller

Specifications				
Model	SPC1-35-E	SPC1-50-E		
Power supply	220VAC □ 50/60Hz			
Allowable voltage range	90 to 110% of rated voltage			
Operating frequency fluctuation	±1Hz			
Rated load current	35A (Single phase)	50A (Single phase)		
Control power	220VAC □			
Control range	Phase control: 0 to 98%, Cycle control: 0 to 100%			
Applied load	Resistance load (Min. load: over 5% of rated current)			
Cooling method	Natural air cooling			
Control circuit	Micom control type			
Control input	1-5VDC □			
	DC4-20mA (250Ω)			
	ON/OFF (External contact or 24VDC)			
	External adjuster (1kΩ)			
Control method	Output limit input (Front OUT ADJ. adjuster)			
	Phase control※1			
	Cycle control (Zero Cross turn-on) - period 0.5, 2.0, 10sec※1			
	ON/OFF control (Zero Cross turn-on)			
Starting type	SOFT START (0 to 50 sec variable)			
Indicator	Output indicator (OUT): red LED			
Insulation resistance	Over 100MΩ (at 500VDC megger)			
Dielectric strength	2000VAC 50/60Hz for 1 minute			
Noise immunity	±2kV the square wave noise (pulse width: 1μs) by the noise simulator			
Vibration	Mechanical	0.75mm amplitude at frequency of 10 to 55Hz (for 1 min) in each X, Y, Z direction for 1 hour		
	Malfunction	0.5mm amplitude at frequency of 10 to 55Hz (for 1 min) in each X, Y, Z direction for 10 min		
Shock	Mechanical	300m/s <sup>2</sup> (approx. 30G) in each X, Y, Z direction for 3 times		
	Malfunction	100m/s <sup>2</sup> (approx. 10G) in each X, Y, Z direction for 3 times		
Environment	Ambient temperature	0 to 50°C, storage: -25 to 65°C		
	Ambient humidity	35 to 85%RH, storage: 35 to 85%RH		
Wire specification	AWG16 to 8			
Unit weight	Approx. 1kg			
※1. Refer to '■ Operation and Function.'				
※Environment resistance is rated at no freezing or condensation.				

Factory Default	
Control method	Phase control
Control mode	Phase equal division type according to control input
Cycle control period	0.5 sec (JP1, JP2 short)
SOFT START setting	0 sec
OUT ADJ. setting	100%

Unit Description

① Case

② Terminal block cover

③ Terminal block for control input

④ Terminal block of the power

⑤ Terminal block for load connection

⑥ Output indicator (OUT)

⑦ Control method selection switch

⑧ SOFT START setting adjuster

⑨ Output limit setting adjuster

⑩ Selection jumper of control period

⑪ Selection jumper of control mode

⑫ Panel mounting hole

※⑩, ⑪ are placed on the inner PCB of the product.

※The above specifications are subject to change and some models may be discontinued without notice.

※Be sure to follow cautions written in the instruction manual and the technical descriptions (catalog, homepage).

Operation and Function

2550

0 sec 50

0 % 100

PHASE

CYCLE

ON/OFF MODE

① SOFT START setting adjuster (0 to 50 sec)  
② Output limit setting adjuster (0 to 100%)  
③ Output indicator  
④ Control method selection switch  
PHASE: Phase control method  
CYCLE: Cycle control method  
ON/OFF: ON/OFF control method

1. Control method selection

Control method	Phase control	Cycle control (Zero Cross turn-on)	ON/OFF control (Zero Cross turn-on)
Switch			

※When selecting cycle control method, the cycle has been set as 0.5 sec.  
It can be changed to 2 sec, 10 sec by selection.  
※The control method setting cannot be changed while it is operating.  
Turn OFF the power at first then change the setting and supply the power again.

1) Phase control

It is output type to control phase of an alternating signal according as control input signal.

(Fig. 1) Equal division type of phase according as control input

This is analog type to output control angle with dividing equally according as control input signal. It shows power characteristic as (Fig. 1) and it might occur over power or lack power at point middle of control input.

2) Cycle control

It divides control angle non-equally according as control input signal then make power curve linearization, so it becomes possible to output the power, which is proportioned control input as outputting (Fig. 1).

(Fig. 2) Equal division type of power according as control input

※To change control mode, please change the JP3 of the PCB as below.

JP3

Division method (control mode)

SHORT	Equal division of phase according as control input
OPEN	Equal division of power according as control input

SHORT

OPEN

2) Cycle control (fixed cycle) - Zero cross turn on

It controls the power, which is applied into the load to repeat ON/OFF cycle like below picture with constant proportion according to control input signal. It is easy to control the load and there is no ON/OFF noise because it turns ON and OFF at the zero point of AC. Usually it is used in a place or electric furnace which is not easily effected by external noise.

When control input signal is 0% (DC4mA, 1VDC)

When control input signal is 25% (DC8mA, 2VDC)

When control input signal is 50% (DC12mA, 3VDC)

When control input signal is 100% (DC20mA, 5VDC)

T: Cycle (0.5sec)

T: Cycle (0.5sec)

T: Cycle (0.5sec)

T: Cycle (0.5sec)

※To change control cycle, please change JP1 and JP2 of PCB as below.

JP1

JP2

Cycle (sec)

SHORT	SHORT	0.5sec
SHORT	OPEN	2.0sec
OPEN	SHORT	10sec
OPEN	OPEN	× (Not used)

SHORT

OPEN

3) ON/OFF control - Zero cross turn on

It controls when control input is ON, output is 100%. When it is OFF, output is 0%. It is the same function as SSR (Solid State Relay). (It always turns ON/OFF at zero point of AC.)  
※OUT ADJ. and SOFT START functions are not available in ON/OFF control method.

Output

Control input

ON

OFF

100%

0%

<Output wave form of ON/OFF control>

2. OUT ADJ. (Output limit) (0 to 100%)

This function will be [Control input(%) × output limit set(%) = Output] and it controls the power supplied into the load. Although control input is 100% (5V or 20mA), the output is the 50% which is proportioned with OUT ADJ. When not using OUT ADJ. function, please make set value 100%.

Output

Control input

100%

50%

0%

When OUT ADJ. is 100%

When OUT ADJ. is 50%

Control input

<The output characteristic of OUT ADJ. and control input>

※This function must not be used in ON/OFF control method.

3. SOFT START (0 to 50sec)

This function protects the load in cases that the set temperature is high, such as controlling the load (platinum, molybdenum, tungsten, infrared lamp, etc.) in which inrush current flows when power is supplied, or showing large width of temperature rise during initial operation.

Output

Time

100%

50%

0

T/2

T

The output which is supplied in to the load is 100%

The output which is supplied in to the load is 50%

※T: Time to get the output which is applied into the load is 100%.  
※T/2: Time to get the output which is applied into the load is 50%.

T: SOFT START setting time

SOFT START set time (T) is the required time that output reaches to 100%, and it is differentiated by OUT ADJ. set value. For example, SOFT START is set as 10sec and OUT ADJ. is set as 70%, it takes 7 sec to reach goal output.  
[Set time (T) × OUT ADJ. set value (%) = 10sec × 0.7 = 7sec]  
If increasing the OUT ADJ. before output reaches to goal output, it delays as much as the value, multiply of increased value (%) and SOFT START set time.  
When not using SOFT START function, set value 0.  
※This function must not be used in ON/OFF control method.

4. OUT display

This is LED lamp to display the status of output and will be getting brighter according as output. (0%: Min. LED light, 100%: Max. LED light)

Dimensions

94.6

108

124.8

2-Ø4.2

136.9

93.2

37.2

• Spacing

2-M4

108

100

100

100

30

※When installing multiple power controllers, please keep space at least 30mm in horizontal and 100mm in vertical between power controllers for heat radiation.

Connections

1. External connection

2. Connection of control input terminals

1) DC4-20mA control input

It controls 0 to 100% when you supply DC 4 to 20mA on ②, ③ terminals when power is supplied.

※This function must not be used in ON/OFF control method.

2) 1-5VDC control input

It controls 0 to 100% when you 1 to 5VDC on ②, ③ terminals when power is supplied.

※This function must not be used in ON/OFF control method.

3) ON/OFF external contact control input

It controls 100% if you connect external contact or switch to ②, ③ terminal when it is ON, it controls 0% when it is OFF.

※It is available for all control methods.  
OUT ADJ and SOFT START functions are not available in ON/OFF control method.

4) External adjuster control input

After power is applied, connecting the external adjuster 1kΩ to ②, ③ and ④ terminals and turning adjuster control from 0% to 100%. In another way, connecting to the ② and ③ terminals and turning OUT ADJ control from 0% to 100%. <Refer to 'E.g. 2)' of '■ Applications'>  
It is available to control as OUT ADJ. adjuster for the above 1), 2), 3) and set at 100% when it is not used.

※This function must not be used in ON/OFF control method.

5) External 24VDC control input

It can be used with external 24VDC voltage as below.  
It is available to control of ON/OFF, outputs 100% for applying 24VDC and 0% for applying 0VDC.

※It is available for all control methods.  
OUT ADJ and SOFT START functions are not available in ON/OFF control method.

※Tighten the terminal screw with the below tightening torque.

terminal type	Signal input (control input)	Output and power
Screw	M3.5	M5
Tightening torque	0.6 to 1.2N·m	1.5 to 2.2N·m

※Use terminals of size specified below.

terminal type	Signal input (control input)	Output and power
a	Min. 3.5mm	Min. 5mm
b	Max. 7.0mm	Max. 12mm

Applications

E.g. 1) When controlling by limiting the power at ON/OFF in phase control and cycle control method.

For example, if it needs to control 80% output when it is ON, 24% output when it is OFF, please keep below.

Firstly set OUT ADJ. as 80% and connect external adjuster and external relay contact switch as the figure then set external adjuster as 30%.  
●When the External contact signal is ON : 100%(contact input) × 80%(OUT ADJ.) = 80%  
●When the External contact signal is OFF: 30% (adjuster input) × 80%(OUT ADJ.) = 24%

E.g. 2) This is how to control 0 to 100% without external adjuster in phase control and cycle control method.

It is possible to control 0 to 100% with turning OUT ADJ. in state of connecting terminal 2 and terminal 3.

Control Input Specification and Function			
Control method	Phase control	Cycle control	ON/OFF control
	DC4-20mA		
Control input specification	1-5VDC		External contact or 24VDC
	External contact, 24VDC		
Function	OUT ADJ.		OUT display
	SOFT START		

Temperature Derating Curve

Vertical installation

Horizontal installation

(two mounting holes and terminal blocks are the same height)

1. SPC1-35

Load 50 current [A]

50

40

30

25

20

10

0

0

10

20

30

40

50

Ambient temperature[°C]

2. SPC1-50

Load 50 current [A]

50

40

30

25

20

10

0

0

10

20

30

40

50

Ambient temperature[°C]

Remove of Case

After disconnecting all power sources supplied to the product, remove the case, Push the Joint part (4 points) on the right and left side of the case with the flat head screw-driver, and disassemble the case.  
⚠When using the tool, be careful not to injure yourself.

Cautions during Use

1. Follow instructions in 'Cautions during Use'. Otherwise, it may cause unexpected accidents.

2. Use the product, after 3 sec of supplying power.

3. Before use, set the mode and function according to the specification.

Especially, be cautious that the product does not operate when OUT ADJ. is set to 0%. Since mode/parameter can not be changed during operation, set the mode and function after turning off the power.

4. To ensure the reliability of the product, install the product on the panel or metal surface vertically to the ground.

5. Install the unit in the well ventilated place.

6. While supplying power to the load or right after turning off the power of the load, do not touch the body and heat sink.  
Failure to follow this instruction may result in a burn due to the high temperature.

7. Install a power switch or circuit breaker in the easily accessible place for supplying or disconnecting the power.

8. Do not wire to terminals which are not used.

9. The rapid fuse must be connected between R terminal and the power source.

10. Do not use near the equipment which generates strong magnetic force or high frequency noise.

11. This unit may be used in the following environments.  
①Indoors (in the environment condition rated in 'Specifications')  
②Altitude max. 2,000m  
③Pollution degree 2  
④Installation category III

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