Autonics

POWER CONTROLLER
SPC SERIES
M A N U A L

Thank you very much for selecting Autonics products.
For your safety, please read the following before using.

■ Caution for your safety

※Please keep these instructions and review them before using this unit.

※Please observe the cautions that follow;

⚠ **Warning** Serious injury may result if instructions are not followed.

⚠ **Caution** Product may be damaged, or injury may result if instructions are not followed.

※The following is an explanation of the symbols used in the operation manual.
⚠caution:Injury or danger may occur under special conditions.

⚠ Warning

1. **In case of using this unit with machinery(Ex: nuclear power control, medical equpment, ship, vehicle, train, airplane, combustion apparatus, safety device, crime/disaster prevention equipment, etc) which may cause damages to human life or property, it is required to install fail-safe device.**
   It may result in fatal damage, fire or human injury.
2. **This unit must be installed on panel and F.G. terminal must be a good earth ground.**
   It may give an electric shock.
3. **Do not connect terminals when it is power on.**
   It may give an electric shock.
4. **Do not disassemble and modify this unit, when it requires.**
   If needs, please contact us.
   It may give an electric shock and cause a fire.
5. **Do not touch terminals after power off.**
   It may give an electric shock.

⚠ Caution

1. **This unit shall not be used outdoors.**
   It might shorten the life cycle of the product or give an electric shock.
2. **Please see the wire spec. chart for power and load connection by load current.**
   It may give an electric shock.
3. **Please tighten bolt on terminal block with specified tightening torque.**
   Specified tightening torque -M3.5 : 0.6 to 1.2N·m(6.0 to 12.0kgf·cm)
   -M5 : 1.5 to 2.2N·m(15 to 25kgf·cm)
   It may cause a fire due to contact error.
4. **Please observe the rated specification.**
   It might shorten the life cycle of the product and cause a fire.
5. **In cleaning the unit, do not use water or an oil-based detergent.**
   It might cause an electric shock or fire that will result in damage to the product.
6. **Do not use this unit at place where there are flammable or explosive gas, humidity, direct ray of the sun, radiant heat, vibration, impact etc.**
   It may cause explosion or a fire.
7. **Do not inflow dust or wire dregs into the unit.**
   It may cause a fire or mechanical trouble.
8. **Do not touch the heat sink while it is running.**
   It may cause a burn.
9. **This unit requires 1 to 3 sec ready time to operate after supplying power.**
   At this ready time, output does not occur.

■ Ordering information

SPC 1 — 35

	35	Rated current(A)
	50	Rated current(A)
	1	Single phase
SPC		Solid state Power Controller

■ Specifications

Model	SPC1-35	SPC1-50
Power supply	220VAC 50/60Hz	
Allowable operating voltage	90 to 110% of rated voltage	
Operating frequence fluctuation	± 1Hz	
Maximum rated 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 relay contact or 24VDC)	
	External VR(1kΩ)	
	Output limit input(Front OUT ADJ. VR)	
Control type By selection S/W	Phase control[1]	
	Cycle control(ZERO CROSS)-period 0.5, 2.0, 10sec[1]	
	ON/OFF control(ZERO CROSS)	
Starting type	SOFT START(0 to 50 sec variable)	
Display	Output indication(LED)	
Insulation resistance	100MΩ (at 500VDC megger)	
Dielectric strength	2000VAC for 1minute	
Noise	± 2kV the square wave noise(pulse width:1μs) by the noise simulator	
Vibration Mechanical	0.75mm amplitude at frequency of 10 to 55Hz in each of X, Y, Z directions for 1hour	
Vibration Malfunction	0.5mm amplitude at frequency of 10 to 55Hz in each of X, Y, Z directions for 10min.	
Shock Mechanical	300m/s² (30G) in X, Y, Z directions for 3 times	
Shock Malfunction	100m/s² (10G) in X, Y, Z directions for 3 times	
Environ-ment Ambient temperature	0 to 50℃, Storage : -25 to 65℃	
Environ-ment Ambient humidity	35 to 85%RH	
Unit Weight	Approx. 1kg	

※Environment resistance is rated at no freezing or condensation.
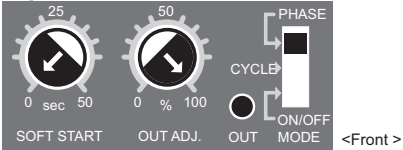※1. Refer to ■**Operation and function** 1. Control mode selection.

■ Factory default

Control mode	Phase control mode
Control type	Phase equality division type according as control input
Cycle control period	0.5sec(JP1, JP2 short)
SOFT START setting	0sec
OUT ADJ. setting	100%

■ Parts name

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 LED display for output
⑦ Selection S/W of control mode
⑧ SOFT START adjusting volume
⑨ OUT ADJ. volume
⑩ Selection jumper of control period
⑪ Selection jumper of control type
⑫ The hole for fixing on panel
   (Bolt size:M4 × 50)

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

The above specifications are subject to change without notice.

■ Operation and function

<Front >

1. Control mode selection

Control mode	Phase control mode	Cycle control mode (Zero Cross)	ON/OFF control mode (Zero Cross)
Mode switch			

※When selecting cycle control mode, the cycle has been set as 0.5sec. It can be changed to 2.0sec, 10sec by selection.
※The mode cannot be changed during it is operating.
   Be sure to set the proper mode after turnning the power off then supply the power again.

1)Phase control

It is output type to control phase of an alternating according as control input signal.
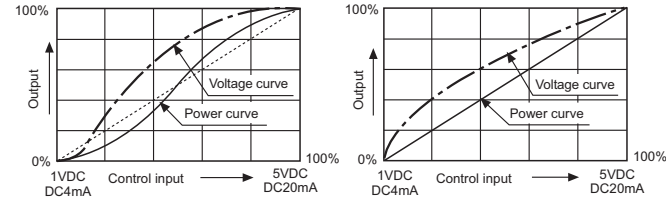
(Picture 1)Equality division type of phase according as control input

This is analog type to output control angle with dividing equally according as control input signal. It shows power characteristic as (Picture 1) and it might be occurred over power and lack power at point middle of control input.
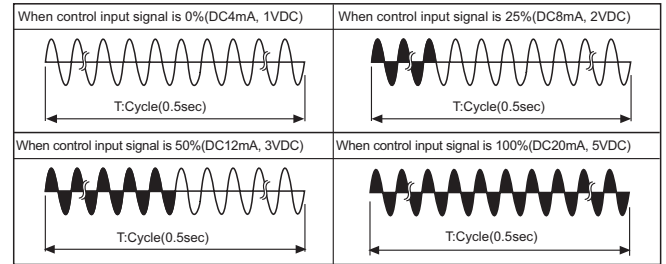
(Picture 2)Equality division type of power according as control input

It divides control angle non-equally according as control input signal then make power curve linerize, so it becomes possible to output the power, which is proportioned control input as outputing(Picture 2).

※To change a controlling method, please change JP3 of PCB as below.

	Control type
SHORT	Equality division type of phase according as control input
OPEN	Equality division type of power according as control input

2)Cycle control-Zero Cross

It controls the supplied power by ON/OFF cycle repetitively according to controlling input signal during set cycle(Selectable 0.5, 2, 10sec) as below. 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 whit 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)

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

| JP1	JP2	Period
SHORT	SHORT	0.5sec
SHORT	OPEN	2.0sec
OPEN	SHORT	10sec
OPEN	OPEN	X(Not used)

3)ON/OFF control-Zero Cross

This function 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). (On and Off is operated on the ZERO point of AC.) OUT ADJ. and SOFT START function are not available in ON/OFF control mode.

<The output characteristic of OUT ADJ. and control input >
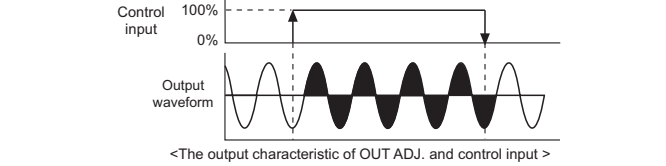
2. OUT ADJ. function(0 to 100%)

This function will be[Control input(%) X OUT ADJ.(%) = 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 characteristic of OUT ADJ. and control input>

※This function must not be used in ON/OFF control mode.
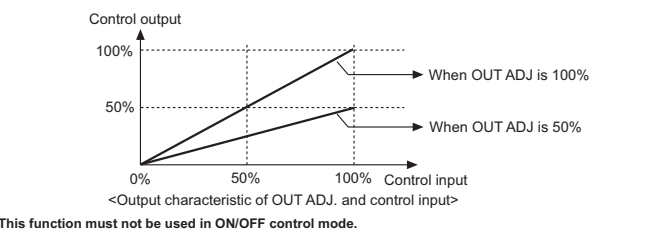
3. SOFT START function(0 to 50sec)

When the power is supplied, this function is able to protect the load when it controls load (Molybdnum, White gold, infrared Lamp) with inrush current or the width of rising temperature in big(SV is big).
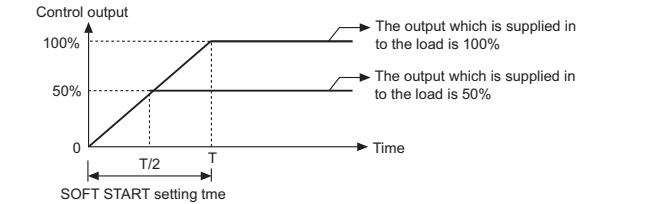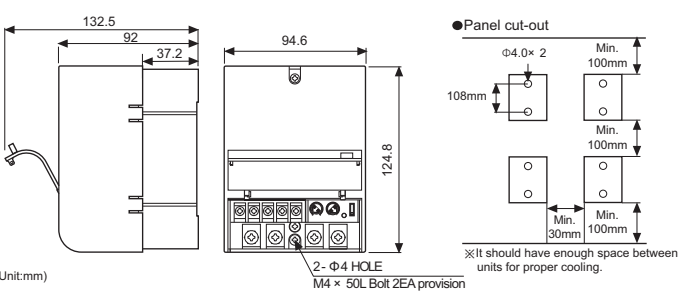
SOFT START set time (T) is the required time that output reaches to 100%, and it is differentiated by OUT ADJ. set value. For example, SOFT START is set as 10sec and OUT ADJ. is set as 70%, it takes 7sec. to reach goal output.
[Set time (T) × OUT ADJ. set value (%)=10sec × 0.7 = 7sec]
If increasing the OUT ADJ. before output reaches to goal output, it delays as much as the value, multipliyiof increased value (%) and OUT START set time.
When not using SOFT START function, please make set value 0.
※This function must not be used in ON/OFF control mode.
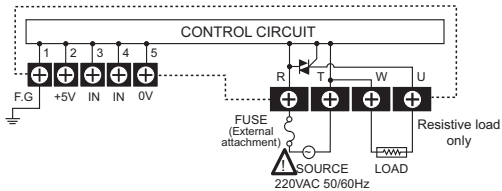
4. OUT display function

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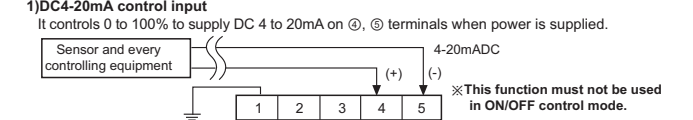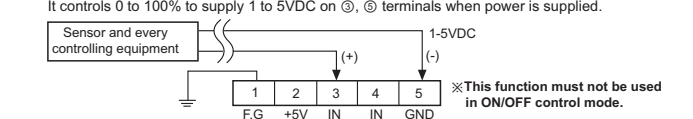(0%:Min. LED light, 100%:Max. LED light)

■ Dimensions

(Unit:mm)

2- Φ4 HOLE
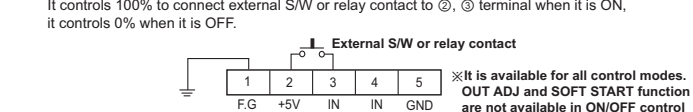M4 × 50L Bolt 2EA provision

●Panel cut-out

※It should have enough space between units for proper cooling.

■ Connection

1. External connection

FUSE (External attachment)
SOURCE 220VAC 50/60Hz
Resistive load only

2. Connection of control input terminals

1)DC4-20mA control input
It controls 0 to 100% to supply DC 4 to 20mA on ④, ⑤ terminals when power is supplied.

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

2)1-5VDC control input
It controls 0 to 100% to supply 1 to 5VDC on ③, ⑤ terminals when power is supplied.

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

3)External contact control input
It controls 100% to connect external S/W or relay contact to ②, ③ terminal when it is ON, it controls 0% when it is OFF.

※It is available for all control modes. OUT ADJ and SOFT START function are not available in ON/OFF control mode.
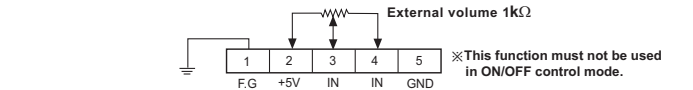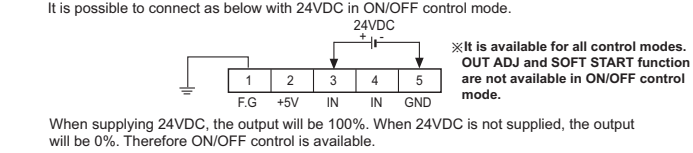
4)External volume control input
It controls 0 to 100% with turning VR to connect 1kΩ to ②, ③, ④ terminals when power is supplied, or after connect ② terminal to ③ terminal, it is possible to control 0 to 100% with turning OUT ADJ. <See Ex2) of ■Application>
OUT ADJ will be operated in state of (above 1), 2), 3).Set at 100% when it is not used.

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

5)External 24VDC control input
It is possible to connect as below with 24VDC in ON/OFF control mode.

※It is available for all control modes. OUT ADJ and SOFT START function are not available in ON/OFF control mode.

When supplying 24VDC, the output will be 100%. When 24VDC is not supplied, the output will be 0%. Therefore ON/OFF control is available.

■ Application

Ex1) When it needs to control accurately with adjusting the power in phase control and cycle control mode. For example, if it needs to control 80% output when it is ON, 24% output when it is OFF, please keep below.

External volume 1kΩ
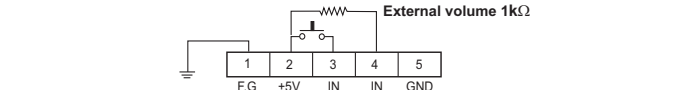
Firstly set OUT ADJ. as 80% and connect external volume and external relay contact S/W as above picture then set external volume as 30%.
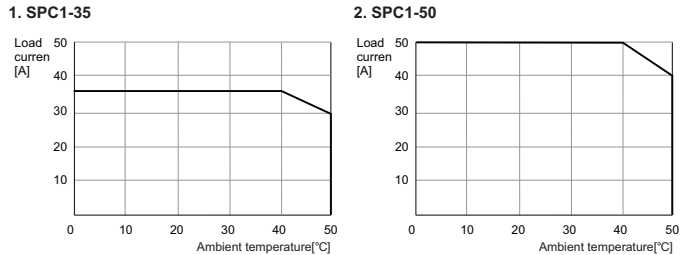●When the External contact signal is ON : 100%(contact input) × 80%(OUT ADJ.) = 80%
●When the External contact signal is OFF : 30% (volume input) × 80%(OUT ADJ.) = 24%

Ex2) This is how to control 0 to 100% without external volume in phase control mode and cycle control mode.
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 for each mode

●Please see <Connection of control input terminals> and above function.

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

■ Temperature characteristic curve

1. SPC1-35

2. SPC1-50

■ Caution for using

1. Installation environment
   ①It shall be used indoor ②Altitude Max. 2000m
   ③Pollution Degree 2 ④Installation CatergoryII
2. Do not use this unit at below places.
   ①Place where there are severe vibration or impact.
   ②Place where there are direct ray of the sun
   ③Place where strong magnetic field or electric noise are generated.
3. When test dielectric voltage and insulation resistance of the control panel with this unit installed.
   ①Isolate this unit from the circuit of control panel.
   ②Make all terminals of this unit short-circuited.
4. When you installing it on panel, it should be installed vertically at the place which is well ventilation. If install it horizontally, under 70% of rated current should be supplied.
5. The fuse for inner circuit must be installed between the terminal of R and the power.
6. The inductive load cannot be used because this is for resistive load only.
7. Be sure to set the proper mode after cut the power off then supply the power again.
8. Case detachment
   Please turn off the power before detaching the case.
   ①Widen lock device toward the outside with a driver
   ②Pull up the case and separate it.
   ※Be careful to use machine tools, it may cause an injury.

AWG No.	Area(mm²)	Applicable current(A)
16	1.3mm²	Max. 10A
14	2.1mm²	Max. 15A
12	3.3mm²	Max. 20A
10	5.3mm²	Max. 30A
8	8.4mm²	Max. 40A
6	13.3mm²	Max. 55A

●Wire specification by load current

※It may cause malfunction if above instructions are not followed.

■ Major products

- ■ Proximity sensors
- ■ Area sensors
- ■ Door/Door side sensors
- ■ Counters
- ■ Rotary encoders
- ■ Power controllers
- ■ Panel meters
- ■ Temperature controllers
- ■ Temperature/Humidity transducers
- ■ Stepping motors/drivers/motion controllers
- ■ Laser marking system(CO₂, Nd:YAG)
- ■ Laser welding/soldering system
- ■ Photoelectric sensors
- ■ Fiber optic sensors
- ■ Pressure sensors
- ■ Timers
- ■ Display units
- ■ Sensor controllers
- ■ Graphic/Logic panels
- ■ Tachometer/Pulse(Rate) meters

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