(I) SSR / Power Controller

NEW

Integrated heatsink type SSR
SRH1 Series

Power controller
SPC1 Series

SRH1 Series

Single phase, Intergrated heatsink type SSR

NEW

▣Features

- ●Superior dielectric voltage : 4,000VAC
- ●Improved reliability by maximizing heat protection efficiency with heatsink integrated design and ceramic board
- ●Various mounting methods (DIN rail, panel front)
- ●Zero cross turn-on / Random turn-on type

Please read "Caution for your safety" in operation manual before using.

▣Ordering information

SRH 1 - 1 4 60 R

Function	Blank	Zero cross turn-on
	R	Random turn-on
Rated load current (Resistive load)	15	15A
	20	20A
	30	30A
	40	40A
	60	60A
Load voltage(Rated)	2	24-240VAC
	4	48-480VAC
Input voltage(Rated)	1	4-30VDC
	2	24VAC
	4	90-240VAC
Control phase	1	Single phase
Item	SRH	Solid State Relay(Integrated heatsink type)

Model	Input voltage	Rated load current	Load voltage	Zero cross/Random turn-on
SRH1-1215	4-30VDC	15A	24-240VAC	Zero cross turn-on
SRH1-2215	24VAC			
SRH1-4215	90-240VAC			
SRH1-1220	4-30VDC	20A		
SRH1-2220	24VAC			
SRH1-4220	90-240VAC			
SRH1-1230	4-30VDC	30A		
SRH1-2230	24VAC			
SRH1-4230	90-240VAC			
SRH1-1240	4-30VDC	40A		
SRH1-2240	24VAC			
SRH1-4240	90-240VAC			
SRH1-1260	4-30VDC	60A		
SRH1-2260	24VAC			
SRH1-4260	90-240VAC			
SRH1-1420	4-30VDC	20A	48-480VAC	Zero cross turn-on
SRH1-1420R				Random turn-on
SRH1-2420	24VAC			Zero cross turn-on
SRH1-1430	4-30VDC	30A		Zero cross turn-on
SRH1-1430R				Random turn-on
SRH1-2430	24VAC			Zero cross turn-on
SRH1-1460	4-30VDC	60A		Zero cross turn-on
SRH1-1460R				Random turn-on
SRH1-2460	24VAC			Zero cross turn-on

▣Specifications

◎Input

4-30VDC input voltage		
Input voltage range		4-32VDC
Max. input current		8mA(Zero cross turn-on), 12mA(Random turn-on)
Pick-up voltage		4VDC
Drop-out voltage		1VDC
Turn-on time	Zero cross turn-on	0.5 cycle of load source + 1ms
	Random turn-on	Max. 1ms
Turn-off time		0.5 cycle of load source + 1ms
24VAC input voltage		
Input voltage range (50/60Hz)		19-30VACrms
Max. input current		12mArms(24VACrms)
Pick-up voltage		19VACrms
Drop-out voltage		4VACrms
Turn-on time		1.5 cycle of load source + 1ms
Turn-off time		1.5 cycle of load source + 1ms
90-240VAC input voltage		
Input voltage range (50/60Hz)		85-264VACrms
Max. input current		6mArms(240VACrms)
Pick-up voltage		85VACrms
Drop-out voltage		10VACrms
Turn-on time		1.5 cycle of load source + 1ms
Turn-off time		1.5 cycle of load source + 1ms

◎Output

24-240VAC load voltage						
Load voltage range (50/60Hz)		24-264VACrms				
Rated load current Ta=25℃	Resistive load (AC-51)	15Arms	20Arms	30Arms	40Arms	60Arms
Min. load current		0.15Arms	0.2Arms	0.2Arms	0.5Arms	0.5Arms
Max. 1 cycle surge current(60Hz)		170A	260A	330A	500A	1000A
Max. non-repetitive surge current (I^2t, t=8.3ms)		150A^2s	300A^2s	500A^2s	1000A^2s	4000A^2s
Peak voltage(Non-repetitive)		600V				
Leakage current (240VAC/60Hz, Ta=25℃)		Max. 10mArms				
Output ON voltage drop (Max. load current)		Max. 1.6Vrms				
Static off state dv/dt		500V/㎲				
48-480VAC load voltage						
Load voltage range (50/60Hz)		48-528VACrms				
Rated load current Ta=25℃	Resistive load (AC-51)	20Arms		30Arms		60Arms
	Motor load (AC-53a)	5Arms		8Arms		15Arms
Min. load current		0.5Arms		0.5Arms		0.5Arms
Max. 1 cycle surge current(60Hz)		300A		500A		1000A
Max. non-repetitive surge current (I^2t, t=8.3ms)		350A^2s		1000A^2s		4000A^2s
Peak voltage(Non-repetitive)		1200V(Zero cross turn-on), 1000V(Random turn-on)				
Leakage current (480VAC/60Hz, Ta=25℃)		Max. 10mArms				
Output ON voltage drop (Max. load current)		Max. 1.6Vrms				
Static off state dv/dt		500V/㎲				

▣Specifications

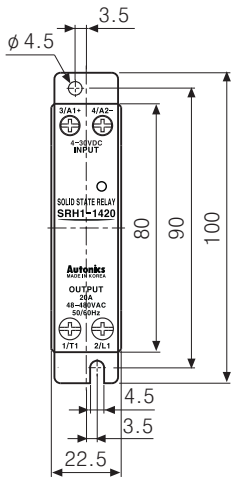
◎General Specifications

Dielectric strength(Vrms)	4000VAC 50/60Hz for 1 min. (Input-Output, I/O-Case)
Insulation resistance	Min. 100MΩ (at 500VDC megger)
Vibration	10 to 55Hz double amplitude 0.75 mm in each X, Y, Z direction for 1 hour
Protection	IP20(IEC standards)
Input LED	Green
Ambient temperature	-20 to 80℃ / -20 to 70℃(In case of 90-240VAC is input voltage), Storage : -30 to 100℃
Ambient humidity	45 to 85%RH, Storage : 45 to 85%RH
Input terminal connection	Min. 1×0.5mm²(1×AWG20) Max. 2×1.5mm²(2×AWG16)
Output terminal connection	• Case width 22.5mm(M4 terminal bolt): Min. 1×0.75mm²(1×AWG18) Max. 2×2.5mm²(2×AWG14) • Case width 45mm(M5 terminal bolt): Min. 1×1.5mm²(1×AWG16) Max. 2×6mm²(2×AWG10) ※Use wires compliant with load current capacity to connect to the terminal.
Input terminal fixed torque	0.75N・m to 0.95N・m
Output terminal fixed torque	• Case width 22.5mm(M4 terminal bolt): 1N・m to 1.35N・m • Case width 45mm(M5 terminal bolt): 1.6N・m to 2.2N・m
Unit weight	• Rated load current(Resistive load) 15A/20A : Approx. 225g • Rated load current(Resistive load) 30A/40A : Approx. 410g • Rated load current(Resistive load) 60A : Approx. 680g

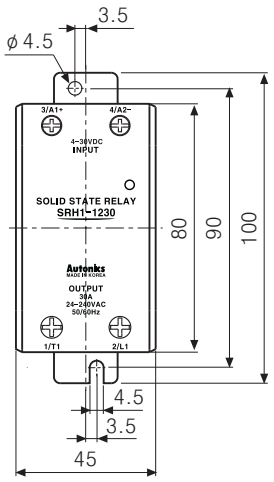
▣Dimensions & Mounting

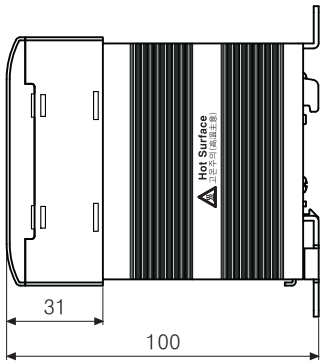
◎Dimensions

●15A/20A Rated load current

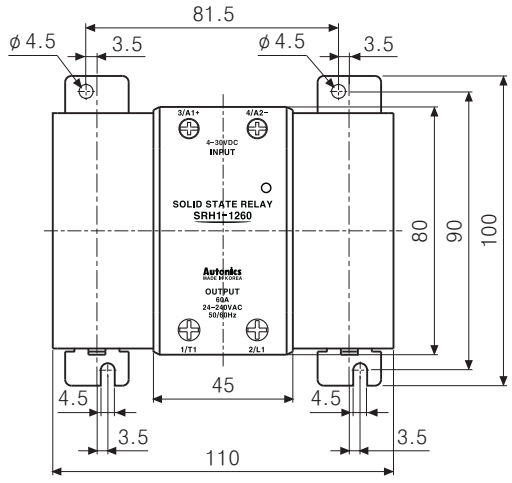


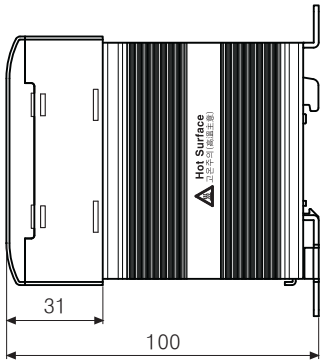
●30A/40A Rated load current





●60A Rated load current

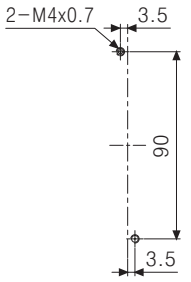




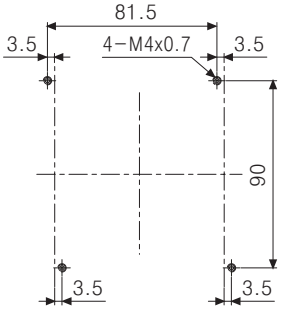
(Unit:mm)

◎Hole cut-out for panel front mounting

●15A/20A/30A/40A rated load current

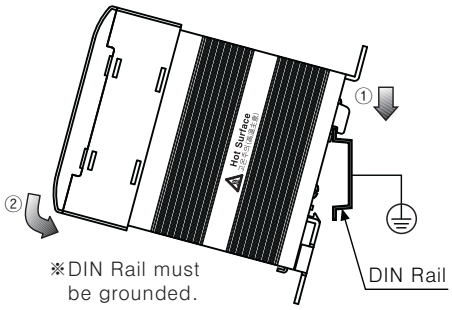


●60A rated load current

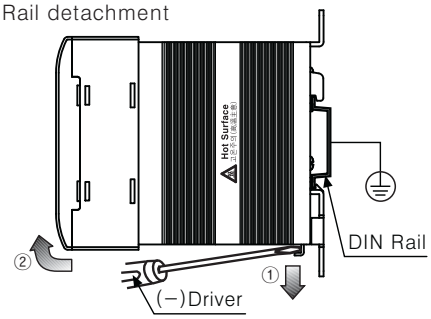


◎DIN Rail mounting

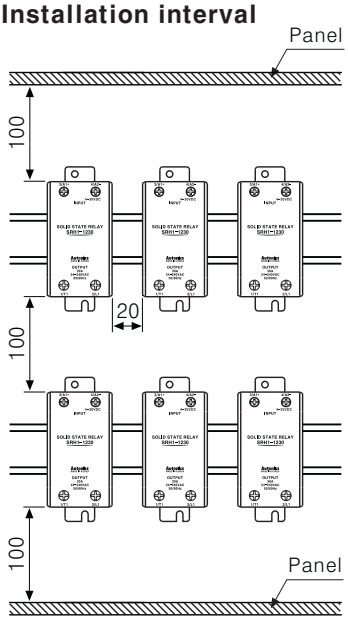
●DIN Rail attachment



●DIN Rail detachment



◎Installation interval



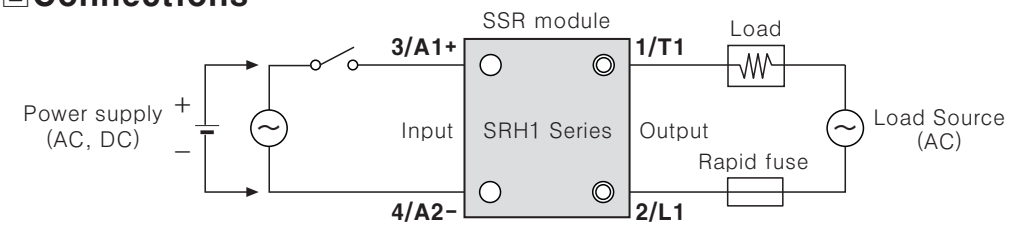
(Unit:mm)

※For mounting multiple SSR, please keep certain installation intervals for heat prevention.
For horizontal installation(when the heights of input part and output part are equal), it is recommended to apply 50% of rated load current.

High temperature caution

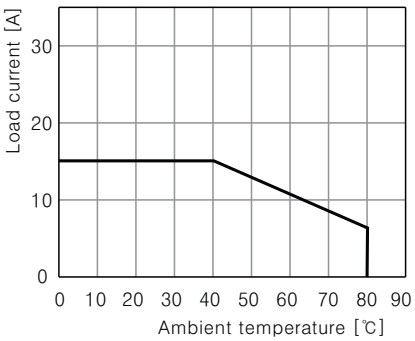
Make sure do not touch the heat sink or the unit body while power is supplied or right after load power is turned off. If not, it may cause a burn.

▣Connections

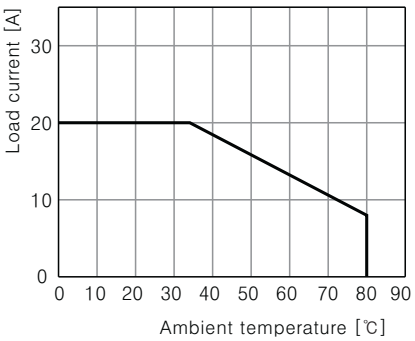


▣SSR Characteristic curve

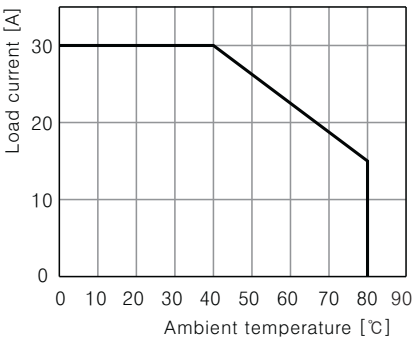
◎SRH1-1215/2215/4215



◎SRH1-1220/2220/4220 SRH1-1420/1420R/2420

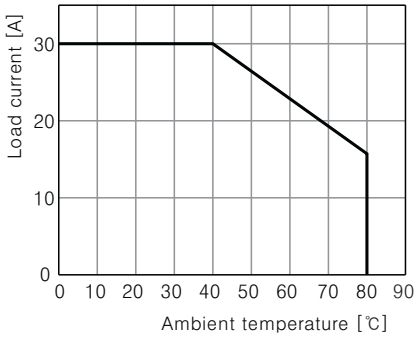


◎SRH1-1230/2230/4230

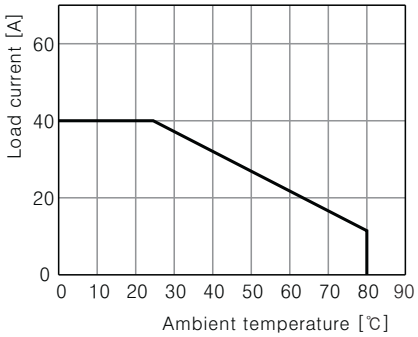


▣SSR Characteristic curve

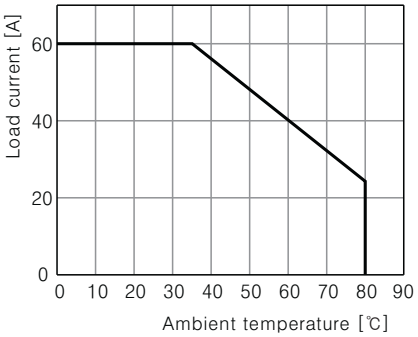
◎SRH1-1430/1430R/2430



◎SRH1-1240/2240/4240



◎SRH1-1260/1460/1460R
SRH1-2460/2260/4260



▣Proper usage

High Temperature Caution

Make sure do not touch the heat sink or the unit body while power is supplied or right after load power is turned off. If not, it may cause a burn.

⚠ Caution for using

1. Keep the dispance between heat sink and the unit to ventilate.
   If not, congested heat transfer may cause product failure or malfunction.
2. Make sure do not touch the heat sink or the unit body while power is supplied or right after load power is turned off. If not, it may cause a burn
3. Use rapid fuse of which I^2t is under 1/2 of SSR I^2t in order to protect the unit from load's short-circuit current.
4. In case that load current is lower than SSR min. load current, connect dummy resistance to the load in parallel so as to make load current higher than SSR min. load current.
5. When selecting phase control with random turn-on model, install the noise filter between load and load source.
6. Make sure that the screw on output terminal is tightly fastened.
   Using the unit with loose bolt may cause product failure or malfunction.
7. Do not touch the load terminal even if output is OFF.
   It may cause an electric shock.
8. Proper application environment(Avoid following environments to install)
   ① Where temperature / humidity is beyond the specification
   ② Where dew condensation occurs due to temperature change
   ③ Where inflammable or corrosive gas exists
   ④ Where direct rays of light exist
   ⑤ Where severe shock, vibration or dust exists
   ⑥ Where near facilities generating strong magnetic forces or electric noise
9. Installation environment
   ①It shall be used indoor
   ②Altitude Max. 2,000m
   ③Pollution Degree 2
   ④Installation Category III

▣Features

●Various and simple input specification
- DC4−20mA, 1−5VDC, External 24VDC
- External adjuster(1kΩ)
- External contact(ON/OFF)

●Various function
- Out ADJ(Limit the output) function
- Soft Start function(Except for ON/OFF control type)
- Out display function
- 50/60Hz automatic converting function

●Various control type by mode switches
- Phase control type
- Cycle control type(Zero cross)
- ON/OFF control type(Zero cross)

Please read "Caution for your safety" in operation manual before using.

▣Ordering information

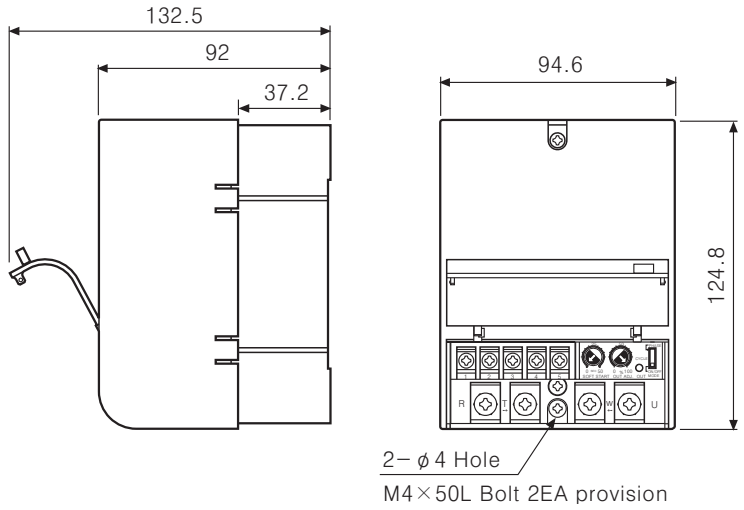
SPC 1 − 35

Rated load current	35	35A
	50	50A
Control phase	1	Single phase
Item	SPC	Solid State Power Controller

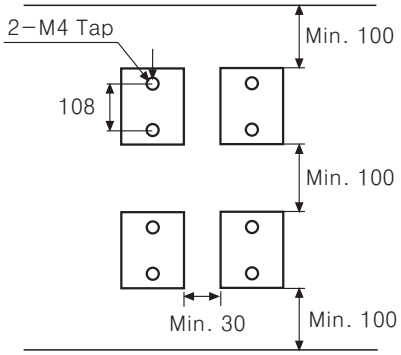
▣Specifications

Model		SPC1-35	SPC1-50
Power supply		220VAC 50/60Hz	
Allowable voltage range		90 to 110% of rated voltage	
Maximum rated current		35A	50A
Control power		220VAC	
Control range		0 to 100%(Except for triac voltage drop)	
Application load		Resistance load(Min. load : Over 5% of rated current)	
Cooling method		Natural cooling by heat sink	
Control circuit		Micom control type	
Control input		• 1−5VDC • DC4−20mA(250Ω) • ON/OFF(External relay contact) • External adjuster(1kΩ) • Output limit input(Inner adjuster) • External 24VDC	
Control mode		Phase control	
		Cycle control(Zero cross)−Period 0.5sec., 2.0sec., 10sec. selectable	
		ON/OFF control(Zero cross)	
Starting type		Soft start(0 to 50 sec. variable) − Only for phase control and cycle control	
Display		Output indication(LED)	
Insulation resistance		100MΩ(at 500VDC megger)	
Dielectric strength		2000VAC for 1minute	
Noise strength		±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	
	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	
	Malfunction	100m/s² (10G) in X, Y, Z directions for 3 times	
Ambient temperature		0 to 50℃(at non−freezing status)	
Storage temperature		−25 to 65℃(at non−freezing status)	
Ambient humidity		35 to 85%RH	
Net weight		Approx. 1kg	

▣Dimensions



●Panel lay−out

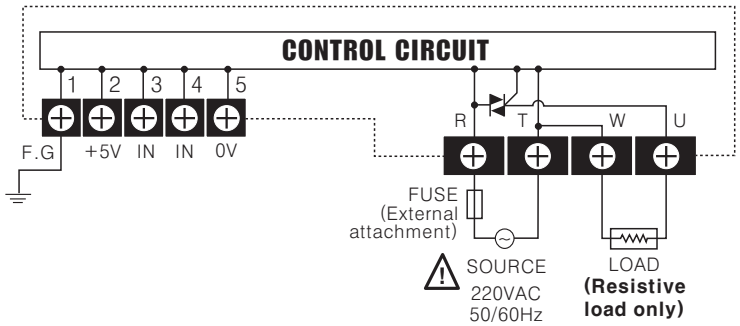


※It should have enough space between units for proper cooling.

(Unit:mm)

▣Connections

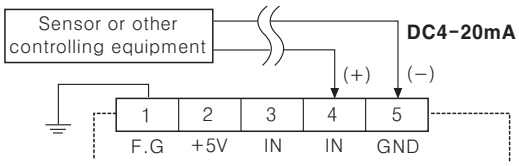
1. External connection



2. Connection of control input terminals

1)DC4-20mA control input

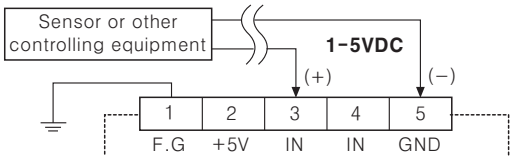
It controls 0 to 100% when you apply DC4−20mA on ④, ⑤ terminals when power is applied.



※It is not available in ON/OFF control mode.

2)1-5VDC control input

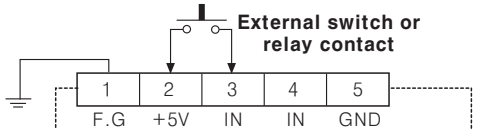
It controls 0 to 100% when you apply 1−5VDC on ③, ⑤ terminals when power is applied.



※It is not available in ON/OFF control mode.

3)ON/OFF External contact control input

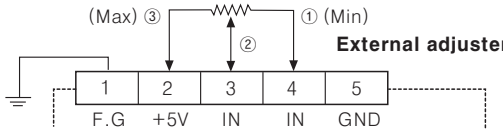
It controls 100% if you connect external switch or relay contact to ②, ③ terminal when it is ON, it controls 0% when it is OFF.



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

4)External adjuster control input

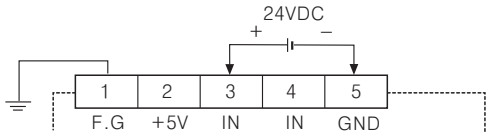
After power is applied, connecting the external adjuster 1kΩ to ②, ③ and ④ terminals and turning adjuster control from 0% to 100%.
It is available to control as OUT ADJ, adjuster for the ablove 1), 2), 3) and set at 100% when it is not used.



※It is not available in ON/OFF control mode.
※OUT ADJ, adjuster and SOFT START are not available to use.

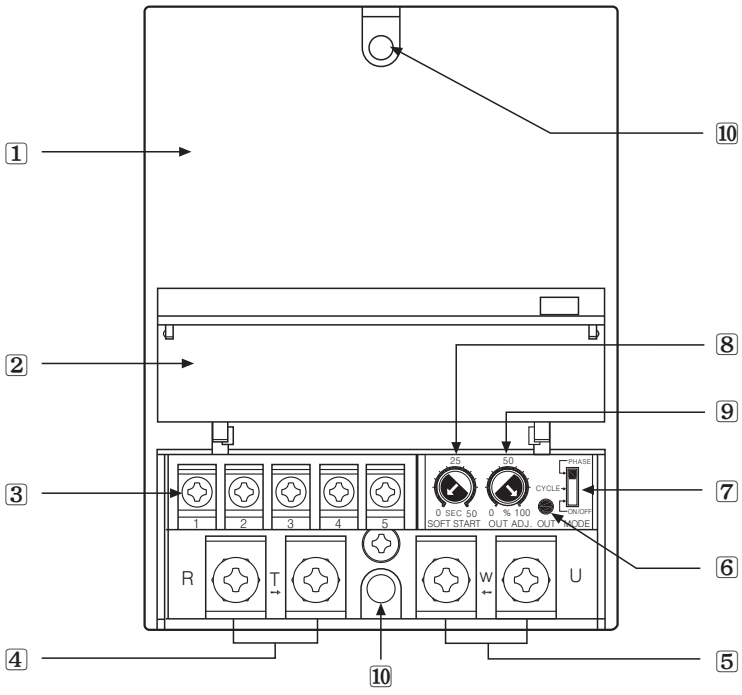
5)External 24VDC control input

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 not available in ON/OFF control mode.
※OUT ADJ, adjuster and SOFT START are not available to use.

▣Front panel identification



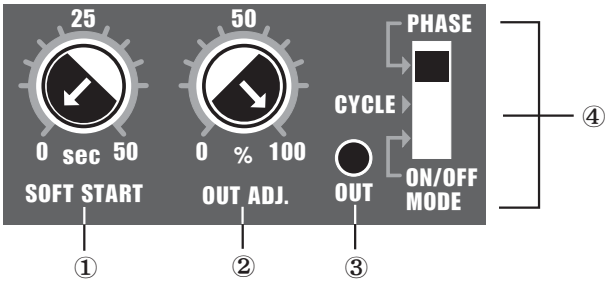
1 Case
2 Terminal block cover
3 Terminal block for control input
4 Terminal block for connecting power
5 Terminal block for connecting load
6 The LED display of output
7 Control mode switch
8 The adjuster of SOFT START
9 The adjuster of OUT ADJ.
10 The hole for fixing on panel
(Bolt size:M4×50mm)

▣Factory Default setting

Control mode	Phase control mode
Control type	Phase equality division type according to control input
Control cycle	0.5sec.
SOFT START setting	0sec.
OUT ADJ. setting	100%

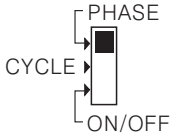
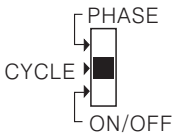
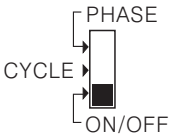
▣Operation and function

◎Front



①SOFT START time setting adjuster(0 to 50sec.)
②Output limiting setting adjuster(0 to 100%)
③Output operation display LED
④Control mode switch
- PHASE : Phase control mode
- CYCLE : Cycle control mode
- ON/OFF : ON/OFF control mode

◎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 jumper function.
※The mode cannot be changed while it is operating. Please be careful to set the proper mode **after turning the power off** then apply the power again.

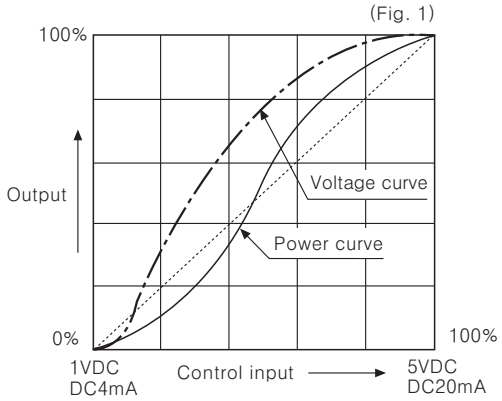
1)Phase control

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

●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 (Fig. 1) and it might be occurred over power and lack power at point middle of control input.

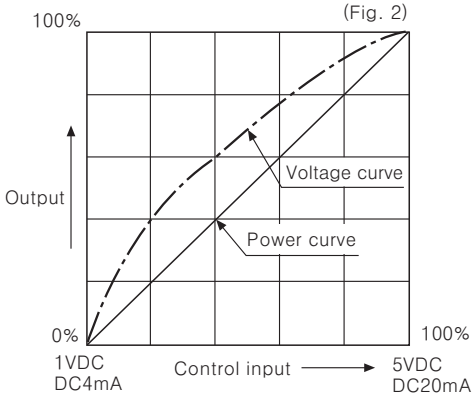
(Fig. 1)



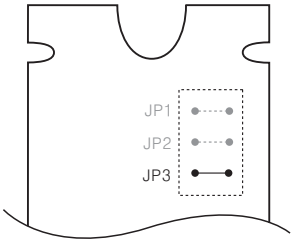
●Equality division type of power according as control input

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 outputting(Fig. 1).

(Fig. 2)



※To change the control method, change TP3 of PCB as below.

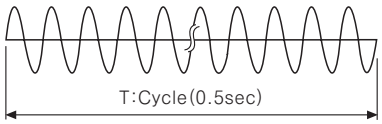
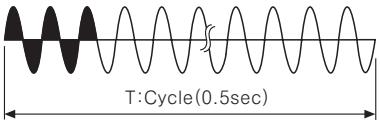
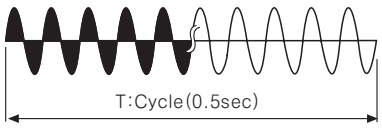
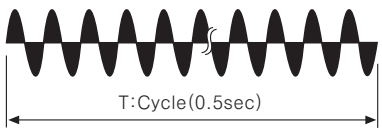


JP3	Division method(Control method)
SHORT	Equal division of phase according to control input
OPEN	Equal division of power according to control input

※ SHORT OPEN

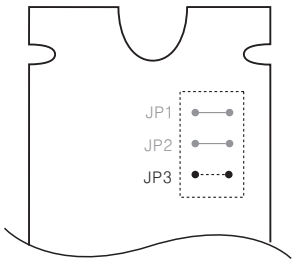
2)Cycle control-Zero cross

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)**
	

※The left cycle waveform is shortened as 1/2 of real one. (30Hz)

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



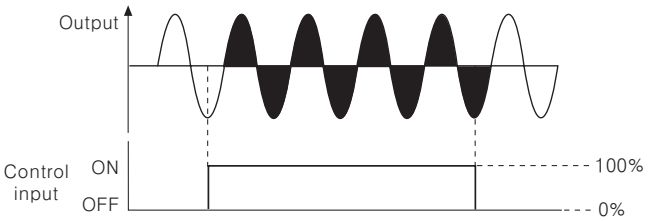
JP1	JP2	Cycle(sec.)
SHORT	SHORT	0.5sec.
SHORT	OPEN	2.0sec.
OPEN	SHORT	10sec.
OPEN	OPEN	X(Not used)

※ SHORT OPEN

3)ON/OFF control-Zero cross

This function is 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).

※OUT ADJ. and SOFT START function are not available in ON/OFF control.

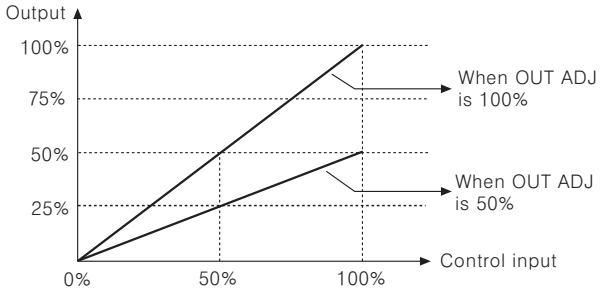


〈 Output wave form of ON/OFF control 〉

◎OUT ADJ. function(0 to 100%)

This function will be as follows :
[Control input(%) × OUT ADJ.(%) = Output]
and it controls the power applied into the load.
Ex) Although the control input is 100%(5VDC or DC20mA), if OUT ADJ. is 50%, the output will be 50% which is proportioned with OUT ADJ. When this function is not used, OUT ADJ. should be 100%.

※This function is not available in ON/OFF control mode.

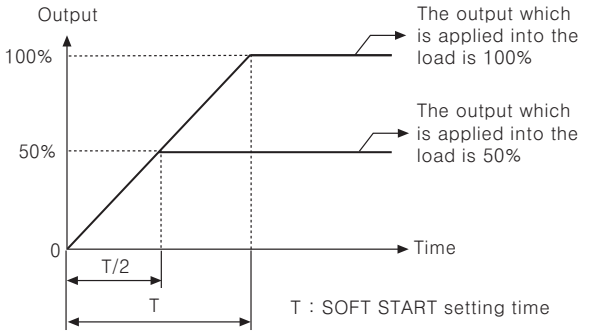


〈The output characteristic of OUT ADJ. and control input〉

◎SOFT START function(0 to 50sec.)

When the power is applied, this function is able to protect the load when it controls load(Molybdnum, White gold, tungsten, infrared Lamp) with inrush current or the width of rising temperature is big(SV is big).
When this function is not used, T should be "0".
Note) In this time, if you increase the OUT ADJ. before it reaches T/2, it will slowly increase and then reaches the new output in a total time period equal to T multiplied by the new OUT ADJ percentage.

※This function is not available in ON/OFF control mode.



※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%.

◎OUT display function

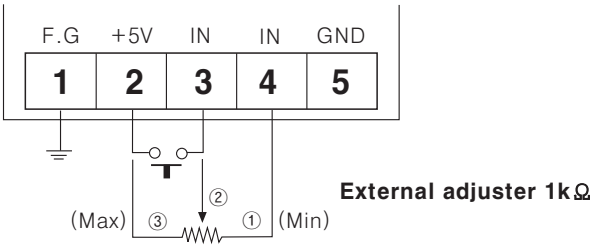
This is LED lamp to display the status of output and will be getting brighter according to output.
(0% : Minimum, 100% : Maximum)

▣Application

Ex1) When it needs to control accurately by 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.
Firstly set OUT ADJ. as 80% and connect external adjuster and external relay contact switch as above picture then set external adjuster as 30%.

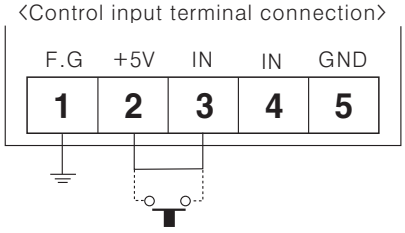
- ●When the External contact signal is ON : 100%(External contact input) × 80%(Out ADJ.) = 80%
- ●When the External contact signal is OFF : 30%(Adjuster input) × 80%(Out ADJ.) = 24%

<Control input terminal connection>



Ex2) This is how to control 0 to 100% without external adjuster in phase control mode and cycle control mode.
It is possible to control 0 to 100% by turning OUT ADJ. in state of connecting terminal 2 and terminal 3.

<Control input terminal connection>



▣Proper usage

⚠ Warning

When using this item, ground F.G terminals to avoid an electric shock.
Do not touch the heat sink since it radiates high temperature.

⚠ Caution

1. When you install it on panel, it should be installed vertically at the place, which is well ventilated.
   If install it horizontally, under 70% of rated current should be applied, and a vent fan needs to be installed on the upper part of panel.
2. Be careful to attach prompt fuse between R phase terminal and power.
3. If over the maximum rated current, it causes product damage.
   (Do not over maximum rated current when using high rush current.)
4. Since it is only for resistive load, the inductive load cannot be used.
5. When connecting power and load, please use the cable(When rated current is 35A : Min. 8.4mm², when rated current is 50A : Min. 13.3mm²) which is able to send the maximum rated current.
6. Before using this unit, set the proper mode and function.
   Especially, if the setting of Out ADJ. is 0%, it does not operate.
7. The mode cannot be changed while it is operating.
   Please be sure to set the proper mode after cutting the power off and then apply the power.
8. Do not use this unit as following place.
   ①A place where corrosive or inflammable gas is occurred.
   ②A place where water and oil is occurred.
   ③A place where there are a lot of dusts.
9. Case detachment
   Please turn off the power and detach the case.
   ①Widen lock device toward the outside with a driver.

   ※Be careful to use machine tools, it may cause an injury.

   ②Put the case up and seperate it.