(20A,30A,45A,60A,80A,100A type)

THV-A1

General Description

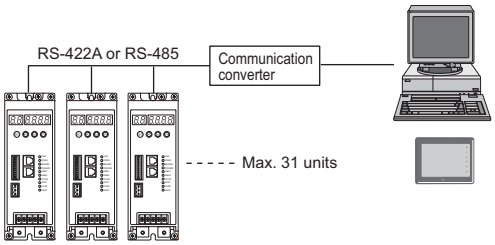
As the THV-A1 single phase power control unit can be used with control modes selectable from constant voltage, constant current and constant power, it can be used with such heaters as noble metals (Platinum and molybdenum), super Kanthal, and SiC (Silicon Carbide) that have changing resistance in accordance with temperature changes.
Optional features like heater break alarm and communication can improve system safety and establishment of a supervisory system.

Features

☆ Control type selection
(Phase-angle/continuous zero-cross/zero-cross)
☆ Communication function
☆ Detects heater break of non-linear load
☆ Ramp-up, Ramp-down
☆ Gradient setting
☆ Output Limiter High and Low
☆ Base-up Setting (output bias)
☆ Output mode selection
(proportional electric power/voltage/phase angle)
☆ Digital input for Auto/manual

Communication

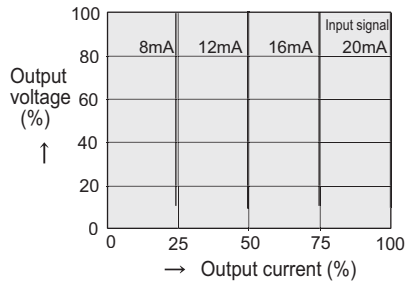
With the communication function, a connection to a host computer and an MMI is possible.
(Protocol: Modbus-RTU)



Constant current control (For phase control only)

This function maintains the output current constant when a load or a power supply fluctuates. It makes the THW Series suitable for heaters of which resistance greatly changes by temperature change, such as Platinum, Molybdenum, Tungsten, and Kanthal heaters.

Constant current control characteristic diagram

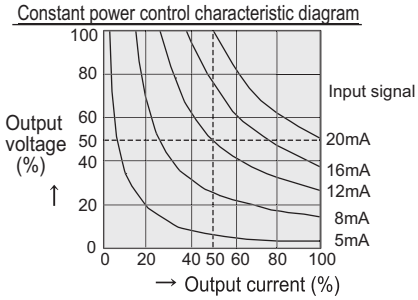


Constant power control (For phase control only)

This function controls the output to make its effective value power proportional to the input. It makes the THW Series suitable for heaters of which resistance gradually increases by temperature or time, such as silicon carbide type heater.
This function controls its effective value power at 50% of the rating shown in the diagram below.

• From the diagram below, constant power control is expressed as a curve obtained from a line between two points which is a 50% of the rating of the unit; a point at 100% voltage x 50% current and a point at 50% voltage x 100% current.

Constant power control characteristic diagram

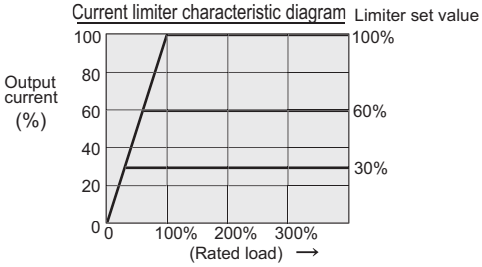


Load current limiter (For phase control only)

This function limits the load current value to the heater. The setting range is 30 to 100% of the rated current.

(Note) If the load has a large inrush current, use soft-start function along with this function to suppress the inrush current.
This function alone can not prevent the inrush current.

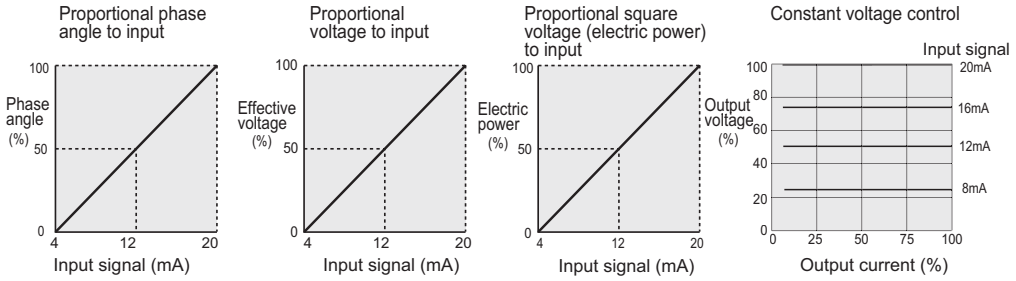
Current limiter characteristic diagram



Features

Output modes

When phase control is selected for linear load (R: resistor), output mode can be selected among Proportional phase angle to input, proportional voltage to input, proportional square voltage (electric power) to input, proportional square voltage feedback to input and constant voltage control.



Three Types of Control Mode (Selectable)

● Phase control

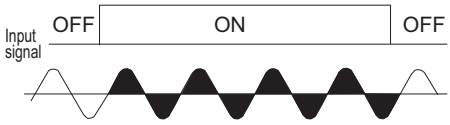
The wave form of the load power is switched at a desired phase angle q to provide smooth control.

● Zero-cross control (Continuous proportion)

Power is switched on and off when the supply voltage is at 0V. This system suppresses high frequency noise inherent to phase control.

● Zero-cross control (Input synchronization system)

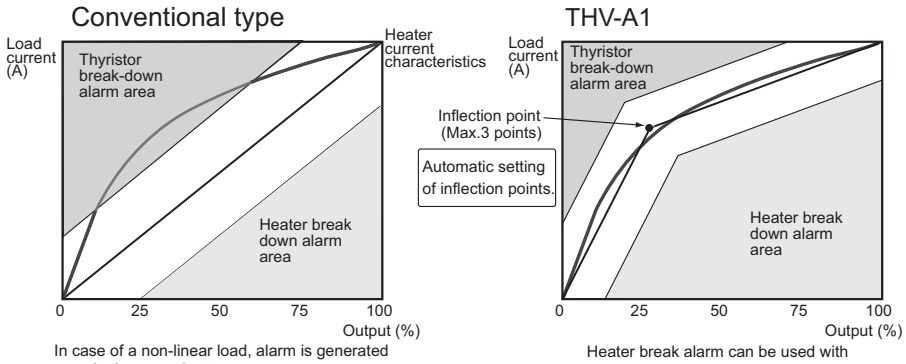
Supply voltage is switched on and off according to the voltage pulse and contact signals from a controller.



Detects heater break of non-linear load

Patent pending

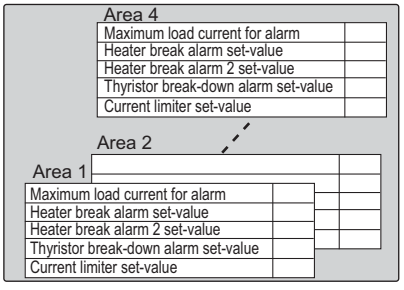
Heater break alarm can be used at up to three inflection points in accordance with heater characteristics. The unit can be used with a load with large resistance changes by temperature (e.g. lamp heaters). There is no need of calculation for inflection points as automatic setting is possible.



Memory area

The THV-A1 stores 4 patterns of heater break alarm settings and enables easy change of settings.

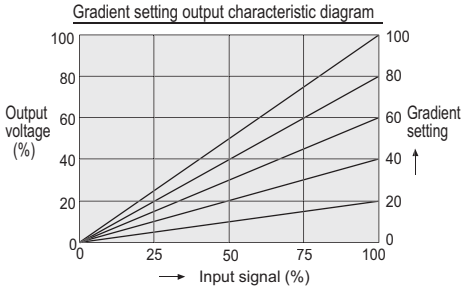
• Memory area is not available with heater break alarms for non-linear load.



Gradient Setting

The relation between the setting input and the output voltage can be set. Gradient setting is possible via front keys or an external setter. Control characteristics may vary with the setting as follows.

1. Auto setting input X Internal gradient setting X External gradient setting
2. Auto setting input X Internal gradient setting
3. Manual setting X Internal gradient setting X External gradient setting

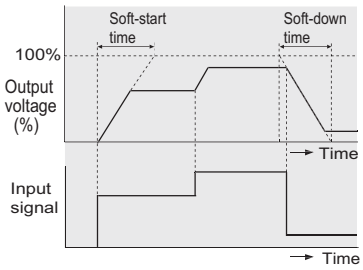


Features

Ramp Function (Soft-start & Soft-down)

Even if setting input changes abruptly, output changes slowly to suppress inrush current. Ramp-up (Start-up) and ramp down (Start-Down) time can be set in the range of 0.1 to 99.9 sec via front keys.

Soft-start & Soft-down action diagram

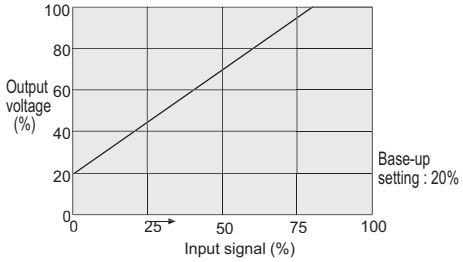


Base-up setting (Output bias)

When the setting input is zero, the output can be set via front keys.

(Base-up setting is valid when output limiter low is set to 0.0)

Base-up output characteristic diagram



Event input

Functions can be assigned to three external contact inputs. Switching of functions can be made externally with contact signals.

RUN/STOP
Auto/Manual
Alarm interlock reset
Heater break alarm : Use/Unuse
Soft-up/Soft\down :Use/Unuse
Key lock : Use/Unuse
Over current alarm : Use/Unuse
Multi-memory area selection (DI: 2 points)

• Heater break alarm, over current alarm and multi-memory area selection are optional.

Heater break alarm

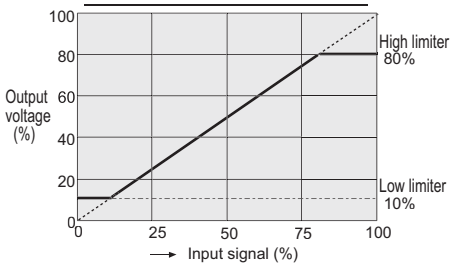
This function measures load current and compares it with a heater break alarm set value. Alarm will be activated if the load current goes into alarm ranges. Maximum two alarm set points can be set for the heater break alarm, which could be used for heater-deterioration alarm and heater-break alarm.

(Note) For phase control, heater break alarm does not work when the load current is less than 15% of maximum load current.

Output limiter (High & Low)

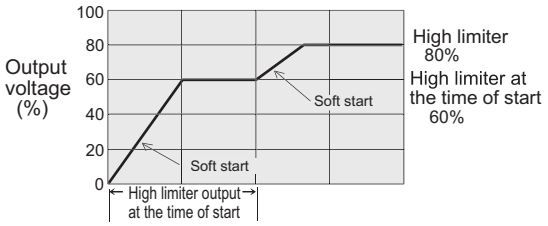
Highest and lowest output values can be set via front keys.

High & Low limiter characteristic diagram



Output limiter High at start-up

This function limits the highest output for the period of a preset time after power-ON and control mode change from Stop to Run. It makes the THV-A1 Series suitable for heaters which cause rush current flow, such as Halogen lamp, Tungsten, Platinum, and Molybdenum heaters.



Over-current alarm

The alarm goes on when the load current exceeds 120% of the rated current.

Alarm output

The alarm types are Power supply voltage abnormal, Power frequency abnormal, Board alarm, Over current alarm, Fuse break alarm, Thyristor break alarm, and Heater break alarm. Alarm output will go on, when any of them goes in alarm status.

(Alarm logic selection, Alarm output : 2 points)

Specifications

Maximum Load Current
20A AC, 30A AC, 45A AC, 60A AC, 80A AC, 100A AC, 150A AC, 200A AC

Control Method
Phase control, Zero-cross control (Selectable)

Applicable Load
Phase control : Linearity (R:Resistor) load, Control of primary side of a transformer (magnetic field density 8,000 gauss or less)
Zero-cross control : Linearity (R:Resistor) load

Input Signal
Group 1 (Field-programmable within Group)
Current input 4 to 20mA DC (Input impedance : 100Ω)
Current input 0 to 20mA DC (Input impedance : 100Ω)
Voltage input 0 to 5V DC (Input impedance : 30kΩ)
Voltage input 1 to 5V DC (Input impedance : 30kΩ)
Voltage pulse input 0/12V DC (Input impedance : 30kΩ)
Non-voltage contact input
Group 2 (Field-programmable within Group)
Voltage input 0 to 10V DC (Input impedance : 60kΩ)
Voltage pulse input 0/12V DC (Input impedance : 60kΩ)
Voltage pulse input 0/24V DC (Input impedance : 60kΩ)
Non-voltage contact input
a) Current input 4 to 20mA DC (Input impedance : 100 Ω)
b) Voltage input 1 to 5V DC (Input impedance : 30kΩ)
c) Voltage input 0 to 10V (Input impedance : 68kΩ)
d) Voltage pulse input 0/12V DC (Input impedance : 30kΩ)
e) Non-voltage contact input (Input impedance : 47Ω)

Output mode
a) Constant voltage control
b) Proportional phase angle • Proportional voltage • Proportional square voltage • Proportional square voltage feed back [when phase control is selected for linearity load (R: resistor)]
c) Constant current control
d) Constant power control
• a), b) : Standard function, c), d) : Optional function

Input sampling cycle
0.5 cycle of power cycle

Minimum Load Current
0.5A (at 98% output of rated voltage)

Output Voltage Range
0 to 98% of rated voltage

Power OFF leakage current
20A, 30A, 45A, 80A 100A AC type
27mA AC rms or less (load voltage 200V rms, 60Hz, Ta=25ºC)
150A, 200A AC type
90mA AC rms or less (load voltage 200V rms, 60Hz, Ta=25ºC)

Power Supply Voltage
90 to 264V AC (Including power supply voltage variation)
[Rating : 100 to 240V DC]

Power Frequency
50/60Hz (Automatic discriminating)

Allowable Power Frequency Variation
50Hz±1Hz, 60Hz±1Hz,(Performance guarantee range)
45 to 54.9Hz (50Hz), 55 to 64.9Hz (60Hz) (Operating guarantee range)

Allowable Ambient Temperature
Performance guarantee range: 0 to +50ºC (60A type : 0 to +45ºC)
Operating guarantee range: -15 to +55ºC (20A,30A,45A,60A,80A,100A type)
-10 to +55ºC (150A,200A type)

Operating ambient humidity
5 to 95%RH (Non-condensing)
Absolute humidity : MAX.W.C 29.3g/m^3 dry air at 101.3kPa

Cooling method
20A, 30A, 45A, 80A 100A AC type : Natural convection
150A, 200A AC type : Air cooling (Built-in cooling fan)

Dielectric voltage
Between main circuit terminals, power terminals and heat sink 2000V AC for one minute.
Between main circuit terminals, power terminals and input terminals 2000V AC for one minute.

Insulation resistance
Between main circuit terminals, power terminals and heat sink 20MΩ or more (500V DC)
Between main circuit terminals, power terminals and input terminals 20MΩ or more (500V DC)

Mounting Method
Vertical mounting

Weight
Approx. 1.4kg (20A, 30A), Approx. 1.6kg (45A, 60A)
Approx. 2.4kg (80A, 100A), Approx. 4.5kg (150A, 200A),

Power consumption
20A, 30A, 45A, 80A 100A AC type
Less than 6VA (at 100V AC), Rush current 10A or less
Less than 8VA (at 240V AC), Rush current 24A or less
150A, 200A AC type
Less than 14VA (at 100V AC), Rush current 22A or less
Less than 22VA (at 240V AC), Rush current 52A or less

Self-diagnostic function
Check item
a) Data check, Back-up check, Power frequency check, Main circuit power supply check, A/D converter check
b) Power supply voltage check, Watch dog-timer
Action at abnormality :
Check item a) : Control stop, Board abnormality lamp ON, Thyristor output OFF
Check item b) : Action stop, FAIL lamp ON, Thyristor output OFF

Output Setting Range
Gradient setting : 0.0 to 200.0% [Front key], 0 to 100% [External setting unit]
Output limiter (High) : 0.0 to 100.0% [Front key]
Output limiter (Low) : 0.0 to 100.0% [Front key]
Output limiter at start-up (High) : 0.0 to 100.0% [Front key]
Output limiter time at start-up (Low) : 0.0 to 600.0 sec [Front key]
Base-up setting (Output bias) : -10.0 to 100.0% [Front key]
Manual setting : 0.0 to 100% [Front key] 0 to 100% [External setting unit]

Standard functions
• Auto/Manual selection (External manual setting unit is optional)
• Gradient setting (External setting unit is optional)
• Soft-up/Soft-down : 0.0 to 100.0sec
• Digital input (DI) : 3 points, Non-voltage contact input
RUN/STOP, Auto/Manual, Alarm interlock reset
Heater break alarm : Use/Unuse,
Soft-up/Soft\down :Use/Unuse
Key lock : Use/Unuse,
Over current alarm : Use/Unuse
Multi-memory area selection (For heater break alarm) (Selectable)
• ON/OFF control (External setting units are optional)

Option function
• Alarm output : 2 points
Open collector output, 250V AC, 1A (Resistive loaf)
Energized/De-energized is selectable.
(Heater break alarm, Thyristor break alarm, Fuse break alarm, Power supply voltage abnormal, Power frequency abnormal, Over current alarm, Board alarm)
* Selectable
• Heater break alarm
Current measuring accuracy : ±2% of rated load current
Number of alarm delay times : 0 to 99 times
Memory area : 4 areas
• Load current limiter
Setting range :
0.0 to 22.0A (20A type), 0.0 to 33.0A (30A type)
0.0 to 50.0A (45A type), 0.0 to 66.0A (60A type)
0.0 to 88.0A (80A type), 0.0 to 110.0A (100A type)
0.0 to 165.0A (150A type), 0.0 to 220.0A (200A type)
• Heat sink temperature abnormality
* 150A, 200A type: Standard function
• Communication function
Communication method : RS-485 (2-wire, half-duplex)
RS-422A (4-wire, half-duplex)
Synchronous method : Start-stop synchronous type
Communication speed : 9600 bps
Protocol : Modbus-RTU
Data format : Start bit : 1, Data bit : 8, Parity bit : None
Stop bit : 1
Maximum connection : 31 units

Compliance with Standards (20A, 30A, 45A, 60A, 80A, 100A AC Type)
UL : UL61010-1, cUL : CAN/CSA-C22.2 No.61010-1
CE marking : LVD : EN61010-1
OVERVOLTAGE CATEGORYII,
POLLUTION DEGREE 2,
EMC : EN60947-4-3
• A specified noise filter must be used
SOSHIN ELECTRIC CO., LTD
HF2030A-UP (20A,30A), HF2050A-UP (45A)
HF2060A-UP (60A), HF2080A-UP (80A)
HF2100A-UP (100A)

● Table of Stability

Function	Operating condition	Stability
Constant voltage variation	Power supply variation : Within ±10% Load variation : 2 times	Within ±2% of input voltage
Constant current variation	Power supply variation : Within ±10% Load variation : 2 times	Within ±2% of rated current
Constant power variation	Power supply variation: Within ±10% Load variation : 2 times	Within ±4% of rated power

● Table of internal calorific value

Rated load current (A)	20	30	45	60	80	100	150	200
Internal calorific value (W)	23	34	56	72	95	116	190	245

Model and Suffix Code

● Rated load current : 20A,30A,45A,60A,80A,100A AC

Specifications	Model and Suffix Code										
Type	THV-A	1	PZ	□	–	□	*	□	□	□	□	□
Power supply	Single phase 100 to 240V AC	1										
Control method	Phase control/Zero-cross control (programmable, default: phase control)		PZ									
Rated load current	20A AC			020								
	30A AC			030								
	45A AC			045								
	60A AC			060								
	80A AC			080								
	100A AC			100								
Input signal *1	0 to 5V DC				4							
	0 to 10V DC				5							
	1 to 5V DC				6							
	0 to 20mA DC				7							
	4 to 20mA DC				8							
Output mode *2	Standard + Constant voltage control					6						
	Standard + Constant voltage control + Constant current control (with heater break alarm, thyristor break down alarm, memory area load current limiter and over current alarm)					E						
	Standard + Constant voltage control + Constant power control (with heater break alarm, thyristor break down alarm, memory area load current limiter and over current alarm)					W						
Fast-blow fuse	No fast-blow fuse						N					
	With fast-blow fuse						F					
Alarm output	No alarm output							N				
	Alarm output 2 points							A				
Heat sink temperature detection function/ Non-linear resistance heater break alarm (ARC-HBA)	No function								N			
	Heat sink temperature detection function								A			
	Non-linear resistance heater break alarm • When the output mode is specified to E or W code, this alarm can be selected.								B			
	Heat sink temperature detection function + Non-linear resistance heater break alarm • When the output mode is specified to E or W code, this alarm can be selected.								C			
Communication	No communication									N		
	RS-422A									4		
	RS-485									5		
Accessories *3,*4	Setter (Volume, knob, Scale plate) 1 unit + Connector for input (Plug)											-1
	Setter (Volume, knob, Scale plate) 2 units + Connector for input(Plug)											-2
	Connector for input (Plug)											-9
	Connector for alarm output (Plug)											-B

● Rated load current : 20A,30A,45A,60A,80A,100A AC

Specifications	Model and Suffix Code										
Type	THV-A	1	PZ	□	–	□	*	□	□	□	□	□
Power supply	Single phase 100 to 240V AC	1										
Control method	Phase control/Zero-cross control (programmable, default: phase control)		PZ									
Rated load current	150A AC			150								
	200A AC			200								
Input signal *1	0 to 5V DC				4							
	0 to 10V DC				5							
	1 to 5V DC				6							
	0 to 20mA DC				7							
	4 to 20mA DC				8							
Output mode *2	Standard + Constant voltage control					6						
	Standard + Constant voltage control + Constant current control (with heater break alarm, thyristor break down alarm, memory area load current limiter and over current alarm)					E						
	Standard + Constant voltage control + Constant power control (with heater break alarm, thyristor break down alarm, memory area load current limiter and over current alarm)					W						
Fast-blow fuse	No fast-blow fuse						N					
	With fast-blow fuse						F					
Alarm output	No alarm output							N				
	Alarm output 2 points							A				
Heat sink temperature detection function/ Non-linear resistance heater break alarm (ARC-HBA)	Heat sink temperature detection function								A			
	Heat sink temperature detection function + Non-linear resistance heater break alarm • When the output mode is specified to E or W code, this alarm can be selected.								C			
Communication	No communication									N		
	RS-422A									4		
	RS-485									5		
Accessories *3,*4	Setter (Volume, knob, Scale plate) 1 unit + Connector for input (Plug)											-1
	Setter (Volume, knob, Scale plate) 2 units + Connector for input(Plug)											-2
	Connector for input (Plug)											-9
	Connector for alarm output (Plug)											-B

*1 : Input signal is programmable within group. When contact input is required, specify the connector for input as an accessory (Either of -1, -2, or -9).

Group 1	0 to 20mA DC	4 to 20mA DC	0 to 5V DC	1 to 5V DC	Voltage pulse 0/12V DC	Non-voltage contact
Group 2	0 to 10V DC	Voltage pulse 0/12V DC	Voltage pulse 0/24V DC	Non-voltage contact		

*2 : Standard output mode : Proportional phase angle • Proportional voltage • Proportional square voltage.

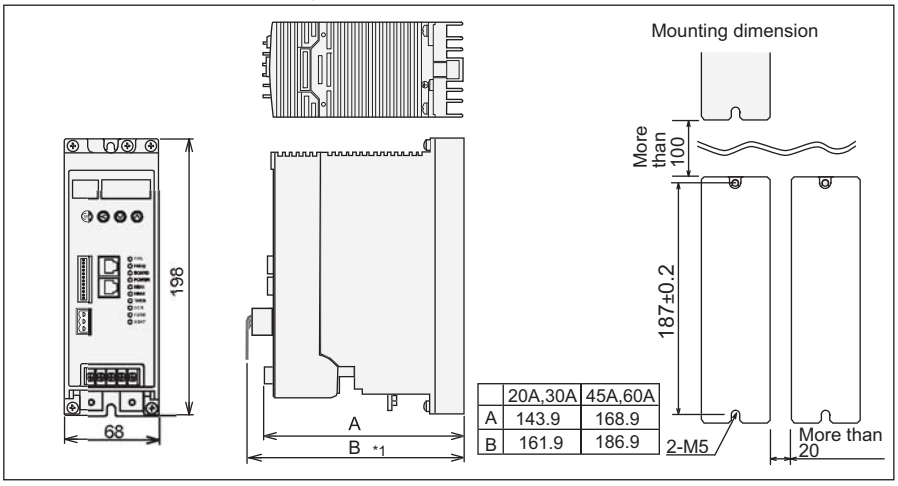
*3 : Setters are for external gradient setting, external manual setting, and external high/low setting for on/off control. Use two units of setter in the following cases;
- When external gradient setting and external manual setting are required.
- High/low setting for on/off control is used.

*4 : It is possible to specify more than one accessories by adding suffix code at the end.
Example: -1-B : Setter (Volume, knob, Scale plate) 1 unit + Connector for input (Plug) + Connector for alarm output (Plug)
-1-2-9 and -4-5 cannot be specified simultaneously.

External Dimensions

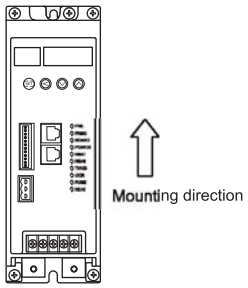
Unit : mm

○ 20A, 30A, 45A, 60A type

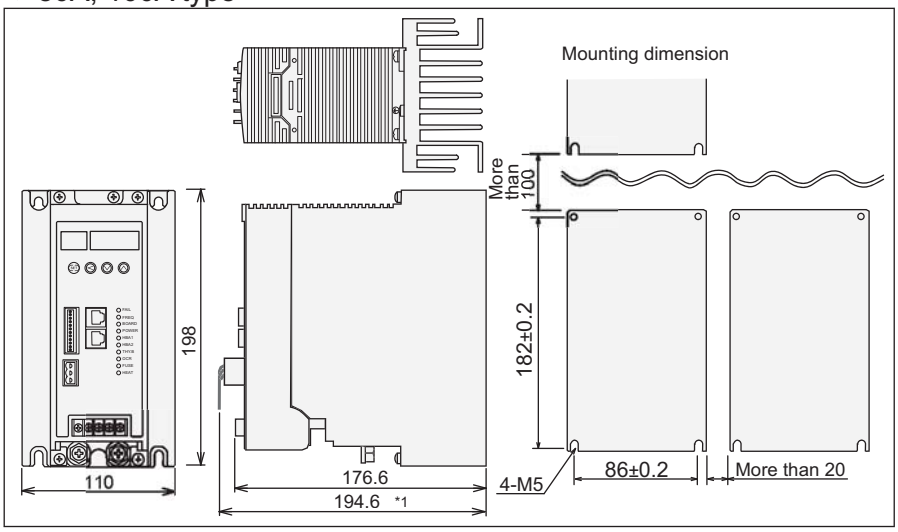


	20A,30A	45A,60A
A	143.9	168.9
B	161.9	186.9

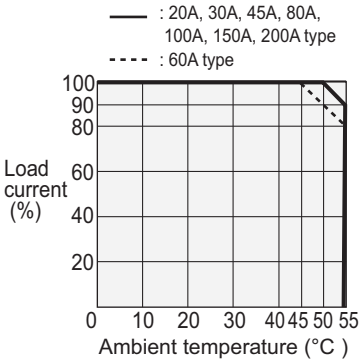
• Install the instrument as illustrated in the drawing to increase the cooling effect.



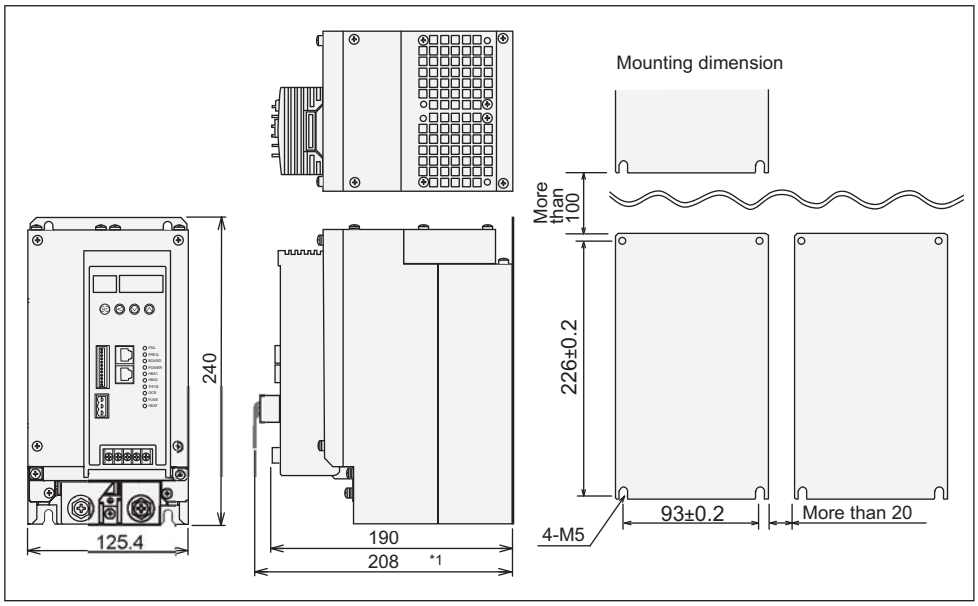
○ 80A, 100A type



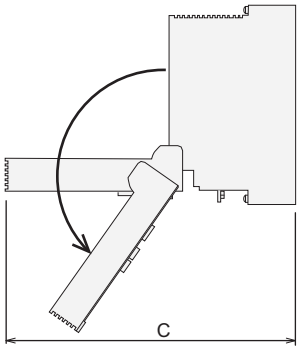
• Temperature characteristics of load current



○ 150A, 200A type



• The front of the instrument can be opened to allow replacement of the fast-blow fuse.
When installing the instrument, leave enough space to allow the cover to be opened.

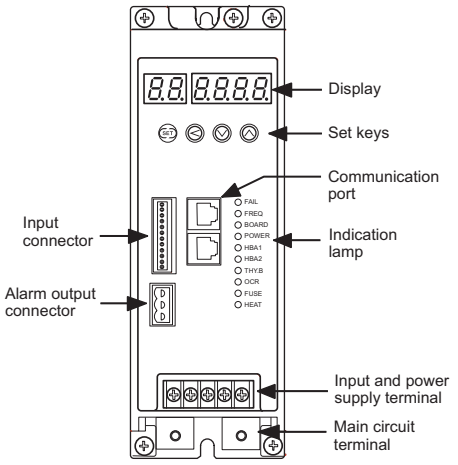


C

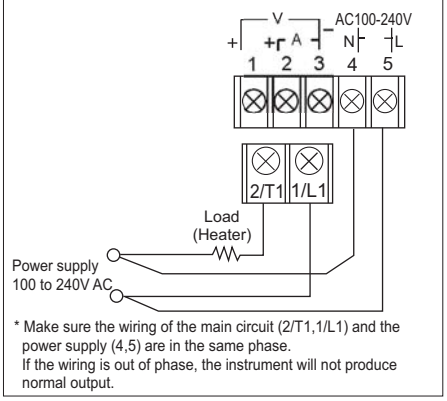
20A,30A	45A,60A	80A,100A	150A,200A
276	301	311	322

*1 : Length includes that of an optional connector, but space for wiring to connector is not included.

External Wiring

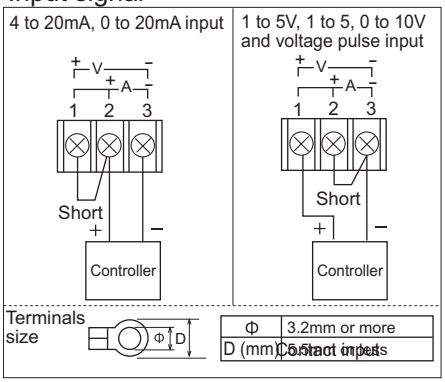


Main circuit terminal

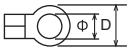


* Make sure the wiring of the main circuit (2/T1,1/L1) and the power supply (4,5) are in the same phase. If the wiring is out of phase, the instrument will not produce normal output.

Input signal



Terminals size



Item \ No.	T1,L1			1 to 5
	20A/30A	45A/60A	80A/100A	
Φ	4.3mm or more	6.4mm or more	8.4mm or more	3.2mm or more
D (mm)	9.5mm or less	13.2mm or less	22.6mm or less	5.5mm or less

Indication Lamp

INDICATION LAMP

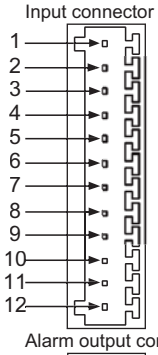
- FAIL
- FREQ
- BOARD
- POWER
- HBA1
- HBA2
- THY.B
- OCR
- FUSE
- HEAT

Lamp	Contents
FAIL	FAIL(Self-diagnostic abnormality)
FREQ	Power frequency abnormality
BOARD	Board abnormality
POWER	Power supply voltage abnormality
HBA1	Heater break alarm SV1
HBA2	Heater break alarm SV2
THY_B	Thyristor break alarm
OCR	Over current alarm
FUSE	Fuse break alarm
HEAT	Heat sink temperature abnormality

* Up to two alarm set points can be set for the heater break alarm.
* Fuse break alarm lamp is available when a fast blow fuse with fuse break alarm output is used.

Connector

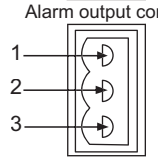
Input connector



* Connector (Plug side) is optional.

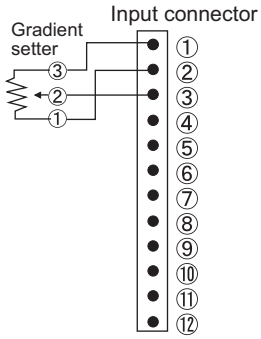
Pin No.	Contents	
1	+5V (Gradient setting input)	
2	0V (Gradient setting input)	
3	Gradient setting input (0 to 5V input by gradient setter)	
4	+5V (Manual setting input)	
5	0V (Manual setting input)	
6	Manual setting input (0 to 5V input by manual setter)	
7	External contact input 1 (DI1)	
8	External contact input 2 (DI2)	
9	External contact input 3 (DI3)	
10	0V (External input)	• Pins 10-12 are internally connected.
11	0V (External input)	
12	0V (External input)	

Alarm output connector

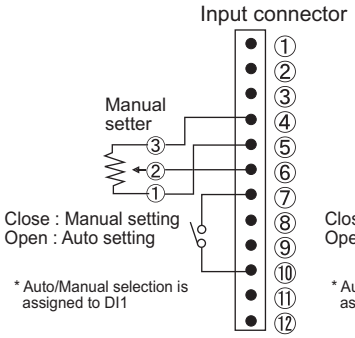


Pin No	Contents
1	Digital output 1 (DO1) : Relay contact output
2	Digital output 2 (DO2) : Relay contact output
3	COM : Common

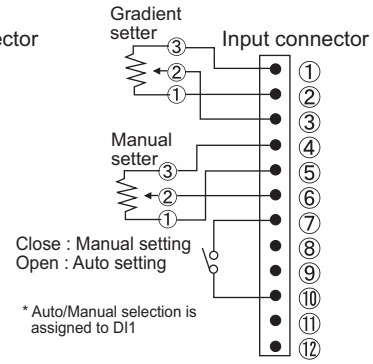
• Auto setting (With gradient setter)



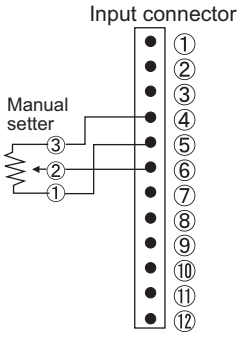
• Auto/Manual setting selection



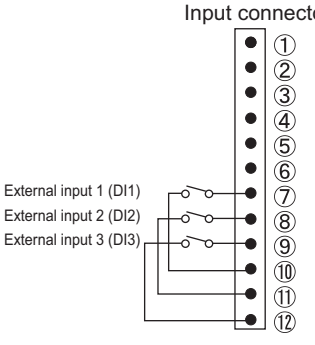
• Auto/Manual setting selection (With gradient setter)



• Manual setting (With manual setter)



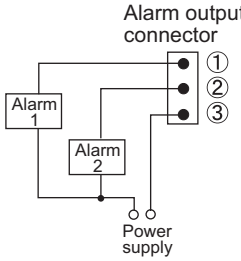
• External contact input



• External contact input can be assigned from function below.

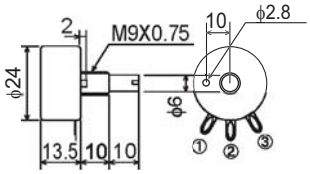
RUN/STOP
Auto/Manual
Alarm interlock reset
Heater break alarm function : Use/Unuse
Soft start : Use/Unuse
Key lock : Use/Unuse
Over current alarm : Use/Unuse
Memory area selection (DI 2 points)

• Alarm output

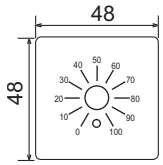


Accessories

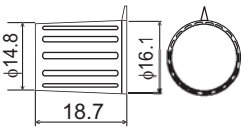
• Gradient setter, Manual setter, High/Low setter : THVP-S01 Unit : mm



Volume (Resistance:5kΩ,B)



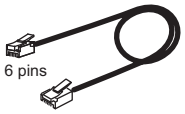
Scale plate

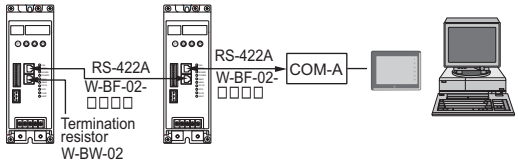


Knob

• RS-422A Communication cable

Model Code :
W-BF-02-500 (0.5m)
W-BF-02-1000 (1m)
W-BF-02-3000 (3m)





• Termination resistor connector

Model : W-BW-01
(For RS-485)
Model : W-BW-02
(For RS-422A)

• Model code * Please refer to the following codes to order accessories.

Name	Model Code
Setter	THVP-S01
Input connector (plug)	THWP-C01
Alarm output connector (plug)	THVAP-C01

Name		Model Code
Fast-blow fuse	20A	THVAP-F20
	30A	THVAP-F30
	45A	THVAP-F45
	60A	THVAP-F60
	80A *1	THVAP-F45 (2 pieces)
	100A *1	THVAP-F60 (2 pieces)
	150A *1	THVAP-FB0 (2 pieces)
	200A *1	THVAP-FC0 (2 pieces)

*1 : A fast-blow fuse for 80A uses two 45A rapid blow fuses (THVAP-F45).
A fast-blow fuse for 100A uses two 60A rapid blow fuses (THVAP-F60).
A fast-blow fuse for 150A, 200A uses two rapid blow fuses
(150A:THVAP-FB0, 200A:THVAP-FC3).