

# THV-40 SERIES

## Power Controller

Single Phase Thyristor Unit (High Voltage Type)

AC380-480V



AC150A,200A



AC20A,30A,45A



AC60A,80A,100A



• CE marking : A specified noise filter must be used.

# Designed for load voltage 380 to 480V AC

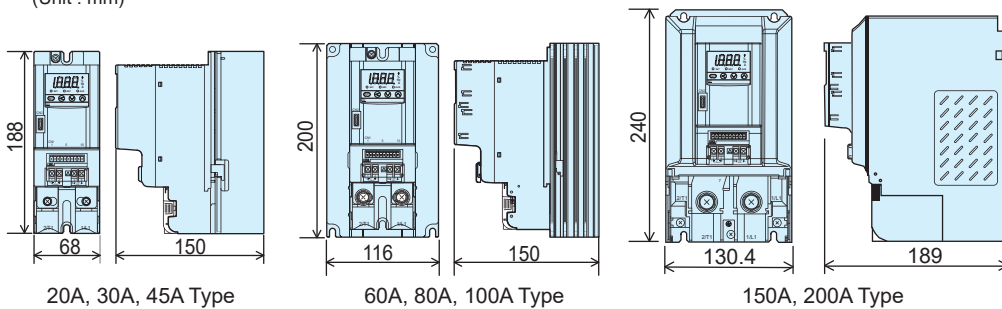
## 1 Easy and accurate setting

Single phase power controller THV-40 has an LED display to show set values and input signals, and front keys for easy setting and monitoring. Setting can also be made with an external setting unit (variable resistor).



## 2 Compact Size

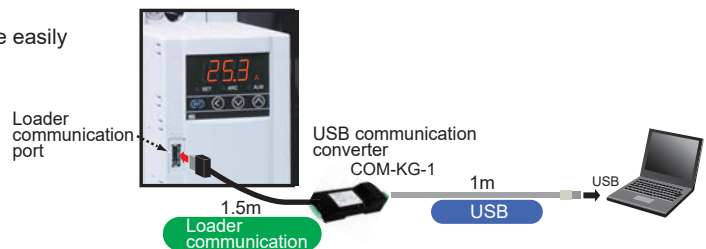
(Unit : mm)



## 3 Communication with a PC via USB port (Loader communication)

The THV-40 has a standard loader port to connect a PC USB port via COM-KG (USB communication converter). Using PROTEM2 software on the PC, parameter setting can be easily done from a PC.

• The Loader communication is only for parameter setup.



## 4 Three types of control modes are selectable

### ○ Phase control

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



### ○ Zero-cross control (Continuous proportional)

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



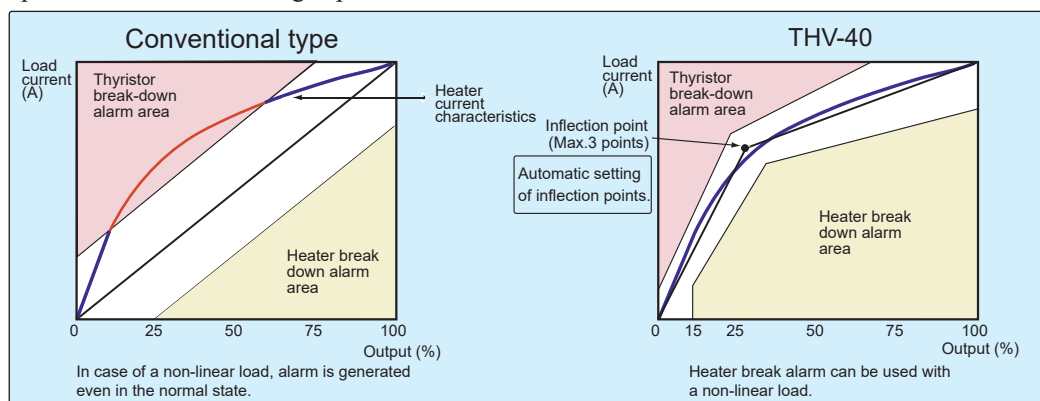
### ○ Zero-cross control (Input synchronization system)

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



## 5 Detects heater break of non-linear load

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.



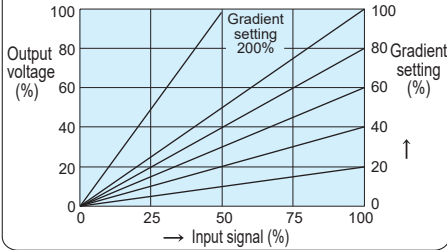
# Standard Functions

## 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

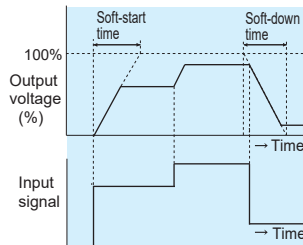
Gradient setting output characteristic diagram



## Ramp function (Soft-start & Soft-down)

Even if setting input changes abruptly, output changes slowly to suppress inrush current. Ramp-up (Soft-start) and ramp-down (Soft-down) time can be set in the range of 0.1 to 100.0 sec via front keys.

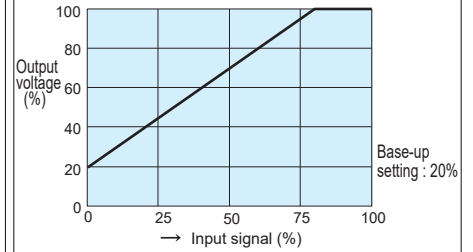
Soft-start & Soft-down action diagram



## Base-up setting (Output bias)

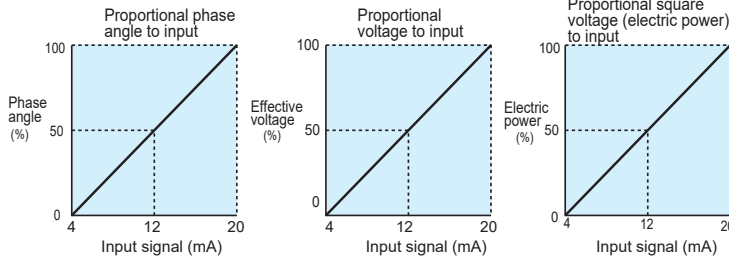
Output bias can be set via front keys. (Base-up setting is valid when lower output limiter is set to 0.0)

Base-up output characteristic diagram



## Output modes

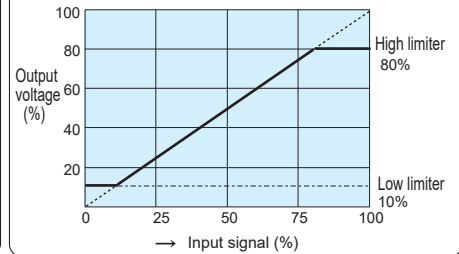
When phase control is selected for linear load (R: resistor), output mode can be selected among Proportional phase angle to input, proportional voltage to input and proportional square voltage (electric power) to input.



## Output limiter (High & Low)

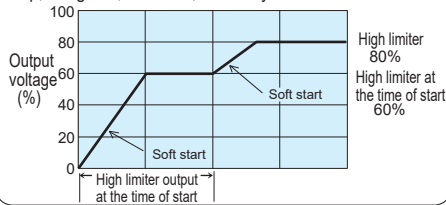
Highest and lowest output values can be set via front keys.

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-40 Series suitable for heaters which cause rush current flow, such as Halogen lamp, Tungsten, Platinum, and Molybdenum heaters.



## Event input

Can assign a function (see below) to the external contact input. Function switching can be made from external contact input.

In use/Unused

Phase control/Zero-cross control (Continuous proportional)
RUN/STOP
Auto/Manual
External manual/Internal Manual
Heater break alarm : Use/Unuse
Soft-up/Soft-down : Use/Unuse
Setting data lock : Use/Unuse
Over current alarm : Use/Unuse

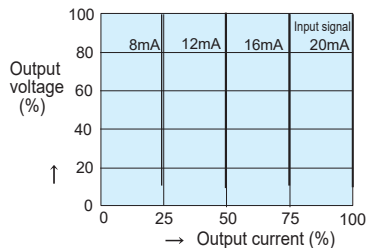
• Heater break alarm and over current alarm selection are optional.

# Optional Functions

## 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 THV 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

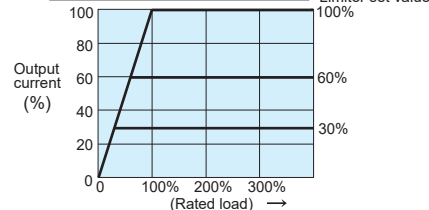


## Load current limiter (For phase control only)

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



## Over-current alarm

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

## 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.

## Alarm output

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

(Alarm output : 1 points, Energized/De-energized is selectable. FAIL is De-energized (Fixed).)

## Protection function for control of primary side of a transformer

If momentary power failure occurs during execution of the control of primary side of a transformer, inrush current is generated. Protection function for control of primary side of a transformer is to protect the thyristor from the inrush current.

To control the primary side of the transformer, it is recommended to use the THW with a protection function for control of primary side of a transformer.

# Specifications

Rated current : 20A, 30A, 45A, 60A, 80A, 100A, 150A, 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\*1  
Zero-cross control : Linearity (R:Resistor) load

Input signal : Current input 4 to 20mA DC (Input impedance : 50Ω)  
Voltage input 1 to 5V DC (Input impedance : 30kΩ)  
Voltage input 0 to 10V DC (Input impedance : 30kΩ)  
Voltage pulse input 0/12V DC (Input impedance : 30kΩ)

Input sampling cycle : 0.5 cycle of power cycle

Min. load current : 20A : 0.6A (at 98% output of rated voltage)  
30A to 200A : 1A (at 98% output of rated voltage)

Output voltage range : 0 to 98% of rated voltage

Power OFF leakage current : Approx. 30mA AC (load voltage 480V rms, 60Hz, Ta=25°C)

Power supply voltage for Load : 323 to 528V AC (Including power supply voltage variation)  
Rating : 380 to 480V AC

Power supply voltage for Control : 85 to 264V AC (Including power supply voltage variation)  
Rating : 100 to 240V AC

Power frequency : 50/60Hz (Automatic detection)

Allowable power frequency variation : Power supply voltage for load 50±1Hz, 60±1Hz  
Power supply voltage for control 50±2Hz, 60±2Hz

Power consumption : 20 to 100A type  
Less than 5VA (at 100V AC), Rush current 5.6A or less  
Less than 8VA (at 240V AC), Rush current 13.3A or less  
150, 200A type  
Less than 12.5VA (at 100V AC), Rush current 21A or less  
Less than 22.0VA (at 240V AC), Rush current 155A or less

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 : 0.0 to 600.0 sec [Front key]  
Base-up setting (Output bias) : -9.9 to 100.0% [Front key]  
Manual setting : 0.0 to 100% [Front key]  
0 to 100% [External setting unit]

Output mode : a) Proportional phase angle • Proportional voltage • Proportional square voltage  
b) Constant current control  
• a) : Standard function, b) : Optional function

Cooling method : Natural convection

Ambient temperature : -15 to +55°C (Guaranteed operation range)

Ambient humidity : 5 to 95%RH (Non-condensing)  
Absolute humidity : MAX.W.C 29g/m<sup>3</sup> dry air at 101.3kPa

Dielectric voltage : Between main circuit terminals/power terminals for control and heat sink : 2500V AC for one minute.  
Between main circuit terminals/heat sink and input terminals : 2500V AC for one minute.  
Between power terminals for control and input terminals : 2300V AC for one minute.

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

Self-diagnostic function : a) Data check, Back-up check, A/D converter check, Watch dog-timer, Power supply voltage check  
b) Action at abnormality : Thyristor output OFF, FAIL output open

Mounting method : Vertical mounting

Weight : Approx. 1.3kg (20A, 30A, 45A), Approx. 1.8kg (60A, 80A, 100A)  
Approx. 3.7kg (150A, 200A)

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) : 1 points, Non-voltage contact input (Phase control/Zero-cross control (Continuous proportional) RUN/STOP, Auto/Manual, Heater break alarm : Use/Unuse, Soft-up/Soft-down : Use/Unuse  
Setting data lock : Use/Unuse, Over current alarm : Use/Unuse (Selectable)  
• ON/OFF control (External setting units are optional)  
• Loader communication : ANSI/RKC standard protocol, COM-KG needed.

Optional functions : • Alarm output : 1 point  
Open collector output, Sink type  
Maximum load current : 100mA,  
Load voltage : Less than 30V DC  
Energized/De-energized is selectable.  
(FAIL is de-energized only)  
(Heater break alarm, Thyristor break alarm, Power frequency abnormal, Over current alarm, FAIL)  
\* Selectable  
• Heater break alarm  
Current measuring accuracy : ±5% of rated load current or ±2A (Whichever is larger)

Option function : • 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)

Compliance with Standards : 20 to 100A type  
UL : UL508 [POLLUTION DEGREE 2]  
cUL : C22.2 No.14 [POLLUTION DEGREE 2]  
150A, 200A type  
UL : UL60947-4-1 [POLLUTION DEGREE 2]  
cUL : C22.2 No.60947-4-1 [POLLUTION DEGREE 2]  
CE marking : LVD : EN60947-4-3  
POLLUTION DEGREE 2,  
EMC : EN60947-4-3  
• A specified noise filter must be used  
SOSHIN ELECTRIC CO., LTD  
NF3020C-SVB (20A) Leak current 150mA  
NF3030C-SVB (30A) Leak current 150mA  
NF3050C-SVB (45A) Leak current 150mA  
NF3060C-SVB (60A) Leak current 150mA  
HF3080C-SZC (80A) Leak current 7mA  
HF3100C-SZC (100A) Leak current 7mA  
HF3150C-SZC (150A) Leak current 7mA  
NF3200C-VZ (200A) Leak current 10mA

\*1 : If momentary power failure occurs during execution of the control of primary side of a transformer, inrush current is generated. Protection function for control of primary side of a transformer is to protect the thyristor from the inrush current.

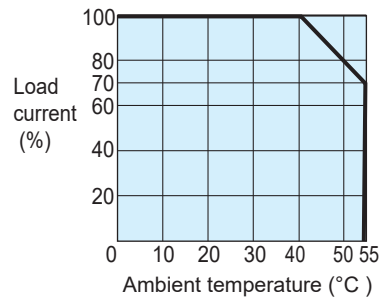
Table of Stability

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

Table of internal calorific value

Rated load current (A)	20	30	45	60	80	100	150	200
Internal calorific value (W)	30	43	63	84	112	140	200	250

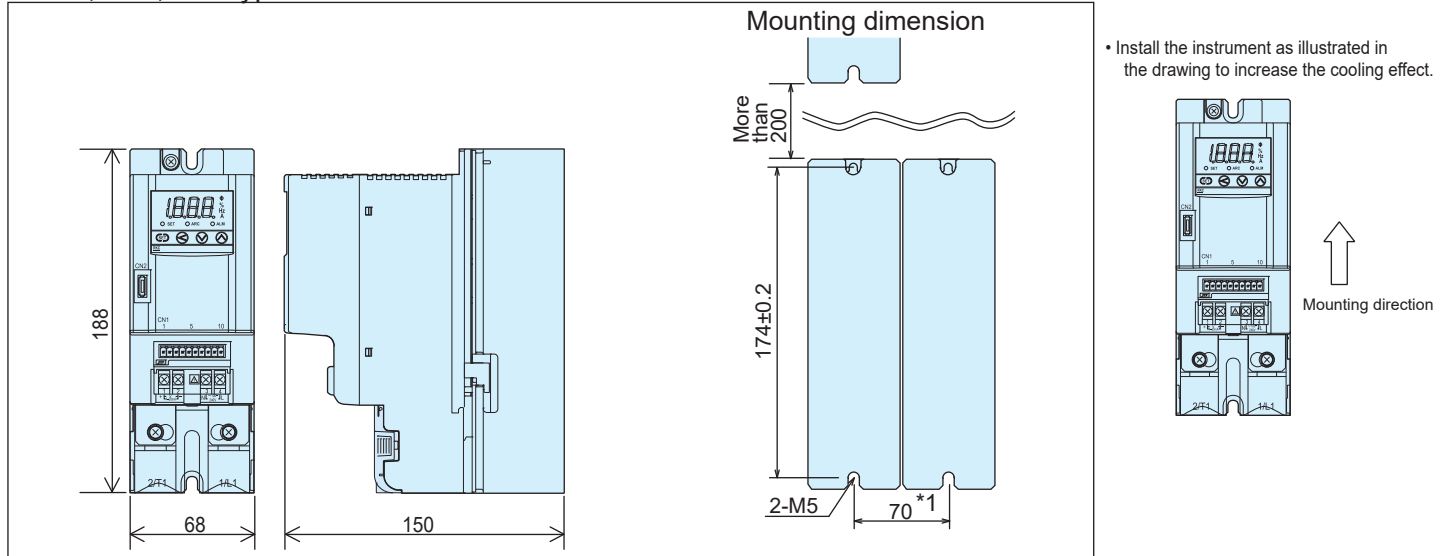
• Temperature characteristics of load current



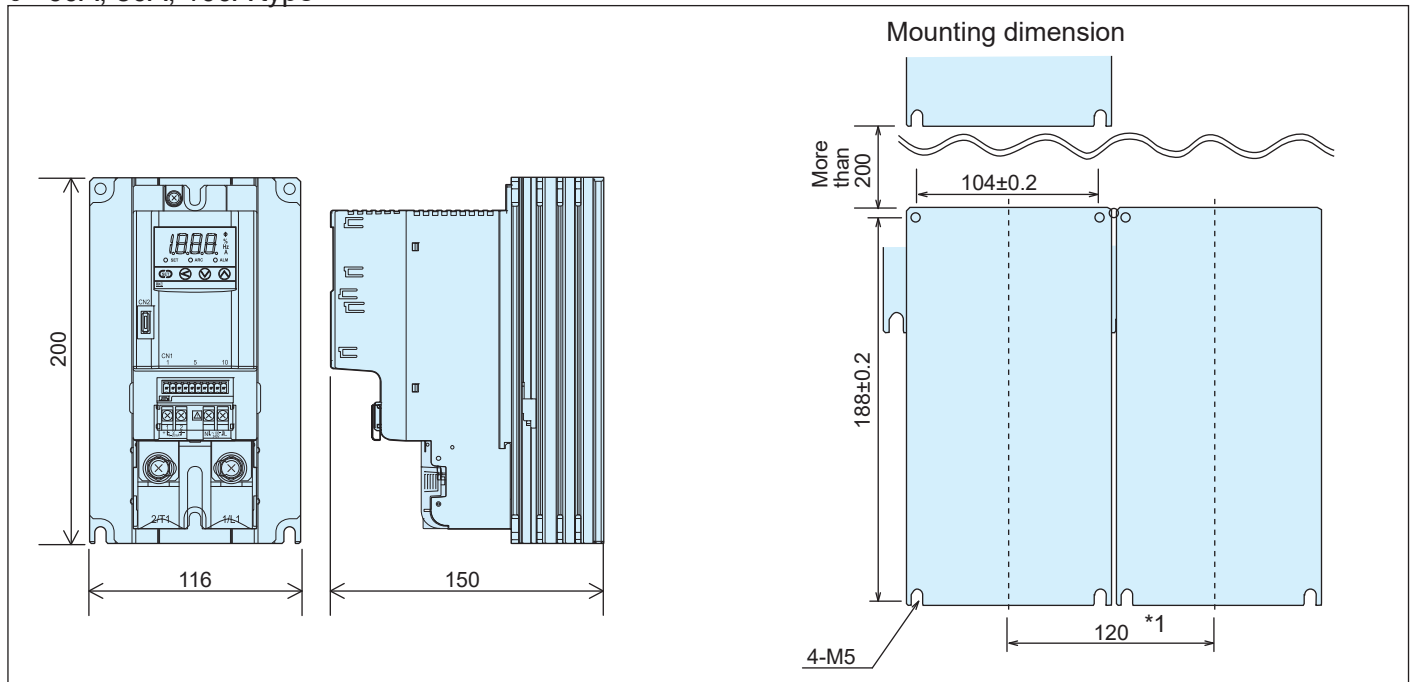
# External Dimensions

## ○ 20A, 30A, 45A type

Unit : mm

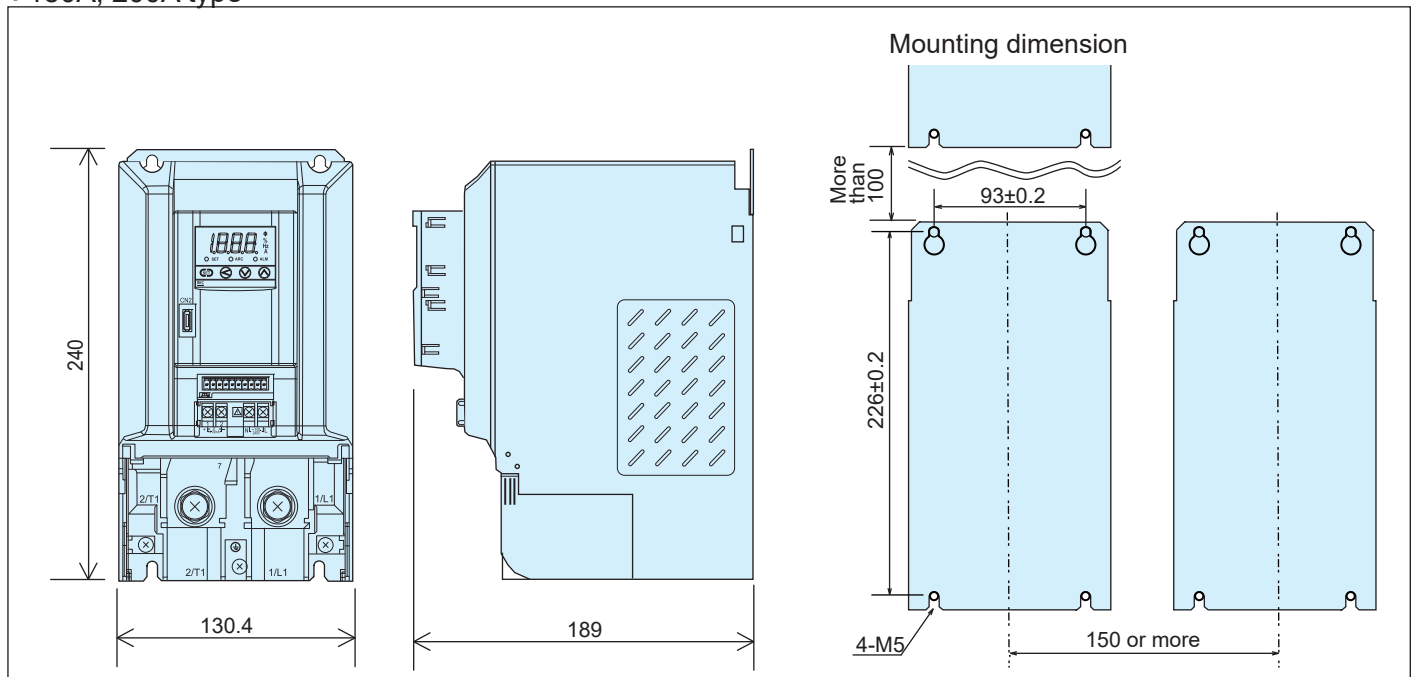


## ○ 60A, 80A, 100A type



\* Minimum space when mounted closely side by side.

## ○ 150A, 200A type



\* 150A/200A type is not available for close mounting.

# Model and Suffix Code

Specifications	Model and Suffix Code			
Type	Single phase 380 to 480V AC	<b>THV-40</b>		PZ <input type="checkbox"/> - <input type="checkbox"/> * <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
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	
	150A AC	.....	150	
	200A AC	.....	200	
Input signal *1	0 to 10V DC	.....	5	
	1 to 5V DC	.....	6	
	4 to 20mA DC	.....	8	
	Voltage pulse input 0/12V DC	.....	V	
• Heater break alarm • Current limiter • Constant current	No function	.....	N	
	Heater break alarm, Current limiter, Constant current control	.....	H	
	Non-linear resistance heater break alarm, Current limiter, Constant current control	.....	B	
Alarm output	No alarm output	.....	N	
	Alarm output 1 point * Connector for Input/Output (Plug) is necessary, Specify accessories code (-9).	.....	A	
Accessories *2,*3	Setter (Volume, knob, Scale plate) 1 unit + Connector for Input/Output (Plug)	.....		-1
	Setter (Volume, knob, Scale plate) 2 units + Connector for Input/Output (Plug)	.....		-2
	Fuse unit (Fast-blow fuse + Holder [1 circuit type])	.....		-6
	UL/CE Marking type Fuse unit (Fast-blow fuse + Holder [1 circuit type]) Clamped input terminal type	.....		-7
	Connector for Input/Output (Plug)	.....		-9

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

\*2 : 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.

\*3 : It is possible to specify more than one accessories by adding suffix code at the end.

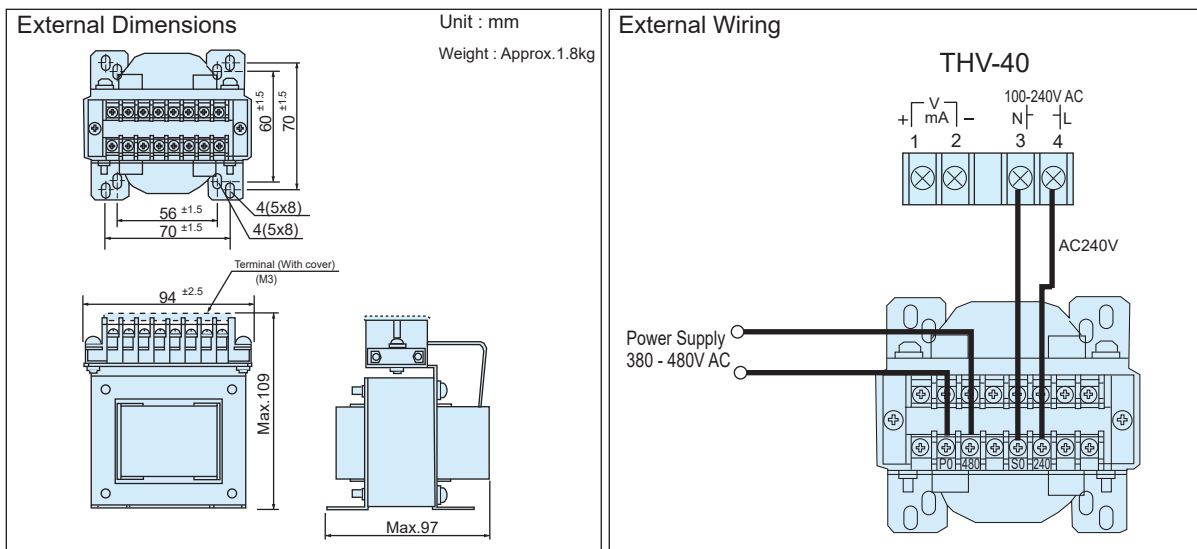
Example: -1-6 : Setter (Volume, knob, Scale plate) 1 unit + Connector for input/output (Plug)  
-1-2-9 cannot be specified simultaneously.

**CAUTION** The supply voltage to the THV-40 is 100 to 240V AC.  
If you need a stepdown transformer, we are ready to supply such a transformer.

### ● Step-down transformer (Sold separately)

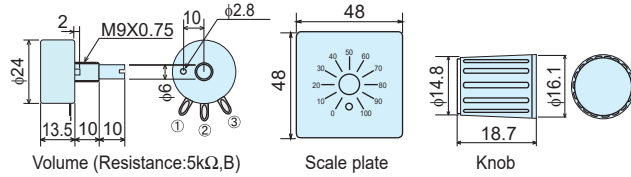
**Model Code**  
CH1-4H381-006

• Manufactured by CHUO ELECTRIC INDUSTRY Co.,Ltd



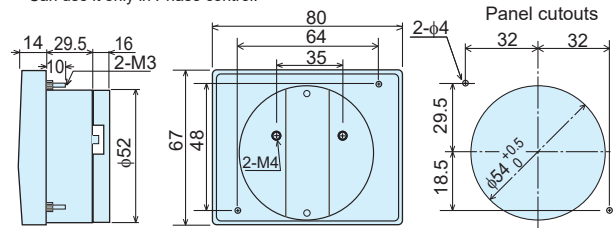
# Accessories

- External setter (knob) used for gradient setting, manual input setting, Output limiter (High&Low) : THV1P-S01



- Output voltmeter : THV4P-V03

Can use it only in Phase control.

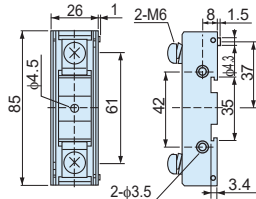


\*The output voltmeter is provided with a series resistor (DM-41).

- Fuse Holder

- Holder for THV4P-F20/F30/F45/F60/F80/FA0 (UL Not available) Screw Mounting or DIN rail mounting

Model Code	Name
THV4P-H01	Holder

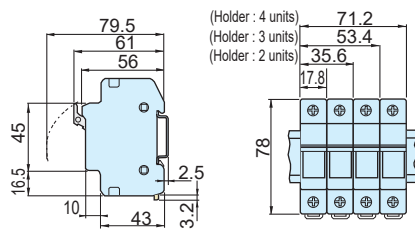


- Holder for THVP-F2B/F3B/F4B/F6B/F8B/FAB (UL/CE Marking type) DIN rail mounting

- Clamped input terminal type

For THVP-F2B/F3B (20A/30A type)

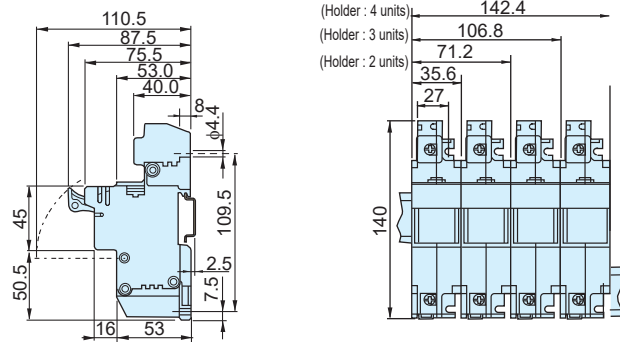
Model Code	Name
THVP-H04	UL/CE Marking type Holder



- UL/CE Marking type Fast-blow fuse and Fuse holder : Manufactured by SIBA GmbH & Co.KG (Germany)

For THVP-F4B/F6B/F8B/FAB (45A/60A/80A/100A type)

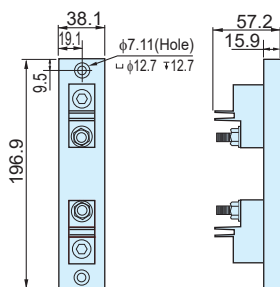
Model Code	Name
THVP-H05	UL/CE Marking type Holder



- Holder for THV4P-FBB/FCB (UL available) Screw Mounting or DIN rail mounting

For THV4P-FBB (150A type)

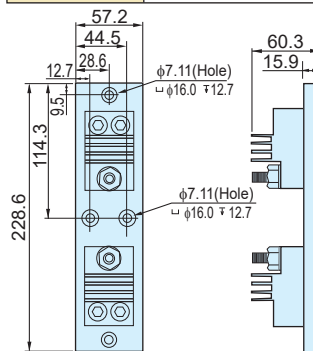
Model Code	Name
THVP-H06	UL available Holder



- UL available type Fast-blow fuse and Fuse holder : Manufactured by Littelfuse, Inc. (USA)

For THV4P-FCB (200A type)

Model Code	Name
THV4P-H07	UL available Holder



- Model Code

- Please refer to the following codes to order accessories.
- The rating of the fast-blow fuse may be different from the current rating of the THV-40 main unit.

Name	Code	Note
Setter	THV1P-S01	
Output voltmeter	THV4P-V03	* Manufactured by Daiichi Electronics Co., Ltd. : LSK-8CH
Connector for Input/Output (Plug)	THV4P-C01	
Fast-blow fuse	*1 20A THV4P-F20	660GH-25UL
	30A THV4P-F30	660GH-40UL
	45A THV4P-F40	660GH-63UL
	60A THV4P-F60	660GH-80UL
	80A THV4P-F80	660GH-100UL
	100A THV4P-FA0	660GHX-125
Fuse holder (For THV4P-F20/F30/F45/F60/F80/FA0)	THV4P-H01	HT6017
Step-down transformer	CH1-4H381-006	* Manufactured by CHUO ELECTRIC INDUSTRY Co.,Ltd

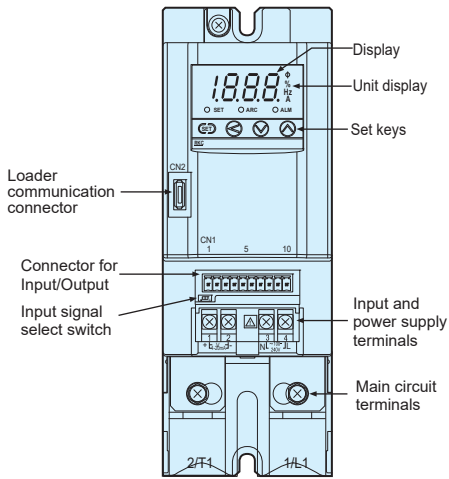
\*1:Fast-blow fuse and Fuse holder : Manufactured by HINODE Electric Co. Ltd.

Name	Code	Note
UL/CE Marking type Fast-blow fuse	*2 *3 20A THVP-F2B	5017906(20A)
	30A THVP-F3B	5017906(30A)
	45A THVP-F4B	5014006(50A)
	60A THVP-F6B	5014006(63A)
	80A THVP-F8B	5014006(80A)
	100A THVP-FAB	5014006(100A)
	150A THV4P-FBB	JLLS200X (200A)
200A THV4P-FCB	JLLS250X (250A)	
UL/CE Marking type Fuse holder	20,30A THVP-H04	5106305.1
	45,60,80,100A THVP-H05	5106004
	150A THV4P-H06	LFT602001CS
	200A THV4P-H07	LFT604001CS

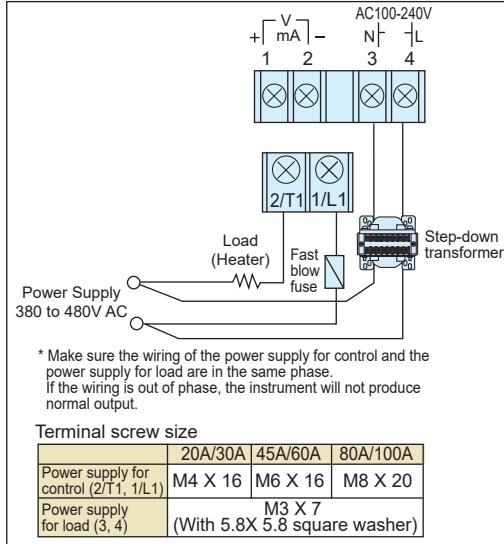
\*2 :20 to 100A type UL/CE Marking type Fast-blow fuse and Fuse holder : Manufactured by SIBA GmbH & Co.KG (Germany)

\*3 : The 150A and 200A fuses are manufactured by Littelfuse, Inc. of the United States. The note column is the model code from Littelfuse, Inc.

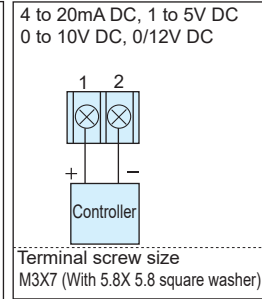
# External Wiring



## Main circuit terminal



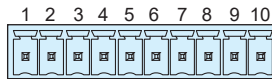
## Input signal



## Indication Lamp

Lamp	Contents
SET	Setting mode lamp
ARC	Knee points calculation lamp. (When a Non-linear resistance heater break alarm is use.)
ALM	Alarm lamp

## Connector

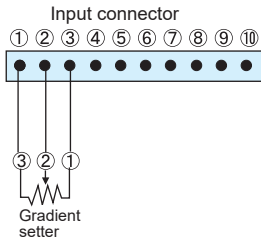


\* Connector (Plug side) is optional.

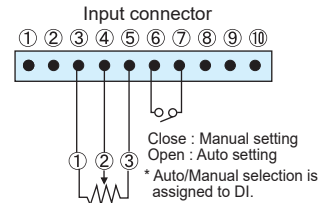
Pin No.	Contents
1	+2.5V (Gradient setting input)
2	Gradient setting input (0 to 2.5V input by gradient setter)
3	0V (Gradient setting input, Manual setting input)
4	Manual setting input (0 to 2.5V input by manual setter)
5	+2.5V (Manual setting input)
6	External contact input : DI +
7	0V (External contact input) : DI -
8	Unused
9	Open collector output (Alarm output) : DO (+)
10	Open collector output (Alarm output) : DO (-)

(With external setter)

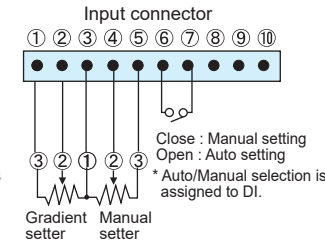
### • Auto setting (With external setter)



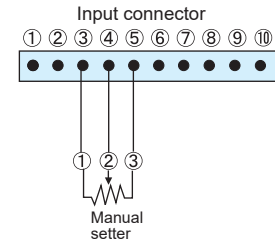
### • Auto/Manual setting selection



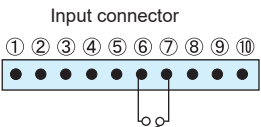
### • Auto/Manual setting selection (With external setter)



### • Manual setting (With external setter)



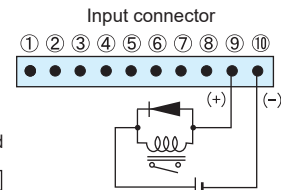
### • External contact input



External contact input can be assigned from function below.

Phase control/Zero-cross control
Run/Stop
Input signal (Auto/Manual)
Manual input switch (Front panel key/External adjusting knob)
Heater break alarm : In use/Unuse
Soft-start/Soft-down : In use/Unuse
Setting data lock : In use/Unuse
Over current alarm : In use/Unuse

### • Alarm output

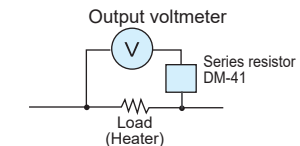


\* When a relay is used, connect an external diode or use a relay with diode inside.

Alarm output can be assigned from function below.

Heater break alarm 1
Heater break alarm 2
Power frequency abnormal
FAIL(De-energized (Fixed.))
Thyristor break alarm 1
Thyristor break alarm 2
Over current alarm

### • Wiring of Output voltmeter



\* The output voltmeter is provided with a series resistor



Safety Warning

- Before operating this product, read the instruction manual carefully to avoid incorrect operation.
- This product is intended for use with industrial machines, test and measuring equipment. It is not designed for use with medical equipment.
- If it is possible that an accident may occur as a result of the failure of the product or some other abnormality, an appropriate independent protection device must be installed.
- When installing this product, avoid the following:
  - Direct exposure to sunlight. Direct contact with water.
  - Corrosive environments. Hazardous areas containing explosive or flammable gases.
  - Vibration or shock.
  - Areas subject to electrical noise caused by inductive interference, static electricity or magnetic fields.

### Caution for imitated products

As products imitating our product now appear on the market, be careful that you don't purchase these imitated products. We will not warrant such products nor bear the responsibility for any damage and/or accident caused by their use.

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