

THYRISTOR UNIT

# THV-40 SERIES

## Power Controller

Single Phase Thyristor Unit (High Voltage Type)

AC380-480V



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



RoHS compliant

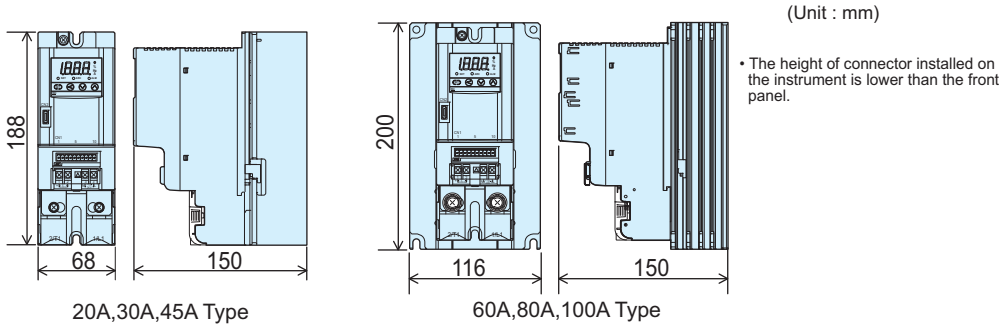
# Designed for load voltage 380 to 480V AC

## 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).



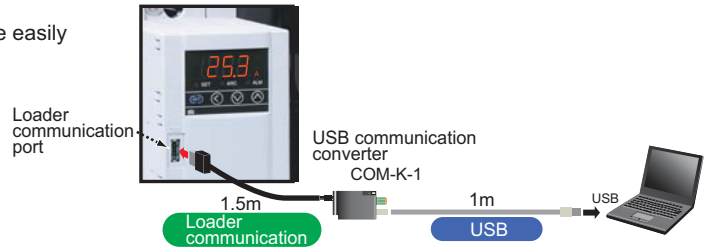
## 2 Compact Size



## 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-K (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.



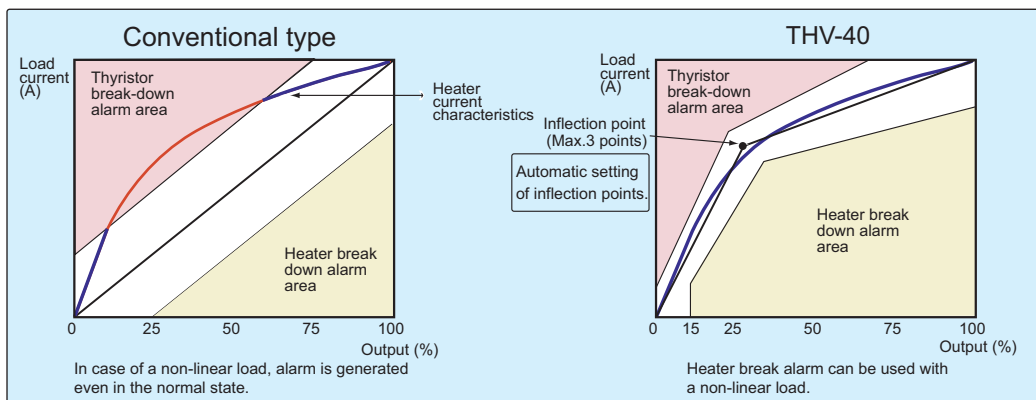
### ○ Zero-cross control (Input synchronization system)

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.



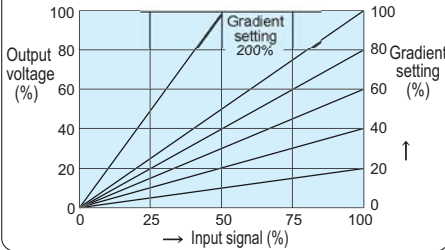
# Standard Functions

## 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

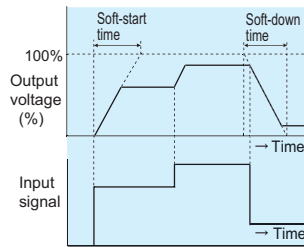
Gradient setting output characteristic diagram



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

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

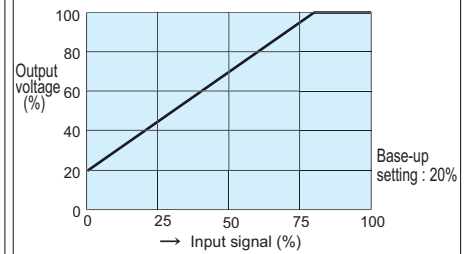
Soft-start & Soft-down action diagram



## Base-up setting (Output bias)

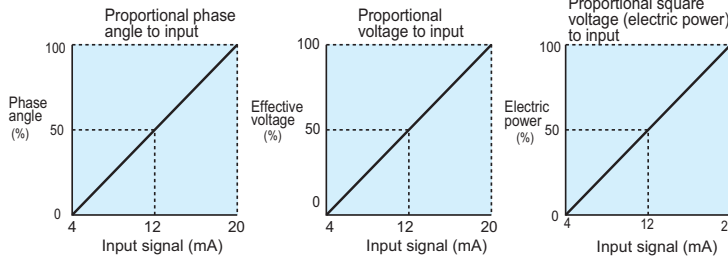
Output bias can be set via front keys. (Base-up setting is valid when output limiter low is set to 0.0)

Base-up output characteristic diagram



## Output modes

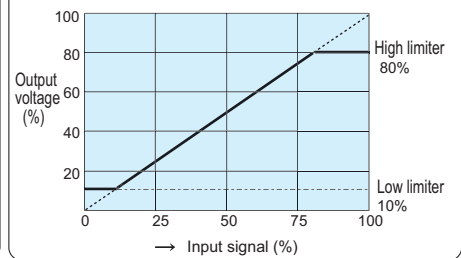
When phase control is selected for linear load (R: resistor), output mode can be selected among Proportional phase angle to input, proportional voltage to input and proportional square voltage (electric power) to input.



## Output limiter (High & Low)

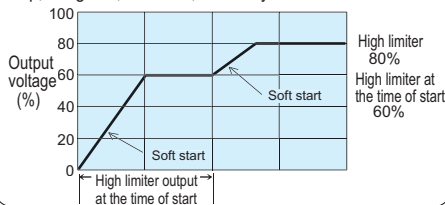
Output highest and lowest values can be set via front keys.

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

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

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

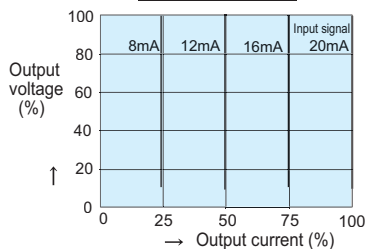
\* Heater break alarm and over current alarm selection are optional.

# 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.

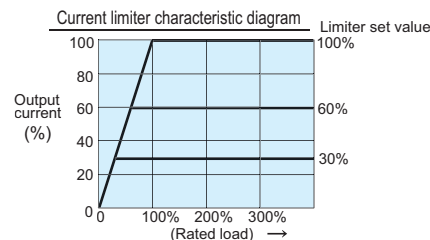
Constant current control characteristic diagram



## 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.



## 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).)

# Specifications

Rated current : 20A, 30A, 45A, 60A, 80A, 100AAC  
 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 : 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,45A,60A,80A,100A : 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 : Less than 5VA (at 100V AC), Rush current 5.6A or less  
 Less than 8VA (at 240V AC), Rush current 13.3A 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 (Operation guarantee 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)  
 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 Connection : COM-K loader cable  
 Option function : • 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)  
 • 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)

Compliance with Standards : UL : UL508 [POLLUTION DEGREE 2]  
 cUL : C22.2 No.14 [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)  
 NF3030C-SVB (30A)  
 NF3050C-SVB (45A)  
 NF3060C-SVB (60A)  
 HF3080C-SZC (80A)  
 HF3100C-SZC (100A)

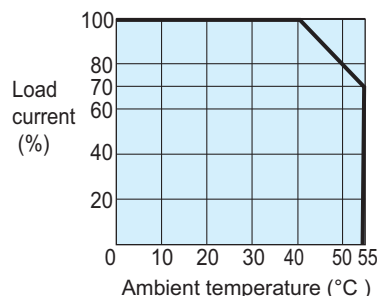
Table of Stability

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
Internal calorific value (W)	30	43	63	84	112	140

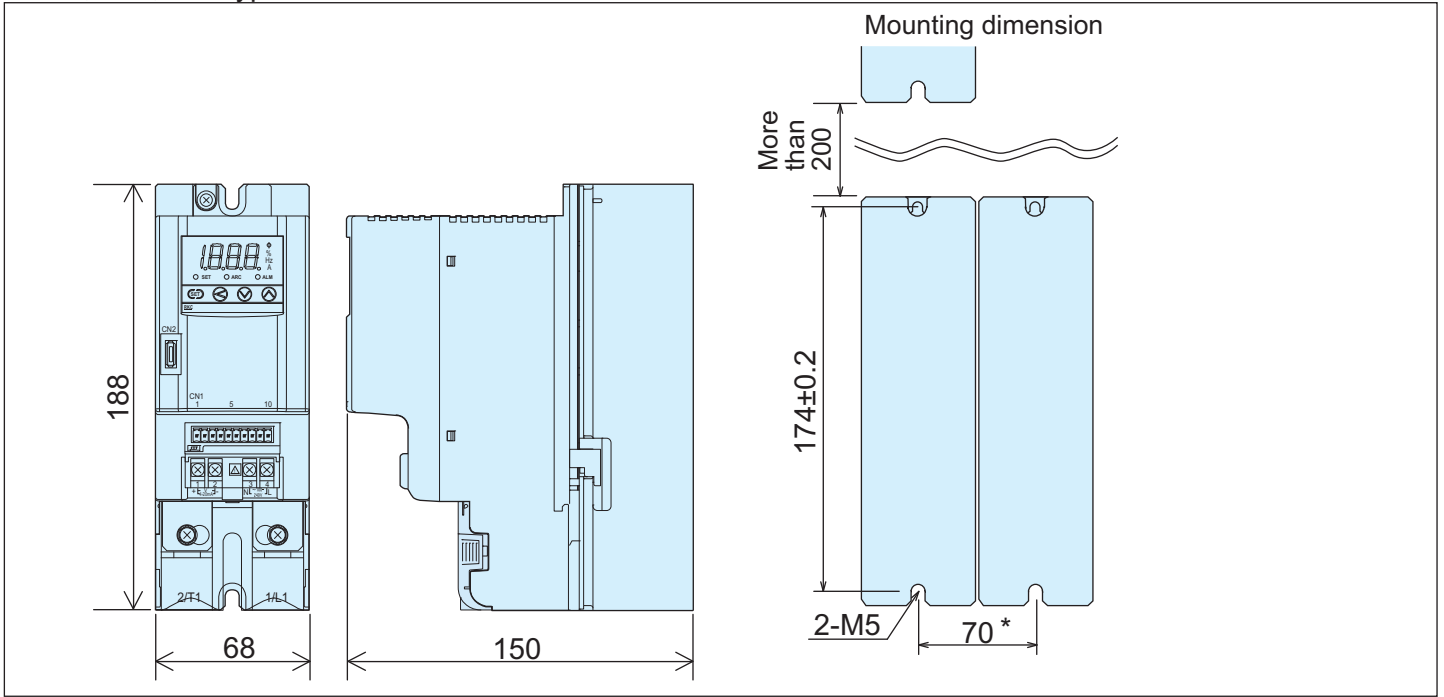
## • Temperature characteristics of load current



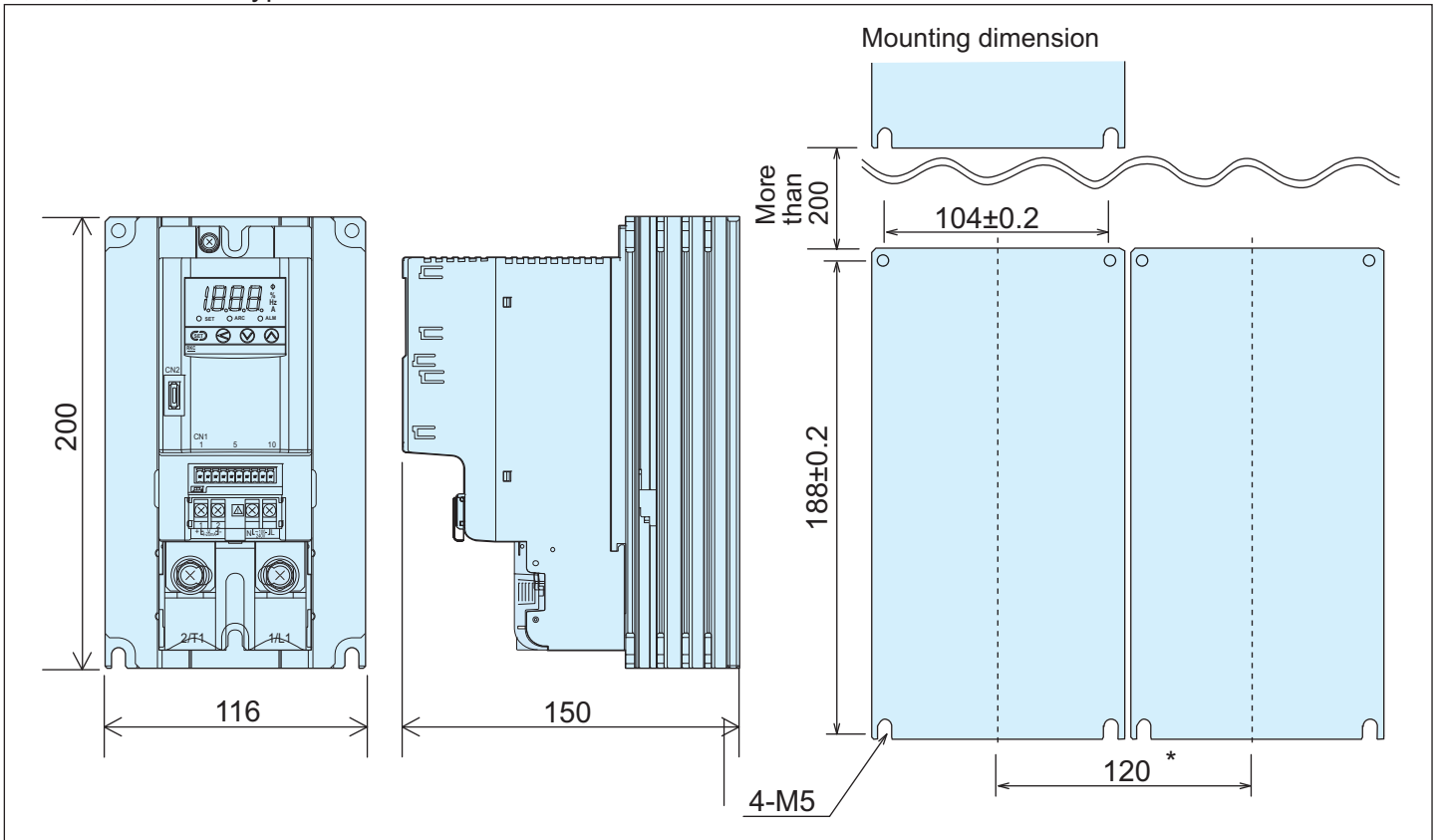
# External Dimensions

Unit : mm

## ○ 20A, 30A, 45A type

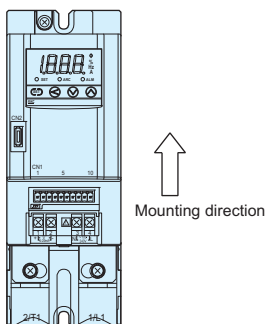


## ○ 60A, 80A, 100A type



\* Minimum space when mounted closely side by side.

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



# 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	20AAC	.....	020	
	30AAC	.....	030	
	45AAC	.....	045	
	60AAC	.....	060	
	80AAC	.....	080	
	100AAC	.....	100	
	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 control	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])	.....		-7
	Clamped input terminal type Connector for Input/Output (Plug)	.....		

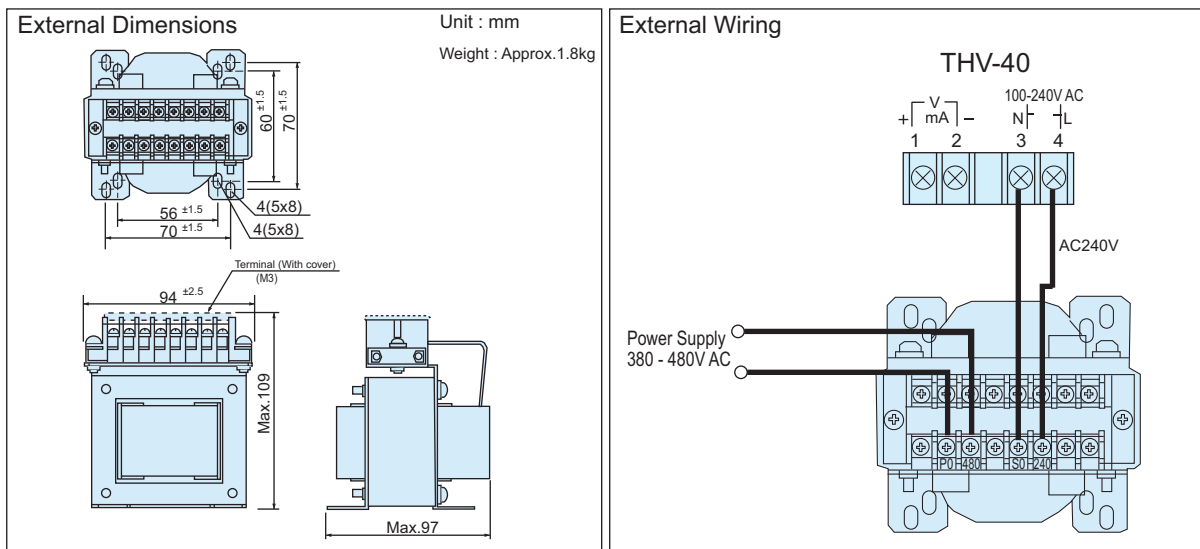
- \*1 : Input signal is programmable. When contact input is required, specify the connector for input as an accessory (Either of -1, -2, or -9).  
 \*2 : Setters are for external gradient setting, external manual setting, and external high/low setting for on/off control. Use two units of setter in the 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.

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.

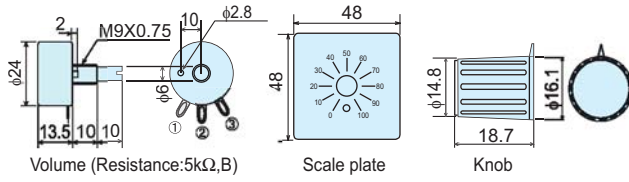
● Step-down transformer (Sold separately)

Model Code
CH1-4H381-006

• Manufactured by CHUO ELECTRIC INDUSTRY Co.,Ltd

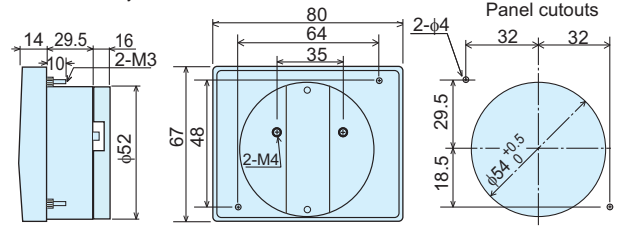


• Gradient setter, Manual setter, High/Low setter : THVP-S01



• Output voltmeter : THV4P-V03

Can use it only in Phase control.

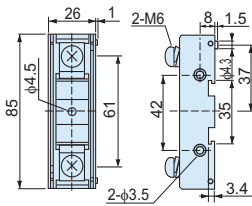


\*The output voltmeter is provided with a series resistor (DM-41).

• 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

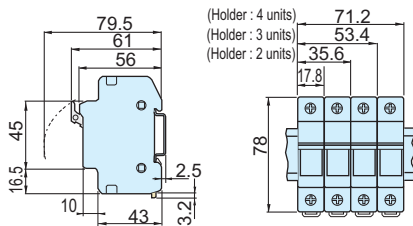


• Holder for THVP-F2B/F3B/F4B/F6B/F8B/FAB (UL/CE Marking type) DIN rail mounting

• Clamped input terminal type

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

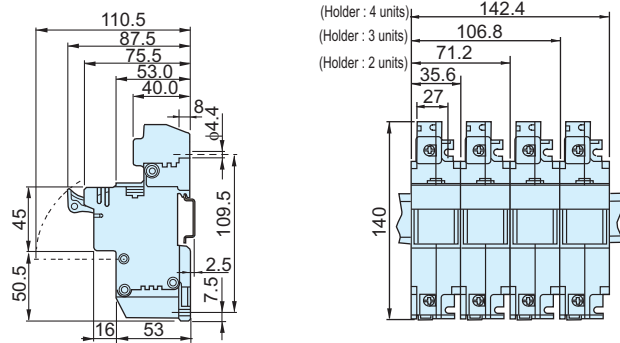
Model Code	Name
THVP-H04	UL/CE Marking type Holder



• 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



UL/CE Marking type Fast-blow fuse

• 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.

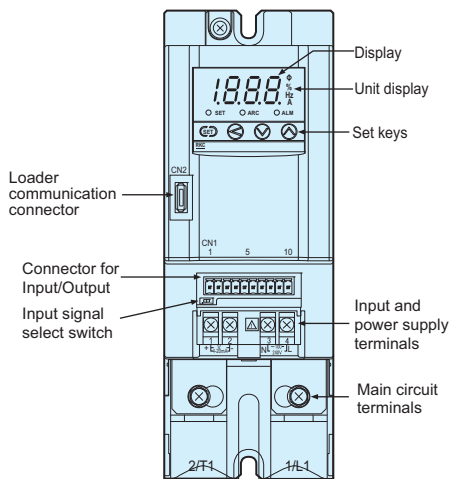
Name	Code	Note
Setter	THVP-S01	
Output voltmeter	THV4P-V03	• Manufactured by Daiichi Electronics Co., Ltd. : LSK-8CH
Connector for Input/Output (Plug)	THV4P-C01	
*1 Fast-blow fuse	20A THV4P-F20	660GH-25UL
	30A THV4P-F30	660GH-40UL
	45A THV4P-F40	660GH-63UL
	60A THV4P-F60	660GH-80UL
	80A THV4P-F80	660GH-100UL
	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.

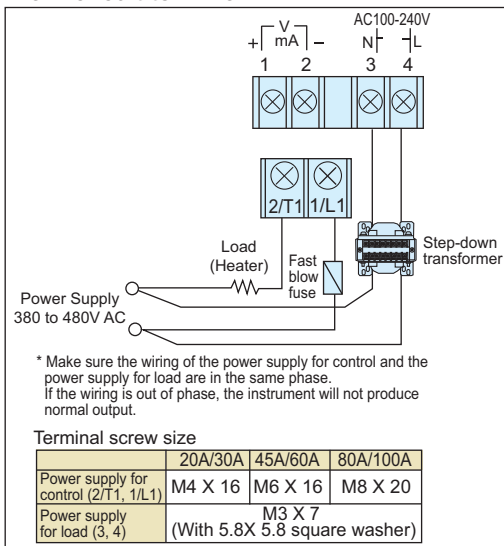
Name	Code	Note
*2 UL/CE Marking type Fast-blow fuse	20A THVP-F2B	5017906(20A)
	30A THVP-F3B	5017906(30A)
	45A THVP-F4B	5014006(50A)
	60A THVP-F6B	5014006(63A)
	80A THVP-F8B	5014006(80A)
	100A THVP-FAB	5014006(100A)
UL/CE Marking type Fuse holder	20,30A THVP-H04	5106304
	45,60,80,100A THVP-H05	5106004

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

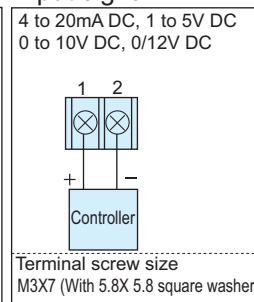
# External Wiring



## 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

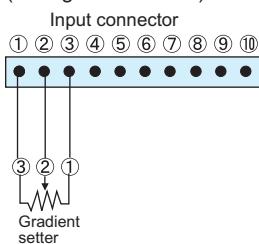
## Connector



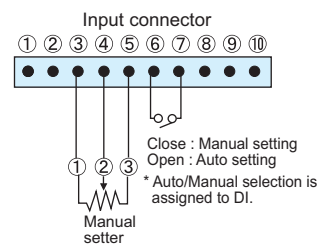
\* Connector (Plug side) is optional.

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 (-)

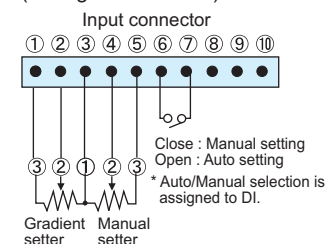
### • Auto setting (With gradient setter)



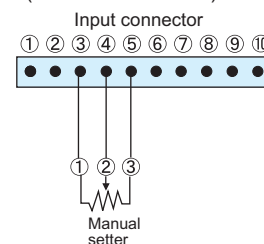
### • Auto/Manual setting selection



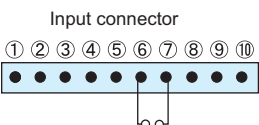
### • Auto/Manual setting selection (With gradient setter)



### • Manual setting (With manual setter)



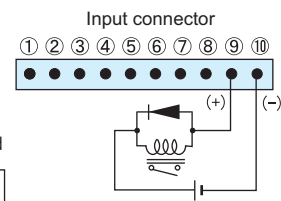
### • External contact input



\* External contact input can be assigned from function below.

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

### • Alarm output

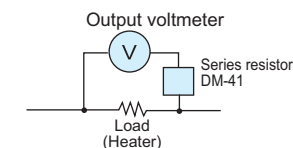


\* When a relay is used, connect an external diode or use a relay with diode inside.

\* 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.

**RKC**

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