Single-phase Thyristor Unit

150 A/200 A THV-10 Installation Manual

IMR02W02-E6

Than k you for purchasing this RKC product. In order to achieve maximum performance and ensure proper operation of your new instrument, carefully read all the instructions in this manual. Please place the manual in a convenient location for easy reference.
This manual describes the mounting, wiring and specifications only.

For detailed handling procedures and key operations, refer to separate **THV-10 Instruction Manual (IMR02W03-E□)**. (On CD-ROM)
The manual can be downloaded from the official RKC website:
https://www.rkcinst.co.jp/english/download-center/

■ Product Check

THV-10 Installation Manual (IMR02W02-E6) 1
CD-ROM 1

Accessories (Order separately)
- Setter for open loop control [potentiometer, knob and scale plate] (Code: THV1P-S01) ..... Ordered quantity
- Input/Output connector [plug] (Code: THV4P-C01) 1

For other accessories not described above, refer to the **THV-10 Instruction Manual (IMR02W03-E□)**.

■ Safety Precautions

WARNING

- To prevent injury to persons, damage to the instrument and the equipment, a suitable external protection device shall be required.
- All wiring must be completed before power is turned on to prevent electric shock, fire or damage to the instrument and the equipment.
- This instrument must be used in accordance with the specifications to prevent fire or damage to the instrument and the equipment.
- This instrument is not intended for use in locations subject to flammable or explosive gases.
- Do not touch high-voltage connections such as power supply terminals, etc. to avoid electric shock.
- When the withstand voltage test or each test is performed, please contact RKC sales office or the agent. If you make a mistake in the test method, the instrument failure may result.
- RKC is not responsible if this instrument is repaired, modified or disassembled by other than factory-approved personnel. Malfunction may occur and warranty is void under these conditions.

High temperature caution:
Do not touch the heat radiation fin while the power is turned on or just after the power is turned off as it may be at high temperatures.
If touched, burning may result.

CAUTION

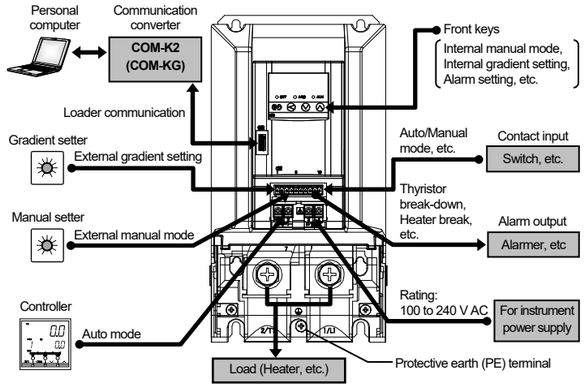
- This product is intended for use with industrial machines, test and measuring equipment. (It is not designed for use with medical equipment and nuclear energy plant.)
- This is an Environment A instrument. In a domestic environment, this instrument may cause radio interference, in which case the user may be required to take additional measures.
- Be sure to provide an appropriate surge control circuit respectively for the following:
  – If input/output or signal lines within the building are longer than 30 meters.
  – If input/output or signal lines leave the building, regardless the length.
- This product is manufactured on the assumption that it is mounted within a control panel. All high-voltage connections such as power supply terminals must be enclosed in the control panel to avoid electric shock to operating personnel.
- All precautions described in this manual should be taken to avoid damage to the instrument or equipment.
- All wiring must be in accordance with local codes and regulations.
- Always use this product at the rated power supply voltage, load current and power frequency.
- All wiring must be completed before power is turned on to prevent electric shock, instrument failure, or incorrect action.
- To prevent instrument damage or failure, protect the power line and the input/output lines with a protection device such as fuse, etc.
- If this product is used for phase control, higher harmonic noise may be generated. Therefore in this case, take such measures as separating the power line from the high-voltage line for load drive.
- Prevent metal fragments or lead wire scraps from falling inside instrument case to avoid electric shock, fire or malfunction.
- Tighten each terminal screw to the specified torque found in the manual to avoid electric shock, fire or malfunction.
- For proper operation of this instrument, provide adequate ventilation for heat dispensation.
- Do not connect wires to unused terminals as this will interfere with proper operation of the instrument.
- Turn off the power supply before cleaning the instrument.
- Do not use a volatile solvent such as paint thinner to clean the instrument. Deformation or discoloration may occur. Use a soft, dry cloth to remove stains from the instrument.
- To avoid damage to the instrument display, do not rub with an abrasive material or push the front panel with a hard object.

NOTICE

- This manual assumes that the reader has a fundamental knowledge of the principles of electricity, process control, computer technology and communications.
- The figures, diagrams and numeric values used in this manual are only for explanation purpose.
- RKC is not responsible for any damage or injury that is caused as a result of using this instrument, instrument failure or indirect damage.
- RKC is not responsible for any damage and/or injury resulting from the use of instruments made by imitating this instrument.
- Periodic maintenance is required for safe and proper operation of this instrument. Some components have a limited service life, or characteristics that change over time.
- Every effort has been made to ensure accuracy of all information contained herein. RKC makes no warranty, expressed or implied, with respect to the accuracy of the information. The information in this manual is subject to change without prior notice.
- No portion of this document may be reprinted, modified, copied, transmitted, digitized, stored, processed or retrieved through any mechanical, electronic, optical or other means without prior written approval from RKC.

1. OUTLINE

This instrument is a single-phase thyristor unit for power supply voltage 100 to 240 V AC. It is possible to adjust power supplied to heaters, etc. by setting the signal from the controller, setter (variable resistor) or front keys.



2. MOUNTING

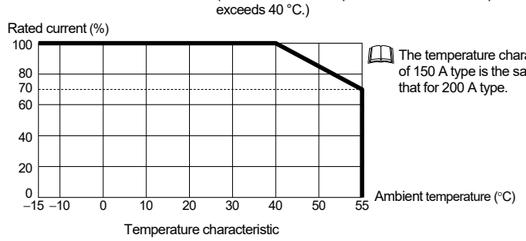
WARNING

- In order to prevent electric shock or instrument failure, always mount or remove this instrument after power supplied to the entire system is turned off.
- As the temperature of this instrument becomes high, mount the instrument on a non-inflammable material (metal plate, etc.).
- As this instrument generates a large amount of heat, it is cooled by circulating air by convection. Therefore, if mounted in any direction other than specified, accident or failure may result.
- To carry the instrument, wait for the radiation fin to cool down. Grip the instrument firmly with your fingers on the anti-slip parts on both sides of the instrument.

2.1 Mounting Environment

(1) This instrument is intended to be used under the following environmental conditions.
- EN60947-4-3, UL60947-4-1, C22.2 No.60947-4-1 POLLUTION DEGREE 2

(2) Use this instrument within the following environment conditions:
- Allowable ambient temperature: –15 to +55 °C
  (The rated current drops when the ambient temperature exceeds 40 °C.)



Temperature characteristic

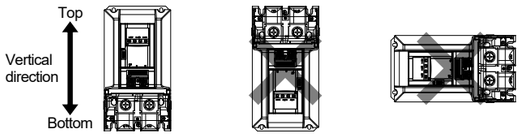
The temperature characteristic of 150 A type is the same as that for 200 A type.

- Allowable ambient humidity: 5 to 95 %RH
  (Absolute humidity: MAX. W. C 29 g/m^3 dry air at 101.3 kPa)

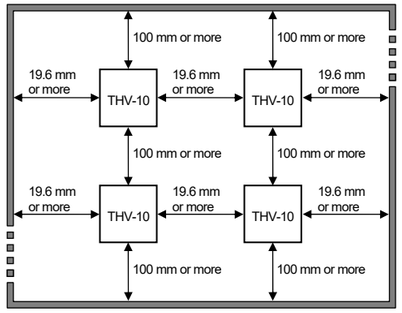
(3) Do not use this instrument in the following environment:
- Sudden change in ambient temperature
- Condensation or icing
- Corrosive or inflammable gases.
- Such a place where there are inflammable materials near this instrument.
- Strong vibration or impact
- Water, oil, chemicals, vapor or steam splashes.
- Excessive dust, salt or iron particles.
- Excessive induction noise, static electricity, magnetic fields or noise.
- Direct air flow from an air conditioner.
- Exposure to direct sunlight.
- Direct radiant heat

2.2 Mounting Cautions

Take the following points into consideration when mounting this instrument.
- The instrument must be mounted in a proper direction. When installing the instrument, observe mounting directions.

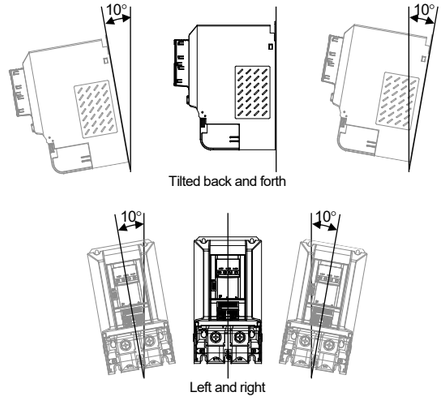


- Provide adequate heat radiation space so that heat does not build up.
- At least 19.6 mm is necessary on the left and right and at least 100 mm on the top and bottom.



Also consider working space.

- Mount the instrument tilted within 10 degrees from vertical (back and forth and left and right).



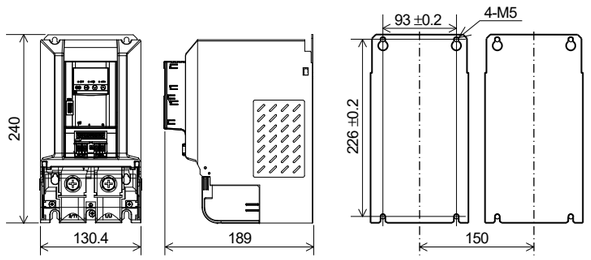
- The temperature inside the control panel increases due to heat generation of this instrument itself. Therefore, take into account full ventilation by mounting forced ventilation fans on the panel.

Table of calorific values (100 to 240 V AC)

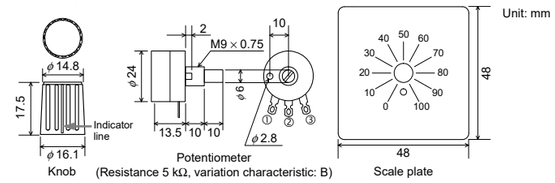
Rating current	Calorific values
150 A	Approx. 200 W
200 A	Approx. 250 W

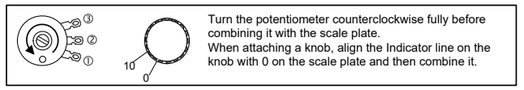
2.3 Dimensions

Dimensions **Mounting dimensions** (Unit: mm)



■ Setter (Potentiometer, Knob and Scale plate)



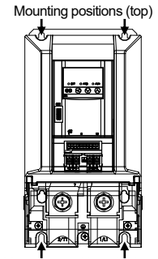


Turn the potentiometer counterclockwise fully before combining it with the scale plate.
When attaching a knob, align the Indicator line on the knob with 0 on the scale plate and then combine it.

For dimensional details of a fuse holder, and an output voltmeter, refer to the **THV-10 Instruction Manual (IMR02W03-E□)**.

2.4 Mounting Procedures

1. Prepare the holes as specified in **2.3 Dimensions**.
2. Place the instrument in mounting position.
3. Insert the mounting screws into the holes, then tighten them with a screwdriver.
   - Mounting screw
     Customer must provide the set of screws.
     Screw type: Pan-head screws Recommended tighten torque: 3.6 N·m [36 kgf·cm]
     Size: M5, Length: 10 mm



3. WIRING

WARNING

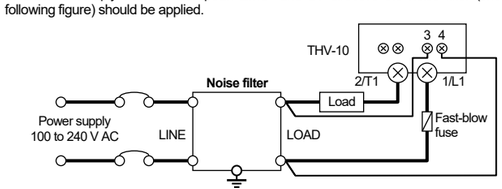
To prevent electric shock or instrument failure, do not turn on the power until all wiring is completed. Make sure that the wiring is correct before applying power to the instrument.

3.1 Wiring of Main Circuit

CAUTION

- **Match the phase between the supply voltage for the instrument and the supply voltage for the load. Without proper matching, the instrument may not work properly.**
- When a noise filter or a transformer is connected to the load side of this product, a load must be connected when control is executed.
- Caution for conducting control of primary side of a transformer
  – When a protection function for control of primary side of a transformer is provided:
    To conduct control of primary side of a transformer, make sure protection function for control of primary side of a control is set. Appropriately adjust the soft-start time for in case of secondary side breakdown depending on the operating condition.
  – When a protection function for control of primary side of a transformer is not provided:
    If the action of the device is influenced by excessive current (inrush current, current due to flux saturation of transformer), use a transformer 1.25 T (magnetic flux density) or less.
    Make sure soft-start time is appropriately set.

    When connecting a transformer to the load side of this product, make sure that the current value of the primary side of the transformer is equal to or more than the minimum load current of this product. When the current value of the primary side of the transformer is less than the minimum load current value of this product, connect a bleeder resistor in parallel with the primary side of the transformer, and allow the current more than the minimum load current to flow.
    [Minimum load current: 1 A]
- In order to comply with the European EMC- and LV directive the noise filter (shown in the following figure) should be applied.



The noise filter specified: SOSHIN ELECTRIC CO., LTD.
150 A: HF3150C-SZC 200 A: NF3200C-VZ

- There are neither fuses nor power switches in the power circuit of this instrument. Therefore install the fuses and switches near the instrument, if necessary.
- To avoid noise induction, keep input signal wire of controller away from instrument power line, load lines and power lines of other electric equipment. If wiring near high-voltage power is unavoidable, use shielded wires.
- Use wires satisfying the rated current capacity.
- Tighten the hexagon headed bolts on the main circuit terminals using a torque wrench. Always tighten each of them by contacting the diagonal surfaces of the wrench with those of each hexagon head.
- Firmly tighten each terminal hexagon headed bolt with the tightening torque specified below. Otherwise, electric shock, fire or heat generation may result.
- Choose solderless terminals from the following table.

Input terminals (1, 2) and Power supply terminals (3, 4)

	150 A/200 A
Maker	J.S.T Mfg. Co., Ltd.
Parts No.	V1.25–MS3
Applicable wire (twisted wire)	0.5 to 1.25 mm^2
Recommended tightening torque	0.4 N·m (4 kgf·cm)

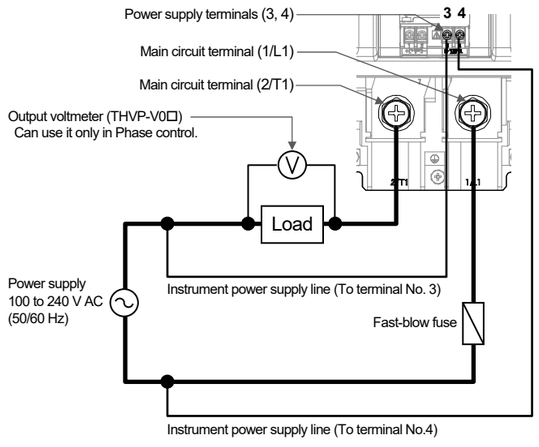
Main circuit terminals (2/T1, 1/L1)

	150 A	200 A
Maker	J.S.T Mfg. Co., Ltd.	
Parts No.	R60-10 (Circular terminal)	R100-10 (Circular terminal)
Applicable wire (twisted wire)	42.42 to 60.0 mm^2	96.3 to 100.0 mm^2
Recommended tightening torque	18.0 N·m (180 kgf·cm)	

- Make sure that during field wiring parts of conductors cannot come into contact with adjacent conductive parts.

■ Wiring diagram of main circuit

Match the phase between the supply voltage for the instrument and the supply voltage for the load. Without proper matching, the instrument may not work properly.



Terminal screws size

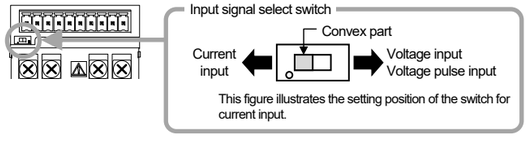
	150 A/200 A
Main circuit terminals (2/T1, 1/L1)	M10 × 25
Power supply terminals (3, 4)	M3 × 7 (With 5.8 × 5.8 square washer)

3.2 Wiring of Input Signal

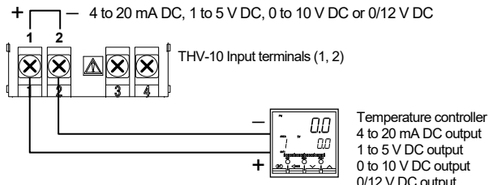
Input signal is factory preset to your specification. If the input signal type needs to be changed on the user's side, refer to **THV-10 Instruction Manual (IMR02W03-E□)**.

■ Wiring procedure for input signal

1. Make sure that the Input signal select switch is set to the signal specified at the time of ordering. There is an Input signal select switch under an Input/Output connector.



2. Connect output signals from a temperature controller, etc. to input terminals 1 (+) and 2 (–) of this instrument.



Input impedance of THV-10 input terminals
Current input: Approx. 50 Ω
Voltage input or Voltage pulse input: Approx. 30 kΩ

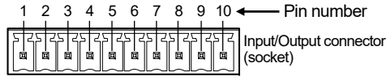
Terminal screws size

	150 A/200 A
Input terminals (1, 2)	M3 × 7 (With 5.8 × 5.8 square washer)

3.3 Input/Output Connector Pin Number and Details

Input/Output connector (plug) and setting unit are optional and sold separately.

■ Pin number and details

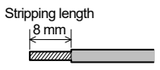


Pin number	Details
1	+2.5 V (Gradient setting input)
2	Gradient setting input (0 to 2.5 V input by gradient setter)
3	0 V (Gradient setting input, Manual mode input)
4	Manual mode input (0 to 2.5 V input by manual setter)
5	+2.5 V (Manual mode input)
6	Contact input: DI (+)
7	0 V (Contact input): DI (–)
8	Unused (Do not connect any device to this terminal.)
9	Open collector output (alarm output): DO (+)
10	Open collector output (alarm output): DO (–)

DI: Digital input DO: Digital output

■ Wire size used for Input/Output connector

Use the stranded leadwires.
Stranded leadwires: AWG28-20 (cross-section: 0.14 to 0.5 mm^2)
Stripping length: 8 mm

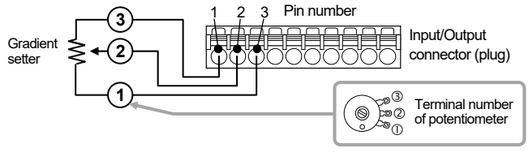


■ Wiring of setting unit

When both of gradient and manual setters are connected, connect the 0 V wires externally. Just connect a single wire to pin 3.

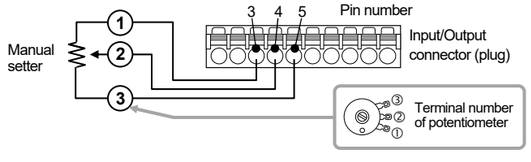
- Wiring of external gradient setter

Connect external gradient setter to pins 1, 2 and 3.



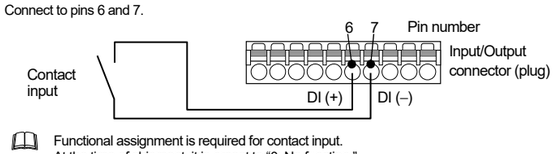
- Wiring of external manual setter

Connect external manual setter to pins 3, 4 and 5.



■ Wiring of contact input

Connect to pins 6 and 7.

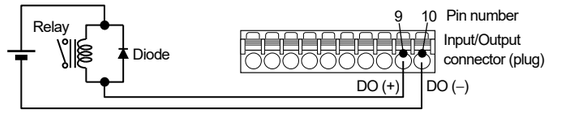


Functional assignment is required for contact input.
At the time of shipment, it is preset to "0: No function."
For the setting, refer to **THV-10 Instruction Manual (IMR02W03-E□).**

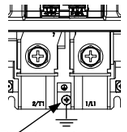
■ Wiring of alarm output

Connect to pins 9 and 10.
A diode should be used and connected as show in the diagram, when using a relay.

When the power is turned on, the Heater break alarm output may be turned on for up to 0.5 ms. When an interlock circuit or any other related circuit is used, take a necessary measure externally for delaying the activation of the circuit more than 0.5 ms.



3.4 Protective Earth (PE) Terminal



- Protective earth no other devices to the location where you earth this device.
- Avoid sharing earth lines with electric motors, motorized equipment, and other equipment that uses large amounts of electrify.
- In the earth system, be careful to earth each point and not to create a earth loop.
- Connect so that the earth resistance is no greater than 100 Ω.
- Use wire of at least 2.0 mm^2 for earth lines.

4. MODEL CODE

Check whether the delivered product is as specified by referring to the following model code list. If the product is not identical to the specifications, please contact RKC sales office or the agent.

THV- 10 PZ □ – □ ∗ □ □ – □ (–□……)*
(1) (2) (3) (4) (5) (6) (7)

* The code for accessory will be more than one if the product has more than one accessory.

(1) Power supply for load
10: 100 to 240 V AC

(2) Control method
PZ: Phase control/Zero-cross control (configurable)

(3) Rated current
150: 150 A AC * 200: 200 A AC * * With Heat sink temperature detection function

(4) Input signal
5: Voltage input 0 to 10 V DC 8: Current input 4 to 20 mA DC
6: Voltage input 1 to 5 V DC V: Voltage pulse input 0/12 V DC

(5) Heater break alarm, Current limit function, Constant current control function and Protection function for control of primary side of a transformer
N: No function
H: Heater break alarm, Current limit function, Constant current control function and Protection function for control of primary side of a transformer
B: Non-linear resistance heater break alarm, Current limit function, Constant current control function and Protection function for control of primary side of a transformer

To control the primary side of the transformer, it is recommended to purchase a THV-10 with a protection function for control of primary side of a transformer.

(6) Alarm output
N: No alarm A: Alarm output 1 point

(7) Accessories
1: Setter for open loop control (potentiometer, knob and scale plate) [1 set] and Input/Output connector (plug)
2: Setter for open loop control (potentiometer, knob and scale plate) [2 sets] and Input/Output connector (plug)
4: Output voltmeter (150 V span) [For Phase control]
5: Output voltmeter (300 V span) [For Phase control]
7: Fuse unit (UL approved instrument) for 150 A and 200 A (fast-blow fuse and holder [1 circuit type])
9: Input/Output connector (plug)

Combination example of accessories
-1-7: Setter for open loop control [1 set] and Input/Output connector (plug) and Fuse unit (UL approved instrument)

For part number of accessories, refer to the **THV-10 Instruction Manual (IMR02W03-E□)**.

5. SPECIFICATIONS

Number of phase: Single-phase
Maximum rated current: 150 A AC, 200 A AC
For the ambient temperature characteristic, refer to temperature characteristic graph.
Minimum load current: 1 A (When output is 98 %)
Supply voltage for load: 85 to 264 V AC [Including power supply voltage variation] (Rating: 100 to 240 V AC)
Power frequency: 50/60 Hz (Automatic discriminating)
Allowable power frequency variations:
50 Hz ±1 Hz, 60 Hz ±1 Hz (Performance guarantee)
Input signal: Current input 4 to 20 m A DC (Input impedance: Approx. 50 Ω)
Voltage input 1 to 5 V DC, 0 to 10 V DC (Input impedance: Approx. 30 kΩ)
Voltage pulse input 0/12 V DC (Input impedance: Approx. 30 kΩ)
Output voltage range: 0 to 98 % of supply voltage for load
Applicable load: Phase control: Resistor load (Corresponding utilization category: AC-51)
Control of primary side of a transformer
The magnetic flux density must be 1.25 T [12,500 Gauss] or less when the protection function for control of primary side of a transformer is not provided.
Zero-cross control (continuous, input synchronous type):
Resistor load (Corresponding utilization category: AC-51)
Overload current profile and duty cycle:
1.1 x I_e– 60s: 100–12
Control method: Phase control, Zero-cross control (continuous) or Zero-cross control (input synchronous type)

Output setting range: Auto mode (control input): 0.0 to 100.0 %
Internal manual set value: 0.0 to 100.0 % (Set by theTHV-10 front keys)
External manual set value: 0.0 to 100.0 % (Set by the setter *)
Internal gradient set value: 0.00 to 2.00 (Set by theTHV-10 front keys)
External gradient set value: 0.0 to 100.0 % (Set by the setter *)
Output limiter high/low: 0.0 to 100.0 % (Set by theTHV-10 front keys)
Base-up set value: –9.9 to +100.0 % (Set by theTHV-10 front keys)
* Sold separately
Output limiter high at operation start:
High setting: 0.0 to 100.0 % (Set by the THV-10 front keys)
Time setting: 0 to 600 seconds (Set by the THV-10 front keys)
Output limiter setting in case of a break on the secondary side of the transformer:
15.0 to 50.0 % of phase angle (Set by theTHV-10 front keys)
Ramp (Soft-start/Soft-down) function:
0.0 to 100.0 seconds (Set by the THV-10 front keys)
Soft-start function in case of a break on the secondary side of the transformer:
0.1 to 100.0 seconds (Set by the THV-10 front keys)
Current limiter function (optional): Valid at phase control
Setting range: 150 A: 0 to 165 A 200 A: 0 to 220 A
If a Current limit value is set to its maximum value, the Current limit function is deactivated. Setting the current limiter value to zero turns off the output.
Output mode for phase control:
Proportional phase angle, Proportional voltage, Proportional square voltage (electric power) or Constant current control (optional)
Power off leakage current:
Approx. 27 mA AC (load voltage 200 V rms, 60 Hz, Ta = 25 °C)
Contact input: Contact input can be assigned the function.
Number of input points: 1 point
Input type: Dry contact input
OFF state (open): 50 kΩ or more
ON state (close): 1 kΩ or less
Contact current: 5 mA or less
Voltage at open: Approx. 4 V DC
Capture judgment time: 50 Hz: 100 ms, 60 Hz: 83.33 ms
Current transformer (CT) input (optional):
Input: Current transformer (Built-in)
Input range: 0.0 to Rated current × 2
Sampling cycle: 50 Hz: 10 ms, 60 Hz: 8.33 ms
Alarm output (optional): Number of output points: 1 point
Output type: Open collector output
Output type: Sink type
Allowable load current: 100 mA
Load voltage: 30 V DC or less
Voltage drop at ON: 2 V or less (at maximum load current)
Leakage current at OFF: 0.1 mA or less
Allowable ambient temperature:
–15 to +55 °C (Operation guarantee range)
Allowable ambient humidity:
5 to 95 %RH (Non-condensing)
Absolute humidity MAX. W. C 29 g/m^3 dry air at 101.3 kPa
Supply voltage for instrument:
85 to 264 V AC [Including power supply voltage variation]
(Rating 100 to 240 V AC) 50/60 Hz
Frequency variation 50 Hz: 48 to 52 Hz, 60 Hz: 58 to 62 Hz
Power consumption: 12.5 VA MAX. (100 V AC) rush current 21 A or less
22.0 VA MAX. (240 V AC) rush current 55 A or less
Withstand voltage: 50/60 Hz 1 minute

Time: 1 minute	①	②	③	④	⑤
① Radiator fins (PE terminal)					
② Main circuit terminals	2500 V				
③ Power terminals for instrument	2000 V	2500 V			
④ Input terminals	2500 V	2500 V	2300 V		
⑤ Alarm terminals	2500 V	2500 V	2300 V	2000 V	

Insulation resistance:

	①	②	③	④	⑤
① Radiator fins (PE terminal)					
② Main circuit terminals	500 V DC 20 MΩ or more				
③ Power terminals for instrument	500 V DC 20 MΩ or more	500 V DC 20 MΩ or more			
④ Input terminals	500 V DC 20 MΩ or more	500 V DC 20 MΩ or more	500 V DC 20 MΩ以上		
⑤ Alarm terminals	500 V DC 20 MΩ or more	500 V DC 20 MΩ or more	500 V DC 20 MΩ or more	500 V DC 20 MΩ or more	

Rated conditional short-circuit current:
4200 A (150 A/200 A)
Short-circuit protective device (fuse):
Breaking capacity: 200 kA (fast-blow fuse for 150 A/200 A), UL certified
Cooling method: Forced air cooling (built-in cooling fan)
The cooling fan service life: 50000 hours (Ambient temperature 23 ±2°C)
Mounting method: Panel mountintg
Dimensions: Refer to Dimensions
Weight: Approx. 3.7 kg
Standard: Safety standards: UL: UL60947-4-1 (file No. E177758)
cUL: C22.2 No. 60947-4-1 (file No. E177758)
CE marking: In order to comply with the European EMC- and LV directive the noise filter (refer to 3.1) should be applied.
LVD: EN60947-4-3 (Form 4)
POLLUTION DEGREE 2
Rated insulation voltage: 690 V
EMC: EN60947-4-3 (Form 4)
RoHS: EN IEC 63000

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