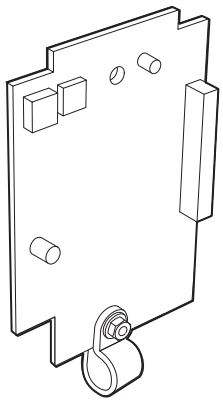
SanRex

Conversion Board for Thyristor Type Power Adjusting Unit UF-3 series



UF-TB

INSTRUCTION MANUAL

- Thank you very much for having purchased the “Conversion Board UF-TB for Thyristor Type Power Adjusting Unit UF-3 series”.
- The operators and other persons concerned are all requested to read this INSTRUCTION MANUAL thoroughly and to operate this conversion board as instructed therein so that it can fulfill its functions perfectly. Keep this INSTRUCTION MANUAL carefully at any easily accessible place so that it can be referred to at any time when required.

SAFETY PRECAUTIONS

Before installing, operating, maintaining, and inspecting this conversion board, be sure to read the present INSTRUCTION MANUAL and all other documents attached therein carefully in order for you to operate this conversion board properly. Before use, you are requested to master the know-how, safety instructions, and all other precautions on the equipment.
In this INSTRUCTION MANUAL, the following safety precautions are ranked as “DANGER” and “CAUTION” .

⚠ DANGER	A procedure which, if not properly followed, may cause extremely hazardous conditions, resulting in death or serious injury.
⚠ CAUTION	A procedure which, if not properly followed, may cause hazardous conditions, resulting in medium or slight injury and/or only damage on physical assets.

Further, note that articles, even if noted in the ⚠ CAUTION , may cause a serious result depending on the situation. Strictly observe the articles since they describe important matters.

⚠ DANGER

Before attaching the conversion board, operators are required to turn off all the input power by a switch on the distribution panel and to check to see that power is off. Otherwise, an electric shock or an injury may be caused.

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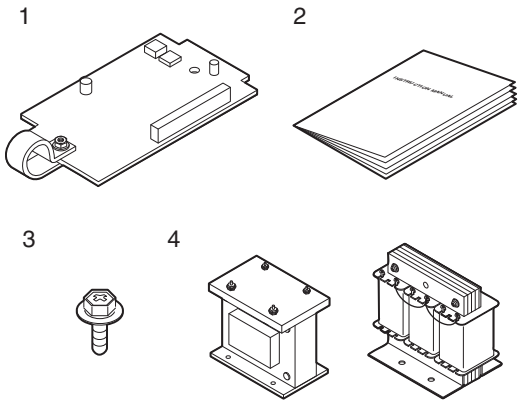
PRECAUTIONS BEFORE USE

■ Confirmation of the product

Check if the following items are all provided.

No	Included items	Q'ty
1	Main body of conversion board	1 unit
2	INSTRUCTION MANUAL (the present document)	1 volume
3	Fixing screw	1 pce
4	CT or PT	

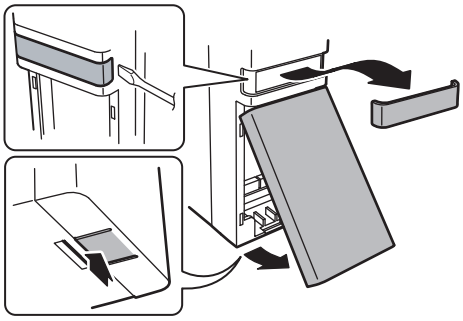


• Combination of CT and PT in a package

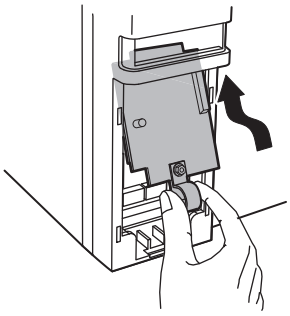
Model	CT	PT
UF-TB21A	2 pce	
UF-TB33, UF-TB33U	3 pce	1 pce

HOW TO INSTALL CONVERSION BOARD

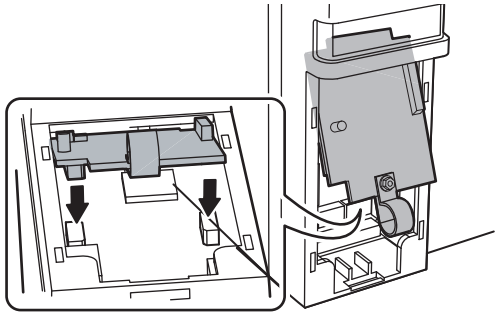
1 Remove the cover which is located on the front of the unit.



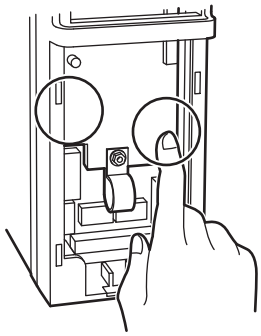
2 Install the conversion board into the unit as shown in the figure on the right.



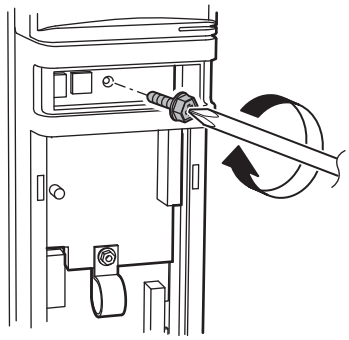
3 Connect the connectors “CN2” and “CN3” which are located on the conversion board to the connectors “CN2” and “CN3” which are located at both sides of the printed circuit board in the unit.



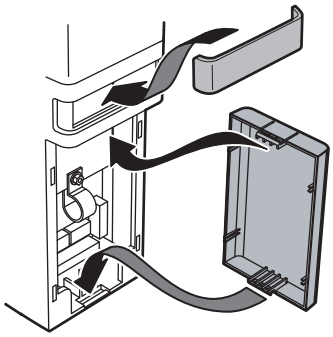
4 After connecting them, lightly push the area of the connectors “CN2” and “CN3” located on the conversion board with the index finger. You should hear it click at that moment.



5 Fix the printed circuit board located in the unit and the conversion board, with an attached screw.



6 After checking to see that the conversion board is properly installed, and that the screw is fastened tightly, attach the cover.



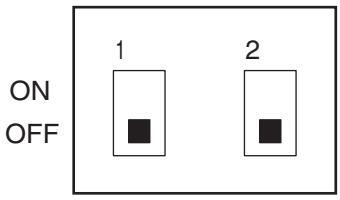
FUNCTION

The control method differs from one type of conversion boards to another, so be careful when you actually use them.

Model	Feedback control method				Display function			Heater disconnection detection function
	Constant current control	Constant voltage control	Constant power control	Without control	Current	Voltage	Power	
UF-TB21A	Available	N/A	N/A	N/A	Available	N/A	N/A	N/A
UF-TB33	Available	Available	Available	Available	Available	Available	Available	N/A
UF-TB33U	Available	Available	Available	Available	Available	Available	Available	Available

■ Changeover of feedback control method (Available only for UF-TB33, and TB33U)

Changeover of the feedback control method is possible through the setting of the dip switch S6 on the conversion board.



Feedback control method	1	2
Without control	OFF	OFF
Constant current control	ON	OFF
Constant voltage control	OFF	ON
Constant power control	ON	ON

■ Display function

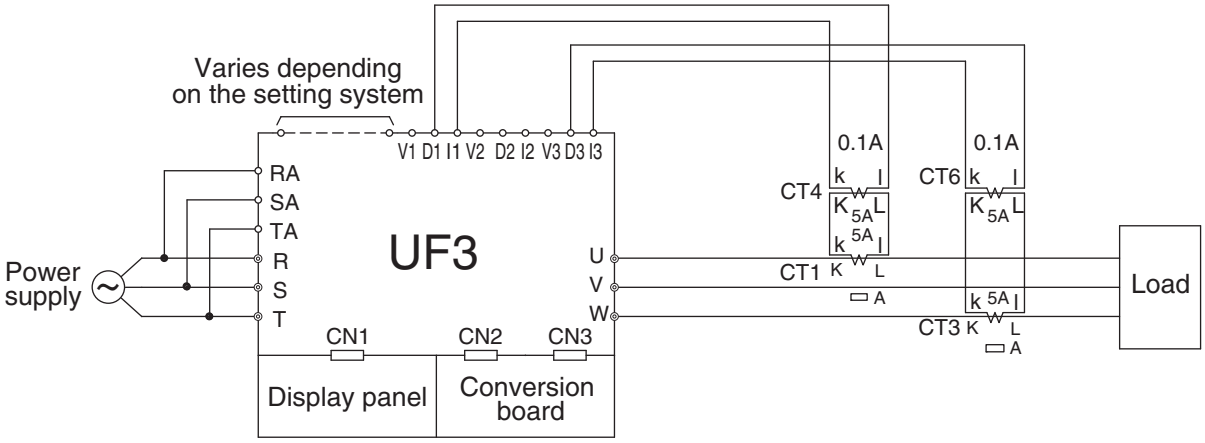
Use the Display Panel for Thyristor Type Power Adjusting Unit UF Series (UF-DP) together with this conversion board to display output current, voltage, and power. Refer to the “INSTRUCTION MANUAL for Display Panel for UF Series” for details.

■ Heater disconnection detection function

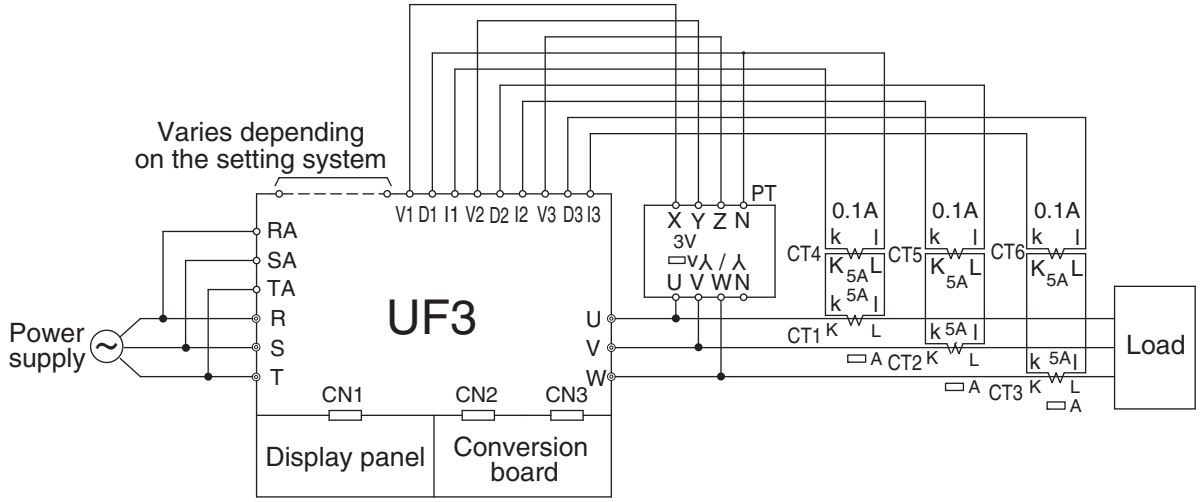
Able to detect a heater disconnection.
Refer to the “Heater Disconnection Detection Function” for details.

CONNECTION DIAGRAM

■ When UF-TB21A is to be used



■ When UF-TB33, or TB33U is to be used



∗ CT1-3: main circuit CT
CT4-6: detect circuit CT

ADJUSTMENT PROCEDURE

Adjustment procedure differs from one type of conversion boards to another.

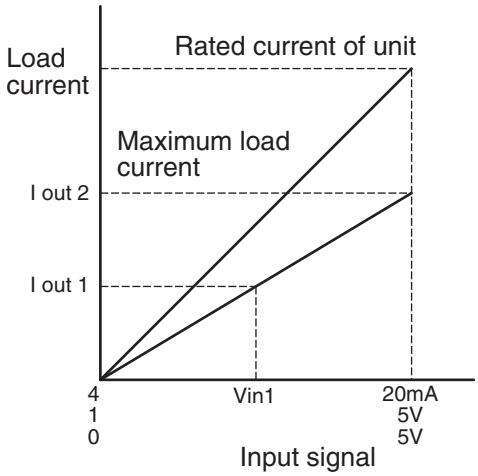
Model		Reference item
UF-TB21A		■ When the maximum load current and the rated current of main circuit CT are the same
		■ When the maximum load current is lower than the rated current of main circuit CT
		When the display panel (UF-DP) is provided
UF-TB33, UF-TB33U	In the case of without control or constant voltage control setting	■ When the maximum load voltage and the rated voltage of PT are the same
		■ When the maximum load voltage is lower than the rated voltage of PT
		When the display panel (UF-DP) is provided
	In the case of constant current control setting	■ When the maximum load current and the rated current of main circuit CT are the same
		■ When the maximum load current is lower than the rated current of main circuit CT
		When the display panel (UF-DP) is provided
	In the case of constant power control setting	■ When the maximum load current and the rated current of main circuit CT are the same, and when the maximum load voltage and the rated voltage of PT are the same
		■ When the maximum load current is lower than the rated current of main circuit CT, or when the maximum load voltage is lower than the rated voltage of PT
		When the display panel (UF-DP) is provided

■ When the maximum load current and the rated current of main circuit CT are the same

No adjustment is required.

■ When the maximum load current is lower than the rated current of main circuit CT

Adjust the “grade setting” so that the load current and the maximum load current are the same when the input signal is set to the maximum.
If applying of the maximum load current is not possible when adjusting, set the input signal Vin1 so that an arbitrary load current will be within the value of the allowable current, and adjust the “grade setting” so that the load current and the load current value Iout1 at the input signal Vin1 are the same.
However, in order that the load current will stay within the allowable load current when the power is turned on, the “grade setting” should be set to the state of “0” beforehand, and adjust it by gradually increasing the value.

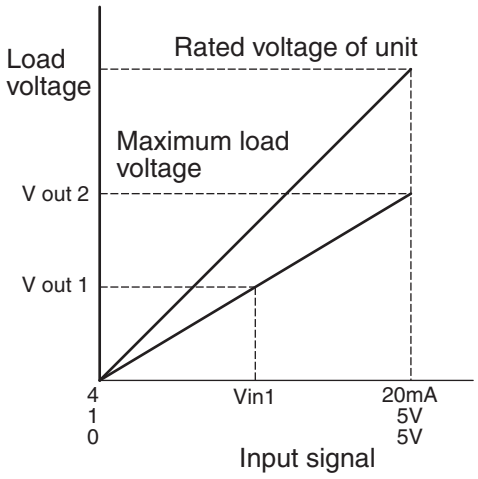


■ When the maximum load voltage and the rated voltage of PT are the same

No adjustment is required.

■ When the maximum load voltage is lower than the rated voltage of PT

Adjust the “grade setting” so that the load voltage and the maximum load voltage are the same when the input signal is set to the maximum.
If applying of the maximum load voltage is not possible when adjusting, set the input signal Vin1 so that an arbitrary load voltage will be within the value of the allowable voltage, and adjust the “grade setting” so that the load voltage and the load voltage value Vout1 at the input signal Vin1 are the same.
However, in order that the load voltage will stay within the allowable load voltage when the power is turned on, the “grade setting” should be set to the state of “0” beforehand, and adjust it by gradually increasing the value.

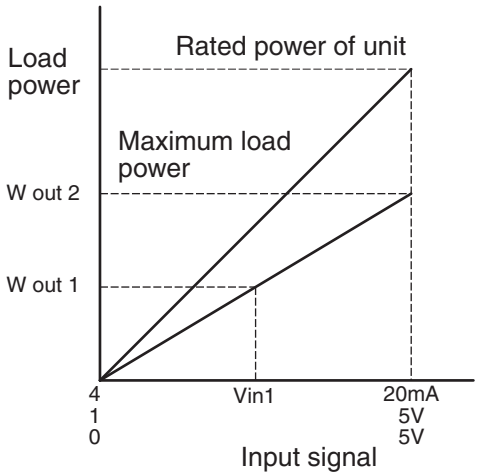


■ When the maximum load current and the rated current of main circuit CT Are the same, and when the maximum load voltage and the rated voltage of PT are the same

No adjustment is required.

■ When the maximum load current is lower than the rated current of main circuit CT, or when the maximum load voltage is lower than the rated voltage of PT

Adjust the “grade setting” so that the load power and the maximum load power are the same when the input signal is set to the maximum.
If applying of the maximum load power is not possible when adjusting, set the input signal Vin1 so that an arbitrary load power will be within the value of the allowable power, and adjust the “grade setting” so that the load power and the load power value Wout1 at the input signal Vin1 are the same.
However, in order that the load power will stay within the allowable load power when the power is turned on, the “grade setting” should be set to the state of “0” beforehand, and adjust it by gradually increasing the value.



■ Precautions

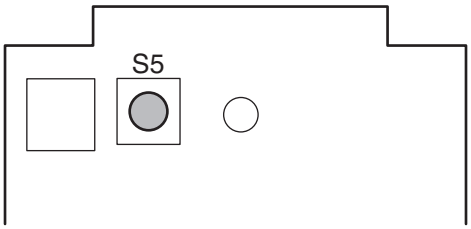
To prevent any damage on the heaters, etc. when the “grade setting” was manipulated in a wrong way, set the current limit amount using a display panel (UF-DP) higher than the load current used but lower than the current value with which the heater can be protected.

HEATER DISCONNECTION DETECTION FUNCTION

Using of the conversion boards UF-TB33U allows any one of heaters to be detected for disconnection. For the wiring procedure, refer to the relevant sections regarding each model of conversion boards.

■ Major features

- Can detect a disconnection of any one of heaters which are connected in parallel.
  (Maximum allowable number of heaters to be connected in parallel is 8.)
- Setting at the resistance value is possible from the pushbutton switch (S5) on the conversion board.



- Arbitrary setting of a disconnection detecting amount is possible from the display panel (UF-DP) .
- Disconnection of any one heater, when detected, lights the indicator lamp (HET) on the front of the unit. The display panel (UF-DP), if provided, lights the “HEAt” on the numerical value display.
- Additionally, disconnection of any one heater, when detected, causes a minor failure relay to activate.
- Disconnection of any one heater, even when detected, causes the unit to continue its output.

■ Principles of operation

- Load current and load voltage are calculated with the main circuit, the detect circuit CT • PT, and the conversion board.
- Load current (%) and load voltage (%) at the beginning of operation are memorized.
- The resistance value at the time of the load capacity setting of the heater is calculated from the load current and load voltage.
- The resistance value during operation is calculated at necessity from the load current and load voltage.
- When the amount of fluctuation in resistance value exceeds the disconnection detecting amount set beforehand, the warning of heater disconnection is outputted.
- For the prevention of malfunction, if the load voltage is less than 10% of the rated voltage, disconnection is not to be detected.
- For the prevention of detection in a wrong way, warning is not outputted for 5 minutes after starting operation.

■ Setting procedure

After the connection of CT, PT, conversion boards, heaters, and the like is completed, start the operation of heaters in a normal way. After the temperature in the furnace has been kept constant after a while, perform the following settings. Setting without the temperature kept constant can cause any error in detection.

○ Setting of the resistance value of the heater

When the pushbutton switch S5 on the conversion board is held in the pushed state over about one second, the indicator lamp (HET) on the front of the unit flickers, and calculate load resistance than load electric current and the load voltage and memorize for resistance value of the heaters. When the switch is released, the indicator lamp is turned off, and the setting of the resistance value of heaters is completed.

○ Setting the disconnection detecting amount

The initial value of disconnection detecting amount is set to 50%. If the value needs to be changed, it can be set with the display panel (UF-DP). (It is set in a place where the indication at the left end is “U” in the INPUT mode.)
When multiple heaters with the same resistance are in parallel operation, a disconnection of one heater can be detected by setting the values as shown below.
But when, as for the following set point, a resistance value of a parallel heater is the same, and the balance of the power supply of each aspect is the same, besides. A resistance value of a parallel heater has some errors, and some balance of the power supply of each aspect is really different, besides. Therefore, in the following set point, the heater disconnection detection function may not detect heater disconnection. With real load, please confirm it.

In the case of 3 arm units
(UF3-0XXXF)

Number of heaters connected in parallel	In the case of △ load	In the case of 人 load
1	(43%)	(50%)
2	23%	40%
3	16%	25%
4	12%	18%
5	10%	14%
6	8%	11%
7	---	10%
8	---	8%

In the case of 6 arm units
(UF3-0XXXKF)

Number of heaters connected in parallel	In the case of △ load	In the case of 人 load
1	(47%)	(50%)
2	24%	40%
3	17%	25%
4	12%	18%
5	10%	14%
6	8%	11%
7	---	10%
8	---	8%

■ Operating status

○ Indication of disconnection

Heater disconnection, when detected, starts the following indication procedure.

- The indicator lamp (HET) lights up on the front door of the unit body.
- The display panel (UF-DP), if provided, lights “HEAt” on the numerical value display.

∗ The heater disconnection detection function is not self-held. Therefore, the indicator lamp is returned to its original status when the detected value falls below the set value upon the detection of heater disconnection.

○ Warning output

Heater disconnection, when detected, starts the following operation procedure.

- A minor failure relay in the unit body activates, and the HA and HC on a terminal block become closed.
- The detection of heater disconnection is released when the detected value falls below the set value after heater disconnection was detected, and the minor failure relay is returned to its original (open) status.
- When the output in the unit body comes to a standstill (for example, the ST and PH are opened) after heater disconnection was detected, such detection is held with the minor failure relay stayed in its closed status.

∗ The heater disconnection detection function is not self-held. Therefore, a minor failure relay is returned to its original (open) status when the control power supply is turned off upon the detection of heater disconnection.

∗ Under-voltage and abnormal frequency in addition to heater disconnection, when detected, will cause the minor failure relay to activate. So, check the indicator lamp for a cause of activating the relay.
However, in the event of under-voltage or abnormal frequency, the minor failure relay activates after such abnormalities have been detected continuously for about 2 seconds.

○ Output status

Heater disconnection, even when detected, causes the unit to continue its operation. So, be careful when the unit is to be used under the constant current control and constant power control modes.
Leaving the unit in the operated status may increase the output voltage, and thereby cause an excessive load to be imposed on the heater.

VARIOUS CHARACTERISTICS

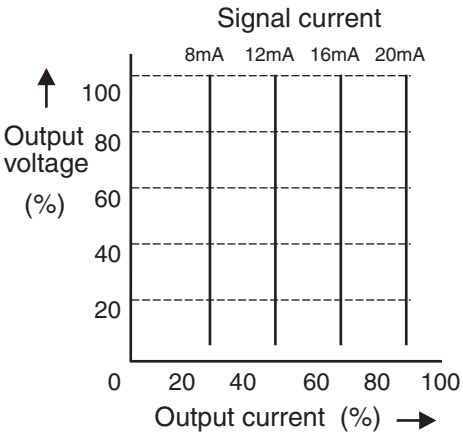
■ Constant current control (Phase control)

• **Specifications**

Condition		Accuracy
Power supply voltage fluctuation at constant load and at constant ambient temperature	±10%	Within ±1% (F.S)
Load fluctuation at constant power supply voltage and at constant ambient temperature	1/10-1 fold	Within ±2% (F.S)
Ambient temperature fluctuation at constant power supply voltage and at constant load	-10 to 50°C	Within ±2% (F.S)

∗ When use it by Cycle control, pray for an inquiry to our business.

• **Characteristics**



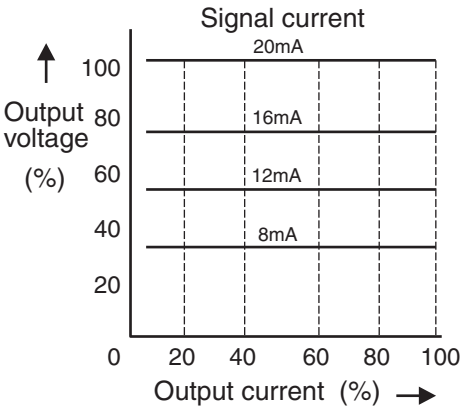
■ Constant voltage control (Phase control)

• **Specifications**

Condition		Accuracy
Power supply voltage fluctuation at constant load and at constant ambient temperature	±10%	Within ±1% (F.S)
Load fluctuation at constant power supply voltage and at constant ambient temperature	1-10 fold	Within ±1% (F.S)
Ambient temperature fluctuation at constant power supply voltage and at constant load	-10 to 50°C	Within ±2% (F.S)

∗ When use it by Cycle control, pray for an inquiry to our business.

• **Characteristics**



■ Constant power control (Phase control)

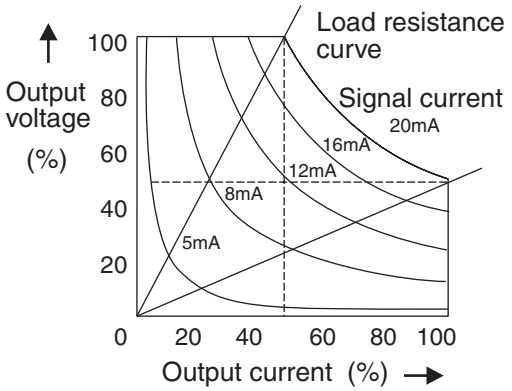
○ The case of UF-TB33, or TB33U

• **Specifications**

Condition		Accuracy
Power supply voltage fluctuation at constant load and at constant ambient temperature	±10%	Within ±1% (F.S)
Load fluctuation at constant power supply voltage and at constant ambient temperature	1-4 fold	Within ±5% (F.S)
Ambient temperature fluctuation at constant power supply voltage and at constant load	-10 to 50°C	Within ±3% (F.S)

∗ When use it by Cycle control, pray for an inquiry to our business.

• **Characteristics**



■ Heater disconnection detection

Item	Contents of specifications
Setting range for load capacity	25% or more of the rated voltage, and 25% or more of the rated current
Setting range for warning of disconnection	8 to 50% Initially, it is set to 50%.
Disconnection detection range	10% or more of the rated voltage
Detection accuracy for load capacity	Within 10%, in the case of 10% or more of the rated voltage, and 10% or more of the rated current (∗)
	Within 5%, in the case of 50% or more of the rated voltage, and 50% or more of the rated current (∗)
Warning output	Relay contact 1a, AC250V1A or DC30V1A (at resistive load)
Warning terminal	Between HA and HC on the terminal block in the unit

∗ For conditions, secondary voltage of PT: 3.0V/100%, and secondary current of CT: 0.1A/100%

OTHERS

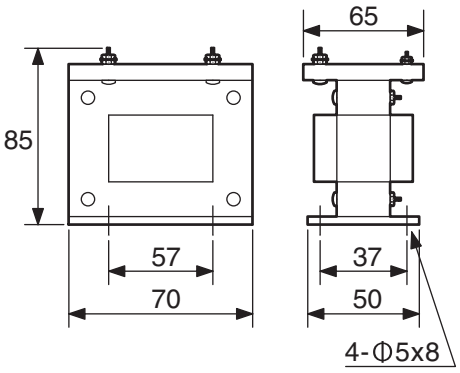
■ Troubleshooting

Situation		Remedy
Fully output control is not functioning.	• Are not detection lines opened?	• Check the wiring.
	• Are polarities aligned in the case of constant power control?	• Check polarities.
THY abnormality occurs.	• Are not detection lines of PT and CT disconnected?	• Check the wiring.
Load abnormality occurs.	• Are not detection lines of PT disconnected?	• Check the wiring.
Output does not agree with its set value.	• Are switches all right on the conversion board?	• Set the switches properly.
	• In the case that the secondary voltage of PT is other than 3V, or that the secondary current of CT is other than 0.1A, is adjustment of VR completed on the conversion board?	• Adjust VR.
	• Are CN2 and CN3 inserted properly on the conversion board?	• Check CN2 and CN3.
Setting of heater disconnection detection cannot be made properly.	• Are both output voltage and current detected 25% or more of their rated values?	• Increase outputs.

∗ Also, refer to “Troubleshooting” included in the INSTRUCTION MANUAL for the unit main body.

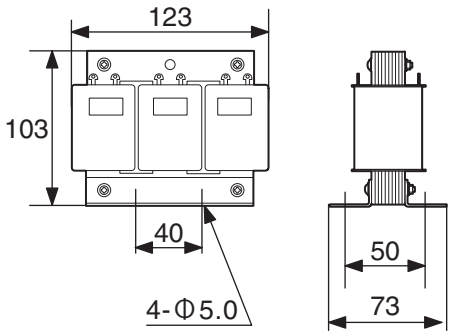
■ Dimensions

○ **CT**



○ **PT**

• **For 210V and 420V**



∗ Unit: mm

-MEMO-

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