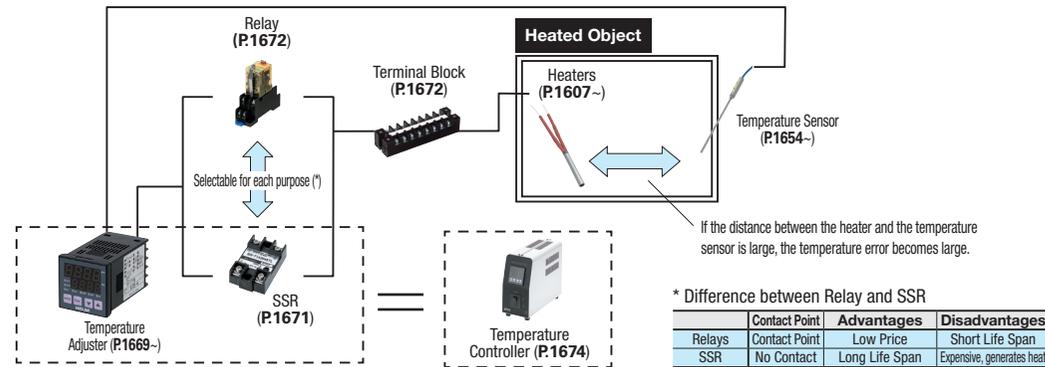


## Example of Connecting Temperature Controlling Products

General example of connecting heaters is shown below.



Temperature controller is the unit of a temperature adjuster and SSR.  
 Temperature adjusters are recommended for wall-mounting, and temperature controllers are recommended for easy use as a unit.

**Overview**  
 The MISUMI's Temperature Adjuster is a compact multifunctional unit permitting the selection of input types according to the sensor to be used. By operating the front face key of the regulator, the input types of the thermocouple and temperature measuring resistance can be switched. Also in conformity to "IP66".

- Features**
- Self-tuning PID
    - If the control value fluctuates due to external interference or the setting value change, the Self-tuning function enables a temperature controller to converge (stabilize) such fluctuation by automatically tuning / correcting the PID constant.
  - PID with overshoot restricting function
    - The overshoot (a rise exceeding the set value) occurring at the start of control, or at the time of changing the setting, is restricted for stable control.
  - With Upper and lower limit alarm function
  - The alarm operation can be selected from the eight kinds according to the usage. Since the controller is provided with the delay timer function (setting range: 0 to 9999 sec.), it is also possible to set the alarm operation timing.
  - Utilizing EV1 and EV2, two-step alarm setting is possible.
  - MTCTRD / MTCTSD has the function of breakage detection for heaters when connected to the included CT (current transformer).

- Precautions on Wire Connection**
- When connecting wires, make sure to turn off the power supply in advance. It may cause shock.
  - This unit does not perform control operation for approx. 4 seconds after turning on the power. Output does not function. Be careful when using it as an interlock circuit.
  - Use the Crimp Terminal for wire connection that fits M3.5 thread. (Tighten the wire directly at the center portion.)
  - The wire material of the wire connecting Temperature Measuring Resistor and Temperature Adjuster should be 5Ω or less wire resistant (per wire), and the wire material of the wire connecting Thermocouple and Temperature Adjuster should be the specified compensation lead wire or an element wire.
  - When using the unit in the vicinity of a noise source, use shielded wire. Do not lay input and output lines together in the same duct or conduit tube.
  - Separate the input and output signal lines 50cm or more from the power supply line and load line.

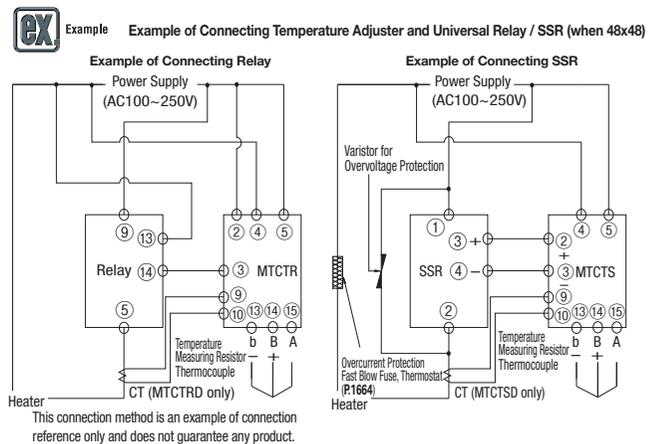
**Warranty**  
 Warranty Period: One year from the shipping date.  
 Warranty Condition: Please present the guarantee card included at the time of delivery.  
 Coverage of Warranty: Problems or damages arising through the normal usage in compliance with the instruction manual included at the time of delivery.

If trouble occurs during the warranty period even though the unit has been used in the proper manner, we will collect and repair/replace the unit.

In the following cases, repairs are fare-paying services. We will collect the product and make an quotation.

- ① When the damage is caused by a factor other than covered by the warranty and the product is repairable.
- ① When the damage has occurred beyond the warranty period and the product is repairable.

- Operating Environment**  
 Never use in the environments with following conditions. It may cause fires or breakage.
- (1) Explosive gases, inflammable gases or corrosive gases.
  - (2) Either sunshine or ambient temperature (above 50°C) remarkably increases.
  - (3) Extremely low ambient temperature (below 0°C), such as outdoors in cold areas.
  - (4) Extremely high humidity (85%RH or higher).
  - (5) Splashing of water or chemicals.
  - (6) Severe vibration or shocks.
  - (7) Large volume of dust, iron powder or black smoke.
  - (8) External noise, induction trouble, vibration, large shocks, and other factors deemed to affect the electric circuit adversely.
  - (9) Violent temperature change.



Q1 : What are the advantage and disadvantage of each temperature controlling method?  
 A : The following ways of temperature controlling are available.

	Advantages	Disadvantages
ON-OFF Control	Quick temperature raise	Easily overshoot
PID Control	Restrains overshooting	Slow temperature raise

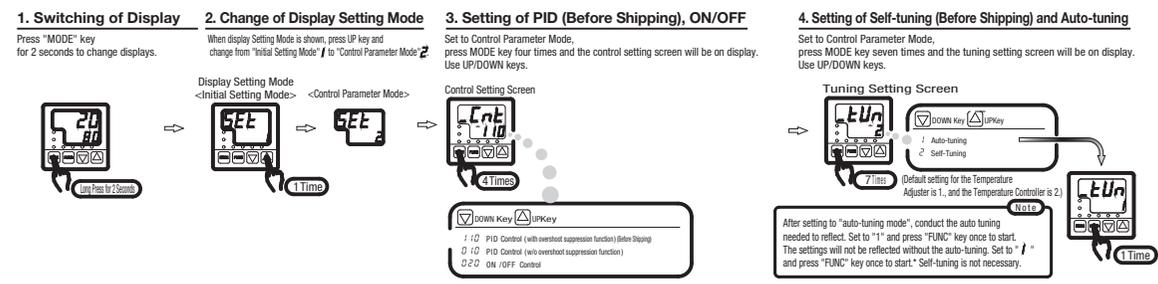
	Advantages	Disadvantages
Auto tuning	Reach to an optimum setting value for control after running.	Tuning is required when the operating condition has changed.
Self-tuning	Auto-tuning is conducted when disturbance occurs.	Does not recognize a slight change as a disturbance and the optimal control setting is not always performed.

Confirm the advantage and disadvantage of each type before selecting products. For Temperature controllers (P.1674), PID Control - Self-tuning is activated by default. However, as stated above, this setting is not always optimal. In that case, please follow Q5 and conduct the auto-tuning.

- Q2 : Can we connect heaters from other manufacturers to MISUMI temperature adjusters and temperature controllers?  
 A : No problem at all. Beware of the rated voltage (V) and the allowable current (A).
- Q3 : Which temperature controller should be used?  
 A : Use the single-phase controller (MTCS, MTCRM, MTCD) for single-phase heaters. Use the 3-phase controller (MTCH) for 3-phase heaters. Cartridge heaters and rubber heaters are all single-phase. For other heaters, see the information in the diagram for each product.

Q4 : Is it possible to control several heaters with one temperature controller?  
 A : Possible. Be sure to use them under the allowable current of the temperature controller. Up to two terminals of the heater are possible to connect to one terminal. When using 3 or more terminals, use terminal blocks on P.1672. For calculation examples, refer to "Temperature Controllers" on P.1606.

Q5 : The temperature ascends very slowly. Controlling is not stable.  
 A : For PID Control with Self-Tuning, temperature is controlled by the value of P (Proportional), I (Integral Time) and D (Derivative Time). If a value in each of the above PID fields is not optimal for the operating environment, this may cause problems. Please conduct self-tuning by following the procedure below. \* Tuning may be completed in a few minutes, but may require longer than one hour in some cases. (Heat-resisting jigs may take longer time to complete the task because its temperature doesn't descend soon.)



Q6 : We use several controllers and cannot have the same temperature.

A : If the PID control method is used for those several controllers and if the same values of P, I and D are shared by those controller, the controllers should theoretically behave in the same way. If the problem is not solved even after the same P, I, D values are inputted in the controllers, the root cause of the problem is deemed to be individual difference among the controllers or malfunction of the sensor.

Q7 : I cannot input the temperature higher than a certain degree.

A : Setting temperature could be limited.  
 (After turning the power on, press "MODE" for 2 seconds → Set 1 Screen → press "▲" once → Set 2 Screen → press "MODE" once → SLH display is shown. The temperature shown below is set as the upper limit temperature. Press "▲" and raise the temperature.)

Q8 : Temperature error is large.

A : Make sure if the distance between the sensor and the heated object is not too far. When the sensor and the power line are placed near, the sensor might be affected by the noise. Place the sensor away from the power line. Other two possibilities are as follows:

1. Make sure the type of the temperature sensor (K/J Thermocouple, Temperature Measuring Resistor, etc.) and the setting of the temperature adjuster is correct. (After turning the power on, press "MODE" for 2 seconds → Set 1 Screen → press "Mode" once → <Input Type Setting Screen> appears. Configure the following parameters according to the temperature sensor type - K Thermocouple: 00, J Thermocouple: 01, Temperature Measuring Resistor Pt100Q: 10)
2. Check whether input correction value is set. (After turning the power on, press "MODE" for 2 seconds → Set 1 Screen → press "MODE" three times → on PV adjustment at 0 point screen, set the adjustment value at "0".

Q9: Temperature remains high and doesn't descend.

A : SSR inside of the temperature controller might be damaged. Stop using the controller immediately. Contact us at the following for repairs and send us the product. We will check if the repair is possible and inform you of the price and the days to ship.

Temperature Controllers/Related Products, MISUMI Corporation TEL: 03-5805-7470 FAX: 03-5805-7318  
 (Address for sending products) Iidabashi First Bldg., 5-1, Koraku 2-chome, Bunkyo-ku, Tokyo 112-8583, Japan (Contact us before sending products.)