

# What is a thermostat ?

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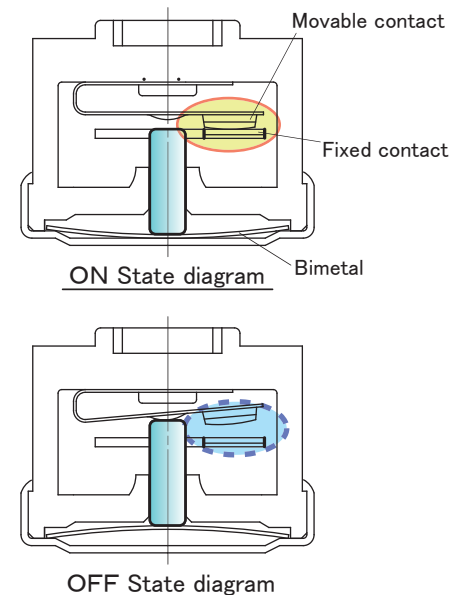
- **Thermostat**  
A device that stabilizes heat and temperature  
The etymology for thermostat is a compound word combining “thermo” which means temperature or heat, and “stat” which means a stationary state.  
“Thermo” is how the word is pronounced in English, but in German it is pronounced “terumo” or “tamu”.
- **Purpose**
  - (1) Temperature regulator (controller): Maintains a certain degree of temperature.
  - (2) Excess temperature rise protector (limiter/protector): Turns off the heat source when the temperature rises above a particular level.
  - (3) Temperature detector: Signals when the set temperature has been reached and causes another operation to occur.

These are the main purposes of the thermostat.
- **Asahi’s Thermostat is a bimetal thermostat.**  
The temperature switch senses the temperature through the bimetal and controls the electricity contacts (turning them on or off).  
There are various kinds of devices for temperature control and measurement.

## What are the principles of bimetal?

- **Bimetal**  
Two metals (a low expansion metal and a high expansion metal) are milled into a single sheet using a roller → Bimetal
- combining “bi” (a prefix meaning “two”) and “metal.”
- **Pressurized bonding** ... Bonding by cool or hot rolling (molecular bonding).  
No adhesive is used.
- **Materials**  
High expansion metal contains an iron alloy ( Fe ) and nickel ( Ni ) with added substances Cr, Mn, and Mg; low expansion metal contains iron ( Fe ) and nickel ( Ni ) as the main materials for Invar (Ni35-Fe)
- Bimetal bends in one direction as the temperature rises and in the other direction as it falls.
- Force arises where the movement is controlled, and in the thermostat. the set point pressure exerts a repelling force.

Operating principle Figure



## Types, structures and purposes of bimetal thermostats

- **Types and structures**
  - Laminated type** : In this type, parts have been laminated together and fastened with a rivet, facilitating temperature variations in small increments.
  - Snap disc type** : In this type, parts are contained in a covered case. It has a relatively large differential, and uses a low cost snap disc to prevent excessive temperature rises.
  - Protector type** : This type is contained in a covered case, with a snap disc integrated into the electric circuit for the detection and prevention of temperature rises or overcurrent situations.
- **Applications**
  - Home electric appliances** : Home electric appliances: Kitchen goods (Computerized hot water kettles, coffee makers, ovens, hot plates, rice-cake makers, etc.)  
Heating devices: Electric space heaters, electric heating pads, electric kotatsu (coffee-table type heaters with coverlets), panel heaters, electric mats, etc.)  
Others: Ironing presses, hair dryers, vacuum cleaners, futon dryers, etc.)
  - Household goods** : Lavatory seats, washlets (a seat-type of bidet incorporating seat warming and warm water irrigator), battery chargers, etc.)
  - Gas and oil** : Bathtub boilers, water heaters, floor warmers, fan heaters, space heaters, etc.)
  - Others** : Copy machines, automatic vending machines, automobiles, motorboats, marine jets, etc.
  - Industrial equipment** : Construction tools, road signs, welding machines, etc.

Q. What's Snapper?

A. Snapper is a registered trademark of Asahi Keiki. It is a generic name for round thermostats (US-118, 602, 603, 621, 622, 625, 628) using disc bimetals.

Q. Could you explain the related domestic and overseas standards?

A. In Japan, our products have passed the tests defined in the Electric Parts/Material Registration System and the Gas Burner Parts Inspection System. In addition, they have been qualified in the overseas standards such as UL, C-UL, CSA, DEMCO, VDE and CCEE. or details, refer to our product catalog.

Q. Could you explain the rated current and rated voltage?

A. Unless otherwise stated, the rated current and rated voltage are represented by resistance loads (power factor:  $\cos \phi = 1$ ). When the load is not a resistance load, the current capacity and rush current vary. For details, refer to the relevant catalog or contact us.

Q. Could you explain the use of gold and silver contacts?

A. gold contact should be used when the maximum rating is 125 VAC, 0.5 A, 50 VDC, 1 A, 40 VDC, 0.5 A or 24 VDC, 1A. In contrast, a silver contact should be used when the maximum rating is other than the above combinations.

Q. Could you explain the temperature range?

A. temperature range must be 150° C for US-602 and US-603, 0 to 185° C for US-622, 50 to 250° C for US-625 and 0 to 250° C for US-118. A temperature point is set in each range. (For other models, contact us with the specifics.)

Q. Why does a sound (a snap) occur at startup?

A. This sound is generated due to the thermostat's bimetal inversion. It does not indicate a problem.

Q. Could you explain a differential?

A. In short, it means the difference between the operating temperature and the return temperature. For example, for a thermostat, the thermostat temperature is 15 degrees by default when the temperatures are set to 100° C OFF and 85° C ON.

Q. Could you explain us how to set the operating temperature?

A. The operating temperature data of our thermostats are as follows:

- (1) Using an air circulation high temperature furnace
- (2) Raising or lowering the temperature based on 1K per minute
- (3) Preventing load current
- (4) Recording the first operating temperature

This method is being widely used as the regular method.

In addition, when the operating temperature varies significantly depending on the mounting location and the real load current, check the temperature of the control target and designate it before placing an order.

Q. Please tell me the contact for product procurement or other information acquisition.

A. From office guidance on the home page, please contact us. Please refer also to the contacts in 24 pages.

Q. Could you explain the difference between excess temperature rise prevention and temperature control, and their purposes?

A. Generally, excess temperature rise prevention does not take place frequently. It is usually used as a fail-safe. For example, it is used to prevent heating without water supply in water heaters. In addition, temperature control usually takes place to keep the temperature of the product constant. It frequently is used in such electrical appliances as electric rice-cookers, electric mats, and kotatsu (coffee-table type heaters with coverlets).

Q. What physically happens to contacts that have exceeded their limits of open/close durability?

A. All thermostats turn OFF because the contact springs of the traveling points bend or the traveling contact plate drops, except in situations where the contacts have melted due to overcurrent.

Q. Is it possible to use a thermostat with a thermal surface depression without problem?

A. We don't recommend that you use such a thermostat because thermostats are very important components and their set temperatures sometimes vary due to thermal surface depressions or significant shock.