

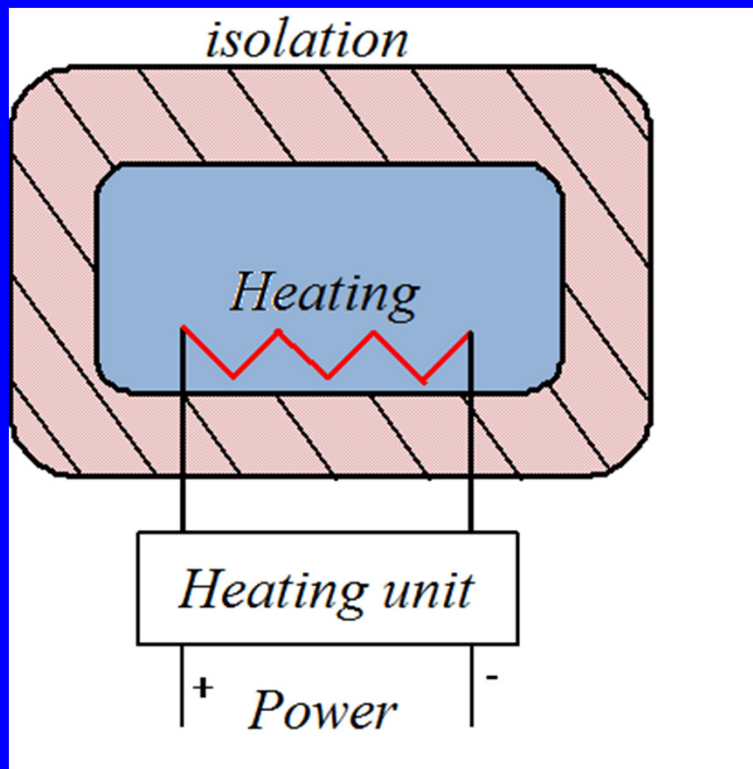
---

# FDE 404 Process Control

## ◆ An electrical oven

**Question:** Can you detect a problem in the heating process (oven) below?

If you can find, what kind of a solution you can suggest??



- No heat loss
- The power has a positive value

# Important definitions about process control

## Process

A series of activity or operation which convert inputs (data, material, parts, etc.) into outputs.

## System

A group of processes which are interrelated or interacting.

## Control System

An equipment or a group of equipment which controls the behaviour of other equipments or systems directly or indirectly.

A control system consist of subsystems and processes assembled for the purpose of controlling the outputs of the process.

## Block Diagram

A diagram which is used to clarify and visualize the process steps.

## Terms related to process control

---

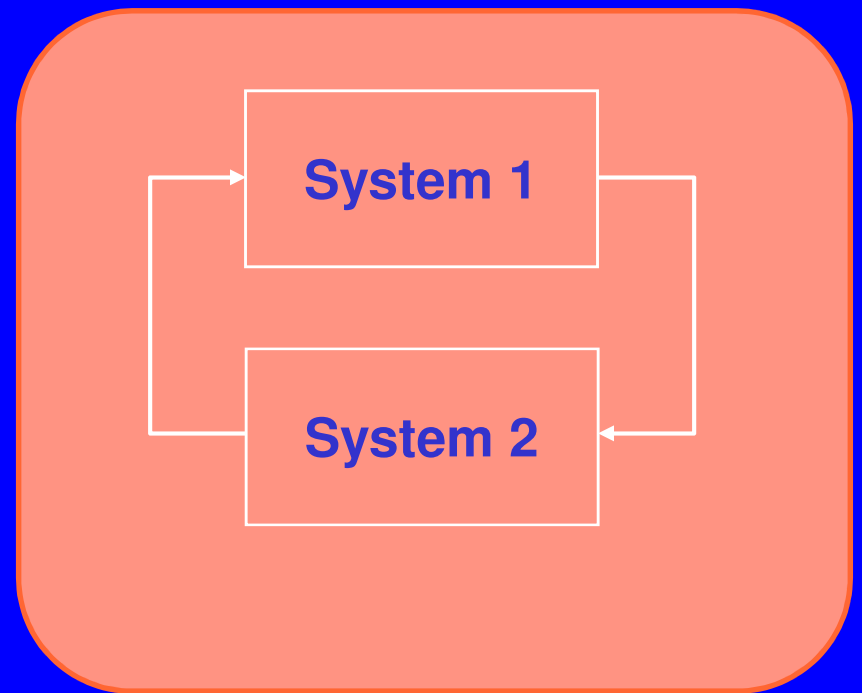
### What is Feedback?



## Terms related to process control

---

Feedback can be defined as the effect of a change in a step of process on the previous step



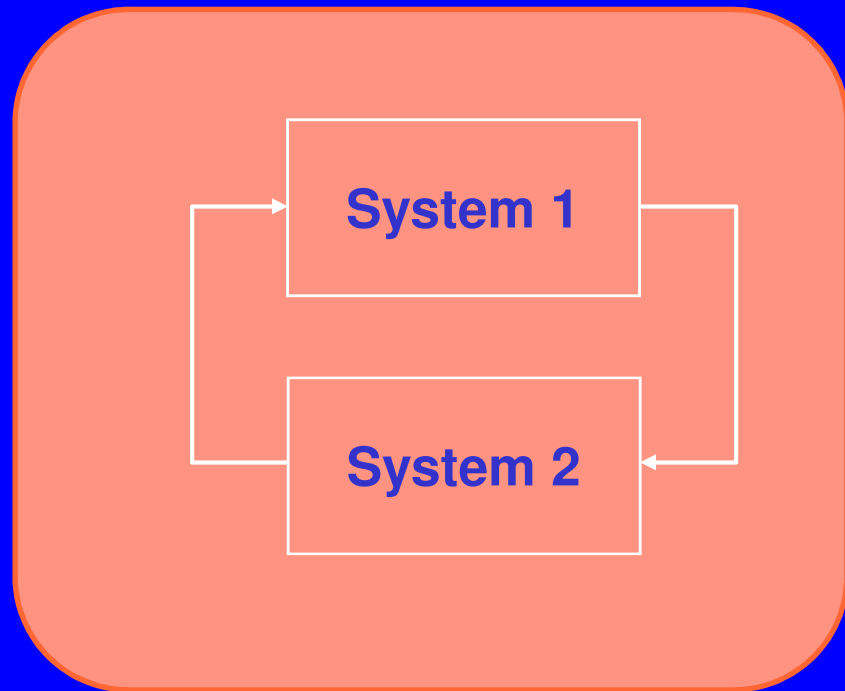
# Terms related to process control

---

Feedback?

Feedback= It means two or more systems are interrelated.

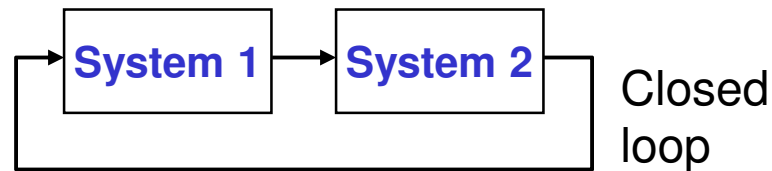
- System 1 affects system 2,
- System 2 affects system 1



**It is valid not only for flows but also for electrical signals**

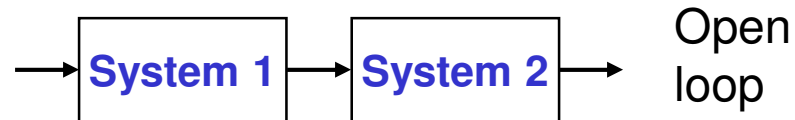
## Terms related to process control

### The concept of open and closed loop



Closed  
loop

**The input of the  
system is related  
to the output**

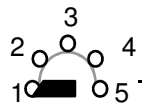


Open  
loop

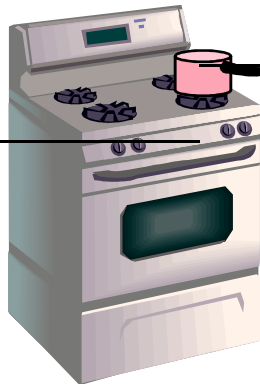
**No relation between input and output.  
(Experience and calibration is important)**

# Open loop and Closed loop

Open loop:

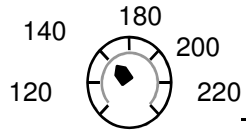


on  
/off

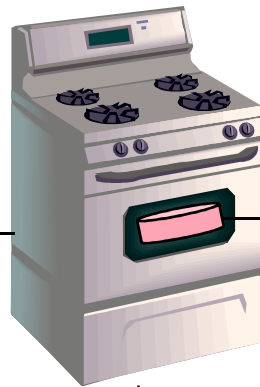


Temperature

Closed loop:



Higher/  
Lower



The closed loop control: the output parameter (temperature) should be measured.

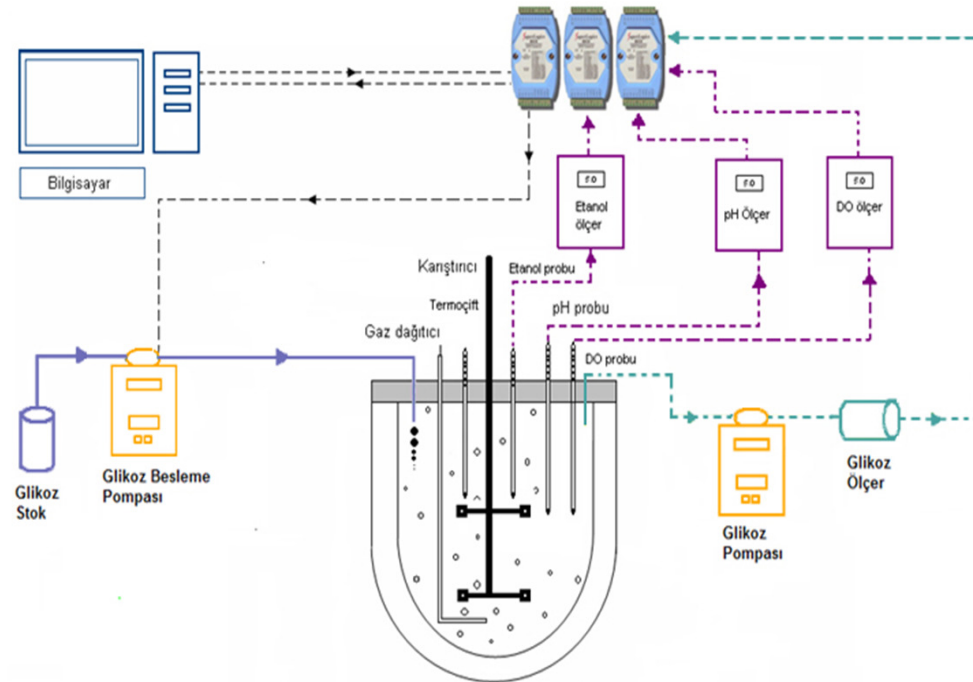
thermocouple



- **Washing Machine?**
- **Dish washer?**
- **Sprinkler**
- **The main problem??**



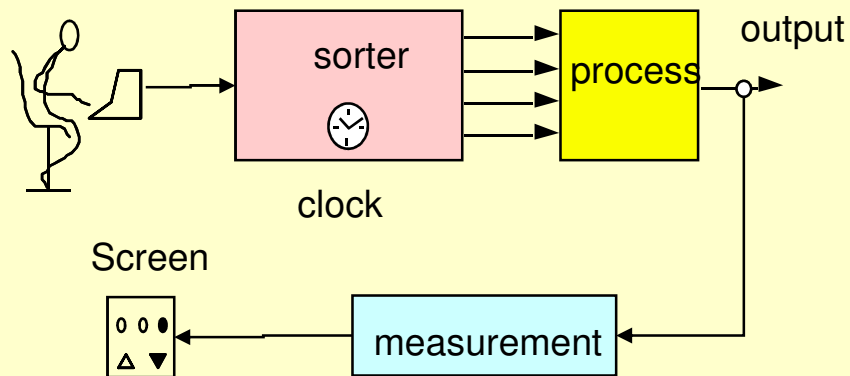
- **Cruise control?**
- **Fermentor?**



# Open loop and Closed loop

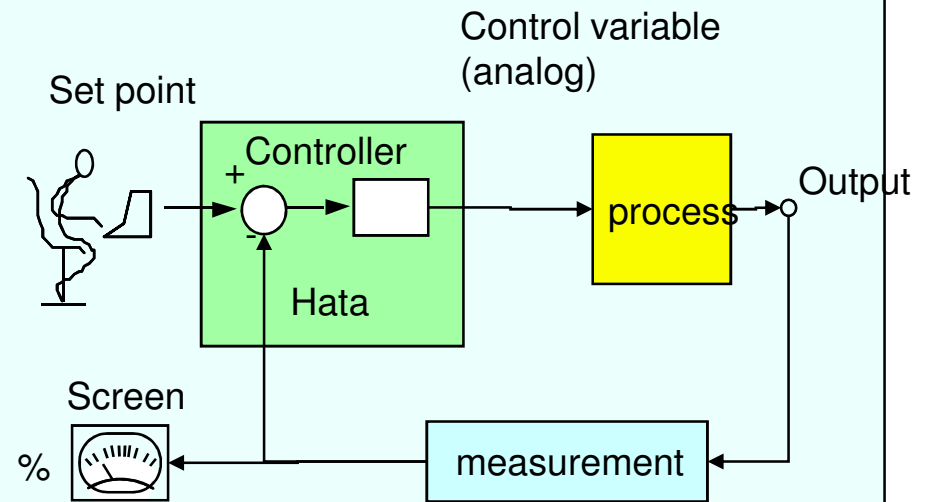
## Open loop/ order

-It depends on the calibration between the input and output variables



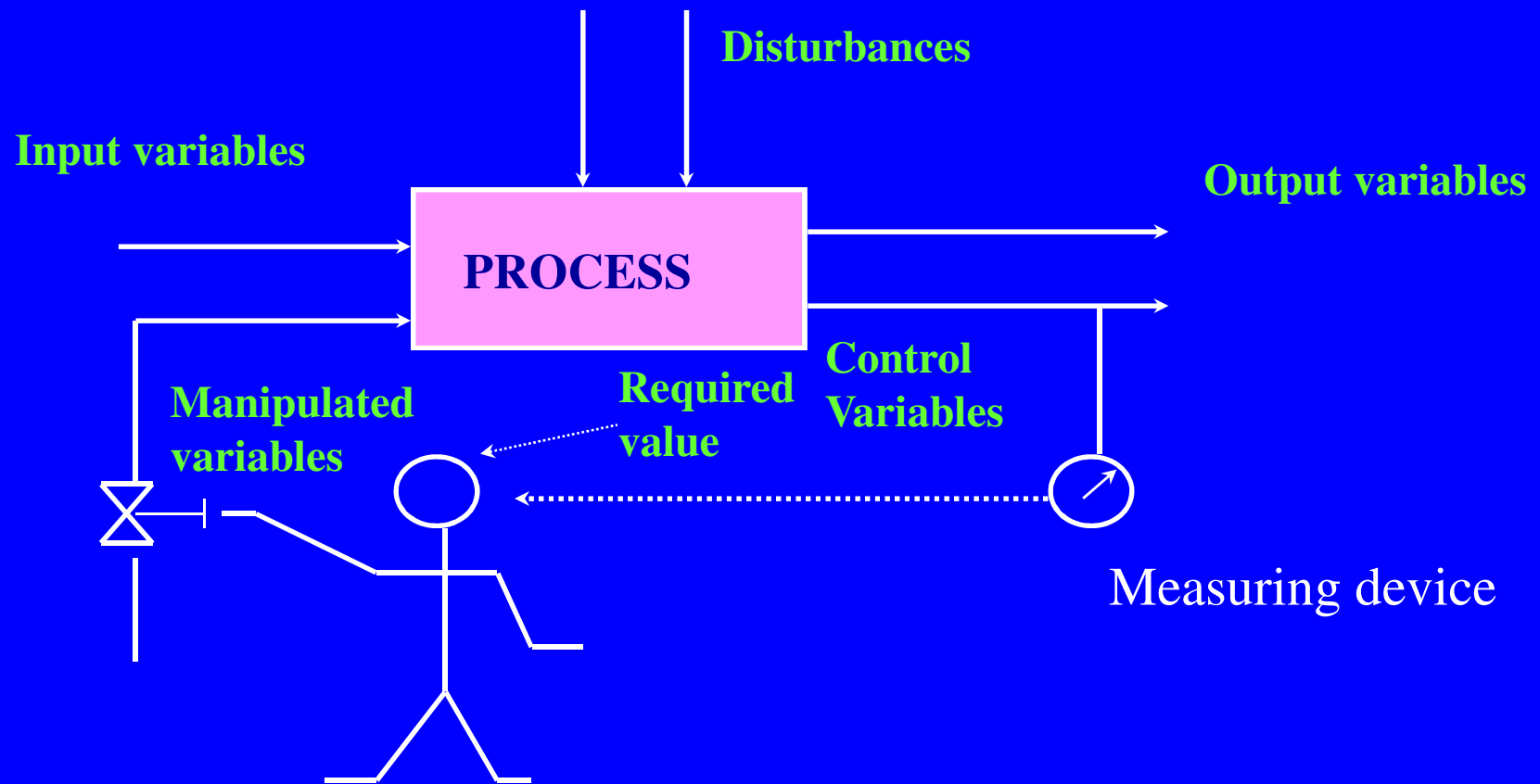
## Closed loop/ Regulation

- Increases the accuracy.  
- Decreases the effects of disturbances



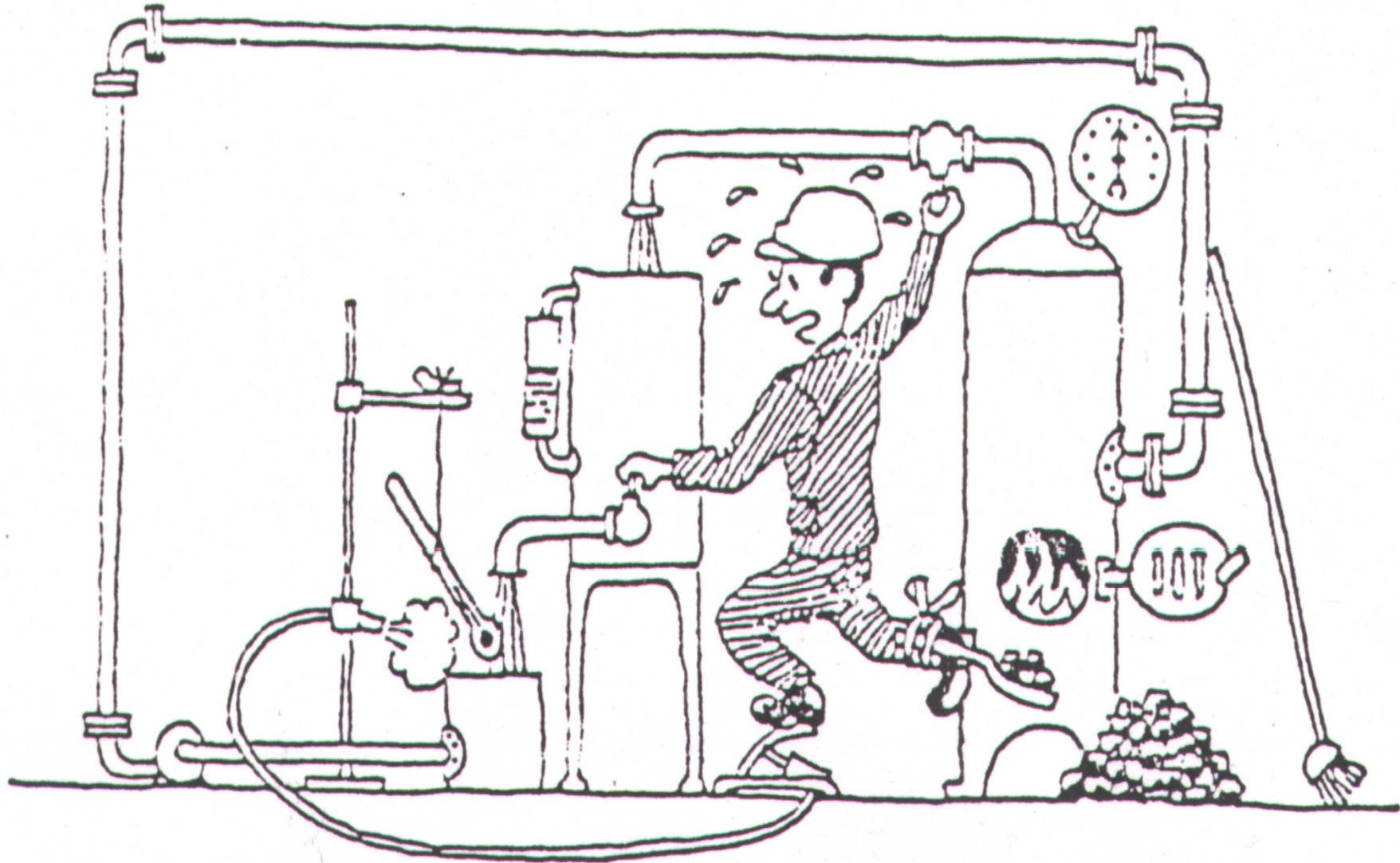
- **Open loop**
- **Closed loop**
  - Manual control
  - Automatic control

# Closed loop/ feedback/ manual control system

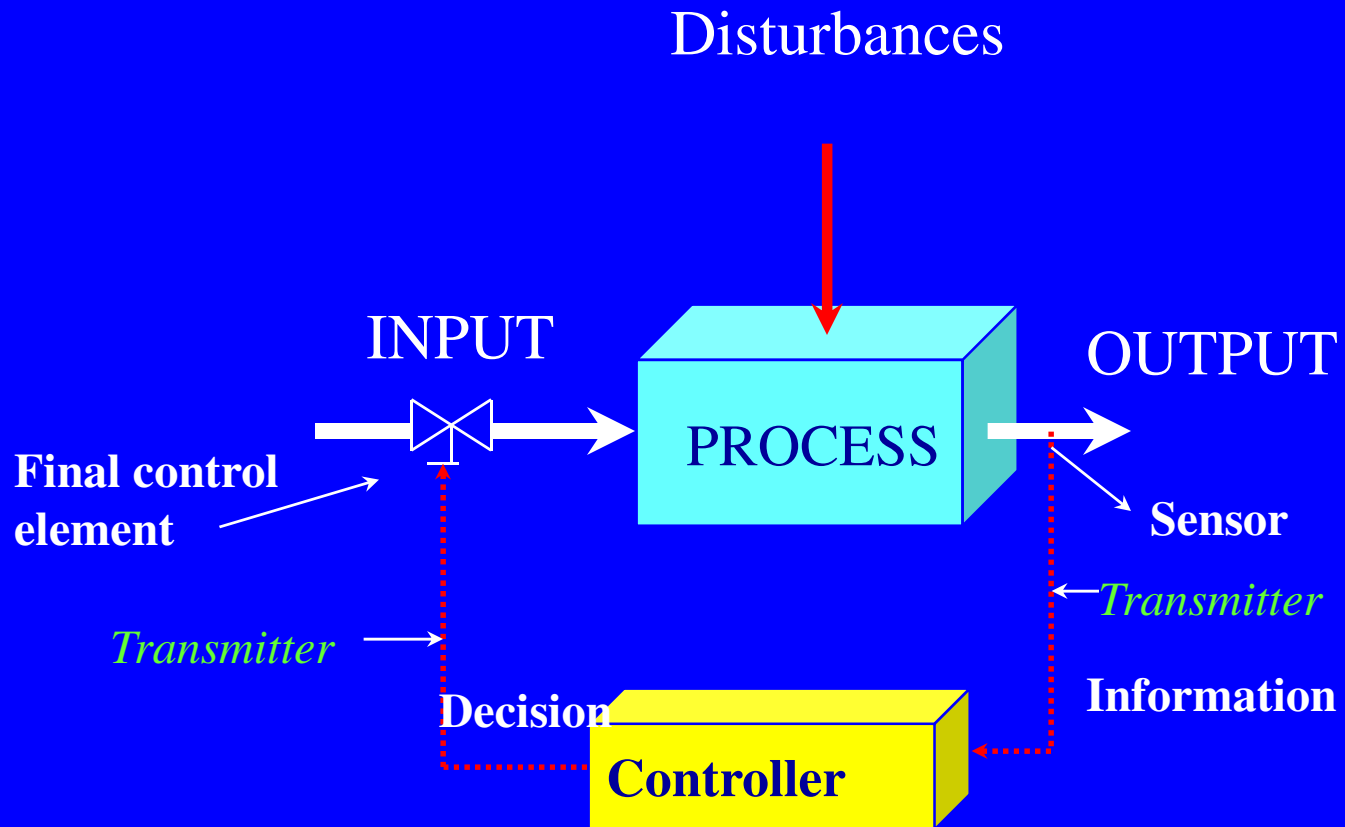


**Manual Control System**

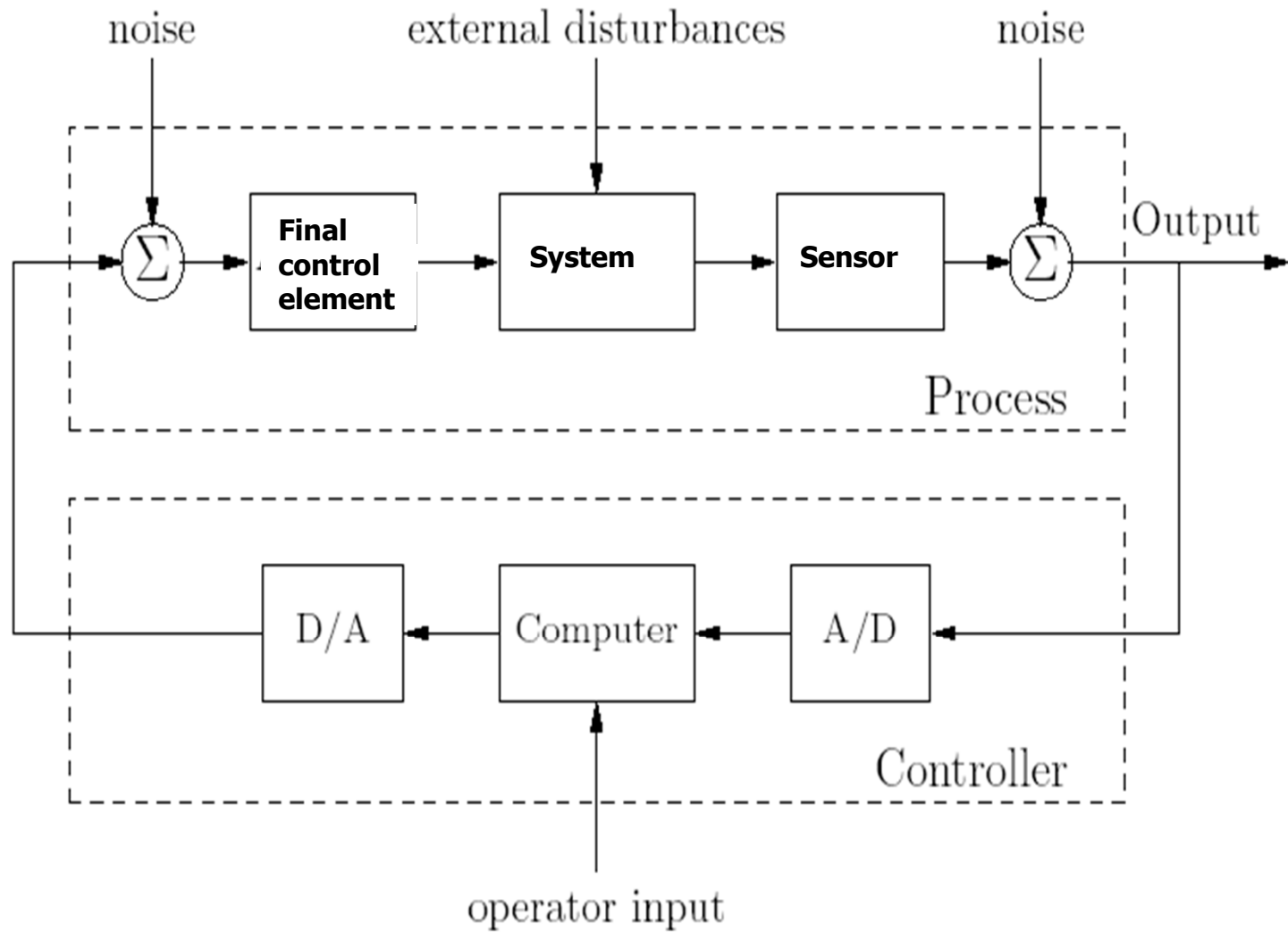
Its equivalence in the factory:



# Closed loop/feedback /automatic control system



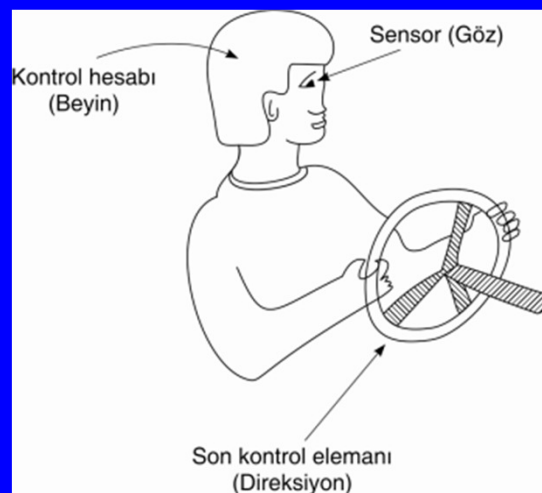
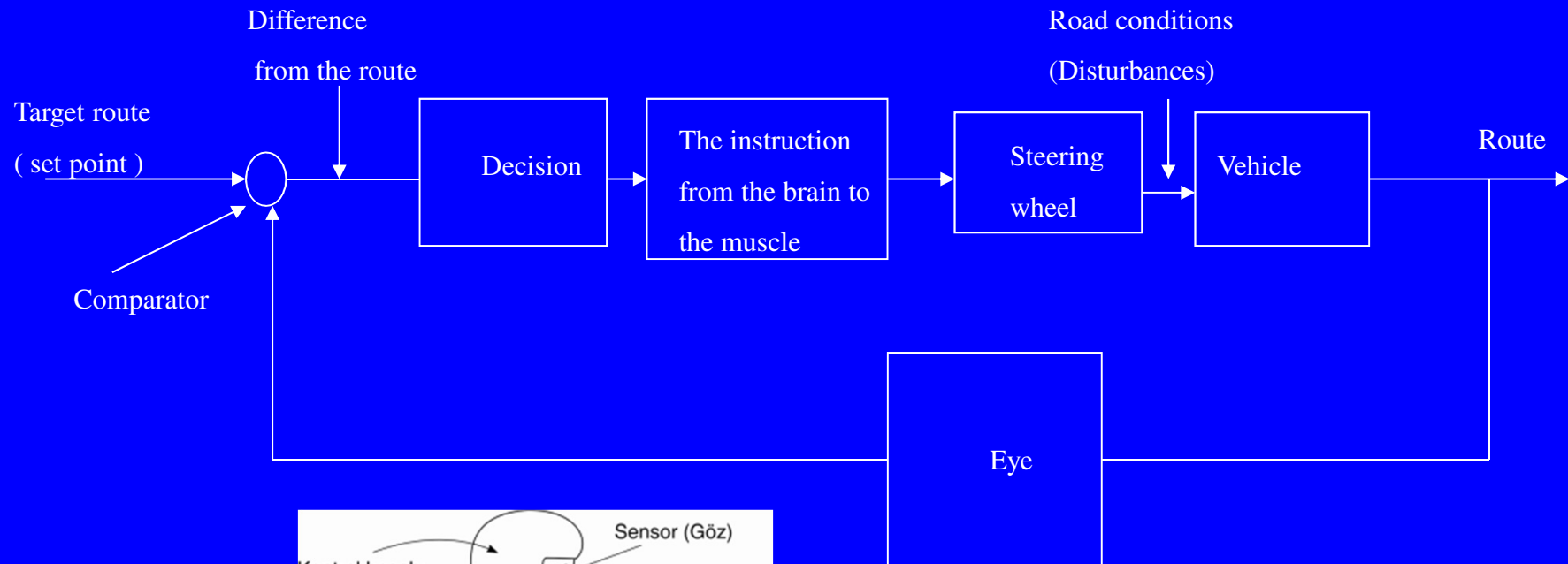
# Feedback control system





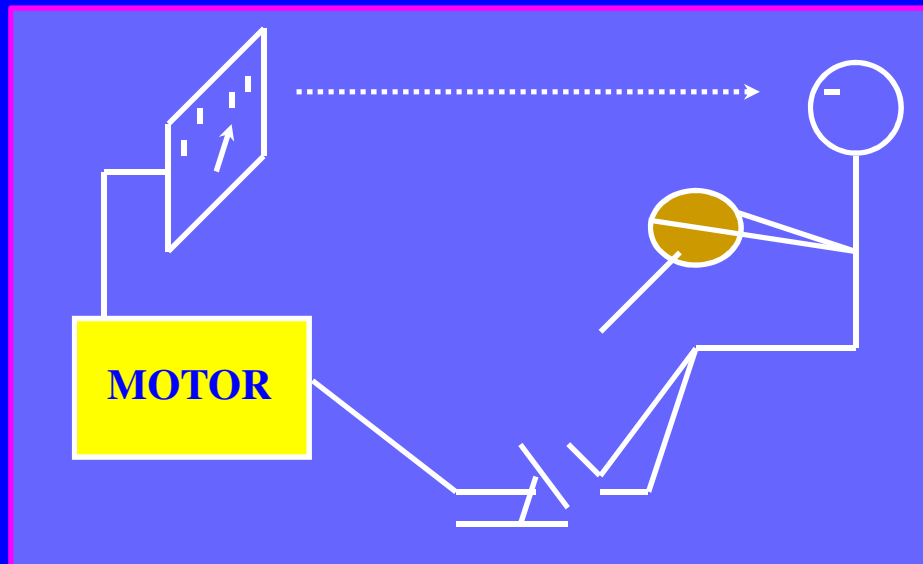
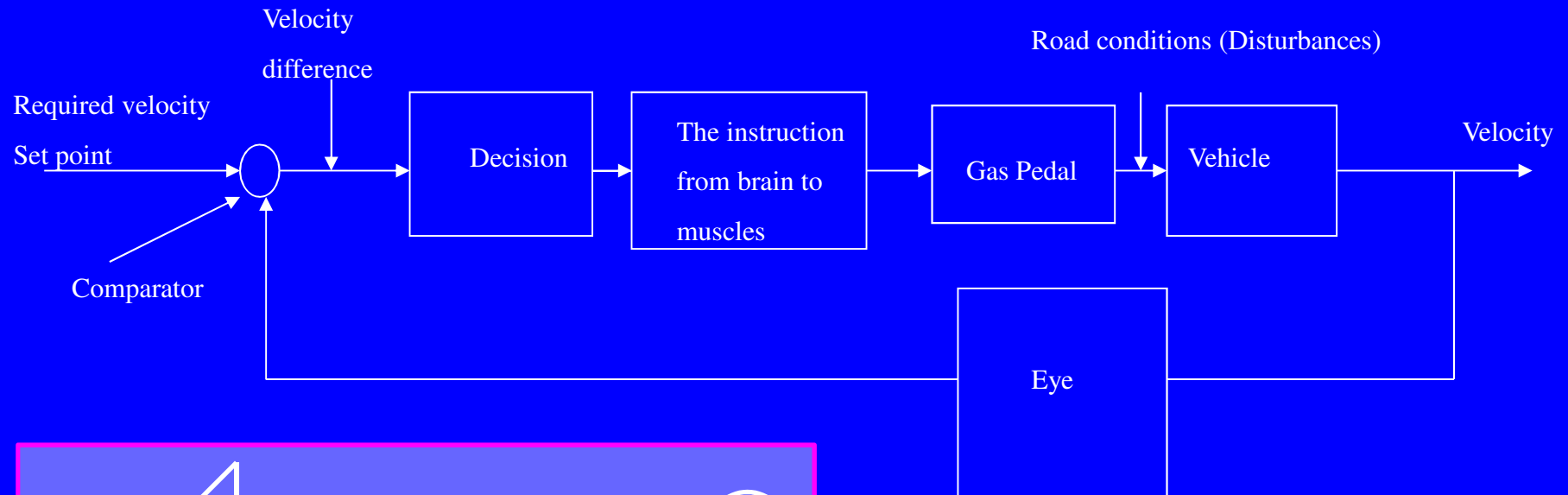
# Feedback control system

The block diagram of a system for proper motion of a vehicle



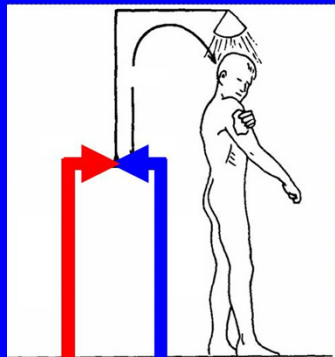
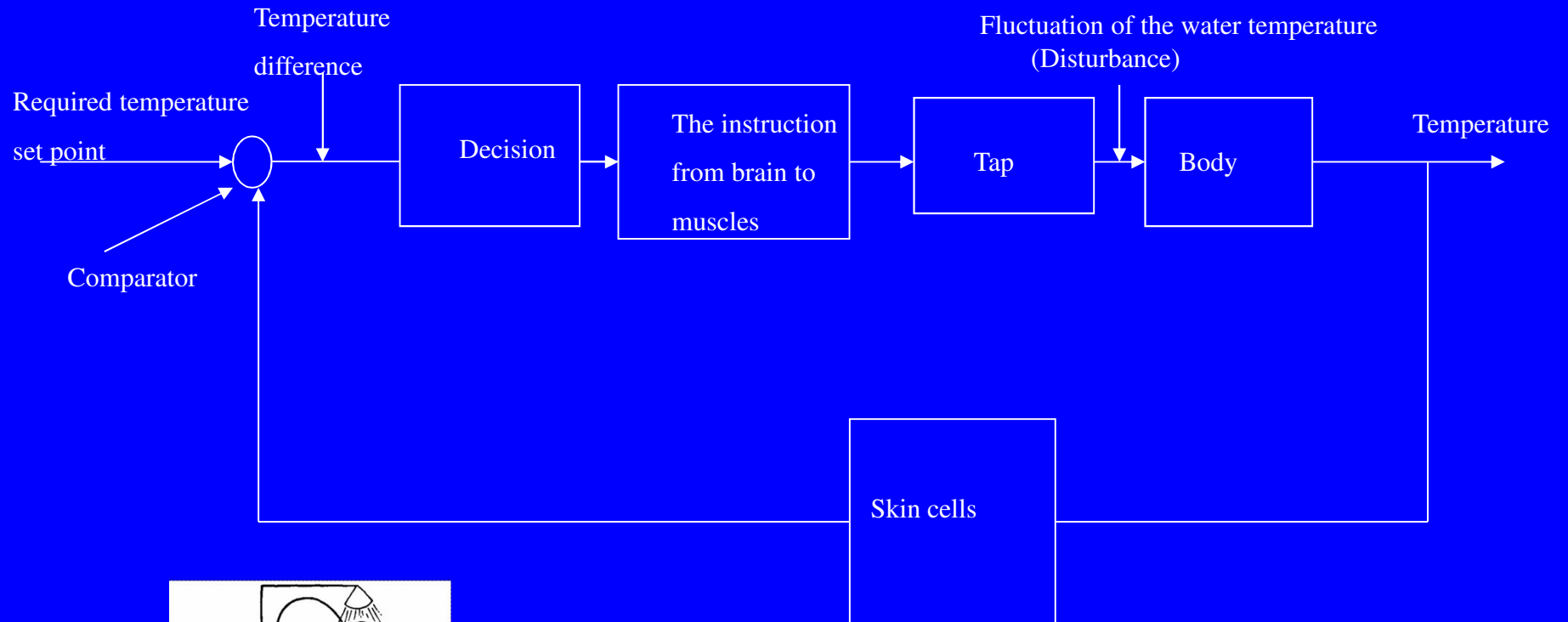
# Feedback control systems

## Block diagram of velocity system of a vehicle



# Feedback control system

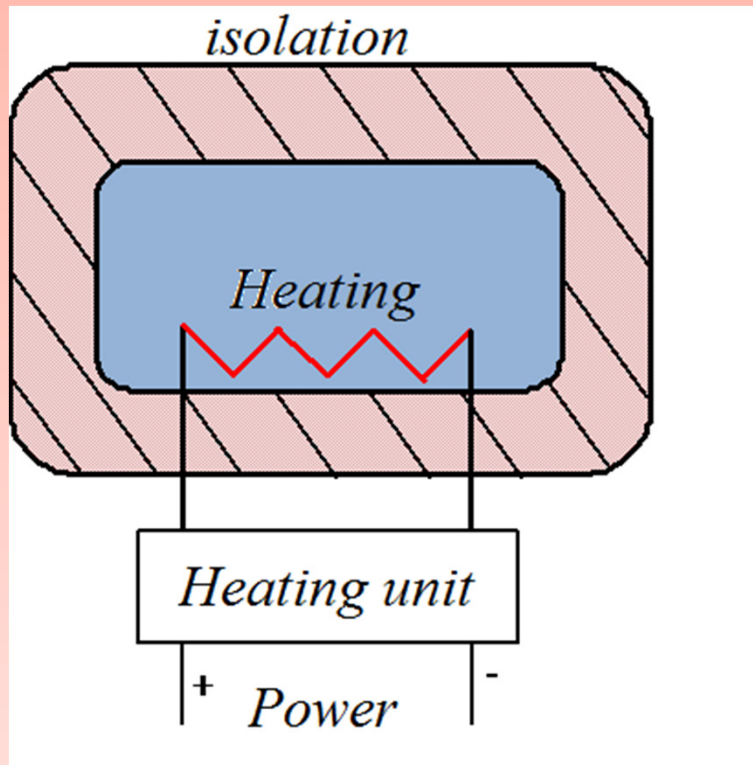
## Block diagram of a shower system



→ DUŞ SİSTEMİ

## ◆ An electrical oven

? **Question:** Can you detect a problem in the heating process (oven) below?



- No heat loss
- The power has a positive value

→ **There is no way to decrease the temperature.**