

Assignment 4: Solar panel control

Design and implement a device (using your Arduino with VIA-shield) that can control solar heating in a house.

The device measure temperature and controls a valve (using a servo motor) so cold brine is not led into the storage tank when it is cold, and the sun not shining. A pump is also controlled (LED).

The valve must close, and the pump stop when temperature drops below t_{low} , and when the temperature rises above t_{high} , the valve must open and the pump start.

The set points, t_{low} , and t_{high} are configurable by the user.

You should use the already implemented drivers for:

- ✓ Keys
- ✓ LEDs
- ✓ Display
- ✓ Analogue thermometer

You should write a driver for the Matrix keyboard.

Requirements:

The current temperature must be displayed on the numeric display.

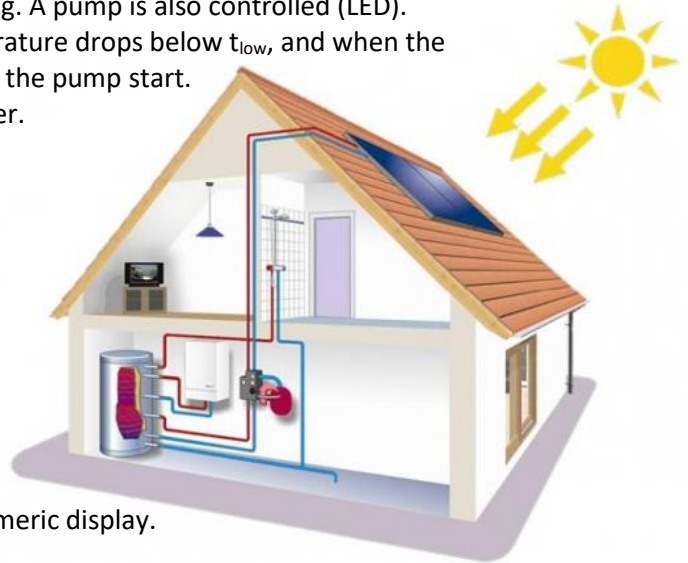
Pressing *switch 1* change the numeric display to t_{low} .

Pressing *switch 2* change the numeric display to t_{high} .

When the numeric display show t_{low} , or t_{high} the user can enter a new value on the matrix keyboard and save it by pressing '#' or cancel by pressing '*'.

Pressing *switch 3* change the numeric display to current temperature.

A LED must indicate whether the pump is running or not (you do not connect a real pump).



Optional:

- A servo must turn 90° clockwise when the t_{high} trigger point is reached and 90° counter-clockwise when the t_{low} setpoint is reached.
Servo, using PWM (see datasheet on last page). Study how to configure Fast PWM in the MCU datasheet
- Use a Timer to return to current temperature in the numeric display 5 sec. after t_{low} , or t_{high} have been shown/changed.

Hardware:

Arduino with VIA-shield (borrowed for this course)

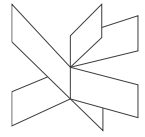
Matrix keyboard (from your Arduino set)

Servo motor (from your Arduino set)

Documentation

Inline comments.

UML class and activity diagrams.

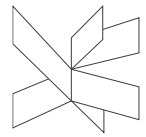


What to hand-in:

Alle source files and diagrams.

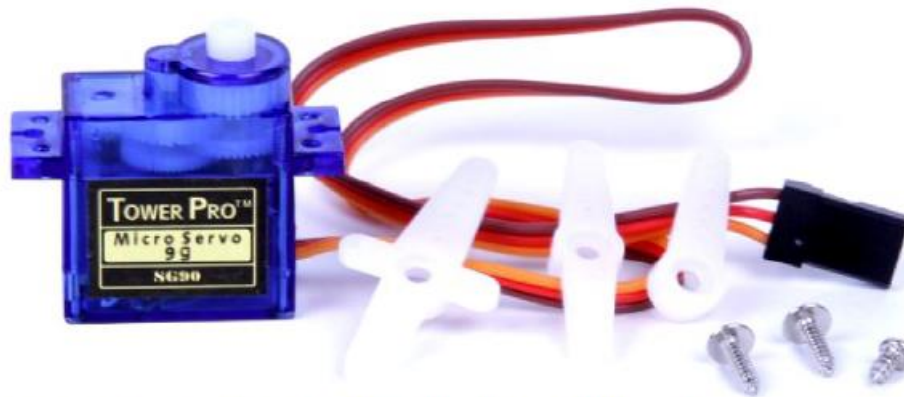
This assignment could be discussed at the exam and you must show and explain your solution at the exam on request.

You are welcome to work together with a classmate, but you will both be expected to know all details about the entire system.

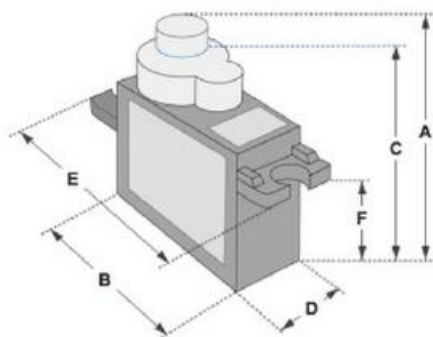


SERVO MOTOR SG90

DATA SHEET



Tiny and lightweight with high output power. Servo can rotate approximately 180 degrees (90 in each direction), and works just like the standard kinds but smaller. You can use any servo code, hardware or library to control these servos. Good for beginners who want to make stuff move without building a motor controller with feedback & gear box, especially since it will fit in small places. It comes with a 3 horns (arms) and hardware.



Dimensions & Specifications	
A (mm) :	32
B (mm) :	23
C (mm) :	28.5
D (mm) :	12
E (mm) :	32
F (mm) :	19.5
Speed (sec) :	0.1
Torque (kg-cm) :	2.5
Weight (g) :	14.7
Voltage :	4.8 - 6

Position "0" (1.5 ms pulse) is middle, "90" (~2ms pulse) is middle, is all the way to the right, "-90" (~1ms pulse) is all the way to the left.

PWM=Orange (⏏)
Vcc = Red (+)
Ground=Brown (-)

