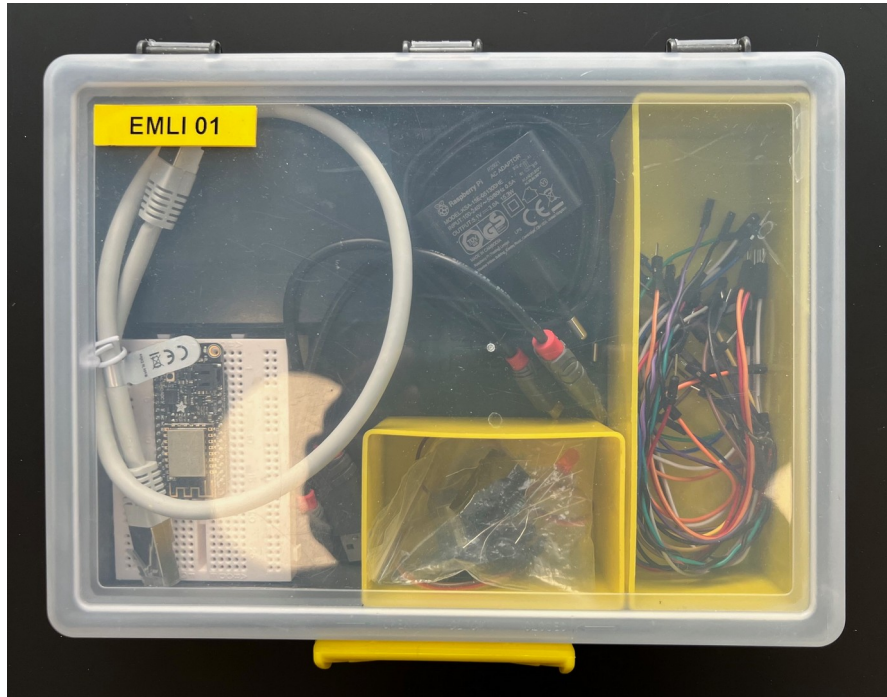


Embedded Linux (EMLI)

Course kit documentation



Version 2024-03-04, Kjeld Jensen kjen@sdu.dk

This document has been formatted for viewing on a phone or a similar small screen.

Important instructions

We aim to use only the best teaching materials. This requires that all students take good care of the materials. Please observe the following:

- **Keep the electronics safe** – disconnect USB cables before modifying the circuit. Double check everything before connecting the power. Please read information at the end of this document carefully.
- **No tools, no soldering, no wire cutting** - all exercises can be conducted with the materials in the kit and the prerequisites defined for the course. Tools are not needed and should not be used.
- **Return in same condition** - please return the kit in the same condition as you received it. Before returning please remove any surplus materials and make a full inventory check. Please inform the teacher if something is defective or missing.

Course kit content

Raspberry Pi 4

Please do not remove the Raspberry Pi 4 from the bottom enclosure.

The enclosure color may vary across kits

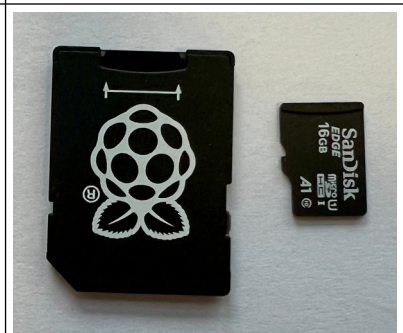


USB-C Power supply for Raspberry Pi 4



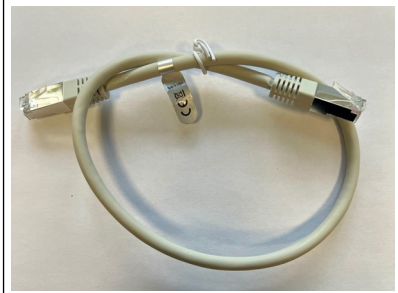
MicroSD Card SD to MicroSD card adapter

The card brand may vary across kits



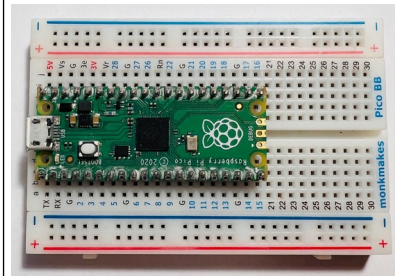
Short ethernet cable

The cable brand may vary across kits



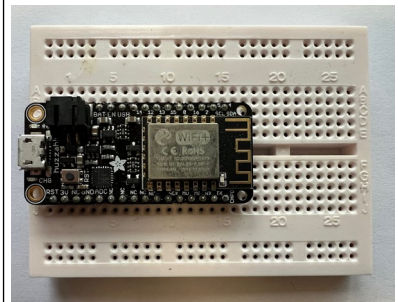
Raspberry Pi Pico on breadboard

Please do not remove the Pico from the breadboard



Adafruit Feather HUZZAH on breadboard

Please do not remove the HUZZAH from the breadboard



2 x Short MicroUSB cable

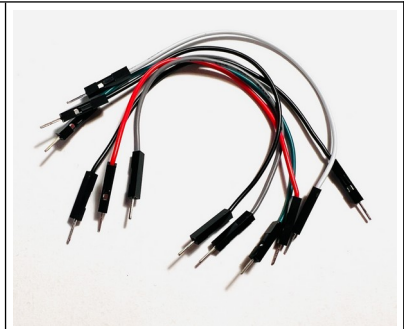
The cable brand may vary across kits



Jumper wires

Used to build circuits on the breadboard

We do not track inventory of the jumper wires. Extra will be available at the lessons.



2 x Light Emitting Diode (LED)

The longest pin is the **positive (+)** pin

If the LED has a flat side, this is closest to the **negative (-)** pin

Should be connected in series with a 220 Ohm resistor.

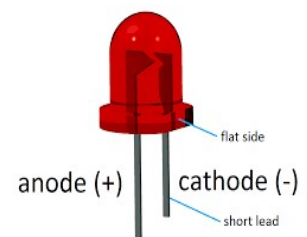
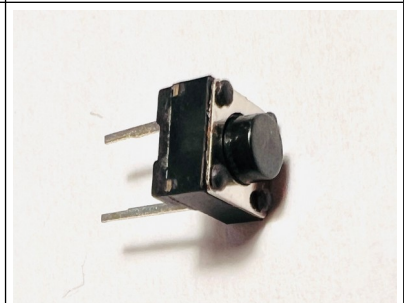


Image source:
<https://www.pinterest.nz>

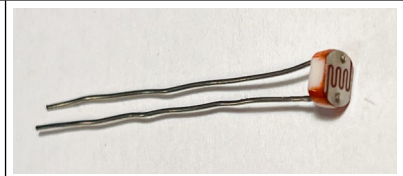
Push button

When pushed, the two pins are short circuited.



Light Dependent Resistor (LDR, Photoresistor)

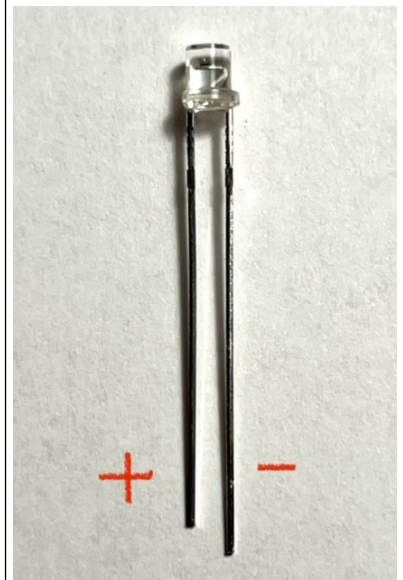
Should be connected in series with a 1 kOhm resistor.



Phototransistor

The shortest pin is the **positive (+)** pin (note this is different from the red LED)

Should be connected in series with a 10 kOhm resistor.



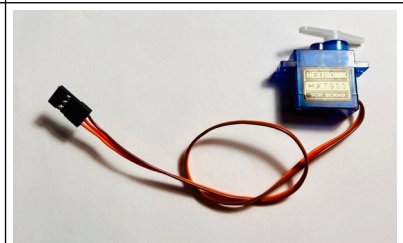
Piezo buzzer

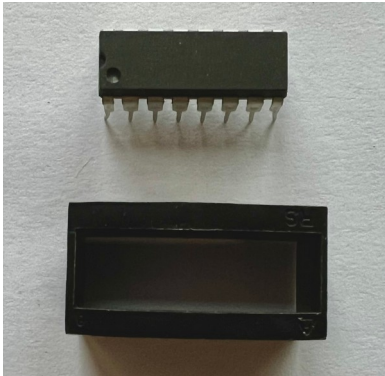
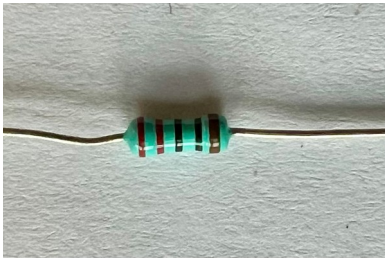
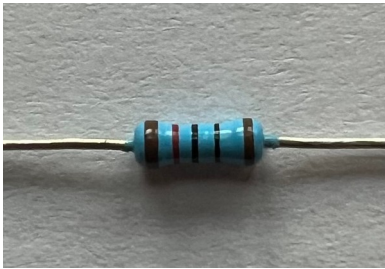
Some buzzers have a **+** mark on top or the side indicating the **positive** pin.



Servo motor

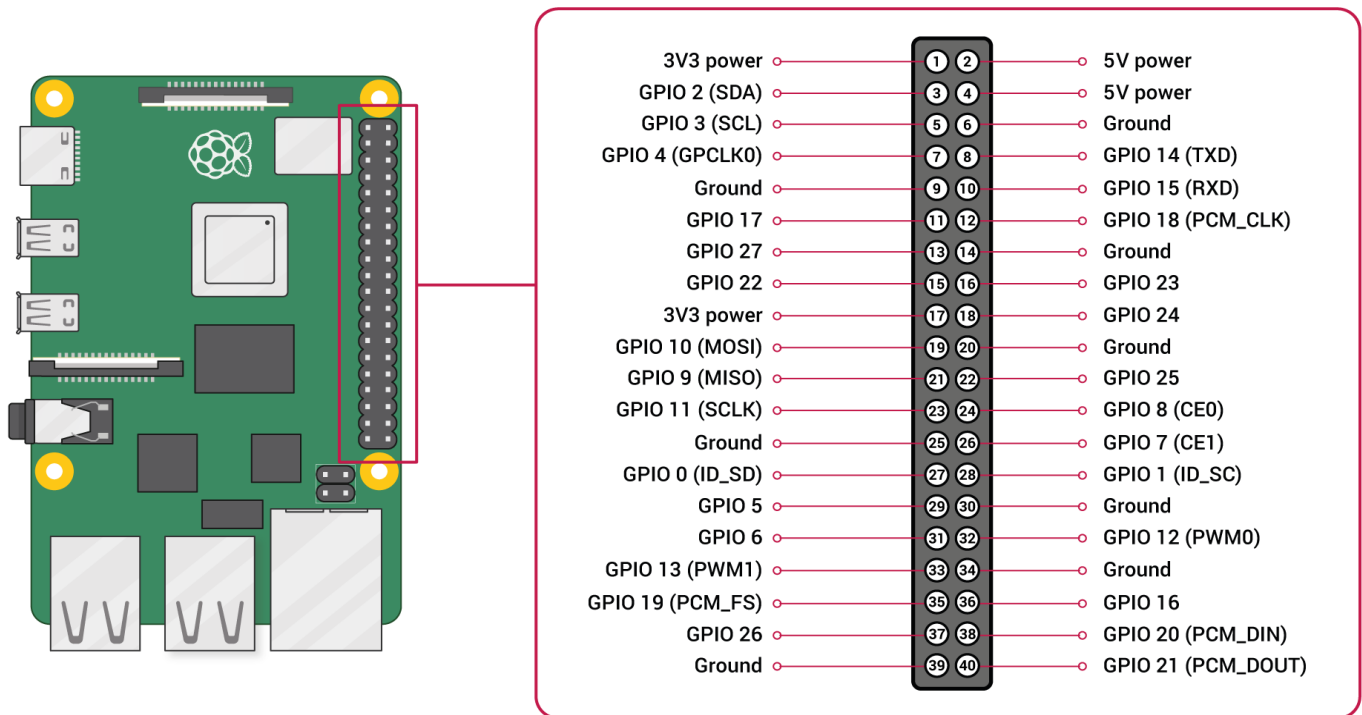
<i>Wire</i>	<i>Type</i>	<i>Pico pin</i>
Orange	Signal	GPIO
Red	+5V	5V



Brown GND G Signal should be connected to GPIO pin through a 10 kOhm resistor.	
MPC 3008 Analog to Digital Converter (ADC)	
2 x Resistor 220 Ohm Color code: red-red-black-black-brown	
1 x Resistor 10 Kohm Color code: brown-black-black-	

red-brown	
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Raspberry Pi embedded computer



Documentation:

<https://www.raspberrypi.com/documentation/computers/raspberry-pi.html#raspberry-pi-4-model-b>

Data sheet:

<https://datasheets.raspberrypi.com/rpi4/raspberry-pi-4-datasheet.pdf>

Image source:

<https://www.raspberrypi.com/documentation/computers/raspberry-pi.html>

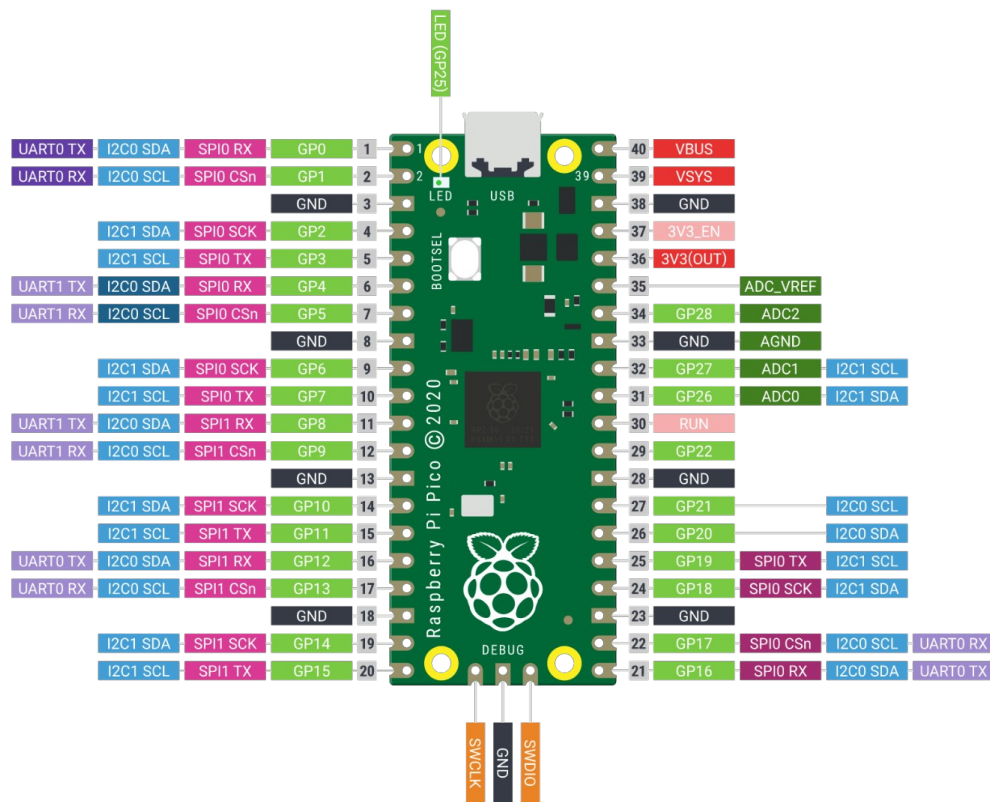
Raspberry Pi embedded computer



You can open the enclosure by gently pressing onto the two triangle symbols while lifting the lid upwards.

Please do not remove the Raspberry Pi from the bottom part of the enclosure

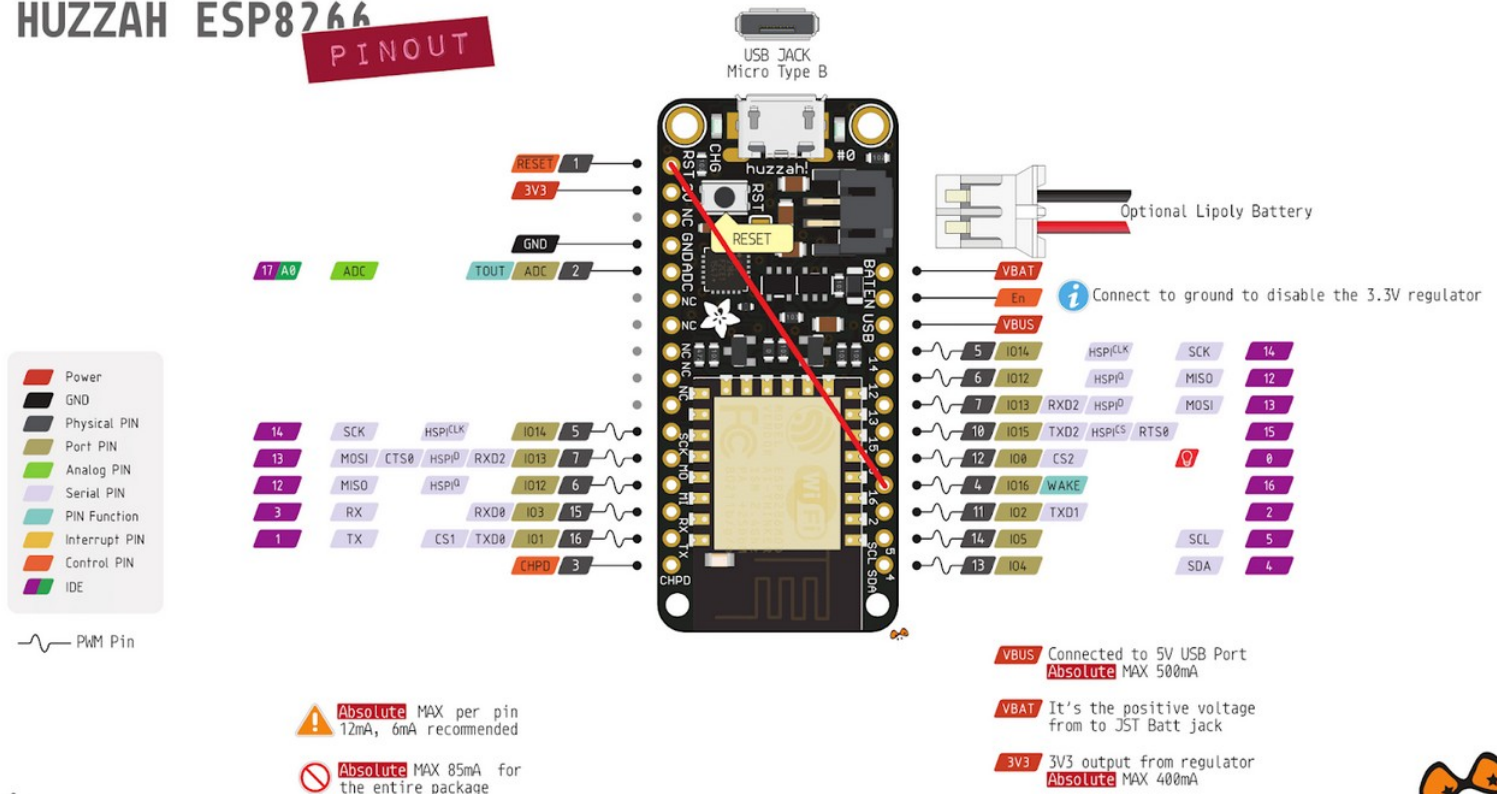
Raspberry Pi Pico microcontroller



Documentation:

<https://www.raspberrypi.com/documentation/microcontrollers/raspberry-pi-pico.html>

Adafruit Feather HUZZAH microcontroller



<https://www.adafruit.com/product/2821>



Documentation:

<https://adafru.it/2821>

Espressif ESP8266:

<https://www.espressif.com/en/products/socs/esp8266>

Adafruit Feather HUZZAH microcontroller

The Adafruit Feather HUZZAH is based on the ESP8266 microcontroller.

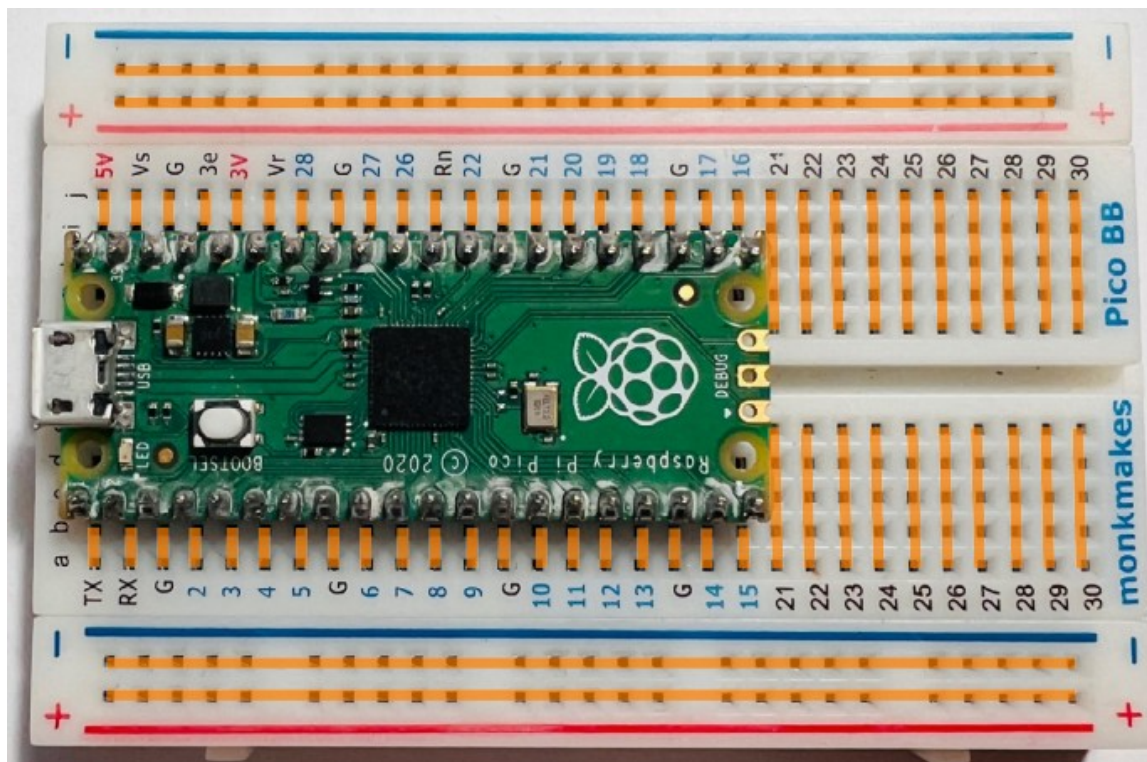
The ESP8266 Wifi module is 2.4 GHz only.

Please notice that the Arduino ESP8266 library supports WPA and WPA2 (Wi-Fi Protected Access protocol) but not WPA3.

Please do not remove the HUZZAH from the breadboard

Breadboard

The orange lines on the picture below shows how the pinholes are connected. These connections facilitate building up the experimental circuits using jumper wires.



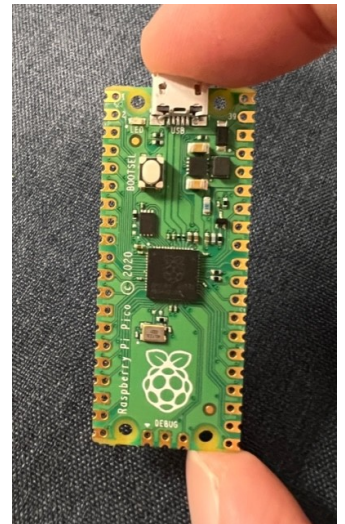
Please do not remove the microcontrollers from the breadboard.



Keeping the electronics safe

The highest risk is erroneously connected circuits. We all make mistakes, and it happens often in electronics. Please double check your circuit before connecting the USB cable, otherwise the electronics and maybe your computer may become defective.

When you handle a PCB please try to touch as little of the PCB as possible as shown in the picture. This lowers the risk of an electrostatic discharge (ESD) from your fingers destroying the electronics.



Please keep the electronics away from any liquids and food.

Please keep your hands clean while working with electronics, otherwise your hands may carry small residues of acid (e.g. from fruits) or other destructive substances.