

**MISB KIT**  
**DIY**  
**DOCUMENTATION**

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## INTRODUCTION

The MisB Kit is an open source building block kit that allows you to quickly create and animate physical objects without requiring any previous experience in engineering, coding or robotics. The kit is similar to a “high-definition” Lego, combining basic robotics — a custom made software, servomotors, sensors and microcontrollers, but also structural elements covered with Velcro and carbon or bamboo rods that are fully compatible and extremely easy and quick to assemble. More information about the kit can be found here: <https://misbkit.ensadlab.fr/misb-kit-elements/>

In this DIY document you will learn a few key steps to build the CM9 or “the brain” that allows to control and animate servomotors and manage information arriving from different kinds of sensors. We will start by setting up the “brain” by using a Cm9 microcontroller.

# CM9 MICROCONTROLLER SETUP

The CM9 is the central unit or what we often call the “brain” that allows to pilot and connect sensors and servomotors. The Cm9 receives and sends information from/to a laptop using WIFI signals. In order to build the “brain” let’s first check the materials you need to acquire.

## Material / Equipment

- CM9 microcontroller:

<https://www.robotshop.com/ca/en/32bit-opencm904-microcontroller.html>

- Wi-Fi Serial Module – ESP8266:

<https://www.robotshop.com/ca/en/wifi-module-esp8266-sfe.html>

- Motors – Dynamixel AX 12A:

<https://www.robotshop.com/ca/en/dynamixel-ax-12a-smart-servo-serial.html>

- Connectors – MOLEX 5267-03 (3 pin):

<https://www.reichelt.de/molex-stiftleiste-mini-spox-1x3-polig-stecker-molex-22035035-p185732.html>

- Motor cables:

<https://www.robotshop.com/ca/en/robotis-bioloid-3pin-cable-set.html>

- Battery and charger:

<http://www.robotis.fr/batteries-alimentation/112-batterie-lipo-lbs-10-111v.html>

<http://www.robotis.fr/batteries-alimentation/114-chargeur-batterie-lipo-lbc-10.html>

- Prototyping card:

<http://fr.farnell.com/roth-elektronik/re060-hp/circuit-imprime-fr2/dp/1172182?st=Pcb%20prototypage>

- Electrical cable

- Board-To-Board Connector:

<http://fr.farnell.com/multicomp/mc34763/embase-male-1-rangee-coude-20voies/dp/1593437?st=Connecteur%20carte-à-carte,%20Angle%20Droit,%202.54%20mm>

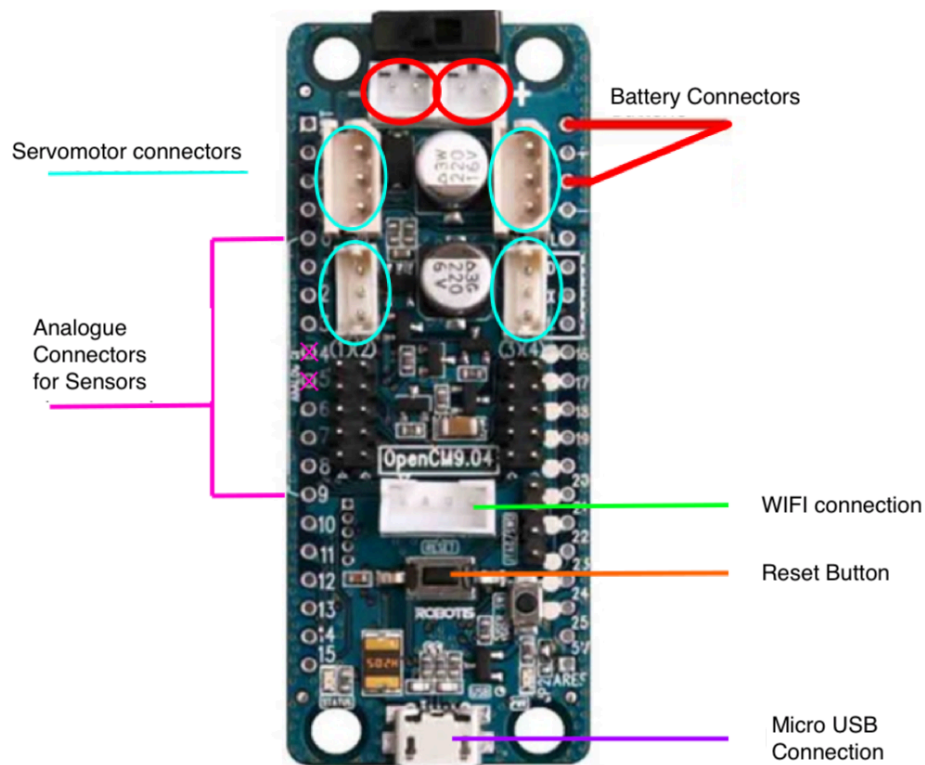
- Standoff threaded:

<https://fr.rs-online.com/web/p/entretoises-filetees/0222402/>

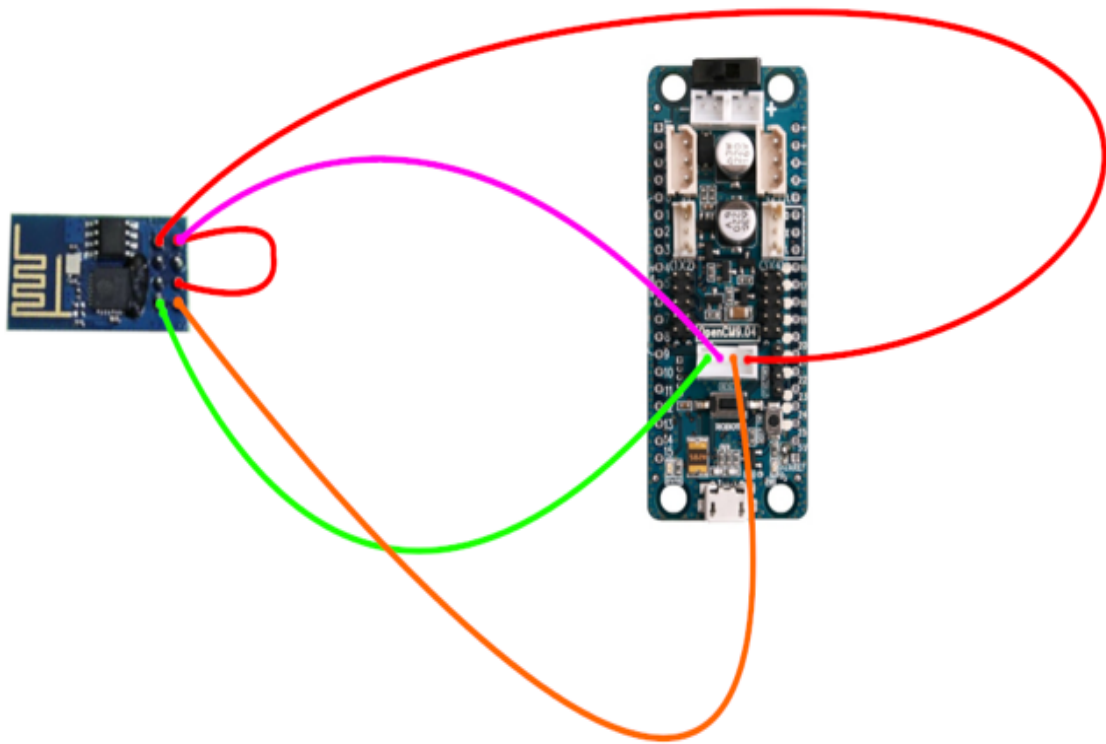
- Screws:

<https://fr.rs-online.com/web/p/vis-a-metiaux/5466196/>

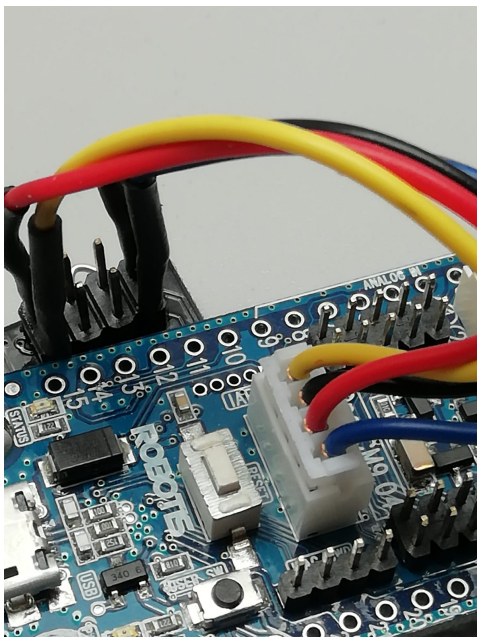
## STEP 1 — Connect WIFI module

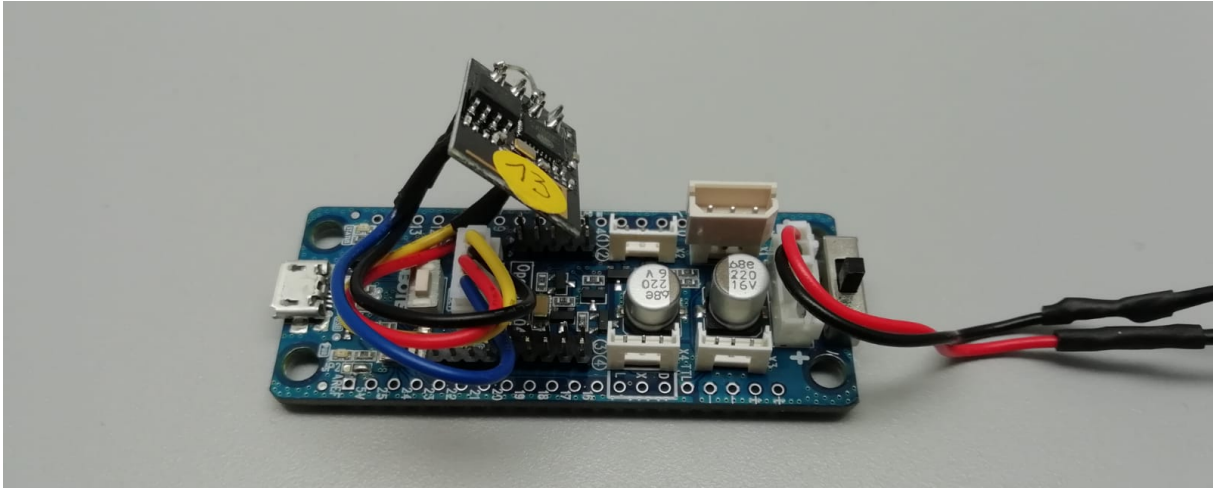


To start configuring the CM9, we suggest you start with the Wi-Fi module which is positioned on the white socket in the middle of the microcontroller. You will have to solder the ESP8266 Wi-Fi module (which communicates with the computer via a wireless connection) to CM9 as presented below:



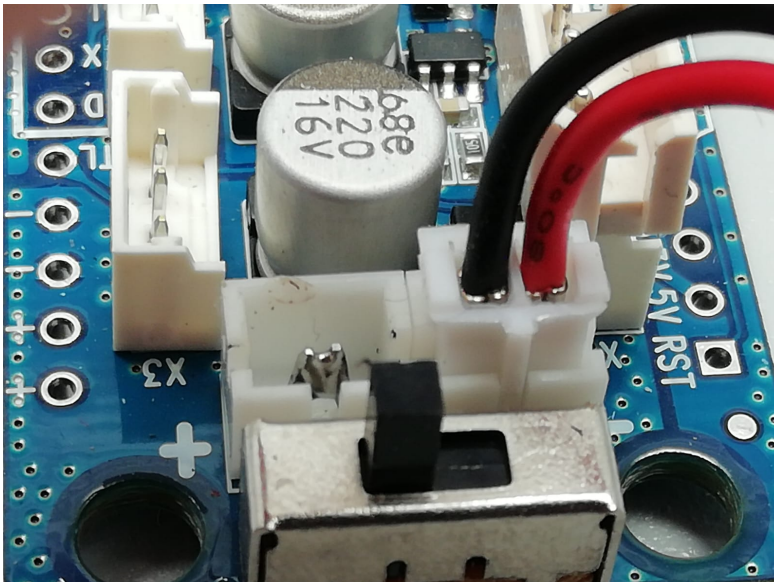
You can solder the 4 ESP8266 pins directly into the Open Cm9 pins however, it is recommended that you use a 4-pin socket. This socket will provide a more resistant and durable connection.



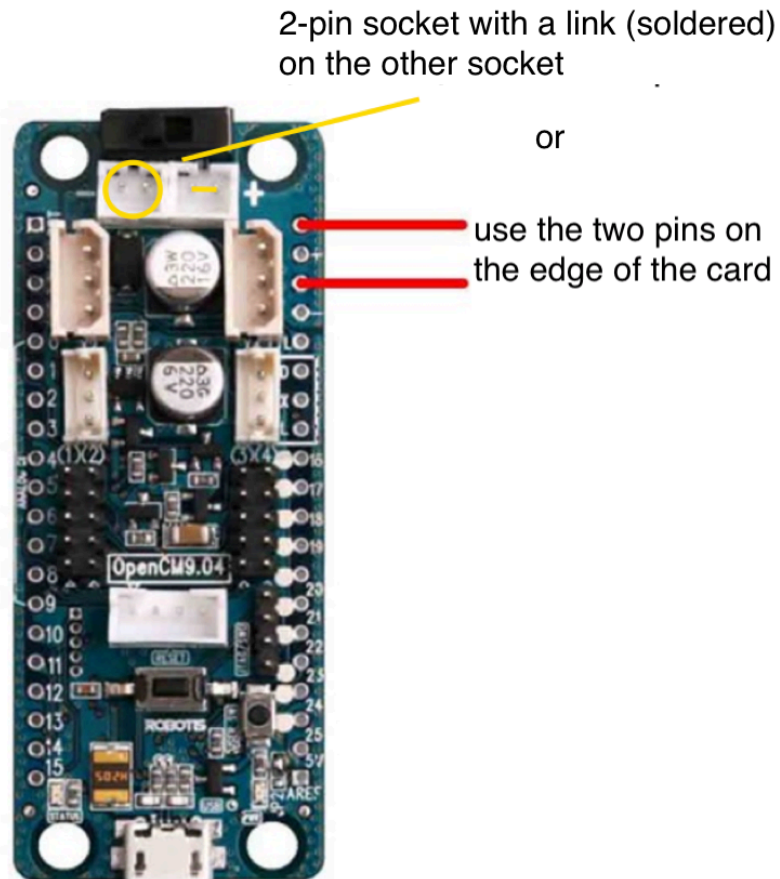


## STEP 2 — Connect battery cables to CM9

The Cm9 microcontroller needs power in order to feed the servomotors and the card itself, therefore you must solder the battery connectors to the (+) and (-) pins on the microcontroller. Nevertheless, if you use the plugs (in white) do not forget to invert your cables (+) and (-) because the power terminals of CM9 are inverted! If not, there is a risk of burning out your microcontroller. Moreover, only in this case, connect on the (-) side and cross over under the pins on the (+) side.



## Battery Connections

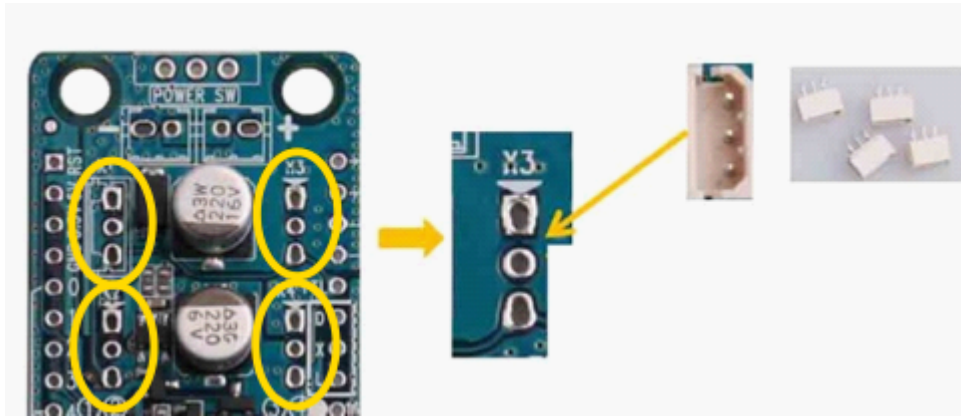


If you prefer to use the pins on the edge of the card (+ and - ), there is no need to reverse the cables.

### STEP 3 — Soldering the motor connector to the CM9

In order to connect the DYNAMIXEL servomotors to the CM9 you will now have to solder two MOLEX-5267-03 sockets the CM9. Spaces are provided for this purpose. Please make sure you solder it the right way as presented below:





## STEP 4 — Uploading the pilot to the CM9

You will need to upload a piece of code into the CM9 microcontroller to allow the connection with the computer.

Please proceed with the following steps:

1) Download Robotis Open CM on your computer:

[http://support.robotis.com/en/software/robotis\\_opencm/robotis\\_opencm.htm](http://support.robotis.com/en/software/robotis_opencm/robotis_opencm.htm)

2) Download misbkit\_cm9 code on your computer:

[https://github.com/EnsadLab/MisBKIT\\_CM9/tree/master/MisBKIT\\_cm9](https://github.com/EnsadLab/MisBKIT_CM9/tree/master/MisBKIT_cm9)

3) Connect the CM9 card to the computer using a micro-usb cable.

5) Open the Robotis CM9 software, then misbkit\_cm9 code.

6) Select the serial port (USB port of your computer to which you have connected the cable to the CM9 card) to upload the data.

7) Press the reset button + the round button next to it to format the card (indicator light green and steady).

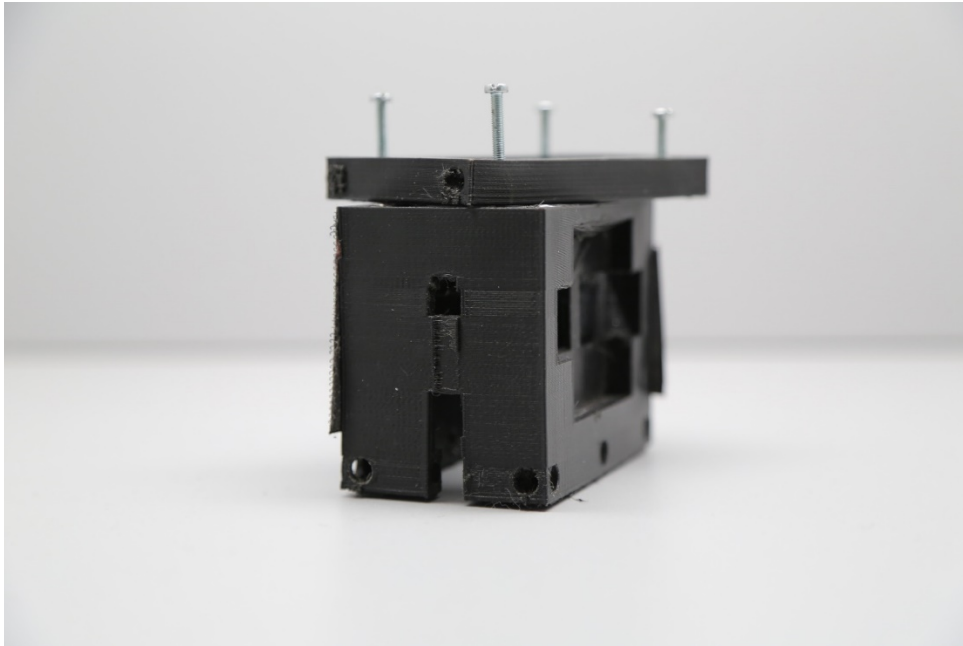
8) Upload the data. It should be good now!

## STEP 5 — Printing the CM9 case

In order to protect your CM9 microcontroller, we recommend you to build a flexible case. You can find the printable objects (case + cover) here:

In order to use certain structural elements such as carbon rods, you should print the case by using flexible filaments (PLA) such as: [https://www.machines-3d.com/en/ninjabflex-filament-500g-175mm-black-xml-367\\_397-1062.html](https://www.machines-3d.com/en/ninjabflex-filament-500g-175mm-black-xml-367_397-1062.html)

Once the objects are printed, you can use the threaded standoffs and the screws to attach the cover to the case.



## STEP 6 — Connecting CM9 to MisB Kit software

Once you have uploaded the code, you can connect the battery and a motor to the CM9 card. Press the reset button. The CM9 must be powered (indicator light flashing).

Then, you will have to switch on the Wi-Fi of your computer and log on to the Wi-Fi network created by the CM9.

The Wi-Fi network of your CM9 is named by default: "CM9-00" and the password is "ensad-mbk00". If you wish to change the name and the password of this network, you have to modify the Cm9Num of the code and upload again the code into CM9:

```
const char* routerSSID = "MisBKit00"; //Router ssid //TOTHINK changeable -->
EEPROM
const char* routerPswd = "ensad-mbk00"; //password

const int  cm9Num = 13;           //TOTHINK changeable --> EEPROM

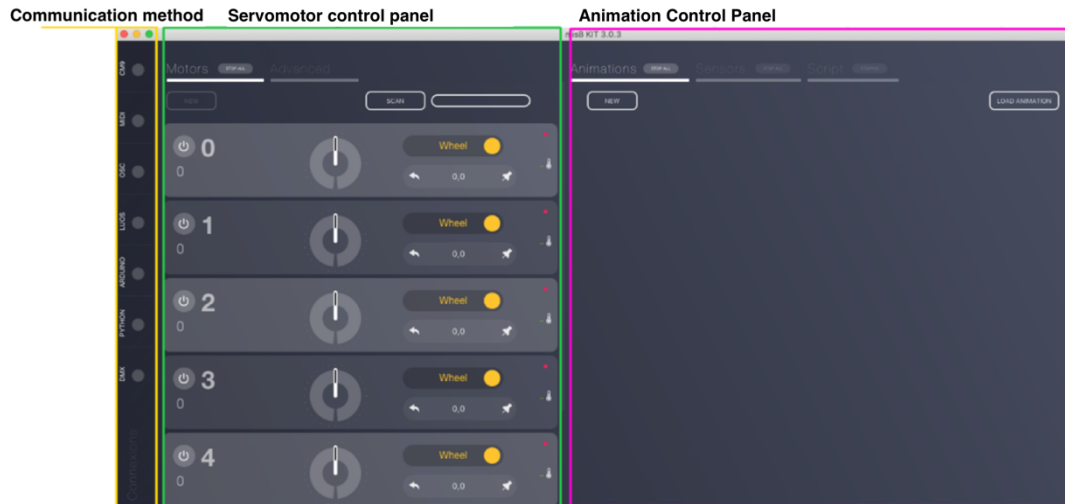
const int version[2] = {5,0};

char cm9Name[8] = "CM9_00";      //modifié par cm9Num
char cm9Pswd[16] = "ensad-mbk00"; //modifié par cm9Num
const char* routerSSID = "MisBKit00"; //Router ssid //TOTHINK changeable -->
EEPROM
const char* routerPswd = "ensadmbk00"; //password
```

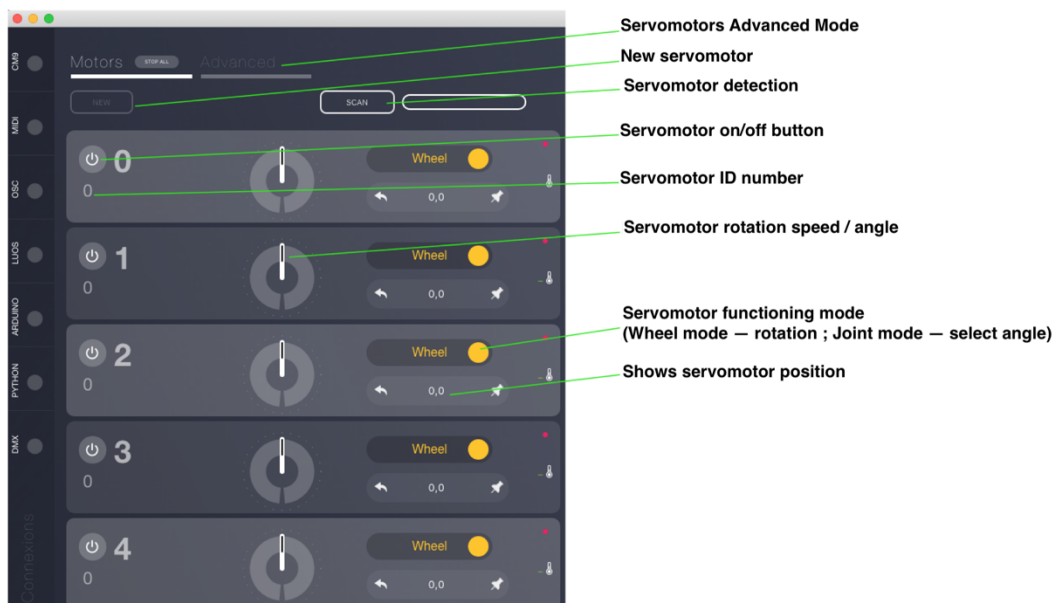
Once the WIFI connection is established you will be able to open the MisB Kit software and connect CM9 by pressing the button at the top left of the interface.

# MisB Kit Software Interface

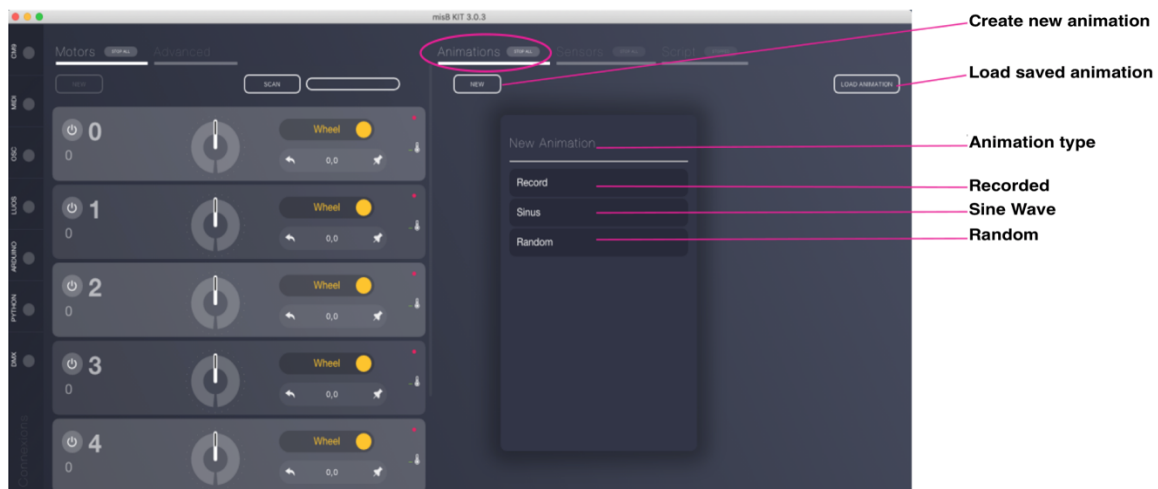
Download the latest MisB Kit version here: [https://github.com/EnsadLab/MisBKIT\\_js/](https://github.com/EnsadLab/MisBKIT_js/)



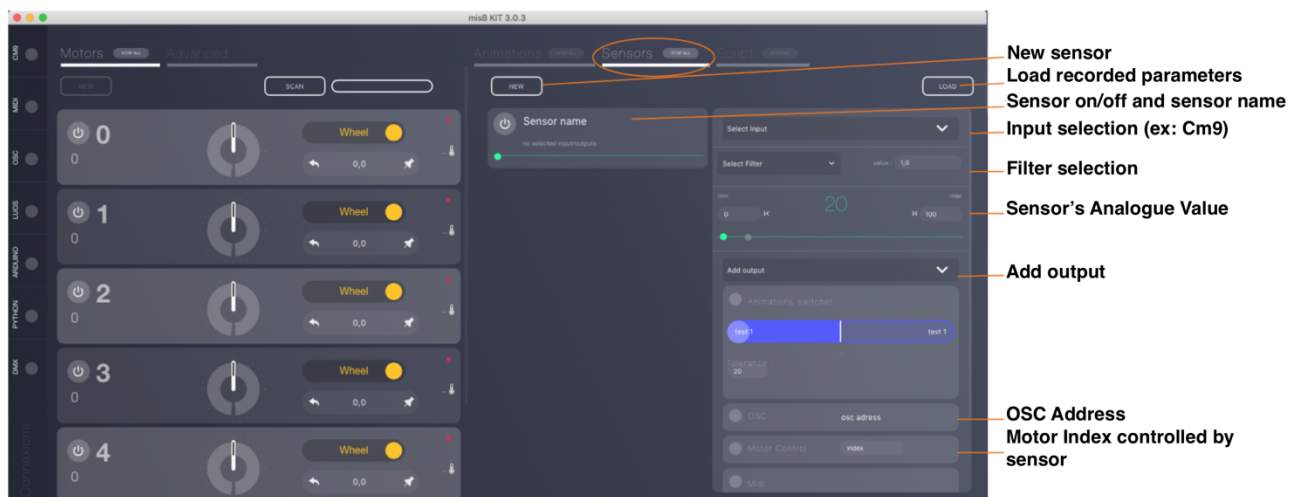
## Basic motor settings



## Animation management



## Sensor management



## Define motor ID

When motors are new, you have to assign them a numerical identifier (ID) to communicate with them. Choose different numbers for each motor.

1. Open the MisB Kit program
2. Click on "Advanced" in order to get to the motor's advanced settings (section 6.1.1.2.)
3. Right click on "ID:"
4. Enter your ID number in "Change ID:" (e.g. 6)
5. Press "Enter"

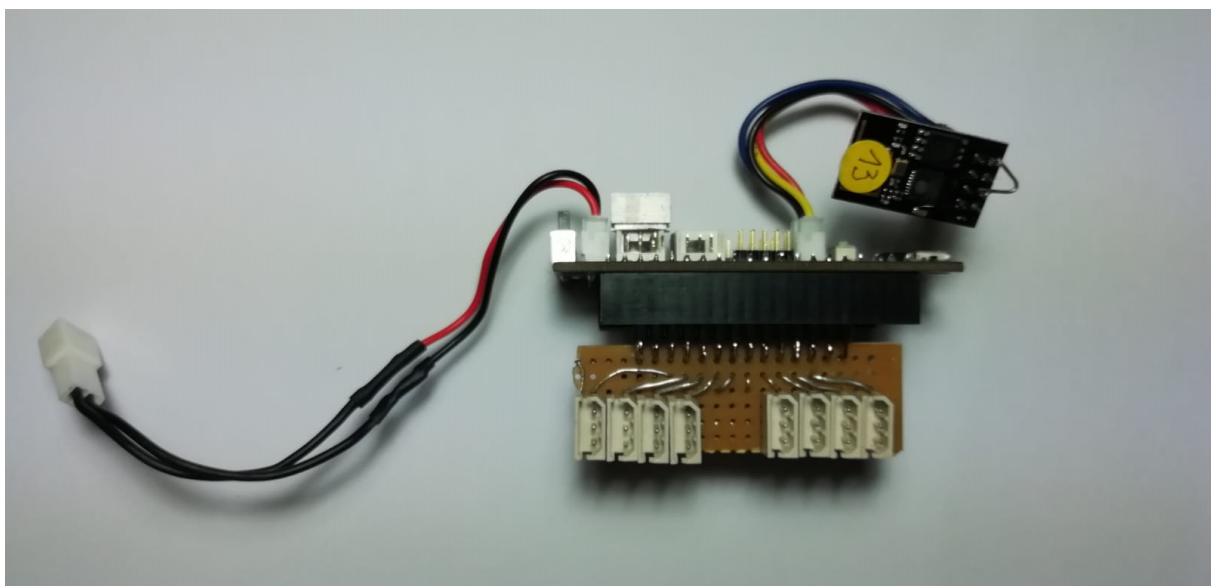
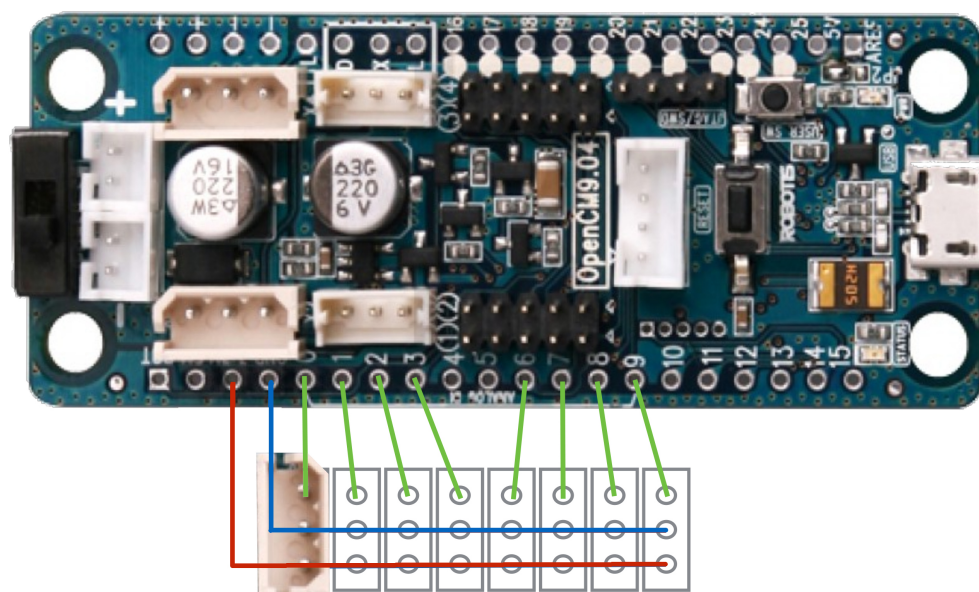
## SENSORS: Soldering connectors

To connect the sensors to the card, we must use a printed circuit board (PCB).

In fact, creating the base to connect the sensors limits the need to solder/desolder components directly onto the CM9 card. Thus, you will improve the lifetime of your components.

We use the same connectors as those used for motors (Molex).

Make sure to leave pins 4 and 5 free (always used by the Wi-Fi module).



# TESTING

## Controlling one or more motors

Once you have completed the preparatory steps you can start playing with the kit. For this purpose, you need to:

1. Connect the battery
2. Press the reset button until the green led no longer flashes in fast mode
3. Connect the CM9 to the software via the computer's Wi-Fi connection
4. Connect the motor to the Molex plug (as stated above)
5. Run a scan to detect the motor (ensure that it has the correct identifier)
6. Rotate the motor using the software (see video)

Check the video here: [Link soon](#)

To add more motors, simply connect the other motors in series to the first motor and then run a scan again in order for the interface to detect them.

## Controlling a motors with a sensor

Now that the motor is running, you can add a sensor. The objective is for the motor to run according to the sensor's signals. In this example, we have used a "flex sensor".

1. Turn on your motor
2. Connect a sensor to one of the Molex provided for this purpose (see the sensor section – 8)
3. Click on the "Sensor" tab on the top right corner of the interface
4. Click on "New"
5. Changer the sensor's name
6. Select "CM9" in "Select input" on the right side of the screen
7. Add the number of the analog pin connected to the sensor. On the left side of CM9, pins range from 0 to 3 then from 6 to 9. By default, pin 0 is selected.
8. Select "Motor control" in the "Add output" section. Check the motor index. You can connect several motors to one sensor as desired by repeating the "Add output" operation.
9. Click on the power symbol next to "sensor name"
10. Click on the power symbol of your motors to turn them on
11. Check the value range on the right side of your screen (analog values of the sensors). Adjust if needed

Check the video here: [Link soon](#)

## Creating my first behavioral object

Now that you have mastered the basics of the MisB Kit, you can create slightly more complex objects.

What you know:

- Starting the CM9 card
- Starting the software and using the interface
- Running a motor
- Operating a motor using sensors

Check this video to learn how to animate a motor: [Link soon](#)