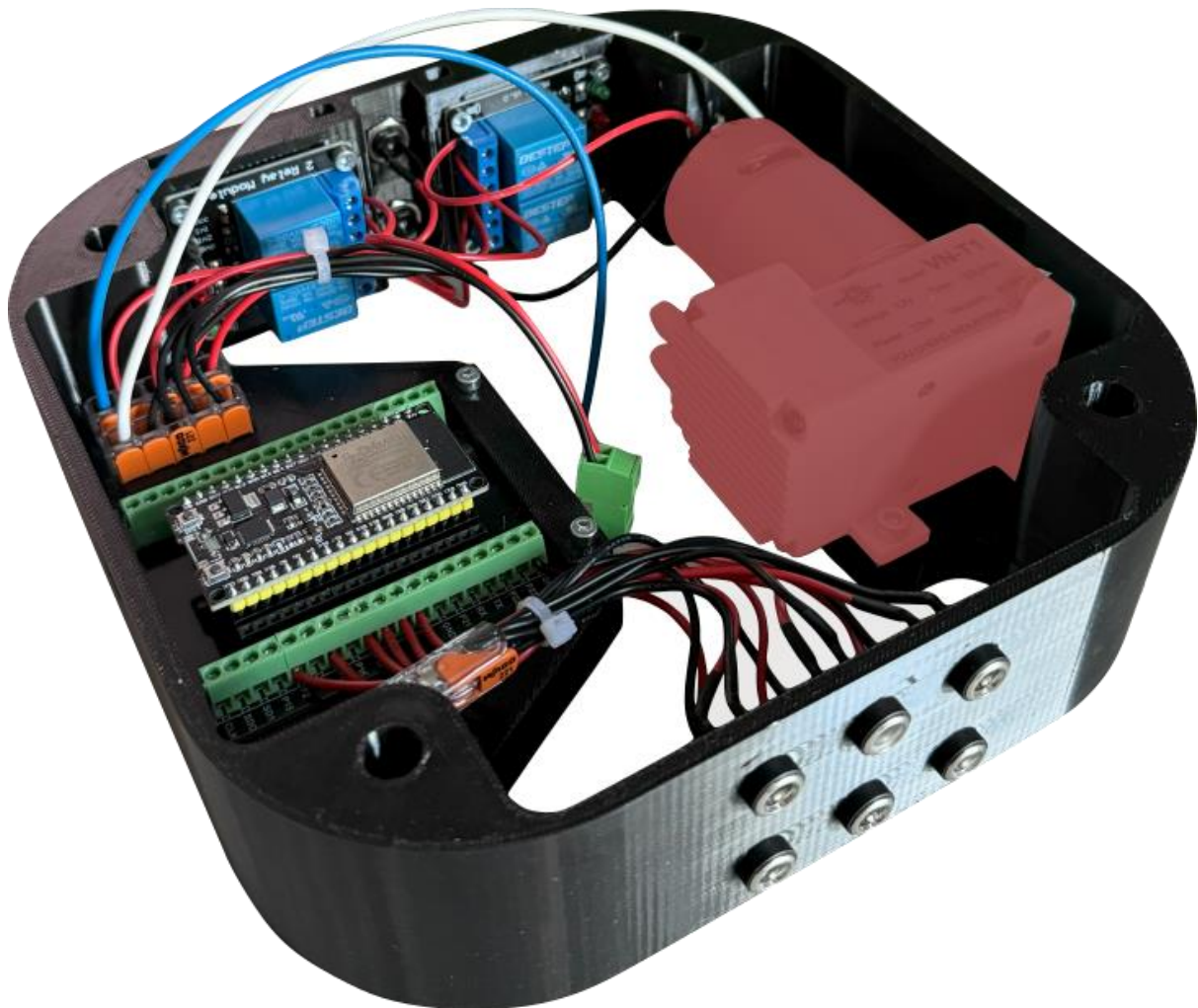


# Assembly guide:

## IO-box



Version 1.1

Date: 14-10-2024



## Revision:

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<b>REV</b>	<b>Date</b>	<b>Description</b>
<b>1</b>	2-7-2024	First release
<b>1.1</b>	14-10-2024	<ul style="list-style-type: none"><li>• Updated missing information<ul style="list-style-type: none"><li>○ Firmware installation</li></ul></li><li>• Updated parts:<ul style="list-style-type: none"><li>○ IO_BOX_01</li></ul></li><li>• Updated the assembly instructions</li></ul>

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## 1: Introduction

This document will describe how to assemble the IO box of the Miko-1 robot arm. Because this is the first version of the assembly guide, there might be some imperfections. We will try to resolve these as soon as possible. We apologize for any inconvenience you may encounter. If you find any mistakes in this document, please let us know by emailing us [info@mikobots.com](mailto:info@mikobots.com).

Using the robot is at your own risk.

To ensure the safe operation of the robot arm, you need to have sufficient knowledge of electronics. If you are unsure how to proceed, please do not attempt it and ask a professional.

All measurements in this document are in millimeters (mm) or specified otherwise.



## 2: Print files

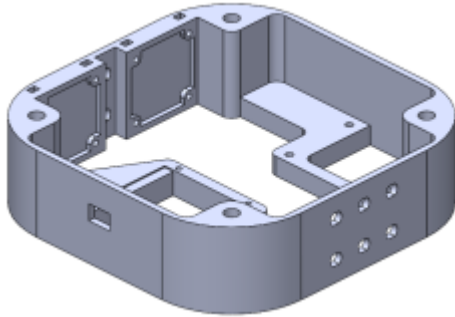
In this chapter you will find all the parts that you need to print for the Miko-1 robot arm. We recommend using PETG filament because it has a higher glass transition temperature than PLA and is still easy to print.

The general print settings that we have used for the parts are:

- Layer height: 0.2mm
- Walls: 2
- Infill: 20%

The tolerances used are as tight possible to achieve the best results. This means that sometimes you may need to use a little bit of force to assemble some parts. The given tolerance for certain parts, such as bearings, depends on the layer direction of the part. We have created a test part to check if your printer can print the parts with the given tolerances. If you encounter problems with the tolerance of any part, please let us know.

If you want access to the 3D files you will have to buy the digital files, or a kit.



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**Art. name:** IO\_BOX\_01

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**Revision:** 001

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**Quantity:** 1

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**Infill:** 20%

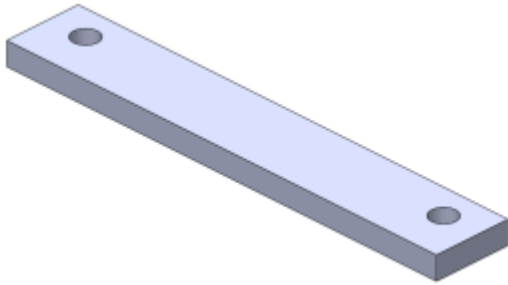
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**Walls:** 2

---

**Comments:**

Colour: Black



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**Art. name:** IO\_BOX\_02

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**Revision:** 000

---

**Quantity:** 1

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**Infill:** 20%

---

**Walls:** 2

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**Comments:**

Colour: Black



### 3: BOM

In this chapter, you will find all the parts that you need to buy for the robot arm. If you see any mistakes or have any questions, you can email us at [info@mikobots.com](mailto:info@mikobots.com) or ask the question in the Discord server. We have tried to provide a link to a shop for each component, but these links could change or become invalid. We will try to update the links regularly.

Please remember that you are solely responsible for ensuring the parts meet the safety requirements for your country.

Besides the parts in the BOM you also need some tyrap and some heat shrink tubing.

Before ordering the parts, it's recommended to first read the whole document.

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### Electronics

Name	QTY.	Description	shop
ELECTRONICS_003	1	Breakout board esp32	<a href="#">Link</a>
ELECTRONICS_004	1	ESP32 38 pin	<a href="#">Link</a>
ELECTRONICS_013	8	5.5 x 2.1 mm jack with cable 20 cm	<a href="#">Link</a>
ELECTRONICS_015	1	Micro usb cable 1.5m	
ELECTRONICS_016	2	Relay 3.3V 2 channel	<a href="#">Link</a>
ELECTRONICS_019	8	DC jack male Ø5.5 x 2.1	<a href="#">Link</a>
ELECTRONICS_020	2	Wago 221-415	<a href="#">Link</a>
ELECTRONICS_021	1	Wago 221-2411	<a href="#">Link</a>
ELECTRONICS_024	1	15EDGRK 3.81 02P Male and female screw	<a href="#">Link</a>

---

### Fasteners

Name	QTY.	Description	shop
DIN 912 M3x10	8	Hexagon socket Head Cap Screws M3x10	
DIN 912 M3x16	2	Hexagon socket Head Cap Screws M3x16	
DIN 912 M8x80	4	Hexagon socket Head Cap Screws M8x80	
ISO 4032 M3	10	Hexagon regular nut M3	

---

### Cables

Name	QTY.	Description	shop
CABLE_01	30 cm	Cable 2 wire, 22 AWG/ 0.34 mm <sup>2</sup>	<a href="#">Link</a>
CABLE_05	20 cm	Cable 0,75 mm <sup>2</sup> , 18 AWG, white	
CABLE_06	20 cm	Cable 0,75 mm <sup>2</sup> , 18 AWG, white	
CABLE_07	8	Dupont cable Female – Male 20 cm	<a href="#">Link</a>

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### Important note

- It is your own responsibility to ensure that the components meet the safety requirements in your country.

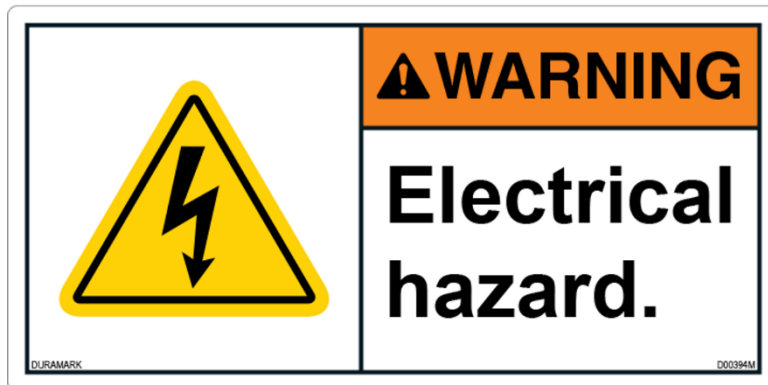


## 4: Schematic and wiring

In this chapter, you will find all the information regarding the schematic and electronics of the robot arm.

Please remember that you are working with electronics, and even though the robot arm operates at only 24V, there are still potential dangers. Incorrect wiring or mishandling of components can lead to short circuits, electric shocks, or damage to the robot arm and its parts. Always double-check your connections and follow safety guidelines. If you are not confident in your knowledge of electronics, please seek assistance from a professional to ensure safe assembly and operation.

You can find the schematic in the appendix.





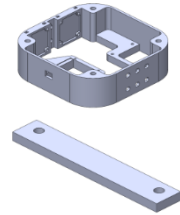
## 5: Assembly instructions

The instructions are written with care to include every step of the assembly process.

Before you start with assembly of the IO box first take a look at the assembly instruction of the robot arm, specifically step 27, 30, 31, 64, 65

## Step 1:

Items	QTY	Description
IO_BOX_01	1	
IO_BOX_02	1	
DIN 912 M3 x 16	2	Hexagon socket Head Cap Screws M3x16
ISO 4032 M3	2	Hexagon regular nut M3
ELECTRONICS_003	1	Breakout board esp32



### Instruction:

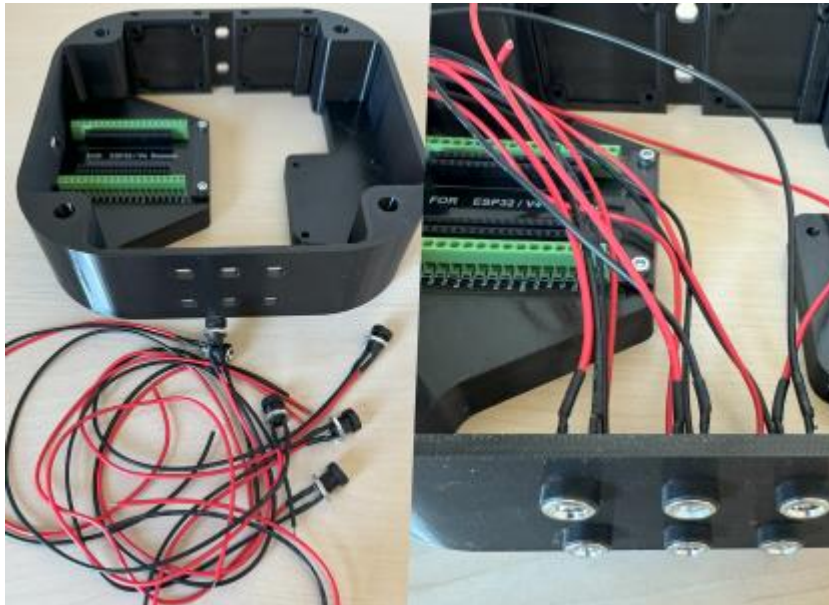
Press the M3 nuts in the back of the 3d printed part, next use the M3 x 16 with IO\_BIX\_02 to fasten the ESP32 breakout board. Make sure the ESP32 board is in the right orientation.



## Step 2:

Items	QTY	Description
ELECTRONICS_013	6	5.5 x 2.1 mm jack with cable 20 cm

### Instruction:

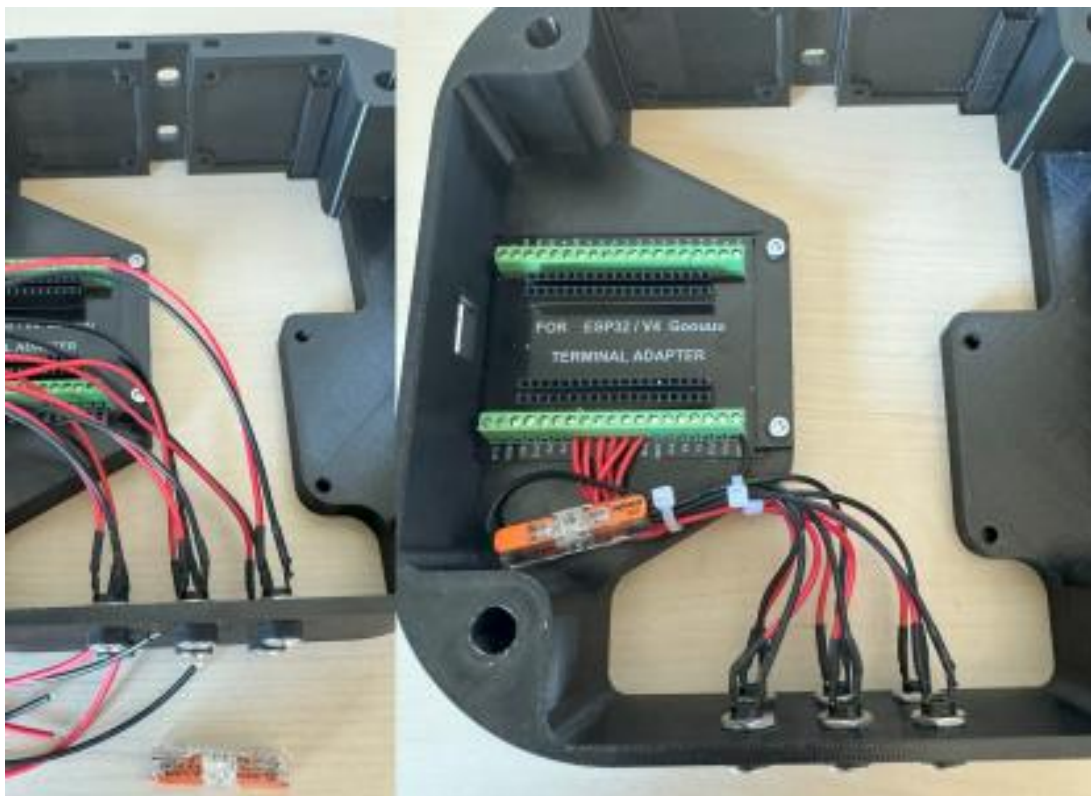


### Step 3:

Items	QTY	Description
ELECTRONICS_021	1	Wago 221-2411

**Instruction:**

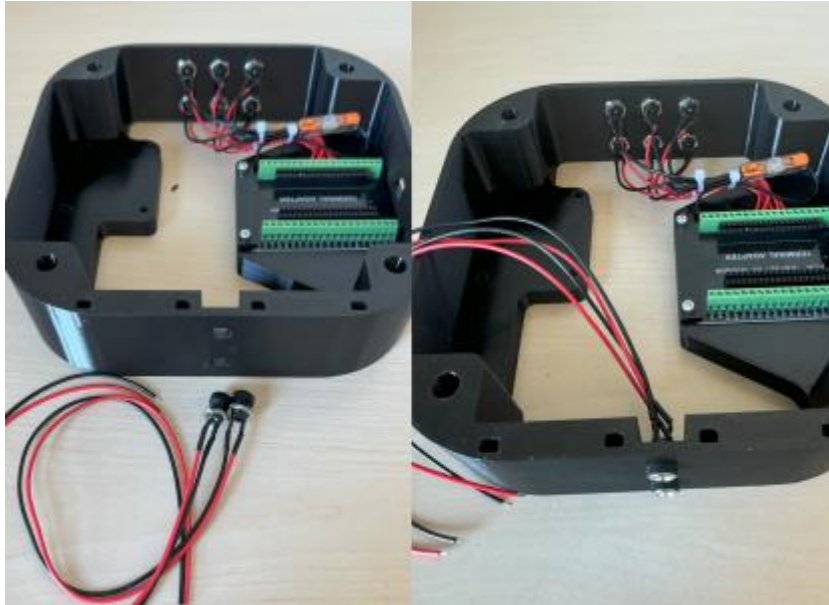
First insert the red cable of the 5.5 mm jack in to the right place and make it to the right length. Next shorten all the black cables and bind them together with the Wago clamp. Use a left over piece of the black cable to connect it from the wago clamp to the GND of the breakout board. Please study the electronics schematics on how to connect each wire.



## Step 4:

Items	QTY	Description
ELECTRONICS_013	2	5.5 x 2.1 mm jack with cable 20 cm

### Instruction:

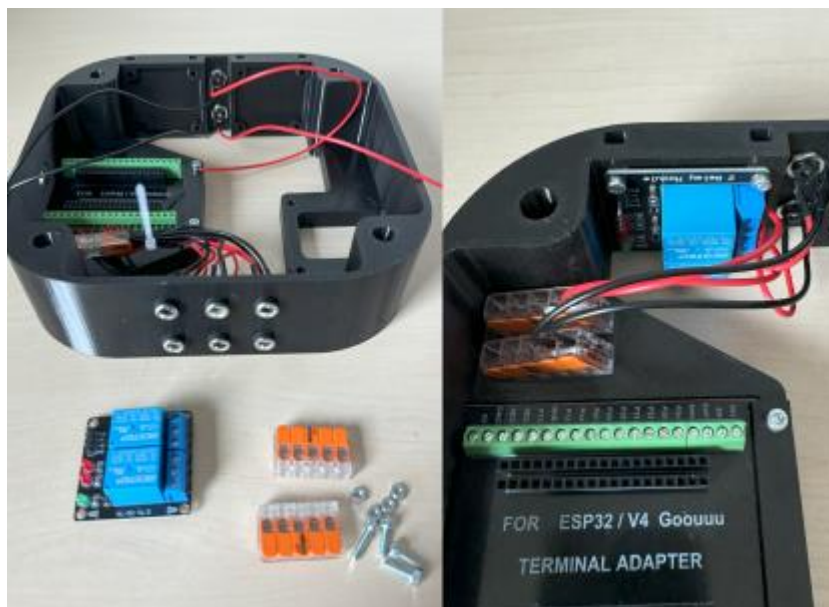


## Step 5:

Items	QTY	Description
ELECTRONICS_016	1	Relay 3.3V 2 channel
ELECTRONICS_020	2	Wago 221-415
DIN 912 M3 x 10	4	Hexagon socket Head Cap Screws M3x10
ISO 4032 M3	4	Hexagon regular nut M3

### Instruction:

Mount the relay to the 3d printed part using the M3 x 10 bolts and M3 screws. Next connect the black wire of the 5.5 mm jack to the wago clamp. After this connect the red wire of the 5.5 mm jack to the relay. Use the leftover red wire to make the connection between the relay and the wago clamp. Please study the electronics schematics on how to connect each wire.

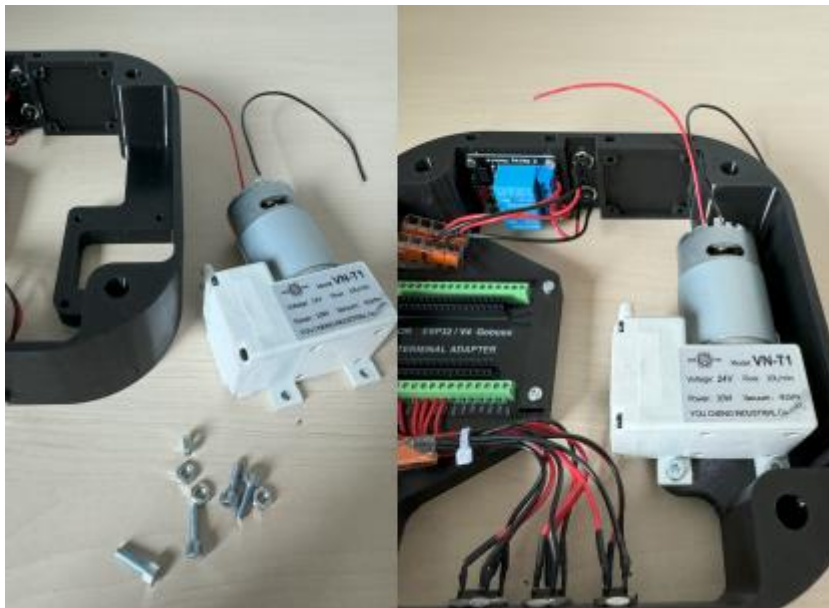


## Step 6:

Items	QTY	Description
ELECTRONICS_011	1	Vacuum pump 24V model VN-T1
DIN 912 M4 x 16	4	Hexagon socket Head Cap Screws M4x16
ISO 4032 M4	4	Hexagon regular nut M4

### Instruction:

These parts are not included in the IO box kit but in the vacuum tool kit  
 First solder the wire to the motor wire is delivered with the Vacuum tool. Next mount the vacuum pump using the M4x16 bolts and the M4 nuts.



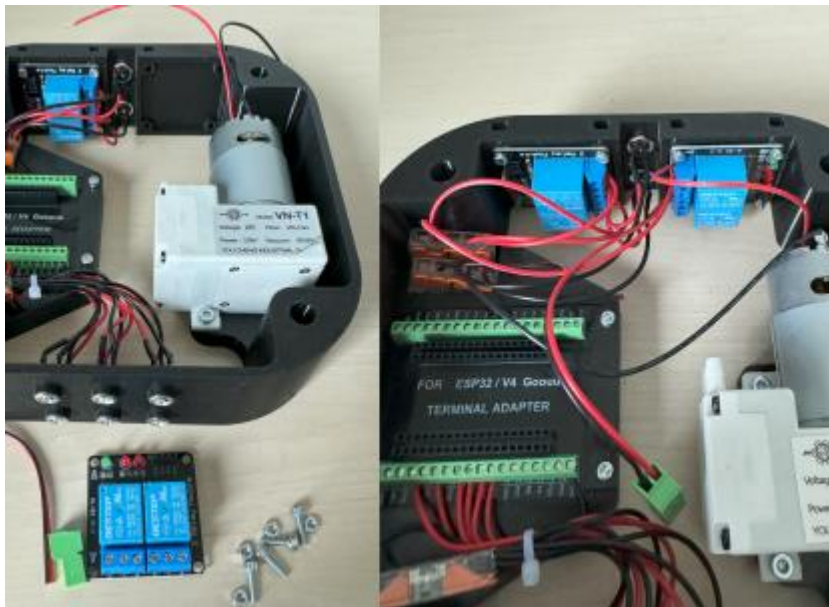


## Step 7:

Items	QTY	Description
ELECTRONICS_024	1	15EDGRK 3.81 02P Male and female screw
ELECTRONICS_016	1	Relay 3.3V 2 channe
CABLE_01	12 cm	Cable 2 wire, 22 AWG/ 0.34 mm <sup>2</sup>
ISO 4032 M3	4	Hexagon regular nut M3
DIN 912 M3 x 10	4	Hexagon socket Head Cap Screws M3x10

### Instruction:

Mount the relay to the 3d printed part using the M3 x 10 bolts and M3 screws. Next connect the black wire of the vacuum pump to the wago clamp, and connect the red wire to the relay. Use the leftover wire to make a connection from the relay to the wago clamp. Please study the electronics schematics on how to connect each wire.

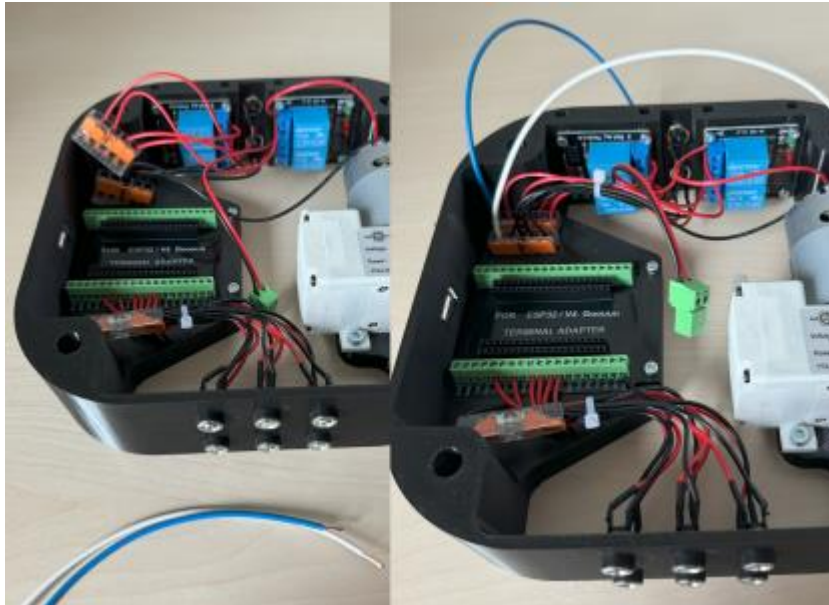


## Step 8:

Items	QTY	Description
CABLE_05	1	Cable 0,75 mm <sup>2</sup> , 18 AWG, blue
CABLE_06	1	Cable 0,75 mm <sup>2</sup> , 18 AWG, white

### Instruction:

Connect the blue + and white – wire to the wago clamp

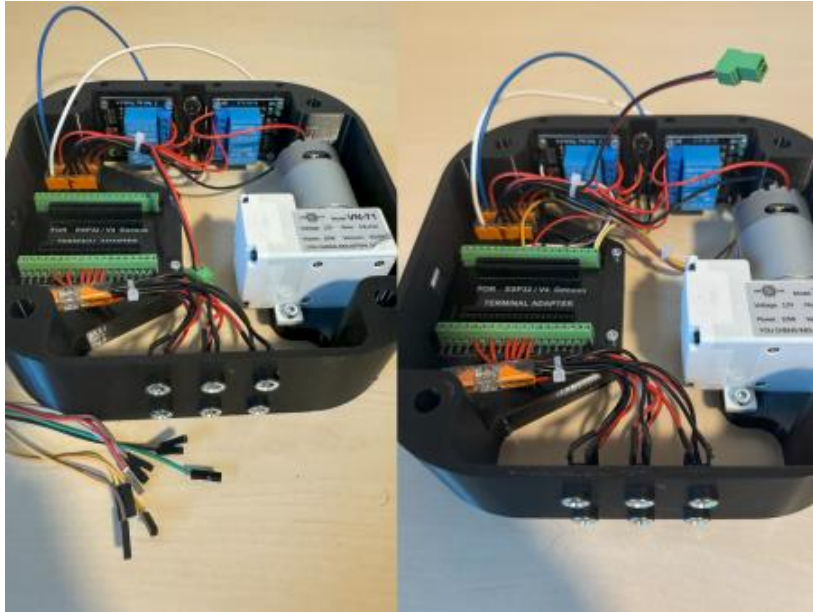


## Step 9:

Items	QTY	Description
CABLE_07	8	Dupont cable Female – Male 20 cm

### Instruction:

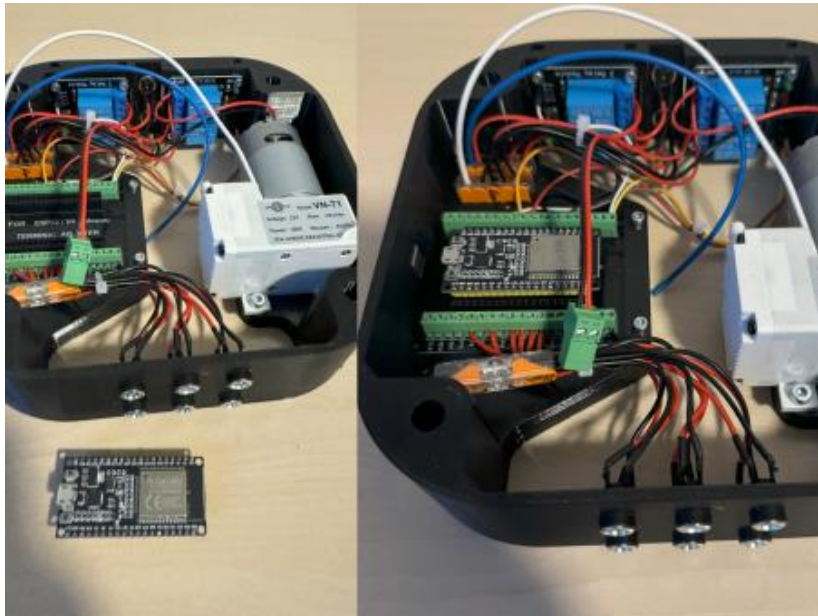
Use the Dupont cable to connect the relay to the breakout board of the ESP32. Please study the electronics schematics on how to connect each wire.



## Step 10:

Items	QTY	Description
ELECTRONICS_004	1	ESP32 38 pin

### Instruction:

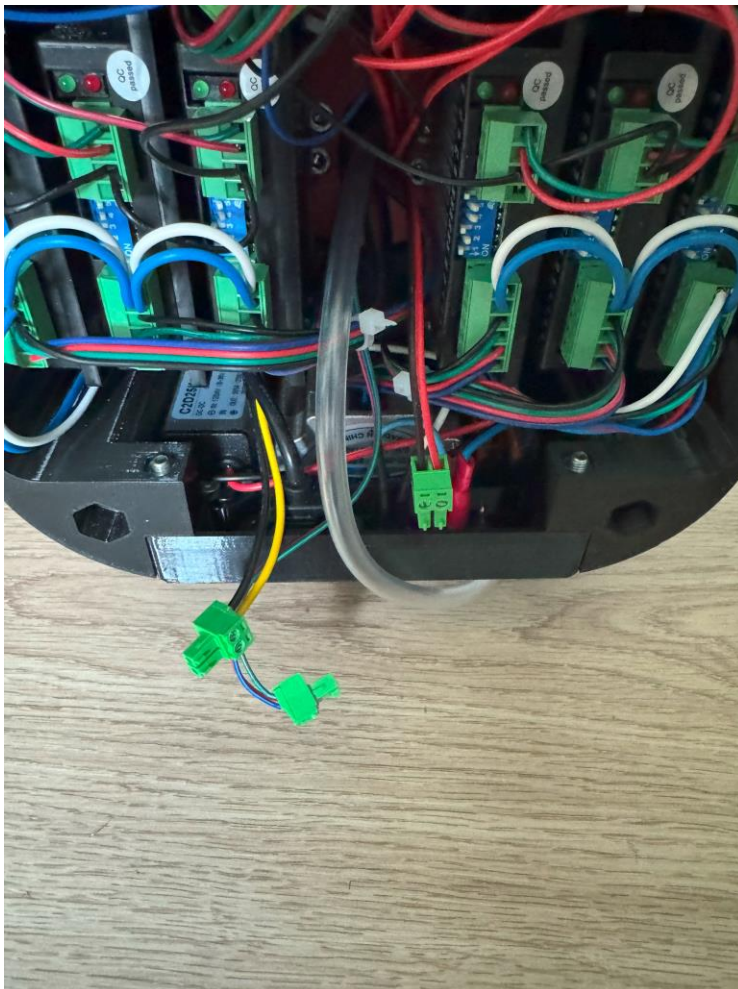


## Step 11:

Items	QTY	Description
ELECTRONICS_024	1	15EDGRK 3.81 02P Male and female screw

### Instruction:

Unplug the 3p terminal of the servo, take of the female side of the plug that is connected to the 5V converter. Remove the GND and signal cable of the servo from the breakout board. Next connect the 02P male connector to the + and – cable of the 5V converter.



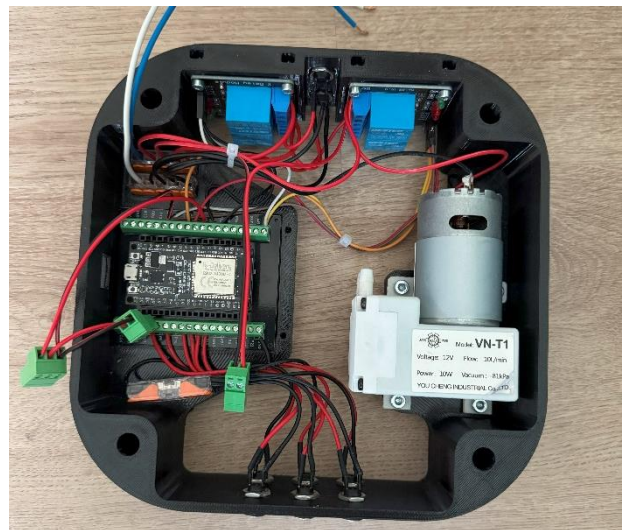
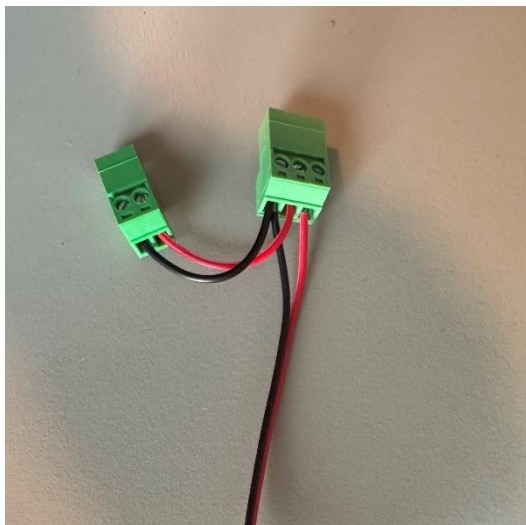
## Step 12:

Items	QTY	Description
ELECTRONICS_024	1	15EDGRK 3.81 02P Male and female screw
CABLE_01	15 cm	Cable 2 wire, 22 AWG/ 0.34 mm <sup>2</sup>

### Instruction:

Make the length of the cable 5 cm and 10 cm

Use the female side of the 03P connector and connect it to the 02P connector female, as shown in the picture below. Next connect the Red wire to the corresponding pin and the black cable to GND pin. Please study the electronics schematics on how to connect each wire.

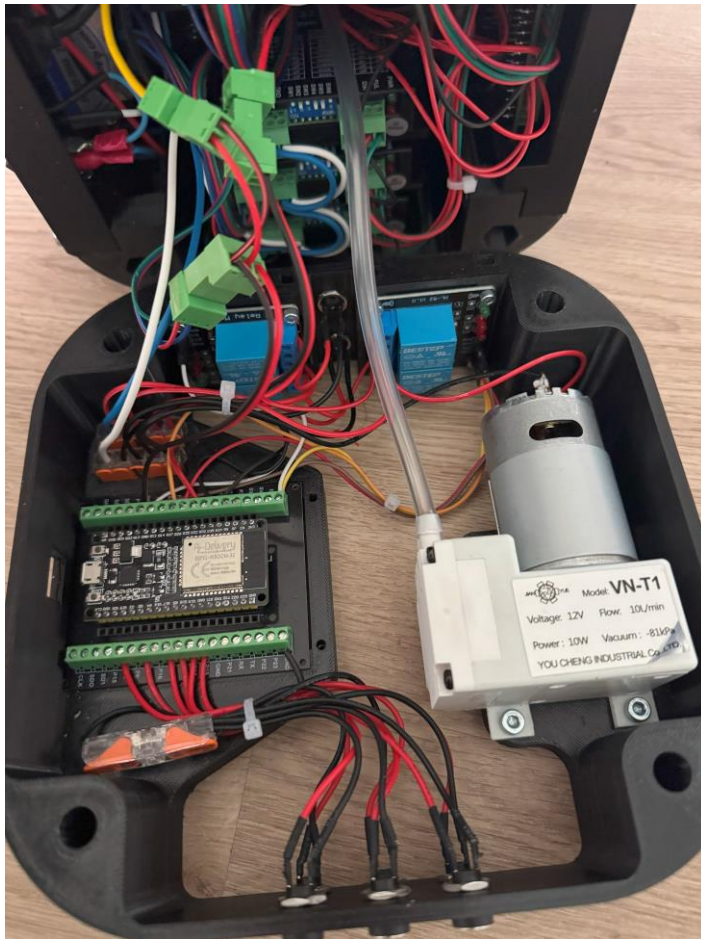


## Step 13:

Items	QTY	Description
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### Instruction:

Connect all the connectors to each other, connect the white (-) and blue (+) cable to the wago clamp of the robot arm.





## Step 14:

Items	QTY	Description
DIN 912 M8x80	4	Hexagon socket Head Cap Screws M8x80

### Instruction:

Use the M8x80 bolts to connect the robot arm and IO box together





## 6: Firmware installation

For the installation of the firmware please visit our the page,

<https://mikobots.com/mikobots-studio/help/installation/installation-firmware-esp32/>.



## 7: Appendix

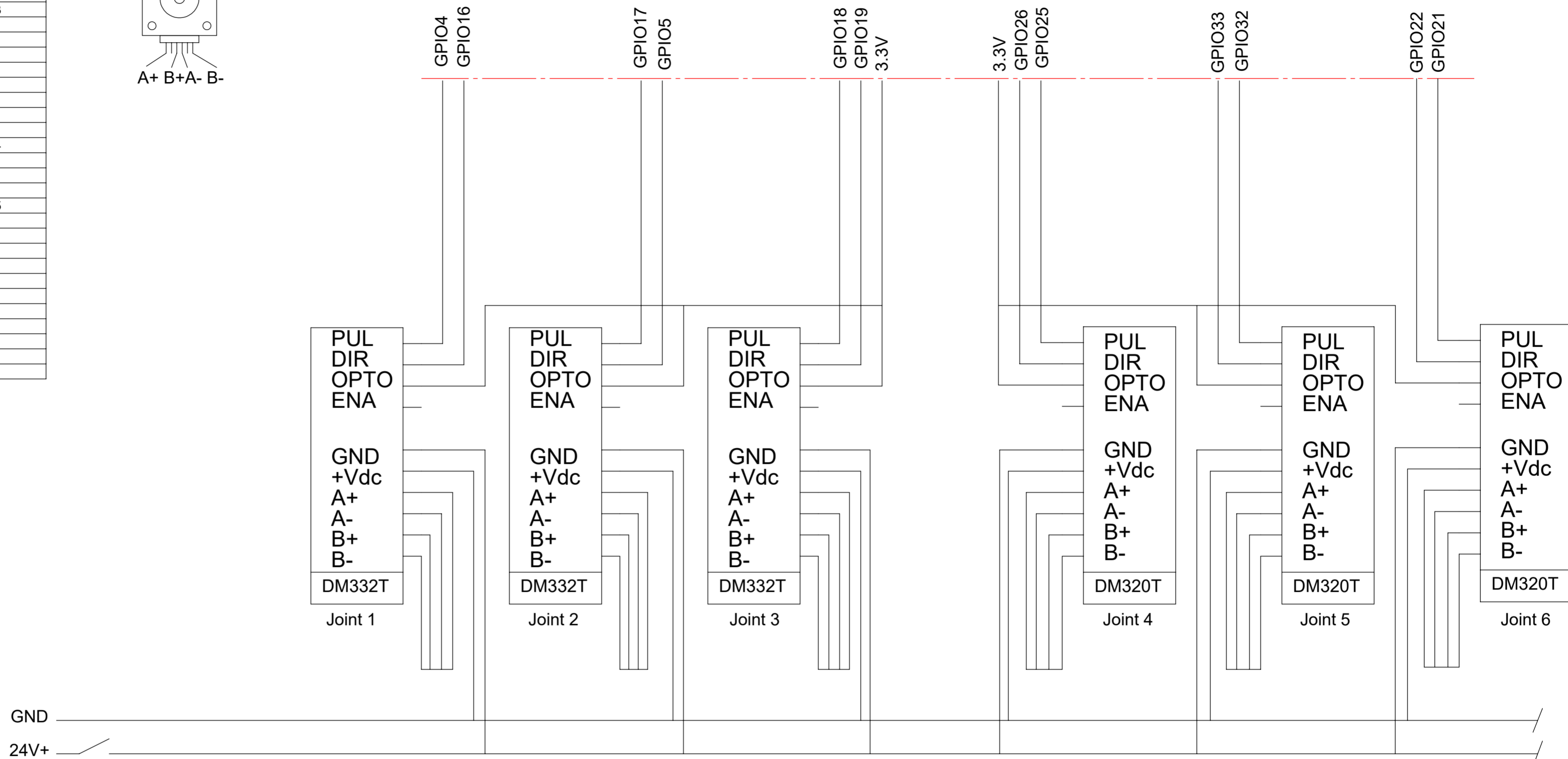
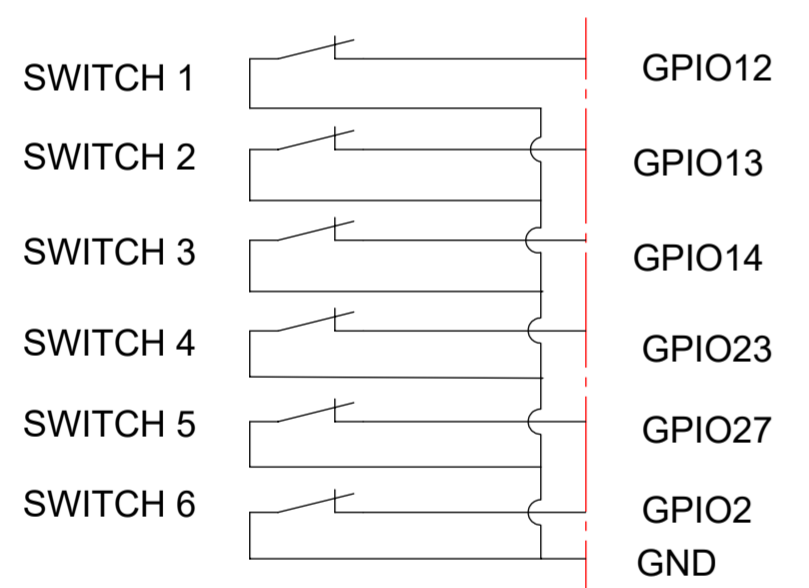
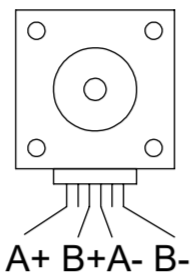
In the appendix you can find the following documents.

- Schematic of MiKo-1 with IO box

**General Table**

GPIO	Comment	Robot
GPIO1		
GPIO2		SWITCH 6
GPIO3		
GPIO4		PUL 1
GPIO5		DIR 2
GPIO6		
GPIO7		
GPIO8		
GPIO9		
GPIO10		
GPIO11		
GPIO12		SWITCH 1
GPIO13		SWITCH 2
GPIO14		SWITCH 3
GPIO15		
GPIO16		DIR 1
GPIO17		PUL 2
GPIO18		PUL 3
GPIO19		DIR 3
GPIO20		
GPIO21		PUL 6
GPIO22		DIR 6
GPIO23		SWITCH 4
GPIO24		
GPIO25		PUL4
GPIO26		DIR 4
GPIO27		SWITCH 5
GPIO28		
GPIO29		
GPIO30		
GPIO31		
GPIO32		PUL 5
GPIO33		DIR 5
GPIO34		
GPIO35		
GPIO36		
GPIO37		
GPIO38		

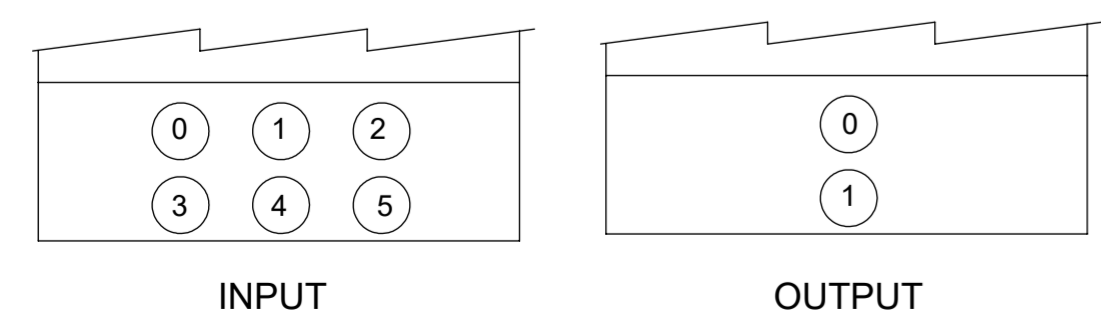
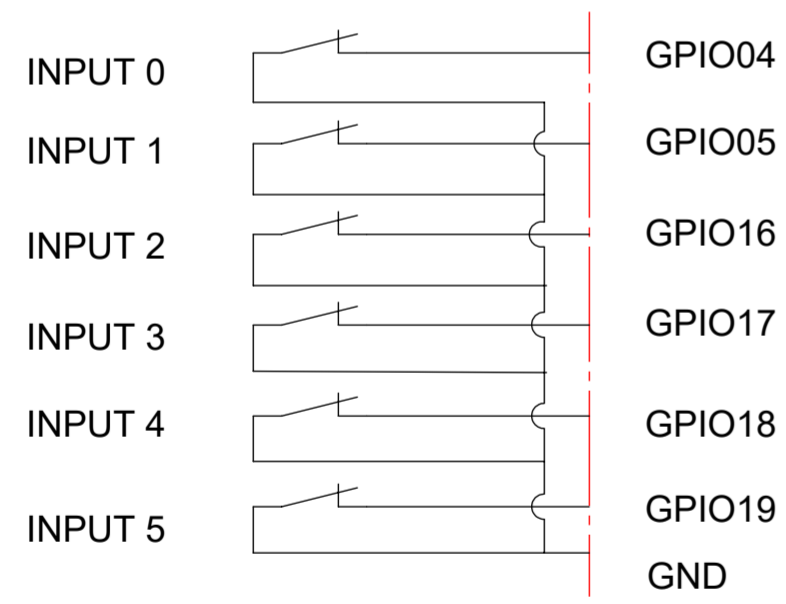
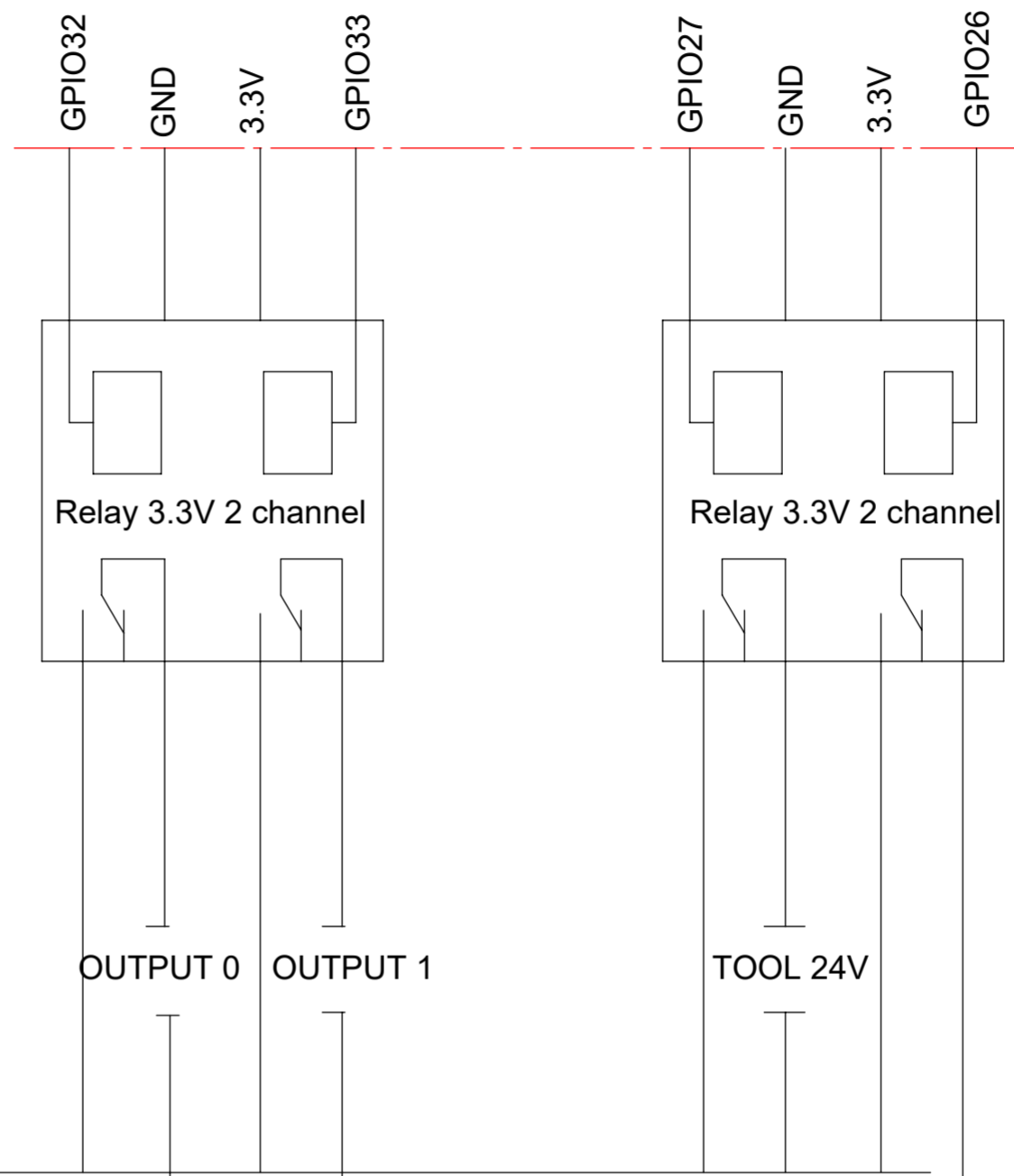
Color code motors				
Motor	A+	A-	B+	B-
Nema 23 L56 - J1	Black	Green	Red	Blue
Nema 23 L76 - J2,3	Black	Green	Red	Blue
Nema 17 L45 - J4	Black	Blue	Green	Red
Nema 17 L45 - J4	Black	Blue	Green	Red



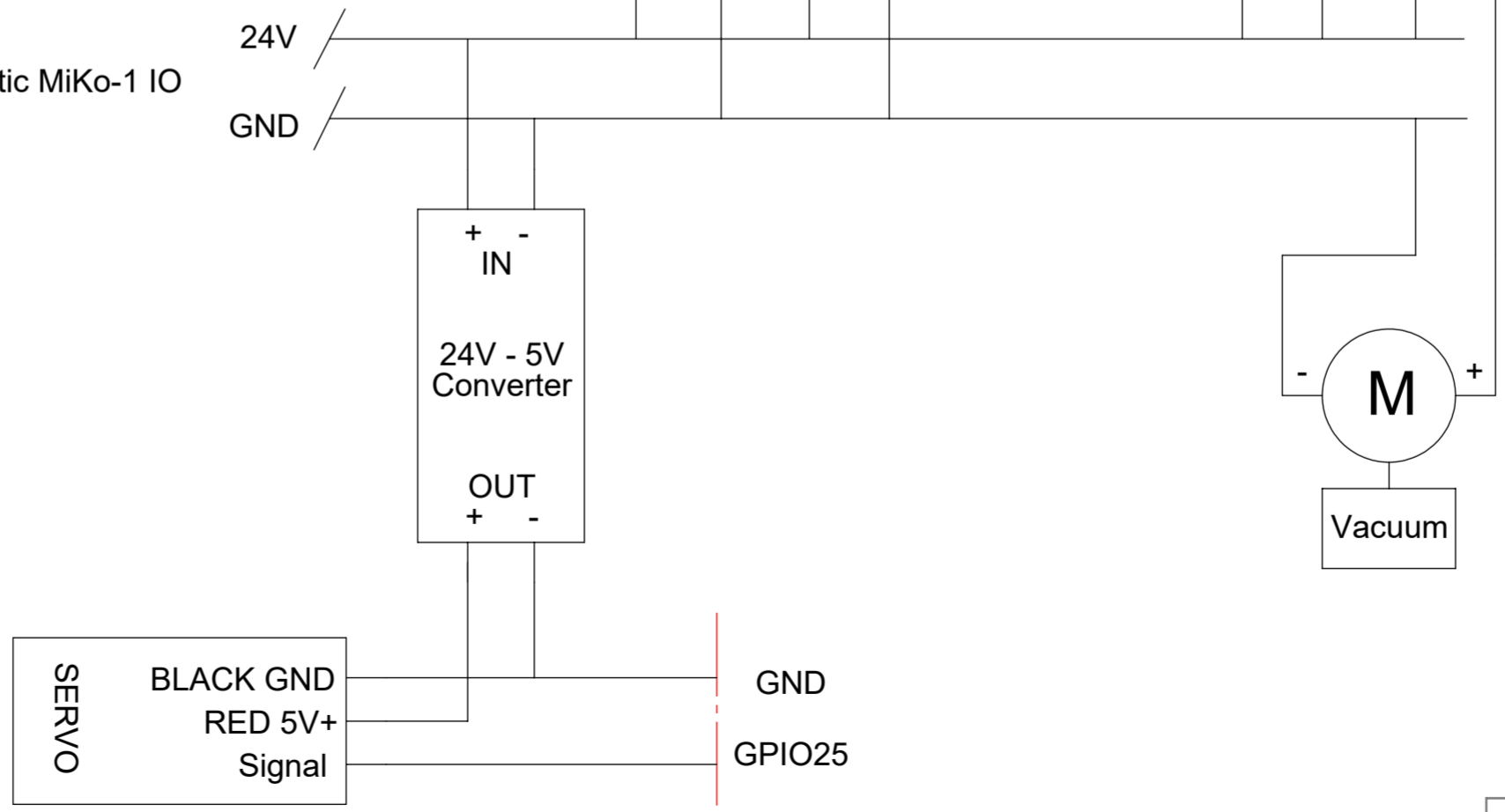
 www.mikobots.com	TOLERANCE :	Algemene toleranties volgens ISO 2768-2	TOL. CLASS : m
		Vormtoleranties volgens ISO 2768-1	TOL. CLASS : m
DISCRIPTION: <b>Schematic MiKo-1 with IO box</b>			
SCALE: 1:2	UNIT OF MEASURE: MM	Sheet 1 of 2	
FORMAT: A2	DRAWING NR.:	REVISION:	000

GPIO	Comment	Robot
GPIO1		
GPIO2		
GPIO3		
GPIO4		INPUT 0
GPIO5		INPUT 1
GPIO6		
GPIO7		
GPIO8		
GPIO9		
GPIO10		
GPIO11		
GPIO12		
GPIO13		
GPIO14		
GPIO15		INPUT 2
GPIO16		INPUT 3
GPIO17		INPUT 4
GPIO18		INPUT 5
GPIO19		
GPIO20		
GPIO21		
GPIO22		
GPIO23		
GPIO24		
GPIO25		SERVO
GPIO26		VACUUM
GPIO27		TOOL 24V
GPIO28		
GPIO29		
GPIO30		
GPIO31		OUTPUT 0
GPIO32		OUTPUT 1
GPIO33		
GPIO34		
GPIO35		
GPIO36		
GPIO37		
GPIO38		

ESP 32



See schematic MiKo-1 IO



**MiKoBots**

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TOLERANCE :	Algemene toleranties volgens ISO 2768-2	TOL. CLASS : m
	Vormtoleranties volgens ISO 2768-1	TOL. CLASS : m
DISCRIPTION:		
<b>Schematic MiKo-1 with IO box</b>		
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MASS (g):	MATERIAL: Material <not specified>	FORMAT: A2
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		REV: <b>000</b>