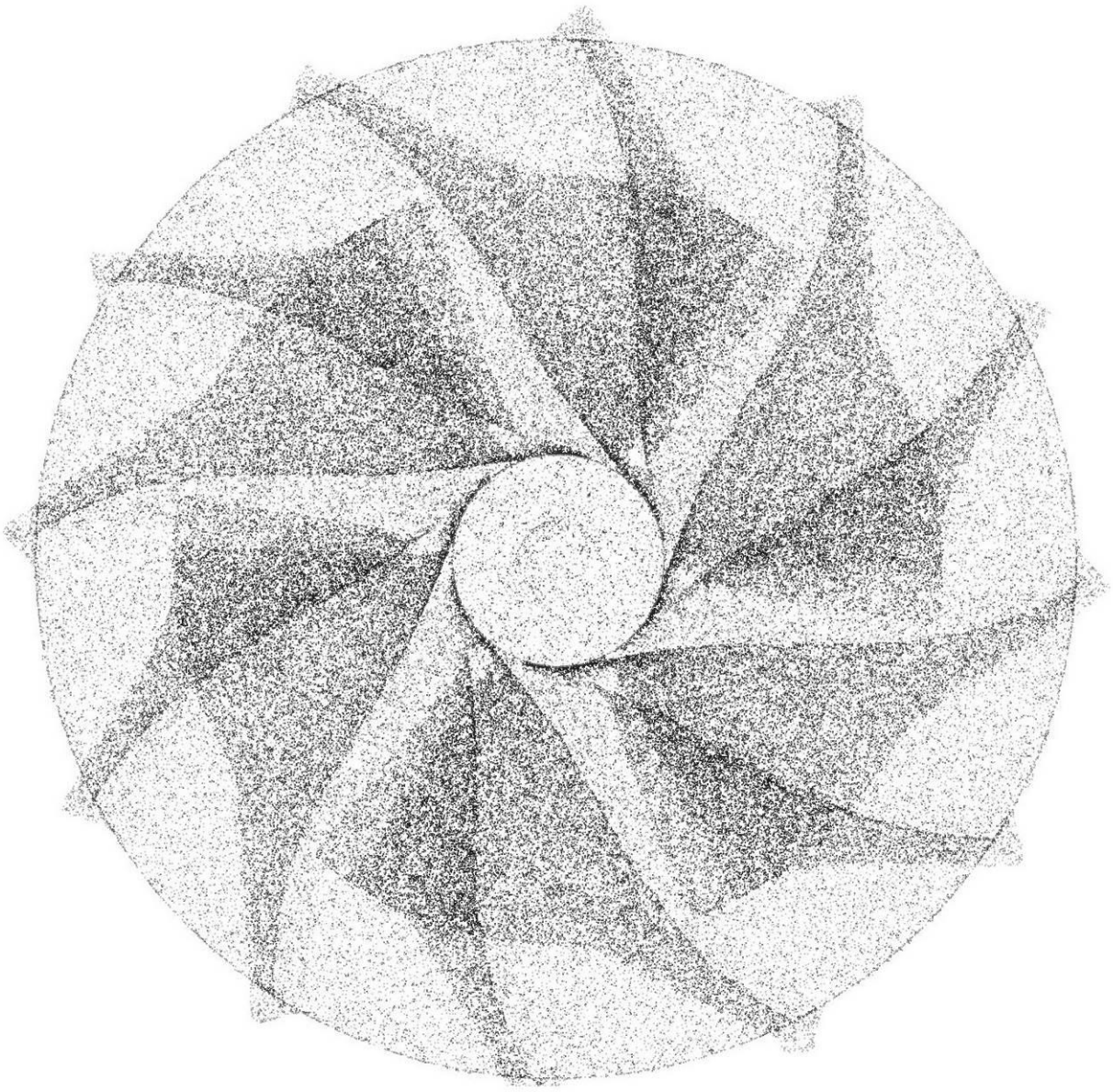


OPENSCAN

# Pi – Version

2020-03-18

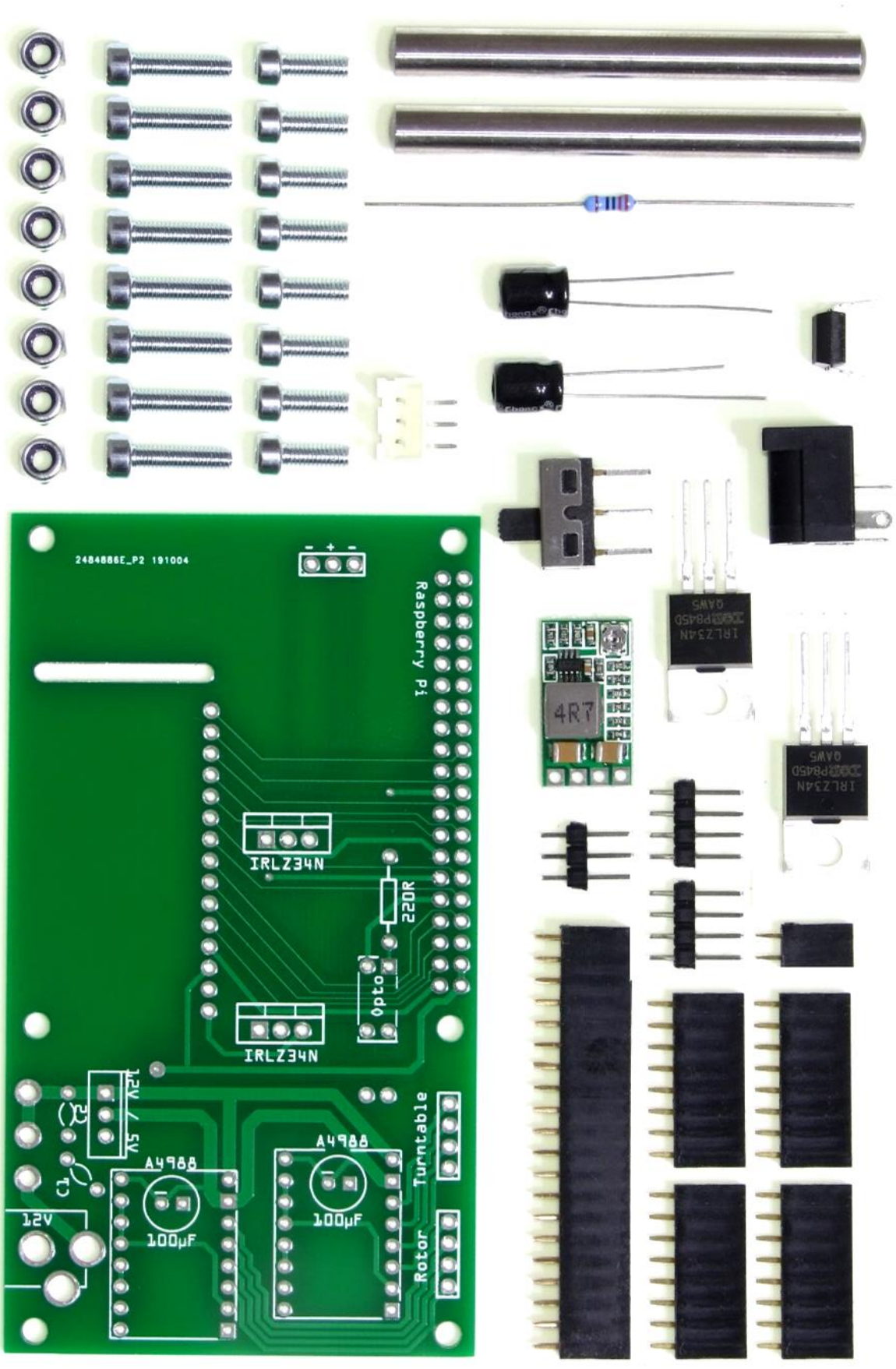
# Inhaltsverzeichnis

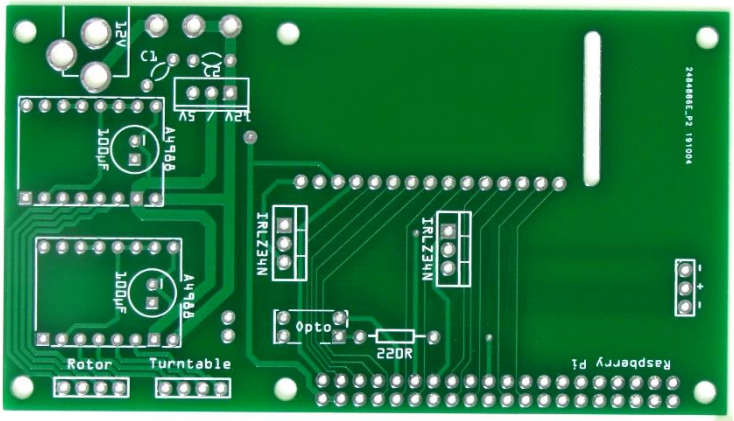
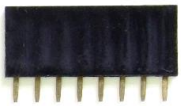
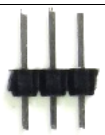
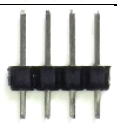
# 1. Soldering

## 1.1. Raspberry Pi Shield

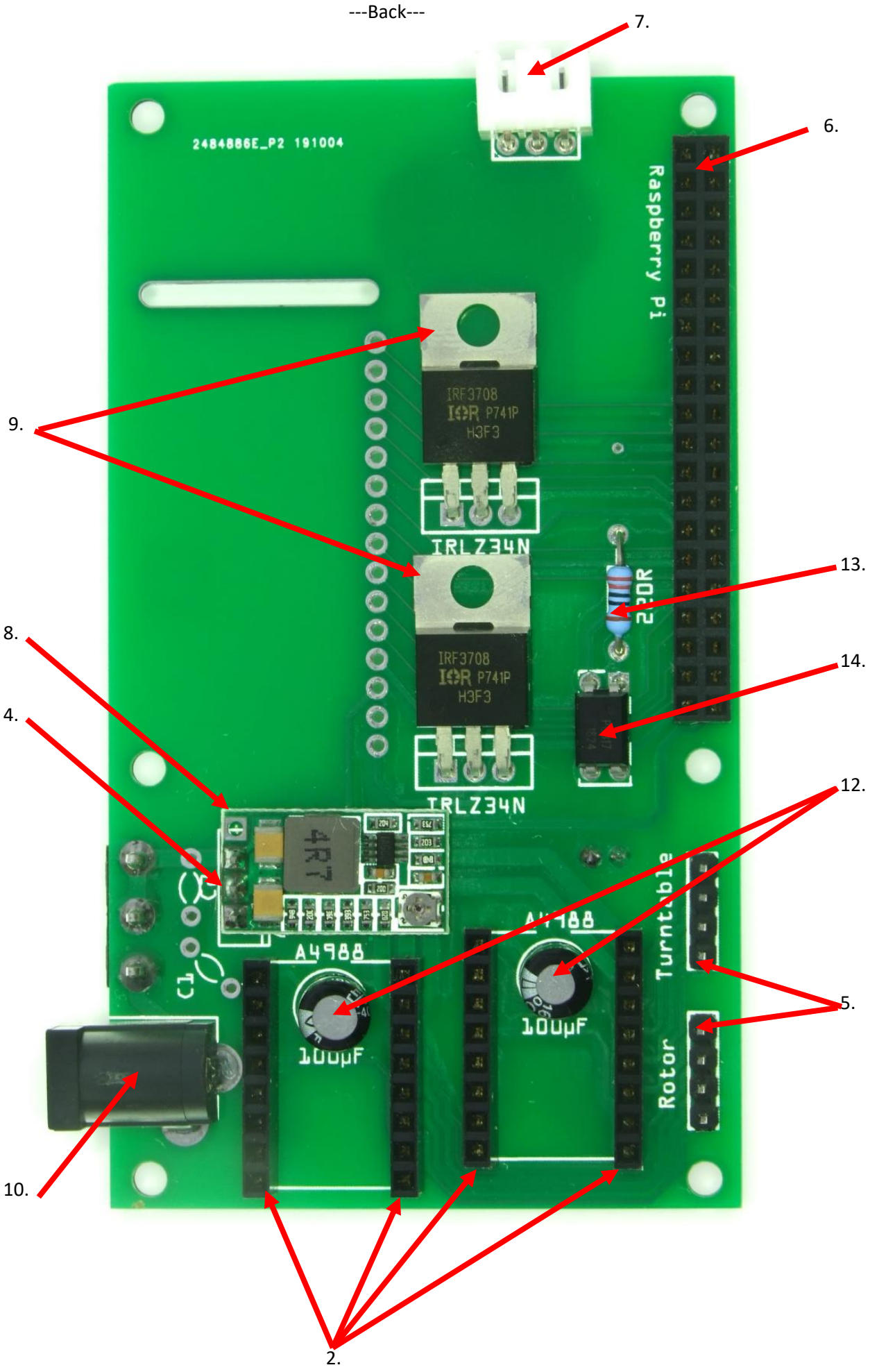
### 1.1.1. Bill of Materials

Overview – Raspberry Pi Shield + Parts



| | | | |
|---|---|---|---|
| 1. |  | 1x | Raspberry Pi Shield - PCB |
| 2. |  | 4x | Pin Header female – 8P |
| 3. |  | 1x | Pin Header female – 2P |
| 4. |  | 1x | Pin Header male – 3P |
| 5. |  | 2x | Pin Header male – 4P |
| 6. |  | 1x | Pin Header – 2x20P |
| 7. |  | 1x | JST-XH-3P 90° |
| 8. |  | 1x | Voltage Regulator 12V → 5V (min. 2.5A) |
| 9. |  | 2x | IRLZ34N |
| 10. |  | 1x | Barrel Connector 5.5-2.1mm |
| 11. |  | 1x | Switch |
| 12. |  | 2x | Capacitor 100uF, 16V |
| 13. |  | 1x | Resistor 220Ohm |
| 14. |  | 1x | Optocoupler PC817 |

### 1.1.2. Soldering

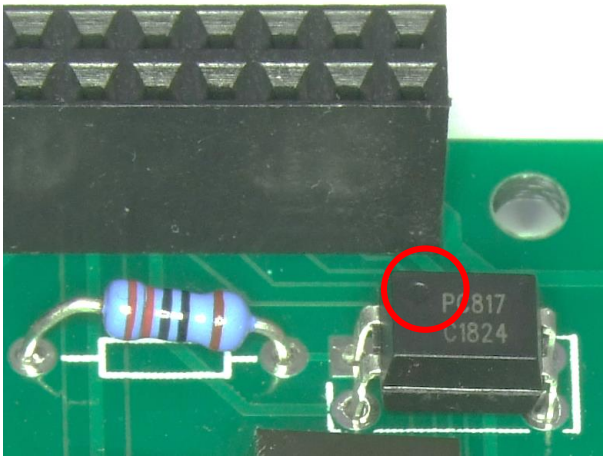


**!!!Important remarks!!!:**

**7. In order to be able to use a Raspberry Pi 4 the white pin header needs to be flipped 180°. Otherwise the cable will collide with the ethernet adapter!**

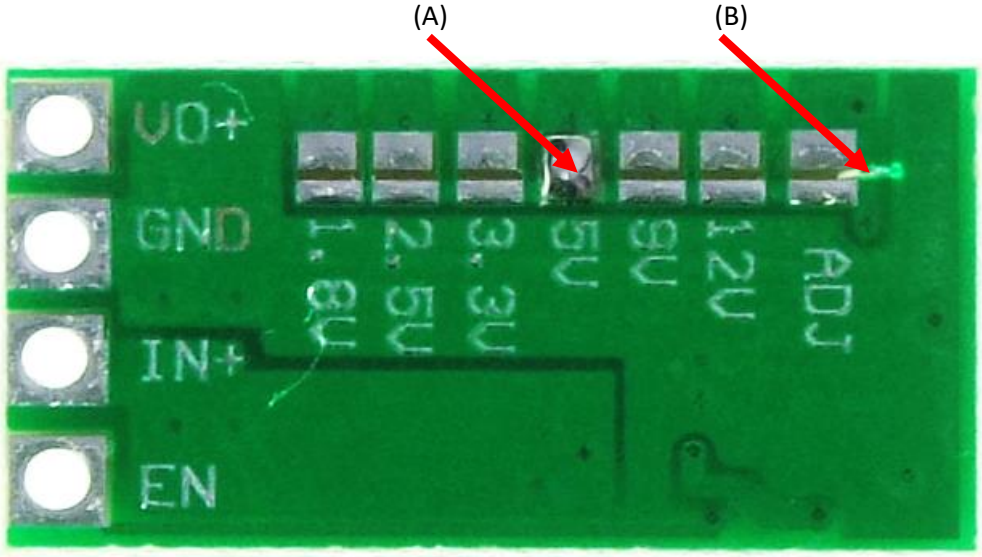
12. make sure to orient the capacitors in the right way due to their polarity. The negative side is labeled both on the PCB and on the capacitor itself.

14. Make sure to orient the optocoupler correctly. There is a small dot in one of the corners, which should face the resistor. see the following closeup:

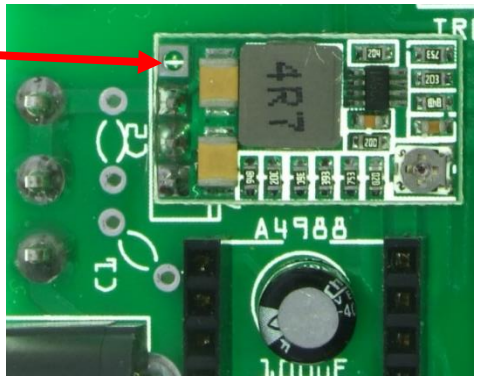


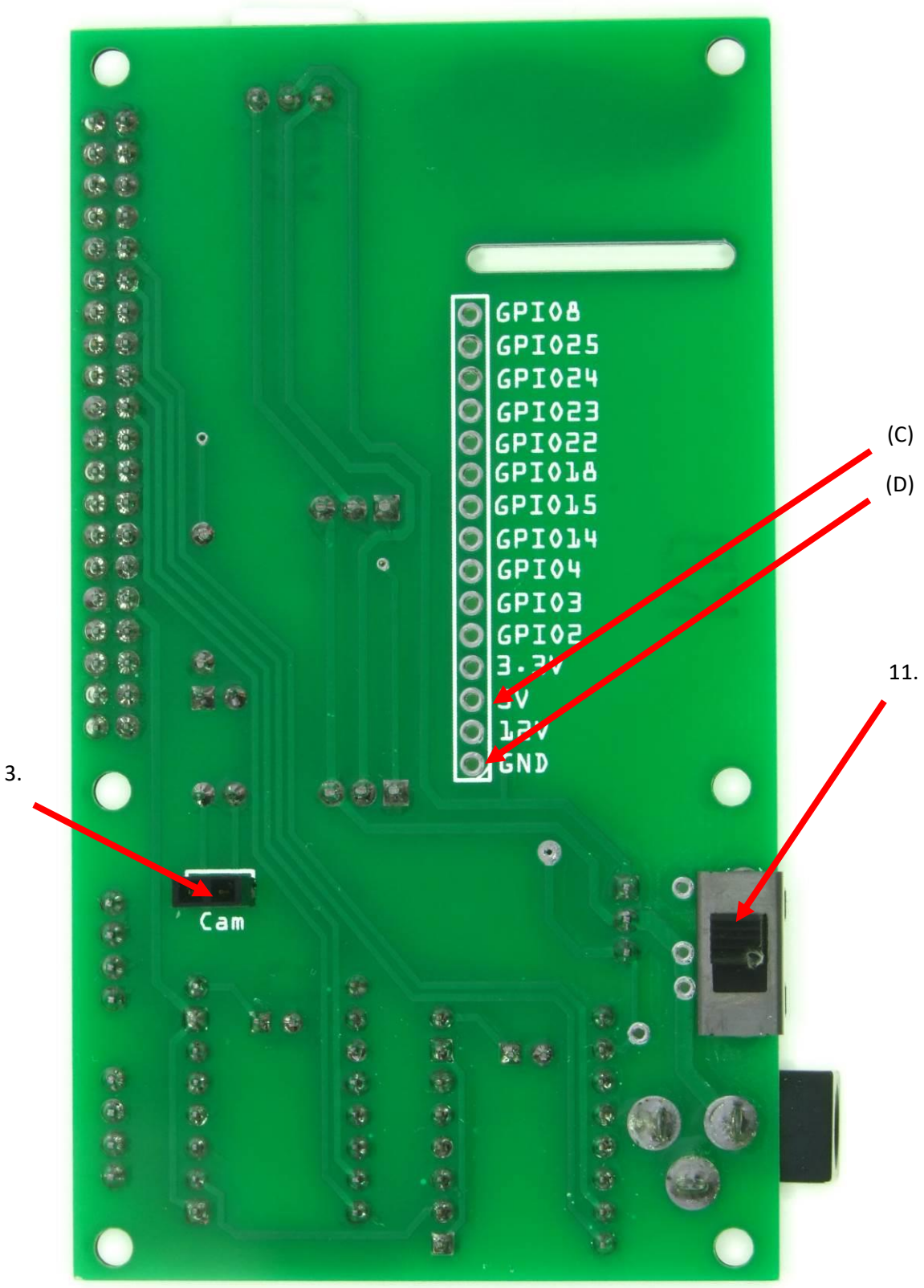

4.& 8. Voltage regulator

- solder the pin header (4.) to the PCB
- check the back oft he voltage regulator. The 5V solder pads (A) must be connected and the connection at point (B) must be disconnected by scratching. Alternatively you can use the potentiometer on the front to set the correct output voltage of 5V.




- When soldering the voltage regulator to the pin headers, make sure to have the right orientation and leave the uppermost hole free





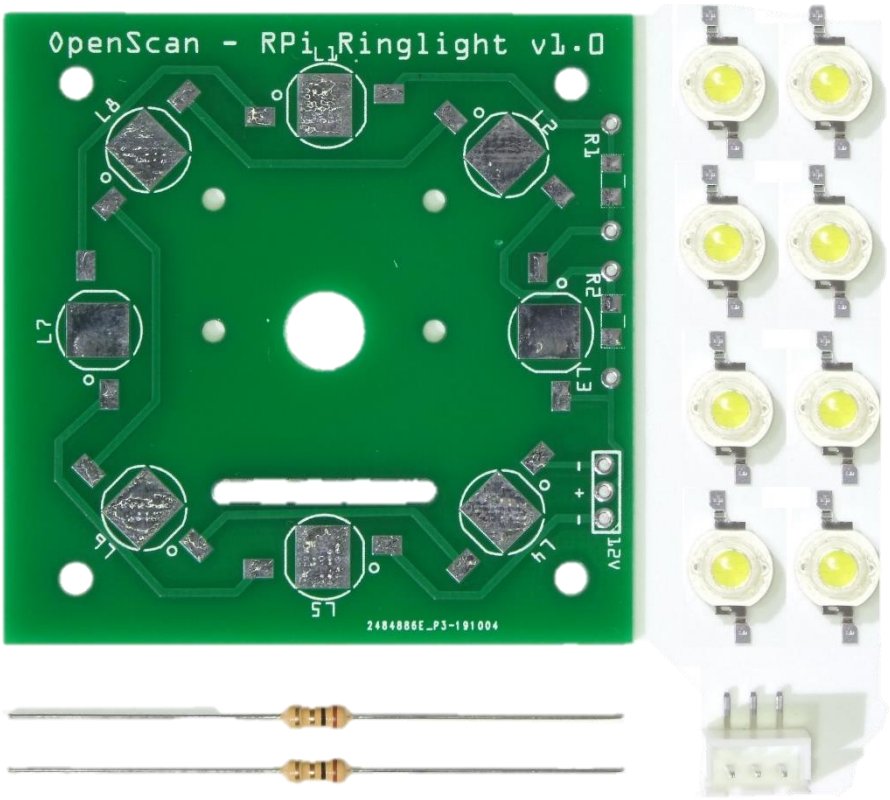

**Important:**

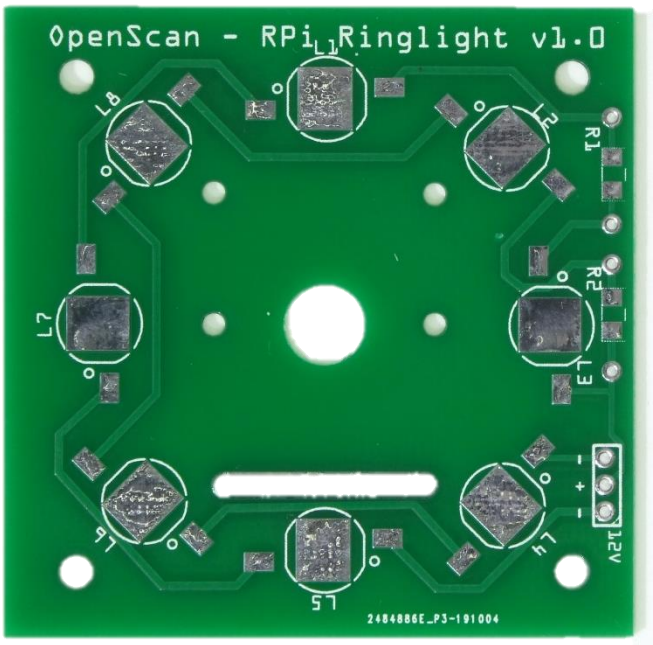
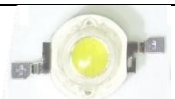
**Before connecting any motors or the Raspberry Pi, you need to check if the voltage regulator is set to the right output of 5V. This can be done by connecting the PCB to 12V power supply through the barrel connector, switching (11.) to the lower position and checking the voltage between point (C) and (D), which must be 5V (±0.2V). If this is not the case, you have to use the potentiometer on the voltage regulator (8.) to change the output voltage accordingly or check the overall connections.**

## 1.2. Ringlight

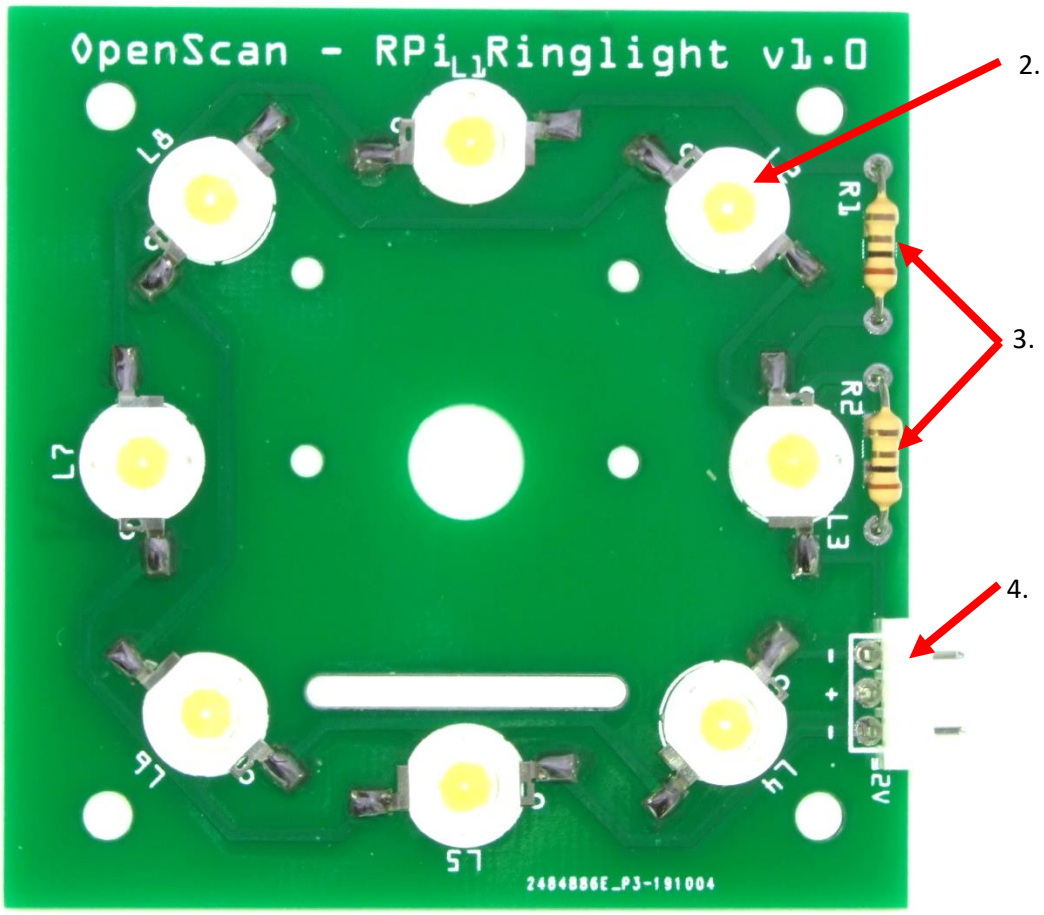
### 1.2.1. Bill of Materials

Ringlight and parts needed



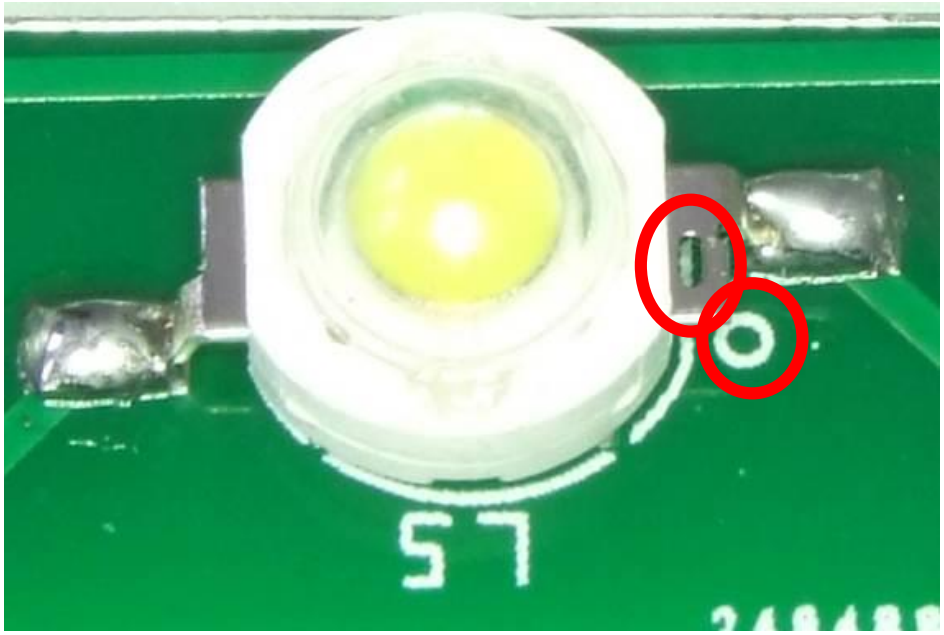

| | | | |
|---|---|---|---|
| 1. |  | 1x | Raspberry Pi Ringlight PCB |
| 2. |  | 8x | LED 1W |
| 3. |  | 2x | Resistor 1Ohm |
| 4. |  | 1x | JST-XH-3P 90° |

### 1.2.2. Soldering



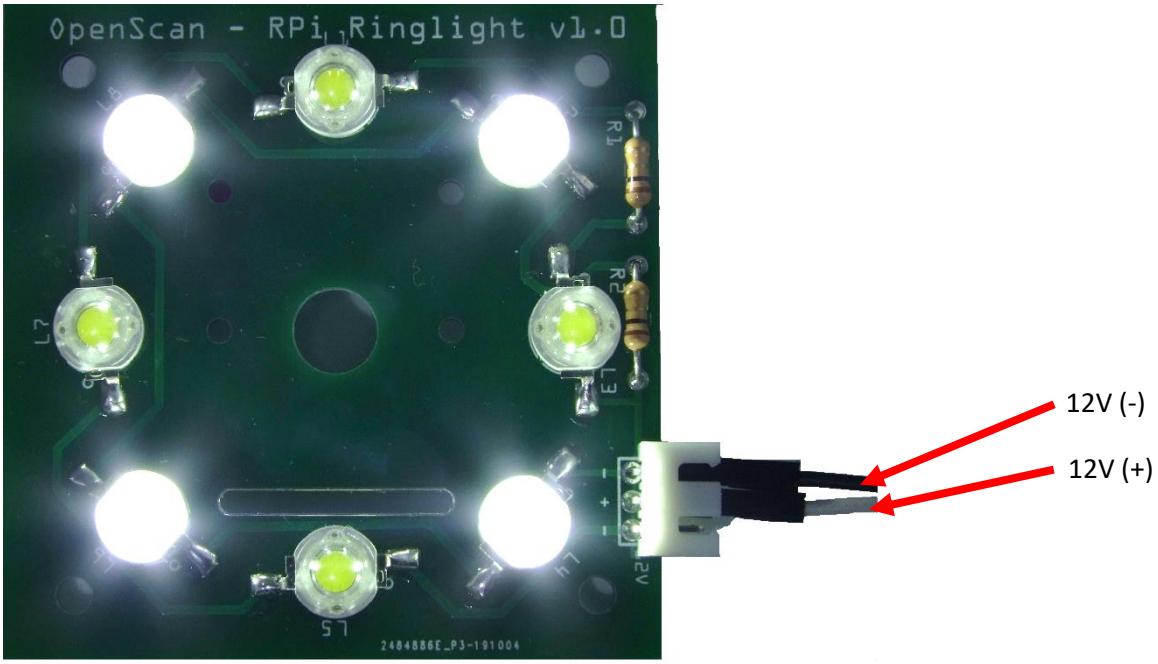

**!!!Important remarks!!!:**

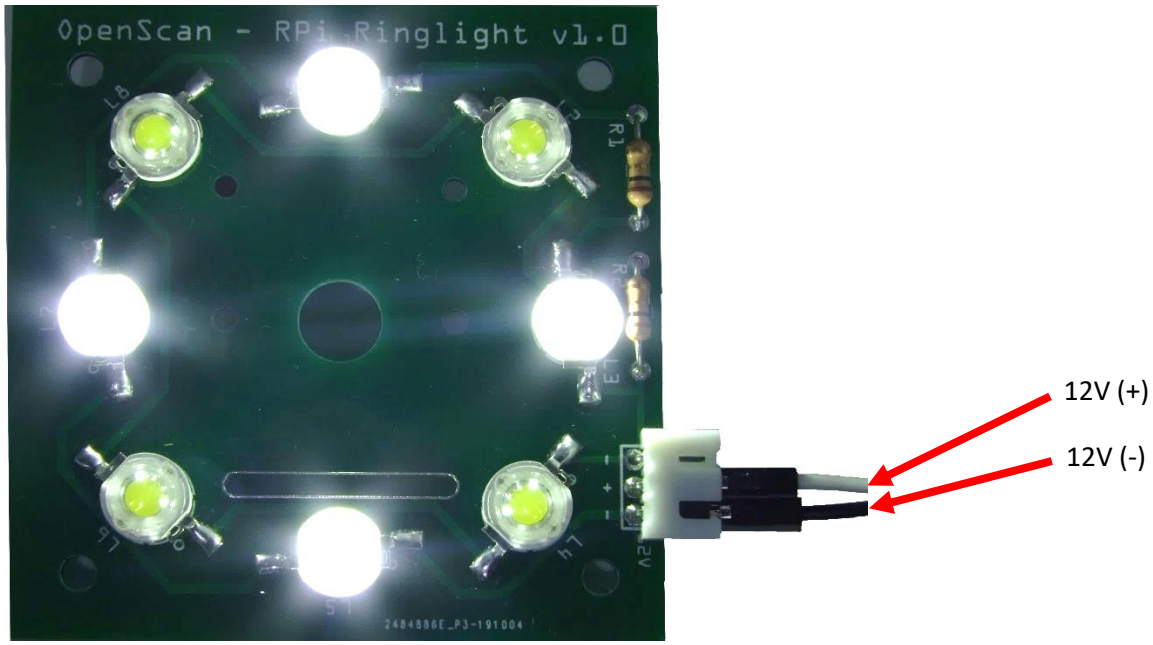
Make sure that all LEDs are aligned correctly as shown in the following close-up. The hole on the negative side of the LED has to be aligned with the circle printed on the PCB.

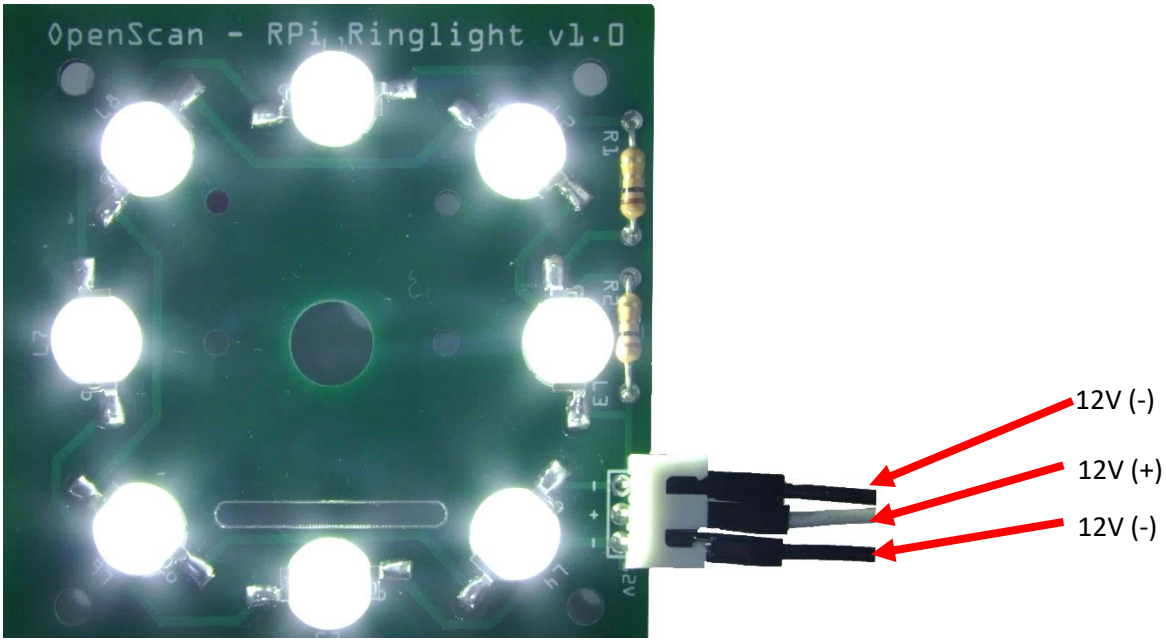


### 1.2.3. Testing

You can test the circuit's functionality by applying 12V directly to the Ringlight PCB as shown in the following images:

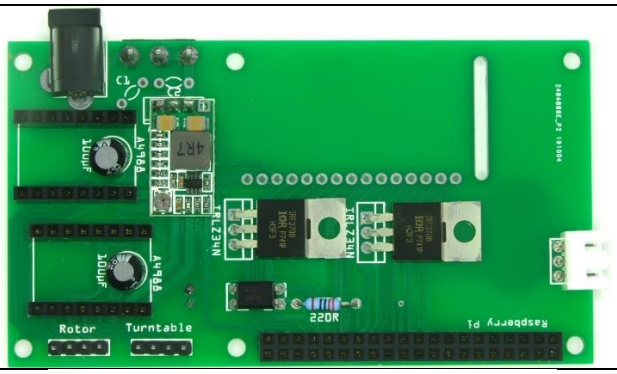
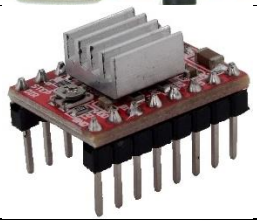
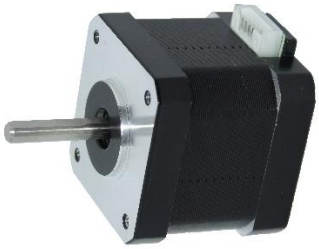


# 2. Wiring all parts

## 2.1. Bill of Materials

| | | |
|---|---|---|
| 1. |  | Raspberry Pi Shield |
| 2. |  | Raspberry Pi versions tested and working: 3B+,3B, 3A+, 2B v1.2 (no wifi) tested and NOT working: B+, A+, Zero WH<br><br>Raspberry Pi 4 works if you flip the ringlight connector (see remark 7. on page 6) |
| 3. |  | 2x A4988 Stepper driver |
| 4. |  | 2x Nema 17 Stepper motor (min. 40Ncm for the rotor, for the turntable a smaller stepper (e.g. 13Ncm) can be used) |
| 5. |  | 2x Stepper motor cable, length depending on the build version (1m is great for all). JST-XH 4P or Dupont headers |
| 6. |  | Raspberry Pi Camera v2.1 (v1.3 would also work but is not recommended due to its lower resolution |
| 7. |  | Raspberry Pi camera ribbon cable (min. 15cm, recommended: 30cm) |
| 8. |  | JST-XH 3P cable (15cm for 3d printed version 30 or 50cm for CNC and lasercut version) |
| 9. |  | Micro SD Card (min. 16GB) |

## 2.2. Preparing the Raspberry Pi

### 2.2.1. Flashing the Raspberry Pi Image

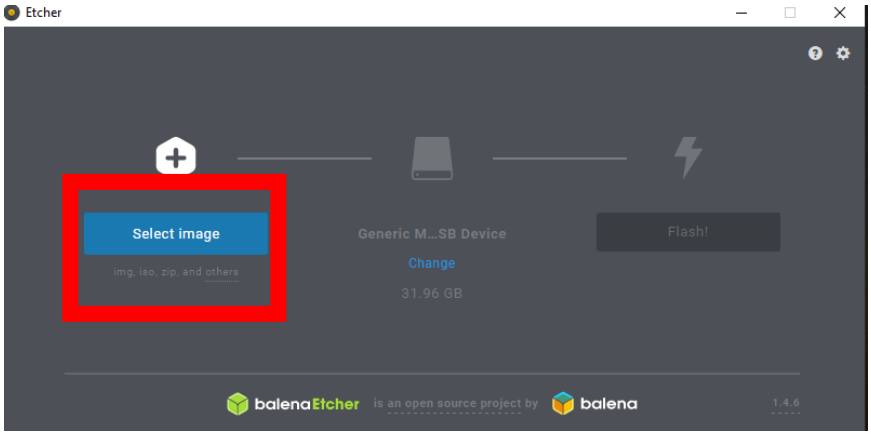
(1) Download the Raspbian Image

https://drive.google.com/open?id=1V_viMNELEG5r0Spcr9WuQKSPY0RPLPbV

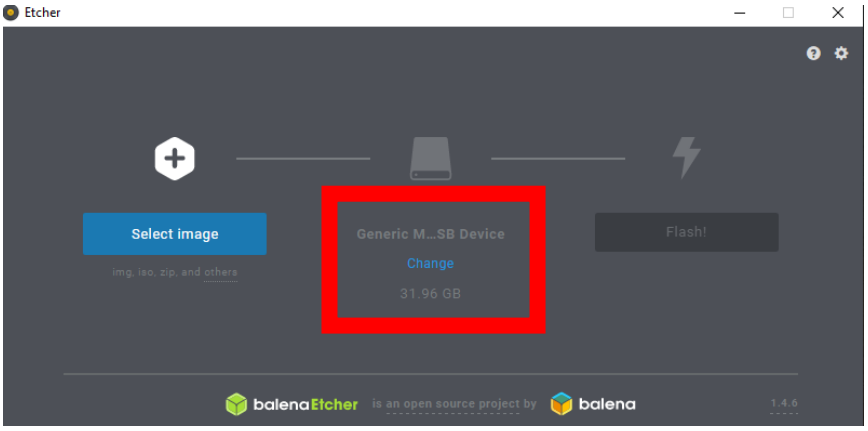
(2) Download and install Belena Etcher (for writing the image to your micro SD card)

https://www.balena.io/etcher/

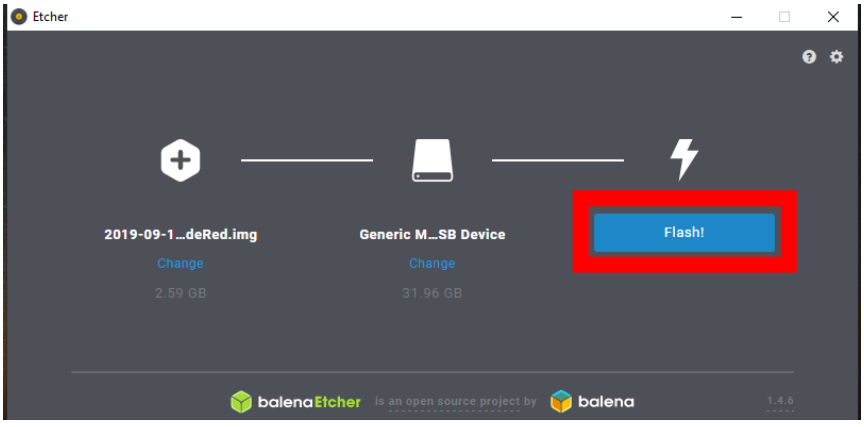
(3) Open Belena Etcher and select Image --> Choose the downloaded .img or .zip file



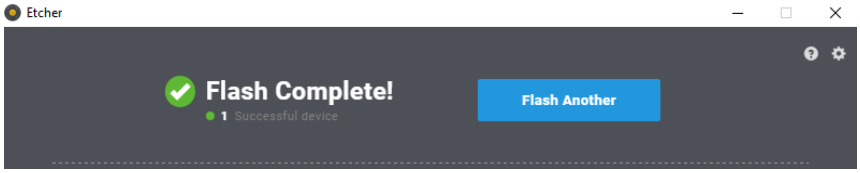

(4) Choose your SD card, which should have a size of 16GB or more




(5) Press "Flash!" and wait, as this can take several minutes

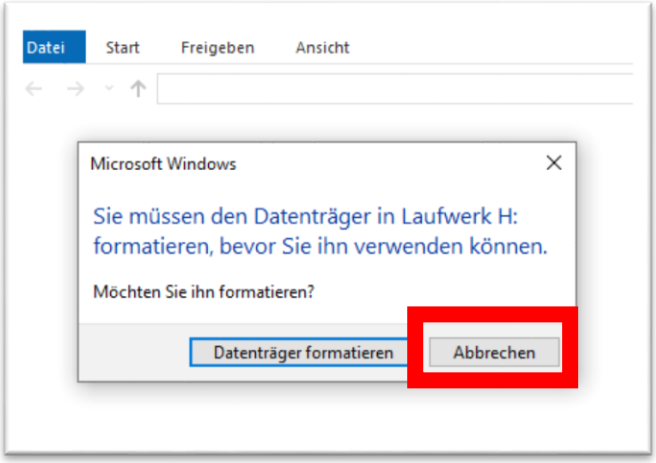



(6) You are ready to savely unmount the sd card

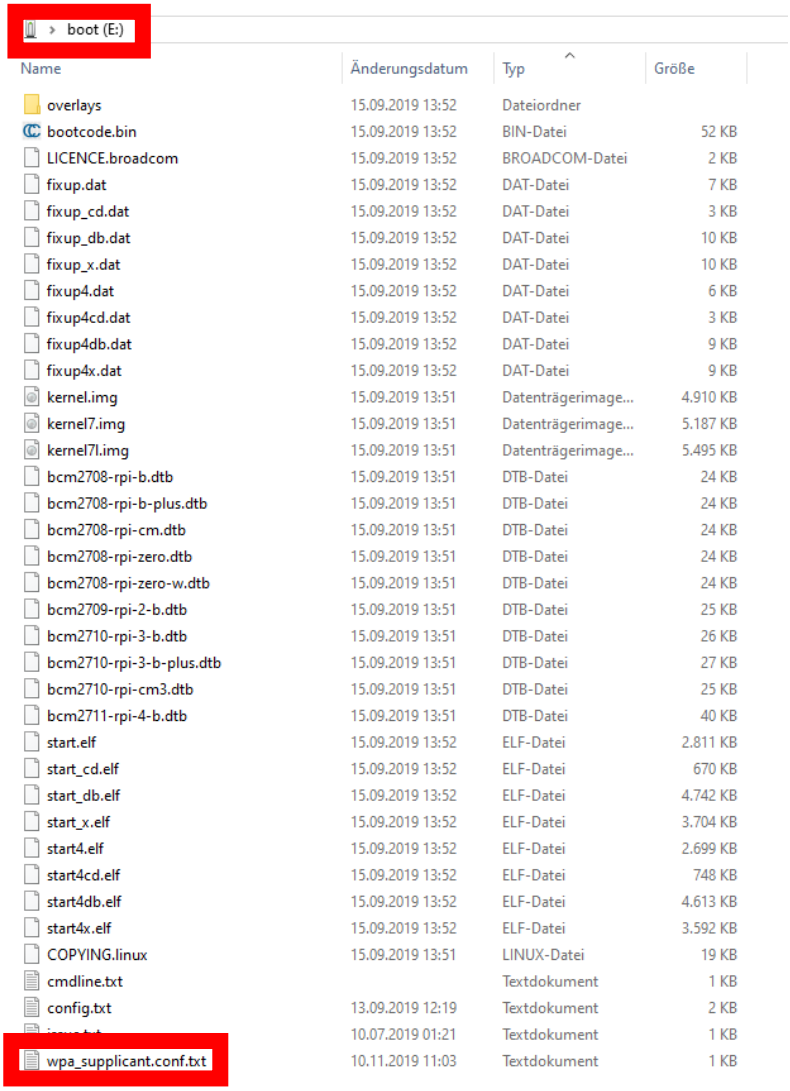


### 2.2.2. Setting up wifi connectivity

(1) Do not insert the card to your Raspberry Pi, yet. Instead, re-insert the card into the sd-slot of your PC. When using windows an error message will appear, saying that the drive needs to be formated. Make sure to cancel!




(2) Open the file explorer and navigate to the drive called "boot"




(3) There should be a file "wpa_supplicant.conf.txt". If not, you can download the file here:

https://drive.google.com/open?id=1V_viMNELEG5r0Spcr9WuQKSPY0RPLPbV

(4) Open "wpa_supplicant.conf.txt" in notepad/texteditor

The content of the file should look like the following, where the red parts have to be changed accordingly. Make sure to keep the "" around your password and network name!

```
country=DE
ctrl_interface=DIR=/var/run/wpa_supplicant GROUP=netdev


network={
  ssid="your network name/SSID"
  psk="your network password"
  key_mgmt=WPA-PSK
}
```

Country:

The Country Code should be set the ISO/IEC alpha2 code for the country in which you are using your Pi.

- GB (United Kingdom)
- DE (Germany)
- US (United States)
- …

If you want to use the device in multiple networks, you can copy the "network={…} section and insert below. You can also specify the priority of those networks by adding "priority = 1", "priority = 2" … to the { … } section.

More information can be found here:

https://www.raspberrypi.org/documentation/configuration/wireless/wireless-cli.md

(5) Make sure to save the file without the .txt extension, so that you can see the following in your browser:

| | | | |
|---|---|---|---|
| COPYING.linux | 15.09.2019 13:51 | LINUX-Datei | 19 KB |
| cmdline.txt | | Textdokument | 1 KB |
| config.txt | 13.09.2019 12:19 | Textdokument | 2 KB |
| issue.txt | 10.07.2019 01:21 | Textdokument | 1 KB |
| wpa_supplicant.conf | 10.11.2019 11:03 | CONF-Datei | 1 KB |

(6) Double check the name of your network, password and the filename/extension, before continuing.

(7) Now, you are ready to unmount the SD-card and insert it to the Raspberry Pi.

(8) Mount the Raspberry Pi to the shield in the shown orientation. **Before plugging in the power supply make 100% sure, that the Raspberry Pi's pins are in the right position.**

### 2.2.3. Finding the IP Address

(1) Connect the shield to the 12V power supply. By switching the large switch (on the other side of the shield) to the lower position, the Raspberry Pi will boot and connect to the specified network.


**Since Version 2020-02-11** the hostname has been modified to make it much easier to access the pi. You can now reach the interface via browser by adding the following address:

frontend: openscanpi:1880/ui

backend: openscanpi:1880

The hostname "openscanpi" can also be used in Putty and similar programs to access the pi. User name and password are default (pi & raspberry) and it is recommended to change those.

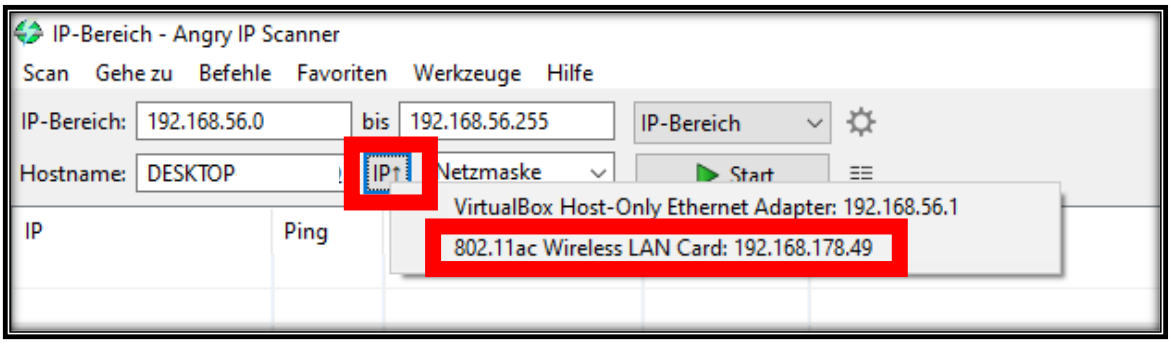
Once connected, you can also see your local IP address in the Update&Info Tab.

If you did not use the provided raspbian image, you can perform the following steps to find out your IP:

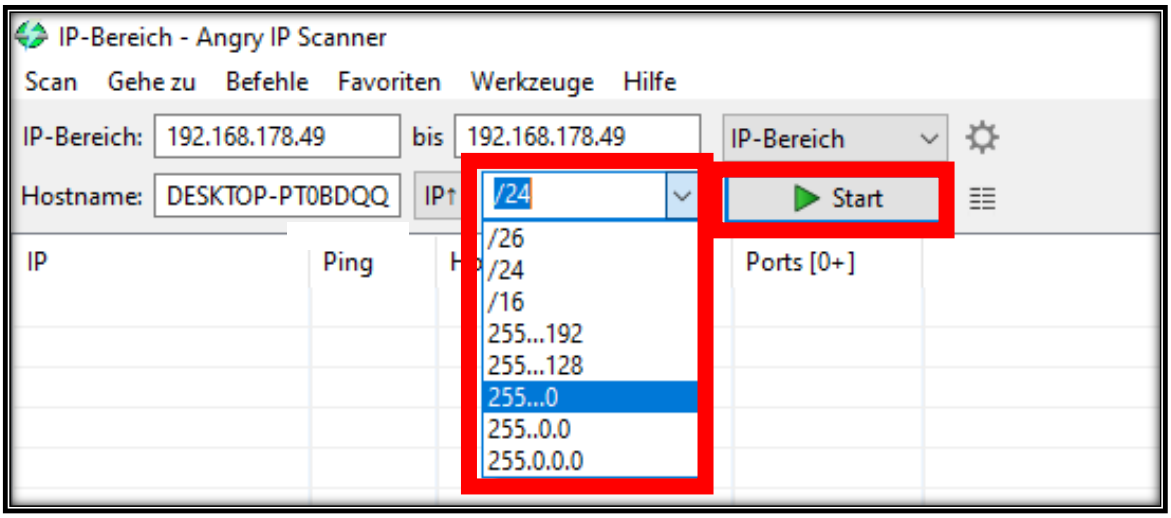
(2) The Raspberry Pi should be up and running and you just need to find the Raspberry Pi's IP address in your network. Therefore you can either check your wifi router or use the small programm "Angry IP Scanner", that you can download and install from here:

https://angryip.org/download/

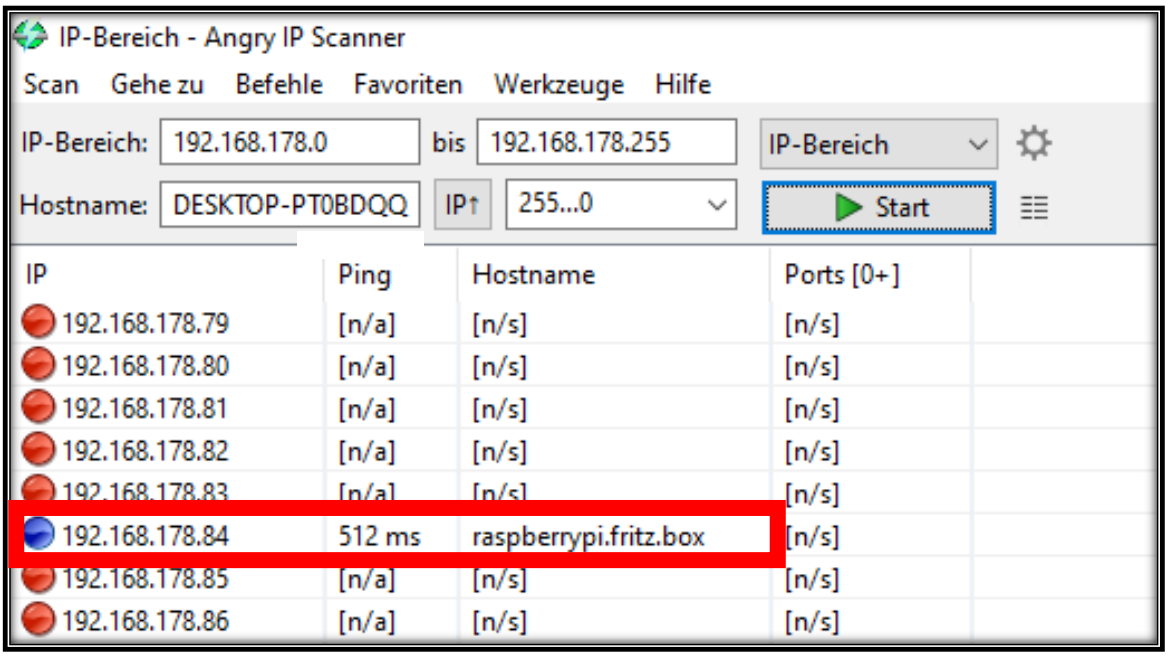
(3) Start Angry IP Scanner and click the "IP" Button. Choose whatever option is shown below "VirtualBox …". In my case it is "802.11ac …"




(4) Choose 255…0 and press "Start"




(5) The program will list all devices, that are currently connected to your wifi. Scroll down the list to find the Raspberry Pi and copy the IP-address.
**In my case: 192.168.178.84**



(6) If the Raspberry Pi does not appear in the list, you should go back to step (7) and go through the steps again. It is most likely a problem with the network settings.

(7) When successful, you will be able to access the OpenScan Browser interface through any device, which is connected to the same network. You just need to open a browser and insert the found IP + the red suffix to the address line. Save the address as bookmark to make future access easier:

| | Address | In my case | |
|---|---|---|---|
| User Interface | "your IP":1880/ui | **192.168.178.84:1880/ui** | **openscanpi:1880/ui** |
| Backend | "your IP":1880 | **192.168.178.84:1880** | **openscanpi:1880** |

(8) For security reasons it is recommended to access the Raspberry Pi through Putty and change the standard password. You can find a detailed description here:

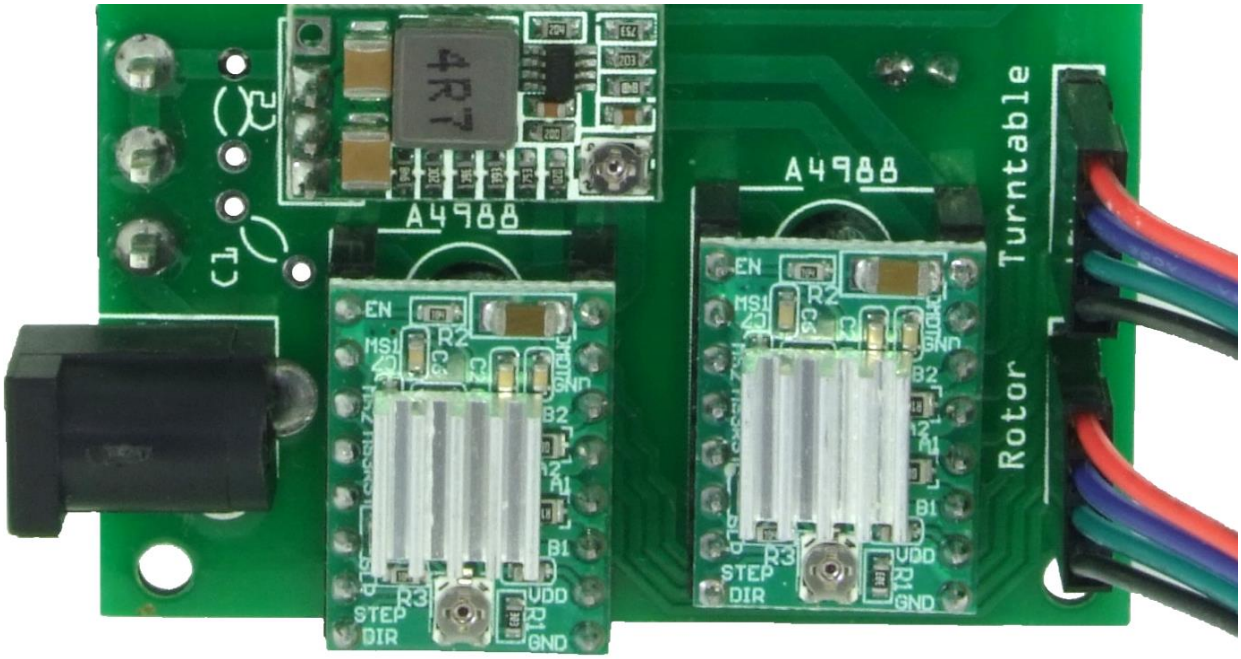
https://www.raspberrypi.org/documentation/remote-access/ssh/windows.md

## 2.3. Connecting the other parts

**Make sure, the power is off. Remove the Raspberry Pi from the shield to access all other slots.**

### 2.3.1. Stepper Motors

**Whenever (un)plugging stepper drivers and/or stepper motors, make sure that the power is off, otherwise you could damage or destroy the stepper motors/drivers and board!**



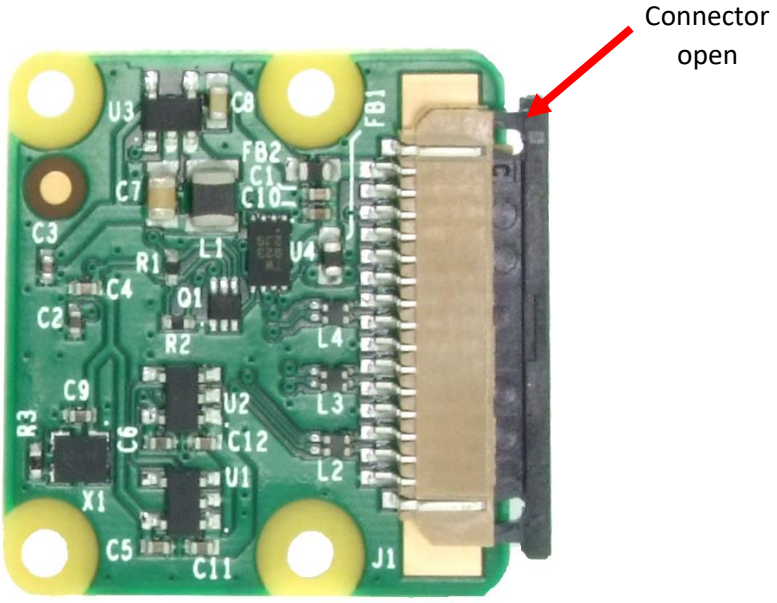

Plug in the two stepper drivers as shown above. When using different stepper motors, it is recommended to adjust the potentiometer on the stepper drivers as described here:

https://e3d-online.dozuki.com/Guide/VREF+adjustment+A4988/92#s813

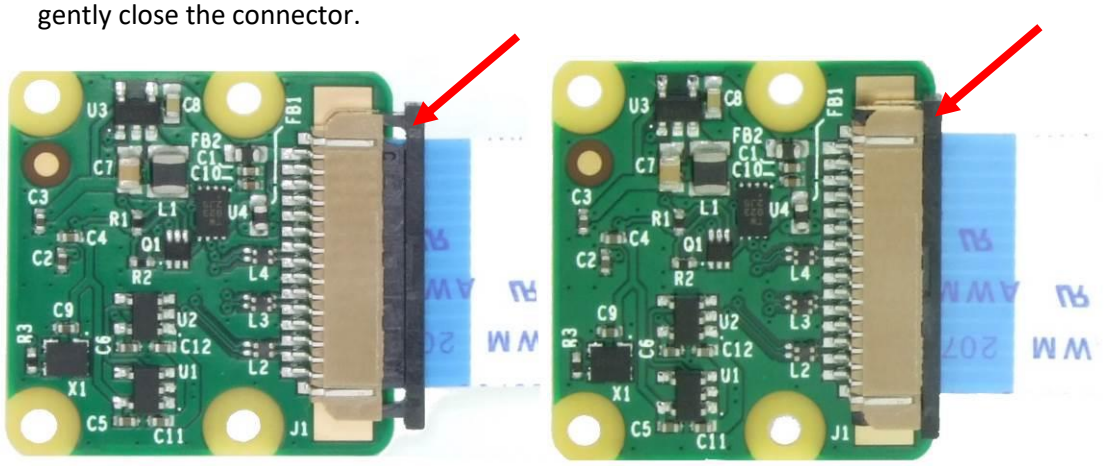
### 2.3.2. Raspberry Pi Camera & Ringlight

**Be careful when handling the Raspberry Pi Camera and ribbon cable, as the connections and the cable are very delicate and break easily.**

(1) Open the connector on the back of the Raspberry Pi Camera

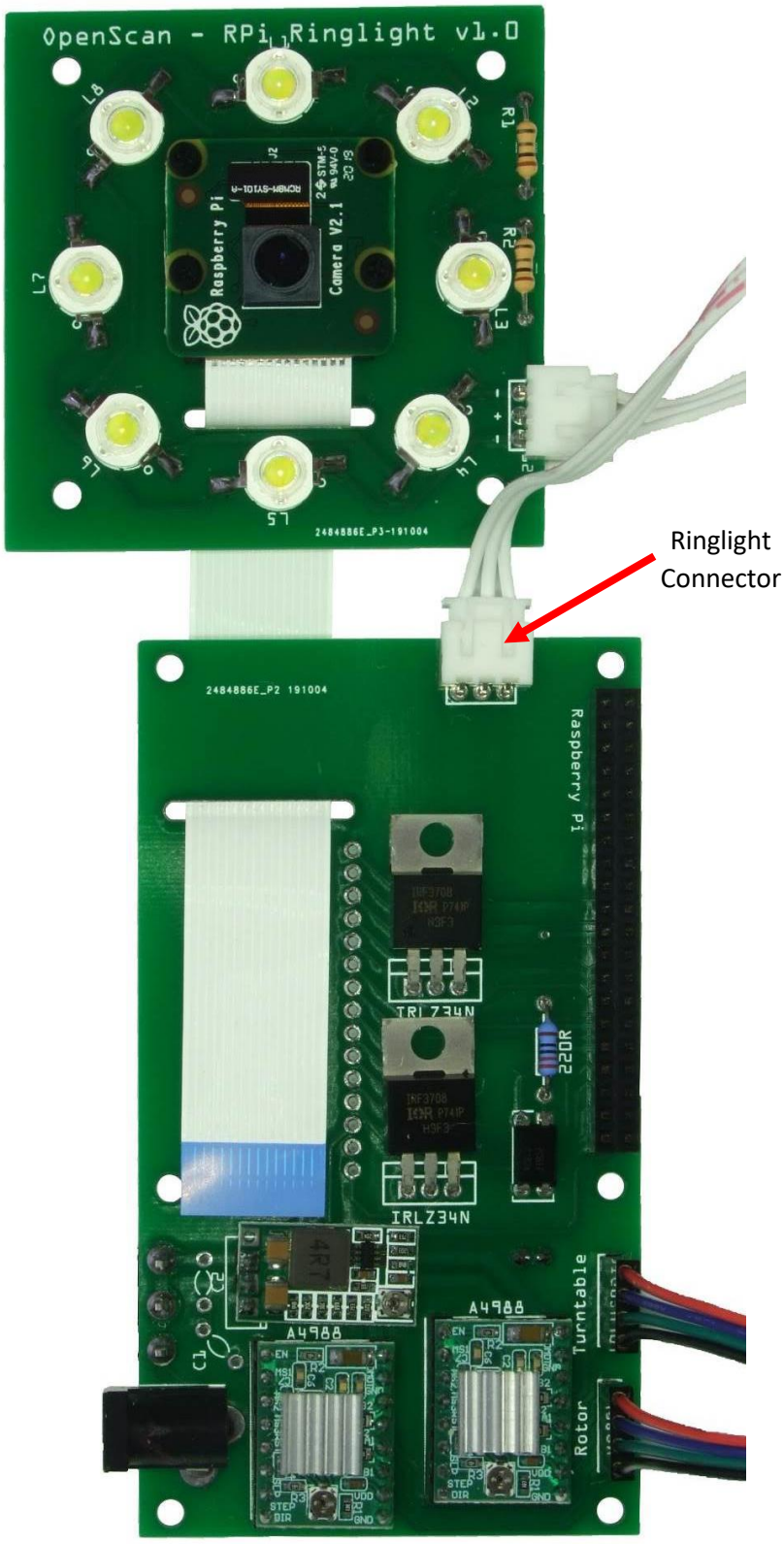


(2) Insert the ribbon cable with the blue side visible from the back side of the camera. Then, gently close the connector.



(3) Screw or glue the Raspberry Pi Camera to the Ringlight and arrange the cables in the following way:

(4) Connect the Raspberry Pi Shield and the Ringlight/Camera in the following way. The blue side oft he camera ribbon cable should be facing upwards.

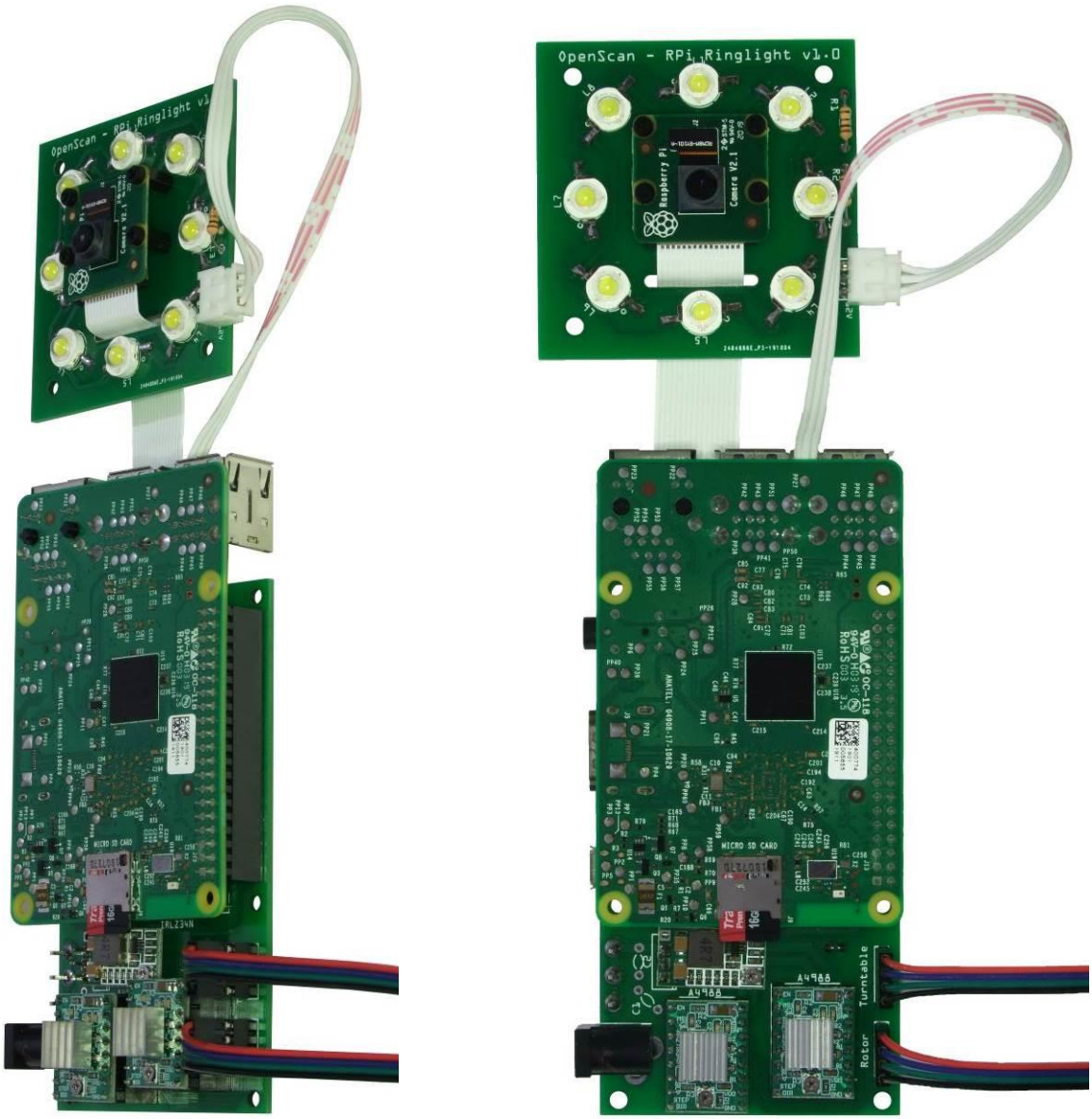



When using the Raspberry Pi 4, the Ringlight Connector needs to be flipped 180°, since the spacing on the Raspberry Pi has been changed. (All pre-soldered shields from [www.openscan.eu/shop](www.openscan.eu/shop) have been modified accordingly, that those are compatible with the following Raspberry Pi Versions: 4, 3B+, 3B, 3A+, 2B v1.2 (no wifi)

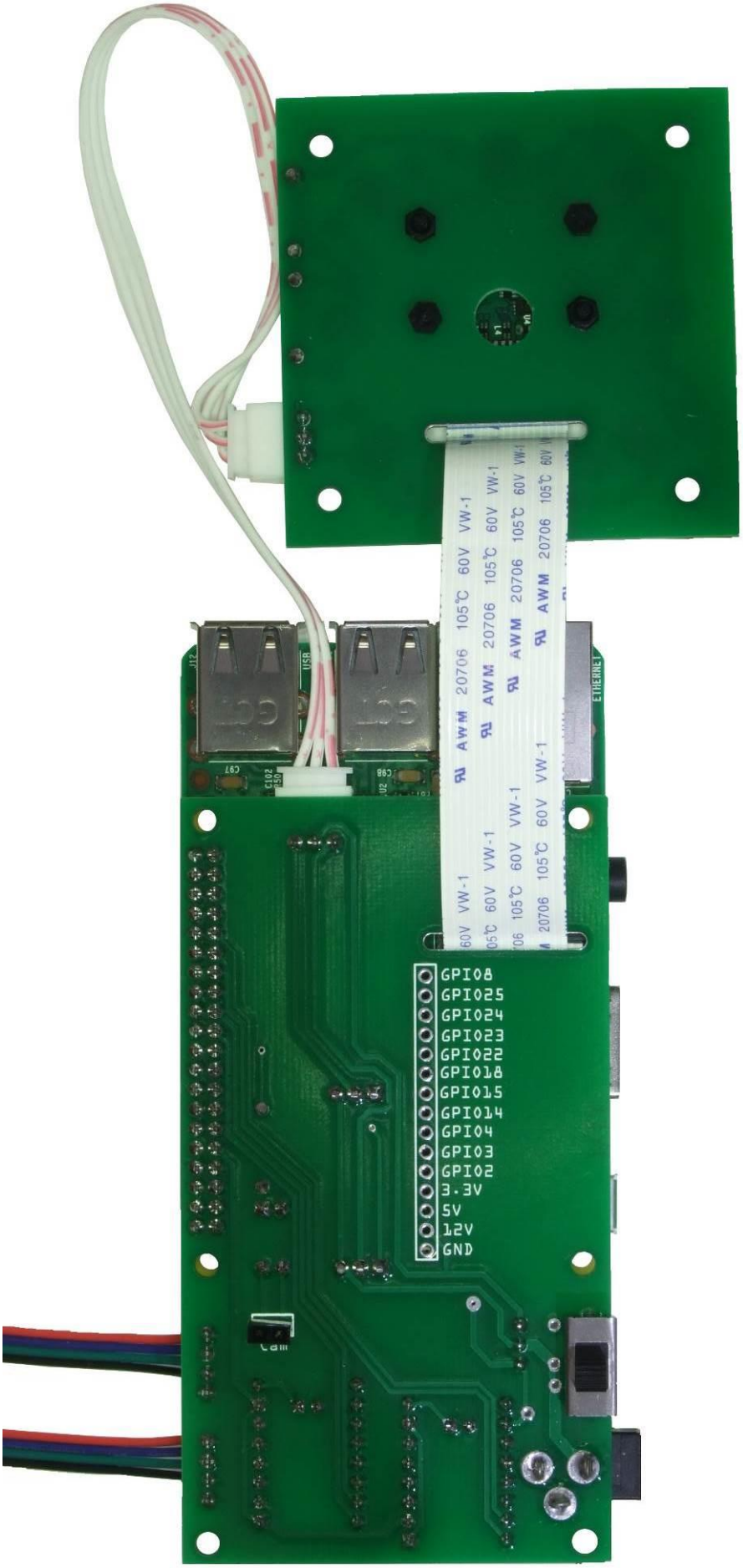
### 2.3.3. Raspberry Pi

(1) Attach the open end of the camera ribbon cable to the Raspberry Pi. The blue side of the ribbon cable has to face towards the USB-connectors of the Raspberry Pi as shown:

(2) Attach the Raspberry Pi to the Shield. Make sure, that all pins are alligned correctly:



(3) Plug in the power supply cable (not shown in picture) and turn the device on by changing the switch to the lower position. After ca. 30-60s the ringlight will flash in a couple of burst indicating the the RPi the system is turned on and that you can access the interface through your browser.



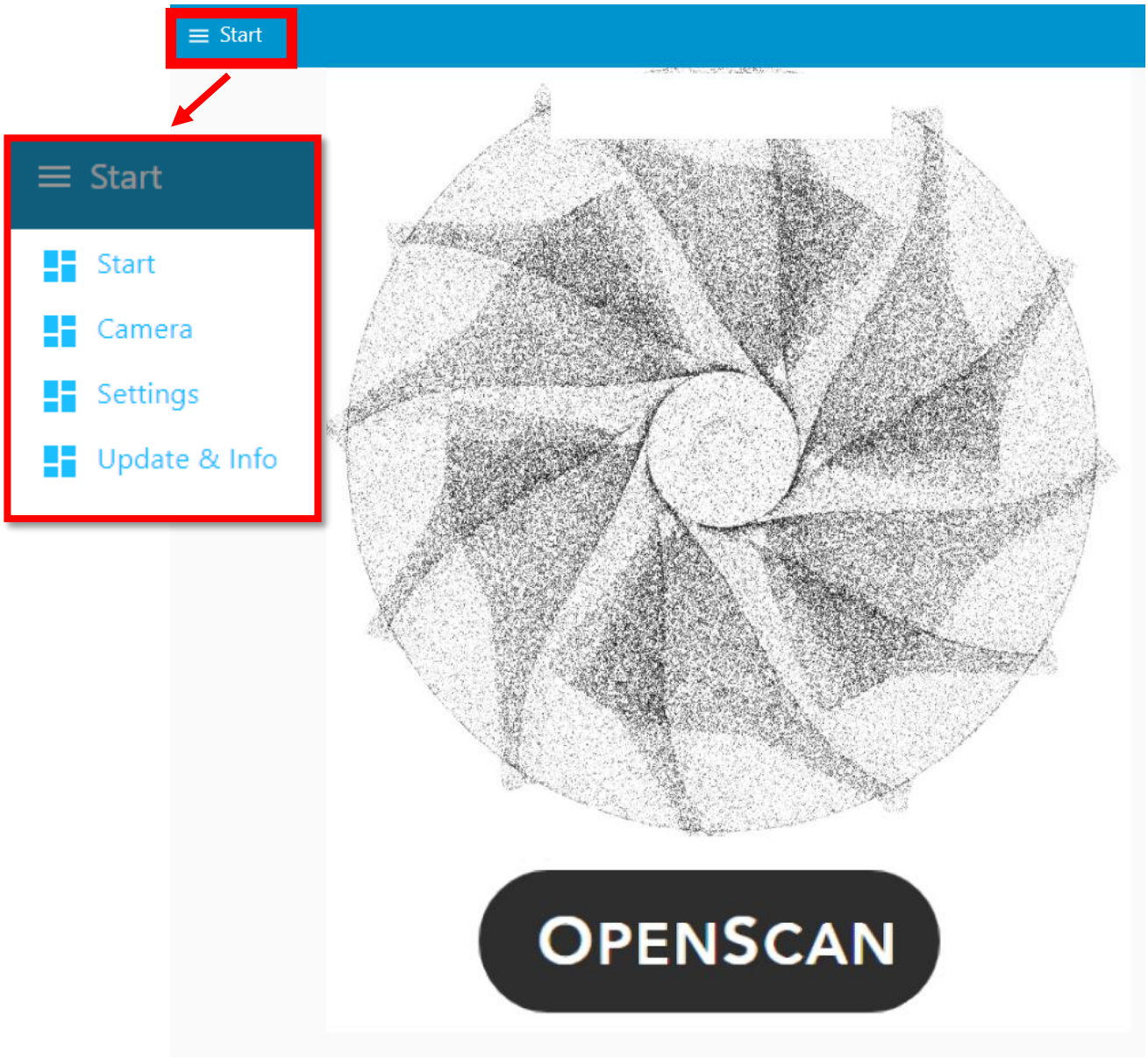
# 3. User Interface

## 3.1. Frontend

To access the interface you need to connect to the same network as the Raspberry Pi and open a web browser on your device. Enter the Raspberry Pi's IP address + the ending ":1880/ui" into the browser's address line and press enter. Alternatively since Version **2020-02-11** you can use the address: "openscanpi:1880/ui"

(For more deteails on finding the IP address see: *2.2.3 Finding the IP Address*)

### 3.1.1. Start

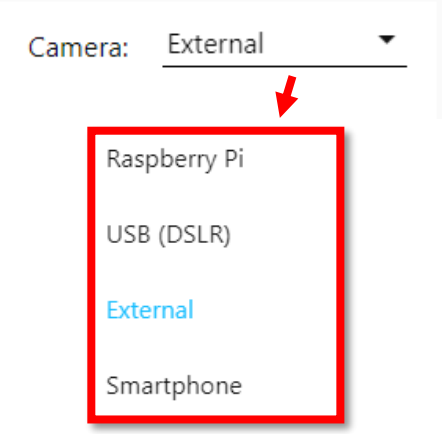
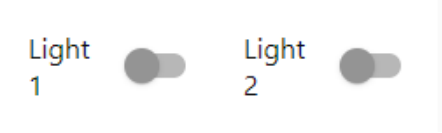
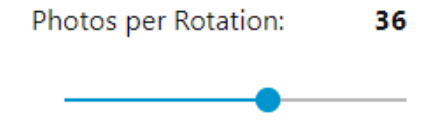
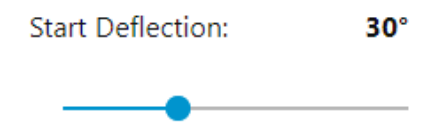
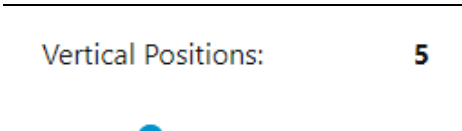
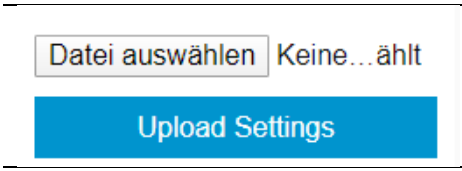



In case, you have selected auto-update in Settings, you will get notifications on the very top of this page.

You can access the main menu by clicking on the symbol in the left-top corner.

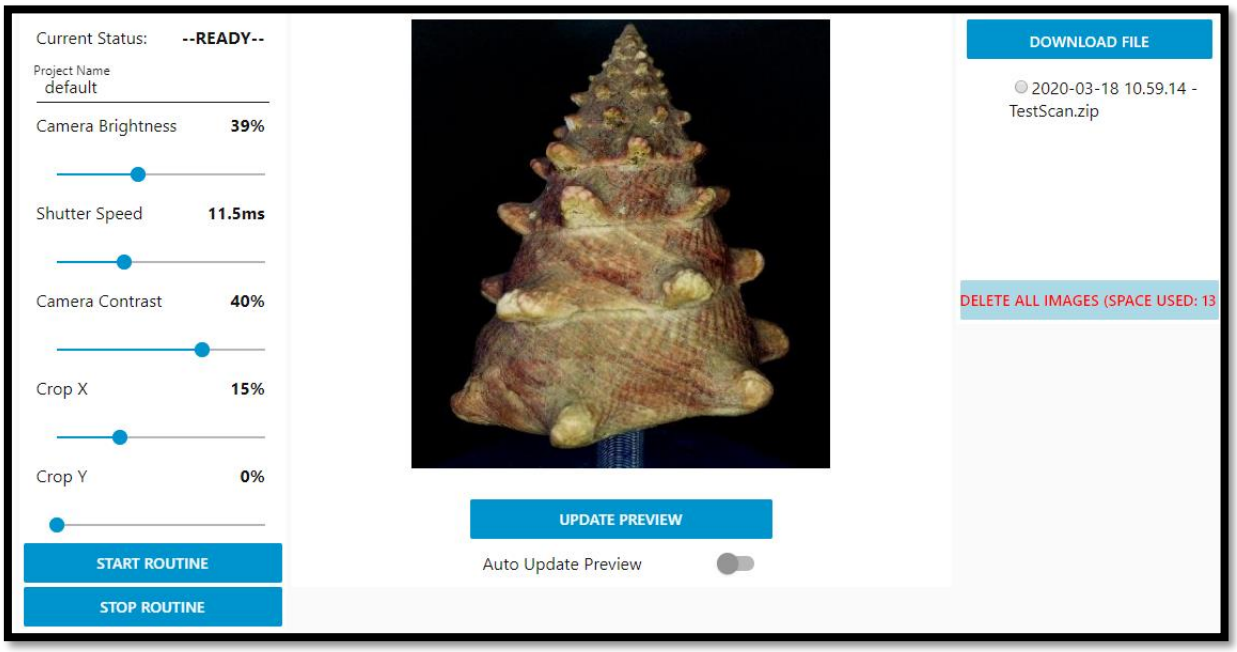
### 3.1.2. Camera

There are four different camera modes, currently supported by the controller: Raspberry Pi Camera, USB (DSLR), External and Smartphone*. All of those modes share the same general control options as shown below:

| | |
|---|---|
|  | Chose the camera mode you want to use. |
|  | Use the control buttons to manually position the object. Make sure to place the object/objectholder in the center of the two rotational planes |
|  | Each switch controls half of the ringlight's LEDs |
|  | On each vertical/rotor position the turntable will stop x times, thus taking x photos per turntable rotation.<br>*recommended value: 30-40* |
|  | This parameter defines the maximum tilting angle, where 0° is the manually set position.<br>*recommended value: 30°-40°* |
|  | This parameter defines the number of increments, where the rotor will stop. In the shown case it is +30°, +15°, 0°, -15° and -30°.<br>*recommended value: 3-5* |
|  | You can upload routine and camera settings from a previous project. The parameter-file will be saved within the zip-archive (RPi Camera + USB(DSLR) only) |
|  | Whenever you finished your work, please use the shutdown button and wait 10s before powering off the Raspberry Pi to prevent any damage. |

### 3.1.2.1. Raspberry Pi Camera

**Overview:**




**Column 1 – Camera and Project Settings:**

| | |
|---|---|
| Current Status: **--READY--** | Feedback about the current state of the device |
| Project Name default | Set the name of the image set, which will later be used to name the zip-file. |
| Camera Brightness **39%** | Set the camera brightness that the image is well-lit but not overexposed.<br>*recommended value: 20-50* |
| Shutter Speed **11.5ms** | *recommended value: below 5-30ms* |
| Camera Contrast **0%** | Use this value to increase the contrast of the photos<br>*recommended value: 0-20%* |
| Crop X **15%**<br>Crop Y **0%** | Depending on the object it might be usefull to crop the photos. This can drastically reduce the filesize and thus speed up processing. |
| START ROUTINE<br>STOP ROUTINE | When all parameters are set, it is time to start the routine. All taken photos will be packed to a zip-file and added to the file list (see below). It is possible to adjust the camera parameters + cropping while the routine is running. You can also stop the routine and all photos taken will be saved. |

**Column 2 - Preview**

| | |
|---|---|
|  | Make sure, that the image:<br>- is not blurry/well-focused<br>- has no over-exposed areas<br>- has a very uniform background<br>- many features visible on the object |
| UPDATE PREVIEW | Manually update the camera preview, whenever you change the settings, position of the scan object or external lighting. |
| Auto Update Preview | Use this option, when focusing the camera, it will update the preview every second. |

**Column 3 – Local file Storage and Download**

| | |
|---|---|
| DOWNLOAD FILE<br>2020-03-18 10.59.14 - TestScan.zip | Locally (on the RPi) saved photo-sets. Chose a set and click download to transfer the files to your computer. Depending on your network and the filesize this might take some time. |
| DELETE ALL IMAGES (13 % USED) | Clean the RPi storrage from time to time by deleting old photosets. This can not be undone! |

#### 3.1.2.2. USB (DSLR)

You can directly connect a camera via USB and use the interface to preview and capture photos automatically. The interface is similar tot he Raspberry Pi Camera. The functionality is based on the great GPhoto2 Library (see http://www.gphoto.org/) and the number of supported cameras is huge.

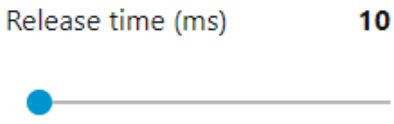
Currently the following cameras are supported for Liveview and Capture:

| | | |
|---|---|---|
| Agfa ePhoto 1280 | Canon PowerShot A510 (PTP mode) | Nikon DSC D5500 |
| Agfa ePhoto 1680 | Canon PowerShot A520 (PTP mode) | Nikon DSC D5600 |
| Agfa ePhoto 307 | Canon PowerShot A60 (PTP) | Nikon DSC D600 |
| Agfa ePhoto 780 | Canon PowerShot A620 (PTP mode) | Nikon DSC D610 |
| Agfa ePhoto 780C | Canon PowerShot A640 (PTP mode) | Nikon DSC D700 (PTP mode) |
| Apple QuickTake 200 (Sierra Mode) | Canon PowerShot A650IS (PTP mode) | Nikon DSC D7000 (PTP mode) |
| Canon Digital IXUS 180 | Canon PowerShot A70 (PTP) | Nikon DSC D7100 |
| Canon Digital IXUS 30 (normal mode) | Canon PowerShot A75 (PTP mode) | Nikon DSC D7200 |
| Canon Digital IXUS 300 | Canon PowerShot A80 (PTP) | Nikon DSC D750 |
| Canon Digital IXUS 330 | Canon PowerShot A85 (PTP mode) | Nikon DSC D7500 |
| Canon Digital IXUS 400 (PTP mode) | Canon PowerShot A95 (PTP mode) | Nikon DSC D800 |
| Canon Digital IXUS 430 (PTP mode) | Canon PowerShot G1 | Nikon DSC D800E |
| Canon Digital IXUS 500 (PTP mode) | Canon PowerShot G10 | Nikon DSC D810 |
| Canon Digital IXUS i (normal mode) | Canon PowerShot G2 | Nikon DSC D810A |
| Canon Digital IXUS i5 (normal mode) | Canon PowerShot G3 (normal mode) | Nikon DSC D850 |
| Canon Digital IXUS II (PTP mode) | Canon PowerShot G3 (PTP mode) | Nikon DSC D90 (PTP mode) |
| Canon Digital IXUS IIs (PTP mode) | Canon PowerShot G3 X | Nikon DSC Df |
| Canon Digital IXUS v | Canon PowerShot G5 (PTP mode) | Nikon DSLR (WLAN) |
| Canon Digital IXUS v2 | Canon PowerShot G5X | Nikon Z6 |
| Canon Digital IXUS v3 (normal mode) | Canon Powershot G6 (PTP mode) | Nikon Z7 |
| Canon Digital IXUS v3 (PTP mode) | Canon PowerShot G7 (PTP mode) | Olympus C-1000L |
| Canon Digital Rebel XT (normal mode) | Canon PowerShot G7 X | Olympus C-1400L |
| Canon Digital unknown 3 | Canon PowerShot G7 X Mark II | Olympus C-1400XL |
| Canon Elura 50 (normal mode) | Canon PowerShot G9 (PTP mode) | Olympus C-2000Z |
| Canon EOS (WLAN) | Canon PowerShot G9 X Mark II | Olympus C-2020Z |
| Canon EOS 1000D | Canon PowerShot IXY Digital L (normal | Olympus C-2040Z |
| Canon EOS 100D | mode) | Olympus C-2100UZ |
| Canon EOS 10D | Canon PowerShot Pro90 IS | Olympus C-2500L |
| Canon EOS 1100D | Canon PowerShot S1 IS (PTP mode) | Olympus C-3000Z |
| Canon EOS 1200D | Canon PowerShot S110 (2001) | Olympus C-3020Z |
| Canon EOS 1300D | Canon PowerShot S2 IS (PTP mode) | Olympus C-3030Z |
| Canon EOS 1D C | Canon PowerShot S200 | Olympus C-3040Z |
| Canon EOS 1D Mark IV | Canon PowerShot S230 (normal | Olympus C-370Z |
| Canon EOS 1D X | mode) | Olympus C-400 |
| Canon EOS 1D X MarkII | Canon PowerShot S230 (PTP mode) | Olympus C-400L |
| Canon EOS 2000D | Canon PowerShot S3 IS (PTP mode) | Olympus C-4040Z |
| Canon EOS 200D | Canon PowerShot S30 | Olympus C-410 |
| Canon EOS 20D (normal mode) | Canon PowerShot S300 | Olympus C-410L |
| Canon EOS 300D (normal mode) | Canon PowerShot S330 | Olympus C-420 |
| Canon EOS 350D (normal mode) | Canon PowerShot S40 | Olympus C-420L |
| Canon EOS 4000D | Canon PowerShot S400 (PTP mode) | Olympus C-5050Z |
| Canon EOS 40D (PTP mode) | Canon PowerShot S410 (PTP mode) | Olympus C-700UZ |
| Canon EOS 450D (PTP mode) | Canon PowerShot S45 (normal mode) | Olympus C-750UZ |
| Canon EOS 500D | Canon PowerShot S5 IS (PTP mode) | Olympus C-770UZ |
| Canon EOS 50D | Canon PowerShot S50 (PTP mode) | Olympus C-800 |
| Canon EOS 550D | Canon PowerShot S500 (PTP mode) | Olympus C-800L |
| Canon EOS 5D (normal mode) | Canon Powershot S60 (PTP mode) | Olympus C-820 |
| Canon EOS 5D Mark II | Canon Powershot S70 (PTP mode) | Olympus C-820L |
| Canon EOS 5D Mark III | Canon PowerShot S80 (PTP mode) | Olympus C-830L |
| Canon EOS 5D Mark IV | Canon PowerShot SD10 Digital ELPH | Olympus C-840L |
| Canon EOS 5DS | (normal mode) | Olympus C-860L |
| Canon EOS 5DS R | Canon PowerShot SD100 (PTP mode) | Olympus C-900 Zoom |
| Canon EOS 600D | Canon PowerShot SD110 (PTP mode) | Olympus C-900L Zoom |
| Canon EOS 60D | Canon PowerShot SD20 (normal | Olympus C-990 Zoom |
| Canon EOS 650D | mode) | Olympus D-100Z |
| Canon EOS 6D | Canon PowerShot SD200 (normal | Olympus D-200L |
| Canon EOS 6d Mark II | mode) | Olympus D-220L |
| Canon EOS 700D | Canon PowerShot SD500 (PTP mode) | Olympus D-300L |
| Canon EOS 70D | Canon Powershot SX100 IS (PTP | Olympus D-320L |
| Canon EOS 750D | mode) | Olympus D-330R |
| Canon EOS 760D | Canon PowerShot SX110 IS | Olympus D-340L |

| | | |
|---|---|---|
| Canon EOS 77D | Canon PowerShot SX540 HS | Olympus D-340R |
| Canon EOS 7D | Canon PowerShot SX740 HS | Olympus D-360L |
| Canon EOS 7D MarkII | Canon PowerShot unknown 1 | Olympus D-400L Zoom |
| Canon EOS 800D | Canon PowerShot unknown 2 | Olympus D-450Z |
| Canon EOS 80D | Canon Rebel T2i | Olympus D-460Z |
| Canon EOS D30 | Canon Rebel T3 | Olympus D-500L |
| Canon EOS D60 | Canon Rebel T3i | Olympus D-535Z |
| Canon EOS Digital Rebel (normal mode) | Canon Rebel T4i | Olympus D-600L |
| | Canon SX 720HS | Olympus D-600XL |
| Canon EOS Kiss Digital (normal mode) | Canon ZR70MC (normal mode) | Olympus D-620L |
| Canon EOS Kiss Digital N (normal mode) | Chinon ES-1000 | Olympus E-M1 |
| | Epson PhotoPC 3000z | Olympus E-M1 Mark II |
| Canon EOS Kiss X2 (PTP mode) | Epson PhotoPC 500 | Olympus E-M5 Mark II |
| Canon EOS Kiss X3 | Epson PhotoPC 550 | Olympus fe-200 |
| Canon EOS M10 | Epson PhotoPC 600 | Olympus SP-500UZ |
| Canon EOS M100 | Epson PhotoPC 650 | Olympus X-450 |
| Canon EOS M2 | Epson PhotoPC 700 | Panasonic Coolshot NV-DCF5E |
| Canon EOS M3 | Epson PhotoPC 800 | Panasonic DC-GH5 |
| Canon EOS M5 | Epson PhotoPC 850z | Pentax Optio 33WR |
| Canon EOS M50 | Fuji Fujifilm X-H1 | Pentax Optio 450 |
| Canon EOS M6 | Fuji Fujifilm X-Pro2 | Polaroid PDC 2300Z |
| Canon EOS R | Fuji Fujifilm X-T1 | Polaroid PDC 640 |
| Canon EOS Rebel T1i | Fuji Fujifilm X-T2 | PTP/IP Camera |
| Canon EOS Rebel T6 | Fuji Fujifilm X-T3 | Sanyo DSC-X300 |
| Canon EOS Rebel T7i | Fuji GFX 50 R | Sanyo DSC-X350 |
| Canon EOS Rebel XSi (PTP mode) | Minolta Dimage V | Sanyo VPC-G200 |
| Canon FV M1 (normal mode) | Nikon 1 (WLAN) | Sanyo VPC-G200EX |
| Canon IXY DIGITAL 300 | Nikon CoolPix 100 | Sanyo VPC-G210 |
| Canon IXY Digital 40 (normal mode) | Nikon CoolPix 2100 (Sierra Mode) | Sanyo VPC-G250 |
| Canon IXY Digital L2 (normal mode) | Nikon CoolPix 2500 (Sierra Mode) | Sierra Imaging SD640 |
| Canon IXY DV M | Nikon CoolPix 300 | Sony Alpha-A5100 (Control) |
| Canon IXY DV M2 (normal mode) | Nikon CoolPix 3500 (Sierra Mode) | Sony Alpha-A6300 (Control) |
| Canon MV630i (normal mode) | Nikon CoolPix 4300 (Sierra Mode) | Sony Alpha-A6500 (Control) |
| Canon MV650i (normal mode) | Nikon CoolPix 700 | Sony Alpha-A68 (Control) |
| Canon MVX 10i (normal mode) | Nikon CoolPix 800 | Sony Alpha-A7 III (PC Control) |
| Canon MVX 3i (normal mode) | Nikon CoolPix 880 | Sony Alpha-A77 M2 (Control) |
| Canon MVX100i | Nikon CoolPix 900 | Sony Alpha-A7III (Control) |
| Canon MVX150i (normal mode) | Nikon CoolPix 900S | Sony Alpha-A7r II (Control) |
| Canon MVX25i (normal mode) | Nikon CoolPix 910 | Sony Alpha-A7R III (Control) |
| Canon MVX2i | Nikon CoolPix 950 | Sony Alpha-A7r III (PC Control) |
| Canon Optura 10 | Nikon CoolPix 950S | Sony Alpha-A7S (Control) |
| Canon Optura 20 | Nikon CoolPix 990 | Sony Alpha-A9 (Control) |
| Canon Optura 20 (normal mode) | Nikon CoolPix 995 | Sony Alpha-A99 M2 (Control) |
| Canon Optura 200 MC | Nikon Coolpix S9700 | Sony Alpha-RX10M4 (Control) |
| Canon Optura 300 (normal mode) | Nikon D100 (Sierra Mode) | Sony DSC-RX0 (PC Control) |
| Canon Optura 40 (normal mode) | Nikon DSC D300s (PTP mode) | Sony DSC-RX100M4 |
| Canon Optura Xi (normal mode) | Nikon DSC D3100 (PTP mode) | Sony DSC-RX100M5A (PC Control) |
| Canon PowerShot A10 | Nikon DSC D3200 | Sony DSC-RX100M6 (PC Control) |
| Canon PowerShot A100 | Nikon DSC D3300 | Sony DSC-RX10M3 (Control) |
| Canon PowerShot A20 | Nikon DSC D3400 | Sony ILCE-7M2 (Control) |
| Canon PowerShot A200 | Nikon DSC D3500 | Toshiba PDR-M60 |
| Canon PowerShot A30 | Nikon DSC D3s (PTP mode) | Toshiba PDR-M61 |
| Canon PowerShot A300 (PTP mode) | Nikon DSC D3x (PTP mode) | Toshiba PDR-M65 |
| Canon PowerShot A310 (PTP mode) | Nikon DSC D4 | USB PTP Class Camera |
| Canon PowerShot A40 | Nikon DSC D4s | |
| Canon PowerShot A400 (PTP mode) | Nikon DSC D5 | |
| Canon PowerShot A460 (PTP mode) | Nikon DSC D500 | |
| | Nikon DSC D5000 (PTP mode) | |
| | Nikon DSC D5100 (PTP mode) | |
| | Nikon DSC D5200 | |
| | Nikon DSC D5300 | |

#### 3.1.2.3. External

You can connect almost any camera via a remote shutter control, that needs to be connected to the Optocoupler on the front of the control panel.

| | |
|---|---|
|  | Depending on the camera model, this parameter has to set accordingly. If this value is to high, the camera might get triggered twice. If it is to low, it would not get triggered at all.<br>*recommended value: 50-150* |
|  | Delay time in each position for the camera to take the photo. This should be greater then the set exposure time.<br>*recommended value: exposure time * 1.5* |

#### 3.1.2.4. Smartphone

Triggering a smartphone via bluetooth is not possible, yet. Feel free to share your thoughts about setting up the bluetooth connection. The following repositories could be a nice starting point:

https://gist.github.com/ukBaz/a47e71e7b87fbc851b27cde7d1c0fcf0

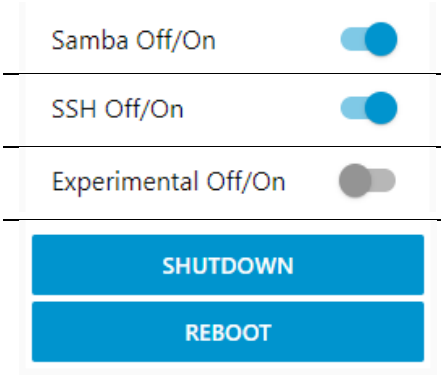
and:

http://yetanotherpointlesstechblog.blogspot.com/2016/04/emulating-bluetooth-keyboard-with.html

A smartphone's camera usually can be triggered by sending an enter or volume up keystroke from a connected HID. It would be my aim to setup the RPi as Bluetooth HID and send those keystrokes. I've successfully tested this on Android devices, but iOS does not work, yet…

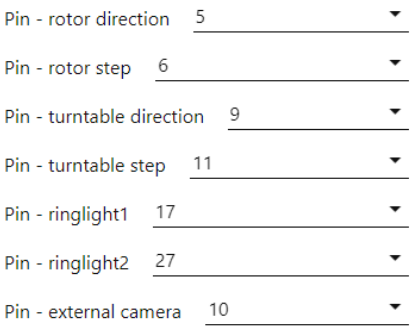
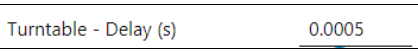
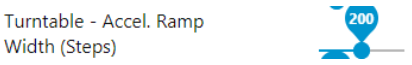
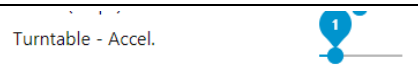
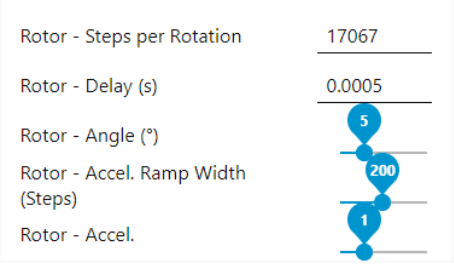
### 3.1.3. Settings

**Column 1 – Settings**

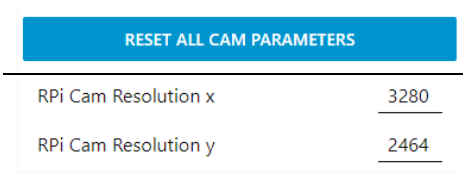
| | |
|---|---|
|  | Samba is a fileserver, that makes the RPi's internal file system visible to your local network.<br>Allow SSH access to the RPi (e.g. with Putty)<br>This will enable the experimental functions, which will show an additional tab in the camera menu with new functions :)<br>It is recommended to shutdown the RPi after use Wait 10s before switching the power off. |

**Column 2 – Advanced Pin & Motor Settings**

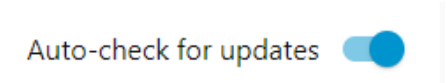
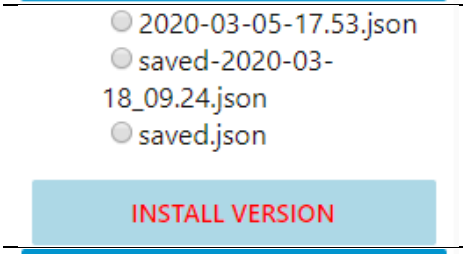
**Please make sure to understand, what changes might do to your hardware. It is recommended to switch off the the device, disconnect external hardware and only then make changes!**

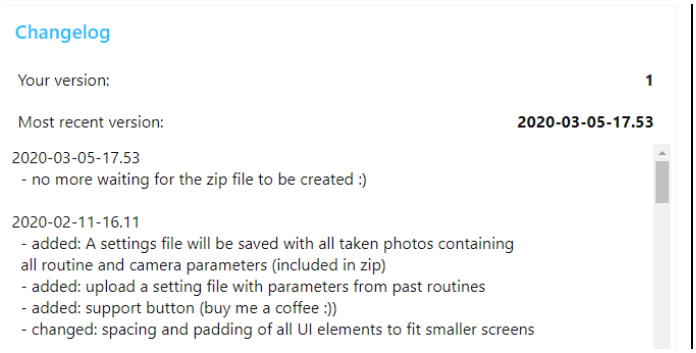
| | |
|---|---|
|  | If you experiment with the settings, you can always reload the standard values. |
|  | If you do not use the provided PCB, you can change the pinout of the RPi accordingly. It is highly adviced to change the pinout without any devices connected to the pins (power off the RPi + unplug everything) |
|  | The turntable in the standard configuration uses microstepping (200 steps per rotation * 16 microsteps = 3200) |
|  | Delay between each step |
|  | Angle for manual movement of the turntable<br>  |
|  | Number of steps defining the width of the acceleration ramp. In this case (200) the delay time will be decreased during the first 200 steps of a movement and increased on the last 200 steps. |
|  | A factor on how fast the delay is increased/decreased during the acceleration process |
|  | *see above* |

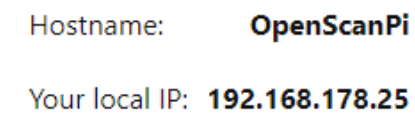
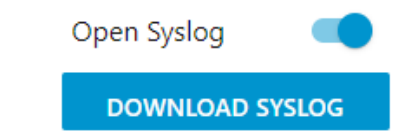
**Column 3 – Advanced Camera Parameters**

| | |
|---|---|
|  | Resolution of the RPi Camera v2.1. You can use other Pi-compatible cameras by adjusting these values accordingly. It is necessary, that the camera can be controlled by this repository: https://picamera.readthedocs.io/ |

### 3.1.4. Update&Info

| | |
|---|---|
|  | If enabled, the RPi will download a small file on start-up to check, whether there are updates available. |
| **new updates available** | |
|  | If auto-update is disabled, you can check for updates manually. |
|  | **This will overwrite the currently used version and restart the RPi. (When you've changed something in the backend, make sure to save your custom node-red flow.)** |
|  | Save your current flow, when you have done any changes in the node-red backend |

| | |
|---|---|
|  | Stay tuned :)<br>If you need any changes in the firmware, find errors or need new features, you can contact me by email: info@openscan.eu |

| | |
|---|---|
|  | Open the User Manual |
|  | Your local settings |
|  | If any errors occur, you can download the syslog and send it to info@openscan.eu with a short explanation of what has happend. |

## 3.2. Backend

To access the backend, you need to enter the Raspberry Pi's IP address + the ending ":1880" into the browser's address line and press enter.

The backend can be used to:

- add custom elements/functions (e.g. buttons, texts …)
- hide elements/submenus
- modify the existing flow