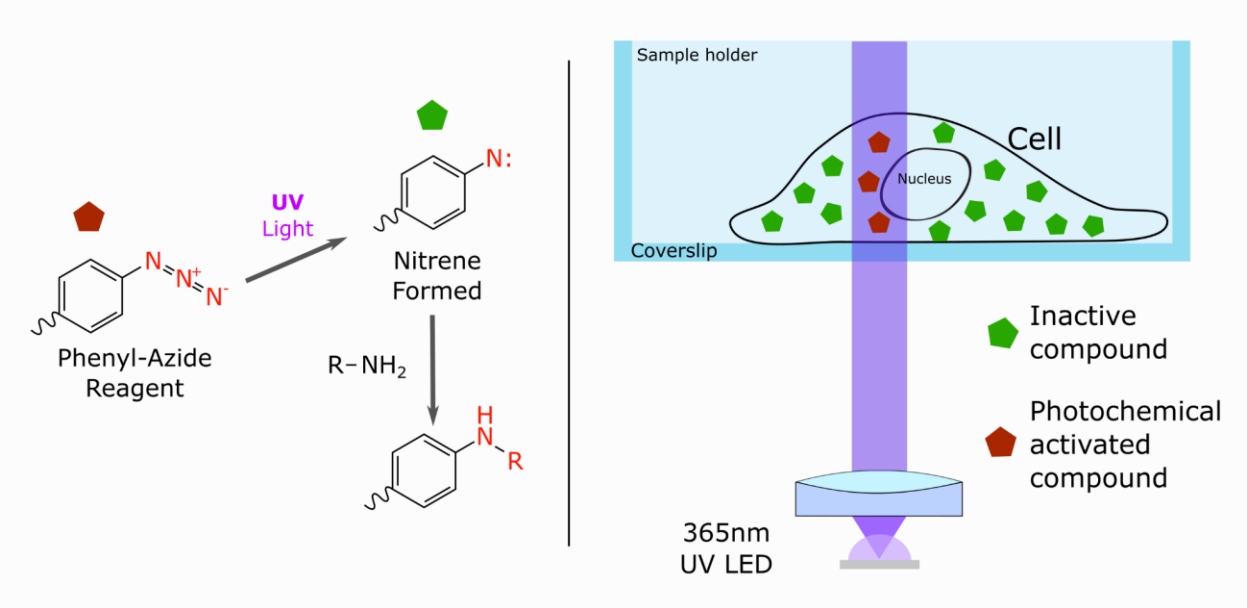

Figure 1. On the left side, the UV activation of phenyl-azide is depicted. The nitrene formed due to the UV light reacts with an amine group. Amine groups are common in protein's binding sites, thus ligands attached with this UV activatable group can covalently bond to the target protein. On the right hand side the device's principle is depicted. In the cell culture plate, we can find the specific ligand of the target protein, completed with fluorophore and UV activeable group. Due to the UV illumination, ligands in the binding sites covalently bind with the target protein, resulting in a specific and permanent labeling.

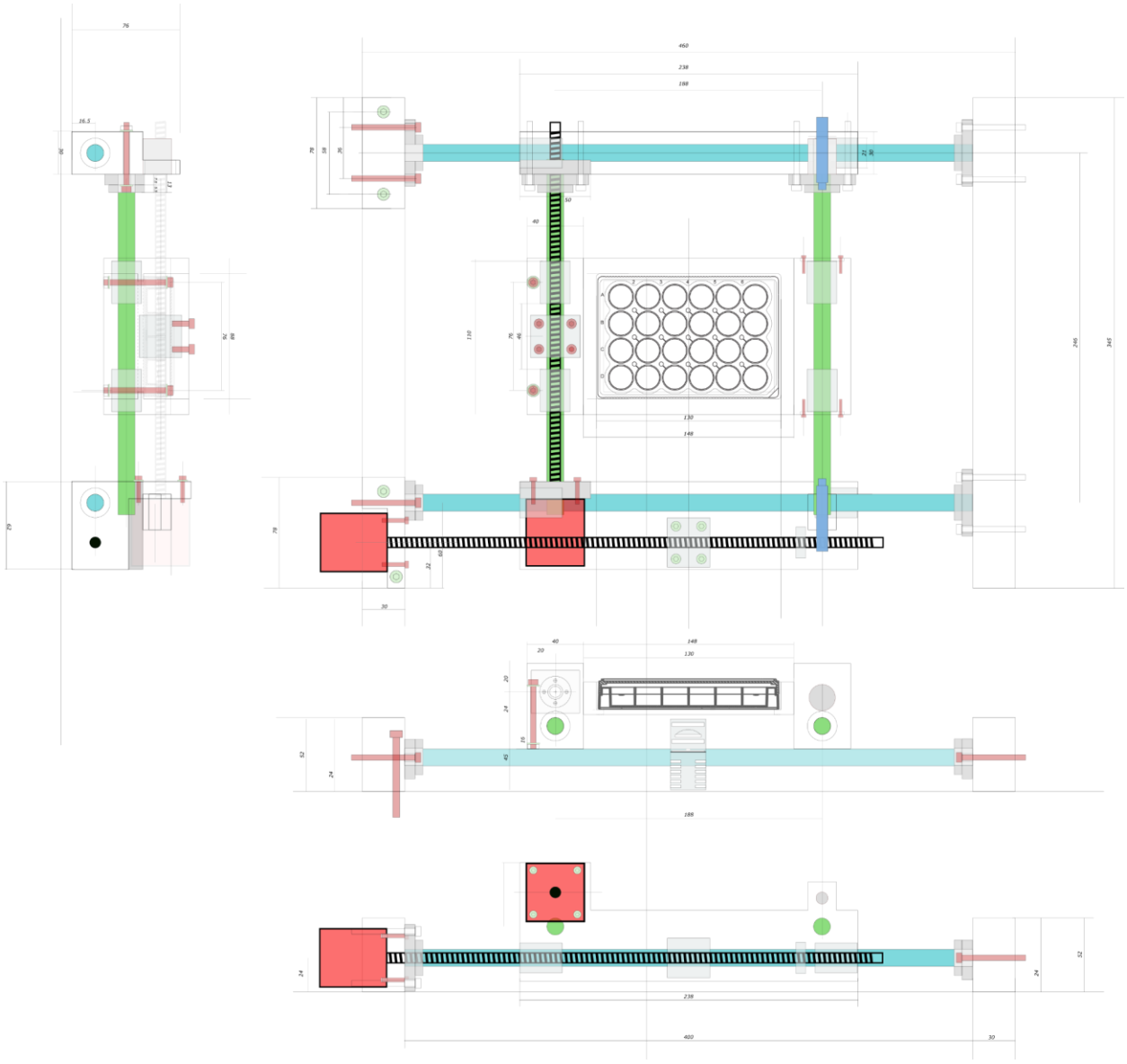

Figure 2. Sections views of the device technical drawing, with the typical dimensions. The two red rectangles are the motors, green and light blue the shafts, the inductive proximity sensors are darker blue.

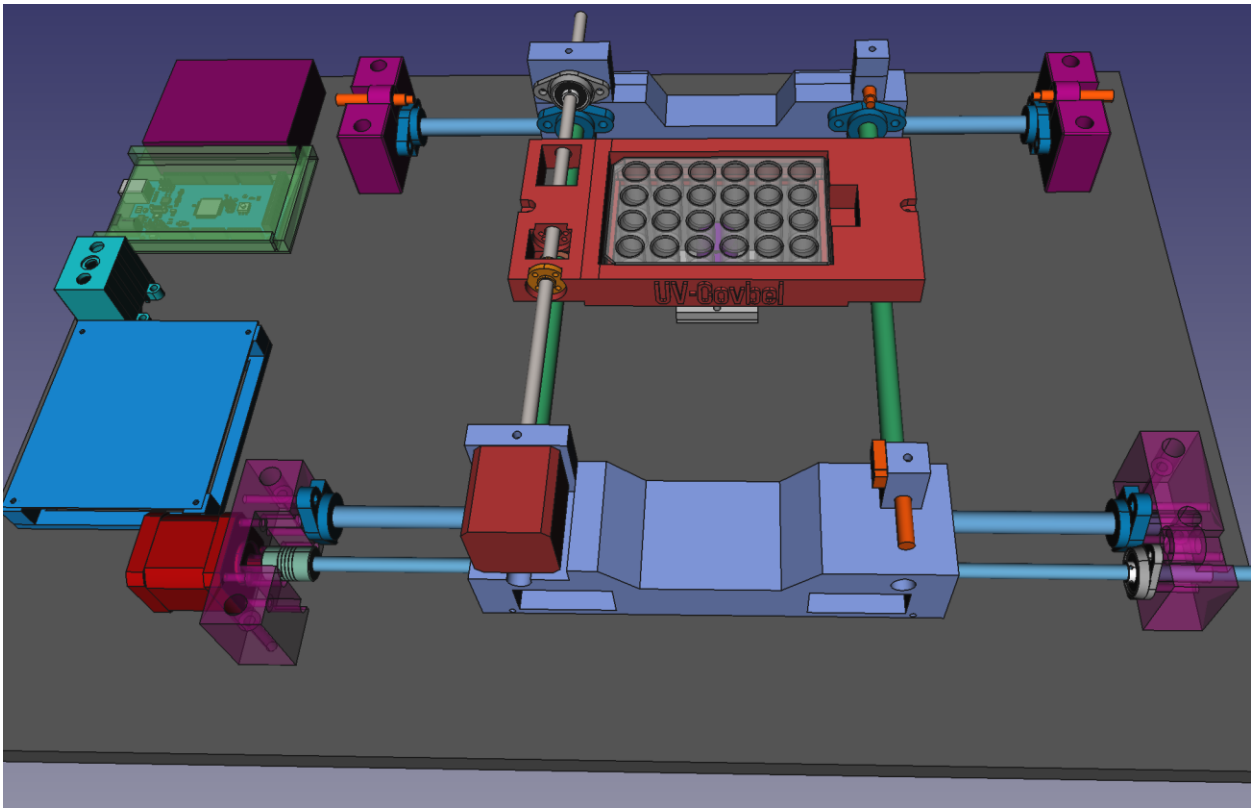

Figure 3. The final assembly was created and visualized by FreeCAD. Stepper motors (red), non-moving 3D printed parts (purple), moving 3D printed parts (cyan), Arduino (green), plate holder in the middle, above the LED, end stop switches (orange)

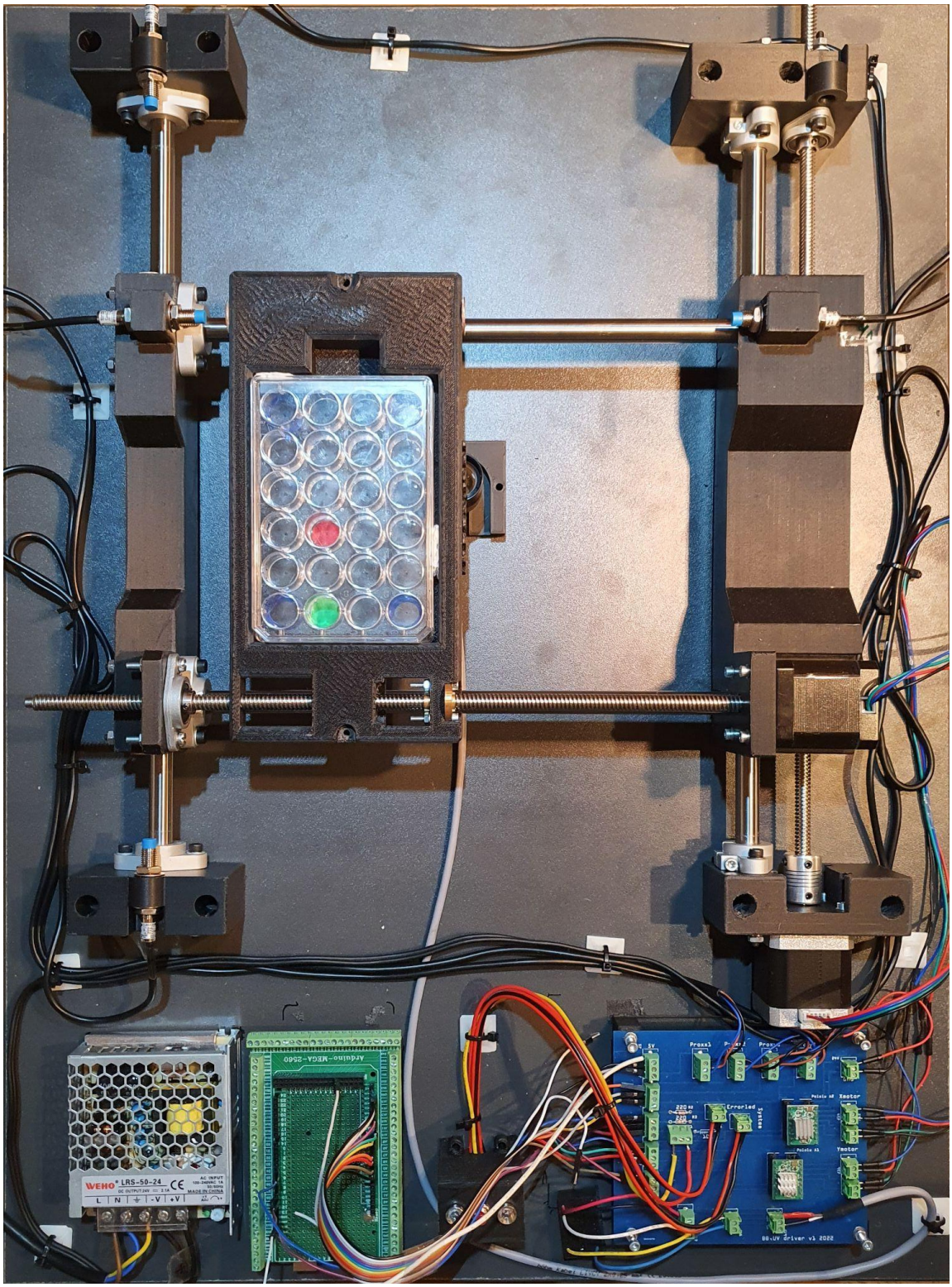

Figure 4. The UV-Covbel instrument. The two stepper motors move the multiwell cell culturing plate above the 365 nm UV light source. A custom design PCB board connects the electrical components with the Arduino controller

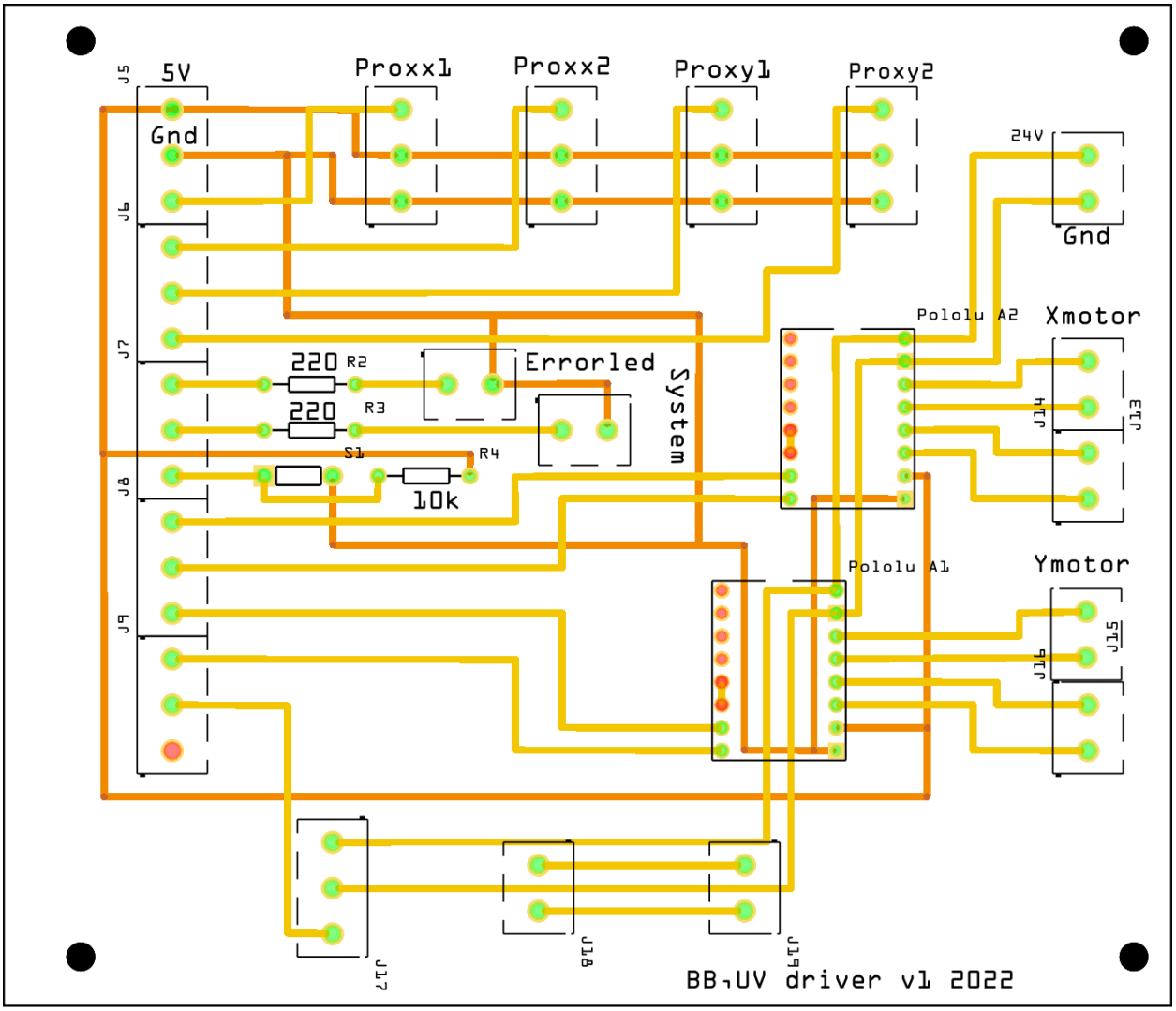

Figure 5. The scheme of the PCB.

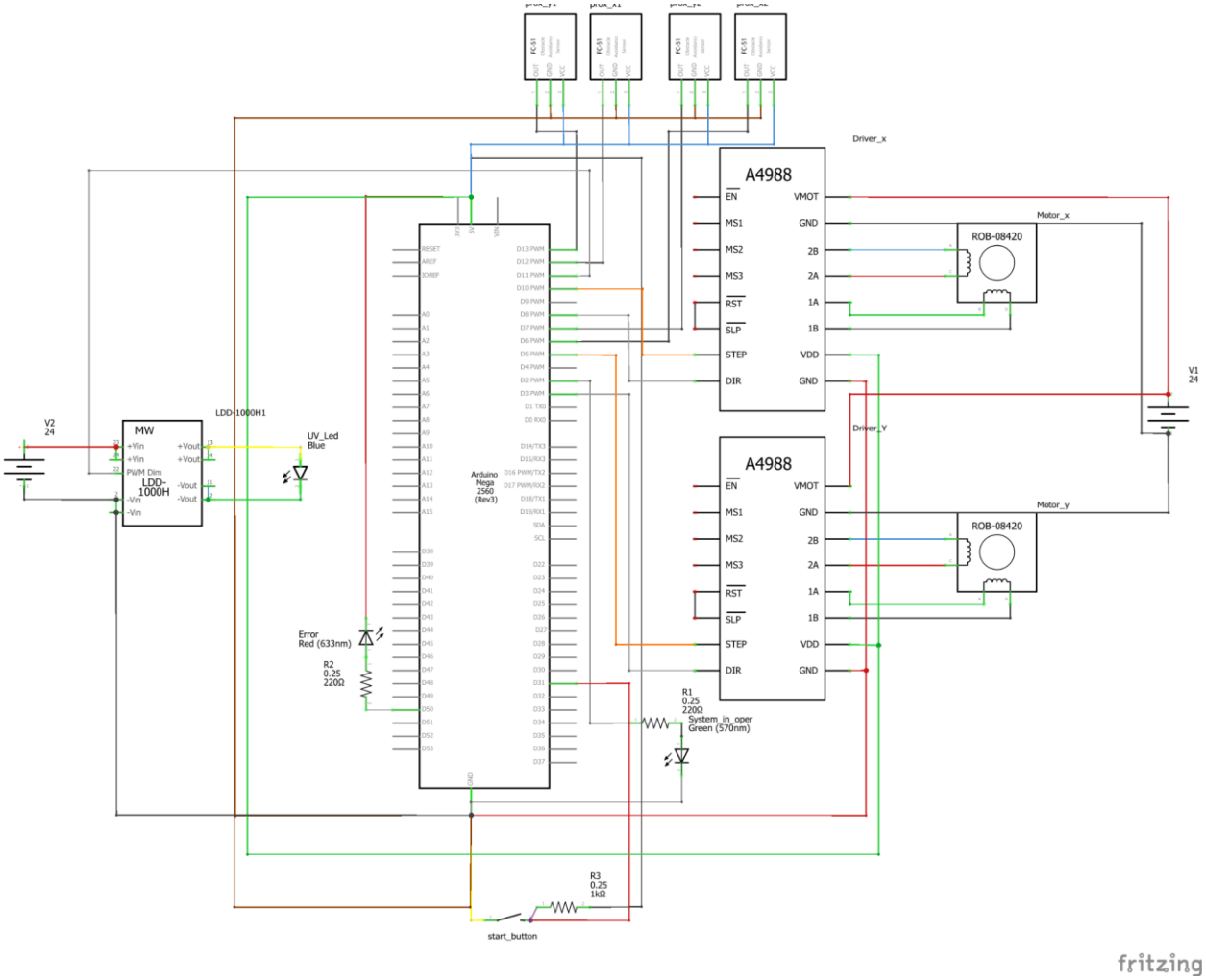

Figure 6. The circuit diagram of the UV-Covbel. In the middle the Arduino, to the left the UV led and its driver, to the right of the Arduino, the two motor drivers, the two motors, on both edges the 24 V power supply. Above the Arduino are the four proximity sensors, below is the start button and the state indicator LEDs.

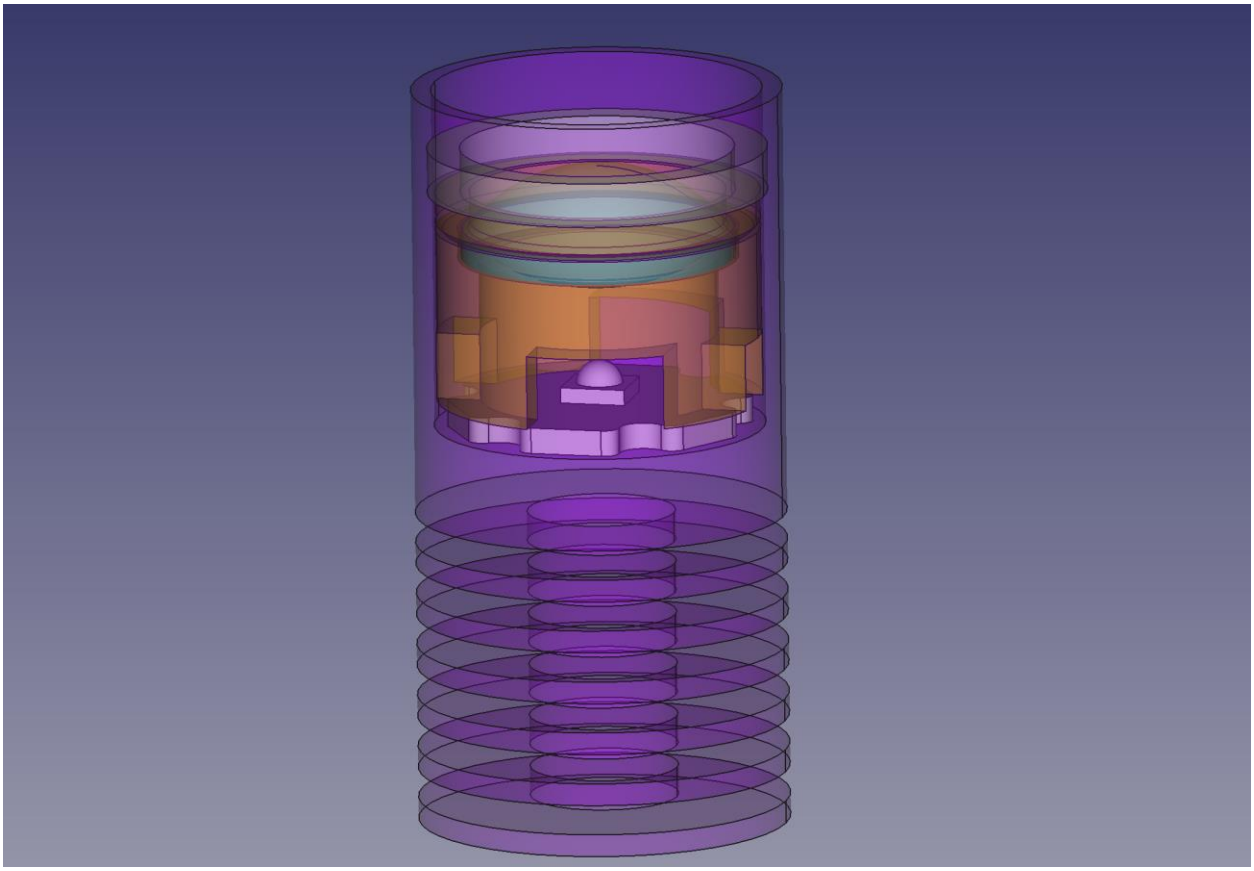

Figure 7. The 365 nm LED is mounted on an MCPCB and built into a metal, thermally conductive lamp housing. The emitted light is collected by a 12mm focal length aspheric condenser lens to produce a quasi parallel beam.

	Serial number	Quantity	Name
M ec	1	1	Y slider (3D printed)
	2	1	Y slider with motor(3D printed)
	3	1	X axis holder with motor(3D printed)
	4	3	X axis holder(3D printed)
	5	2	NEMA17 stepper motor
	6	6	12mm linear axis holder
	7	2	Y axis D12mm x 300mm
	8	2	X axis D12mm x 420mm
	9	1	Leadscrew D8mm x 300mm
	10	1	Leadscrew D8mm x 500mm
	11	2	Flanged Bronze Nut 8mm
	12	4	Proximity sensor 8mm
	13	1	Linear bearing 8mm (3D printed)
	14	1	Baseplate (400mm x 550mm x 18mm)
	15	1	Linear bearing D8mm
	16	4	Linear bearing 21x30
	17	2	Linear bearing 22x32
	18	1	Plate holder (3D printed)
	19	1	Lens holder for the LED optics (3D printed)

	20	2	Lens gaper for the LED optics (3D printed)
	21	1	LED house holder (3D printed)
	22	1	PCB holder (3D printed)
	23	1	Control panel for status LEDs and button (3D printed)
	24	1	Microswitch
	25	2	8 mm KFL08 Self-Aligning Pillow block bearing
	26	1	Plastic protection cover against UV
El ec	27	1	Arduino Mega
	28	1	Arduino Mega Shield
	29	4	Inductive proximity sensor NPN Closer(NO) 5V 8mm
	30	1	Stabilized power supply, 24V, 50W (LRS-50)
	31	2	Bipolar stepper motor driver 2A A4988
	32	1	Pushbutton
	33	1	Red LED
	34	1	GreenLED
	35	2	220 Ohm resistor
	36	1	1 MOhm resistor
	37	1	LED driver 1000mW (LDD-1000 LW MEAN WELL)

Optics	38	1	LED SPOT house, OMI
	39	1	18.5mm Diameter x 12mm FL, Aspheric Condenser Lens
	40	1	LuxiGen LZ1 MCPCB 365nm

Table 1 Part List of the UV-Covbel