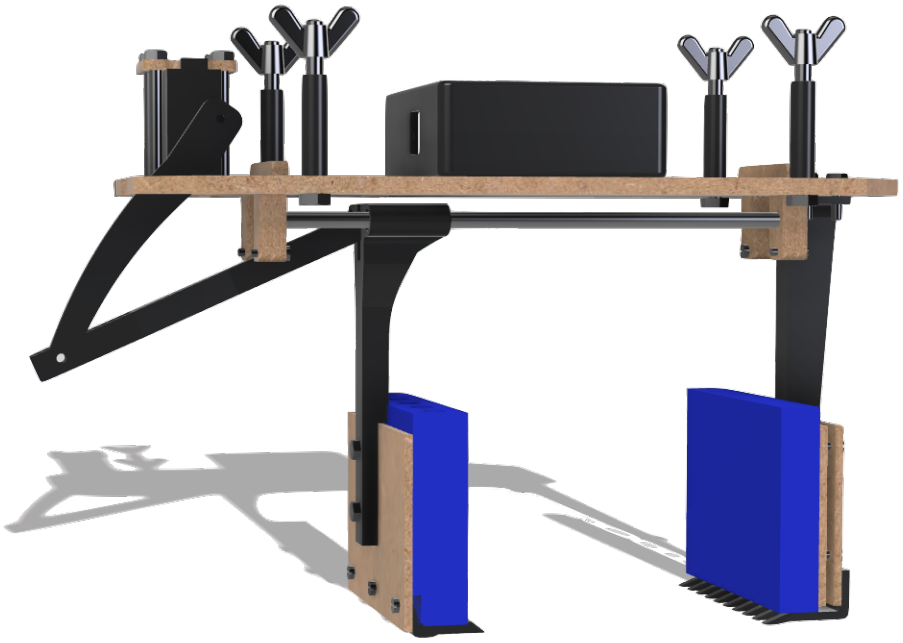
Engineering Drawings

ME-320 Product Development and Engineering Design



Group 42

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Bill-of Materials

Mechanical Components

Part Name	Part Description/ Purpose/Type	Quantity	Material	Production Process/Method	Cost per piece (CHF)	Weight (g)
Sol	Structural part connecting all other components	1	MDF (6mm)	Laser-cutting	0,45	0
Connection to fixed plain	Connection for the fixed plane	1	PLA	3D-printing	0,65	12,49
Connection to moving plain	Connection for the moving plane	1	PLA	3D-printing	0,79	15,8
Palier_Lisse	Plain bearing	4	PLA	3D-printing	0,185	0,37
Alu_bars	Aluminum rod	2	Aluminum (200 mm)	Cut to desired length by a hand saw	0,3	0
Bielle_1	Connecting rod attached to servo	1	PLA	3D-printing	0,25	5
Bielle_2	Connecting rod attached to the PinceMV	1	PLA	3D-printing	0,31	6,2
Plain_surf_1	Fixed plain surface for gripping		MDF (3mm)	Laser-cutting	0,05	0
Plain_surf_2	Fixed plain surface behind the gripping one	1	MDF (3mm)	Laser-cutting	0,05	0
Plain_surf_3	Moving plane surface for gripping	1	MDF (3mm)	Laser-cutting	0,05	0
Raclette Fix	Serve to scoop and grip	1	PETG	3D-printing	0,5	10
Raclette Moving	Serve to scoop and grip	1	PETG	3D-printing	0,45	8,8
Sponge	Sponges	2	Synthetic materials	Cut by hand	0,8	0
-	Bolts	1	Steel alloy	-	3	0
-	Screws	1	Steel alloy	-	1	0
Elec_Box	Electronic Box (housing all electronic components)	1	PLA	3D-printing	2,19	55
Servo_Blocking	Part Servo blocking the servo from the top	1	MDF (6mm)	Laser-cutting	0,02	0
Rods_attach	Part for attaching the alum. rods to the “sol”	2	MDF (6mm)	Laser-cutting	0,04	0
Tube		4	PETG	3D-printing	0,075	1,5
Other (alu_blocking)	**Note: all other smaller structural components**	1	MDF	Laser-cutting	0,01	9
					TOTAL Cost	TOTAL Weight (g)
					13,04	124,16

Note: The weight of the MDF is not shown. Laser-cutting MDF always requires taking some margins, therefore, precise weight is not calculated. This table includes the final assembly materials but uniquely the mechanical components. In another table are presented the electrical components with their type and costs.
Furthermore, the budget on the “Team Budget” sheet does not necessarily match the above-mentioned prices. Above we have included only the prices of pieces that were included in the final design and assembly.

Figure 1: Bill of Materials

Bill of Electronics Materials						
Part Name	**Part Description/ Purpose/Type**	**Quantity**	**Material**	**Production Process/Method**	**Cost per piece**	**Total Cost**
Electronics cable	Cables (0.30/m)				2,00 CHF	
Bernier serre fils	To connect cables going out of the strip board	3			0,25 CHF	
Wagon connector 222	To connect easily the external component to the board	2			0,40 CHF	Only used for prototyping
Capacitor	Metal detection	1			0,20 CHF	
Strip board	Improved stability of the electronic circuit	0,25			7,00 CHF	
						Total Cost = 5,5 CHF

Figure 2: Electrical Bill

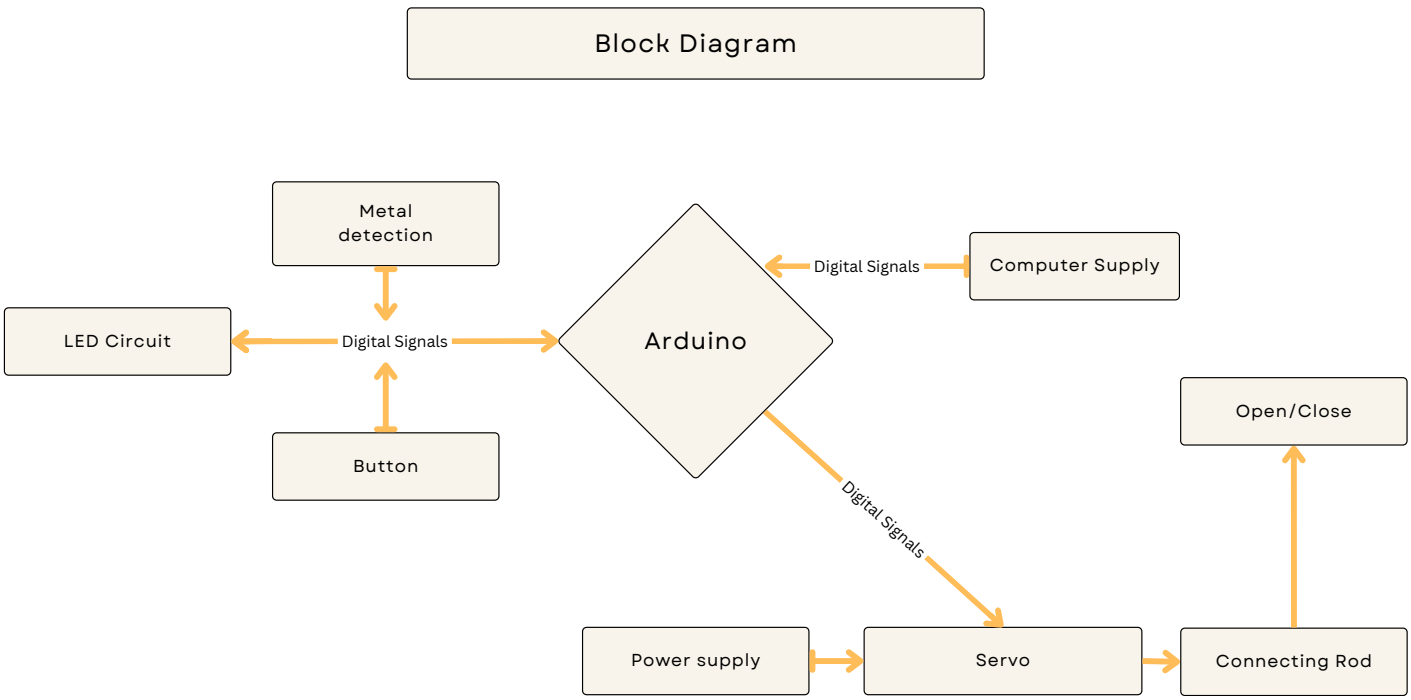
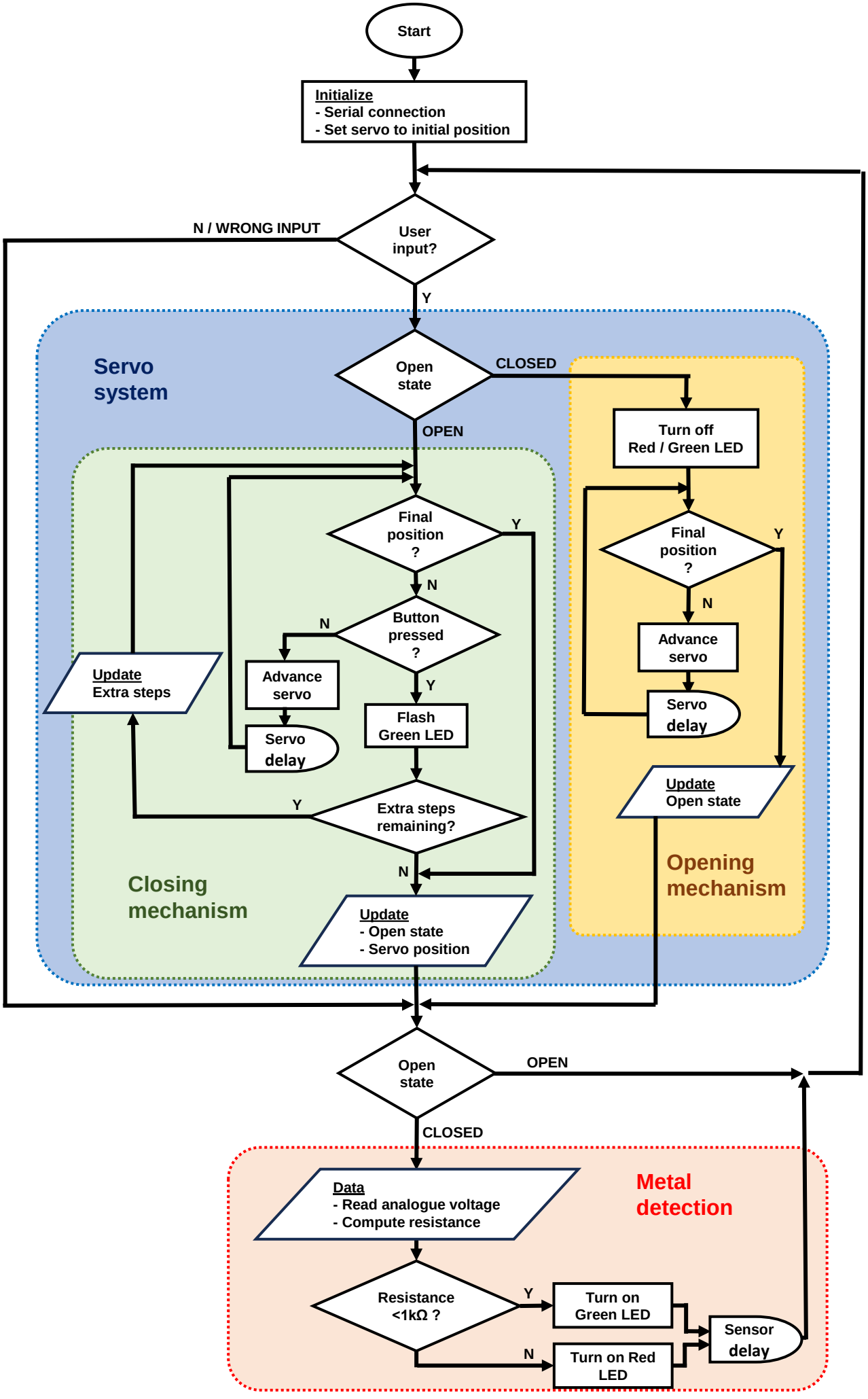
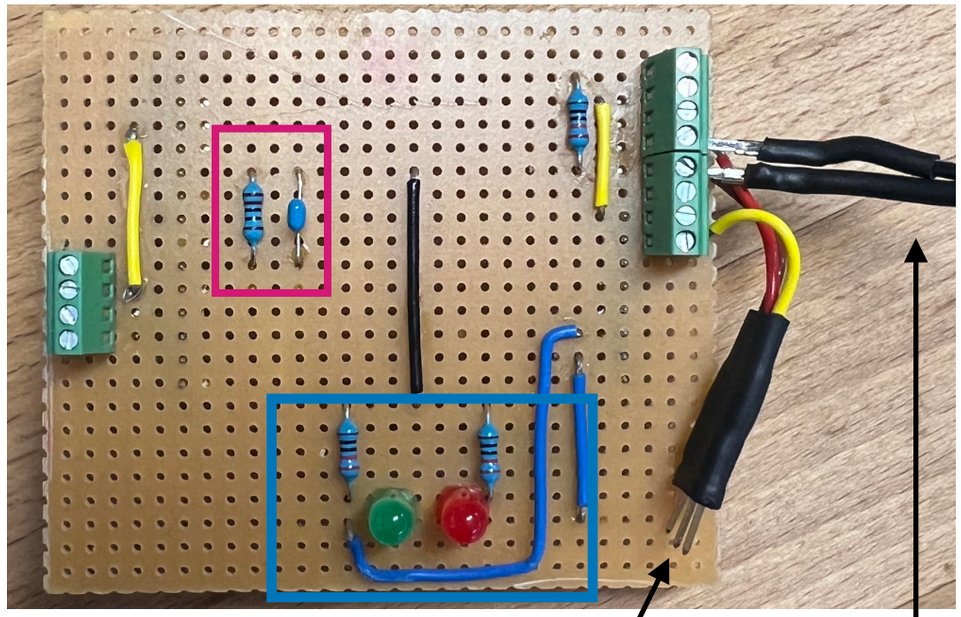


Figure 3: Block Diagram

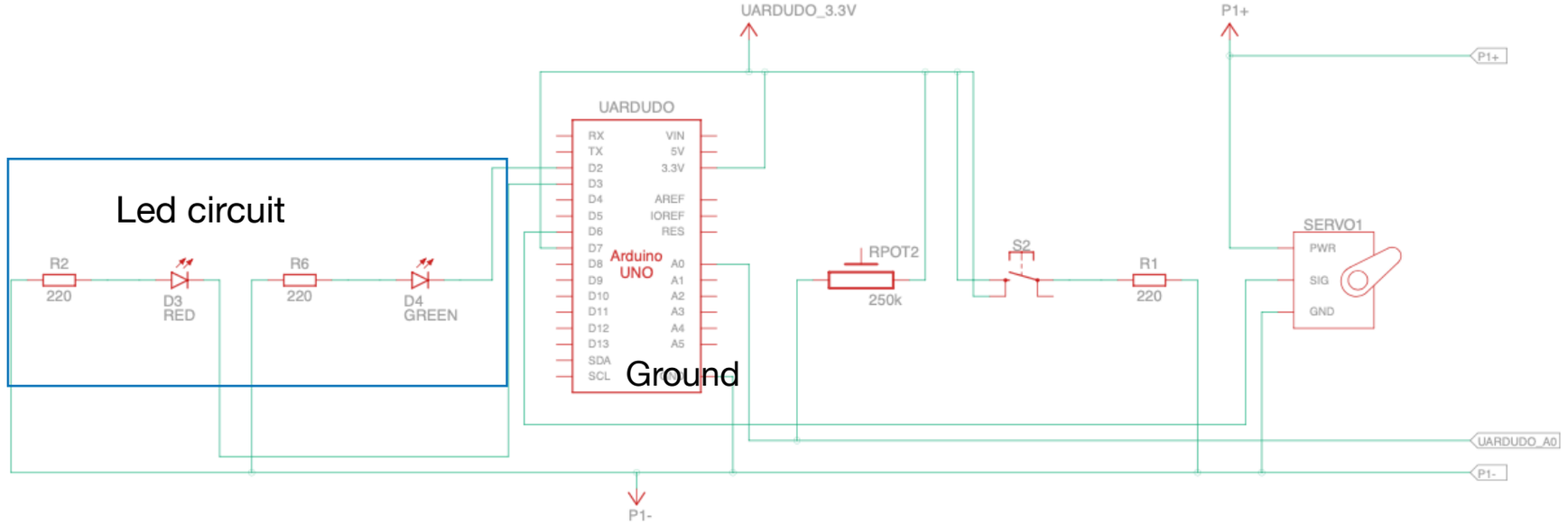

Start
Initialize
- Serial connection
- Set servo to initial position
User input?
N / WRONG INPUT
Y
Servo system
Open state
CLOSED
OPEN
Turn off Red / Green LED
Final position ?
Y
N
Button pressed ?
N
Y
Advance servo
Servo delay
Flash Green LED
Update Extra steps
Extra steps remaining?
Y
N
Update
- Open state
- Servo position
Closing mechanism
Final position ?
Y
N
Advance servo
Servo delay
Update Open state
Opening mechanism
Open state
OPEN
CLOSED
Data
- Read analogue voltage
- Compute resistance
Metal detection
Resistance <1kΩ ?
Y
N
Turn on Green LED
Turn on Red LED
Sensor delay

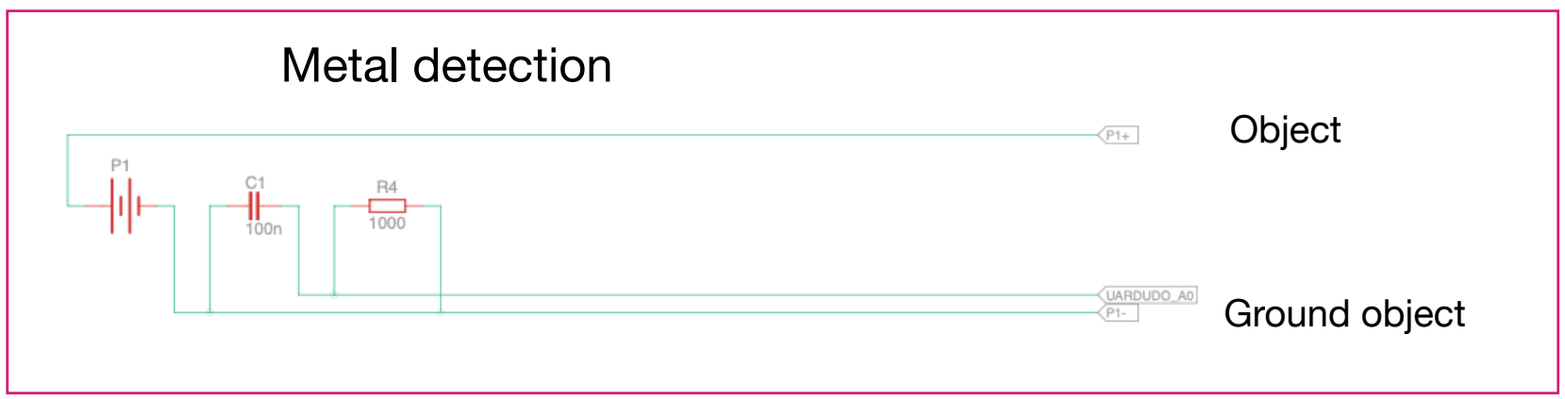
Circuit schematic

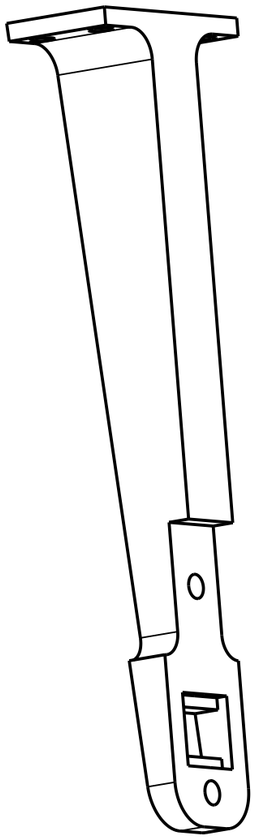


Servo connection

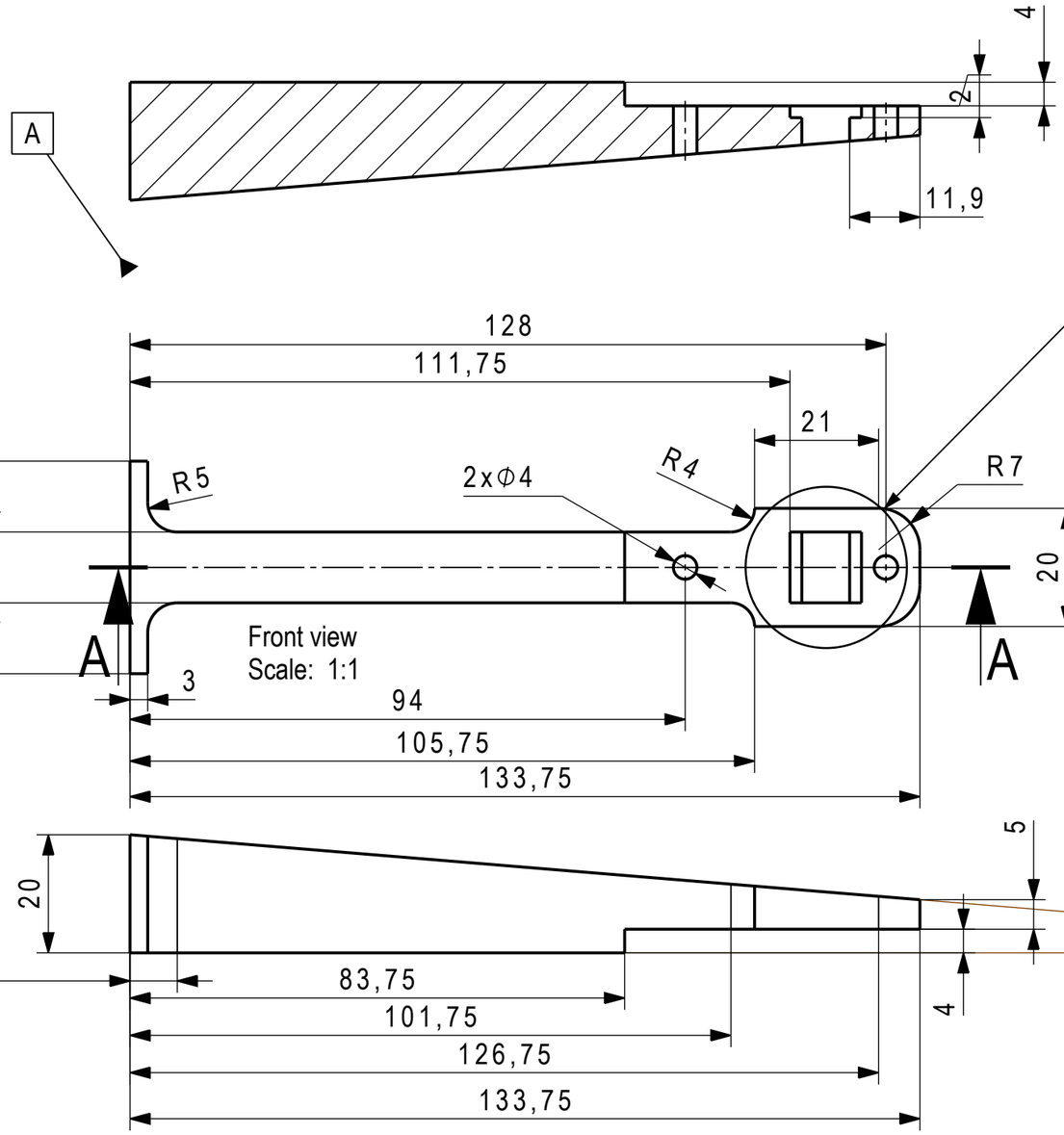
Power supply





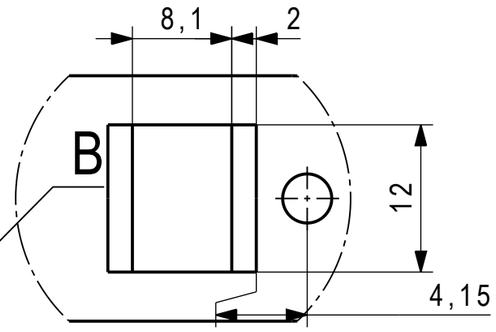


Isometric view
Scale: 1:1

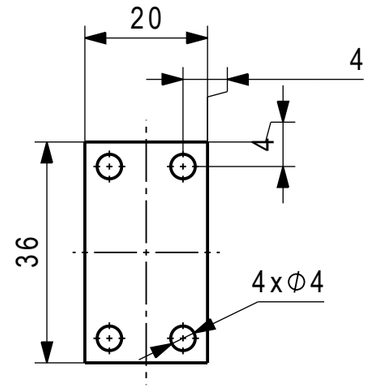


Section view A-A
Scale: 1:1

Top view
Scale: 1:1



Detail B
Scale: 2:1

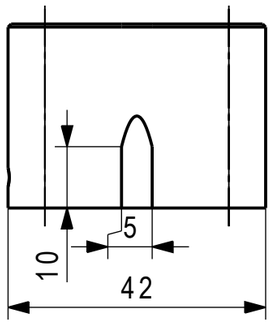


Left view
Scale: 1:1

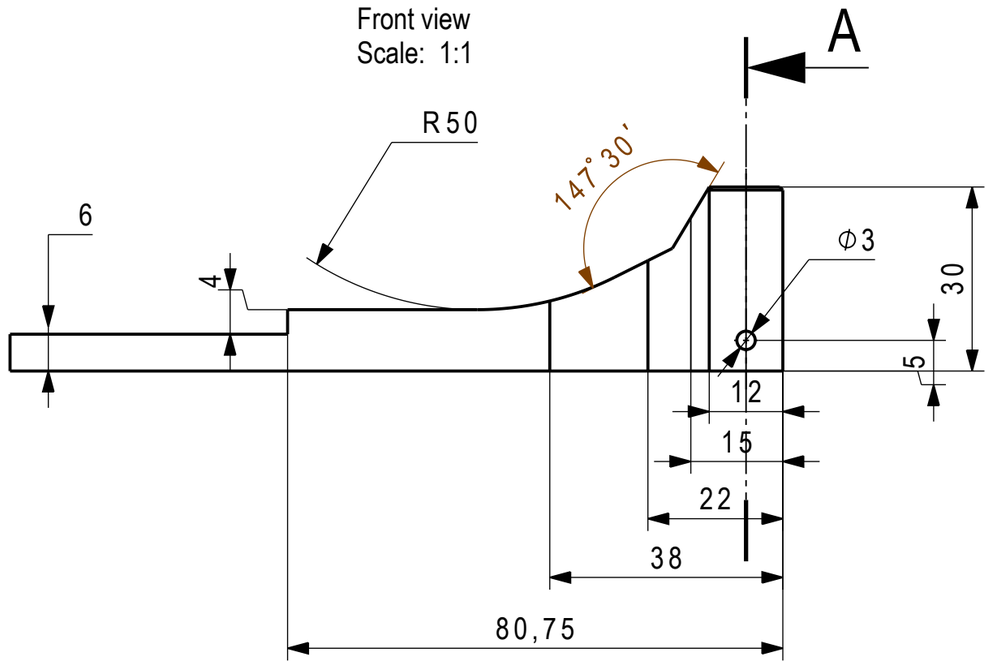
This part serves to attach the fixed plane that grips objects to the rest of the structure. On the bottom there is a placement for the button. On top, the piece is attached with 4 screws to the structure.

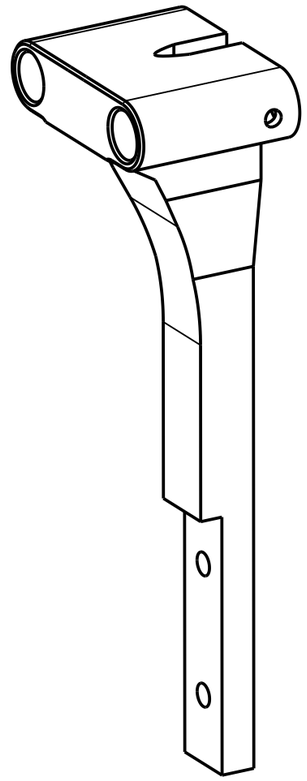
DESIGNED BY: R. Zürcher		Production Method: 3D Printing	
DATE: 23/11/2023			
Weight: 12.49 g			
SIZE: A3		EPFL Product development and engineering design	
SCALE: 1:1	Material: PLA	DRAWING NAME: Connection to fixed plain	SHEET: 1/1

I	–
H	–
G	–
F	–
E	–
D	–
C	–
B	–
A	–

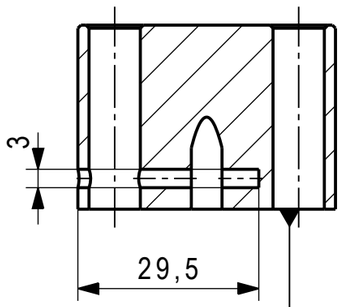


Right view
Scale: 1:1

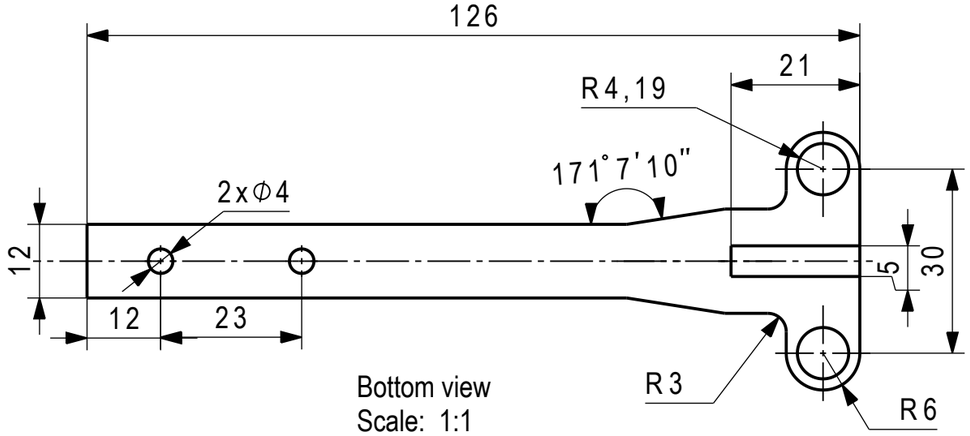




Isometric view
Scale: 1:1



Coupe A-A
Echelle : 1:1



Bottom view
Scale: 1:1

This part is designed to slide on top of plain bearings, and is also connected to the plane surface that is gripping the objects. This piece slides on the 2 aluminium bars in a linear motion, driven by the connecting rod. It is attached by a pin to the connecting rod mechanism.

DESIGNED BY: R. Zürcher DATE: 17/12/2023		Production Method: 3D printing	
Weight: 15.8 g			
SIZE A3		EPFL Product development and engineering design	
SCALE 1:1	Material PLA	DRAWING NAME Connection to moving plain	SHEET 1/1

I	–
H	–
G	–
F	–
E	–
D	–
C	–
B	–
A	17.12.2023