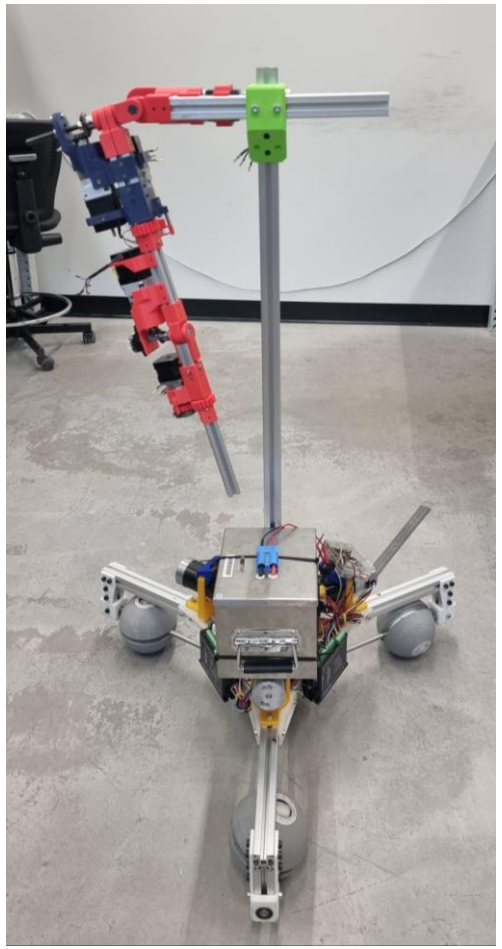
Lisete Viimsalu

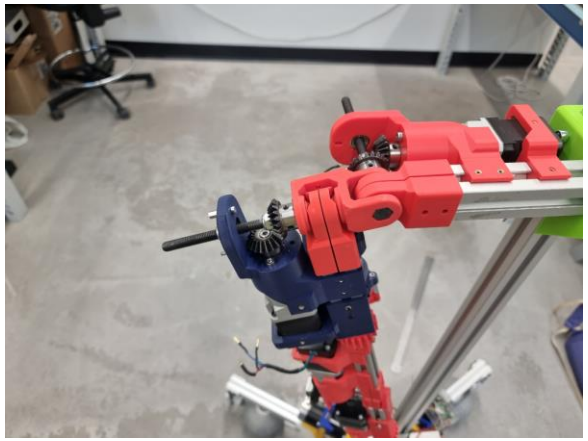
Kristjan Madis Kask

Arm mechanics assembly instructions for SemuBot

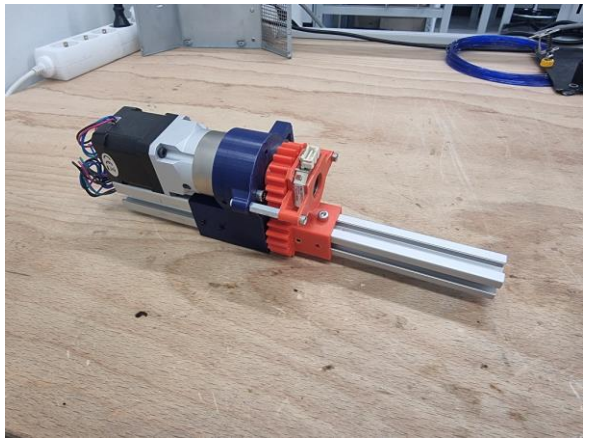
Final solution and parts separately



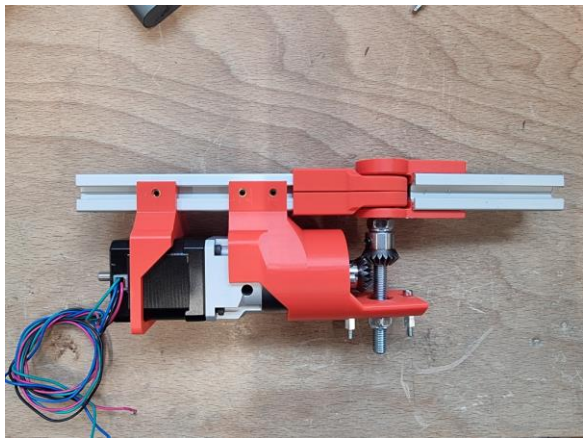
Shoulder



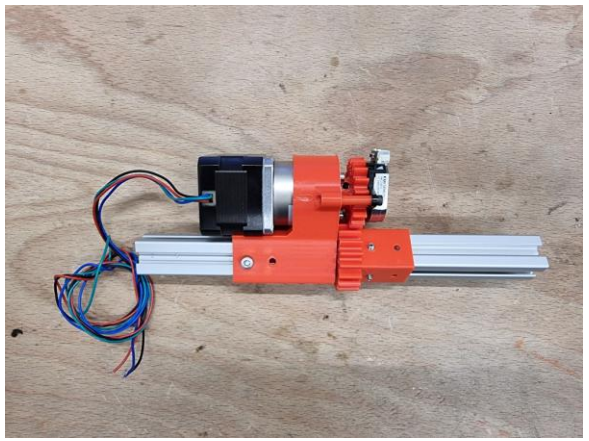
Arm



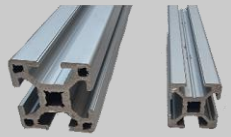
Elbow



Forearm



Required mechanical parts

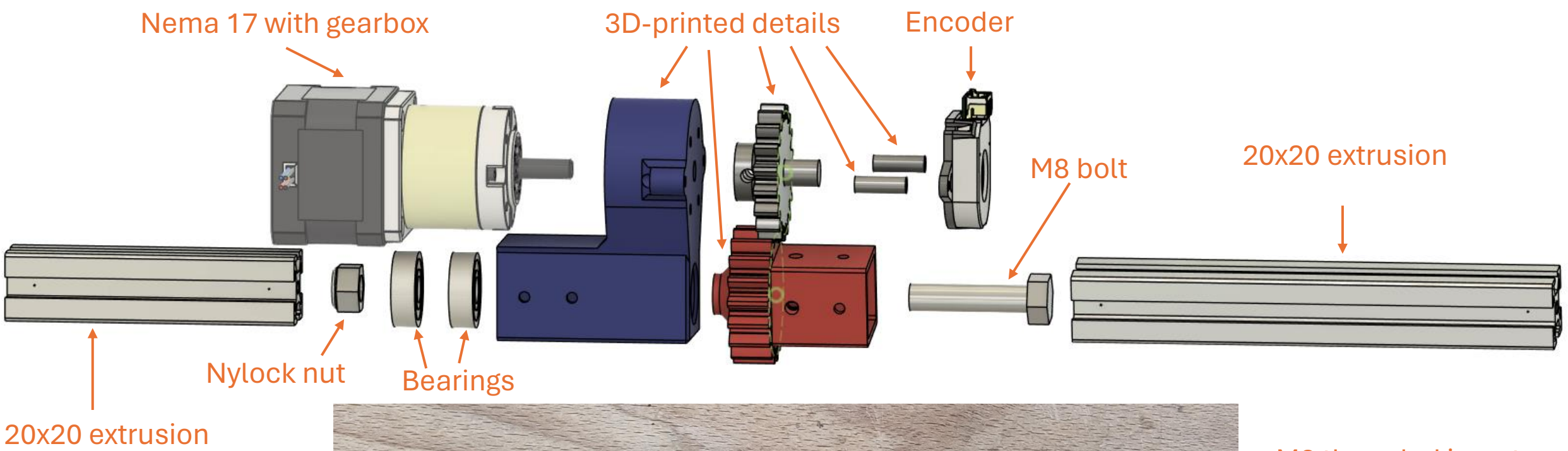
Detail	Amount	Picture
30x30 and 20x20 aluminium extrusions	2x Extrusion30x30 3x Extrusion20x20	
M3 and M4 bolts	22x M3 bolts 12X M4 bolts	
M8 bolt	3	
M8 nylock nut	6	
M3 set screw	44	
M3 long nut	8	
30x30 and 20x20 extrusion mounts	4x mounts for 30x30 7x mounts for 20x20	

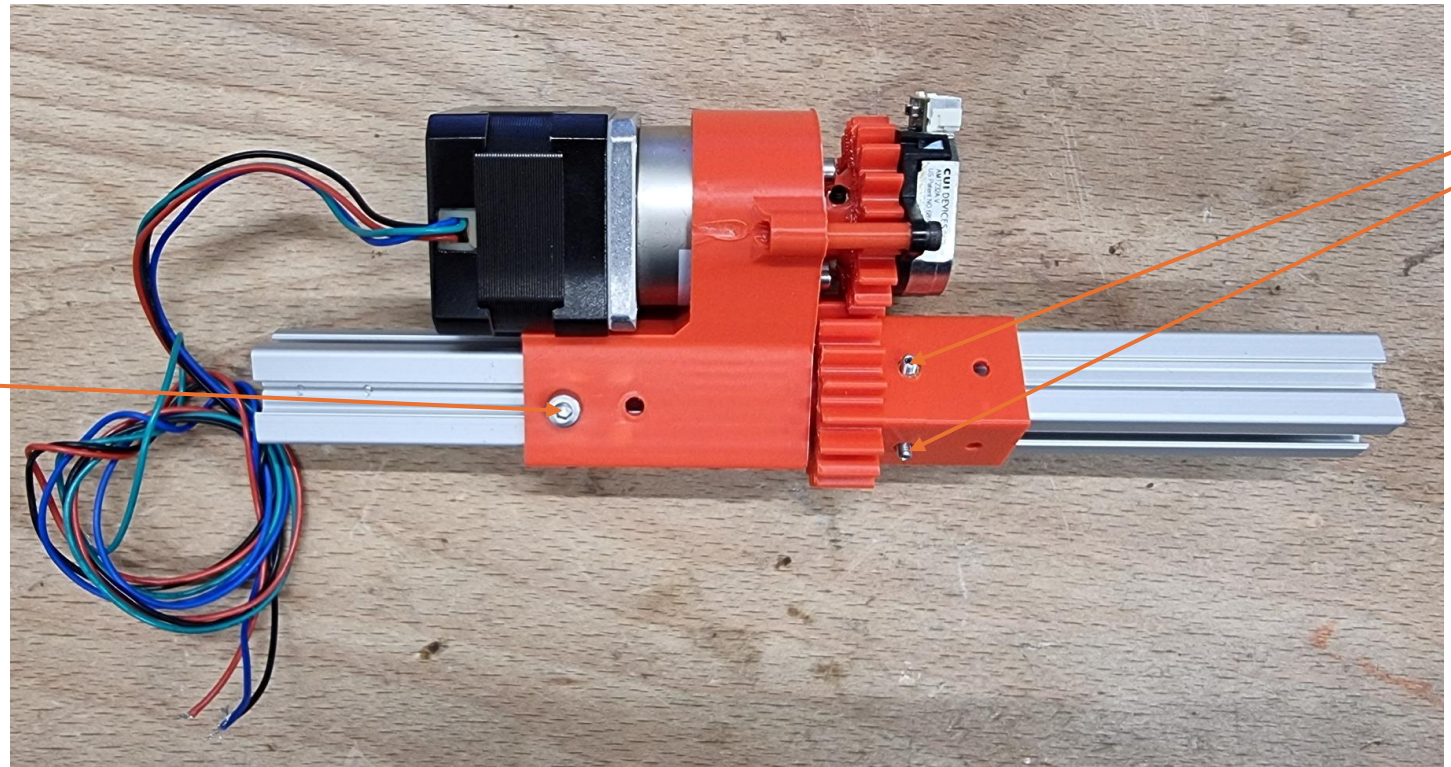
Required mechanical parts

Detail	Amount	Picture
Threaded insert	44	
Bearing 608zz 8x22x7	13	
Smaller 45° bevel gear with 20 teeth	2	
Bigger 45° bevel gear with 20 teeth	4	

Forearm

1. 3D-print details from forearm folder (mount with bearings, mount without bearings, gear for motor and 2 encoder washers)
2. Melt threaded inserts in place and add set screws (4 sets for mount without bearings, 2 sets for motor bearing and 2 inserts for mount with bearings to attach encoder)
3. Add bearings to mount with bearings (blue one on the next page) and fix the parts with a M8 bolt and nylock nut
4. Put 20x20 extrusion mounts and M4 bolts in place and attach parts to extrusions
5. Fix stepper motor with M3 bolts and motor bearing with set screws
6. Use M3 bolts and 3D-printed washers to screw encoder in place

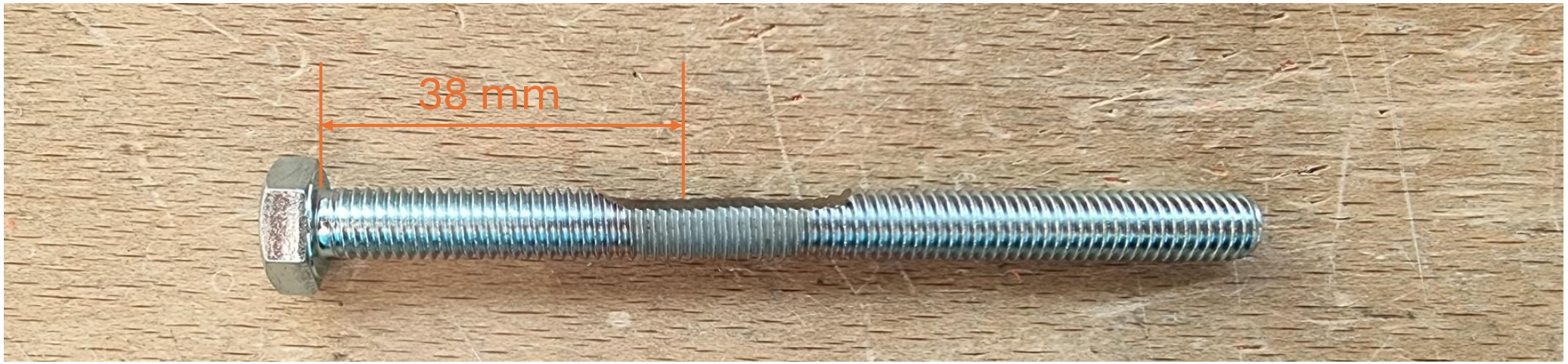

Nema 17 with gearbox
3D-printed details
Encoder
M8 bolt
20x20 extrusion
Nylock nut
Bearings
20x20 extrusion

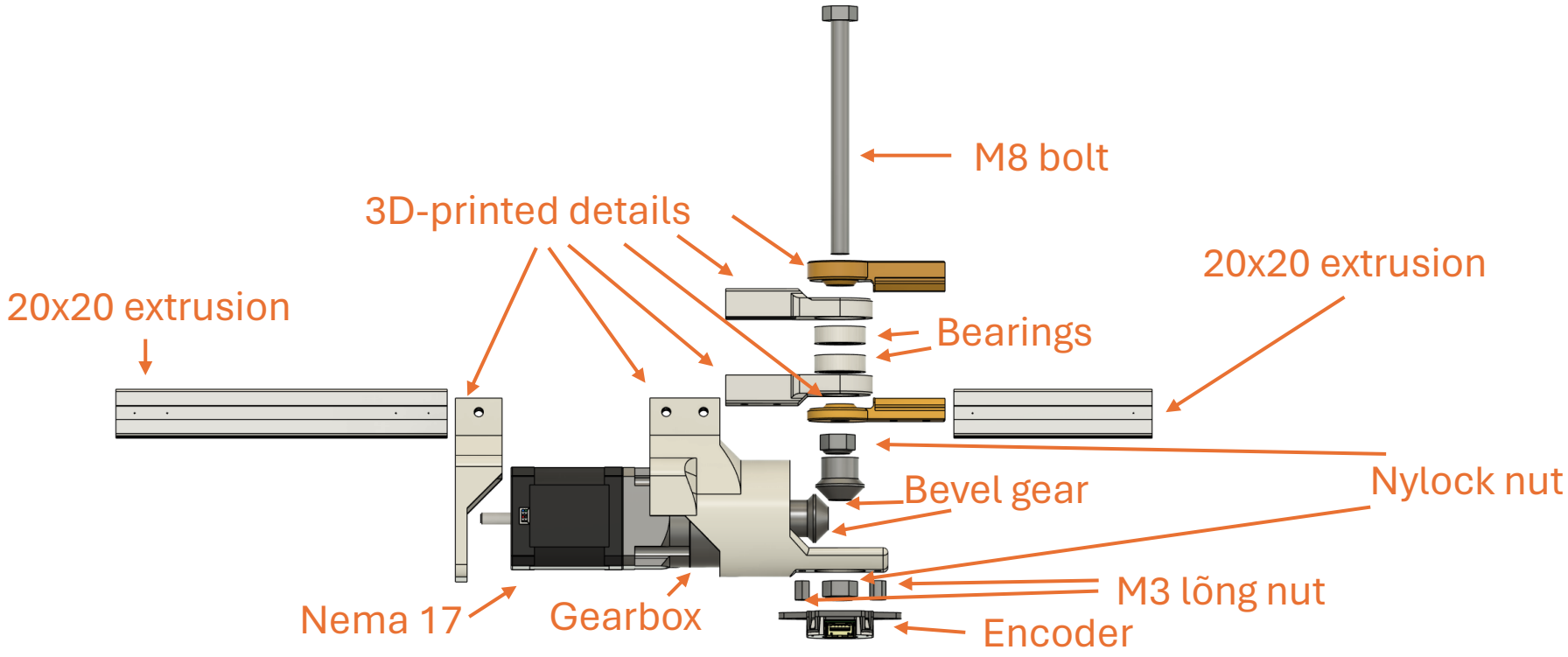

M3 threaded inserts
and set screws
20x20 extrusion mount
with M4 bolt

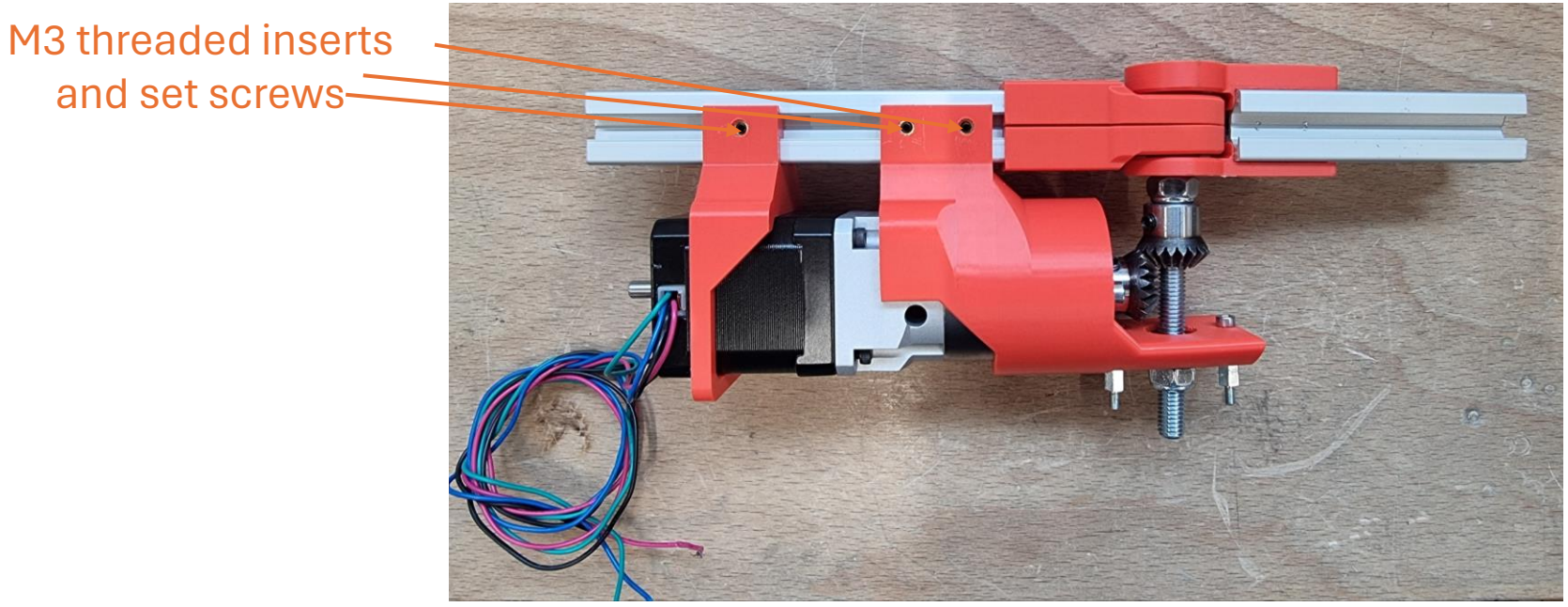
Elbow

1. 3D-print details from elbow folder (motor mounts, elbow mounts without bearings and elbow mounts with bearings)
2. Melt threaded inserts in place and add set screws (6 sets for motor mounts and 4 sets for elbow mounts)
3. Put M3 bolts and long M3 nuts in place for encoder
4. Add bearings to elbow mounts and fix the parts in place on the 20x20 extrusions
5. Abrade M8 bolt as shown in the picture on the nex slide
6. Slide the motor mounts on the extrusion and put M8 bolt, nyloc nut, bevel gear and outer bearing and nylock nut in place
7. When 1st nylock nut and bevel gear are tightened, add motor with gearbox and bevel gear attached to it
8. Attach outer nyloc nut and encoder

Abraded M8 bolt for elbow

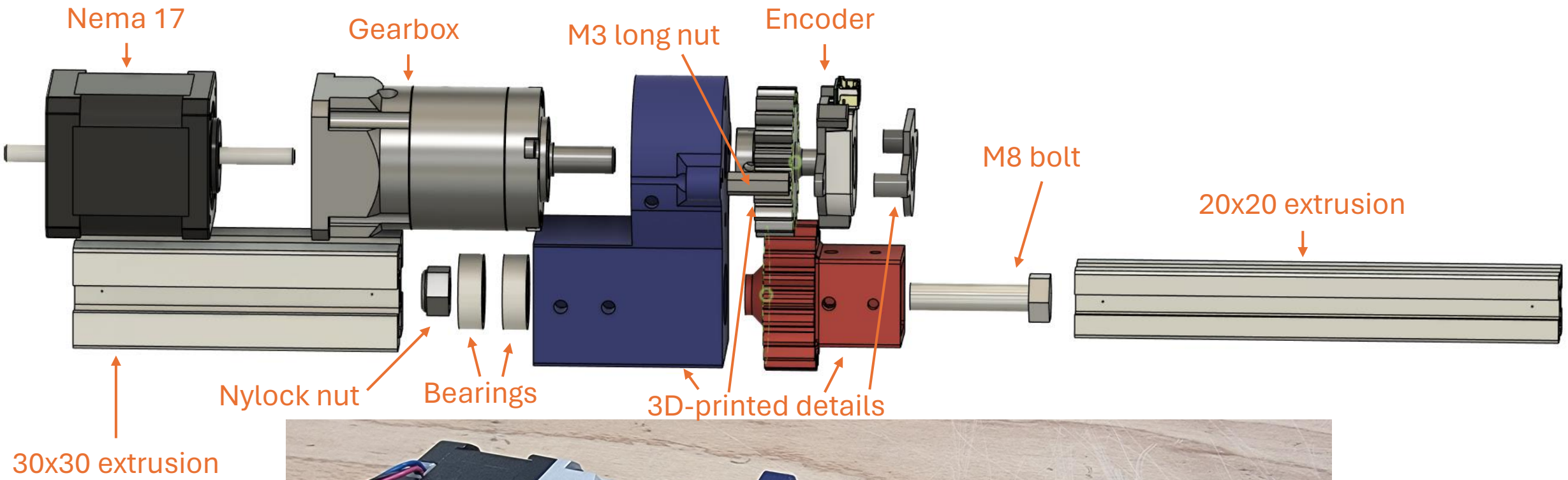


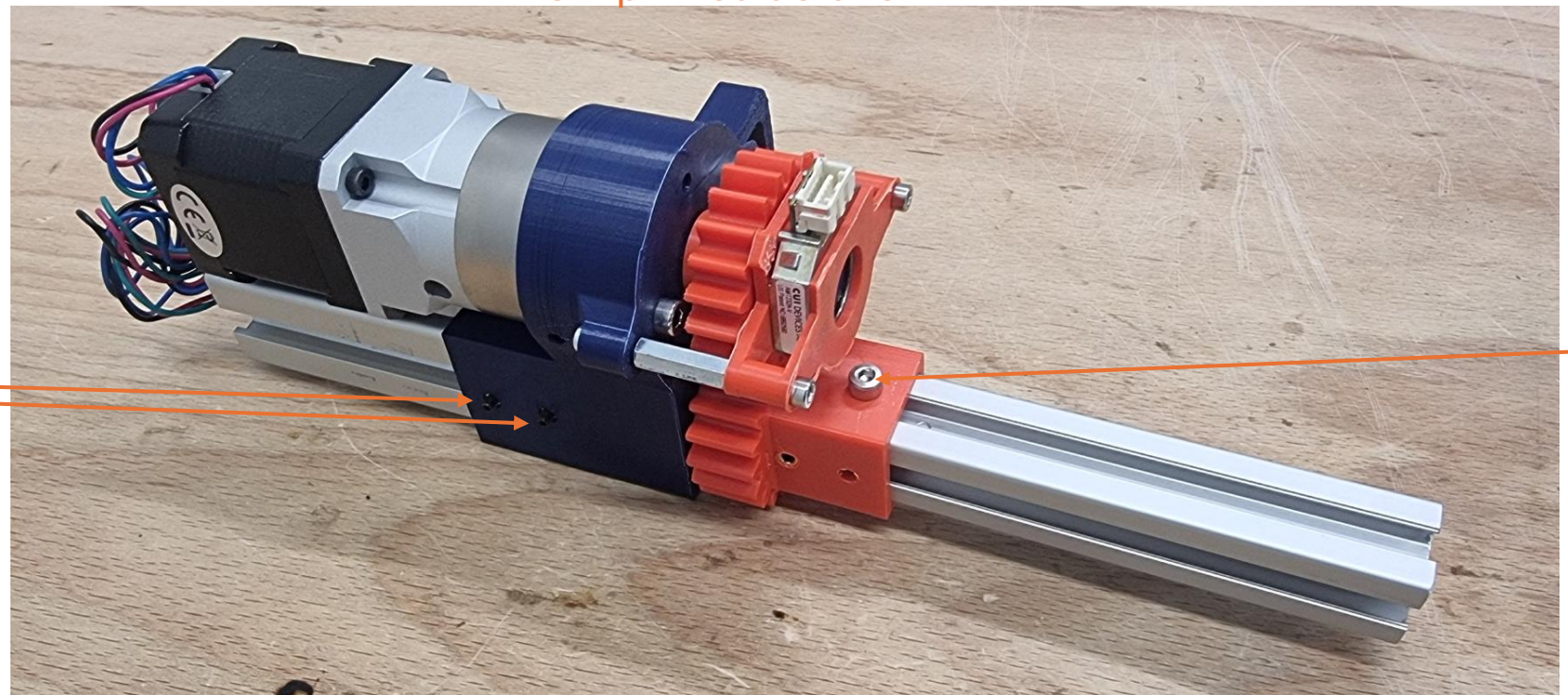

M8 bolt
3D-printed details
20x20 extrusion
20x20 extrusion
Bearings
Nylock nut
Bevel gear
M3 lõng nut
Encoder
Nema 17
Gearbox


M3 threaded inserts
and set screws

Arm

1. 3D-print details from arm folder (mount with bearings, mount without bearings, gear for motor and encoder top and bottom mounts)
2. Melt threaded inserts in place and add set screws (6 sets for mount without bearings and 2 sets for motor gear)
3. Add bearings to mount with bearings (blue one on the next page) and fix the parts with a M8 bolt and nylock nut
4. Put 20x20 extrusion mounts and M4 bolts in place and attach parts to extrusions
5. Fix stepper motor to gearbox and with M4 bolts attach it to the mount
6. Attach 3D-printed parts in place
7. Use M3 bolts, long nuts and printed encoder mounts to screw encoder in place

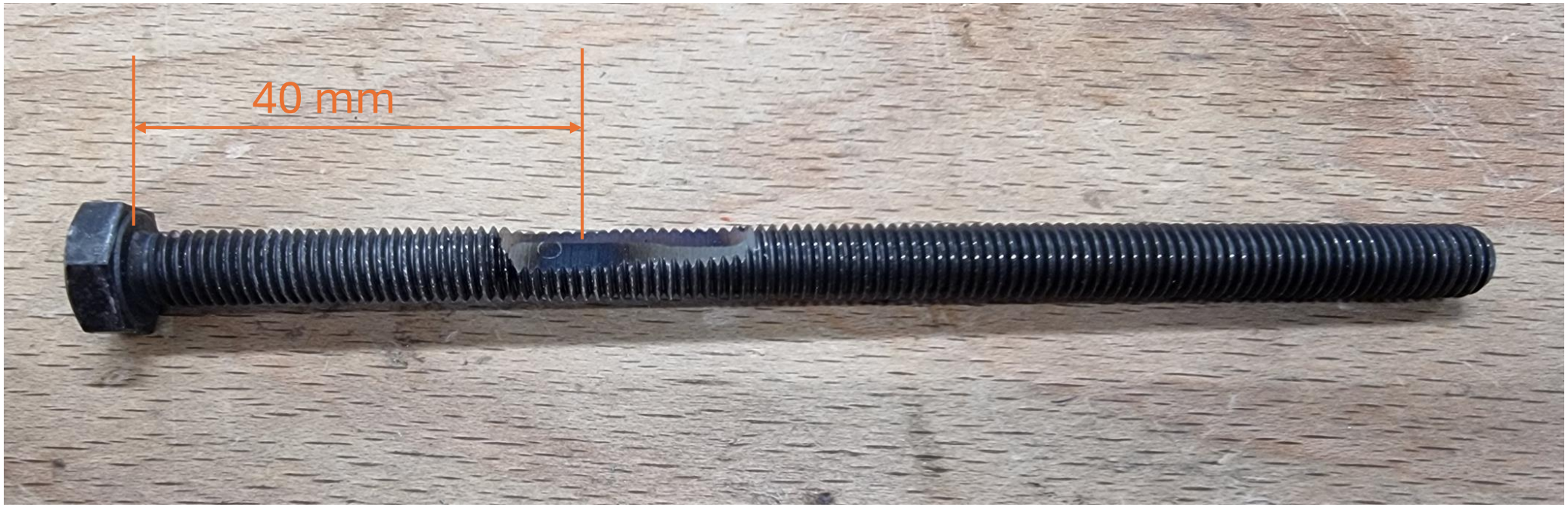

Nema 17
Gearbox
M3 long nut
Encoder
M8 bolt
20x20 extrusion
Nylock nut
Bearings
3D-printed details
30x30 extrusion

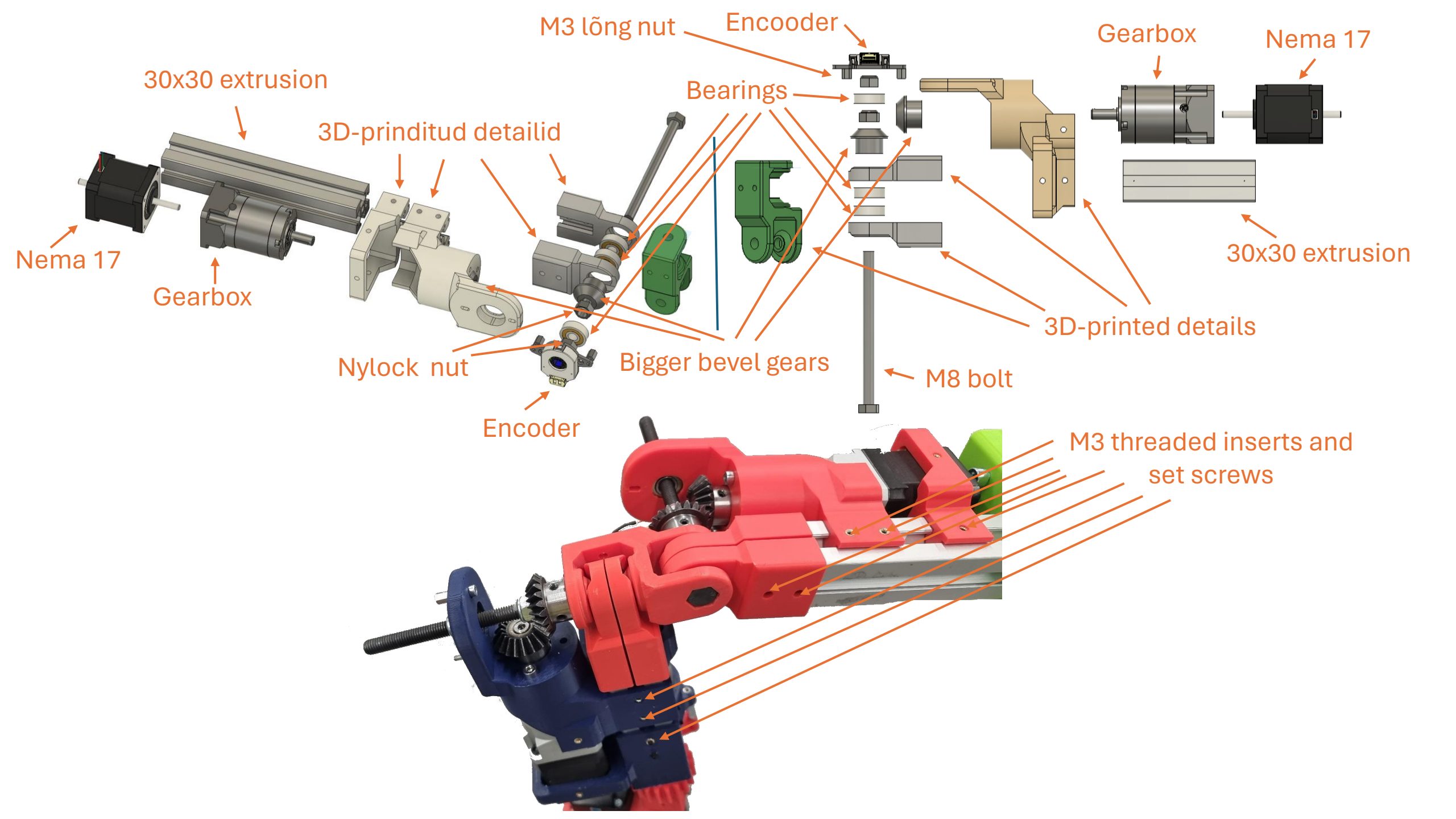

M3 threaded inserts
and set screws
20x20 extrusion
mount with M4 bolt

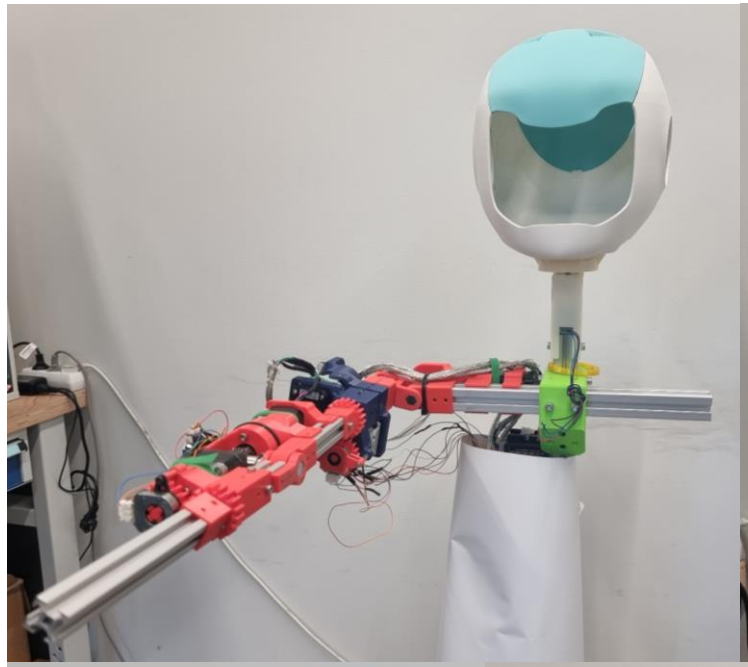
Shoulder

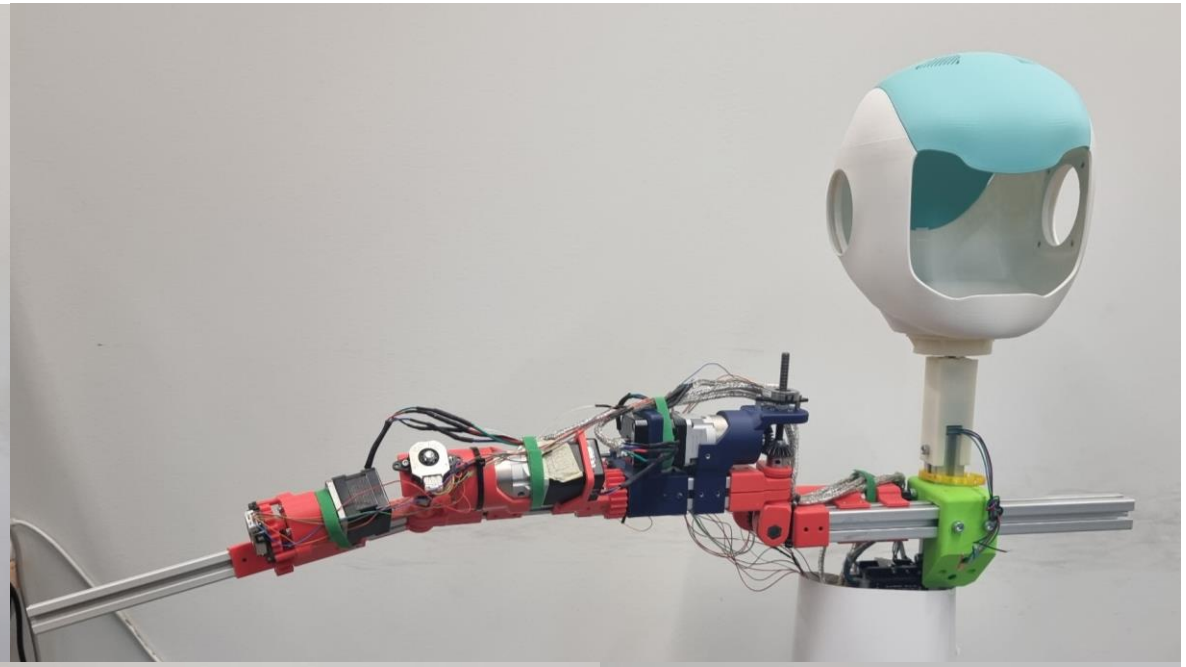
1. 3D-print details from shoulder folder (motor mounts, shoulder mounts with and without bearings, and shoulder-spine mount if needed)
2. Melt threaded inserts in place and add set screws (18 sets for motor mounts and 4 sets for shoulder mounts)
3. Put M3 bolts and long M3 nuts in place for encoder
4. Add bearings to shoulder mounts and fix the parts in place on the 30x30 extrusions
5. Abrade M8 bolt as shown in the picture on the nex slide
6. First you have to attach the upper arm motor (blue one in the picture) and secondly the shoulder one
7. Slide the motor mounts on the extrusions and put M8 bolt, nyloc nut, bevel gear and outer bearing and nylock nut in place
8. Attach motors to motor mounts with M4 bolts and then add bevel gears as well
9. When motor with gearbox is fixed to the mount, slide it in place on the extrusion and start screwing the bolt and nut
10. When 1st nylock nut and bevel gear are tightened, fix the outer bearing with a nylock nut. Repeat the process for other motor
11. Attach encoders

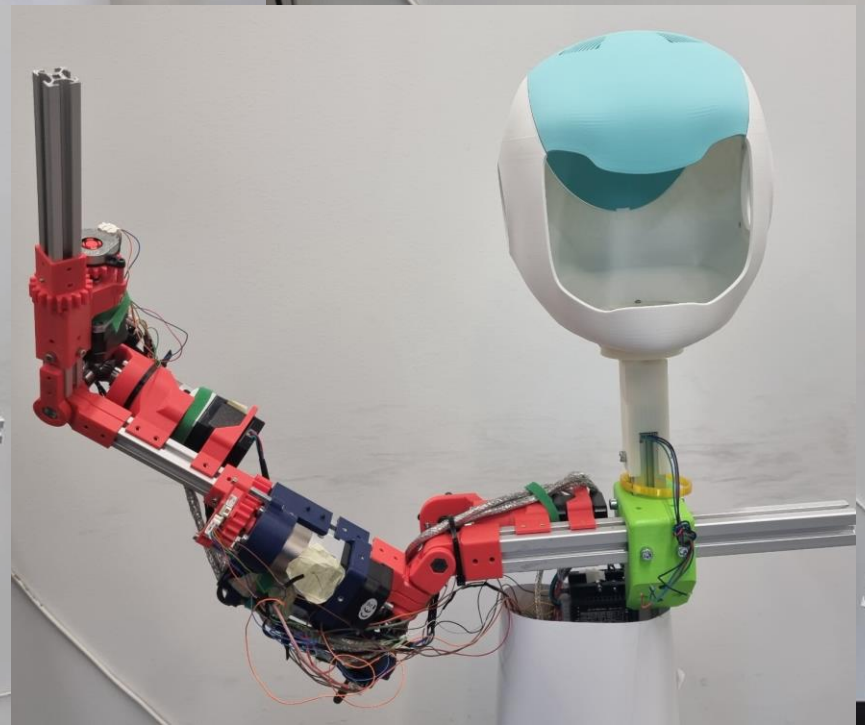
Abraded M8 bolt for shoulder




M3 lõng nut
Encooder
Gearbox
Nema 17
30x30 extrusion
Bearings
3D-prinditud detailid
Nema 17
Gearbox
30x30 extrusion
3D-printed details
Nylock nut
Bigger bevel gears
M8 bolt
Encoder
M3 threaded inserts and
set screws







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