



How to build your robot

www.pib.rocks/build

assembly instructions for:

UPPER BODY

v2024



PRINT

BUILD

DEVELOP

YOUR OWN ROBOT

Printable parts

Printable parts

4 x **B48**-Hinge

2 x **B49**-Hinge_Plate

B51-Servo_Array_Scaffold

2 x **B52**-Tube_Holder_Side

B53-Tube_Holder_Top

2 x **B60p**-M3-M4.5_Adapter

C60-Flange_Inner-Shoulder

C61-Motor_Bracket_Inner-Shoulder

C62-Ringflange_Inner-Shoulder

C63-Motor_Axis_Inner-Shoulder

C64-Motor_Axis_Cap_Inner-Shoulder

Printable parts

B19-Flat_stand_right

B20-Flat_stand_left

7 x **B25**-Wire_connector

6 x **B26**-Wire_connector_pawl

7 x **B27**-Wire_connector_mount

1 x **B31**-Wire_connector_pawl_forearm

B41-L-Clavicle_left

B41-R-Clavicle_right

B42-L-Ribcage_Left

B42-R-Ribcage_Right

B43-L-Ribcage_Lower_Left

B43-R-Ribcage_Lower_Right

B44-Electronics_back

B45-Electronics_base

B46-Power_back

B47-Power_holder

Non-printable parts

You will also need the following non-printable parts from our pib.Box Master.

If you do not have it yet, you can buy in our shop
<https://shop.pib.rocks>.

Non-printable parts

2 x **E03**-TinkerForge ServoBricklet

6 x **E07**-MG996R

1 x **E09**-DS3225

1 x **E15**-DS5180SSG

1 x **E16**-RPi Power Supply

1 x **E17**-GPIO_Header

1 x **E24**-Relay

116 x **S01** M3 nuts

8 x **S02** M3 6 mm screws

52 x **S04** M3 10 mm screws

23 x **S05** M3 12 mm screws

9 x **S06** M3 16 mm screws

2 x **S07** M3 18 mm screws

6 x **S08** M3 20 mm screws

2 x **S09** M3 22 mm screws

2 x **S10** M3 25 mm screws

7 x **S11** M3 30 mm screw

7 x **S13** M3 40 mm screws

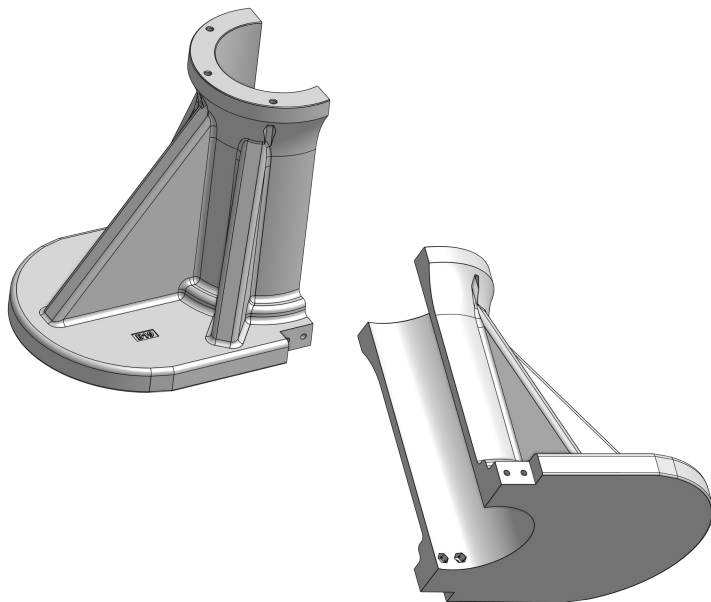
4 x **M08** 20 mm metal rods

1 x **M04** Ballbearing

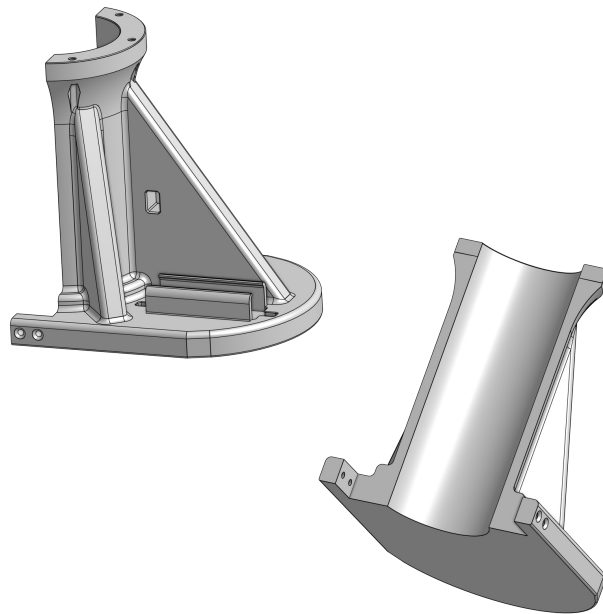
8 x **M13** Distancer

Printable parts - Overview

B19-Flat_stand_right

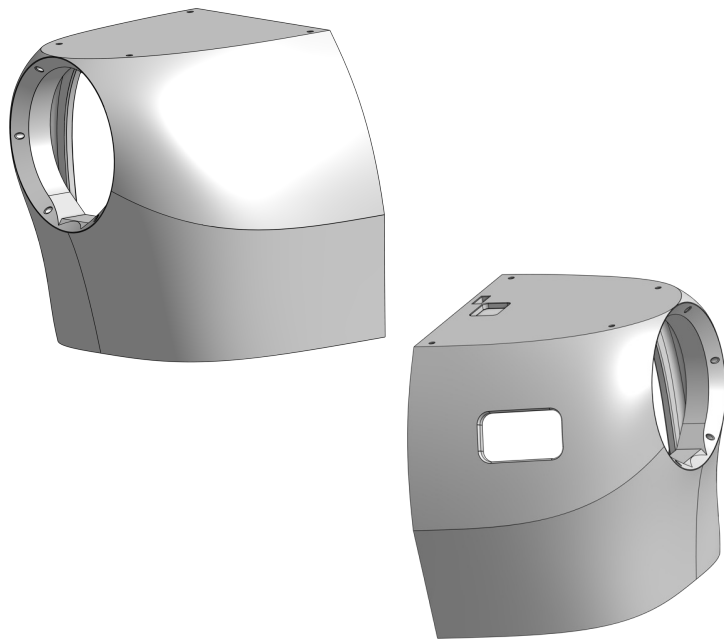


B20-Flat_stand_left



Printable parts - Overview

B41-L/-R-Clavicle_Left/Right

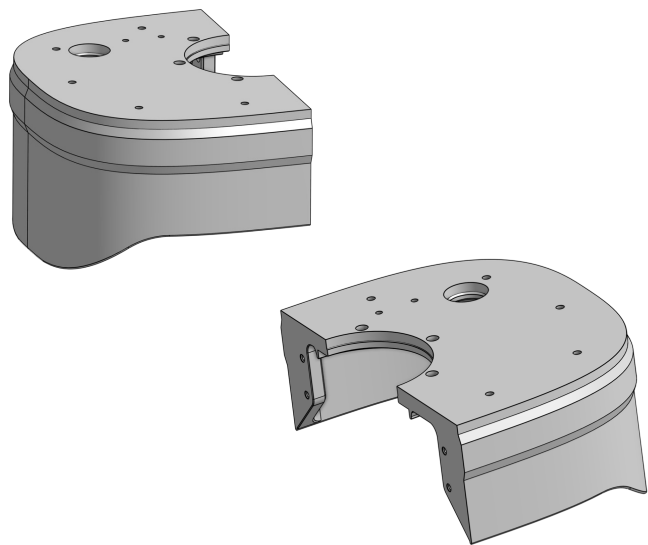


B42-L/-R-Rip cage_Left/Right

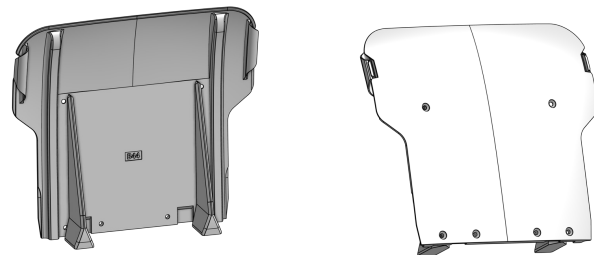


Printable parts - Overview

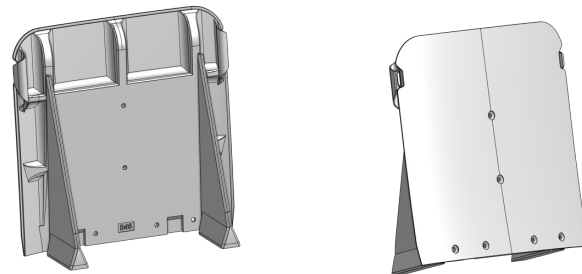
B43-L/-R-Ripcage_Lower_Left/Right



B44-Electronics_back

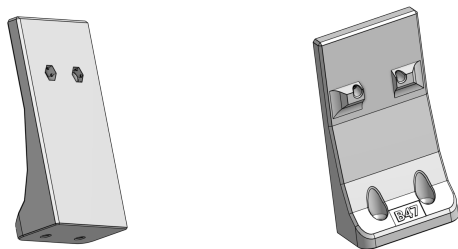


B46-Power_back

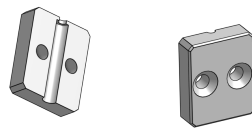


Printable parts - Overview

B47-Power_Holder



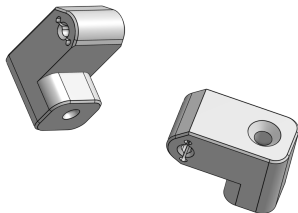
B53-Tube_Holder_Top



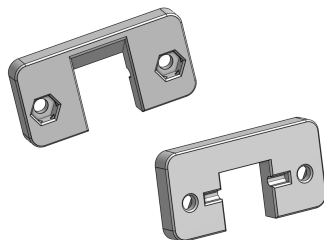
B60p-M3-M4.5_Adapter



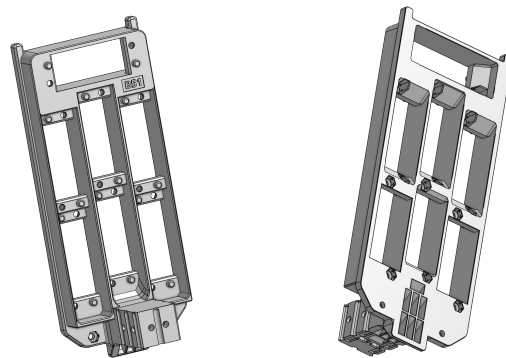
B48-Hinge



B49-Hinge_Plate

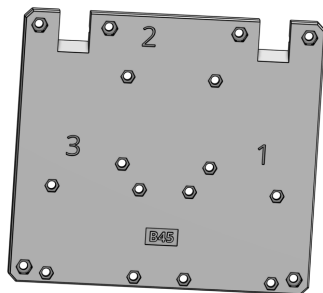


B51-Servo_Array_Scaffold

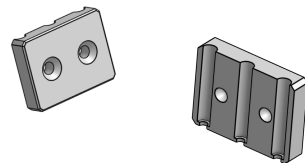


Printable parts - Overview

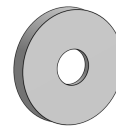
B45-Electronics_base



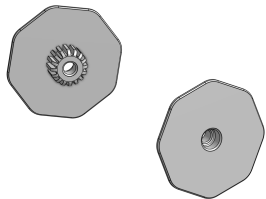
B52-Tube_Holder_Slide



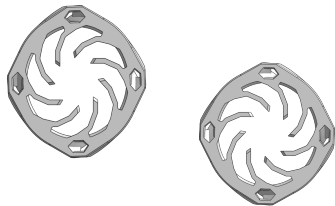
B27-Wire_connector_mount



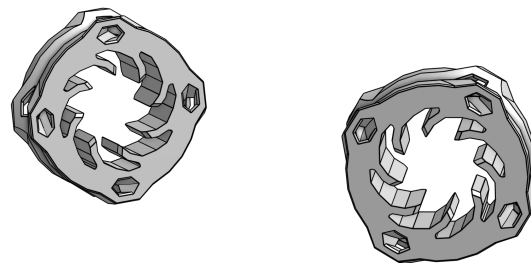
B25-Wire_connector



B26-Wire_connector_pawl

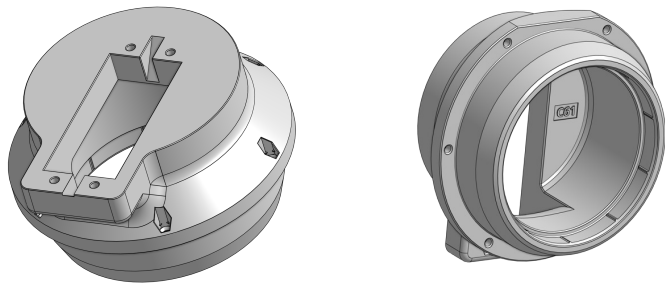


B31-Wire_connector_pawl_forearm



Printable parts - Overview

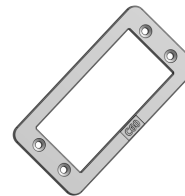
C61-Motor_Bracket_Inner_Shoulder



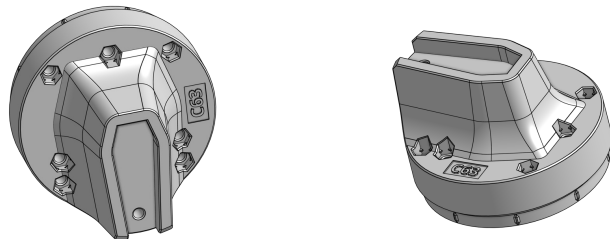
C62-Ringflange_Inner_Shoulder



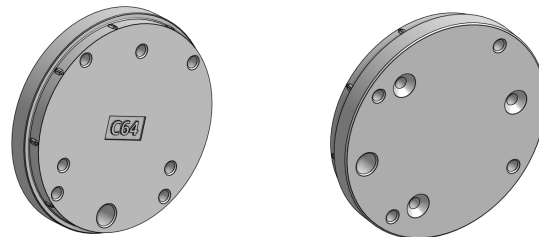
C60-Flange_Inner_Shoulder



C63-Motor_Axis_Inner_Shoulder



C64-Motor_Axis_Cap_Inner_Shoulder



Build it better: our suggestion for assembling pib



We recommend **tools** for each step. These are a suggestion, you can of course also use other tools.



1-5

We have categorized each step according to its **difficulty** - from **1-5** (1 being the easiest, 5 the hardest)



We also show you which **non-printable parts** you need for each step

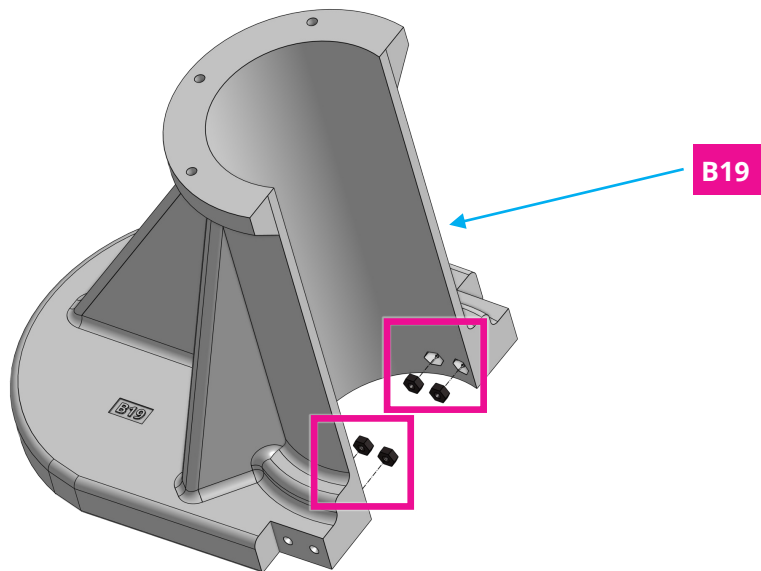
Step 0

Make sure all motors in this tutorial are calibrated according to tutorial "**step 1c motor calibration**"

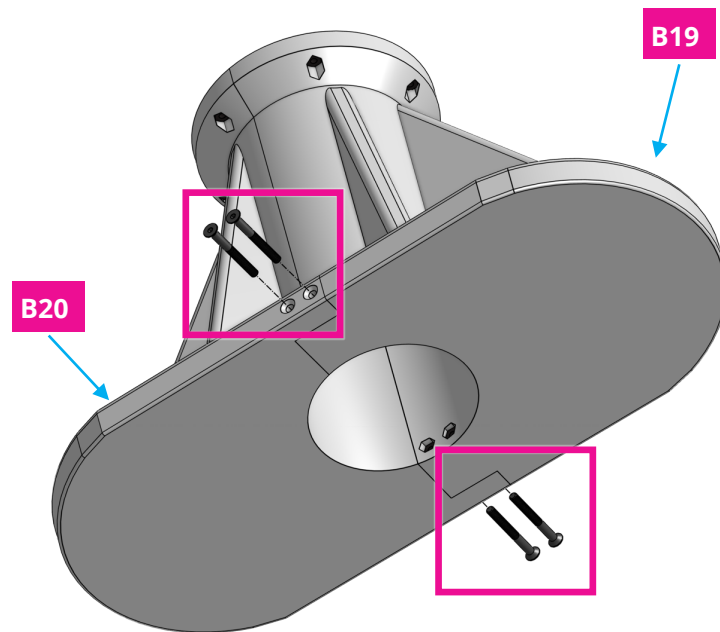


Step 1

Place **4 x nuts** in the shown spots in **B19**, then use **4 x 30 mm screws** to fix **B20** to **B19**.



Our tip: use a hammer and gently push the nuts into the holes.

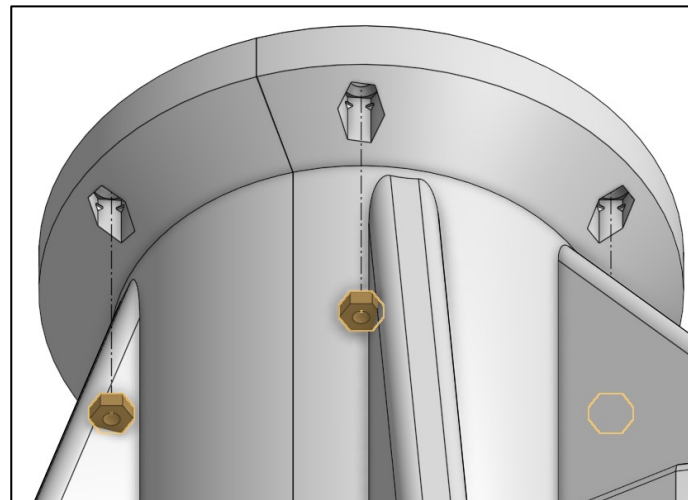
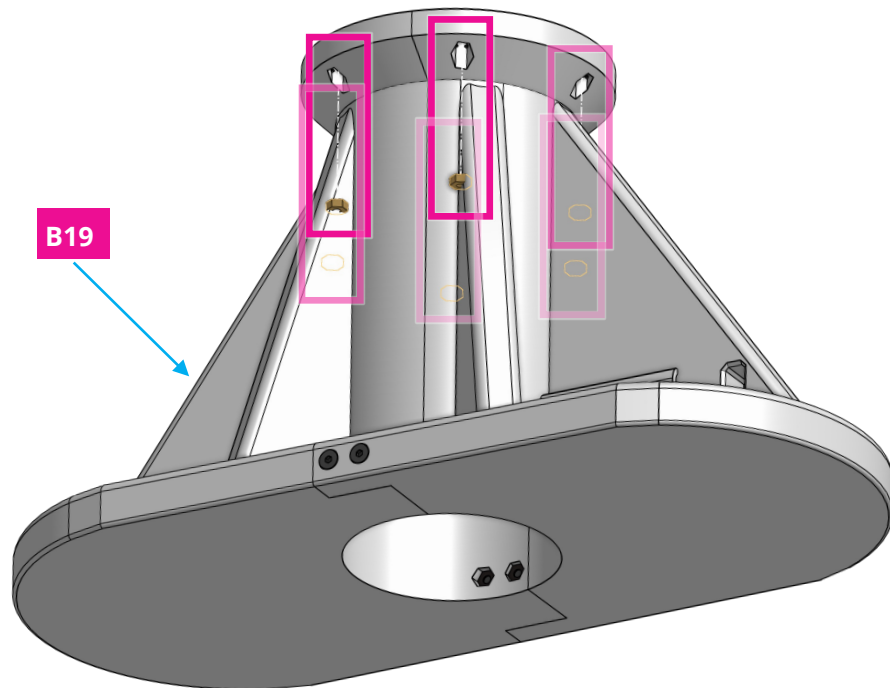


Step 2a

Place **6 x nuts** in shown spots in **B19** and **B20**.



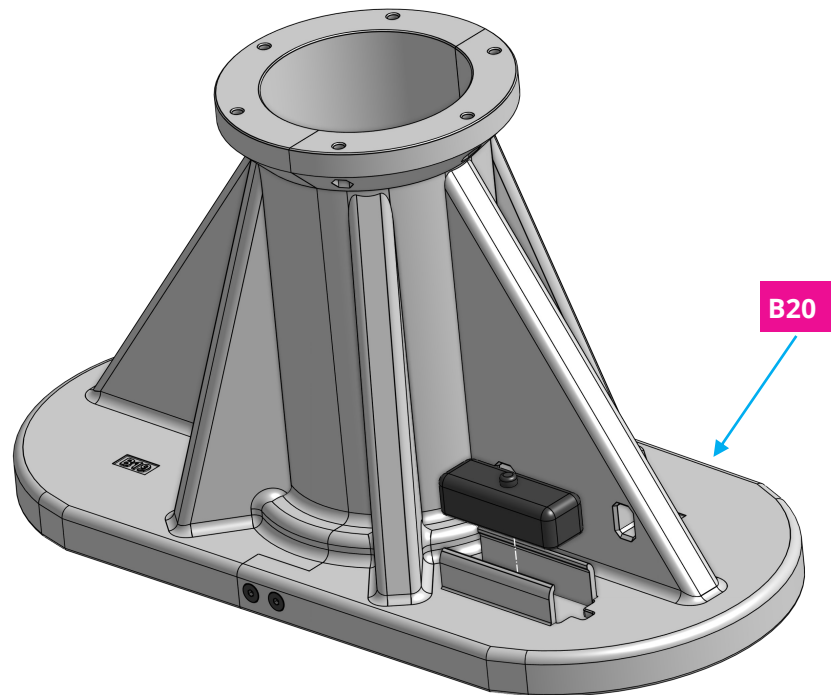
6x



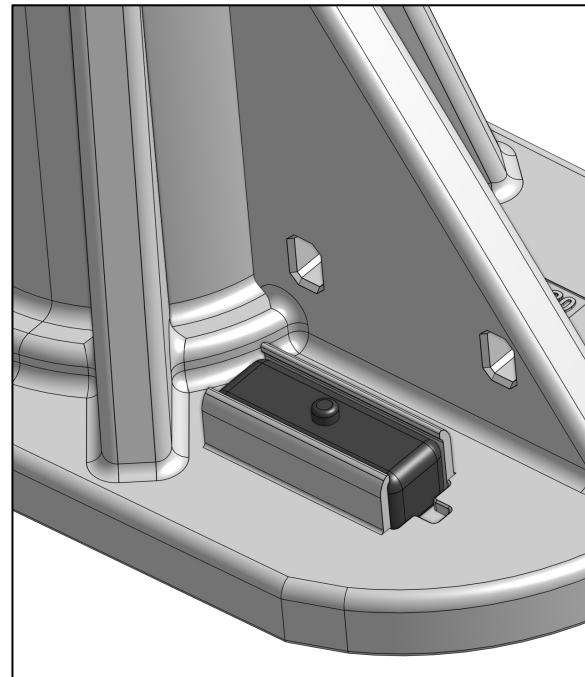
*It is easier to put the nuts into place,
when you flip the assembly.*

Step 2b

Place **E16** in **B20**.

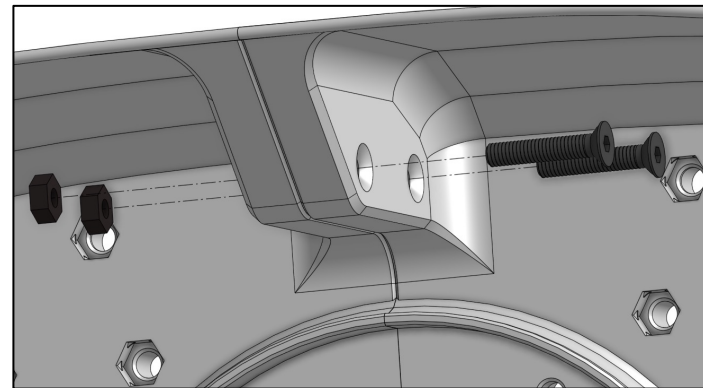
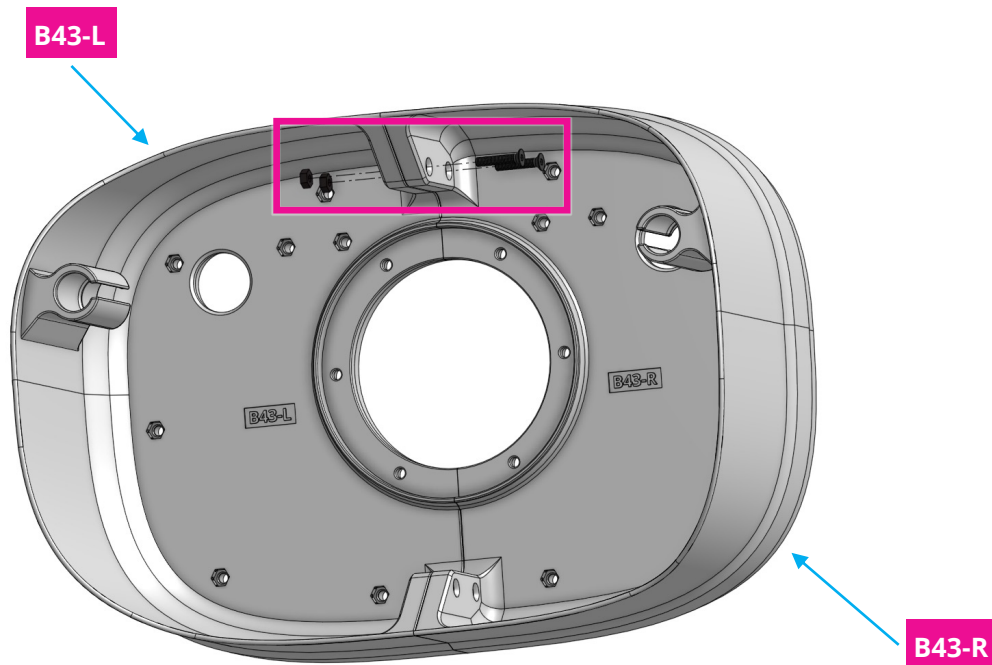


1



Step 3a

Connect **B43-L** and **B43-R** using **4 x M3 nuts** and **4 x M3 16mm screws**.



Step 3b

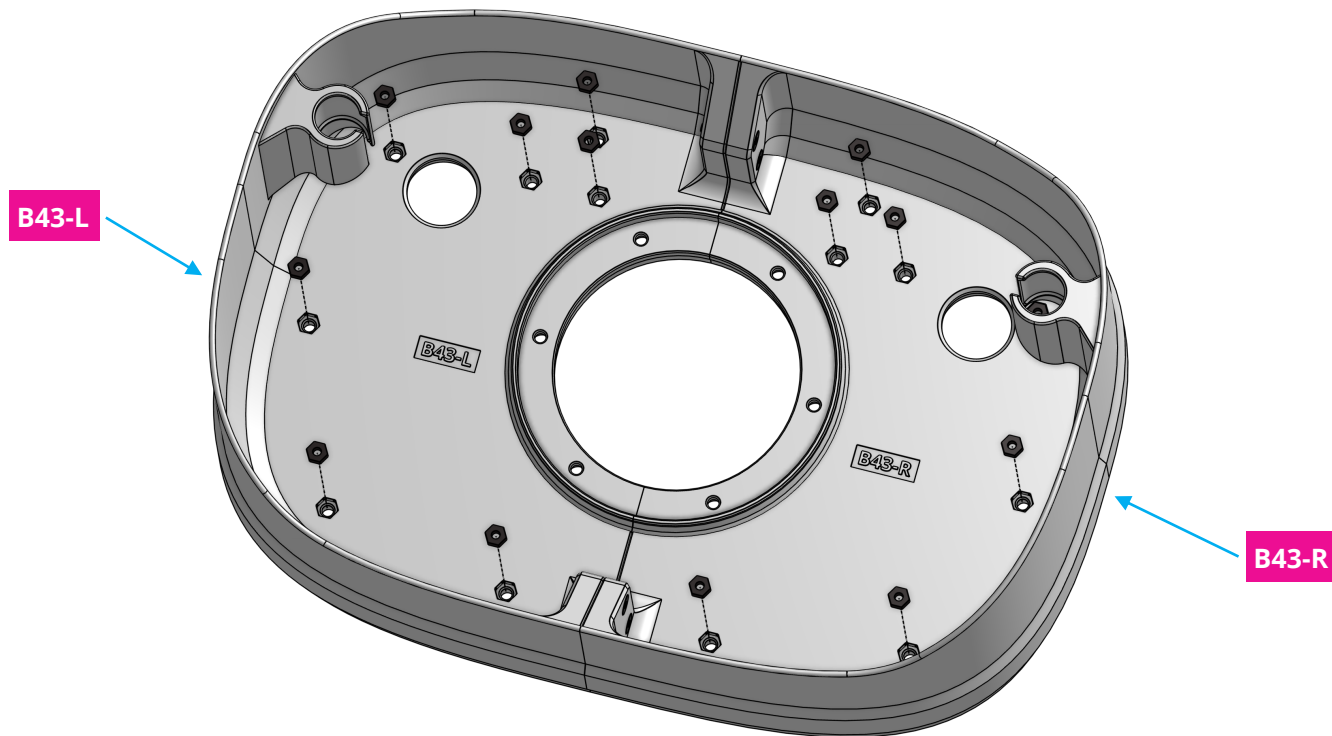
Place **14 x M3** nuts in the assembly.



2



14x



Step 4

Connect both assemblies using **6 x 16 mm screws**.

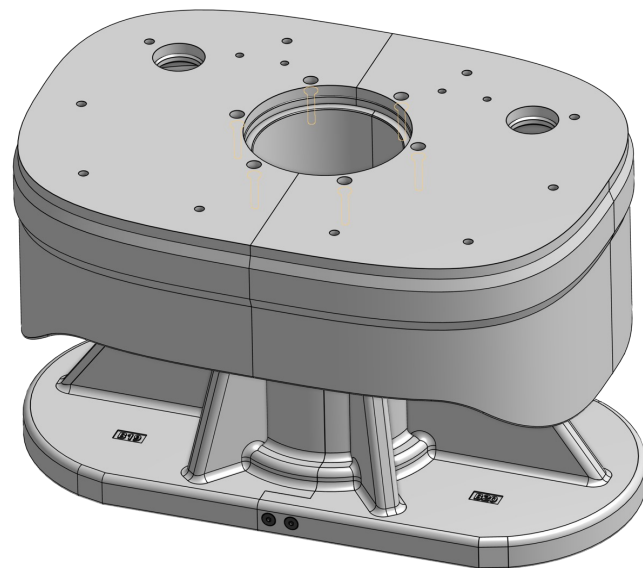
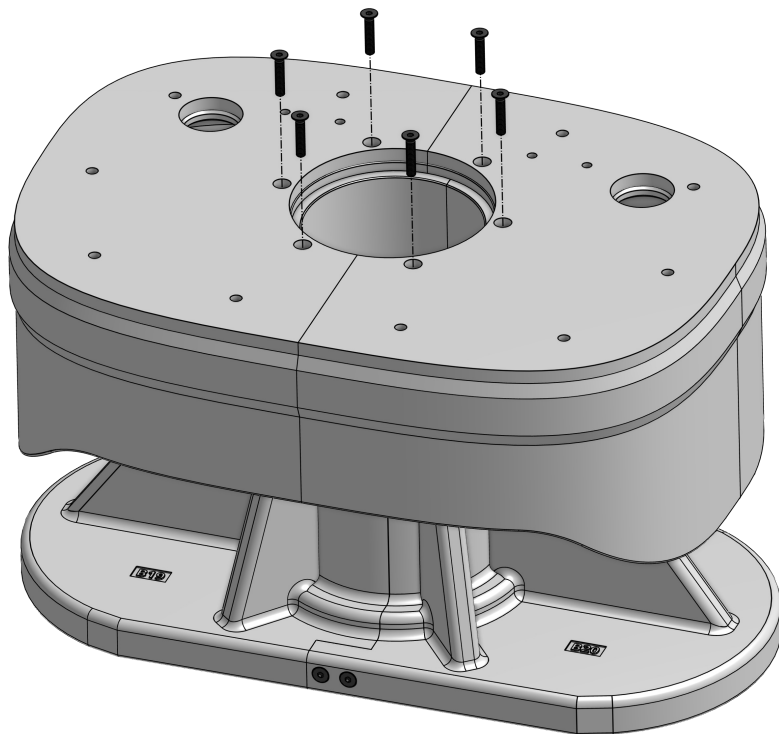
You may apply some gentle force to connect the assemblies.



2

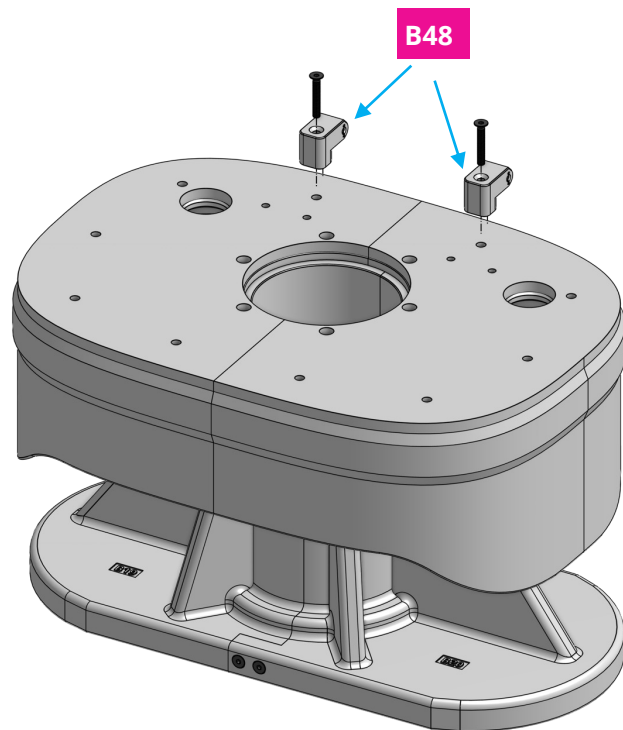


6x



Step 5

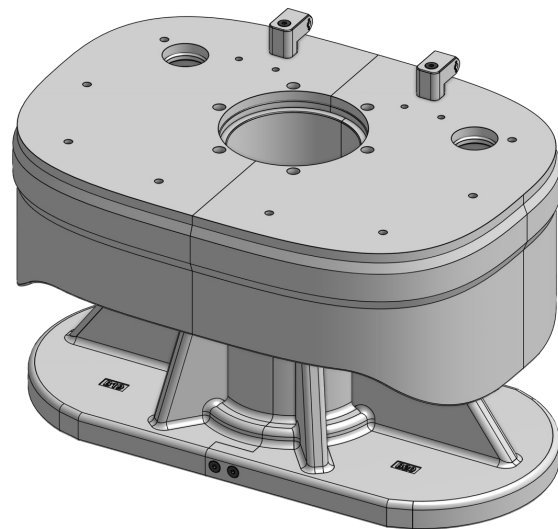
Connect 2 x **B48** to **assembly** using 2 x 25 mm screws.



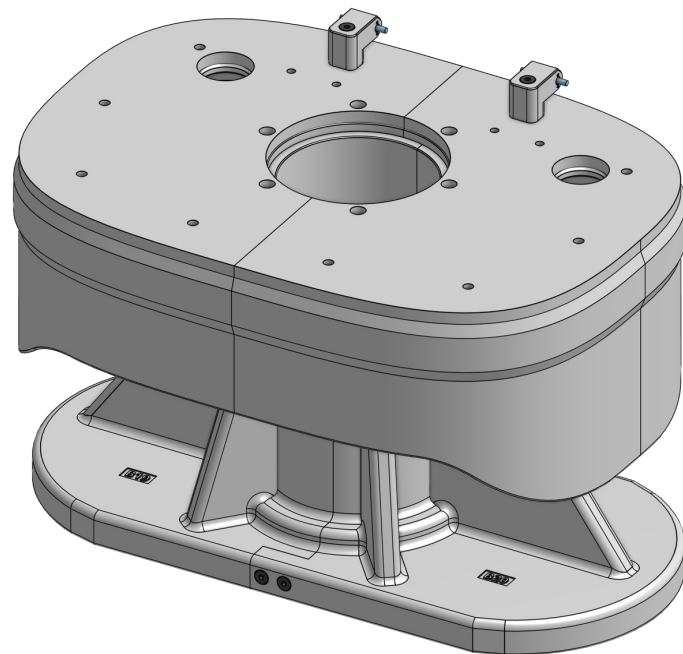
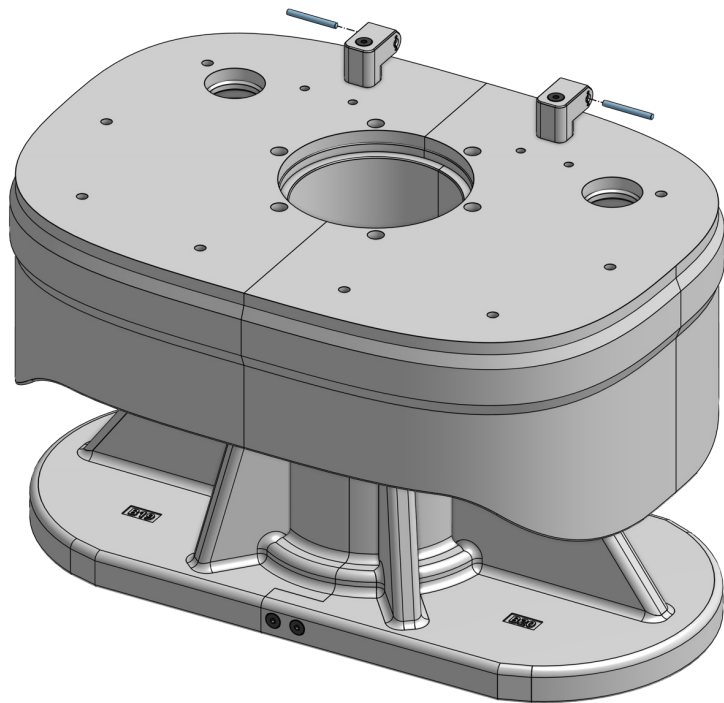
2



2x



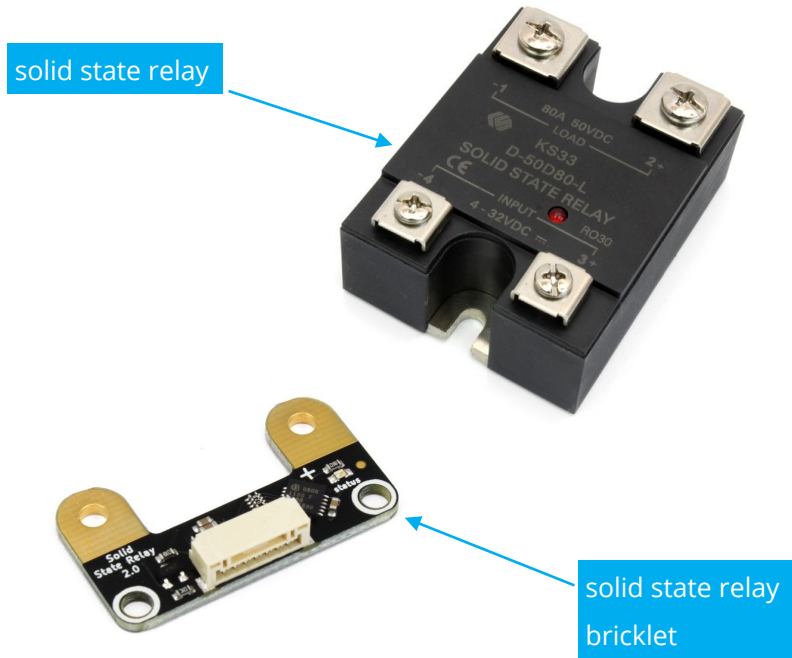
Insert 2 x **M08** to both **B48**.



Step 6b

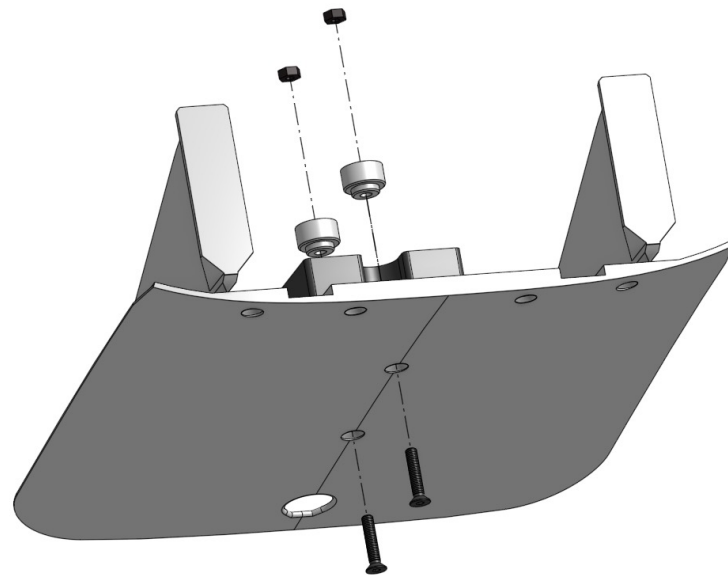
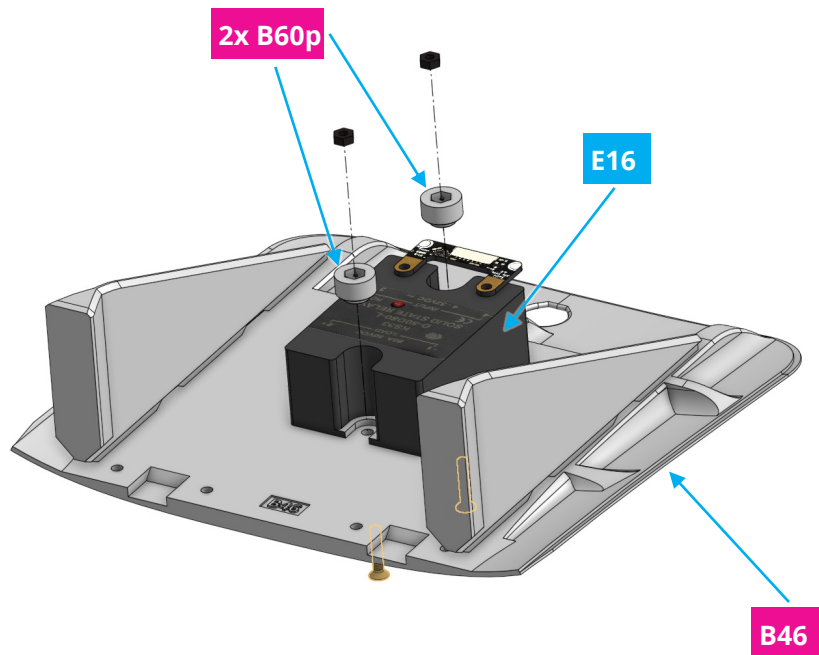


Connect **solid state relay bricklet** and **solid state relay** using 2 screws from the relay. This assembly will be called **E16** from now on.



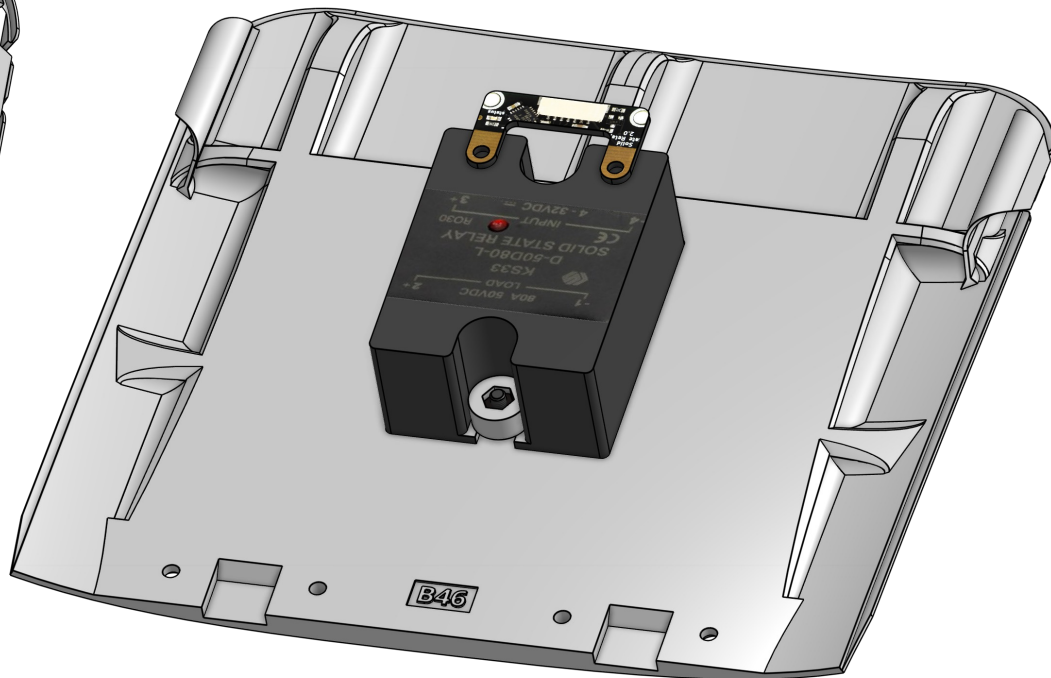
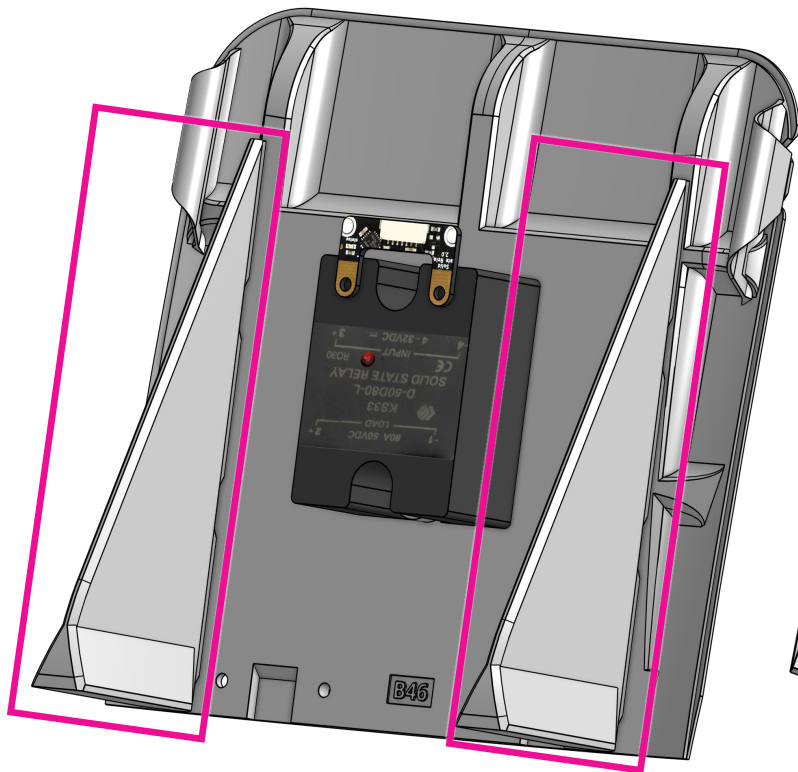
Step 6c

Connect **E16** to **B46** using **2 x B60p**, **2 x M3 nuts** and **2 x M3 18mm screws**.



Step 6d

Remove the print helpers from **B46** gently with your hands or a plier



Step 7

Connect **B46** to the previous assembly using **2 x B49**, **4 x M3 nuts** and **4 x M3 10mm screws**.



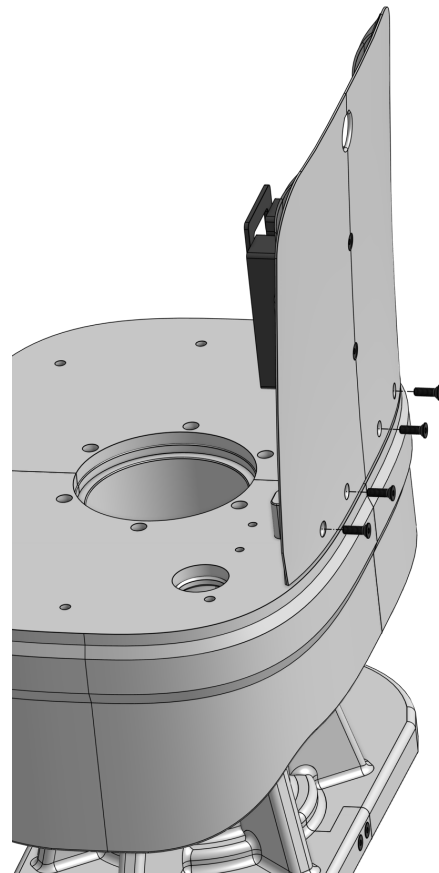
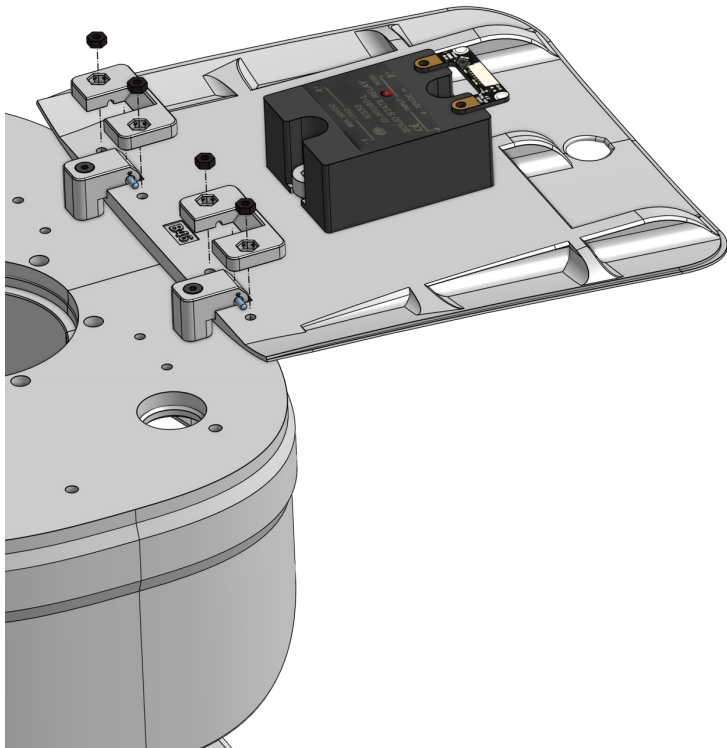
2



4x



4x

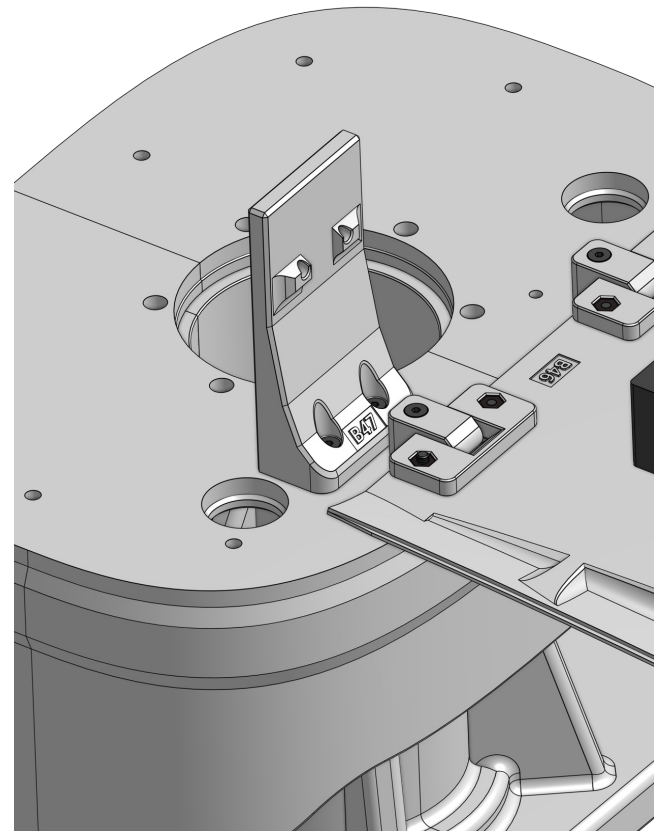
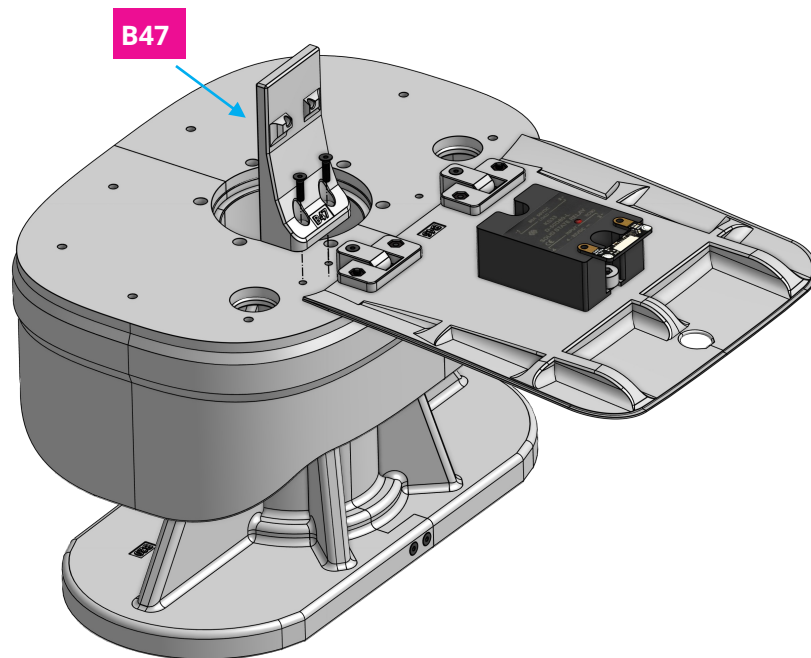


Step 8a

Connect **B47** to assembly using 2 x **M3 16mm** screws.

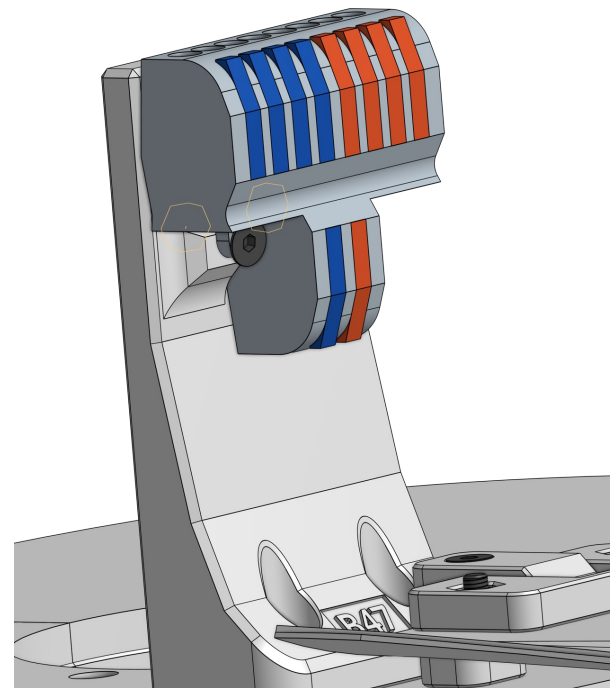
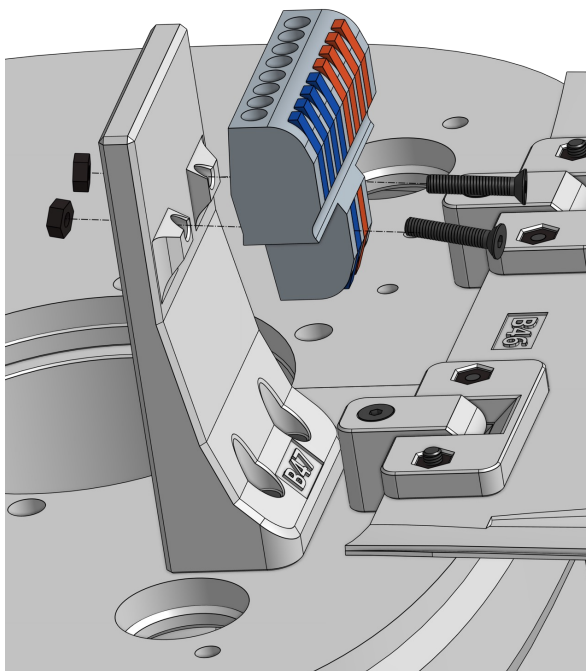


2x



Step 8b

Connect **E13** to **B47** using **2 x M3 nuts** and **2 x M3 12mm screws**.



Step 9a

Connect **B42-L** and **B42-R** using **3 x M3 nuts** and **3 x M3 10mm screws**.



2

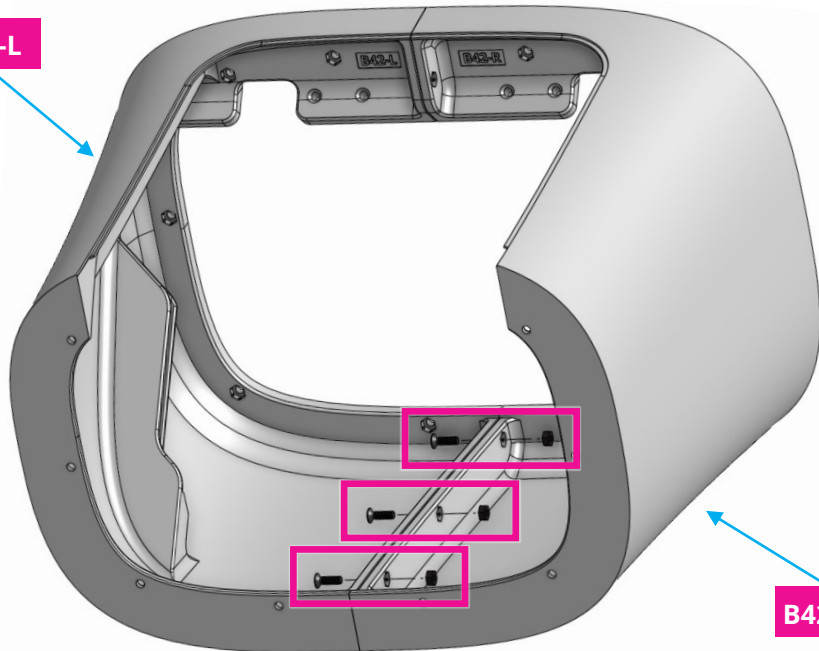


3x

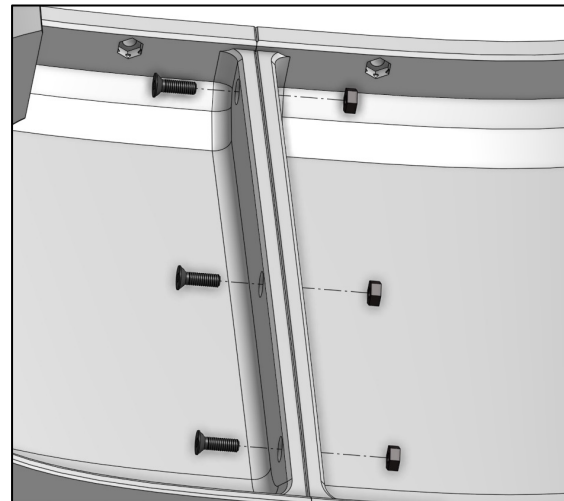


3x

B42-L



B42-R



Step 9b

Place **10 x M3 nuts** in **B42** and improve connection between **L** and **R** using **1 x M3 nut** and **1 x M3 10mm screw**.



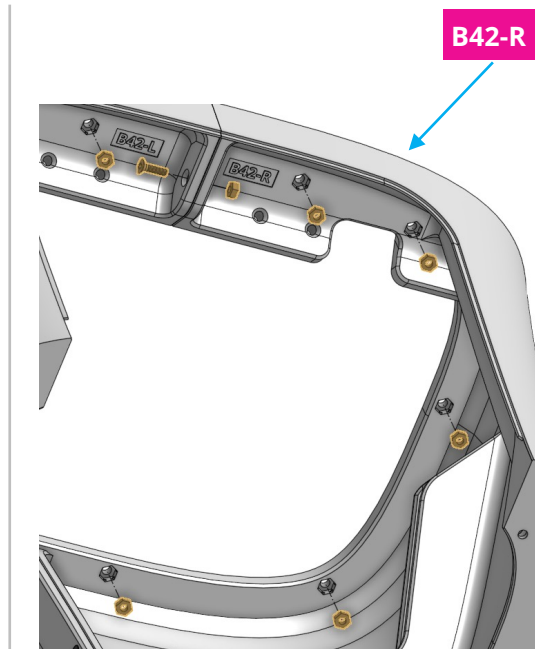
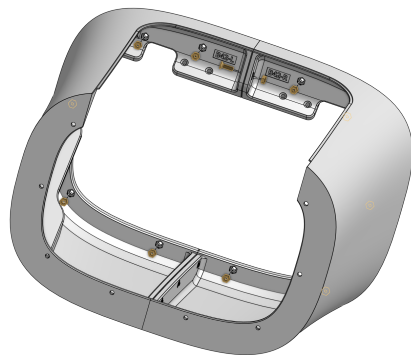
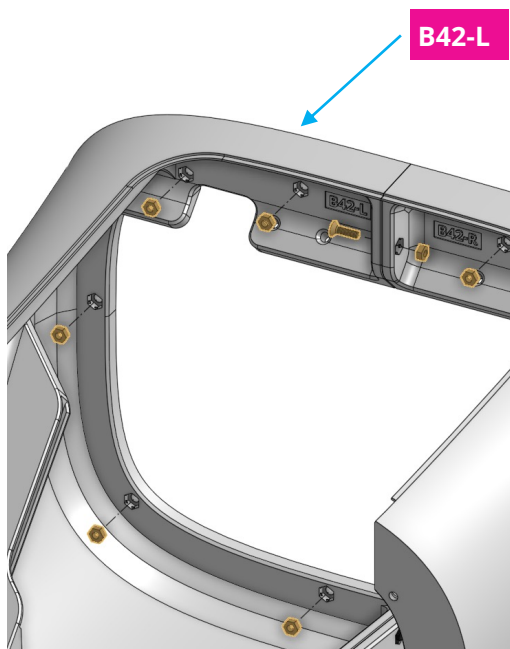
2



11x

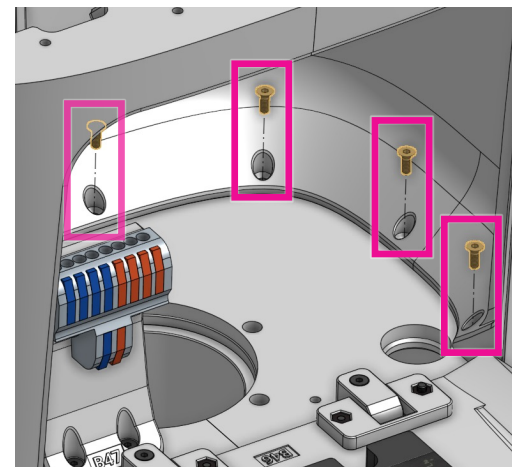
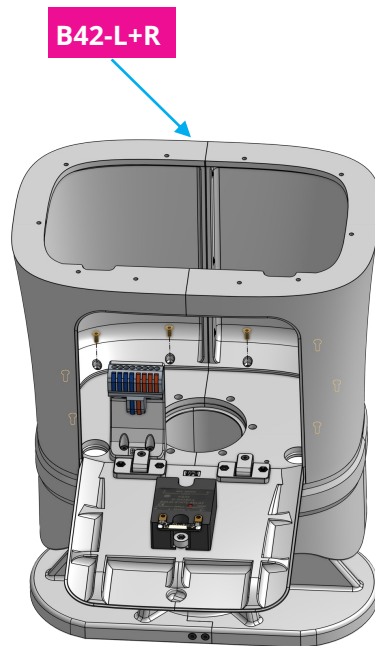
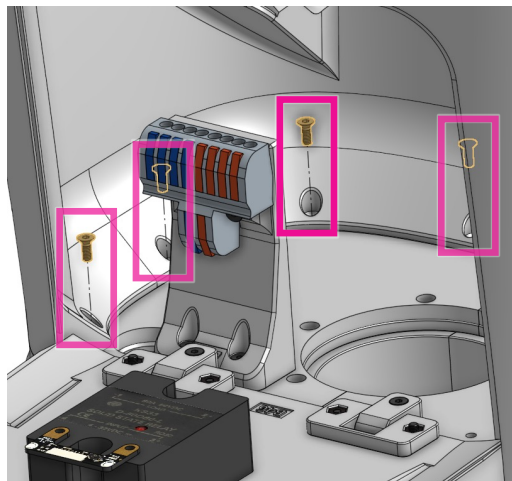


1x



Step 9c

Connect ribcage (previous assembly) to assembly from step 7 with **8 x M3 12mm screws**.



Step 10a

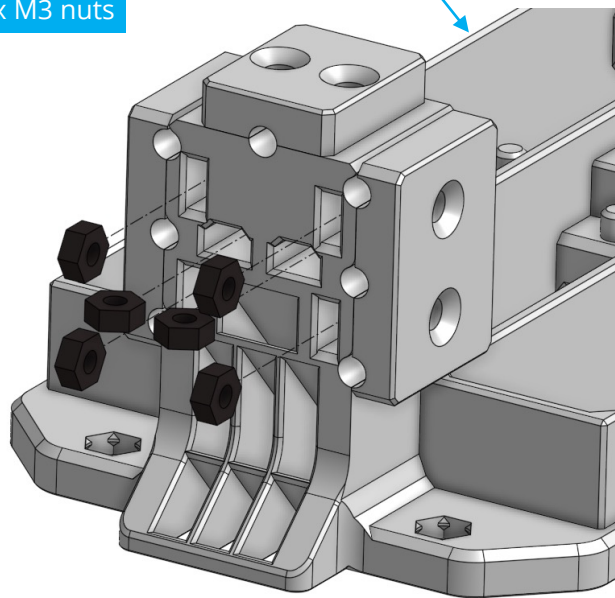
Place **20 x M3 nuts** in **B51**.



20x

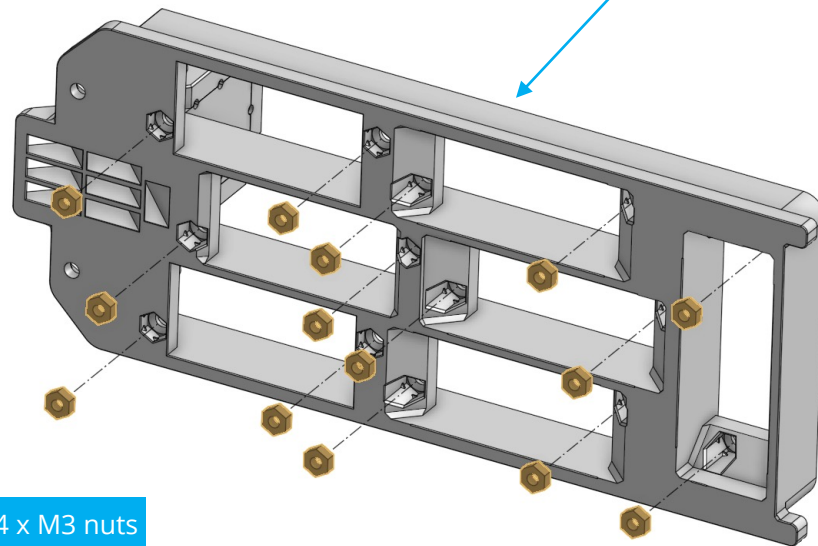
6 x M3 nuts

B51



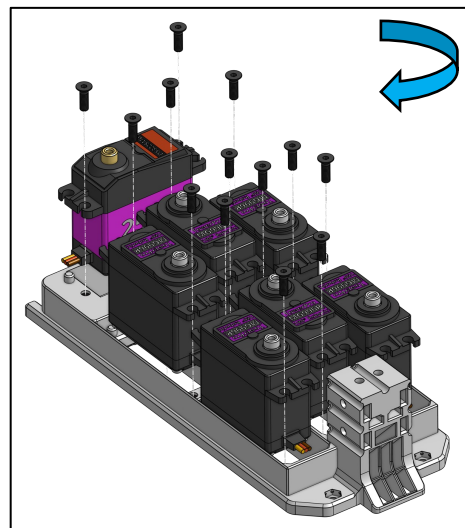
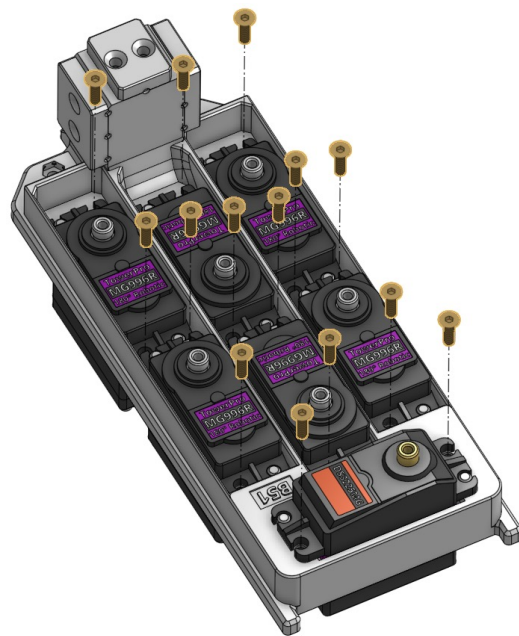
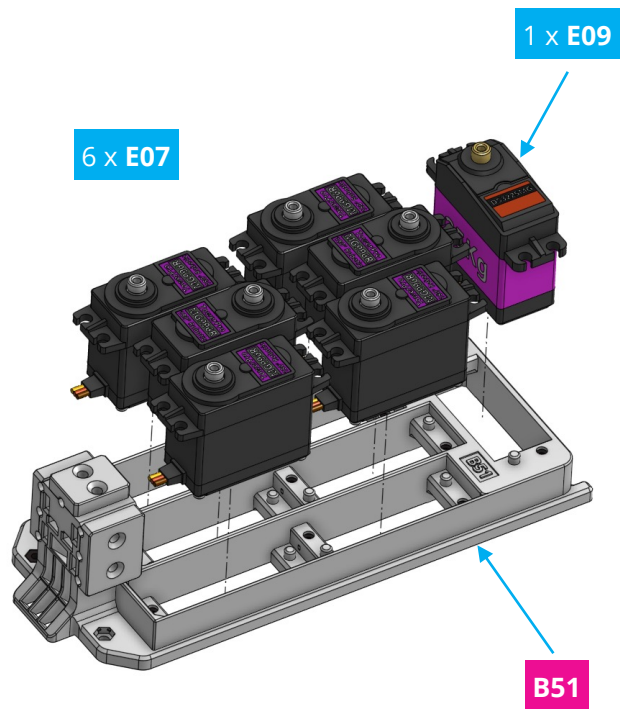
B51

14 x M3 nuts



Step 10b

Assemble 6 x **E07** motors and 1 x **E09** in using 14 x **M3 10mm** screws.



Please revert to step 0 and calibrate the motor if it was not calibrated

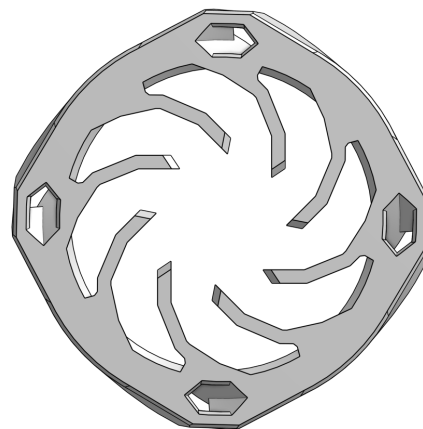
Note

Turn **B26** around to switch orientation between clockwise (CW) and counterclockwise (CCW).

Clockwise (CW)



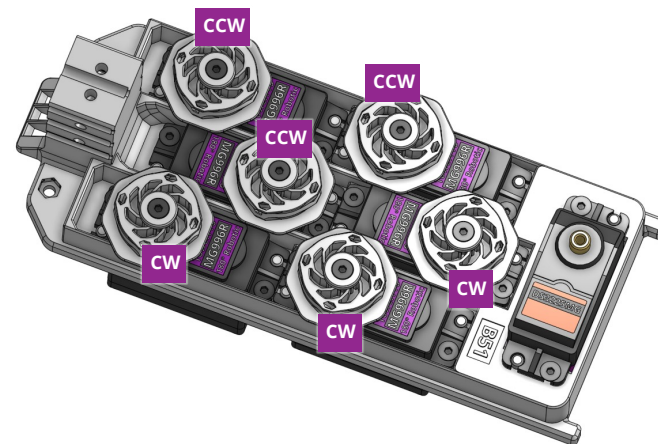
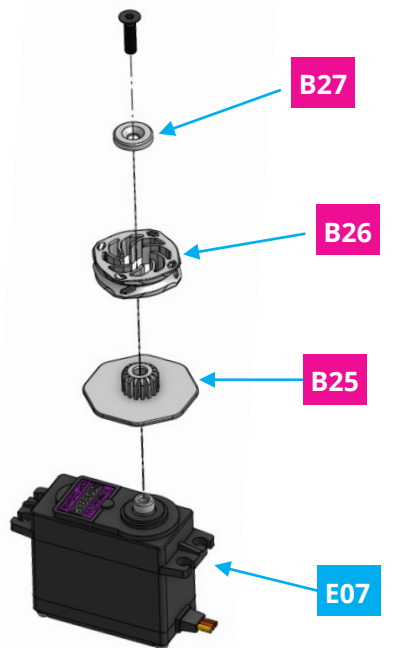
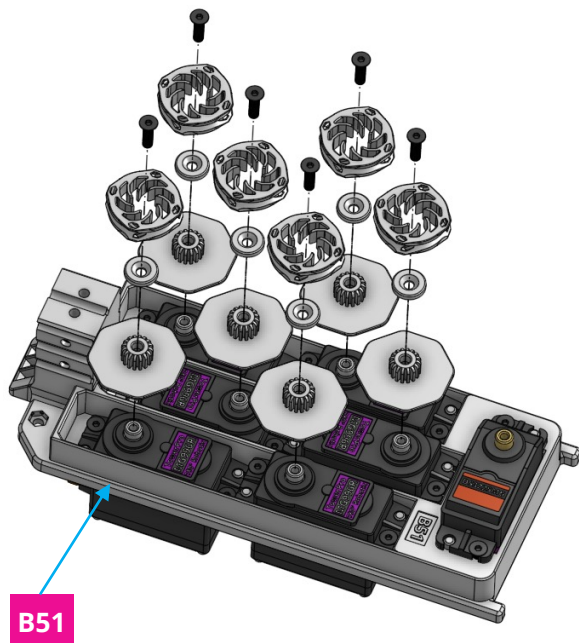
Counter clockwise (CCW)



Step 10c



Assemble wire connectors using the shown arrangement by using **6 x B25**, **B26**, **B27** and **6x M3 12mm screws**. Make sure **B26** orientation matches the shown one the right picture.



Step 10d

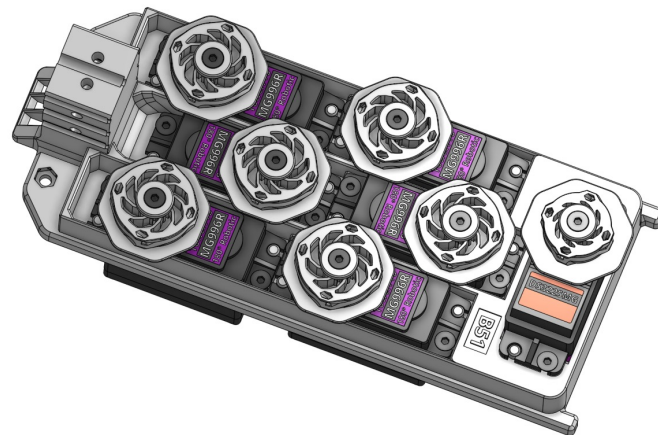
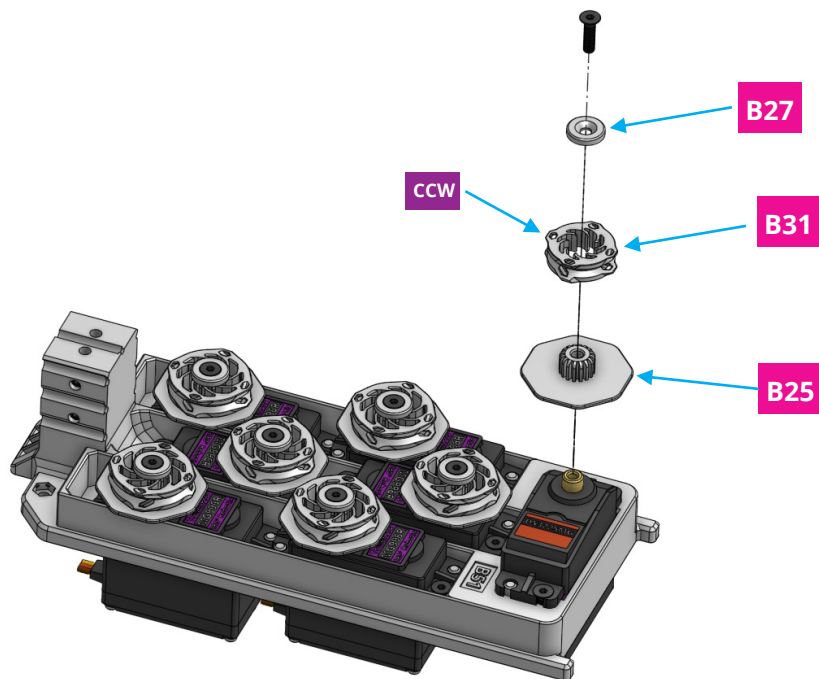
Assemble wire connectors using the shown arrangement by using **B25**, **B31**, **B27** and **1x M3 12mm screw**. Make sure **B31** is switched to counterclockwise orientation.



2



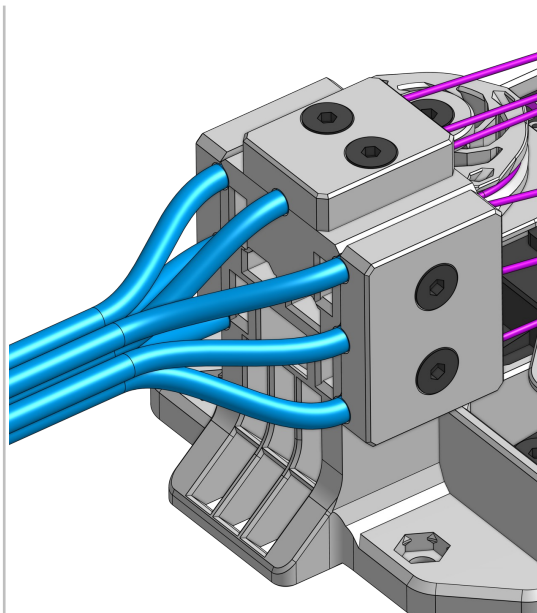
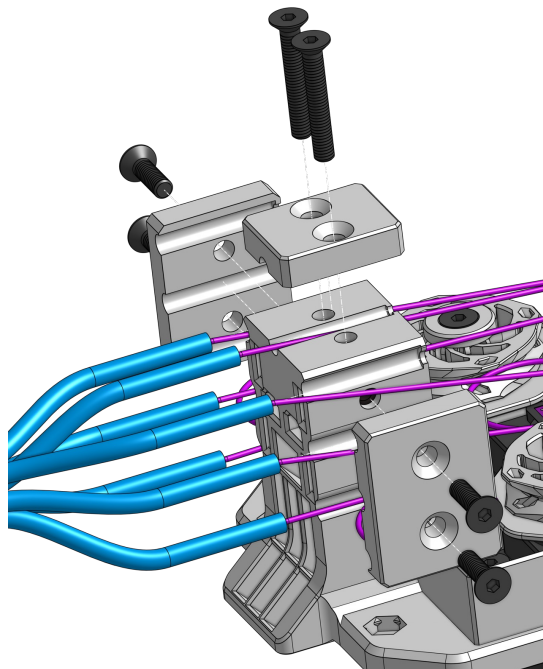
1x



Step 10e

Insert the **teflon tubes** from forearm through the shown spots and use **2 x B52**, **1 x B53** and **2 x 20 mm** screws **and 4 x 10 mm** to fix them.

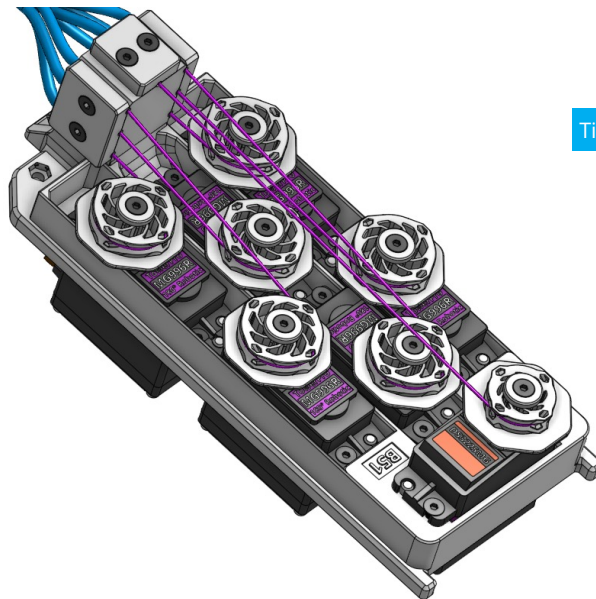
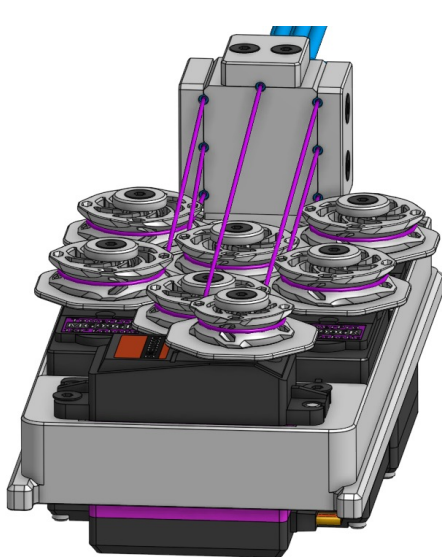
(Tipp: Wrap 2 x pieces of tape around each end of the tube before fixing them to have better grip.)



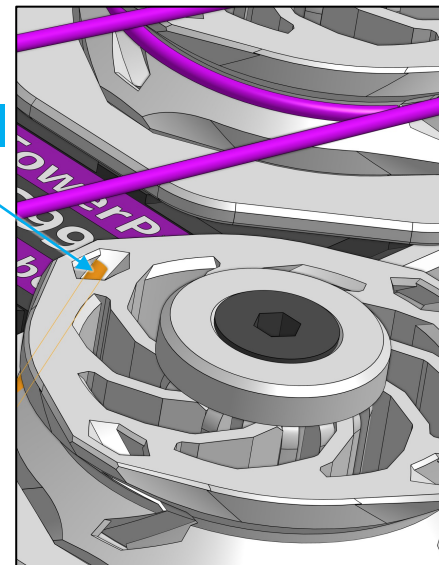
Step 10f



Insert **fluorocarbon wires** coming out of the **teflon tubes** in shown holes of the **B26** and **B31** connectors and tight a knot at the end to fix them. Wires and tubes will be hidden in following slides.

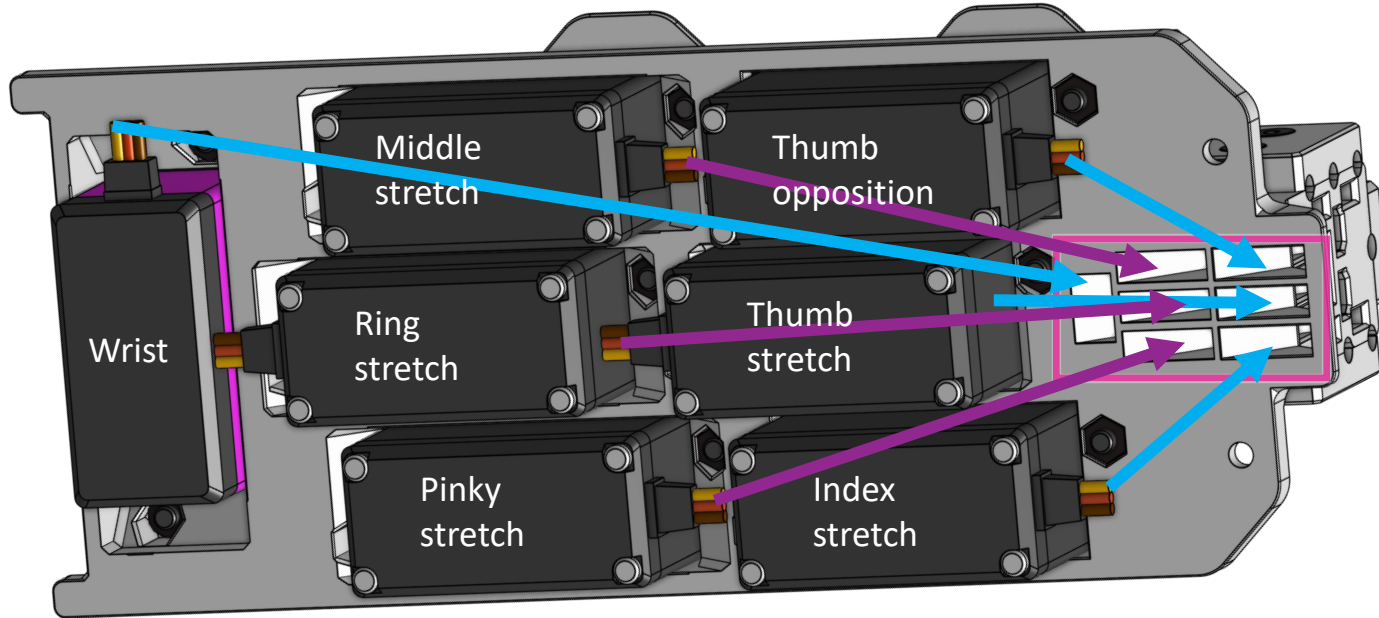


Tie a knot here



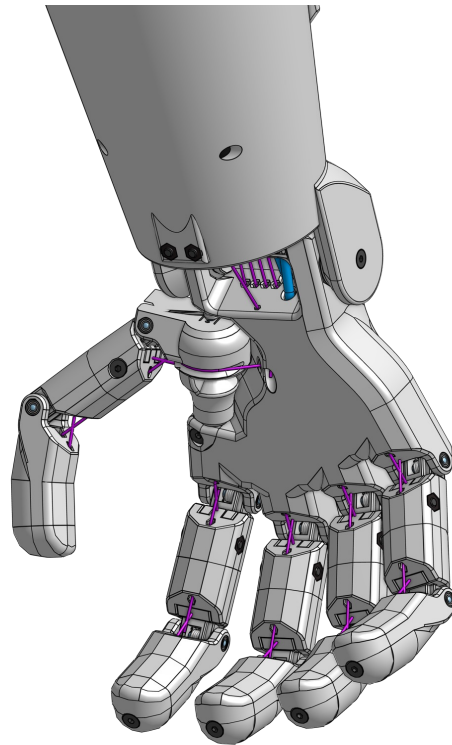
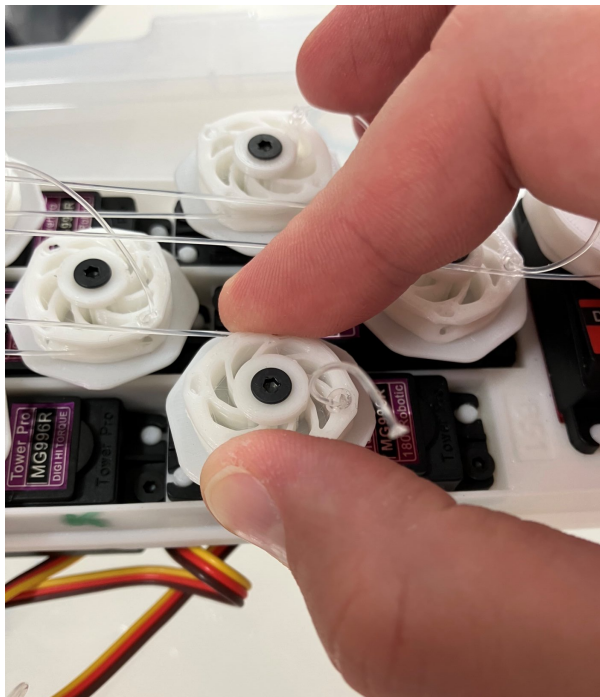
Note

Guide servo wires through the shown holes with an arrangement that makes it easy to connect servos to electronics later, illustrated is a recommended arrangement



Note

After inserting the wire tigh a knot like shown in the picture, and rotate the spindle until the wires are tight while fingers are at around 45 degrees



Note

If you overtighten the spindle and need to reset, unscrew it, rotate it and screw it again



Step 11

Slide servo array into ribcage and fix it using **1 x M3 nut** and **1 x M3 16mm screw**.



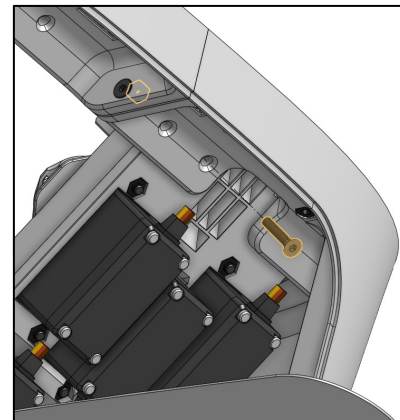
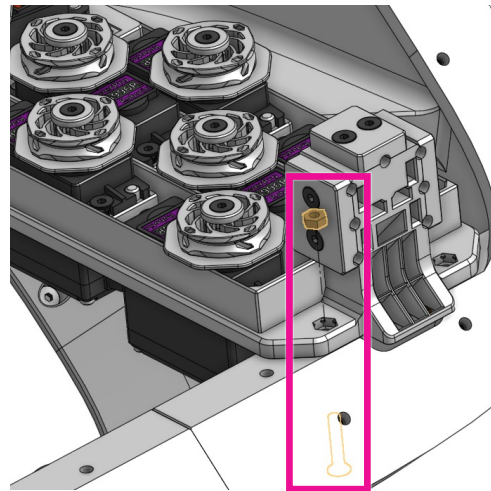
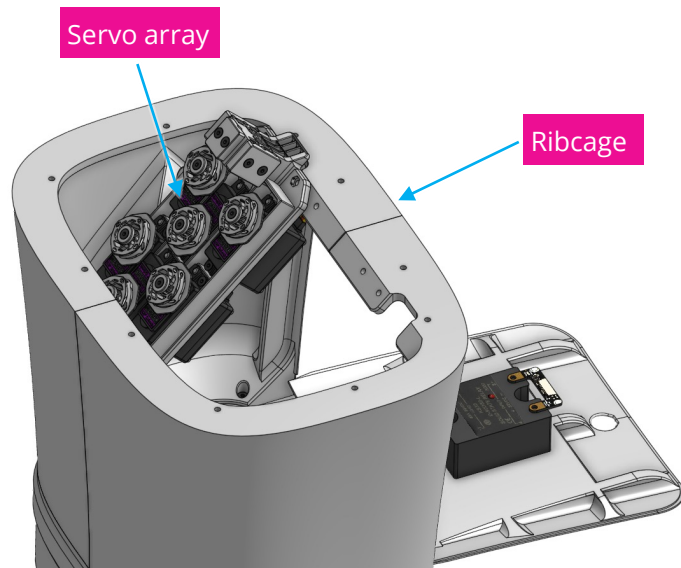
2



1x

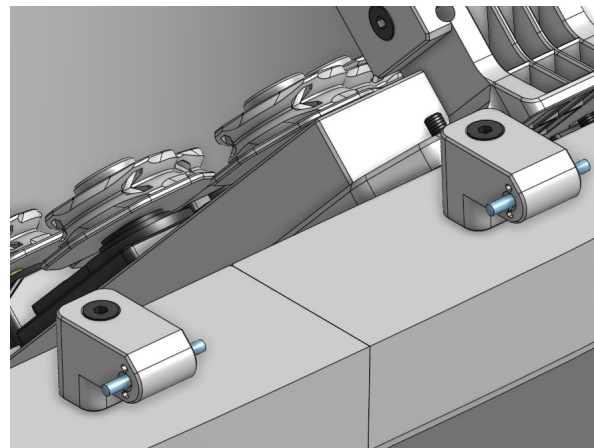
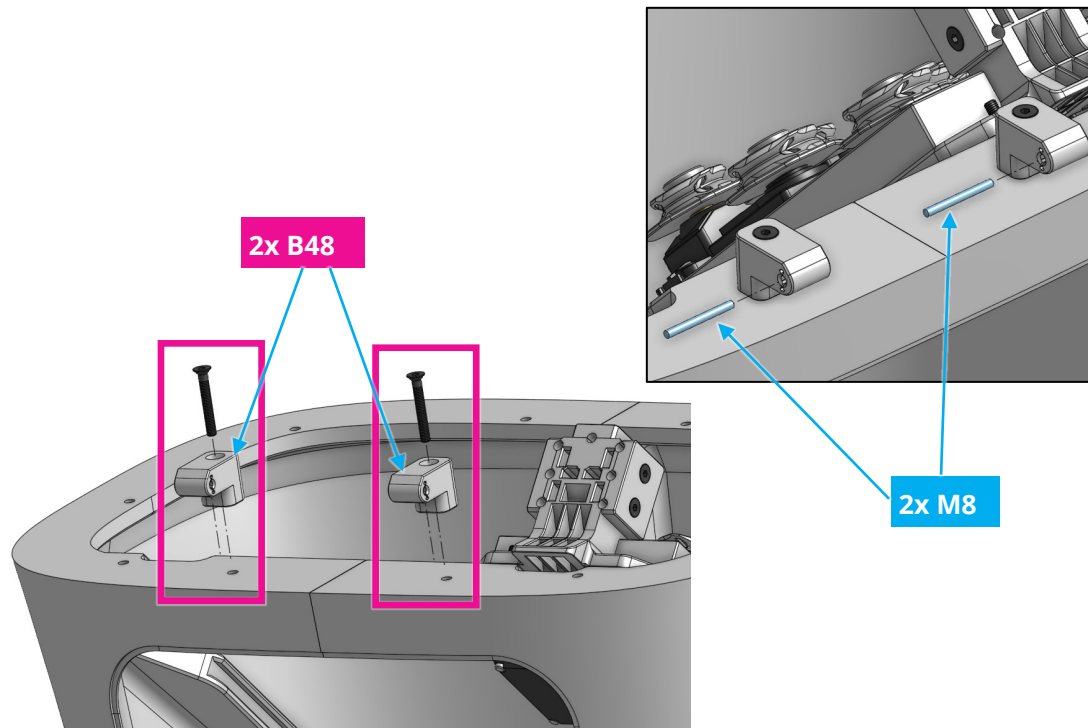


1x



Step 12a

Assemble **2 x B48** to assembly using **2 x M3 22mm screws** and insert **2 x M08**.



Step 12b



8x

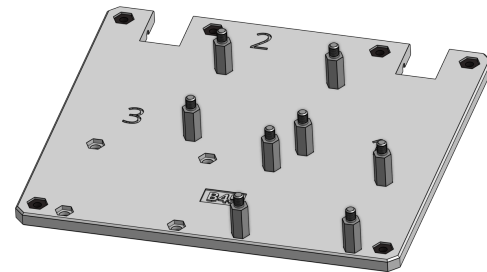
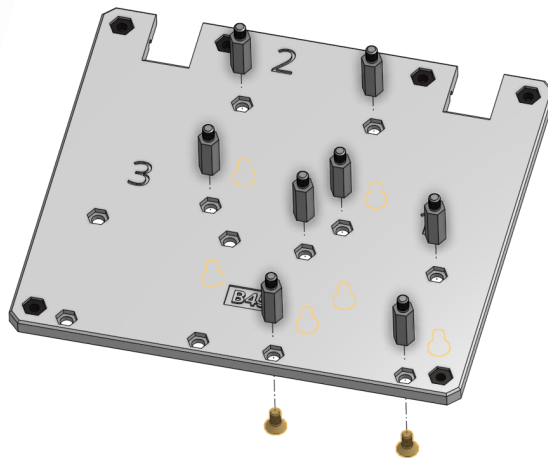
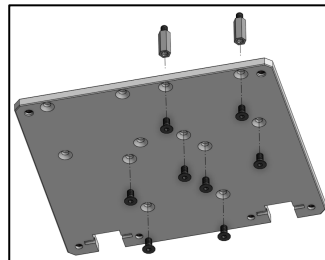
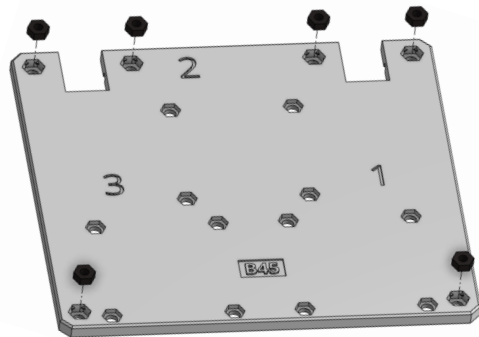


6x



8x

Insert **6 x M3 nuts** and **8 x M13 distancers** in **B45**. Fix the distancers using **8 x M3 6mm screws**.



Step 12c

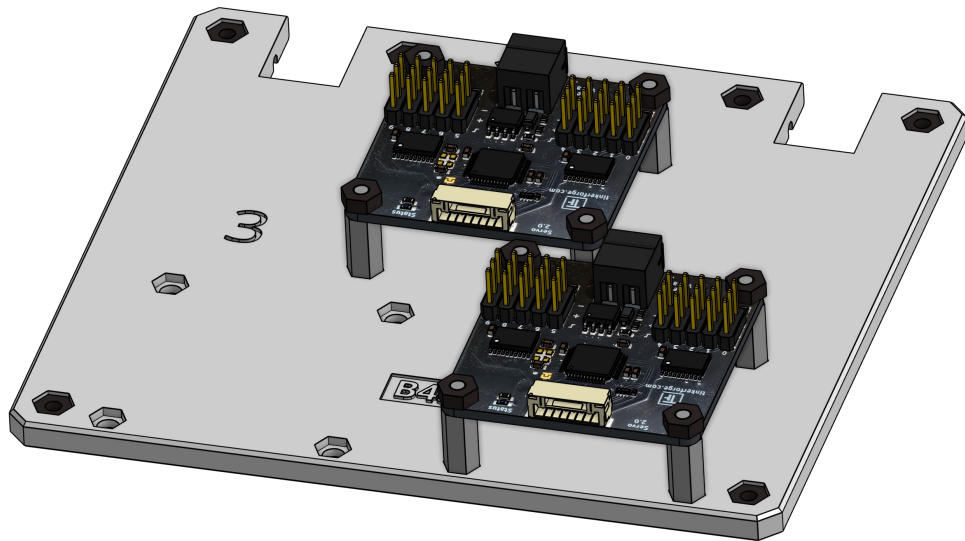
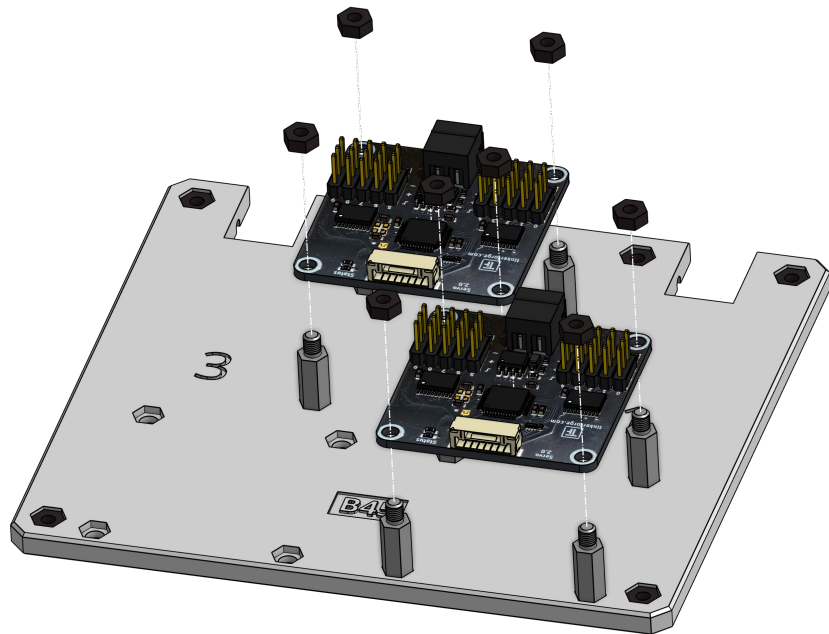
Connect **2 x E03** to the assembly and fix them using **8 x M3 nuts**.



2



8x

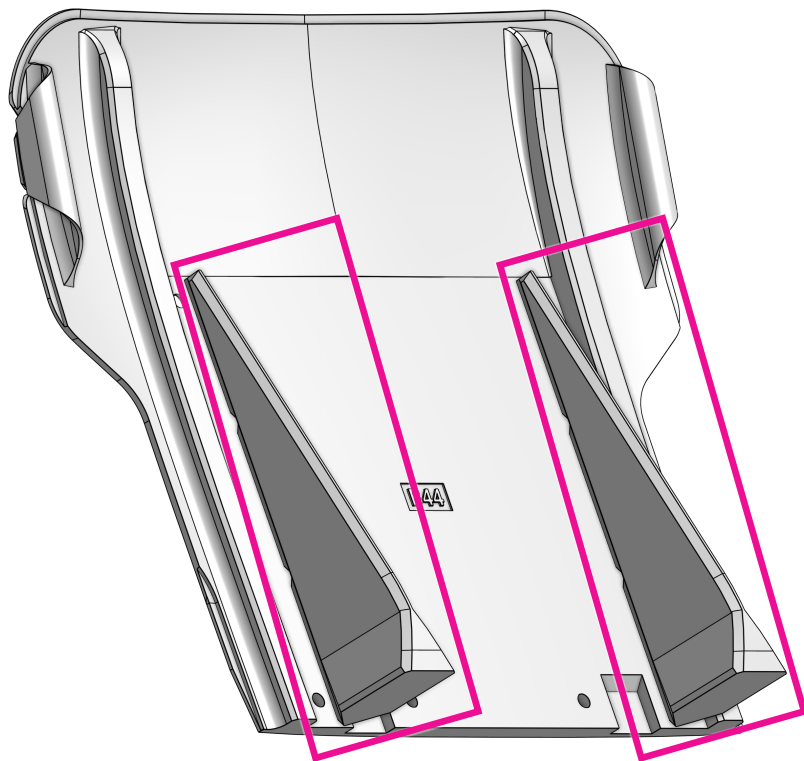


Step 12d

Remove support structure gently from **B44** with hands or plier



2

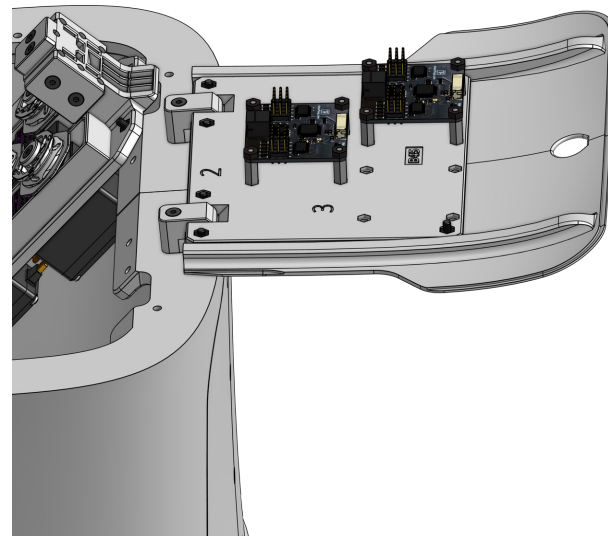
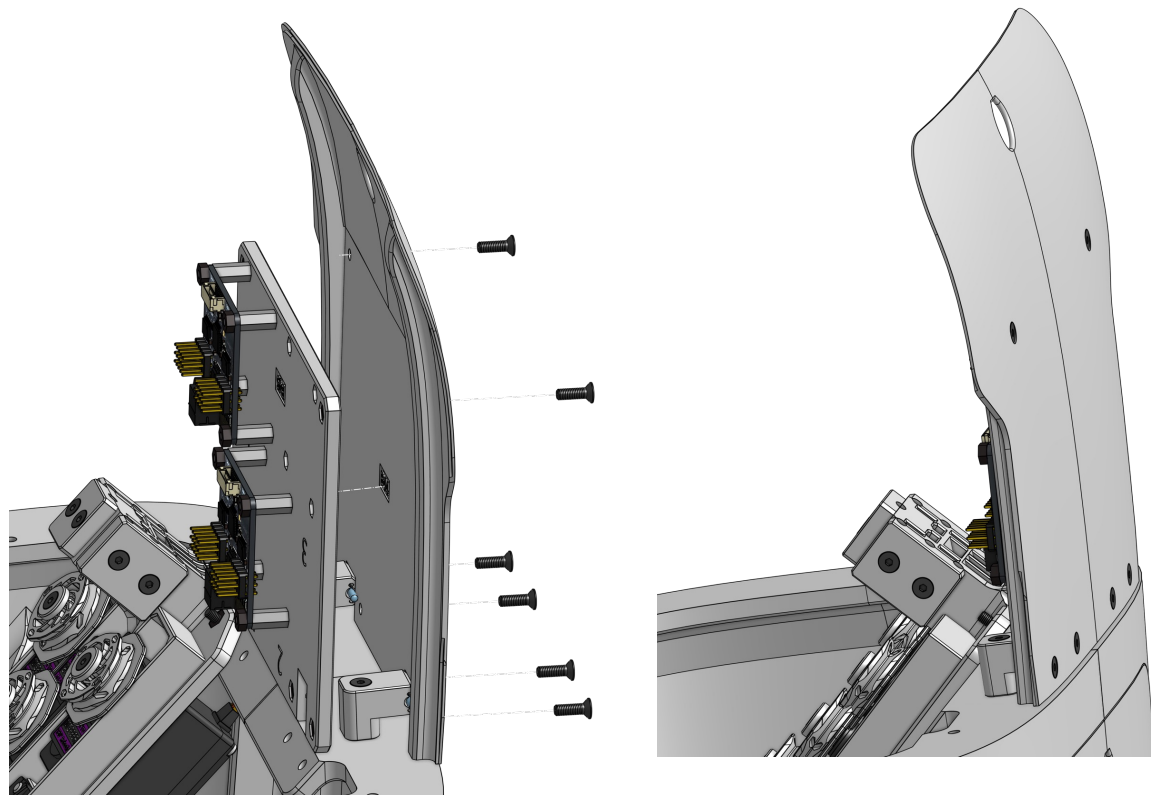


Step 12e

Connect **B44** to **B45** using 6 x M3 10mm screws.



10x

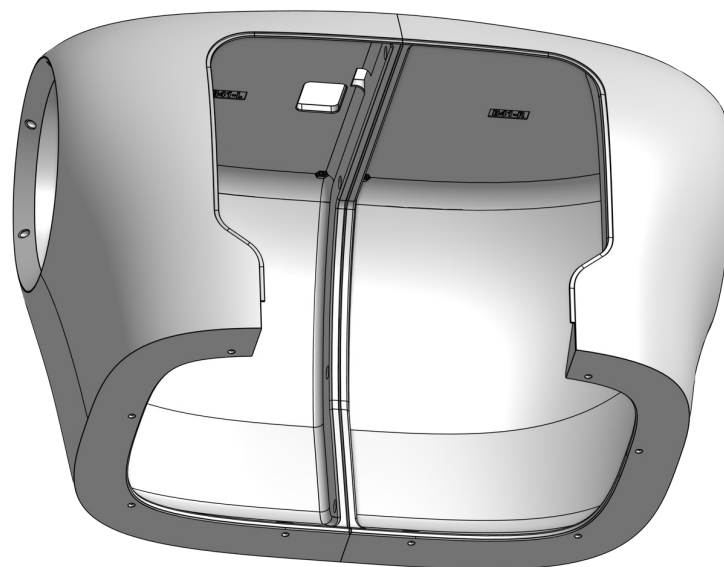
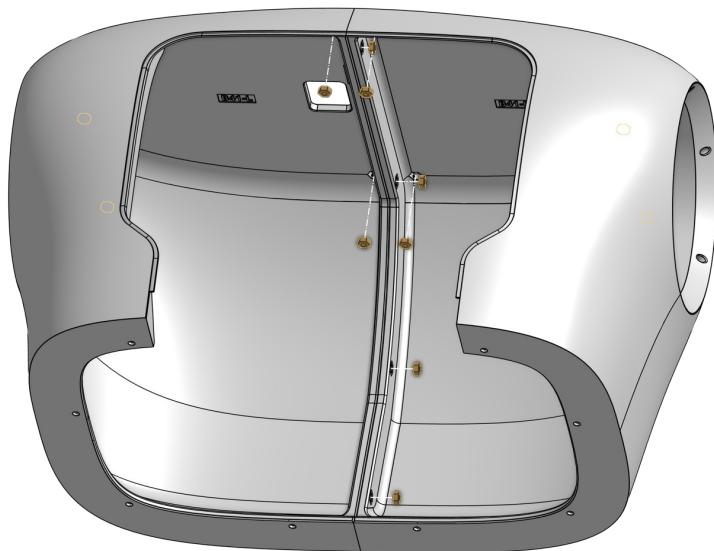


Step 13a

Insert **12 x M3 nuts** into **B41-L** and **B41-R**.



12x



Step 13b

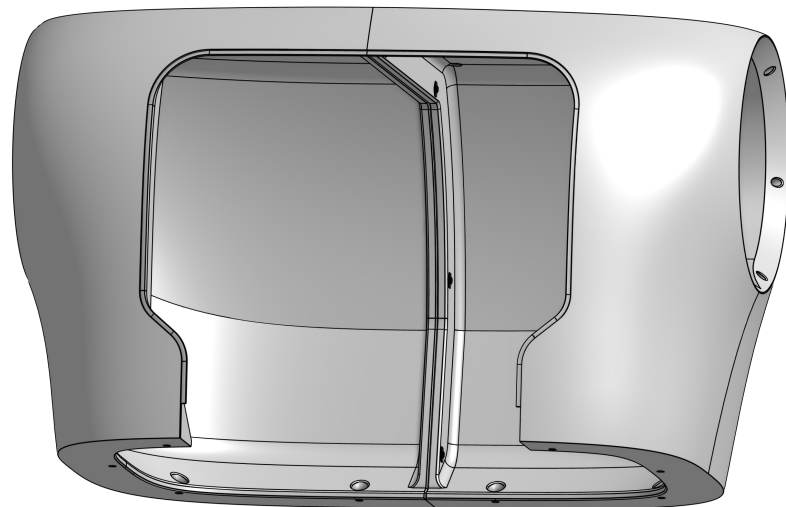
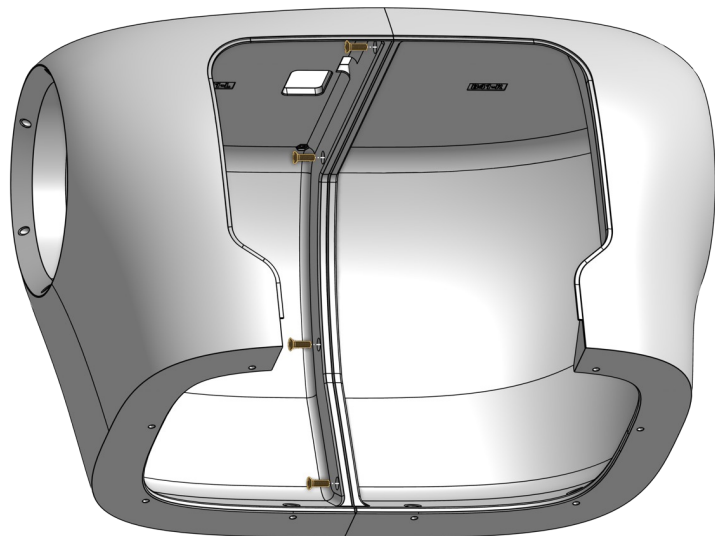
Connect **B41-L** to **B41-R** using 4 x **M3 10mm** screws.



2

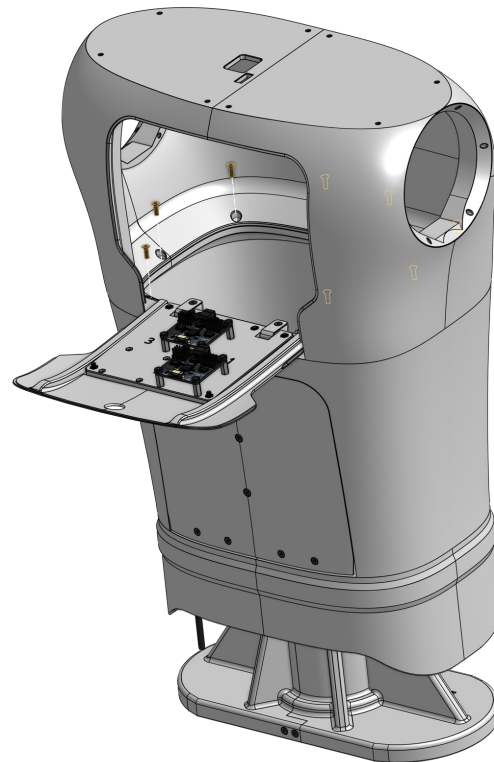
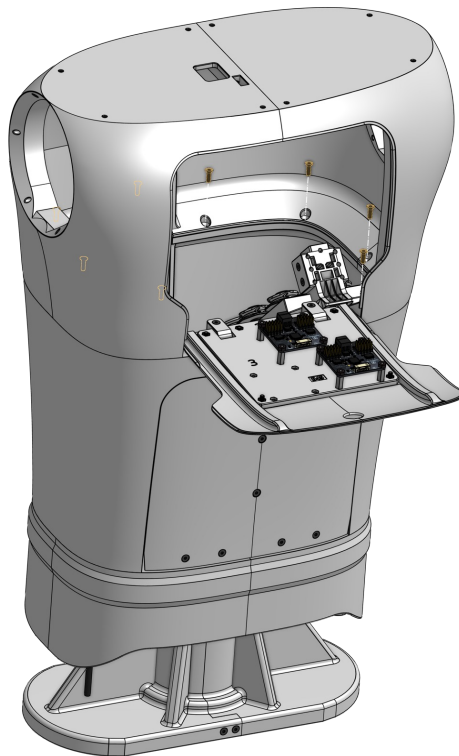
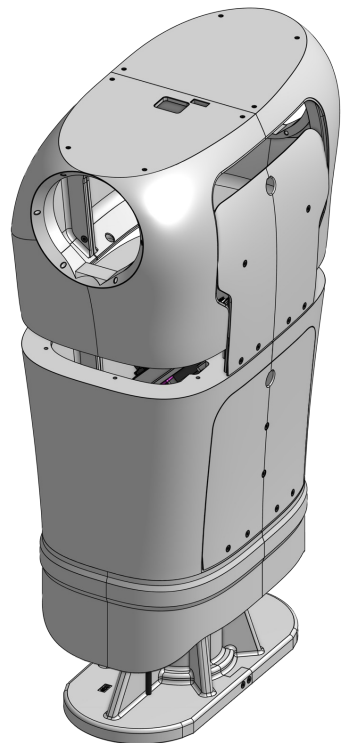


4x



Step 13c

Connect **Clavicles** to **assembly** using 8 x **M3 10mm** screws.



Step 14a

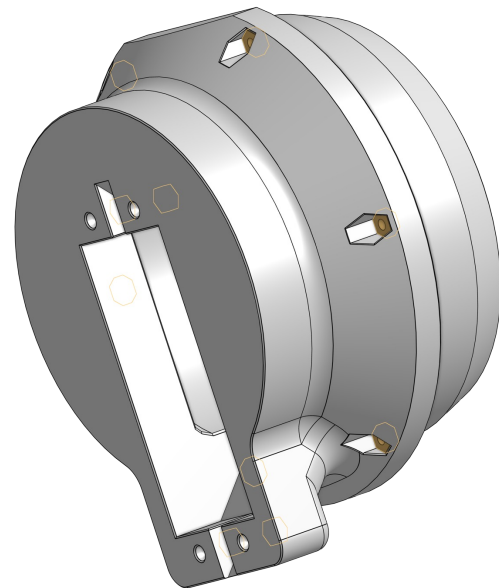
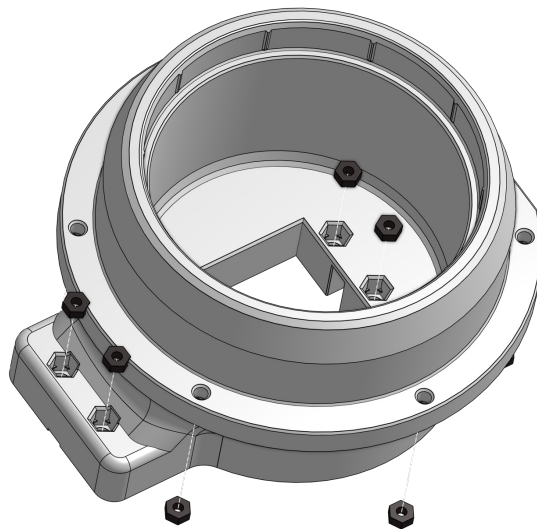
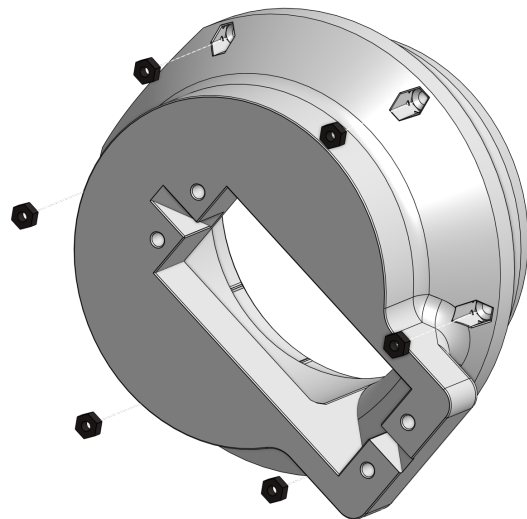
Insert 12 x **M3** nuts in **C61**.



2



10x



Step 14b

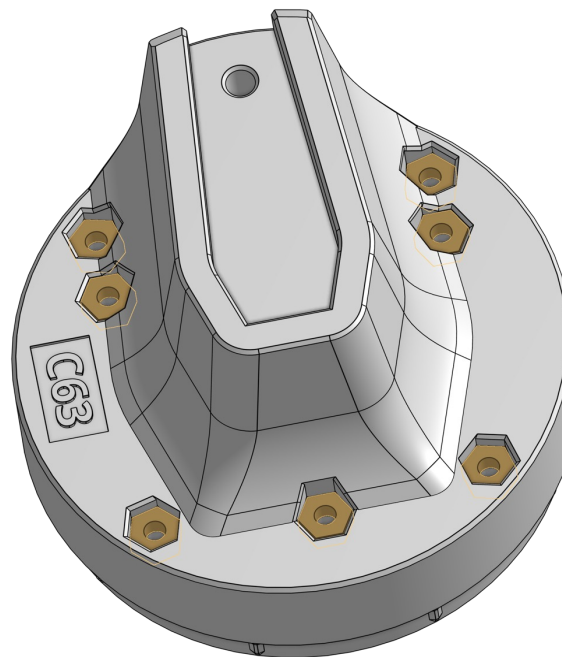
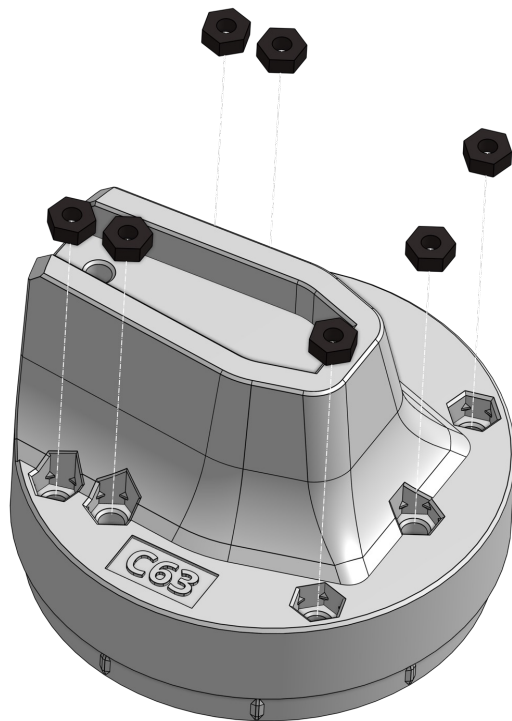
Insert **7 x M3 nuts** in **C63**.



2

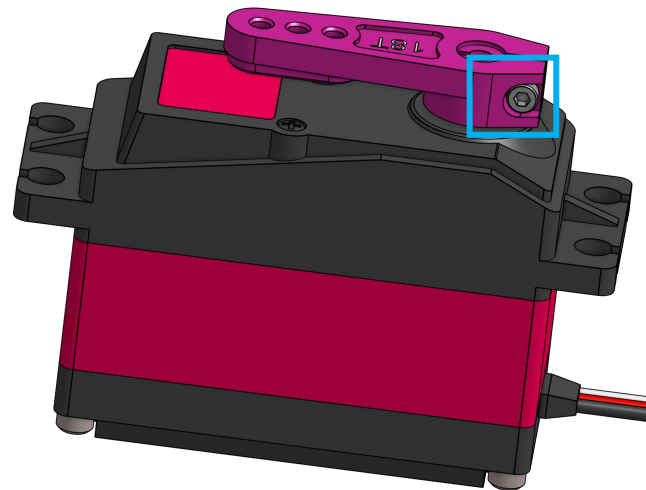
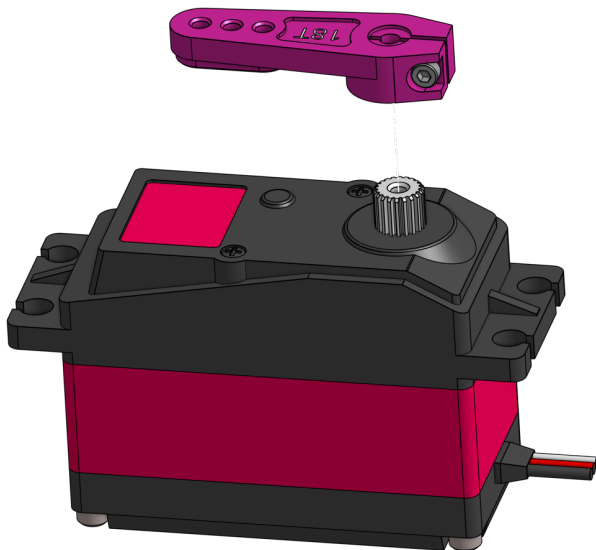


7x



Step 15a

Attach **M17** to **E15** and tighten the connection using the shown screw.



Please revert back to step 0 and calibrate the motor if it was not calibrated

Step 15b

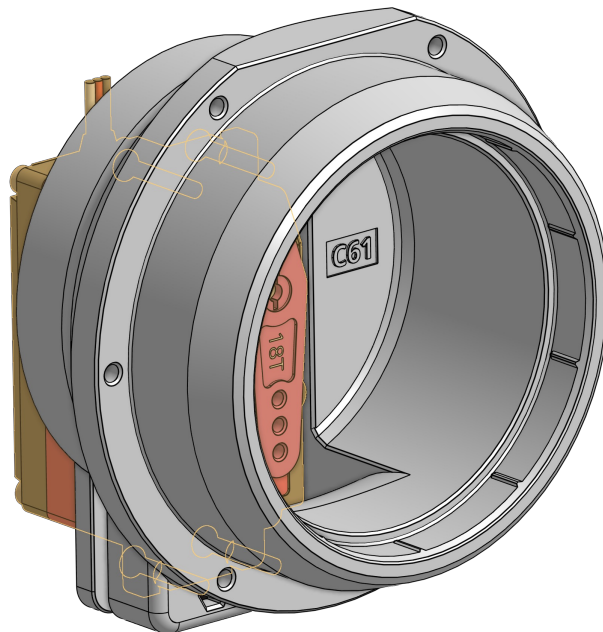
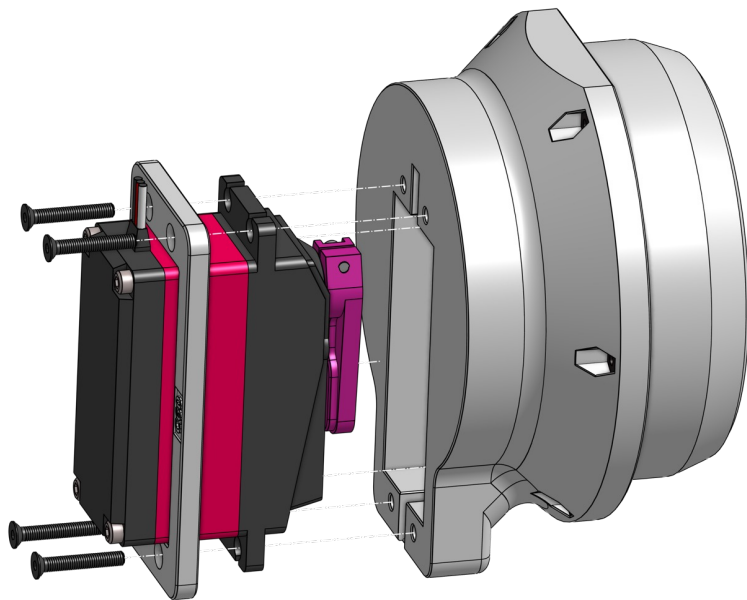
Attach **E15** to **C61** using **C60** and **4 x M3 20mm** screws.



2



4x



Step 15c

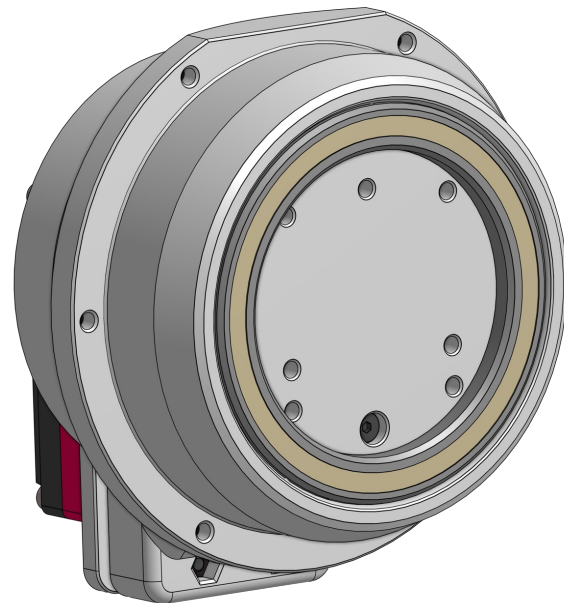
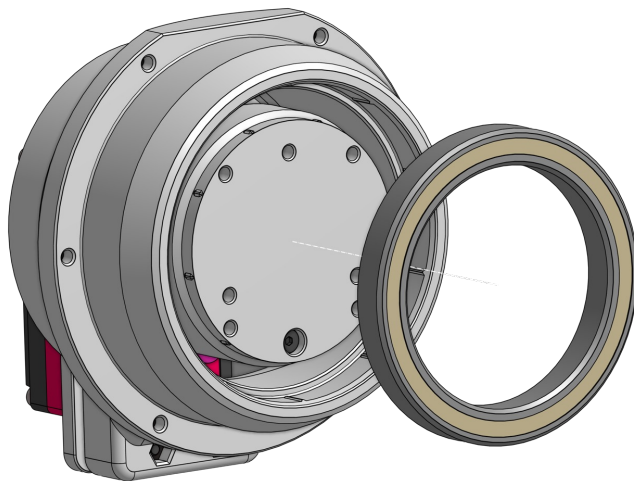
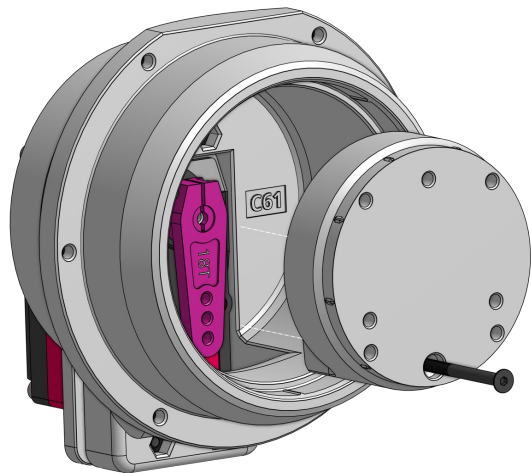
Attach **C63** to assembly using **1 x M3 40mm** screw and place **1 x M04** ballbearing on top.



2

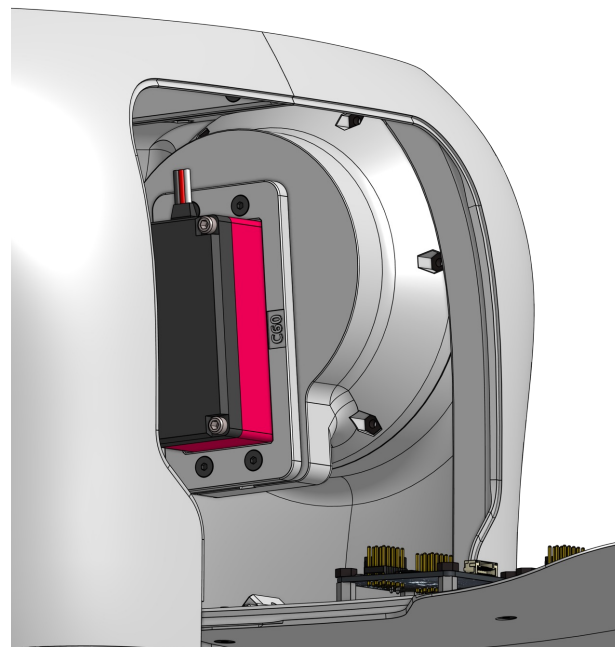
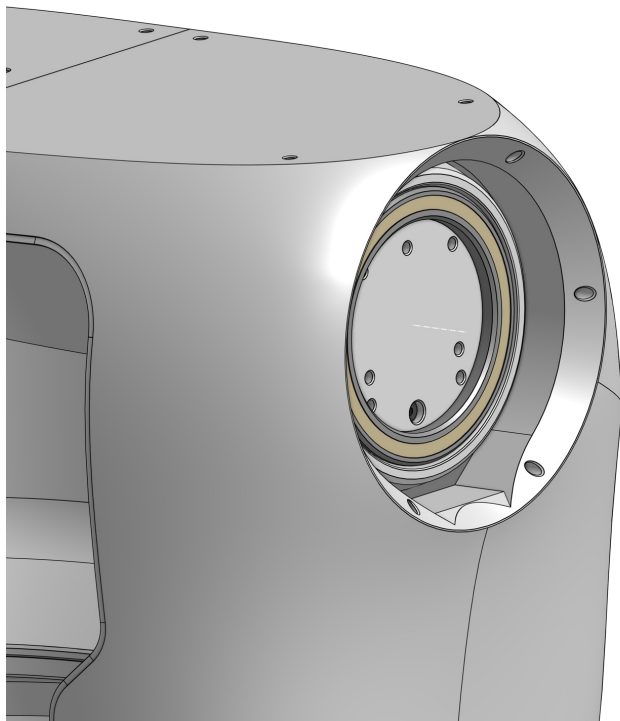


1x



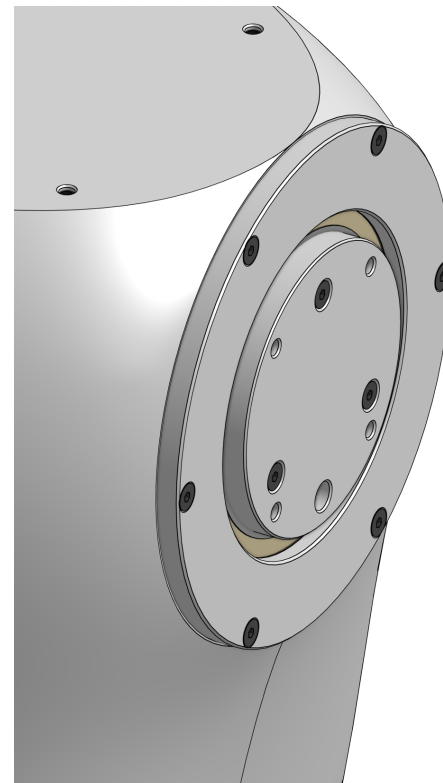
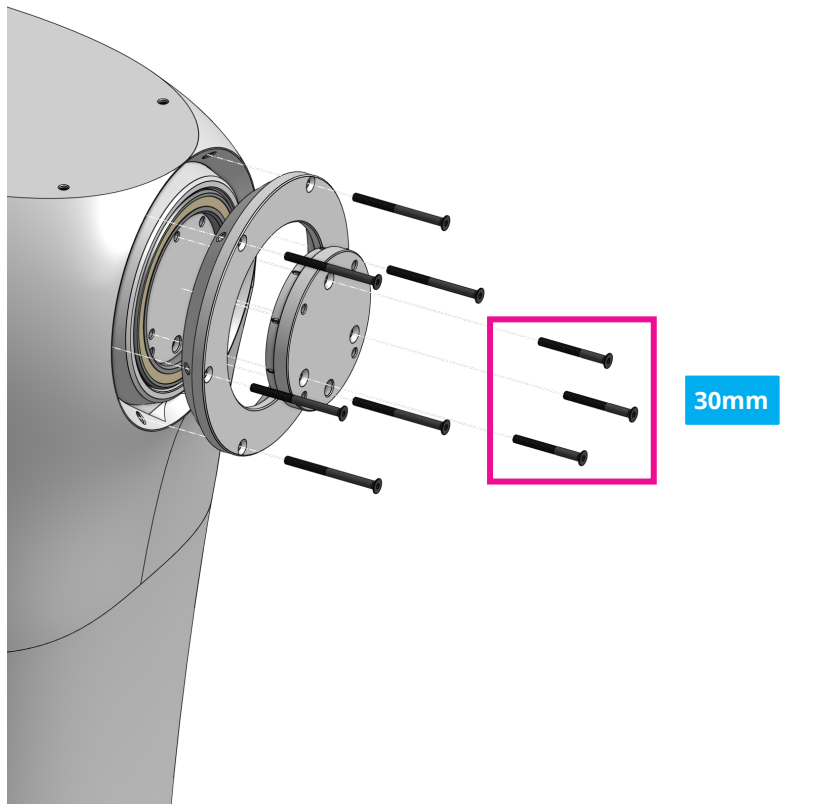
Step 16a

Place assembly into clavicles like shown in the pictures.



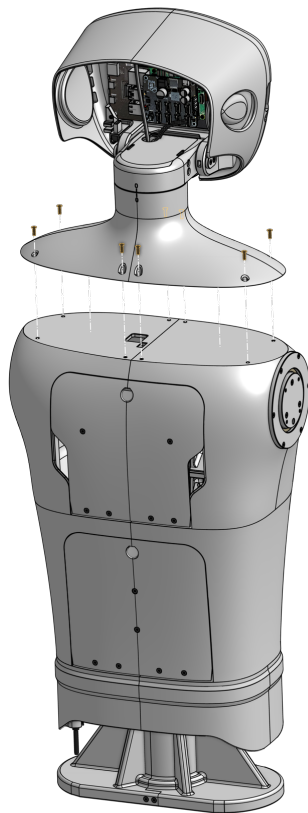
Step 16b

Fix the shoulder using **C62** and **C64** with **6 x M3 40mm** screws and **3 x M3 30mm** screws.

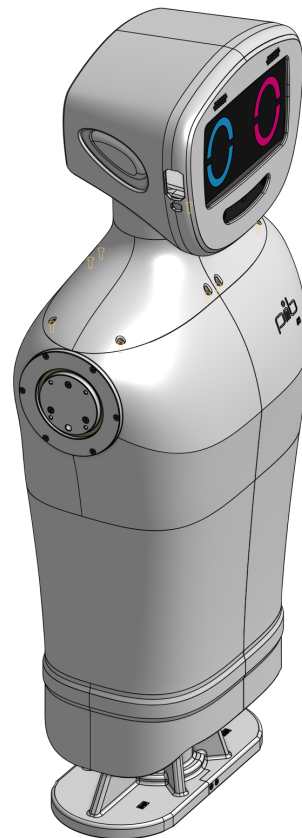


Step 17

Assemble neck and head to upperbody using **8 x M3 10mm screws**.



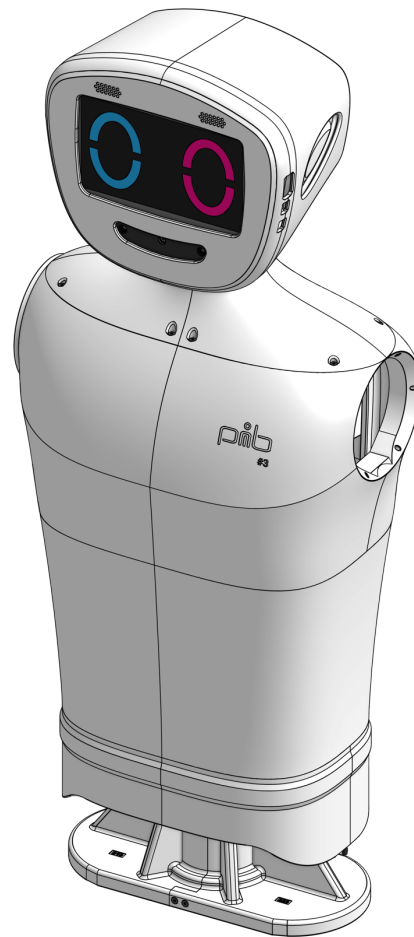
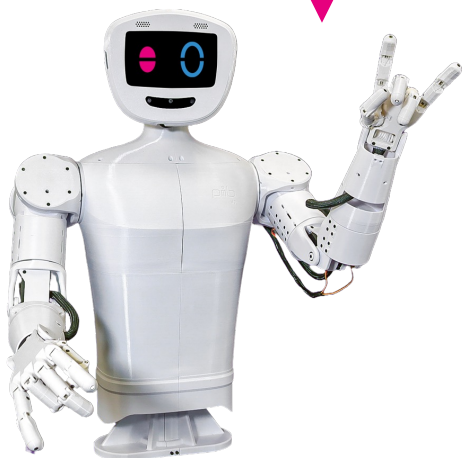
8x



Congratulations

You did a great job, pib's upper body is assembled!

Well done!



Do you need support?

Or do you need our pib.Box with all non-printable parts?

Or maybe you have some new ideas and improvements?

Please contact us.



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